OmniSTAR 8305HP

User Manual

Issue 1.14, October 2010

Notice to Customers

This manual has been produced to ensure the very best performance from your OmniSTAR receiver. The manual has been clearly set out with simple instructions to ensure trouble free usage of your OmniSTAR receiver.

This publication could contain technical inaccuracies or typographical errors. Changes are periodically made to the information herein; these changes will be incorporated in new editions of the manual.

Should you require further assistance please contact your local dealer or the OmniSTAR B.V. office.

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One-Year Limited Hardware Warranty

OmniSTAR B.V and its operating companies world-wide (OmniSTAR), warrants this product to be free from defects in workmanship and material for a period of one year from the date of original sale by OmniSTAR or its authorised dealers, to the original purchaser or end user.

OmniSTAR reserves the right to repair and/or replace, at its option, any part or parts found to be defective, provided such defects, in their opinion, are due to faulty material or workmanship and are not caused by unauthorised or improper repair or abuse, or normal wear. Purchaser shall be responsible for shipping and insurance of the returned product for repair under this warranty. OmniSTAR will pay shipping and insurance for the product's return to purchaser provided that the product returned proves to be defective under this limited warranty.

This warranty applies only to normal usage of the product. It does not apply to units or electronic circuit boards defective due to improper installation or handling. Physical damage due to lightning or other electrical discharge and units subjected to fresh or salt-water contamination are not covered. OmniSTAR reserves the right not to warrant the product if, upon request, sufficient proof of recommended installation compliance as laid out in this manual is not provided. No other warranties are expressed or implied. No other warranties exist.

OmniSTAR assumes no responsibility for any consequential or incidental losses or damages of any nature with respect to the use of this product.

Manual Reference: OmniSTAR 8305HP User Manual

REVISION HISTORY		
Issue 0.1	October 2006	First Issue
Issue 0.2	October 2006	Minor changes
Issue 0.3	March 2007	Major overhaul: checked and corrected specifications, added View8300 / Viewall, added command set
Issue 1.0	March 2007	Comments on version 0.3 incorporated. First official release.
Issue 1.01	March 2007	Textual changes
Issue 1.1	March 2007	Added description of log header and firmware upgrade procedure
Issue 1.11	May 2007	Added userdatum commands and command for logging debug-data
Issue 1.12	October 2008	Corrected information about the 'EVENT' marker inputs.
Issue 1.13	September 2009	Changed EASAT to EUSAT and modified frequencies
Issue 1.14	October 2010	Added OMNIUSEGLONASS ENABLE command Added Omnistar IP (NTRIP Info

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Introduction

About This Manual

This manual has been produced to assist the typical user with the installation and operation of the OmniSTAR 8305HP DGPS Receiver.

System Features

The OmniSTAR 8305HP DGPS Receiver is part of a worldwide DGPS Service. The OmniSTAR service is a full-time differential GPS (DGPS) broadcast system delivering corrections from an array of GPS reference stations located around the globe. Reference stations provide industry standard formatted corrections to Network Control Centres (NCCs) at strategic geographic locations, where the corrections are decoded, checked, and repackaged in a highly efficient format for broadcast. The data is modulated onto a RF carrier that is then up-converted for transmission to an L-band communications satellite.

The signals are received at the user's location by an antenna, demodulated by a receiver, and are made available, after selection of the desired individual reference site's data set, as corrections for use in a GPS, differential-capable, receiver.

The OmniSTAR 8305HP series of receivers support the following OmniSTAR® services:

HP, this is the High Performance service where dual frequency GPS carrier phase measurements are used in an intelligent and innovative way to create wide area positioning results of unmatched accuracy and performance.

XP, this is the Extended Position service where precise orbit and clock data is used to determine the position worldwide without using any reference stations.

VBS, this is the Virtual Base Station service where single frequency GPS code phase measurements are used to create RTCM corrections data optimised for the users current position.

Receiver Features

The OmniSTAR 8305HP receiver has the following features:

- 28 channel "all-in-view" parallel GPS tracking
- 6 channel GPS L5 prepared[1]
- 2 SBAS channels
- 24 channel "all-in-view" parallel Glonass tracking[2]
- Pulse Aperture Correlator (PAC) technology
- Fast reacquisition
- Fully field-upgradeable firmware
- Low power consumption
- 5 Hz position output data (20 Hz optional)
- Voltage and temperature monitoring and reporting
- Auxiliary strobe signals (input and output)

The following models are available for the 8305HP:

- L1 only
- L1/L2
- L1/L2 plus OmniSTAR HP/XP

Housing

The 8305HP is housed in an enclosure to provide a complete receiver solution. When connected to an antenna and a power source, the 8305HP is a fully functioning DGPS/HP receiver.

The enclosure offers protection against environmental conditions and RF interference. In addition, it provides an easy-to-use interface to the GPS card's data, power and status signals and a rugged, water, shock and vibration resistant housing for outdoor applications.

[1] The 8305HP receiver is hardware-capable of tracking L5 but requires a future firmware upgrade to enable L5 positioning. This upgrade will be available when a usable number of L5 capable satellites are in orbit.

[2] Glonass capable antenna required.

Interface

The 8305HP provides the following:

- A rugged, environmentally-sealed enclosure
- 3 serial ports with standard RS232 D-connectors
- GNSS antenna and power ports
- An external oscillator connector
- Auxiliary strobe signals for status and synchronization
- Indicators to provide power and communication status
- Support of peripheral devices, including an Inertial Measurement Unit (IMU) for combined GPS-inertial navigation

The following accessories are included with the 8305HP:

- 1 automotive (12V) power adapter cable
- 1 straight through serial port cable
- 1 null modem serial cable
- 1 USB serial cable
- 1 I/O port cable
- 1 combined L-band/GNSS antenna
- A CD containing PC utilities and product documentation

For technical specifications on the 8305HP, please see Appendix A

Figure 1: 8305HP Back End

Port	Type	Description
Power	LEMO FGG.0B.304.CLAD52Z	DC power input
COM1	DB9P	RS232 signals (NMEA) and USB
COM2	DB9P	RS232 signals (NMEA)
COM3	DB9P	RS232 signals (NMEA)
I/O	DB9S	I/O strobe signals
GPS	TNC	Antenna connection
OSC	BNC	External oscillator connection

Table 1: 8305HP Interface

Installation and Set Up

Installation Considerations

Before commencing installation of the OmniSTAR 8305HP in a vehicle or aircraft, the following should be considered:

- Determine the preferred location for each unit. Consider cable length, connector attachment space (cable bend radius), stowing excess cable, moisture, chemical corrosion, vibration and heat exposure.

- Before drilling holes, consider using existing hardware and locations where equipment was previously installed. Avoid drilling holes that may damage other equipment (e.g. structural frame members, electrical cables or fluid lines).

- High vibration and high temperature locations should be avoided whenever possible.

- In application where vibration exceeds 5Gs acceleration, shock mounts are required. (Refer to Customer support for mounting recommendations).

- Vehicle primary power has voltages that may be harmful to personnel and equipment. Disconnect the battery cable from the battery –Ve (negative) terminal before making connection to any power terminal within the vehicle.

Counter Electromagnetic Force (CEMF)

A potential problem inherent in any installation of electronic systems within a vehicle is Counter Electro-magnetic Force (CEMF).

CEMF is caused when relays or solenoids, connected to the vehicle DC power distribution, are de-energised. The voltage produced may exceed 400 volts.

CEMF is produced by equipment such as the following:

- **Electric fan brakes**
- **Air conditioners**
- **Starter relays**
- **Electric pump relays**

CEMF is more than sufficient to damage or cause erratic operation of any electronic system that is also connected to the same vehicle DC power supply. CEMF can be eliminated by installing diodes at the relays and solenoids that cause the problem, and more importantly at the power supply cable connections on the receiver.

The 8305HP already has some built-in protection circuitry. Nevertheless, if you suspect there might be a risk of damaging the receiver because it is exposed to CEMF on a regular basis, a 47V, 5W, Zener diode (1N5368 or equivalent) may be connected between the receiver +Ve (positive) power input terminal and ground, as illustrated in Figure 2.

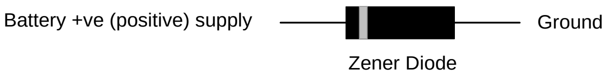


Figure 2: Zener Diode Connected

Cable Installation

Cables must be correctly installed for optimum system operation. Therefore, the following should be noted:

- Do not route an L-Band receiver remote antenna cable with the cabling of any other radio system. This may cause interference between both systems.

- If at all possible, do not run L-Band receiver antenna cables parallel to other radio system cabling closer than 30 centimetres.

- If cables must cross, ensure that they cross at an angle of 90°. This minimises the possibility of interference .

- As far as is practicable, ensure that cables and I/O connectors are unique and fit only in their allocated location.

- Avoid routing cables along-side power generator cabling and other high electrical noise sources. This can cause interference.

- Do not kink or force cables into sharp bends that may damage the cables and cause system failure.

- After installation, ensure that excess cable in looped and clamped or tied safely away from any control cables, fuel lines, hydraulic lines or moving parts.

- When stowing over length cables, form loops not less than 150 mm minimum cable bend radius.

- Cable routing must avoid high temperature exposure (e.g. exhaust manifold).

Additional Features and Information

This section contains information on the additional features of the 8305HP receiver.

Strobes

On the 8305HP, a set of inputs and outputs that provide status and synchronisation signals are given. These signals are called strobes. Access to the strobe signals is obtained through the I/O port.

Strobe signals include two inputs (Event1 and Event2) and a One Pulse Per Second output (PPS). See Table 2 for a complete description.

Pin no.	Signal name	Signal description
1	VARF	Variable frequency out
2	PPS	Pulse Per Second out
3	MSR	Mark1 output
4	EVENT1	Mark1 input, which requires a pulse longer than 65 ns. 10kOhm pull-up resistor to 3.3V internal to the 8305HP. Refer also to the MARKCONTROL command.
5	PV	Valid position available
6	EVENT2	Mark 2 input, which requires a pulse longer than 400 ns. 10kOhm pull-up resistor to 3.3V internal to the 8305HP. Refer also to the MARKCONTROL command.
7	_RESETOUT	Reset TTL signal output to an external system. Active low.
8	ERROR	Indicates a fatal error when high.
9	GND	Digital ground

Table 2: 8305HP I/O port pin-out descriptions

Status Indicators

The 8305HP has LED indicators that provide the status of the 8305HP. The red LED above the power connector lights up when the 8305HP is powered. The LEDs above the COM1, COM2 and AUX ports indicate the data flow over these ports: the red LED indicates incoming data (data received by the 8305HP), the green LED indicates outgoing data (data sent by the 8305HP).

Mounting Bracket

Along with the 8305HP, a mounting kit has been provided to facilitate mounting the receiver to a surface. This section provides information on how to mount the receiver.

Note: The mounting kit is not designed for use in high-dynamics or high-vibration environments.

To install the mounting brackets provided with the 8305HP, refer to the instructions provided with the mounting kit. Figure 3 is included to provide the dimension information for the brackets.

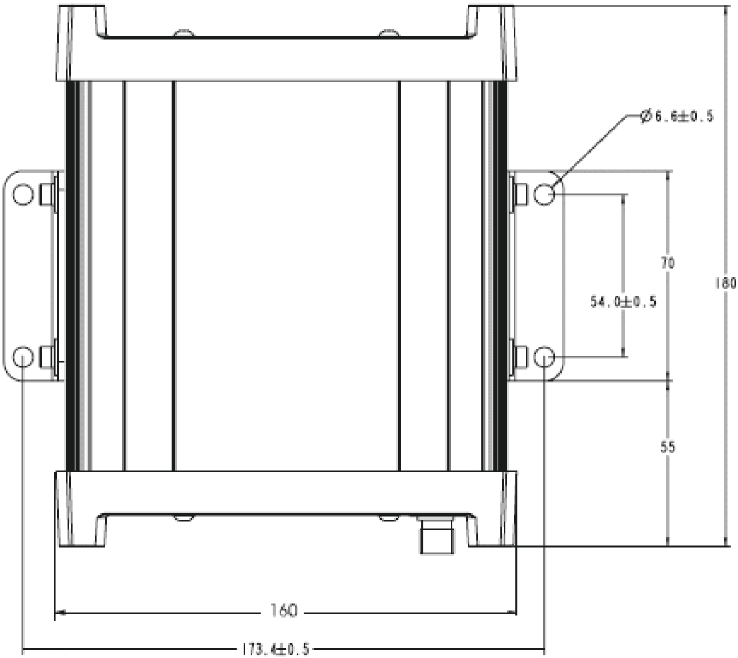


Figure 3: 8305HP with Mounting Brackets (dimensions in millimetres)

Antenna Location

Antenna positioning is critical to system performance.

The following conditions must be met for optimum system performance:

- Antenna must be mounted at least 1.5 metres away from transmitting antennas of any frequency. Closer positioning may cause overloading of receiver RF circuits.

- The antenna should be mounted at the highest practical point that will give a good view of the horizon and be as near level as possible.

- The antenna must be located along the vehicle centre-line, or at a relevant reference point on the vehicle.

Power Supply Requirements

The 8305HP contains a DC-to-DC converter that is very tolerant to noise and ripple at its input. A tightly regulated input supply to the 8305HP is not required, as long as it falls within the input range +6 to +18VDC.
The power supply used should be capable of delivering 5W peak power.

Warning: If the voltage supplied is below the minimum specification, the receiver will suspend operation. If the voltage supplied is above the maximum specification, the receiver may be permanently damaged, voiding your warranty.

Operating considerations

The 8305HP has proven to be a high-quality positioning device. The accuracy that the user can obtain depends on several factors, including:

- Number of visible satellites
- Multipath
- Dilution of Precision (DOP)
- Satellite elevations
- Differential correction

Number of visible satellites

A minimum of four satellites is required to calculate a 3-dimensional position. For HP or XP corrected positions, a minimum of four satellites is required. In general it can be said that every increase in the number of visible satellites will result in an increase in the system's accuracy. As the GPS satellites orbit around the earth the number of visible satellites will change in time. The GPS constellation has been designed so as to provide a minimum of four visible satellites at any location at all times. The number of visible satellites can decrease due to blockage by objects such as trees and buildings.

Multipath

It is possible for satellite signals to reflect off large nearby objects such as buildings, cars or even the ground, thereby resulting in an erroneous distance measurement. This phenomenon is known as multipath. Multipath can cause significant errors in the position determination and it is therefore important to place the receiver in an environment, which is free of large reflective surfaces. It is also recommended to mount the receiver directly onto a surface, while maintaining a clear view of the sky in all directions.

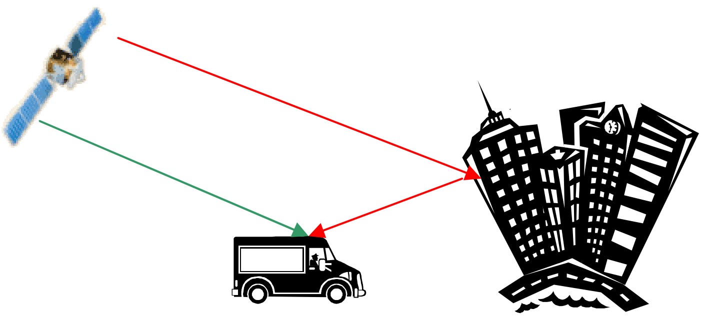


Figure 4: Multipath

Position Dilution of Precision (PDOP)

The Position Dilution of Precision (PDOP) is a measure of the satellite geometry. The lower the PDOP value, the more accurate the GPS position will be.

Satellite elevations

The signal from a satellite that is low on the horizon will travel a greater distance through the atmosphere. This results in lower signal strength and a delayed reception, thereby causing erroneous and noisy data. By default the 8305HP is configured to ignore any satellites that have an elevation angle lower than 5° for VBS and lower than 8° for HP.

Differential corrections

For accurate positioning it is essential that the differential corrections can be received. In order to ensure reception of the OmniSTAR satellite signal the line of sight towards the satellite must not be blocked by objects such as trees and buildings.

Multipath reflections can cause destructive interference, thereby significantly decreasing the signal strength. It is therefore recommended to mount the 8305HP directly onto a surface in a reflection free environment.

Although the 8305HP has been designed to provide optimal system performance under most circumstances, it is possible, due to the nature of radio communications that the system performance degrades due to local interference sources.

Operation

Before operating the receiver for the first time, ensure that you have followed the installation instructions.

Communications with the Receiver

Communications with the receiver is straightforward, and consist of issuing commands through the communications ports from an external serial communication device. This could be either a terminal or an IBM-compatible PC that is directly connected to the receiver serial port. For more information about commands and logs that are useful for basic operation of the receiver, refer to Appendix C.

An even easier way of communicating with the 8305 is using the View8300 program (MS Windows) or ViewAll (PocketPC). For more information about these programs, refer to Appendix B.

Serial Port Default Settings

The receiver communicates with your PC or Terminal via a serial port. For communication to occur, both the receiver and the operator interface have to be configured properly. The receiver's COM1, COM2 and COM3 default port settings are as follows:

- **9600 BPS, no parity, 8 data bits, 1 stop bit, no handshaking, echo off**

Note: Depending on your needs or wishes, OmniSTAR may have altered the default port settings for you.

The data transfer rate you choose will determine how fast information is transmitted. Take for example a log whose message byte count is 96. The default port settings will allow 10 bits/byte. It will therefore take 960 bits per message. To get 10 messages per second then will require 9600 bps. Please also remember that even if you set the bps to 9600 the actual data transfer rate will be less and depends on the number of satellites being tracked, filters in use, and idle time. It is therefore suggested that you leave yourself a margin when choosing a data rate.

Getting Started

The purpose of this section is to get you started with the 8305HP as quickly as possible. The guide will address receiving the satellite data carrier, and then checking the functionality and status of the HP Process.
Generally when the receiver is supplied to you it will be configured for the mode and data link(s) you have subscribed to. In most cases to get up and running will be a case of connecting the appropriate cables and applying power to the system.

Included with your receiver is the View8300 program. View8300 is a Microsoft Windows-based graphical user interface, which allows you to access the receiver's many features without struggling with communications protocol or writing special software. It will also provide you with status and subscription information. See Appendix B for more information and a short manual.

Starting the Receiver

The receiver's software resides in read-only memory. As such, the unit "self-boots" when it is powered on and it performs a complete self-test. If an error condition were detected during a self-test, the self-test status word would change; this self-test status word can be viewed in the header of any data output log.
When the receiver is first turned on, no activity information is transmitted from the COM ports except for the port prompt. An external data communications equipment (terminal) screen will display one of these three messages:

[COM1] *if connected to the COM1 por*t,
[COM2] *if connected to the COM2 por*t,
or
[COM3] *if connected to the AUX port*

Any of these prompts indicates that the receiver is ready and waiting for command input. The screen may display other port names for other port types, for example USB1, USB2 or USB3.

Commands are typed at the interfacing terminal's keyboard, and executed after issuing a carriage return command which is usually the same as pressing the terminal's <Enter> key.

When an input is accepted **<OK** appears.
If a command is incorrectly entered, the receiver will respond with "<Invalid Message ID" (or a more detailed error message).

Initial setup

1. Refer to the following diagrams, as you will need to assemble all the required items.
    - OmniSTAR 8305HP DGPS Receiver
    - DGPS Antenna
    - DGPS Antenna Cable
    - Power Cable
    - Data Port (Straight through or null modem) Cable
2. Install the DGPS antenna where it has a clear view of the sky in the direction of the satellite.
3. Connect the DGPS antenna cable between the DGPS antenna and the 8305HP (TNC connector on rear panel).
4. Connect the Data Port Cable between any of the three COM ports on the 8305HP and a suitable computer or handheld device, which can function as a terminal.
5. Connect the power cable to a suitable 6-18 VDC power supply being sure to check correct polarity. The Power LED should turn red.
6. Send the following commands to any of the comports:
    - psrdiffsource omnistar
    - rtksource omnistar
    - assignlband omnistar 1537440000 1200 (when using EUSAT)
7. Select the output you want using the command:

    LOG [port] message [trigger [period [offset [hold]]]] (see for further information and available logs Appendix C)
8. Save the settings by sending the command SAVECONFIG to any of the COM-ports.

Setting up data output

Factory default, the 8305HP is not configured to output any NMEA-0183 compatible messages on any of its COM ports. However, the receiver may be preconfigured for you by OmniSTAR, in which case the output of the COM port(s) will be set to match your equipment's needs and the rest of this section may not apply to you.

There are essentially three ways to configure the 8305HP receiver:

- Sending commands using a terminal program;
- Using the MS Windows® based program View8300;
- Using the Windows® Mobile based program ViewAll

The use of View8300 and ViewAll is described in detail in Appendix B. Configuring the receiver using a terminal program is covered in this section.

In order to configure the receiver, it has to be connected to a PC using the null modem cable. A terminal program set to communicate at 9600 baud[1], 8 databits, no parity, 1 stop bit (for example hyperterminal) can then be used to send commands to the 8305HP receiver. When a command has been received and processed correctly, the receiver will respond by displaying **<Ok**. If the command sent to the receiver was not a valid command, the receiver will display an error message.
Using the terminal program, any of the communication ports can be configured, regardless of which communication port is used to communicate with the receiver. Just include the desired communication port as part of the command line. A list of possible commands is given in Appendix C.

Example:
The 8305HP is connected to a PC through its COM1 port. The following commands have to be issued to enable GGALONG (5 times per second), OMNIHPPOS (once every second) and GSV (once every 3 seconds) messages over com2 at 57600 bps.

```
COM COM2 57600 N 8 1 N OFF ON
LOG COM2 GPGGALONG ONTIME 0.2
LOG COM2 OMNIHPPOSA ONTIME 1
LOG COM2 GPGSV ONTIME 3
SAVECONFIG
```

The 'A' following the OMNIHPPOS log indicates the value of these messages has to be output in ASCII format (human readable text). 'B' would have indicated binary message logging. If 'A' and 'B' are both omitted, ASCII output is assumed. The 'saveconfig' command makes sure all settings are stored in the receiver's non-volatile memory, so the settings are kept even when the

[1] See also the note about serial port default settings on page 14

receiver is switched off. Omitting the ‘saveconfig’ command means losing all the changes made since the last ‘saveconfig’ when the receiver is powered off.

Seeding the receiver

Normally, when a GPS receiver is powered up, it will take some time before it starts outputting a GPS position and even more time before the position accuracy has improved enough to report a converged HP position solution. This is all due to the fact that the receiver (initially) doesn’t know its position, so it has to go through a (lengthy) process of searching for available satellites, calculating position errors, using the calculated errors to improve the position calculations etc.

This process can be accelerated considerably by providing the receiver with its (accurately known) position. When the receiver knows its position, it can determine which satellites are visible and available and it can calculate its estimated position errors, all within only tens of seconds (instead of tens of minutes). Aiding the receiver by providing it with its (known) position is called seeding.
Seeding is possible in two different ways: using a previously stored seed position or entering the coordinates and standard deviations of a well-known position manually.

Using a stored seed position

When the receiver has reached a fully converged HP or XP position, this position and the corresponding standard deviations can be stored in the receiver’s NVM by sending the following command to the receiver:

```
HPSEED STORE
```

Using the stored position to seed the receiver can be done by sending the following command:

```
HPSEED RESTORE
```

Erasing the stored position can be done by sending the following command:

```
HPSEED RESET
```

Entering a known position manually

The 8305HP is capable of storing only one seed point. In case multiple reference points have to be used or a seed point has not (yet) been stored, the receiver can also be seeded manually. When seeding manually, the more accurate the seed position is known and input, the quicker the HP process will converge. To enter a seed position manually, send the following command to the receiver:
HPSEED SET <lat> <lon> <hgt> <σ_{lat}>,<σ_{lon}>,<σ_{hgt}> [datum] [undulation]

Example:

```
HPSEED SET 52.123456 4.123456 52.1234 0.1,0.1,0.1
```

The datum is the map datum of the seed point. If the datum field is omitted, the current receiver datum will be used. If the undulation (difference between mean sea level and geoid height) is omitted, height will be taken to be in the datum units used.

Warning: fields in the HPSEED command are separated by spaces **except for the sigma fields,** which are separated by **commas.**

Omnistar IP (NTRIP)

The 8305 receiver can receive a copy of the Omnistar L-band Satellite over a serial port. For this an external NTRIPClient is required. This NTRIPClient can be on a PC, PDA or embedded Receiver. Omnistar has made an application on a Siemens TC65 with a Java Application. The command to enable Omnistar IP input is

Interfacemode comx **omnistar novatel off**

x is com1, 2 or 3.

It is no problem to receive both bits over satellite and external serial at the same time a redundancy resolver mechanism will take care of the merging of the bytes to the Omnistar process.

Appendix A

Technical Specifications

Performance

Position Accuracy[1]	VBS:	0.3m CEP50
	XP:	0.15 m RMS
	HP:	0.10 m RMS
Time To First Fix	Hot:	30 s (Almanac and recent ephemeris saved and approximate position)
	Warm:	40 s (Almanac, approximate position and time, no recent ephemeris)
	Cold:	50 s (No almanac or ephemeris and no approximate position or time)
Reacquisition	0.5 s L1 (typical)	
	1.0 s L2 (typical)	
Data Rates	5 Hz (20 Hz optional)	
Time Accuracy [1 2]	20 ns RMS	
Velocity Accuracy	0.03 m/s (0.1 km/h) RMS	
Measurement Precision	C/A code phase	6 cm RMS
	L1 carrier phase differential	0.75 mm RMS
	L2 P code	25 cm RMS
	L2 carrier phase differential	2 mm RMS
Dynamics	Maximum Velocity	515 m/s (1850 km/h) [3]
	Maximum Height	18.288 m [3]

Environmental

Operating Temperature	-40°C to +75°C

[1] Typical values. Performance specifications are subject to GPS system characteristics, U.S. DOD operational degradation, ionospheric and tropospheric conditions, satellite geometry, baseline length and multipath effects.
[2] Time accuracy does not include biases due to RF or antenna delay.
[3] In accordance with export licensing.

Storage Temperature	-45°C to +95°C
Humidity	Not to exceed 95% non-condensing
Power Requirements	
Voltage	+6 to +18 VDC
Input Voltage Ripple	100 mV p-p (max.)
Power consumption	2.8 W (typical)

RF input / LNA power output

Antenna connector	TNC female, 50Ω nominal impedance
RF Input Frequencies	1575.42 MHz (L1), 1227.60 MHz (L2), 1525 MHz – 1560 MHz (L-Band)
LNA Power	+ 4.75 to +5.10 VDC, 90mA max.

Input / Output data interface

Electrical Format	RS232 (all COM ports) / USB (COM1 only)
Bit Rate[1]	300, 1200, 4800, 9600 (default), 19200, 57600, 115200, 230400 bps. COM1 also 460800 and 921600 bps.
Lead input	CTS (all ports) and DCD (COM2 only)
Lead output	RTS (all ports) and DTR (COM2 only)
Signals Supported	TX, RX, RTS, CTS (all ports), DTR and DCD (COM2 only)

Input / Output connectors

[1] Baud rates higher than 115200 bps are not supported by standard PC hardware. Special PC hardware is required for higher rates, including 230400, 460800 and 921600 bps.

ANT	TNC female jack, 50 Ω nominal impedance, + 4.25 to +5.25 VDC, 90 mA max (output from 8305HP to antenna/LNA)
OSC	BNC female jack, 50 Ω nominal impedance
PWR	4-pin LEMO connector, +6 to +18VDC at 2.8W typical (operating range)[1]
COM1	DB9P (male) connector
COM2	DB9P (male) connector
AUX	DB9P (male) connector
I/O Physical	DB9S (female) connector
Size	180 x 154 x 71 mm (not including mounting bracket) 180 x 186 x 75 mm (including mounting bracket)
Weight	1.0 kg without mounting bracket 1.1 kg including mounting bracket

[1] +9 to +18VDC when used in combination with an INS connected to the AUX port.

Dimensions

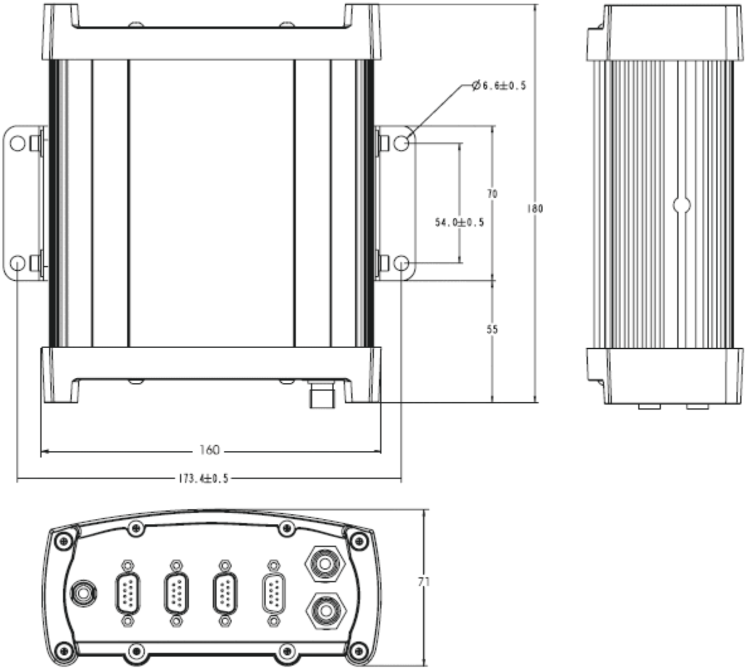


Figure 5: 8305HP Dimensions (all dimensions are in millimetres).

Port Pin-Outs

Connector Pin No.	Signal Name	Signal Description
1	Vin-	Negative power terminal
2	Vin+	Positive power terminal
3	Vin+	Positive power terminal
4	Vin-	Negative power terminal

Table 3: 8305HP PWR port pin-out descriptions

Connector Pin No.	COM1	COM2	AUX	Signal Description
1	Res.	N/C	N/C	Reserved / Not Connected
2	RxD1	RxD2	RxD3	RS232 receive
3	TxD1	TxD2	TxD3	RS232 transmit
4	N/C	Pout	Pout	Power output[1]
5	GND	GND	GND	Signal/power ground
6	D+	N/C	N/C	USB data+ (COM1 only)
7	RTS1	RTS2	RTS3	Ready to send
8	CTS1	CTS2	CTS3	Clear to send
9	D-	N/C	N/C	USB data- (COM1 only)

Table 4: 8305HP serial port pin-out descriptions

[1] Both COM2 and AUX have power output pins that can be used to pass power to peripherals. The voltage on each will be approximately 1 V lower than Vin. The maximum continuous current is 500 mA.

Connector Pin No.	Signal Name	Signal Description
1	VARF	Variable frequency out
2	PPS	Pulse Per Second out
3	MSR	Mark 1 output
4	Event1	Mark 1 input Requires a pulse longer than 65ns. 10kΩ pull up resistor internal to the 3.3V. Leading edge triggered. See also the MARKCONTROL command in Appendix C.
5	PV	Valid position available
6	Event2	Mark 2 input Requires a pulse longer than 400ns. 10kΩ pull up resistor internal to the 3.3V. Leading edge triggered. See also the MARKCONTROL command in Appendix C.
7	_RESETOUT	Reset TTL signal output to an external system. Active low.
8	ERROR	Indicates a fatal error when high.
9	GND	Digital ground

Table 5: 8305HP I/O port pin-out description

Cables

Automobile Power Adapter Cable

The power cable supplied with the 8305HP provides a convenient means for supplying +12 VDC while operating from an automobile.
The output of the power adapter uses a 4-pin LEMO connector. This cable plugs directly into the PWR input located on the back panel of the 8305HP.

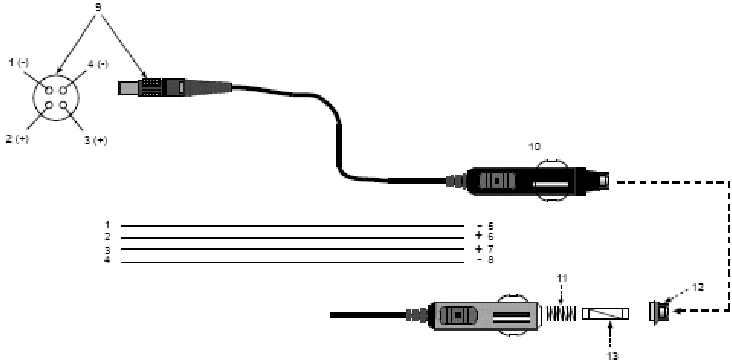


Figure 6: Automobile Power Adapter Cable

Reference	Description
1	Black (-)
2	Red (+)
3	Orange (+)
4	Brown (-)
5	Ground
6	+6 to +18 VDC
7	+6 to +18 VDC
8	Ground
9	Connector key marking
10	12 V adapter
11	Spring
12	Universal tip
13	6 Amp slow blow fuse

Table 6: Figure 6 Reference numbers description

Null modem Cable

The null modem cable shown below provides an easy means of communications between the 8305HP and another serial communications device, such as a PC. At both ends, the cable is equipped with a DB9S connector, which can be plugged into the COM1, COM2 or AUX port of the 8305HP and a 9-pin COM port of a PC.

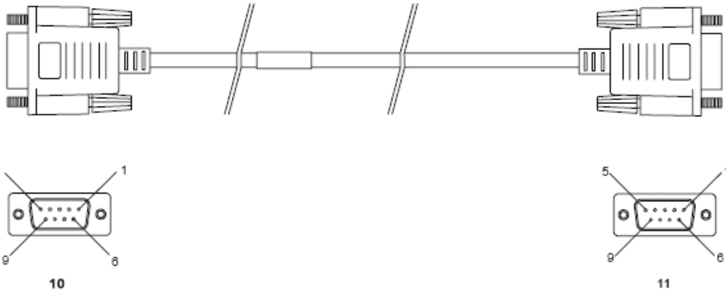


Figure 7: null modem DB9 Serial Cable

Connector	Pin number						
DB9S (10)	2	3	8	7	4	5	1&6
DB9S (11)	3	2	7	8	1&6	5	4

Table 7: null modem pin layout

Straight through DB9 Serial Cable

The straight through serial cable shown below can be used to connect the 8305HP to a modem or radio receiver to receive differential corrections. The cable is equipped with a DB9S (female) connector at the receiver end. At the other end, a DB9P (male) connector is provided to plug into your user-supplied equipment.

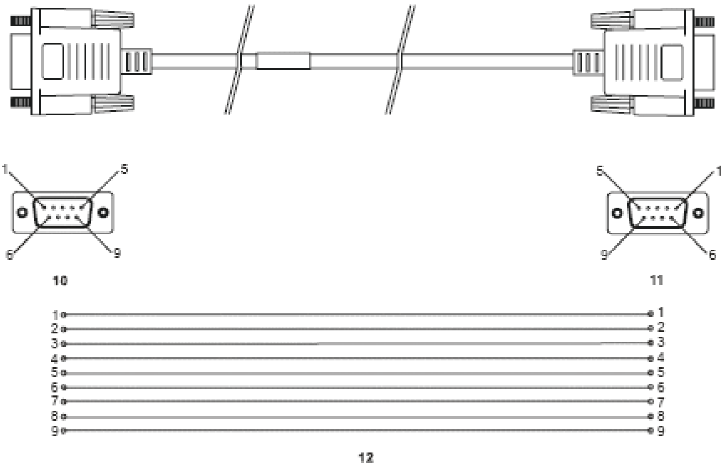


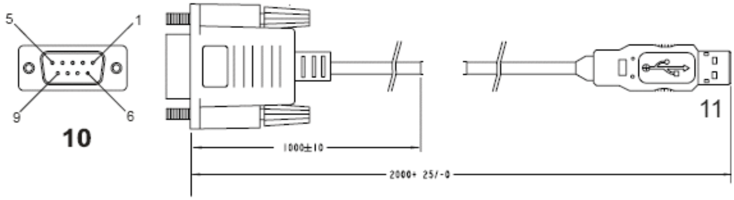
Figure 8: Straight through DB9 Serial Cable

Reference	Description
10	DB9P (male) connector
11	DB9S (female) connector
12	9-conductor cable

Table 8: Figure 8 Reference numbers descriptions

USB Serial Cable

The USB serial cable shown below provides a means of interfacing between the COM1 port on the 8305HP and another serial communications device, such as a PC. At the 8305HP end, the cable is equipped with a DB9S connector, which plugs directly into the COM1 port of the 8305HP. At the other end, a USB (type A) connector is provided.



WIRING			
DB9 CONNECTION ON RECEIVER	SIGNAL	SERIES "A" USB PLUG	WIRE COLOR
PIN 5	GND	PIN 4	BLACK
PIN 6	USB D+	PIN 3	GREEN
PIN 9	USB D-	PIN 2	WHITE
INSULATE TO PREVENT SHORT			RED

Figure 9: USB to DB9 serial cable (dimensions in millimetres)

Reference	Description
10	DB9S (female) connector
11	USB type A connector

Table 9: Figure 9 Reference numbers description

Strobe port cable

The strobe lines on the 8305HP can be accessed by inserting the male DB9 connector of the I/O strobe port cable into the receiver's *I/O* port. The other end of this cable is provided without a connector to provide flexibility. The jacket insulation is cut away slightly from the end but the insulation on each wire is intact. The cable is approximately 2 m in length. See Figure 10.

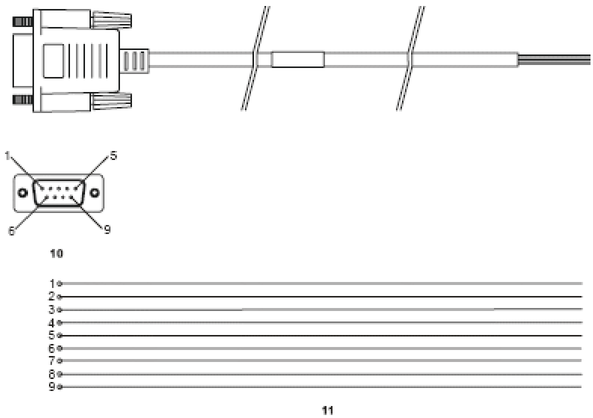


Figure 10: Strobe port cable

I/O port pin (10)	I/O port signal	I/O port cable wire colour (11)
1	VARF	Black
2	PPS	Brown
3	MSR	Red
4	Event1	Orange
5	PV	Yellow
6	Event2	Green
7	_RESETOUT	Blue
8	ERROR	Violet
9	GND	White/Grey

Table 10: Strobe port cable layout

For a description of the various I/O port signals, see Table 5 on page 25

Appendix B

View8300

The MS Windows® based View8300 program is one of the easiest ways to configure the 8305HP receiver. The latest version of the program can always be downloaded from the OmniSTAR website (www.omnistar.nl).

When the program is started, it will show a screen subdivided in 5 smaller screens. The small screens will show information about the receiver, its position and the validity of the subscription. Before this data can be shown, the program and the receiver will have to be connected first. To accomplish this, click 'File' and 'Connect'. A small screen will pop up in which the communication settings can be selected (see Figure 11). After selecting the correct settings, click the 'OK' button. The program will now start trying to communicate with the receiver.

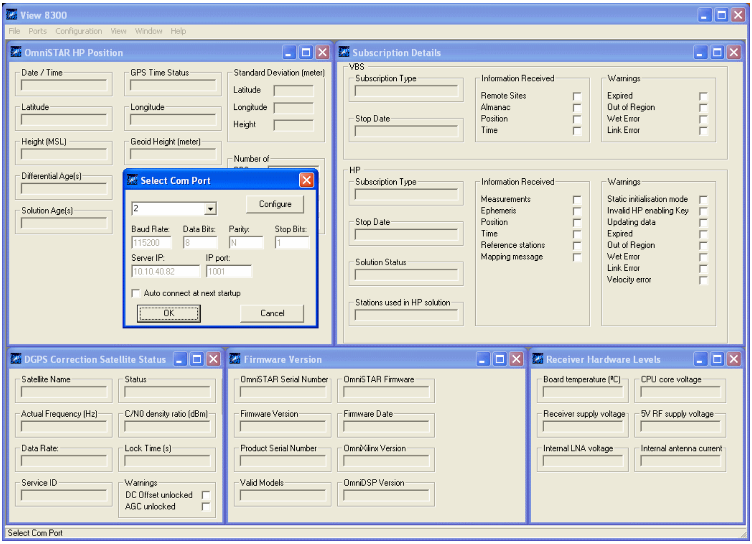


Figure 11 View8300 communication settings

As soon as the communication is set up, the five smaller screens will show information about the receiver. The top left screen (OmniSTAR HP Position) will show the position, position type (GPS, VBS or HP), position standard deviations and the number of satellites received and tracked (see also Figure 12).

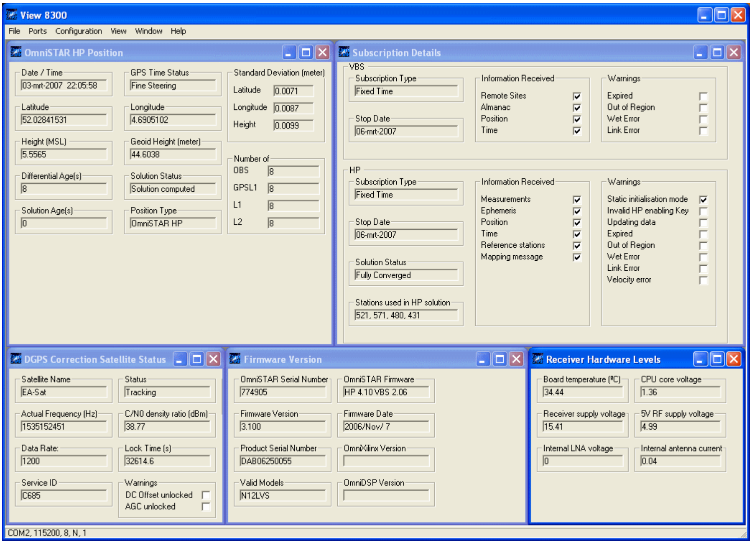


Figure 12 View8300 main screen

The top right screen (Subscription Details) will show subscription type (fixed time or countdown), time remaining or stop date, solution status and the IDs of the stations used in the HP solution. It will also show which information has already been received from the OmniSTAR satellite (checkbox ticked) and whether there are active warnings (for example: the subscription has expired or the receiver is being operated outside its subscribed region). The HP Warnings box will also show whether the 8305HP is currently HP enabled or not (‘Invalid HP enabling Key’ checkbox clear or ticked).

The lower left screen (DGPS Correction Satellite Status) will show information about the currently used OmniSTAR satellite, like the satellite name, frequency and signal-to-noise ratio (C/N0 density ratio). The signal to noise ratio can be used to check whether or not the receiver will currently be able to receive OmniSTAR corrections from the satellite: the C/N0 value should be 38 or more. Values lower than 37 indicate that information from the OmniSTAR satellite cannot be received.

The lower middle screen (Firmware Version) shows information about the receiver itself. The OmniSTAR serial number (6 digits, starting with a 7) is needed to have the receiver OmniSTAR activated. The two boxes in the lower right of this screen (OmniXilinx Version and OmniDSP Version) will stay empty when the View8300 program is connected to an 8305HP receiver.

The lower right screen (Receiver Hardware Levels) shows information about board temperature and different (internal) voltages. It also shows the internal antenna current. In combination with an active antenna, the current should be

30 to 60 mA. If the antenna current shows zero, either the antenna cable or the antenna itself are faulty, or a passive antenna is being used.

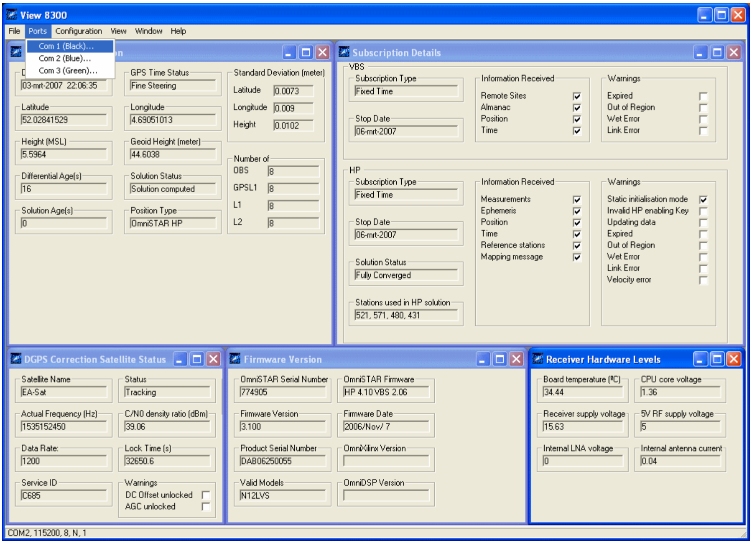


Figure 13 Receiver COM port selection

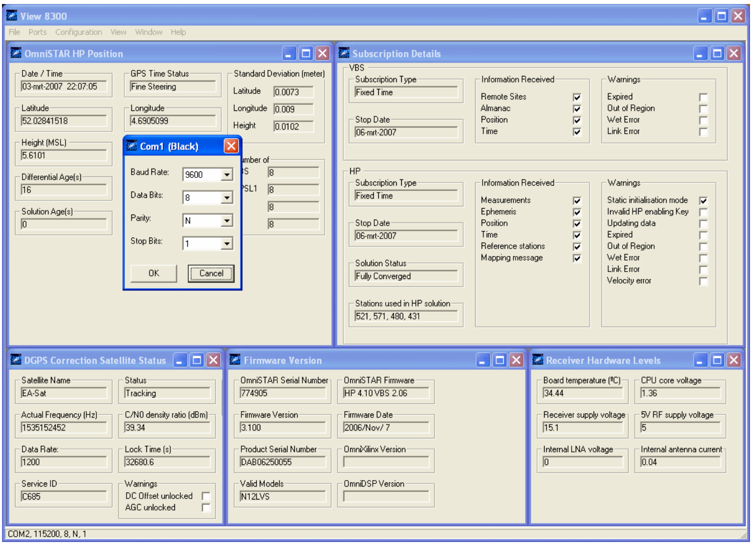


Figure 14 Receiver COM port settings

Using View8300, the communication settings of the three available communication ports can be changed. Under 'Ports', the communication port to be changed can be selected (see Figure 13). A small window will pop up, in which the baud rate, number of data bits, number of stop bits and parity can be changed (see Figure 14). Pressing 'OK' will confirm the change. The new port settings will be activated immediately.

If the settings are changed of the COM port currently used to communicate with View8300, the PC COM port settings will automatically be changed to match the values set for the 8305's COM port. That way, the communication between the receiver and View8300 will not be lost.
The current communication settings used between the View8300 program and the receiver are shown in the lower left corner of the main program screen. The COM port number shown there is the PC's COM port number, not the 8305's COM port number.

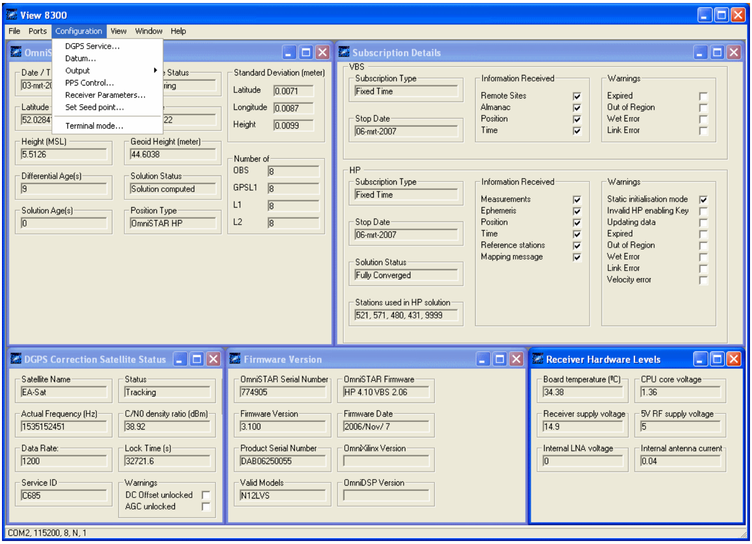


Figure 15 View8300 Configuration menu

The View8300 configuration menu is used to access all settings concerning the actual functioning and output of the 8305HP receiver. Using this menu, the DGPS satellite to be used can be selected, the datum used can be changed (if desired), the output of the three COM ports can be set, the way that 1PPS (pulse per second) is output can be configured, the receiver operational parameters can be set, a seed point can be stored or used to aid HP convergence and a terminal window can be opened to directly send commands to the 8305HP.

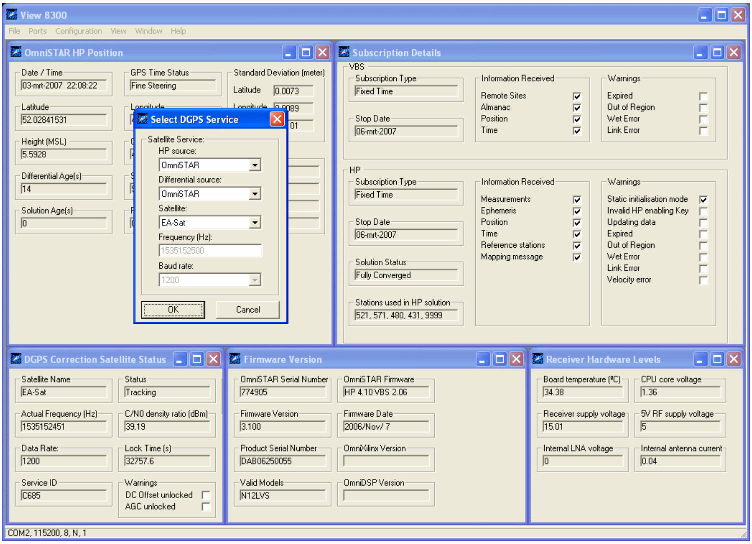


Figure 16 DGPS service configuration

The DGPS service configuration screen (see Figure 16) is used to select the differential source for both HP and VBS operation. The OmniSTAR satellite to be used can be selected by name or by entering its frequency and baud rate manually. Selection by name is preferred, since frequency and baud rate will automatically be set correctly.

The datum configuration screen (Figure 17) is used to select the desired datum in which to output the position coordinates. A datum can be selected from a list, or the user can manually enter the transformation parameters.

The output configuration screen is used to select which NMEA messages are output through which of the three COM ports. When a COM port is selected (see Figure 18), a small window will pop up showing the messages that can be output through the selected port (see Figure 19). The output period can also be set. The minimum value is 0.2 for 5 Hz output (optional 0.05 for 20 Hz output). ‘Debug’ is a special (binary) message for use by OmniSTAR technicians. It will normally not be selected for normal operation of the receiver.

The PPS control screen (see Figure 20) is used to enable or disable the 1PPS output pulse, which is synchronized to GPS time within less than a microsecond. Whether the rising edge or the falling edge of the pulse is synchronized to GPS time can also be selected. The rate setting is used to output more than one pulse per second. Keep in mind, however, that only the pulse output on the integer second is synchronized to GPS time.

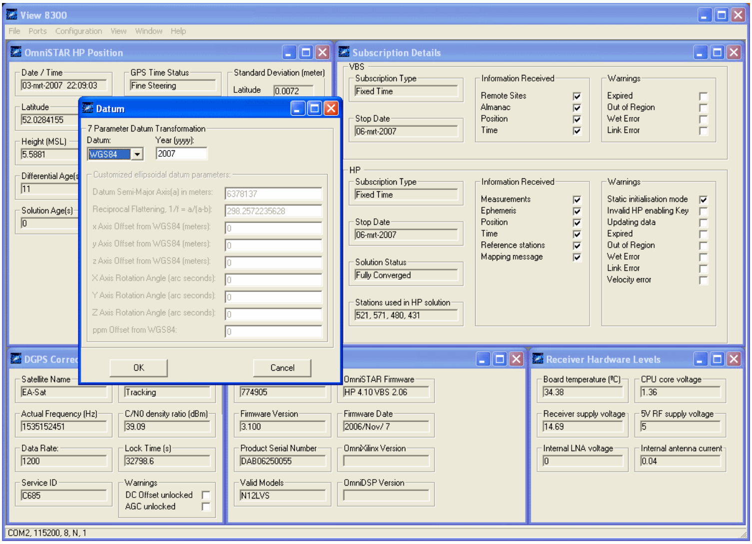


Figure 17 Datum configuration

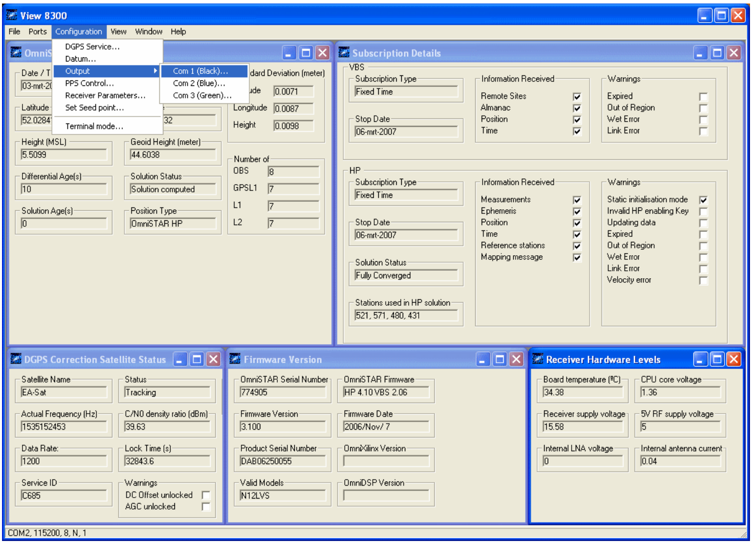


Figure 18 Select COM port to be configured for output

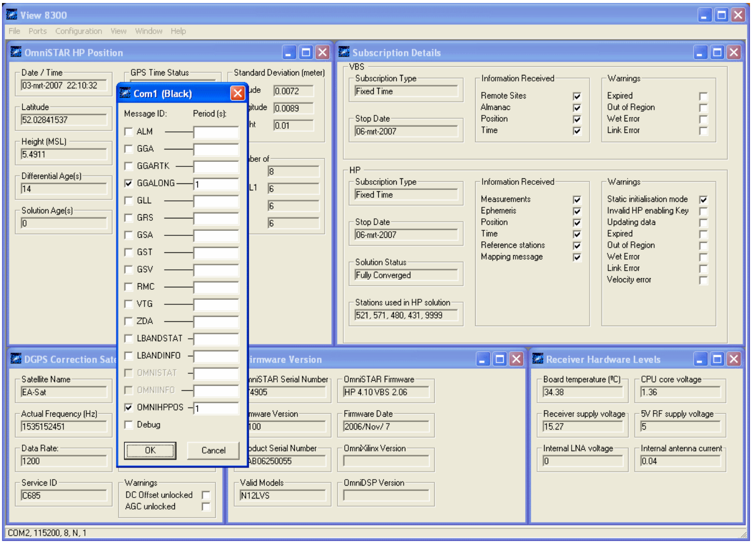


Figure 19 NMEA message output selection

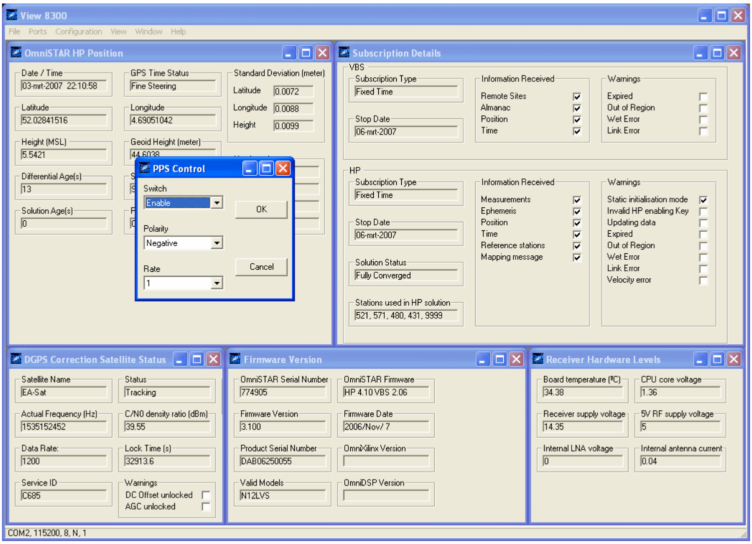


Figure 20 1PPS control

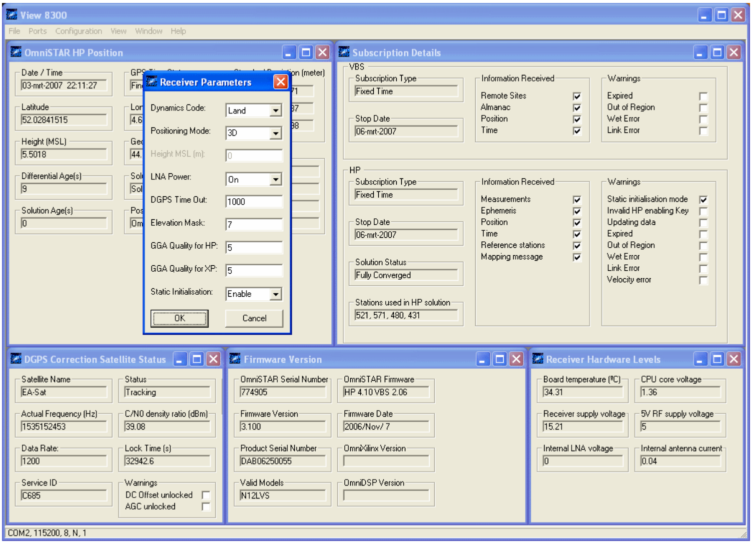


Figure 21 Receiver parameter configuration

Using the receiver parameter screen (see Figure 21) the following parameters can be set:

- Dynamic filter settings (used to smooth the position)
- Positioning mode (2D, 3D or auto switch)
- LNA power (= power to the antenna) on or off
- Validity of DGPS corrections (the time a received DGPS correction message will stay valid)
- GPS satellite elevation mask
- GPS quality indicator number reported in the GPGGA message when in converged HP mode
- GPS quality indicator number reported in the GPGGA message when in converged XP mode
- Static initialisation on/off. When the receiver's antenna is stationary, static initialisation will speed up the HP/XP convergence process.

Seed points can also be used to aid the HP/XP convergence process. Using the Set Seed Point screen (see Figure 22), the location and standard deviations of the (known) position of the antenna can be entered, providing the HP process with a starting point from which it can converge further. The current HP converged position can also be selected as a seed point (see Figure 23), to be stored in receiver memory for use as a seed point in the future.

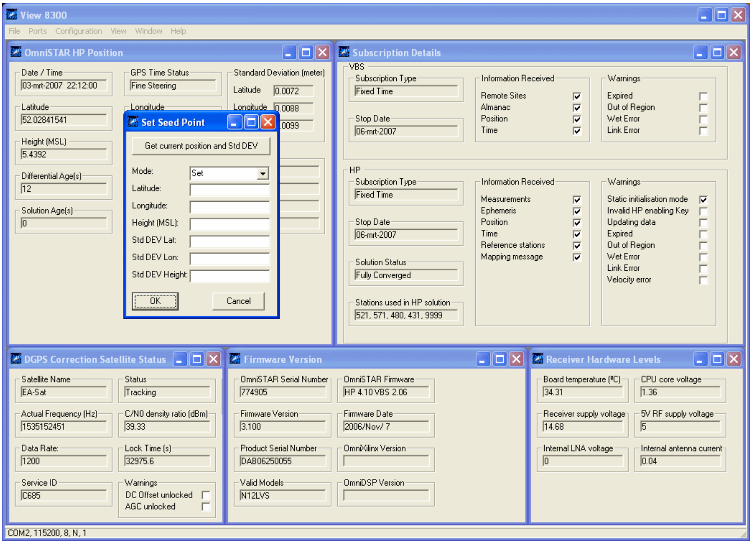


Figure 22 Setting seed point

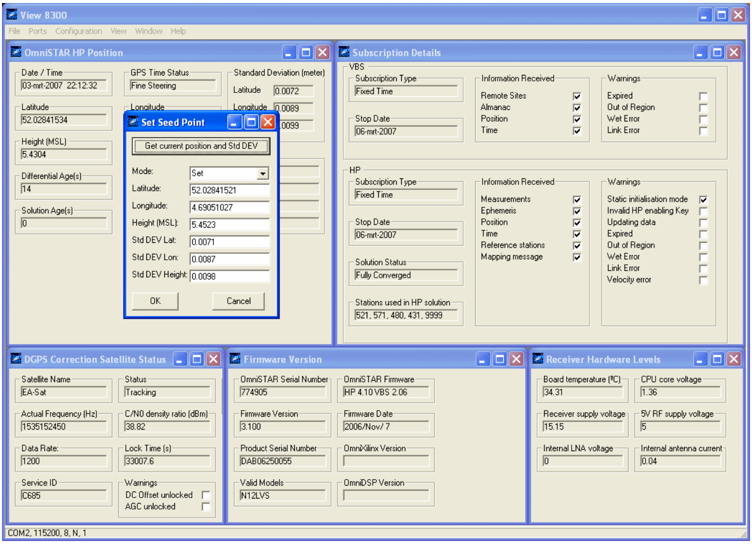


Figure 23 Current position and StdDev as seed point

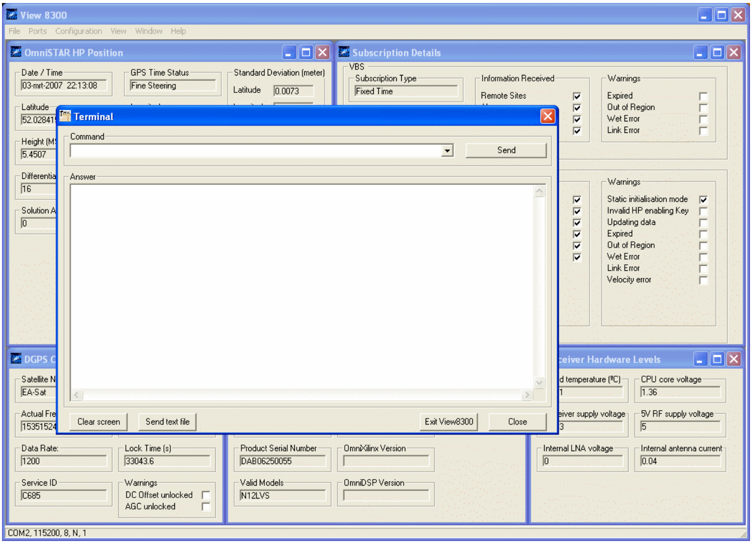


Figure 24 View8300 terminal window

The terminal window (Figure 24) can be used to check the output of a receiver port or configure the receiver manually by sending it the appropriate commands (see also Appendix C). Configuring the receiver manually does require in-depth knowledge of the receiver and its command set.

The View8300 View menu is normally set to show the five screens mentioned earlier. It can also be used to show two more views: a sky plot, which will show elevation, azimuth and a signal strength indication of the GPS satellites currently in view and the elevation and azimuth of the selected OmniSTAR satellite as seen from the current geographical position, and a scatter plot, which will show the (2D) measured positions along with 1, 2 and 3 sigma values/circles. The scatter plot screen will give a fairly good indication of the accuracy of the reported position (see also Figure 25).

The View8300 about screen shows information about the program. The version number is probably the most important information in this screen. The currently latest version of View8300 is 2.5.1.

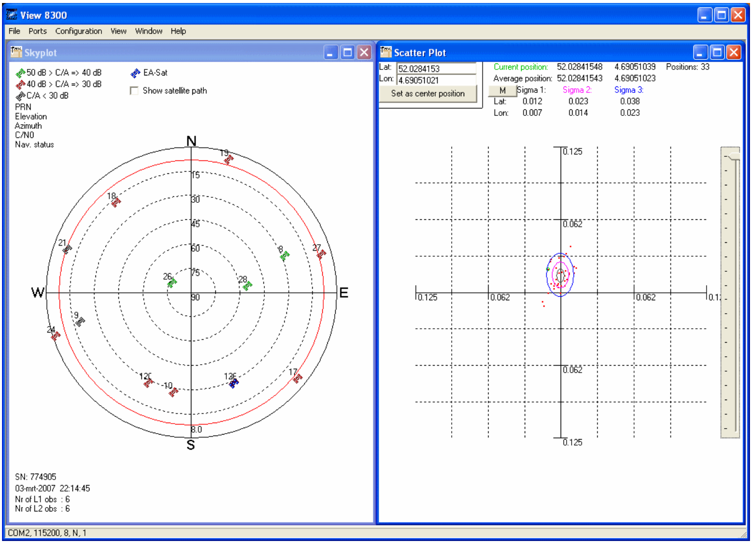


Figure 25 Sky plot and scatter plot view

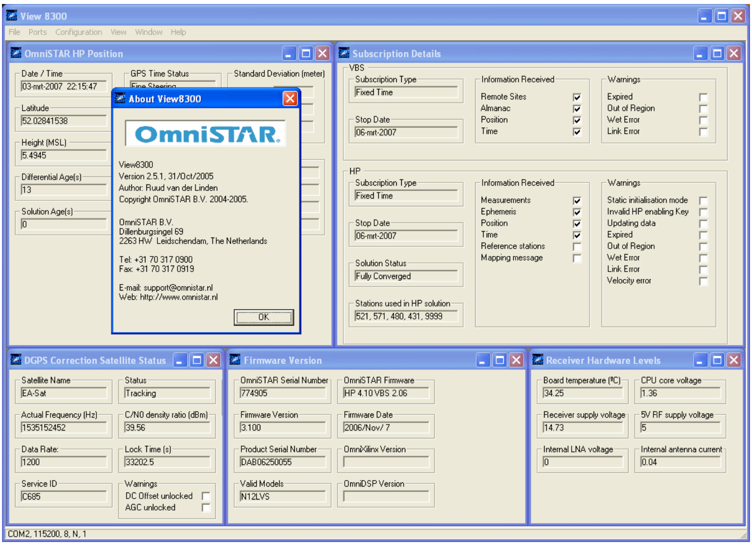


Figure 26 View8300 about screen

ViewAll

When a laptop or desktop PC is not available, a Windows® CE or Windows® Mobile based pocket PC can also be used to configure the 8305HP, on condition that this pocket PC is equipped with a 9-pin RS232 port.

ViewAll main screen

After starting ViewAll and connecting to the receiver (Figure 27), the main screen (Connection screen Figure 28) is presented to the user. Starting from this main screen, nine other screens can be opened, each enabling the user to review or configure certain receiver parameters.

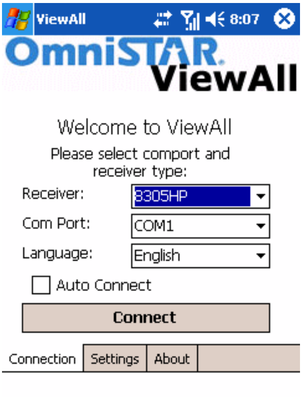


Figure 27 Connection screen

Figure 28 ViewAll main screen

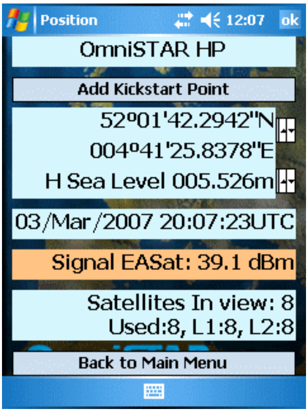


Figure 29 Position screen (1)

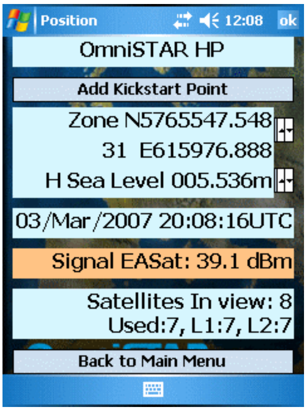


Figure 30 Position screen (2)

The position screen initially shows the position in degrees, minutes and seconds and the height with reference to mean sea level (see Figure 29). By clicking the small arrows on the right side of the position screen, the presentation and content can be changed. See Figure 29 to Figure 35 for the various presentations of the position, height and position accuracies.

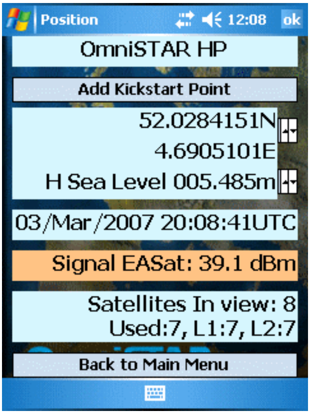


Figure 31 Position screen (3)

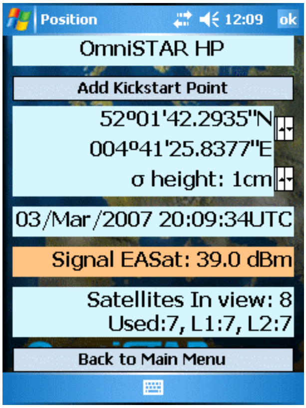


Figure 32 Position screen (4)

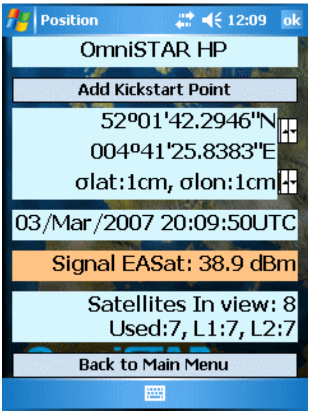


Figure 33 Position screen (5)

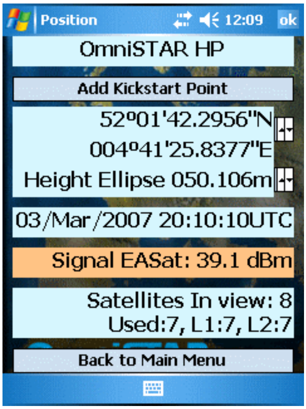


Figure 34 Position screen (6)

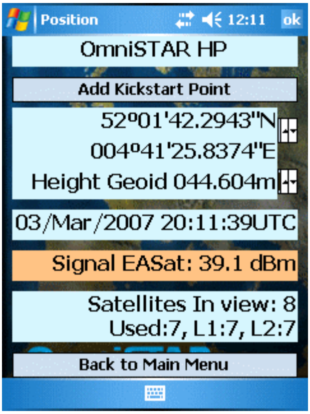


Figure 35 Position screen (7)

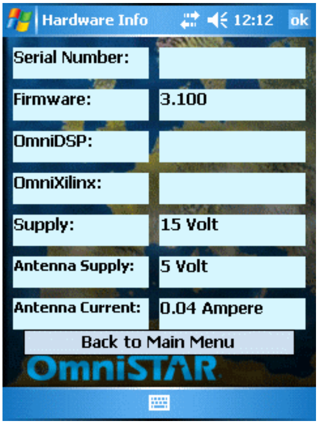


Figure 36 Hardware information

The Hardware information screen (Figure 36) shows receiver serial number, firmware version, DSP and Xilinx version (these fields stay blank when a 8305HP is connected), the power supply voltage, the LNA voltage and the antenna current.

The Subscription information screen shows information about the VBS (Figure 37) and HP (Figure 38) subscription of the receiver. Information shown is subscription type (countdown or fixed time), expiration date or time left, HP reference station information and subscription error status.

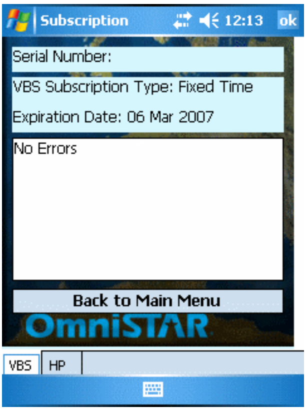


Figure 37 VBS subscription

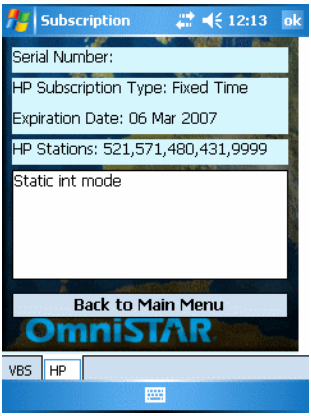


Figure 38 HP subscription

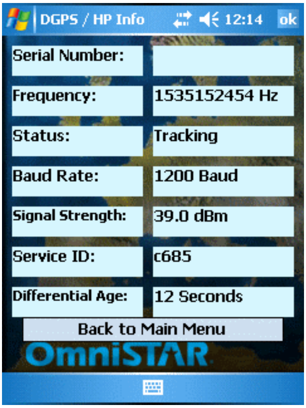
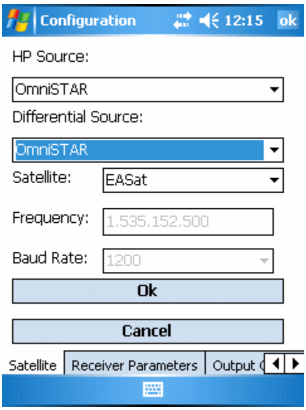


Figure 39 DGPS/HP info

The DGPS/HP Info screen (Figure 39) shows the actual tracked satellite frequency (which is not necessarily equal to the selected satellite frequency; the actual frequency may vary a little as a result of moving the receiver and atmospheric influences), the OmniSTAR satellite baud rate (1200 baud for all current OmniSTAR satellites), the signal strength in dBm, the satellite service identifier and the age of the last received DGPS message. A signal strength over 38 dBm is acceptable, a signal strength less than 37 dBm indicates very poor or no reception of the OmniSTAR satellite.



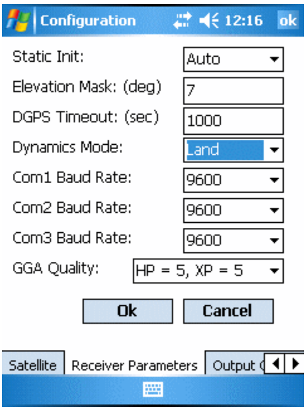


Figure 40 Sat Configuration   *Figure 41 Receiver parameters*

The configuration screens allow the user to set, read back or change the various receiver parameter settings. The first configuration screen (Figure 40) can be used to set both the HP and differential source (if any) and the L-band frequency to be used, either by selecting the satellite name or entering the frequency and baud rate manually. The second configuration screen (Figure 41) is used to set the initialisation mode of the receiver (static or dynamic), elevation mask and DGPS timeout, the dynamics mode (which controls the internal smoothing filter settings of the 8305HP), the 8305HP's COM port baud rates and the way a converged HP or XP position is reported in the GPGGA message.

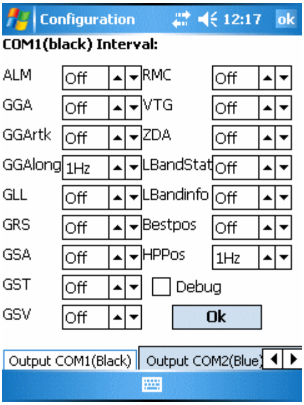


Figure 42 COM1 configuration

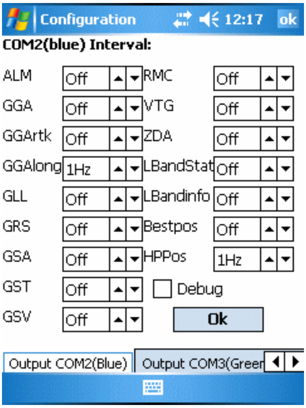


Figure 43 COM2 configuration

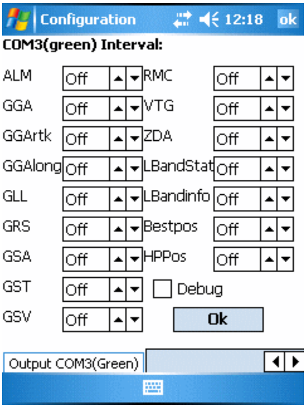


Figure 44 COM3 configuration

The third, fourth and fifth configuration screens (Figure 42 to Figure 44) are used to set the outputs of the three COM ports of the 8305HP. For each possible NMEA output message, the output frequency can be set. If desired, binary debug-data can also be selected to be output. If there's a problem with the 8305HP's HP performance, OmniSTAR engineers might ask you to log and send in a few hours of debug data, which may aid in finding the problem.

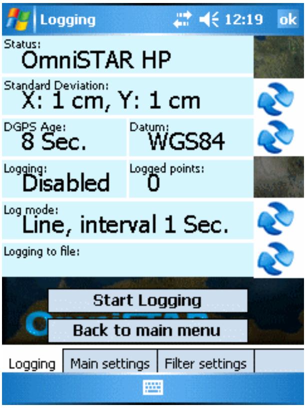


Figure 45 Logging start screen

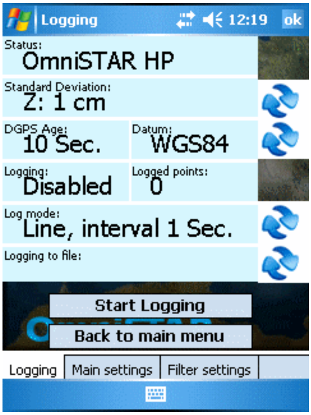


Figure 46 σ_z

ViewAll can also be used to log position data. The logging screen will start with the information shown in Figure 45. By clicking on the arrow symbols, the information presented will change to show the standard deviation in vertical direction (Figure 46), information about the OmniSTAR satellite used (Figure 47), the current date and time (Figure 48), speed and filter information (Figure 49), project name (Figure 50), surveyor name (Figure 51), antenna height (Figure 52) and the amount of internal and external memory available for logging (Figure 53 and Figure 54). When a storage card has not been inserted, the amount of external memory will be reported as zero.

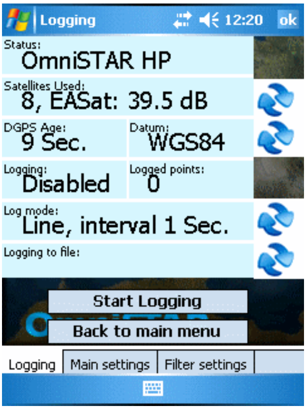


Figure 47 Satellite info

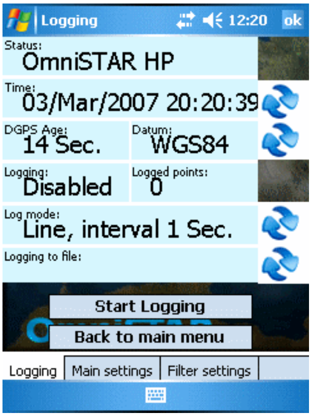


Figure 48 Date and time

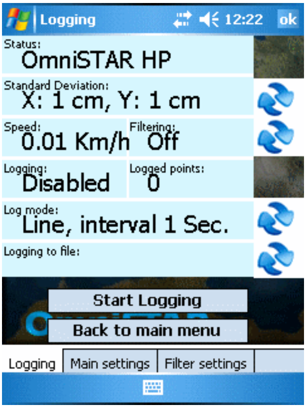


Figure 49 Speed and filtering

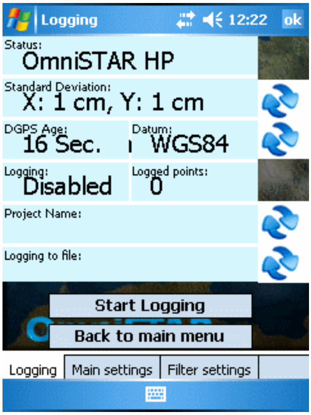


Figure 50 Project name

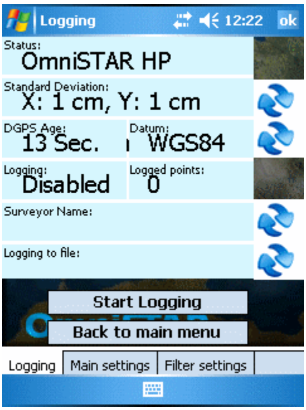


Figure 51 Surveyor name

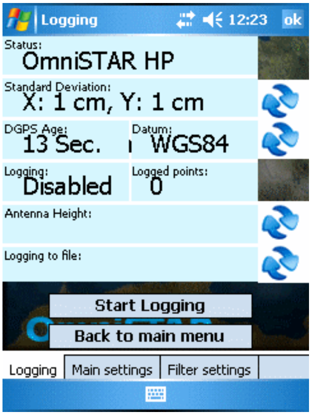
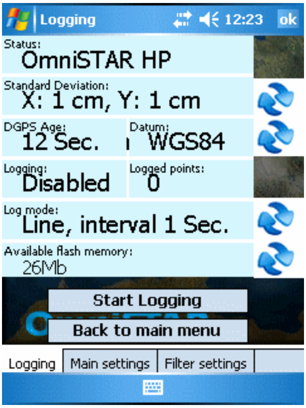


Figure 52 Antenna height



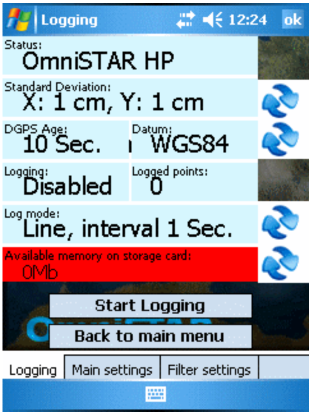


Figure 53 Internal memory *Figure 54 Storage card memory*

In the main settings screen (Figure 55), the file format (.CSV, which can be read by MS Excel, or .KML, which can be imported by Google Earth), log type, log method and interval (in case ‘Time’ is chosen as log method) can be chosen. The project name, Surveyor name, Antenna height and log file name can also be entered.

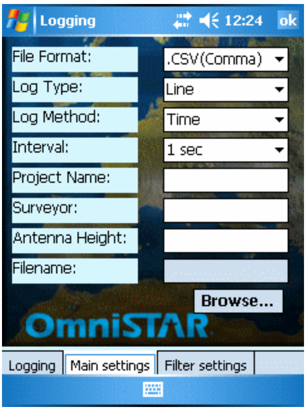


Figure 55 Main settings *Figure 56 Filter settings*

In the Filter settings screen (Figure 56), warning filters can be set. If the program detects that one or more of the filter conditions are met, a visual and/or audio warning can be given, notifying the user the logged position may not be as accurate as expected.

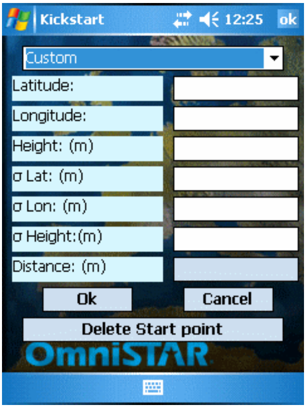
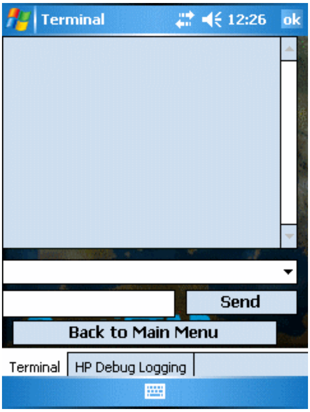


Figure 57 Kickstart point

The Kickstart window (Figure 57) is used to enter the coordinates of a known point, used to seed the receiver in order to speed up the HP convergence. Coordinates and standard deviations of the coordinates can either be entered manually or chosen from a list with previously stored kickstart points.



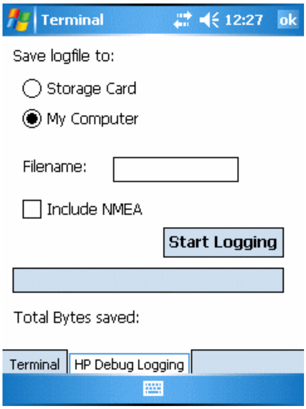


Figure 58 Terminal window *Figure 59 HP Debug logging*

The terminal window (Figure 58) is used to directly send commands to the attached receiver, if the receiver supports command line configuration. HP debug logging (Figure 59) is used to easily log (binary) debug data to either the internal PDA memory or a storage card. Debug data can be used by OmniSTAR engineers for troubleshooting when the receiver does not seem to work correctly in HP mode.

Figure 60 ViewAll Exit

By double tapping the Exit button, the ViewAll program will close. As all data that is not stored in either the PDA's internal memory or on storage card will be lost, the user has to confirm leaving the program (Figure 60) before the program is actually closed.

Appendix C

Commands

Following are the commands with detailed descriptions that can be sent to the 8305HP.

ANTENNAPOWER

The antennapower command allows the user to enable or disable the DC voltage on the centre pin of the antenna connector (LNA power). Normally, the 8305HP is used in combination with an active antenna, which needs the LNA power to be present to function correctly. When a passive antenna is used, the LNA power may be switched off to prevent damage to the antenna. Default, antennapower is set ON.

Abbreviated ASCII Syntax: **Message ID: 98**

ANTENNAPOWER flag

Where ‘flag’ is either ‘on’ or ‘off’.

ASCII Example:

```
ANTENNAPOWER ON
```

ASSIGNLBAND

This command allows you to use manual instructions to ensure that the receiver searches for a specified OmniSTAR satellite at a specified frequency with a specified baud rate.

Field	Field Type	ASCII Value	Description
1	header	-	This field contains the command name
2	mode	OMNISTAR	Set the mode to OmniSTAR and enter specific frequency and baud rate values
3	freq	1525000000 to 1560000000	OmniSTAR service frequency of satellite (Hz).
4	baud	300, 600, 1200, 2400 or 4800	Data rate for communication with the OmniSTAR satellite (default 1200).

Table 11: Description of the assignlband command

Abbreviated ASCII Syntax: **Message ID: 467**

ASSIGNLBAND OMNISTAR freq baud

ASCII Example:

```
ASSIGNLBAND OMNISTAR 1537440000 1200
```

AUTH

This command is used to add or remove authorization codes from the receiver. Authorization codes are used to authorize models of software for a receiver. The receiver is capable of keeping track of five authorization codes at one time. The MODEL command can then be used to switch between authorized models. The VALIDMODELS log lists the current available models in the receiver. This simplifies the use of multiple software models on the same receiver.
If there is more than one valid model in the receiver, the receiver either uses the model of the last auth code entered via the AUTH command or the model that was selected by the MODEL command, whichever was done last. Both the AUTH and MODEL commands cause a reset automatically.

Warning: auth codes are firmware specific. If you have upgraded your receiver to a newer firmware version, you will have to contact OmniSTAR to provide you with a new auth code in order to be able to use the receiver.

Field	Field Type	ASCII Value	Description
1	header	-	This field contains the command name
2	state	'add' or 'remove'	Select whether to add an auth code to the receiver or remove an auth code from the receiver
3	part 1	4 digit hex	Authorization code section 1
4	part 2	4 digit hex	Authorization code section 2
	part 3	4 digit hex	Authorization code section 3
	part 4	4 digit hex	Authorization code section 4
	part 5	4 digit hex	Authorization code section 5
	model	model name	Model name (max 16 characters)
	date	yymmdd	Expiry date in yymmdd format

Table 12 Description of the auth command

Abbreviated ASCII Syntax: **Message ID: 49**

AUTH [state] part1 part2 part3 part4 part5 model [date]

ASCII Example:

```
AUTH ADD 1234 5678 9abc def0 1234 N12LVS
```

COM

This command permits you to configure the receiver's asynchronous serial port communications drivers.

The current COM port configuration can be reset to its default state at any time by sending it two hardware break signals of 250 milliseconds each, spaced by fifteen hundred milliseconds (1.5 seconds) with a pause of at least 250 milliseconds following the second break. This will:

• Stop the logging of data on the current port

• Clear the transmit and receive buffers on the current port

• Return the current port to its default settings

Abbreviated ASCII Syntax: **Message ID: 4**

COM [port] bps [parity[databits[stopbits[handshake[echo[break]]]]]]

Field	Field Type	ASCII Value	Description
1	header	-	This field contains the command name
2	port	See Table 14: Serial port identifiers for COM command on page 56	Port to configure. (default is THISPORT)
3	bps / baud	300, 600, 900, 1200, 2400, 9600, 19200, 38400, 57600, 115200 or 230400	Communication baud rate (bps).
4	parity	See Table 15: Parity, on page 56	Parity
5	databits	7 or 8	Number of databits (default = 8)
6	stopbits	1 or 2	Number of stopbits (default = 1)
7	handshake	See Table 16: Handshaking, on page 56	Handshaking
8	echo	OFF	No echo (default)
		ON	Transmit any input characters as they are received.
9	break	OFF	Disable break detection
		ON	Enable break detection (default)

Table 13: Description of COM command

ASCII Example:

```
COM COM1,57600,N,8,1,N,OFF,ON
```

ASCII	Binary	Description
COM1	1	Com port 1
COM2	2	Com port 2
COM3	3	Com port 3
THISPORT	6	The current com port.
ALL	8	All com ports.

Table 14: Serial port identifiers for COM command

Binary	ASCII	Description
0	N	No parity (default)
1	E	Even parity
2	O	Odd parity

Table 15: Parity

Binary	ASCII	Description
0	N	No handshaking (default)
1	XON	XON/XOFF software handshaking
2	CTS	CTS/RTS hardware handshaking

Table 16: Handshaking

DGPSTIMEOUT

This command is used to set the maximum age of pseudorange differential data to use. Pseudorange differential data received that is older than the specified time is ignored. Standard timeout delay is set to 300s.

Abbreviated ASCII Syntax: **Message ID: 127**

DGPSTIMEOUT delay

ASCII Example:

```
DGPSTIMEOUT 60
```

ECUTOFF

This command sets the elevation cut-off angle for tracked satellites. The receiver does not start automatically searching for a satellite until it rises above the cut-off angle. Tracked satellites that fall below the cut-off angle are no longer tracked unless they were manually assigned. In either case, satellites below the ECUTOFF angle are eliminated from the internal position and clock offset solution computations.
This command permits a negative cut-off angle; it could be used in these situations:

- The antenna is at a high altitude, and thus can look below the local horizon
- Satellites are visible below the horizon due to atmospheric refraction

Warning: Care must be taken when using ECUTOFF because the signals from lower[1] elevation satellites are travelling through more atmosphere and are therefore degraded. Use of satellites below 5 degrees is not recommended. The Omnistar HP/XP process is not affected by the ecutoff setting. The elevation cutoff angle for HP/XP is 8 degrees.

[1] A low elevation satellite is a satellite the receiver is tracking "just" (generally: anywhere between 0 and 15 degrees) above the horizon. Low elevation satellites are usually setting or rising. There is no difference in the data transmitted from a low elevation satellite to that transmitted from a higher elevation satellite. However, differences in the signal path of a low elevation satellite make their use less desirable. Low elevation satellite signals are noisier due to the increased amount of atmosphere they must travel through. In addition, signals from low elevation satellites don't fit the assumption that a GPS signal travels in air nearly the same as in a vacuum. As such, using low elevation satellites in the solution results in greater position inaccuracies.
The elevation cut-off angle is specified with ECUTOFF to ensure that noisy, low elevation satellite data below the cut-off is not used in computing a position. Experimenting with different cut-off angles can be done to provide the best results. In cases where there are not enough satellites visible, a low elevation satellite may help in providing a useful solution.

Abbreviated ASCII Syntax: **Message ID: 50**

ECUTOFF angle

Field	Field Type	ASCII Value	Description
1	header	-	This field contains the command name
2	angle	-90.0…+90.0	Elevation cut-off angle relative to the horizon

Table 17 Description of the ECUTOFF command

ASCII Example:

```
ECUTOFF 5
```

FRESET

This command clears data stored in non-volatile memory. Such data includes the almanac, ephemeris, and any user-specific configurations. The commands, ephemeris, almanac, and L-Band related data, excluding the subscription information, can be cleared by using the STANDARD target. The model can only be cleared by using the MODEL target. The receiver is forced to hardware reset.

Abbreviated ASCII Syntax: **Message ID: 20**

FRESET [target]

ASCII Example:

```
FRESET COMMAND
```

Field	Field Type	ASCII Value	Description
1	header	-	This field contains the command name
2	Target	STANDARD	Resets commands, ephemeris and almanac (default). Also resets all L-band related data except for the subscription information.
		COMMAND	Resets stored commands (saved configuration)
		GPSALMANAC	Resets the stored GPS almanac
		GPSEPHEM	Resets the stored GPS ephemeris
		MODEL	Resets the currently selected model
		LAST_POSITION	Resets the position using the last stored position

Table 18 Description of the FRESET command

GGAQUALITY

This command allows you to customize the GPS quality indicator as reported in the NMEA GPGGA, GPGGALONG and GPGGARTK messages (see also the GPGGA message on page 101).

Abbreviated ASCII Syntax: **Message ID: 691**

GGAQUALITY [#entries] [pos type1] [qual1] [pos type2] [qual2] …

ASCII Example:

```
GGAQUALITY 3 OMNISTAR 2 OMNISTAR_HP 5 OMNISTAR_XP 5
```

Position type	Description
SINGLE	Single point position
WAAS	WAAS/EGNOS corrected position
OMNISTAR	OmniSTAR VBS position
OMNISTAR_HP	OmniSTAR HP position
OMNISTAR_XP	OmniSTAR XP position

Table 19 Position types

HPSEED

This OmniSTAR HP/XP command allows you to specify the initial position for OmniSTAR HP/XP. It allows you to specify the datum and undulation for the position entered. Position is then transformed into the datum currently set in the receiver. You can use STORE or RESTORE as a variable.

Abbreviated ASCII Syntax: **Message ID: 782**

HPSEED mode [lat lon hgt latσ,lonσ,hgtσ [datum undulation]]

ASCII Example:

```
HPSEED SET 12.34567 1.23456 12.345 0.1,0.1,0.2
```

```
HPSEED RESTORE
```

Field	Field Type	ASCII Value	Description
1	header	-	This field contains the command name
2	mode	STORE	Store the current HP/XP position and sigma's in the receiver's NVM
		RESTORE	Use the stored position and sigma's as a seed point
		RESET	Clear the stored position from the receiver's memory
		SET	Manually enter the position coordinates and sigma's to be used as a seed point
3	Lat	-360…+360	Seed point latitude (deg)
4	Lon	-90…+90	Seed point longitude (deg)
5	Hgt	-1000… +20000000	Seed point height (m)
6	Latσ		Latitude standard deviation (m)
7	Lonσ		Longitude standard deviation (m)
8	Hgtσ		Height standard deviation (m)
9	Datum		Datum ID (default WGS84)
10	Undulation	TABLE	Use the internal undulation table (default) (same as OSU89B)
		USER *nnnn*	Use the user specified undulation value (-1000.0 … +1000.0)
		OSU89B	Use the OSU89B undulation table
		EGM96	Use global geoidal height model EGM96 table

Table 20 Description of the HPSEED command

HPSTATICINIT

This command enables or disables static initialization of OmniSTAR HP/XP. If the OmniSTAR HP/XP process knows that the receiver is stationary, it can converge more quickly.

If the HP/XP filter perceives receiver motion, it may abort static initialization. See the Static Initialization Mode bit in the HP/XP Status field of the LBANDSTAT log (see page 115) to confirm that static initialization is in progress.

Abbreviated ASCII Syntax: **Message ID: 780**

HPSTATICINIT switch

Field	Field Type	ASCII Value	Description
1	header	-	This field contains the command name
2	switch	'enable' or 'disable'	Enable or disable static initialization

Table 21 Description of the HPSTATICINIT command

ASCII Example:

```
HPSTATICINIT ENABLE
```

LOG

Many different types of data can be logged using several different methods of triggering the log events. Every log element can be directed to any combination of the three COM ports.

Table 22 shows the ASCII command format.

The optional parameter [hold] will prevent a log from being removed when the UNLOGALL command is issued. To remove a log which was invoked using the [hold] parameter requires the specific use of the UNLOG command.
The [port] parameter is optional. If [port] is not specified, [port] is defaulted to the port that the command was received on.

The 8305HP can handle 30 logs at a time. If you attempt to log more than 30 logs at a time, the receiver will respond with an Insufficient Resources error.

Abbreviated ASCII Syntax: **Message ID: 1**

LOG [port] message [trigger [period [offset [hold]]]]

Abbreviated ASCII Example:

```
LOG COM1 GPGGALONG ONTIME 1
```

Field	Field Type	ASCII Value	Description
1	header	-	This field contains the command name
2	port	See Table 14: Serial port identifiers for COM command on page 56	Output port (default = THISPORT)
3	message	Any valid message name	Message name of log to output
4	trigger	ONNEW	Output when the message is updated (not necessarily changed).
		ONCHANGED	Output when the message is changed.
		ONTIME	Output on a time interval.
		ONNEXT	Output only the next message.
		ONCE	Output only the current message (default).
		ONMARK	Output when a pulse is detected on the Mark1 input, MKI.
5	period	Any positive double value larger than the receiver's minimum raw measurement period.	Log period (for ontime trigger) in seconds (default = 0).
6	offset	Any positive double value smaller than the time period.	Offset for period (ONTIME trigger) in seconds. If you wished to log data at 1 second after every minute you would set the period to 60 and the offset to 1 (default = 0)
7	hold	NOHOLD	Allow log to be removed by the UNLOGALL command (default).
		HOLD	Prevent log being removed by the UNLOGALL command.

Table 22: Description of the LOG command.

MARKCONTROL

This command provides a means of controlling the processing of the mark 1 (MK1I) and mark 2 (MK2I) inputs for the 8305HP. Using this command, the mark inputs can be enabled or disabled, the polarity can be changed, and a time offset and guard against extraneous pulses can be added. The MARKPOS and MARKTIME logs have their outputs (and extrapolated time tags) pushed into the future (relative to the MKI event) by the amount entered into the time bias field. In almost all cases, this value is set to 0, which is also the default setting.

Abbreviated ASCII Syntax: **Message ID: 614**

MARKCONTROL signal switch [polarity] [timebias [timeguard]]

Field	Field Type	ASCII Value	Description
1	header	-	This field contains the command name
2	Signal	'mark1' or 'mark2'	Specifies which mark input the command should be applied to. Set to MARK1 for the MK1I input and MARK2 for MK2I. Both mark inputs have 10K pullup resistors to 3.3 V and are leading edge triggered.
3	Switch	'enable' or 'disable'	Disables or enables processing of the mark input signal for the input specified. If DISABLE is selected, the mark input signal is ignored. The factory default is ENABLE.
4	Polarity	'positive' or 'negative'	Optional field to specify the polarity of the pulse to be received on the mark input. If no value is specified, the default NEGATIVE is used.
5	Timebias	Any valid long value	Optional value to specify an offset, in nanoseconds, to be applied to the time the mark input pulse occurs. If no value is supplied, the default value of 0 is used.
6	Timeguard	Any valid long value larger than the receiver's minimum raw measurement period.	Optional field to specify a time period, in milliseconds, during which subsequent pulses after an initial pulse are ignored. If no value is supplied, the default value of 0 is used.

Table 23: Description of the MARKCONTROL command.

ASCII Example:

```
markcontrol mark1 enable negative 50 100

markcontrol mark2 enable positive
```

MODEL

This command is used to switch the receiver between models previously added with the AUTH command. When this command is issued, the receiver saves this model as the active model. The active model is now used on every subsequent start-up. The MODEL command causes an automatic reset.

Use the VALIDMODELS log to output a list of available models for your receiver. The VALIDMODELS log is described on page 96. Use the VERSION log to output the active model, see page 96.

Warning: If you switch to an expired model, the receiver will reset and enter into an error state. You will need to switch to a valid model to continue.

Abbreviated ASCII Syntax: **Message ID: 22**

MODEL model

ASCII Example:

```
model n12lvs
```

The OmniSTAR 8305HP receiver use the concept of models to enable different levels of functionality in the receiver firmware. For example, a receiver may be purchased with an L1 only enabled version of firmware and be easily upgraded at a later time to a more feature intensive model. All that is required to upgrade is an authorization code for the higher model and the AUTH command (see page 54). Reloading the firmware or returning the receiver for service to upgrade the model is not required. Upgrades are available through your local OmniSTAR dealer.

Field	Field Type	ASCII Value	Description
1	header	-	This field contains the command name
2	model	Max. 16 characters	Model name.

Table 24: Description of the MODEL command.

NVMRESTORE

This command restores non-volatile memory (NVM) data after a NVM Fail error. This failure is indicated by bit 13 of the receiver error word being set. If

corrupt NVM data is detected, the receiver remains in the error state and continues to flash an error code on the Status LED until the NVMRESTORE command is issued.
If you have more than one auth-code and the saved model is lost then the model may need to be entered using the MODEL command or it is automatically saved in NVM on the next start-up. If the almanac was lost, a new almanac is automatically saved when the next complete almanac is received (after approximately 15 minutes of continuous tracking). If the user configuration was lost it has to be re-entered by the user. This could include communication port settings.

Note: The factory default for the COM ports is **9600, n, 8, 1**.

After entering the NVMRESTORE command and resetting the receiver, the communications link may have to be re-established at a different baud rate from the previous connection.

Abbreviated ASCII Syntax: **Message ID: 197**

```
NVMRESTORE
```

Note: The possibility of NVM failure is extremely remote, however, if it should occur it is likely that only a small part of the data is corrupt. This command is used to remove the corrupt data and restore the receiver to an operational state. The data lost could be the user configuration, almanac, model, or other reserved information.

OMNIUSEGLONASS

To enable the use of Glonass for Omnistar Position calculations issue the following command

OMNIUSEGLONASS ENABLE

To disable the use of Glonass use the following command

OMNIUSEGLONASS DISABLE

Adding Glonass improves the convergence time by 30%. It also improves the availability of the HP/XP solutions.

PPSCONTROL

This command provides a method for controlling the polarity and rate of the PPS output on the 8305HP. The PPS output can also be disabled using this command.

Abbreviated ASCII Syntax: **Message ID: 613**

PPSCONTROL switch [polarity] [rate]

Factory Default:

```
PPSCONTROL enable negative 1.0 0
```

ASCII Example:

```
ppscontrol enable positive 0.5
```

Field	Field Type	ASCII Value	Description
1	header	-	This field contains the command name
2	Switch	‘disable’ or ‘enable’	Disable or enable output of the 1PPS pulse. Default is ENABLE
3	Polarity	‘negative’ or ‘positive’	Optional field to specify the polarity of the pulse to be generated on the PPS output. If no value is supplied, the default NEGATIVE is used.
4	Rate	0.2, 0.25, 0.5, 1.0, 2.0, 3.0, … 20.0	Optional field to specify the period of the pulse, in seconds. If no value is supplied, the default value of 1.0 is used.
5	Reserved, set to 0		

Table 25: Description of the PPSCONTROL command.

PSRDIFFSOURCE / RTKSOURCE

This command sets the receiver to accept OmniSTAR HP and Virtual Base Station (VBS) differential corrections.

Enable OmniSTAR HP and VBS:

```
RTKSOURCE OMNISTAR
PSRDIFFSOURCE OMNISTAR
```

To enable OmniSTAR HP debug data output (binary format), expand the `RTKSOURCE` command with the text ‘`DBG`*n*’ , where *n* is the number of the receiver’s communication port to output debug-data.
For example, to output debug data over COM2, send the following command:

```
RTKSOURCE OMNISTAR dbg2
```

To disable OmniSTAR HP debug data output, set *n* to 0, so:

```
RTKSOURCE OMNISTAR dbg0
```

will disable OmniSTAR HP debug data output on all ports.

RESET

This command performs a hardware reset. Following a RESET command, the receiver will initiate a cold-start boot up. Therefore, the receiver configuration will revert either to the factory default if no user configuration was saved or the last SAVECONFIG settings.

The optional delay field is used to set the number of seconds the receiver is to wait before resetting.

Abbreviated ASCII Syntax: **Message ID: 18**

RESET [delay]

Field	Field Type	ASCII Value	Description
1	header	-	This field contains the command name
2	delay		Seconds to wait before resetting. (default = 0)

Table 26: Description of the RESET command.

SAVECONFIG

This command saves the user's present configuration in non-volatile memory. The configuration includes the current log settings, FIX settings, port configurations, etc. and is output in the RXCONFIG log.

Abbreviated ASCII Syntax: **Message ID: 19**

SAVECONFIG

UNLOG

This command permits you to remove a specific log request from the system. The [port] parameter is optional. If [port] is not specified, it is defaulted to the port on which the command was received. This feature eliminates the need for you to know which port you are communicating on if you want logs to be removed on the same port as this command. The UNLOG command allows you to remove one or more logs while leaving other logs unchanged.

Abbreviated ASCII Syntax: **Message ID: 36**

UNLOG [port] message

ASCII Example:

```
unlog com1 bestposa

unlog bestposa
```

Field	Field Type	ASCII Value	Description
1	header	-	This field contains the command name
2	Port	COM1, COM2, COM3, USB1, USB2 or USB3	Port to which log is being sent (default is THISPORT)
3	Datatype	Any valid message	Message name of log to be disabled

Table 27: Description of the UNLOG command.

UNLOGALL

If [port] is specified this command disables all logs on the specified port only. All other ports are unaffected. If [port] is not specified this command defaults to the ALLPORTS setting.

Abbreviated ASCII Syntax: **Message ID: 38**

UNLOGALL [port] [held]

ASCII Example:

```
unlogall com2 TRUE
```

Field	Field Type	ASCII Value	Description
1	header	-	This field contains the command name
2	Port	COM1, COM2, COM3, USB1, USB2 or USB3	Port to clear (default is ALLPORTS)
3	Held	FALSE TRUE	Do not remove logs with the HOLD parameter set (default) Remove previously held logs, even those with the HOLD parameter.

Table 28: Description of the UNLOGALL command.

USERDATUM

If [port] is specified this command disables all logs on the specified port only. All other ports are unaffected. If [port] is not specified this command defaults to the ALLPORTS setting.

Abbreviated ASCII Syntax: **Message ID: 38**

UNLOGALL [port] [held]

ASCII Example:

```
unlogall com2 TRUE
```

Field	Field Type	ASCII Value	Description

1	header	-	This field contains the command name
2	Port	COM1, COM2, COM3, USB1, USB2 or USB3	Port to clear (default is ALLPORTS)
3	Held	FALSE TRUE	Do not remove logs with the HOLD parameter set (default) Remove previously held logs, even those with the HOLD parameter.

Table 29: Description of the UNLOGALL command.

Data Logs

Refer to the LOG command, see page 63, for details on requesting logs.

The receiver is capable of generating many different logs. These logs are divided into the following three types: Synchronous, asynchronous and polled.

The data for synchronous logs is generated on a regular schedule.

Asynchronous data is generated at irregular intervals. If asynchronous logs were collected on a regular schedule, they would not output the most current data as soon as it was available.

The data in polled logs is generated on demand. An example would be RXCONFIG. It would be polled because it changes only when commanded to do so. Therefore, it would not make sense to log this kind of data ONCHANGED, or ONNEW.

For available NMEA logs see Table 54 on page 99.

Datatype	Description
OMNIHPPOS	HP position data
LBANDINFO	Configuration Information
LBANDSTAT	Status Information

Table 30: Available OmniSTAR specific logs

Log message headers

Every data log is preceded by a log header. The header provides information about the log type and the status of the receiver. All data fields in the header are separated with commas. The last field of the header and the first data field of the actual log are separated by a semicolon.
Table 31 on page 75 describes the structure of the log header in detail.

Field	Field Name	Description
1	Sync	Sync character. ASCII messages are always preceded by a single '#' symbol.
2	Message	ASCII name of the log
3	Port	Name of the port from which the log was generated. The string is made up of the port name, followed by a port number (0-31), denoting the virtual address of the port.
4	Sequence #	Used for multiple related logs. It is a number counting down from N-1 to 0, where 0 means it is the last (or only) message of the set.
5	% Idle time	Minimum percentage of time that the processor is idle between successive logs with the same message ID
6	GPS time status	This value indicates the quality of the GPS time, see also Table 32 on page 76
7	Week	GPS week number
8	Seconds	Seconds from the beginning of the GPS week, accurate to the millisecond level.
9	Receiver status	Eight digit hexadecimal number representing the status of various hardware and software components of the receiver between successive logs with the same message ID (see Table 45 on page 92)
10	Reserved	Reserved for internal use.
11	Receiver s/w version	A value between 0 and 65536 that represents the receiver software build number.
12	;	End of header character.

Table 31: Log header structure

GPS time status	Description
UNKNOWN	Time validity is unknown
APPROXIMATE	Time is set approximately
COARSEADJUSTING	Time is approaching coarse precision
COARSE	This time is valid to coarse precision
COARSESTEERING	Time is coarse set, and is being steered
FREEWHEELING	Position is lost and the range bias cannot be calculated
FINEADJUSTING	Time is adjusting to fine precision
FINE	Time has fine precision
FINESTEERING	Time is fine set and is being steered.
SATTIME	Time from satellite. This is only used in logs containing satellite data, such as ephemeris and almanac.

Table 32: GPS time status

BESTPOS

This log contains the best available combined GPS and inertial navigation system (INS - if available) position computed by the receiver. In addition, it reports several status indicators, including differential age, which is useful in predicting anomalous behaviour brought about by outages in differential corrections. A differential age of 0 indicates that no differential correction was used. With the system operating in HP or XP mode, this log reflects the latest low-latency solution for up to 60 seconds after reception of the last HP/XP correction message. After this 60 second period, the position reverts to the best solution available; the degradation in accuracy is reflected in the standard deviation fields. If the system is operating in VBS mode, pseudorange differential solutions continue for the time specified in the DGPSTIMEOUT command (see also page 57).

Message ID: 42 **Log Type: Synch**

Recommended Input:

log bestposa ontime 1

ASCII Example 1:

```
#BESTPOSA,COM1,0,65.0,FINESTEERING,1337,332686.000,
00000000,4ca6,1984;SOL_COMPUTED,SINGLE,51.11636226046,
-114.03820721629,1063.8624,-16.2713,WGS84,2.0389,1.5933,
3.1363,"",0.000,0.000,7,7,0,0,0,0,0,0*b1b0a971
```

Field	Field Type	Description
1	header	This field contains the command name
2	Sol status	Solution status, see Table 68 on page 111
3	Pos type	Position type, see Table 19 on page 60
4	Lat	Latitude
5	Lon	Longitude
6	Hgt	Height above mean sea level
7	Undulation	Undulation
8	Datum ID#	Datum ID number
9	Lat σ	Latitude standard deviation
10	Lon σ	Longitude standard deviation
11	Hgt σ	Height standard deviation
12	Stn ID	Base station ID
13	Diff_age	Differential age in seconds
14	Sol_age	Solution age in seconds
15	#obs	Number of observations tracked
16	#GPSL1	Number of GPS L1 ranges used in computation
17	#L1	Number of GPS L1 ranges above the HP/XP mask angle
18	#L2	Number of GPS L2 ranges above the HP/XP mask angle
19-22	Reserved	
23	xxxx	32-bit CRC
24	[CR][LF]	Sentence terminator

Table 33 Bestpos log description

COMCONFIG

This log outputs the current COM port configuration for each port on your receiver.

Message ID: 317 **Log Type: Polled**

Recommended Input:

log comconfiga once

ASCII example:

```
#COMCONFIGA,COM1,0,57.5,FINESTEERING,1337,394947.236,00000
000,85aa,1984;3,
COM1,57600,N,8,1,N,OFF,ON,NOVATEL,NOVATEL,ON,
COM2,9600,N,8,1,N,OFF,ON,RTCA,NONE,ON,
COM3,9600,N,8,1,N,OFF,ON,NOVATEL,NOVATEL,ON*9d4b21b6
```

Field	Field Type	Description
1	header	This field contains the command name
2	#port	Number of ports with information to follow
3	Port	Serial port identifier (see Table 14 on page 56)
4	Baud	Communication baud rate
5	Parity	See Table 15 on page 56
6	Databits	Number of data bits
7	Stopbits	Number of stop bits
8	Handshake	See Table 16 on page 56
9	Echo	When echo is ON, the port is transmitting any input characters as the are received.
10	Breaks	Breaks are turned ON or OFF
11	RX type	The status of the receive interface mode (see Table 35 on page 79)
12	TX type	The status of the transmit interface mode (see Table 35 on page 79)
13	Response	Responses are turned ON or OFF
14	xxxx	32-bit CRC
15	[CR][LF]	Sentence terminator

Table 34 Comconfig log description

Interface mode	Description
NONE	The port accepts/generates nothing. The port is disabled
NOVATEL	The port accepts/generates NovAtel commands and logs
RTCM	The port accepts/generates RTCM corrections
RTCA	The port accepts/generates RTCA corrections
CMR	The port accepts/generates CMR corrections
RTCMNOCR	RTCM with no CR/LF appended
RTCMV3	The port accepts/generates RTCM Version 3.0 corrections

Table 35: Interface modes

LBANDINFO

This is an OmniSTAR specific log, see the description on page 113

LBANDSTAT

This is an OmniSTAR specific log, see the description on page 115

LOGLIST

Outputs a list of log entries in the system. The following tables show the binary ASCII output. See also the RXCONFIG log on page 87 for a list of current command settings.

Message ID: 5 **Log Type: Polled**

Recommended Input:

log loglista once

ASCII Example:

```
#LOGLISTA,COM1,0,60.5,FINESTEERING,1337,398279.996,0000000
0,c00c,1984;8,
COM1,RXSTATUSEVENTA,ONNEW,0.000000,0.000000,HOLD,
COM2,RXSTATUSEVENTA,ONNEW,0.000000,0.000000,HOLD,
COM3,RXSTATUSEVENTA,ONNEW,0.000000,0.000000,HOLD,
USB1,RXSTATUSEVENTA,ONNEW,0.000000,0.000000,HOLD,
USB2,RXSTATUSEVENTA,ONNEW,0.000000,0.000000,HOLD,
USB3,RXSTATUSEVENTA,ONNEW,0.000000,0.000000,HOLD,
COM1,BESTPOSA,ONTIME,10.000000,0.000000,NOHOLD,
COM1,LOGLISTA,ONCE,0.000000,0.000000,NOHOLD*5b29eed3
```

Field	Field Type	Description
1	header	This field contains the command name
2	#logs	Number of messages to follow, maximum = 20
3	Port	Output port, see also Table 14 on page 56
4	Message	Message ID of log
5	Message type	Bits 0-4 = reserved Bits 5-6 = format 00 = Binary 01 = ASCII 10 = Abbreviated ASCII, NMEA 11 = Reserved Bit 7 = response bit 0 = Original message 1 = Response message
6	Reserved	
7	Trigger	0 = ONNEW 1 = ONCHANGED 2 = ONTIME 3 = ONNEXT 4 = ONCE 5 = ONMARK
8	Period	Log period for ONTIME
9	Offset	Offset for period (ONTIME trigger)
10	Hold	0 = NOHOLD 1 = HOLD
11	xxxx	32-bit CRC

Table 36 Loglist log description

MARKPOS, MARK2POS

This log contains the estimated position of the antenna when a pulse is detected at a mark input. MARKPOS is a result of a pulse on the MK1I input and MARK2POS is generated when a pulse occurs on a MK2I input.
The position at the mark input pulse is extrapolated using the last valid position and velocities. The latched time of mark impulse is in GPS weeks and seconds into the week. The resolution of the latched time is 49 ns. See also the notes on MARKPOS in the MARKTIME log on page 83.

Message ID: 181 (MARKPOS) and **615 (MARK2POS)** **Log Type: Asynch**

Recommended Input:

log markposa onnew

Use the **ONNEW** trigger with the MARKTIME or MARKPOS logs.

Example:

```
#MARKPOSA,COM1,0,82.0,FINESTEERING,1358,418904.000,
00000000,729b,2214;SOL_COMPUTED,SINGLE,51.11636965556,
-114.03819916299,1061.0032,-16.2714,WGS84,2.3645,1.5689,
4.2226,"",0.000,0.000,6,6,0,0,0,0,0,0*ed438435
```

Field	Field Type	Description
1	header	This field contains the command name
2	Sol status	Solution status, see Table 68 on page 111
3	Pos type	Position type, see Table 19 on page 60
4	Lat	Latitude
5	Lon	Longitude
6	Hgt	Height above mean sea level
7	Undulation	Undulation
8	Datum ID#	Datum ID number
9	Lat σ	Latitude standard deviation
10	Lon σ	Longitude standard deviation
11	Hgt σ	Height standard deviation
12	Stn ID	Base station ID
13	Diff_age	Differential age in seconds
14	Sol_age	Solution age in seconds
15	#obs	Number of observations tracked
16	#GPSL1	Number of GPS L1 ranges used in computation
17	#L1	Number of GPS L1 ranges above the HP/XP mask angle
18	#L2	Number of GPS L2 ranges above the HP/XP mask angle
19-22	Reserved	
23	xxxx	32-bit CRC
24	[CR][LF]	Sentence terminator

Table 37 Markpos and Mark2pos log description

MARKTIME, MARK2TIME

This log contains the time of the leading edge of the detected mark input pulse. MARKTIME gives the time when a pulse occurs on the MK1I input and MARK2TIME is generated when a pulse occurs on a MK2I input. The resolution of this measurement is 49 ns.

1. Use the ONNEW trigger with this or the MARKPOS logs.
2. Only the MARKPOS logs, the MARKTIME logs, and 'polled' log types are generated 'on the fly' at the exact time of the mark. Synchronous and asynchronous logs output the most recently available data.

Message ID: 231 (MARKTIME) and 616 (MARK2TIME)
Log Type: Asynch

Recommended Input:

log marktimea onnew

Field	Field Type	Description
1	header	This field contains the command name
2	Week	GPS week number
3	Seconds	Seconds into the week as measured from the receiver clock, coincident with the time of electrical closure on the Mark Input port.
4	Offset	Receiver clock offset, in seconds. A positive offset implies that the receiver clock is ahead of GPS Time. To derive GPS time, use the following formula: GPS time = receiver time – offset
5	Offset std	Standard deviation of receiver clock offset (s)
6	UTC offset	This field represents the offset of GPS time from UTC time, computed using almanac parameters. UTC time is GPS time plus the current UTC offset plus the receiver clock offset. UTC time = GPS time + offset + UTC offset
7	Status	Clock model status
8	xxxx	32-bit CRC
9	[CR][LF]	Sentence terminator

Table 38 Marktime and Mark2time log description

Example:
```
#MARKTIMEA,COM1,0,77.5,FINESTEERING,1358,422621.000,
```

```
00000000,292e,2214;1358,422621.000000500,-1.398163614e-08,
7.812745577e-08, -14.000000002,VALID*d8502226
```

OMNIHPPOS

This is an OmniSTAR specific log, see the description on page 111

PSRDOP

The dilution of precision data is calculated using the geometry of only those satellites that are currently being tracked and used in the position solution by the receiver. This log is updated once every 60 seconds or whenever a change in the satellite constellation occurs. Therefore, the total number of data fields output by the log is variable and depends on the number of SVs that are being tracked. Twelve is the maximum number of SV PRNs contained in the list.

Message ID: 174 **Log Type: Asynch**

Recommended Input:

log psrdopa onchanged

ASCII Example:

```
#PSRDOPA,COM1,0,56.5,FINESTEERING,1337,403100.000,00000000
,768f,1984;1.9695,1.7613,1.0630,1.3808,0.8812,5.0,10,14,22
,25,1,24,11,5,20,30,7*106de10a
```

Field	Field Type	Description
1	header	This field contains the command name
2	GDOP	Geometric dilution of precision – assumes 3-D position and receiver clock offset (all 4 parameters) are unknown.
3	PDOP	Position dilution of precision – assumes 3-D position is unknown and receiver clock offset is known.
4	HDOP	Horizontal dilution of precision
5	HTDOP	Horizontal position and time dilution of precision
6	TDOP	Time dilution of precision – assumes 3-D position is known and only the receiver clock offset is unknown.
7	Cutoff	Elevation cut-off angle
8	#PRN	Number of satellites PRNs to follow
9	PRN	PRN of SV PRN tracking, null field until position solution available.
	xxxx	32-bit CRC
	[CR][LF]	Sentence terminator

Table 39 PSRDop log description

PSRPOS

This log contains the pseudorange position computed by the receiver, along with three status flags. In addition, it reports other status indicators, including differential age, which is useful in predicting anomalous behaviour brought about by outages in differential corrections.

Message ID: 47 **Log Type: Synch**

Recommended Input:

log psrposa ontime 1

ASCII Example:

```
#PSRPOSA,COM1,0,55.0,FINESTEERING,1337,403240.000,00000000
,2174,1984;SOL_COMPUTED,PSRDIFF,51.11632196188,
-114.03833887720,1048.3653,-16.2711,WGS84,0.8854,0.6219,
0.8896,"AAAA",7.000,0.000,10,10,0,0,0,0,0,0*376c6614
```

Field	Field Type	Description
1	header	This field contains the command name
2	Sol status	Solution status, see Table 68 on page 111
3	Pos type	Position type, see Table 19 on page 60
4	Lat	Latitude
5	Lon	Longitude
6	Hgt	Height above mean sea level
7	Undulation	Undulation
8	Datum ID#	Datum ID number
9	Lat σ	Latitude standard deviation
10	Lon σ	Longitude standard deviation
11	Hgt σ	Height standard deviation
12	Stn ID	Base station ID
13	Diff_age	Differential age in seconds
14	Sol_age	Solution age in seconds
15	#obs	Number of observations tracked
16	#GPSL1	Number of GPS L1 ranges used in computation
17-22	Reserved	
23	xxxx	32-bit CRC
24	[CR][LF]	Sentence terminator

Table 40 PSRpos log description

PSRVEL

In the PSRVEL log the actual speed and direction of the receiver antenna over ground is provided. The velocity measurements sometimes have a latency associated with them. The time of validity is the time tag in the log minus the latency value.
The velocity status indicates varying degrees of velocity quality. To ensure healthy velocity, the position sol-status must also be checked. If the sol-status is non-zero, the velocity is likely invalid. It should be noted that the receiver does not determine the direction a vessel, craft, or vehicle is pointed (heading), but rather the direction of the motion of the GPS antenna relative to the ground.
The velocity is computed using Doppler values typically derived from differences in consecutive carrier phase measurements. As such, it is an average velocity based on the average change in pseudorange over the time interval and not an instantaneous velocity at the PSRVEL time tag. The velocity latency to be subtracted from the time tag is normally 1/2 the time between filter updates. Under default operation, the position filter is updated at a rate of 2 Hz. This translates into a velocity latency of 0.25 second. The

latency can be reduced by increasing the update rate of the filter by requesting the BESTVEL, PSRVEL, BESTPOS or PSRPOS messages at a rate higher than 2 Hz. For example, a logging rate of 10 Hz would reduce the velocity latency to 0.05 seconds. For integration purposes, the velocity latency should be applied to the record time tag.
A valid solution with a latency of 0.0 indicates that the instantaneous Doppler measurement was used to calculate velocity.

Message ID: 100 **Log Type: Synch**

Recommended Input:

log psrvela ontime 1

ASCII Example:

```
#PSRVELA,COM1,0,52.5,FINESTEERING,1337,403362.000,00000000
,658b,1984;SOL_COMPUTED,PSRDIFF,0.250,9.000,0.0698,
26.582692,0.0172,0.0*a94e5d48
```

Field	Field Type	Description
1	header	This field contains the command name
2	Sol status	Solution status, see Table 68 on page 111
3	Vel type	Velocity type, see Table 19 on page 60
4	Latency	A measure of the latency in the velocity time tag in seconds. It should be subtracted from the time to give improved results.
5	Age	Differential age in seconds
6	Hor spd	Horizontal speed over ground (m/s)
7	Trk gnd	Actual direction of motion over ground (track over ground) with respect to True North (degrees)
8	Vert spd	Vertical speed, in meters per second, where positive values indicate increasing altitude (up) and negative values indicate decreasing altitude (down)
9	Reserved	
10	xxxx	32-bit CRC
11	[CR][LF]	Sentence terminator

Table 41 PSRvel log description

RXCONFIG

This log is used to output a list of all current command settings. When requested, an RXCONFIG log is output for each setting. See also the LOGLIST log on page 79 for a list of currently active logs.

Message ID: 128 **Log Type: Polled**

Recommended Input:

log rxconfiga once

ASCII Example:

```
#RXCONFIGA,COM1,71,47.5,APPROXIMATE,1337,333963.260,
00000000,f702,1984;
#ADJUST1PPSA,COM1,71,47.5,APPROXIMATE,1337,333963.260,
00000000,f702,1984;OFF,ONCE,0*ba85a20b*91f89b07
#RXCONFIGA,COM1,70,47.5,APPROXIMATE,1337,333963.398,
00000000,f702,1984;
#ANTENNAPOWERA,COM1,70,47.5,APPROXIMATE,1337,333963.398,
00000000,f702,1984;ON*d12f6135*8f8741be
#RXCONFIGA,COM1,69,47.5,APPROXIMATE,1337,333963.455,
00000000,f702,1984;
#CLOCKADJUSTA,COM1,69,47.5,APPROXIMATE,1337,333963.455,
00000000,f702,1984;ENABLE*0af36d92*b13280f2
...
#RXCONFIGA,COM1,7,47.5,APPROXIMATE,1337,333966.781,
00000000,f702,1984;
#STATUSCONFIGA,COM1,7,47.5,APPROXIMATE,1337,333966.781,
00000000,f702,1984;CLEAR,AUX2,0*a6141e28*d0bba9f2
#RXCONFIGA,COM1,2,47.5,APPROXIMATE,1337,333967.002,
00000000,f702,1984;
#WAASECUTOFFA,COM1,2,47.5,APPROXIMATE,1337,333967.002,
00000000,f702,1984;-5.000000000*b9b11096*2e8b77cf
#RXCONFIGA,COM1,1,47.5,FINESTEERING,1337,398382.787,
00000000,f702,1984;
#LOGA,COM1,1,47.5,FINESTEERING,1337,398382.787,00000000,
f702,1984;COM1,MARKPOSA,ONNEW,0.000000,0.000000,NOHOLD
*a739272d*6692c084
#RXCONFIGA,COM1,0,47.5,FINESTEERING,1337,400416.370,
00000000,f702,1984;
#LOGA,COM1,0,47.5,FINESTEERING,1337,400416.370,00000000,
f702,1984;COM2,PASSCOM2A,ONCHANGED,0.000000,0.000000,
NOHOLD*55fc0c62*17086d18
```

The RXCONFIG log can be used to ensure that your receiver is set up correctly for your application.

The embedded CRCs are flipped to make the embedded messages recognizable to the receiver. For example, consider the first embedded message above.

91f89b07: 10010001111110001001101100000111
11100000110110010001111110001001: e0d91f89

Its CRC is really e0d91f89.

Field	Field Type	Description
1	header	This field contains the command name
2	e header	Embedded header
3	e msg	Embedded message
4	e xxxx	Emded (inverted) 32-bit CRC. The embedded CRC is inverted so that the receiver does not recognize the embedded messages as messages to be output but continues with the RXCONFIG message. If you wish to use the messages output from the RXCONFIG log, simply flip the embedded CRC around for individual messages.
5	xxxx	32-bit CRC
6	[CR][LF]	Sentence terminator

Table 42 RXConfig log description

RXHWLEVELS

This log contains the receiver environmental and voltage parameters.

Message ID: 195 **Log Type: Polled**

Recommended Input:

log rxhwlevelsa ontime 60

ASCII Example:

```
#RXHWLEVELSA,COM1,0,82.5,FINESTEERING,1364,490216.808,
00000008,863c,2310;31.563,0.000,1.352,11.763,4.996,0.000,
0.000,0.000,0.000,0.000*76927cb1
```

Field	Field Type	Description
1	header	This field contains the command name
2	Temp	Board temperature (degrees Celsius)
3	Ant current	Approximate internal antenna current (A)
4	Core volt	CPU core voltage (V)
5	Supply volt	Receiver supply voltage (V)
6	Rf volt	5V RF supply voltage (V)
7	Int LNA volt	Internal LNA voltage level (V)
8	GPAI	General purpose analog input (V)
9-10	Reserved	
11	LNA volt	LNA voltage (V) at card output
12	Xxxx	32-bit CRC
13	[CR][LF]	Sentence terminator

Table 43 RXHWlevels log description

RXSTATUS

This log conveys various status parameters of the GPS receiver system. These include the Receiver Status and Error words which contain several flags specifying status and error conditions. If an error occurs (shown in the Receiver Error word) the receiver idles all channels, turns off the antenna, and disables the RF hardware as these conditions are considered to be fatal errors. The log contains a variable number of status words to allow for maximum flexibility and future expansion. The receiver gives the user the ability to determine the importance of the status bits. In the case of the Receiver Status, setting a bit in the priority mask causes the condition to trigger an error. This causes the receiver to idle all channels, turn off the antenna, and disable the RF hardware, the same as if a bit in the Receiver Error word is set. Setting a bit in an Auxiliary Status priority mask causes that condition to set the bit in the Receiver Status word corresponding to that Auxiliary Status.

Message ID: 93 **Log Type: Asynch**

Recommended Input:

log rxstatusa onchanged

ASCII Example:

```
#RXSTATUSA,COM1,0,43.5,FINESTEERING,1337,407250.846,
00000000,643c,1984; 00000000,4,00000000,00000000,00000000,
00000000,00000083,00000008,00000000,00000000,00000000,
00000000,00000000,00000000,00000000,00000000,00000000,
00000000*ba27dfae
```

Nibble	Bit	Mask	Description	Bit=0	Bit=1
N0	0	0x00000001	Dynamic RAM status	OK	Error
	1	0x00000002	Invalid firmware	OK	Error
	2	0x00000004	ROM status	OK	Error
	3	0x00000008	Reserved		
N1	4	0x00000010	Electronic Serial Number (ESN) access status	OK	Error
	5	0x00000020	Authorization code status	OK	Error
	6	0x00000040	Slow ADC status	OK	Error
	7	0x00000080	Supply voltage status	OK	Error
N2	8	0x00000100	Thermometer status	OK	Error
	9	0x00000200	Temperature status (as compared against acceptable limits)	OK	Error
	10	0x00000400	MINOS5 status	OK	Error
	11	0x00000800	PLL RF1 hardware status - L1	OK	Error
N3	12	0x00001000	PLL RF2 hardware status – L2	OK	Error
	13	0x00002000	RF1 hardware status – L1	OK	Error
	14	0x00004000	RF2 hardware status – L2	OK	Error
	15	0x00008000	NVM status	OK	Error
N4	16	0x00010000	Software resource limit	OK	Error
	17	0x00020000	Model not valid for this receiver	OK	Error
	18	0x00040000	Reserved		
	19	0x00080000			
N5	20	0x00100000	Remote loading has begun	No	Yes
	21	0x00200000	Export restriction	OK	Error
	22	0x00400000	Reserved		
	23	0x00800000			
N6	24	0x01000000			
	25	0x02000000			
	26	0x04000000			
	27	0x08000000			
N7	28	0x10000000			
	29	0x20000000			
	30	0x40000000			
	31	0x80000000	Component hardware failure	OK	Error

Table 44 Receiver error

Nibble	Bit	Mask	Description	Bit=0	Bit=1
N0	0	0x00000001	Error flag (see Table 44 on page 91)	No error	Error
	1	0x00000002	Temperature status	Within specs	Warning
	2	0x00000004	Voltage supply status	OK	Warning
	3	0x00000008	Antenna power status (see ANTENNAPOWER on page 52)	Powered	Not powered
N1	4	0x00000010	Reserved		
	5	0x00000020	Antenna open flag	OK	Open
	6	0x00000040	Antenna shorted flag	OK	Shorted
	7	0x00000080	CPU overload flag	No overload	Overload
N2	8	0x00000100	COM1 buffer overrun flag	No overrun	Overrun
	9	0x00000200	COM2 buffer overrun flag	No overrun	Overrun
	10	0x00000400	COM3 buffer overrun flag	No overrun	Overrun
	11	0x00000800	USB buffer overrun flag	No overrun	Overrun
N3	12	0x00001000	Reserved		
	13	0x00002000			
	14	0x00004000			
	15	0x00008000	RF1 AGC status	OK	Bad
N4	16	0x00010000	Reserved		
	17	0x00020000	RF2 AGC status	OK	Bad
	18	0x00040000	Almanac flag/UTC unknown	Valid	Invalid
	19	0x00080000	Position solution flag	Valid	Invalid
N5	20	0x00100000	Position fixed flag	Not fixed	Fixed
	21	0x00200000	Clock steering status	Enabled	Disabled
	22	0x00400000	Clock model flag	Valid	Invalid
	23	0x00800000	Card ext. Oscillator flag	Disabled	Enabled
N6	24	0x01000000	Software resource	OK	Warning
	25	0x02000000	Reserved		
	26	0x04000000			
	27	0x08000000			
N7	28	0x10000000			
	29	0x20000000	AUX3 status event flag	No event	Event
	30	0x40000000	AUX2 status event flag	No event	Event
	31	0x80000000	AUX1 status event flag	No event	Event

Table 45 Receiver status

Nibble	Bit	Mask	Description	Bit=0	Bit=1
N0	0	0x00000001	Reserved		
	1	0x00000002			
	2	0x00000004			
	3	0x00000008	Position averaging	Off	On
N1	4	0x00000010	Reserved		
	5	0x00000020			
	6	0x00000040			
	7	0x00000080	USB connection status	Connected	Not connect ed
N2	8	0x00000100	USB1 buffer overrun flag	No overrun	Overrun
	9	0x00000200	USB2 buffer overrun flag	No overrun	Overrun
	10	0x00000400	USB3 buffer overrun flag	No overrun	Overrun
	11	0x00000800	Reserved		

Table 46 Auxiliary 1 status

Nibble	Bit	Mask	Description	Bit=0	Bit=1
N0	0	0x00000001	Reserved		

Table 47 Auxiliary 2 status

Nibble	Bit	Mask	Description	Bit=0	Bit=1
N0	0	0x00000001	Reserved		

Table 48 Auxiliary 3 status

Field	Field Type	Description
1	header	This field contains the command name
2	Error	Receiver error (see Table 44 on page 91)
3	#stats	Number of status codes (including Receiver Status)
4	Rxstat	Receiver status word (see Table 45 on page 92)
5	Rxstat pri	Receiver status priority mask
6	Rxstat set	Receiver status event set mask
7	Rxstat clear	Receiver status event clear mask
8	Aux1stat	Auxiliary 1 status word (see Table 46 on page 93)
9	Aux1stat pri	Auxiliary 1 status priority mask
10	Aux1stat set	Auxiliary 1 status event set mask
11	Aux1stat clear	Auxiliary 1 status event clear mask
12	Aux2stat	Auxiliary 2 status word (see Table 47 on page 93)
13	Aux2stat pri	Auxiliary 2 status priority mask
14	Aux2stat set	Auxiliary 2 status event set mask
15	Aux2stat clear	Auxiliary 2 status event clear mask
16	Aux3stat	Auxiliary 3 status word (see Table 48 on page 93)
17	Aux3stat pri	Auxiliary 3 status priority mask
18	Aux3stat set	Auxiliary 3 status event set mask
19	Aux3stat clear	Auxiliary 3 status event clear mask
20	xxxx	32-bit CRC
21	[CR][LF]	Sentence terminator

Table 49 RXStatus log description

TIME

This log provides several time related pieces of information including receiver clock offset and UTC time and offset. It can also be used to determine any offset in the PPS signal relative to GPS time. To find any offset in the PPS signal, log the TIME log 'ontime' at the same rate as the PPS output. For example, if the PPS output is configured to output at a rate of 0.5 seconds (see the PPSCONTROL command on page 68), log the TIME log 'ontime 0.5' as follows: log time ontime 0.5
The TIME log offset field can then be used to determine any offset in PPS output relative to GPS time.

Message ID: 101 **Log Type: Synch**

Recommended Input:

log timea ontime 1

ASCII Example:

```
#TIMEA,COM1,0,50.5,FINESTEERING,1337,410010.000,00000000,9
924,1984; VALID,1.953377165e-09,7.481712815e-08,
-12.99999999492,2005,8,25,17,53,17000,VALID*e2fc088c
```

Field	Field Type	Description
1	header	This field contains the command name
2	Clock status	Clock model status (not including current measurement data). VALID The clock model is valid CONVERGING The clock model is near validity ITERATING The clock model is iterating towards validity INVALID The clock model is not valid ERROR Clock model error
3	Offset	Receiver clock offset, in seconds from GPS time. A positive offset implies that the receiver clock is ahead of GPS time. To derive GPS time, use the following formula: GPS time = receiver time – offset.
4	Offset std	Receiver clock offset standard deviation
5	UTC offset	The offset of GPS time from UTC time, computed using almanac parameters. UTC time is GPS time plus the current UTC offset plus the receiver clock offset: UTC time = GPS time + offset + UTC offset
6	UTC year	UTC year
7	UTC month	UTC month (0-12; 0 if UTC time is unknown)
8	UTC day	UTC day (0-31; 0 if UTC time is unknown)
9	UTC hour	UTC hour (0-23)
10	UTC min	UTC minute (0-59)
11	UTC ms	UTC millisecond (0-60999; maximum of 60999 when leap second is applied))
12	UTC status	UTC status: 0 = invalid, 1 = valid
13	xxxx	32-bit CRC
14	[CR][LF]	Sentence terminator

Table 50 Time log description

VALIDMODELS

This log gives a list of valid authorized models available and expiry date information. If a model has no expiry date, it reports the year, month and day fields as 0, 0 and 0 respectively.

Message ID: 206 **Log Type: Polled**

Recommended Input:

log validmodelsa once

ASCII Example:

```
#VALIDMODELSA,COM1,0,54.0,FINESTEERING,1337,414753.310,
00000000,342f,1984;1,"ME3",0,0,0*16c0b1a3
```

Field	Field Type	Description
1	header	This field contains the command name
2	#mod	Number of models with information to follow
3	Model	Model name (max. 16 characters)
4	Expyear	Expiry year
5	Expmonth	Expiry month
6	Expday	Expiry day
7	xxxx	32-bit CRC
8	[CR][LF]	Sentence terminator

Table 51 Validmodels log description

VERSION

This log contains the version information for all components of a system. When using a standard receiver, there is only one component in the log.

A component may be hardware (for example, a receiver or data collector) or firmware in the form of applications or data (for example, data blocks for height models or user applications).

Message ID: 37 **Log Type: Polled**

Recommended Input:

log versiona once

ASCII Example:

```
#VERSIONA,COM1,0,69.0,FINESTEERING,1419,142504.035,
00000008,3681,2616;1,GPSCARD,"N12LVS","DAB06250055",
"OEMV3G-3.01-2T2","3.100","3.000",
"2006/Nov/ 7","07:21:53"*96ce1c88
```

The VERSION log is a useful log as a first communication with your receiver. When you connect to your receiver using a terminal program, log the VERSION log and check that the output makes sense. Also, ensure that you have the receiver components you expected.

Designator	Description
L	1 L-Band channel with CDGPS, VBS and/or HP capability
G	12 L1 or 12 L1/L2 GLONASS channels, frequencies to match GPS configuration
R	Receive RT2 and/or RT20 corrections
V	Vision correlator
I	Synchronized Position Attitude Navigation (SPAN)
S	Reduces positions and measurement rates to 5Hz, disables VARF and EVENT signals
A	Application Program Interface (API)

Table 52 Model designators

Field	Field Type	Description
1	header	This field contains the command name
2	#comp	Number of components (cards and so on)
3	Type	Component type
4	Model	A base model name plus designators, where there are four possible base names: L12: 20Hz positions and measurements, RT2/20 base, 14 GPS L1/L2 and 2 SBAS channels L1: 20Hz positions and measurements, RT20 base, 14 GPS L1 and 2 SBAS channels N12: 20Hz positions, no measurements, 14 GPS L1/L2 and 2 SBAS channels N1 20Hz positions, no measurements, 14 GPS L1 and 2 SBAS channels The model designators are shown in Table 52 on page 97.
5	psn	Product serial number
6	Hw version	Hardware version
7	Sw version	Firmware software version
8	Boot version	Boot code version
9	Comp date	Firmware compile date
10	Comp time	Firmware compile time
11	xxxx	32-bit CRC
12	[CR][LF]	Sentence terminator

Table 53 Time log description

Appendix D

NMEA 0183 Message Options

The OmniSTAR 8305HP is factory configured not to output any messages on any of the communication ports. Up to a maximum of twenty messages can be selected to be output through one communication port. The output rate can be chosen freely up to 5 times per second. As an option faster output rates are available up to 20 times per second. The OmniSTAR 8305HP is capable of outputting a number of messages in accordance with the NMEA-0183 standard and a number of receiver specific messages. The NMEA-0183 messages available in the 8305HP are listed in Table 54.

Message Sentence	Description
ALM	GPS Almanac Data
GGA	GPS Fix Data and Undulation
GGALONG *	GPS Fix Data, Extra Precision and Undulation
GGARTK *	GPS Fix Data with Extra Precision
GLL	Geographic Position – Latitude/Longitude
GRS	GPS Range Residuals for Each Satellite
GSA	GPS DOP and Active Satellites
GST	GPS Pseudorange Measurement Noise Statistics
GSV	GPS Satellites in View
RMB	Generic Navigation Information
RMC	Recommended Minimum Specific GPS Data
VTG	Track Made Good and Ground Speed
ZDA	UTC Time and Date

Table 54: NMEA 0183 messages available for the 8305HP

NOTE:

* GGALONG and GGARTK messages are output as ‘normal’ GGA messages (with a $GPGGA header) for compatibility reasons.

NMEA 0183 Message Formats

In this section each NMEA message is described in more detail.

ALM – GPS Almanac Data

The ALM message identifies the GPS week, SV health and contains the almanac for one satellite. One sentence per satellite, up to a maximum of 32.

$GPALM,1,1,03,698,00,6ae6,1d,779f,fdef,a10d68,6469a6,7c1f62,5f5839,*43

Field Number	Description
1	Total number of ALM sentences for this cycle
2	Sentence sequence number
3	SV PRN number, 01 to 32
4	GPS week number
5	SV health status
6	Eccentricity
7	Almanac reference time
8	Inclination angle
9	Rate of right ascension
10	Root of semi-major axis
11	Argument of perigee
12	Longitude of ascension node
13	Mean anomaly
14	A f0, clock parameter
15	A f1, clock parameter
*16	checksum

Table 55: Description of the ALM message.

GGA – GPS Fix Data

The GGA message includes time, position and fix related data for the GPS receiver.

$GPGGA,hhmmss.ss,llll.llll,a,yyyyy.yyyy,a,x,xx,x.x,x.xx,M,x.xx,M,xx,xxxx*ck

Field Number	Description
1	UTC of Position
2,3	Latitude, N (North) or S (South).
4,5	Longitude, E(East) or W (West).
6	GPS Quality Indicator. *
7	Number of Satellites in Use.
8	Horizontal Dilution of Precision (HDOP).
9,10	Height above Mean Sea level in Meters, M = Meters.
11,12	Geodial Separation in Meters, M = Meters. **
13	Age of Differential GPS Data. ***
14	Differential Reference Station ID (0000 – 1023) ****
*15	checksum

Table 56: Description of the GGA message.

NOTES:

* GPS quality indicators:

- 0 fix not available or invalid
- 1 GPS fix
- 2 C/A differential GPS, OmniSTAR VBS, CDGPS or Egnos
- 4 RTK fixed ambiguity solution (RT2)
- 5 RTK floating ambiguity solution (RT20), OmniSTAR HP, XP or HP+
- 6 Dead Reckoning mode
- 7 Manual input mode (fixed position)
- 8 Simulator mode
- 9 WAAS (temporarily set until the NMEA standard for WAAS is decided)

** Geodial Separation is the difference between the WGS-84 earth ellipsoid and mean-sea-level (MSL).

*** Time in seconds since the last RTCM SC-104 message type 1 or type 9 update (00-99). Left blank when not in differential mode.

**** Reference station ID 0100 = OmniSTAR VBS, 1000 = OmniSTAR HP 1008 = OmniSTAR XP, 1016 = OmniSTAR HP+. Left blank when not in differential mode.

GGALONG – GPS Fix Data Extra Precision and Undulation

The GGALONG message includes time, position and fix related data for the GPS receiver with a higher precision than the GGA message.

$GPGGA,hhmmss.ss,llll.lllllll,a,yyyyy.yyyyyyy,a,x,xx,x.x,x.xxx,M,x.xxx,M,xx, xxxx*ck

Field Number	Description
1	UTC of Position
2,3	Latitude, N (North) or S (South).
4,5	Longitude, E(East) or W (West).
6	GPS Quality Indicator. *
7	Number of Satellites in Use.
8	Horizontal Dilution of Precision (HDOP).
9,10	Height above Mean Sea level in Meters, M = Meters.
11,12	Geodial Separation in Meters, M = Meters. **
13	Age of Differential GPS Data. ***
14	Differential Reference Station ID (0000 – 1023) ****
*15	checksum

Table 57: Description of the GGALONG message.

NOTES:

* GPS quality indicators:

- 0 fix not available or invalid
- 1 GPS fix
- 2 C/A differential GPS, OmniSTAR VBS, CDGPS or Egnos
- 4 RTK fixed ambiguity solution (RT2)
- 5 RTK floating ambiguity solution (RT20), OmniSTAR HP, XP or HP+
- 6 Dead Reckoning mode
- 7 Manual input mode (fixed position)
- 8 Simulator mode
- 9 WAAS (temporarily set until the NMEA standard for WAAS is decided)

** Geodial Separation is the difference between the WGS-84 earth ellipsoid and mean-sea-level (MSL).

*** Time in seconds since the last RTCM SC-104 message type 1 or type 9 update (00-99). Left blank when not in differential mode.

**** Reference station ID 0100 = OmniSTAR VBS, 1000 = OmniSTAR HP 1008 = OmniSTAR XP, 1016 = OmniSTAR HP+. Left blank when not in differential mode.

GGARTK – GPS Fix Data Extra Precision without Undulation

The GGARTK message includes time, position and fix related data for the GPS receiver with a higher precision than the GGA message.

$GPGGA,hhmmss.ss,llll.lllllll,a,yyyyy.yyyyyyy,a,x,xx,x.x,x.xxx,M,,,xx, xxxx*ck

Field Number	Description
1	UTC of Position
2,3	Latitude, N (North) or S (South).
4,5	Longitude, E(East) or W (West).
6	GPS Quality Indicator. *
7	Number of Satellites in Use.
8	Horizontal Dilution of Precision (HDOP).
9,10	Height above Mean Sea level in Meters, M = Meters.
11,12	Blank fields
13	Age of Differential GPS Data. **
14	Differential Reference Station ID (0000 – 1023) ***
*15	checksum

Table 58: Description of the GGARTK message.

NOTES:

* GPS quality indicators:
- 0 fix not available or invalid
- 1 GPS fix
- 2 C/A differential GPS, OmniSTAR VBS, CDGPS or Egnos
- 4 RTK fixed ambiguity solution (RT2)
- 5 RTK floating ambiguity solution (RT20), OmniSTAR HP, XP or HP+
- 6 Dead Reckoning mode
- 7 Manual input mode (fixed position)
- 8 Simulator mode
- 9 WAAS (temporarily set until the NMEA standard for WAAS is decided)

** Time in seconds since the last RTCM SC-104 message type 1 or type 9 update (00-99). Left blank when not in differential mode.

*** Reference station ID 0100 = OmniSTAR VBS, 1000 = OmniSTAR HP 1008 = OmniSTAR XP, 1016 = OmniSTAR HP+. Left blank when not in differential mode.

GLL – Geographic Position – Latitude/Longitude

The GLL message contains the latitude and longitude of the present position, the time of the position fix and the status.

$GPGLL,llll.lllllll,a,yyyyy.yyyyyyy,a,hhmmss.ss,A*ck

Field Number	Description
1,2	Latitude, N (North) or S (South).
3,4	Longitude, E (East) or W (West).
5	UTC of Position.
6	Status: A = Valid, V = Invalid.
*7	checksum

Table 59: Description of the GLL message.

GRS – GPS Range Residuals

The GRS sentence is used to support the Receiver Autonomous Integrity Monitoring (RAIM).

$GPGRS,hhmmss.ss,R,rr1,rr2,rr3,rr4,rr5,rr6,rr7,rr8,rr9,rr10,rr11,rr12,*55

Field Number	Description
1	UTC time of GGA position fix
2	Residuals 0: Residuals used to calculate position given in the matching GGA line (a-priori) 1: Residuals recomputed after the GGA position was computed (preferred)
3 to 14	Range residuals for satellites used in the navigation solution, in meters. Order matches order of PRN numbers in GSA message.
*15	checksum

Table 60: Description of the GRS message.

NOTE:
* Running in HP or XP mode this NMEA message is not valid.

GSA – GPS DOP and Active Satellites

The GSA message indicates the GPS receivers operating mode and lists the satellites used for navigation and the DOP values of the position solution.

$GPGSA,a,x,xx,xx,xx,xx,xx,xx,xx,xx,xx,xx,xx,xx,p.p,h.h,v.v*ck

Field Number	Description
1	Mode: M = Manual, A = Automatic.
2	Current Mode 1 = Fix not available, 2 = 2D fix, 3 = 3D fix.
3 to 14	PRN numbers of the satellites used in the position solution. *
15	Position Dilution of Precision (PDOP).
16	Horizontal Dilution of Precision (HDOP).
17	Vertical Dilution of Precision (VDOP)
*18	checksum

Table 61: Description of the GSA message.

NOTE:
* When less than 12 satellites are used, the unused fields are null.

GST – GPS Pseudorange Noise Statistics

The GST sentence is used to support Receiver Autonomous Integrity Monitoring (RAIM).

$GPGST,hhmmss.ss,r.rr,s.ss,s.ss,ddd.dddd,y.yy,x.xx,h.hh*4F

Field Number	Description
1	UTC time of GGA fix
2	RMS value of the standard deviation of the range inputs to the navigation process (range inputs include pseudoranges and DGPS corrections)
3	Standard deviation of semi-major axis of error ellipse, in meters
4	Standard deviation of semi-minor axis of error ellipse, in meters
5	Orientation of semi-major axis of error ellipse, in degrees from true north
6	Standard deviation of latitude error, in meters
7	Standard deviation of longitude error, in meters
8	Standard deviation of altitude error, in meters
*9	checksum

Table 62: Description of the GST message.

GSV – GPS Satellites in View

The GSV sentence identifies the number of SV's in view, the PRN numbers, elevation, azimuth and SNR values.

$GPGSV,X,x,VV,ss,ee,aaa,dd,ss,ee,aaa,dd,ss,ee,aaa,dd,ss,ee,aaa,dd*67

Field Number	Description
1	Total number of sentences of this type in this cycle
2	Sentence number
3	Total number of SV's visible
4	SV PRN number
5	Elevation in degrees, 00-90
6	Azimuth, degrees from true north, 000-359
7	SNR (C/N0), 00-99 dB (null when not tracking)
8-11	Information about second SV, same format as fields 4-7
12-15	Information about third SV, same format as fields 4-7
16-19	Information about fourth SV, same format as fields 4-7
*20	checksum

Table 63: Description of the GSV message.

RMB – Navigation Information

The RMB sentence shows navigation data from present position to a destination waypoint. The destination is set active by the receiver SETNAV command.

$GPRMB,A,x.xxx,a,ORID,DSID,llll.llllll,a,yyyyy.yyyyyyy,a,x.x,x.x,x.x,A*ck

Field Number	Description
1	Status A: Valid V: Navigation Receiver Warning (V is output whenever the receiver suspects something is wrong)
2	Cross track error (0.000-9.999 NM)
3	Direction to steer to get back on track (L/R)
4	Origin waypoint ID
5	Destination waypoint ID
6,7	Destination waypoint latitude, N (North) or S (South)
8,9	Destination waypoint longitude, E (East) or W (West)
10	Range to destination, nautical miles (0.000-999.9)
11	Bearing to destination, degrees True (0.000-359.999)
12	Destination closing velocity, knots
13	Arrival status: A: Perpendicular passed V: Destination not reached or passed
*14	checksum

Table 64: Description of the RMB message.

RMC – Recommended Minimum Specific GPS Data

The RMC sentence identifies the UTC time, status, latitude, longitude, speed over ground (SOG), date and magnetic variation of the position fix.

$GPRMC,hhmmss.ss,A,llll.llllll,a,yyyyy.yyyyyyy,a,s.sss,ddd.d,DDMMYY,vv.v,a *ck

Field Number	Description
1	Time: UTC time of the position fix in hhmmss.ss format
2	Status A: Valid V: Navigation Receiver Warning (V is output whenever the receiver suspects something is wrong)
3,4	Latitude, N (North) or S (South)
5,6	Longitude, W (West) or E (East)
7	Speed Over Ground (SOG), knots
8	Track Made Good, degrees True
9	Date in dd/mm/yy format
10	Magnetic Variation in degrees
11	Direction of magnetic variation E: Easterly variation from True course (subtracts from True course) W: Westerly variation from True course (adds to True course)
*12	checksum

Table 65: Description of the RMC message.

VTG – Course Over Ground and Ground Speed

The VTG sentence identifies the actual track made good and speed over ground.

$GPVTG,t,T,m,M,s.sss,N,s.sss,K*ck

Field Number	Description
1	Track made good, degrees True
2	Fixed text 'T' – True track indicator
3	Track made good, degrees Magnetic; Track mag = Track true + MAGVAR correction
4	Fixed text 'M' – Magnetic track indicator
5	Speed over ground in knots (0-3 decimal places)
6	Fixed text 'N' shows that speed over ground is in knots
7	Speed over ground in kilometres/hour (0-3 decimal places)
8	Fixed text 'K' shows that speed over ground is in kilometres/hour
*9	checksum

Table 66: Description of the VTG message.

ZDA – Time and Date

The ZDA message contains UTC, the day, the month and the year of the local time zone.

$GPZDA,hhmmss.ss,DD,MM,YYYY,hh,mm*ck

Field Number	Description
1	UTC.
2	Day (0 – 31).
3	Month (0 – 12).
4	Year.
5	Local Zone Description Hours (not available)
6	Local Zone Description Minutes (not available)

Table 67: Description of the ZDA message.

OmniSTAR logs message formats

OMNIHPPOS – OmniSTAR HP Position

The OMNIHPPOS string outputs OmniSTAR High Performance (HP) information.

#OMNIHPPOSA,COM1,0,72.0,FINESTEERING,1161,321910.000,00000000, ad26,683;SOL_COMPUTED,OMNISTAR_HP,51.11635244839,114.03819232 612,1064.1015,-16.2713, WGS84,0.1371,0.1390,0.2741,"",5.000,0.000,7,6,6, 6,0,0,0,0*66c318fb

Solution Status (Binary)	(ASCII)	Description
0	SOL_COMPUTED	Solution computed
1	INSUFFICIENT_OBS	Insufficient observations
2	NO_CONVERGENCE	No convergence
3	SINGULARITY	Singularity at parameters matrix
4	COV_TRACE	Covariance trace exceeds maximum (trace>1000m)
5	TEST_DIST	Test distance exceeded (maximum of 3 rejections if distance > 10km)
6	COLD_START	Not yet converged from cold start
7	V_H_LIMIT	Height or velocity limits exceeded (in accordance with COCOM export licensing restrictions)
8	VARIANCE	Variance exceeds limits
9	RESIDUALS	Residuals are too large
10	DELTA_POS	Delta position is too large
11	NEGATIVE_VAR	Negative variance
12	Reserved	
13	INTEGRITY_WARNING	Large residuals make position unreliable

Table 68: Solution Status

Field #	Field Type	Description
1	Header	Log header
2	Sol status	Solution status (see Table 68 on page 111)
3	Pos type	Position type (see Table 19 on page 60)
4	Lat	Latitude
5	Lon	Longitude
6	Hgt	Height above mean sea level
7	Undulation	Undulation
8	Datum id#	Datum ID number
9	Lat σ	Latitude standard deviation
10	Lon σ	Longitude standard deviation
11	Hgt σ	Height standard deviation
12	Stn id	Base station ID
13	Diff_age	Differential Age
14	Sol_age	Solution age in seconds
15	#obs	Number of observations tracked
16	#GPSL1	Number of GPS L1 ranges used in computation
17	#L1	Number of GPS L1 ranges above the RTK mask angle
18	#L2	Number of GPS L2 ranges above the RTK mask angle
19-22	Reserved	
23	xxxx	32-bit CRC)
24	[CR][LF]	Sentence terminator

Table 69: Description of the OMNIHPPOS message

LBANDINFO – OmniSTAR Configuration Information

This log outputs configuration information for our VBS and HP service.

```
#LBANDINFOA,COM1,0,64.5,FINESTEERING,1164,240223.642,
000000,00,4797,33477;1551489,1200,c685,0,704312,EXPIRED,0,
0,EXPIRED,0,0,0*e8bea6a3
```

Field #	Field Type	Description
1	Header	Log header
2	Freq	Selected frequency for OmniSTAR service (kHz)
3	Baud	Communication baud rate from OmniSTAR satellite
4	ID	OmniSTAR signal service ID
5	Reserved	
6	OSN	OmniSTAR serial number
7	Vbs sub	OmniSTAR VBS subscription type (see Table 71 on page 114)
8	Vbs exp week	GPS week number of OmniSTAR VBS expiration date
9	Vbs exp secs	Number of seconds into the GPS week of VBS expiration date
10	Hp sub	OmniSTAR HP subscription type (see Table 71 on page 114)
11	Hp exp week	Hp exp week GPS week number of OmniSTAR HP expiration date
12	Hp exp secs	Number of seconds into the GPS week of OmniSTAR HP expiration date[1]
13	Reserved	
14	Xxxx	32-bit CRC (ASCII and Binary only)
15	[CR][LF]	Sentence terminator (ASCII only)

Table 70: Description of the LBANDINFO message

[1] If the subscription is COUNTDOWN, see FIELD #7 above, the expiration seconds into the GPS week will contain the amount of running time remaining in the subscription.
If the subscription type is COUNTDOWNOVERRUN, the expiration week and expiration seconds into GPS week will count the amount of the overrun time.

Binary	ASCII	Description
0	EXPIRED	The OmniSTAR subscription has expired or does not exist.
1	FIXEDTIME	The OmniSTAR subscription will expire at a fixed date and time.
2	COUNTDOWN	The OmniSTAR subscription will expire after the specified amount of running time.
3	COUNTDOWNOVERRUN	The COUNTDOWN subscription has expired but has entered a brief grace period. Resubscribe immediately.

Table 71: Subscription types

LBANDSTAT – OmniSTAR Status Information

This log outputs status information for our VBS and HP service.

```
#LBANDSTATA,COM1,0,64.0,FINESTEERING,1164,240276.647,
00000000,a578,33477;1551488896,41.99,149.7,0.00,0082,0000,
18742,33,0,0000,0000,0,0,0*634d507a
```

Field #	Field Type	Description
1	Header	Log header
2	freq	Measured frequency of OmniSTAR signal (Hz).
3	C/N0	Carrier to noise density ratio C/N0=10[log10(S/N0)] (dB-Hz)
4	locktime	Number of seconds of continuous tracking (no cycle slipping)
5	Reserved	
6	Tracking	Tracking status of OmniSTAR signal (see Table 73 on page 116).
7	Vbs status	Status word from the VBS process (see Table 74 on page 116).
8	#bytes vbs	Number of bytes fed to the VBS process.
9	#good dgps	Number of VBS updates.
10	#bad data	Number of missing VBS updates.
11	Hp status 1	Status word from the HP process (see Table 74 on page 116). Obsolete and replaced by the longer HP status field, but kept for compatibility.
12	Hp status 2	Additional status word from the HP process (see Table 75 on page 116).
13	#bytes hp	Number of bytes fed to the HP process.
14	HP status	Status word from the HP/XP process (see Table 76 on page 117)
15	Reserved	
16	xxxx	32-bit CRC (ASCII and Binary only)
17	[CR][LF]	Sentence terminator (ASCII only)

Table 72: Description of the LBANDSTAT message

Nibble #	Bit #	Mask	Description	Range Value
N0	0	0x0001	Tracking State	0=searching, 1=Pull-in, 2=Tracking
	1	0x0002		
	2-3	Reserved		
N1	4-6			
	7	0x0080	Phase Locked	0=not Locked, 1=Locked
N2	8-11	Reserved		
N3	12-14			
	15	0x8000	Error	0=Good, 1=Error

Table 73: OmniSTAR Signal Tracking Status

Nibble #	Bit #	Mask	Description	Bit=0	Bit=1
N0	0	0x0001	Subscription Expired	False	True
	1	0x0002	Out of Region	False	True
	2	0x0004	Wet Error	False	True
	3	0x0008	Link Error	False	True
N1	4	0x0010	No Remote Sites	False	True
	5	0x0020	No Almanac	False	True
	6	0x0040	No Position	False	True
	7	0x0080	No Time	False	True
N2	8-11	Reserved			
N3	12-14				
	15	0x8000	Updating Data	False	True

Table 74: OmniSTAR VBS Status Word/HP Status Word 1

Nibble #	Bit #	Mask	Description	Bit=0	Bit=1
N0	0	0x0001	Solution not fully converged	False	True
	1-3	Reserved			
N1	4	0x0010	HP enabling key invalid	False	True
	5-7	Reserved			
N2-N3	8-15				

Table 75: OmniSTAR HP Additional Status Word

Nibble #	Bit #	Mask	Description	Bit=0	Bit=1
N0	0	0x00000001	Subscription Expired	False	True
	1	0x00000002	Out of Region	False	True
	2	0x00000004	Wet Error	False	True
	3	0x00000008	Link Error	False	True
N1	4	0x00000010	No Measurements	False	True
	5	0x00000020	No Ephemeris	False	True
	6	0x00000040	No Initial Position	False	True
	7	0x00000080	No Time Set	False	True
N2	8	0x00000100	Velocity Error	False	True
	9	0x00000200	No Reference Stations	False	True
	10	0x00000400	No Mapping Message	False	True
	11	Reserved			
N3-N5	12-23				
N6	24-25				
	26	0x04000000	Static Initialisation Mode	False	True
	27	Reserved			
N7	28-30				
	31	0x80000000	Updating Data	False	True

Table 76: OmniSTAR HP/XP Status Word

32-Bit CRC

The OmniSTAR logs message formats all contain a 32-bit CRC for data verification. This allows the user to ensure that the data received (or transmitted) is valid with a high level of certainty. This CRC can be generated using the following C algorithm:

```
#define CRC32_POLYNOMIAL 0xEDB88320L

/* ----------------------------------------------------------------------
Calculate a CRC value to be used by CRC calculation functions.
---------------------------------------------------------------------- */

unsigned long CRC32Value(int i)
{
  int j;
  unsigned long ulCRC;


  ulCRC = i;
  for ( j = 8 ; j > 0; j-- )
  {
    if ( ulCRC & 1 )
      ulCRC = ( ulCRC >> 1 ) ^ CRC32_POLYNOMIAL;
    else
      ulCRC >>= 1;
  }
  return ulCRC;
}

/* ----------------------------------------------------------------------
Calculates the CRC-32 of a block of data all at once
---------------------------------------------------------------------- */

unsigned long CalculateBlockCRC32(
  unsigned long ulCount, /* Number of bytes in the data block */
  unsigned char *ucBuffer ) /* Data block */
{
  unsigned long ulTemp1;
  unsigned long ulTemp2;
  unsigned long ulCRC = 0;

  while ( ulCount-- != 0 )
  {
    ulTemp1 = ( ulCRC >> 8 ) & 0x00FFFFFFL;
    ulTemp2 = CRC32Value( ((int) ulCRC ^ *ucBuffer++ ) & 0xff );
    ulCRC = ulTemp1 ^ ulTemp2;
  }
  return( ulCRC );
}
```

Appendix E

Upgrading the receiver firmware

In order to update the 8305HP firmware, an MS-Windows compatible computer (either desktop or laptop) and the WinLoad program are required. The 8305HP has to be connected to a communication port of the computer and has to be switched on. The update process does not require reception of either GPS or OmniSTAR satellite signals. During the update process, do not switch off either the computer or the 8305HP receiver and do not disconnect the 8305HP from the computer.

After installing and starting the WinLoad program, the following screen will show.

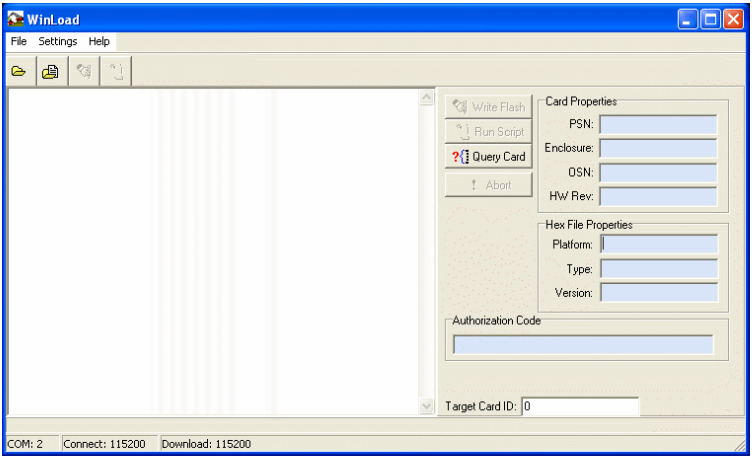


Figure 61 WinLoad main screen

Before proceeding, make sure you have downloaded the latest firmware version from the OmniSTAR website. Since every firmware version requires its own authorization code, make sure you have obtained an authorization code for the firmware version you are going to install on your receiver. Failing to do so may result in your receiver not being able to receive the OmniSTAR correction signal until you enter a new authorization code manually. Authorization codes can be obtained through OmniSTAR.

Select the new firmware file to be uploaded by pressing the top leftmost icon. The 'Open file' screen will show. Select the path containing the firmware file, select the firmware file and press the 'Open' button:

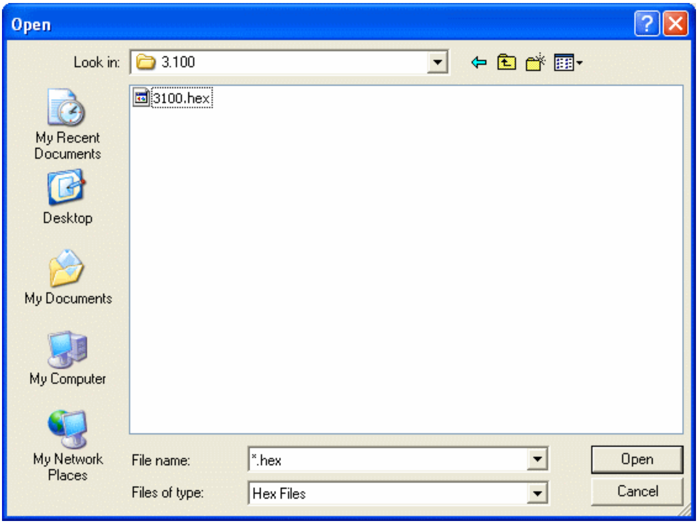


Figure 62 Firmware file select

The name of the file will show in the main screen.

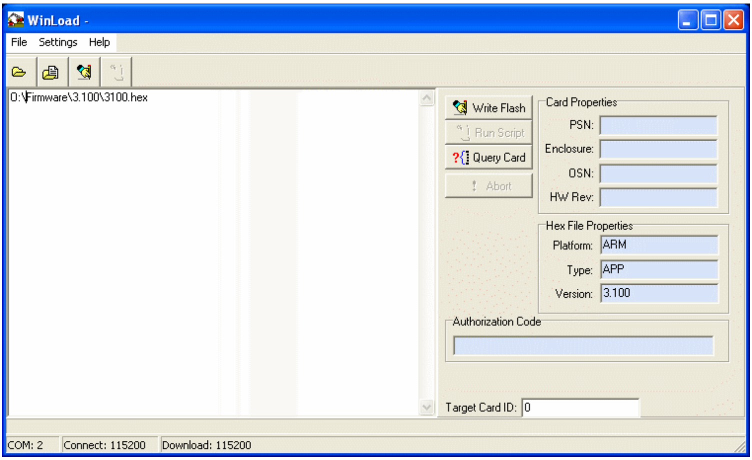


Figure 63 Winload main screen - flash file loaded

Now, disconnect the receiver power supply. Click the ‘Write Flash’ button. The message ‘Searching for card…timeout in: 15 secs’ will appear in the main screen. Reconnect the receiver power supply before timeout has reached 0.

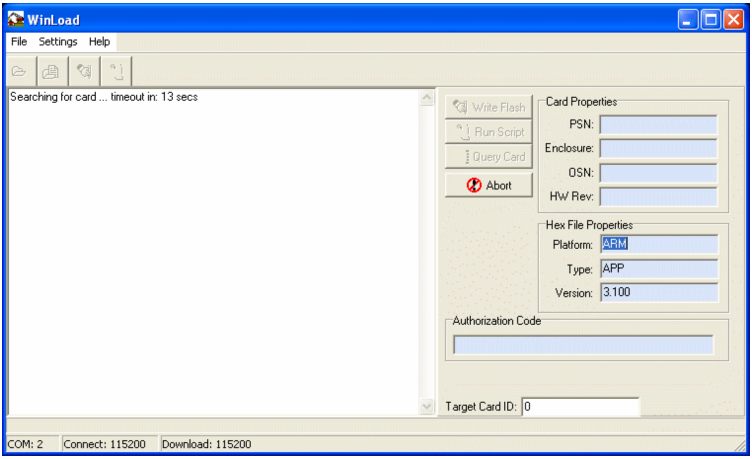


Figure 64 Winload searching for card

After the power supply to the receiver has been restored, the program will connect to the receiver and determine whether or not this particular receiver can be upgraded using the selected firmware file.

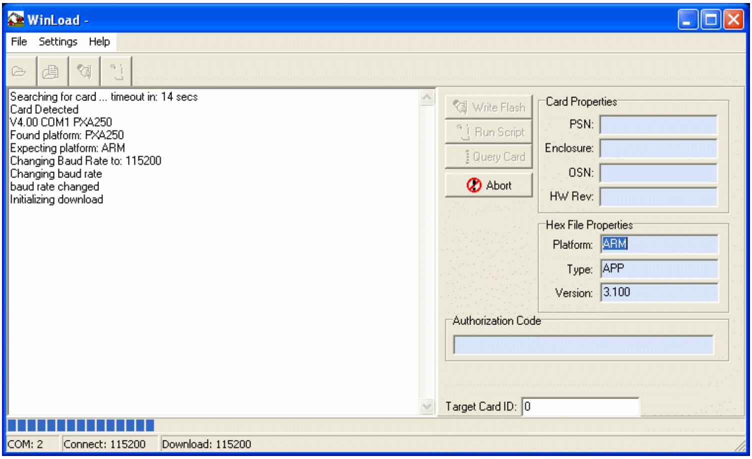


Figure 65 Initializing communication

After making sure the receiver is upgradeable, the program will ask for the authorization code matching this receiver and this firmware version. If you haven't yet obtained the authorization code, you may continue upgrading the receiver by pressing the 'Skip' button. However, in this case the receiver may not be fully functional after the upgrade until you manually enter the correct authorization code.

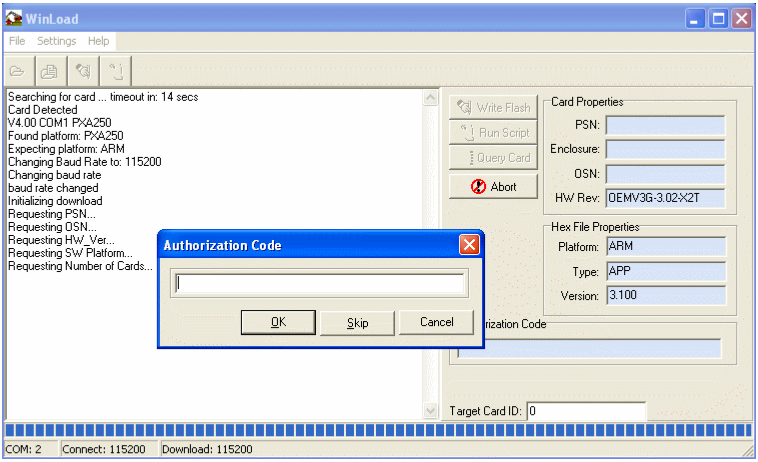


Figure 66 Entering the authorization code

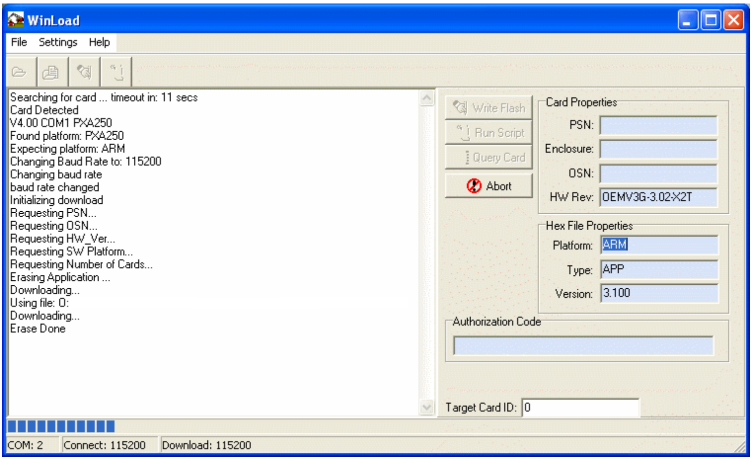


Figure 67 Erasing memory and writing data to the receiver

After entering the authorization code, the WinLoad program will erase the receiver memory and write the new firmware file to the receiver. This may take a few minutes. During this time, do not switch off or disconnect either the receiver or the computer. If the communication is lost during the upgrade process, the receiver may have to be returned to OmniSTAR to get it working again.

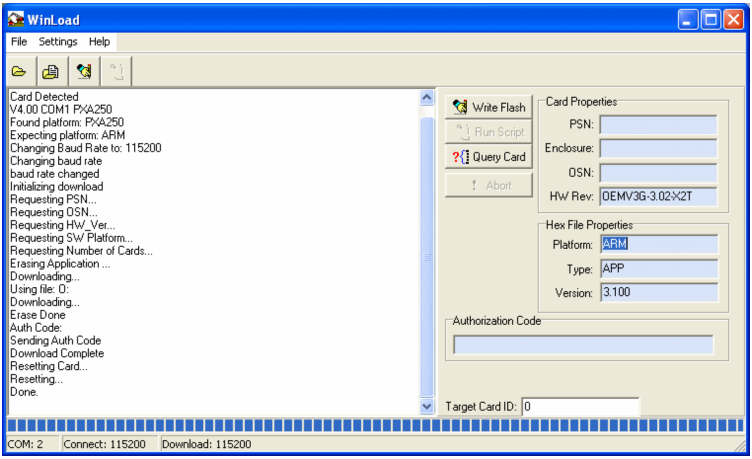


Figure 68 Upgrade finished

After the upgrade process has finished, the receiver will be reset by the WinLoad program. The last line of the main screen will show the word ‘Done.’. You may now close the WinLoad program and disconnect the receiver from the computer.

Upgrading firmware will overwrite all personal settings, including active logs and possibly OmniSTAR subscription information. If the OmniSTAR subscription is lost as a result of the upgrade, please call OmniSTAR support to have the receiver reactivated.

Appendix F

Acronyms used in this manual

1PPS	One Pulse Per Second
2D	Two Dimensional
3D	Three Dimensional
ASCII	American Standard Code for Information Interchange
bps	bits per second
CEMF	Counter Electro-magnetic Force
DGPS	Differential Global Positioning System
GGA	Global Positioning System fixed data (NMEA standard)
GLL	Geographic position (NMEA standard)
GPS	Global Positioning System
GSA	Global Positioning System, dilution of position, active satellite (NMEA standard)
GSV	GPS satellites in view (NMEA standard)
HP	High Performance
LED	Light Emitting Diode
LNA	Low Noise Amplifier
NCC	Network Control Centre
NMEA	National Marine Electronics Association (Standard for interfacing marine electronic devices)
NVM	Non-Volatile Memory
RF	Radio Frequency
RTCM	Radio Technical Commission Maritime
VTG	'Track made good' and 'ground speed' (NMEA standard)
XP	Extended Performance
ZDA	Time and date (NMEA standard)

APPENDIX F

GPS Time of Week To Week and Time of Day

Example: 511200 s

Day	511200 / 86400 seconds per day	**5**.91666666 **days**
Hour	0.9166666 x 86400 / 3600 s per hour	**22**.0000 **hours**
Minute	0.000 x 3600 / 60 s per minute	**0**.000 **minutes**
Second	0.000 x 60	**0**.000 **seconds**

Day 5 (Thursday) + 22 hours, 0 minutes, 0 seconds into Friday.

Calendar Date to GPS Time

Example: 14:30 hours, March 5, 2007

Days from January 6, 1980 to March 5, 2007: 27 years x 365 days/year	9855 days
Add one day for each leap year (a year which is divisible by 4 but not by 100 unless it is divisible by 400; every 100 years a leap year is skipped)	7 days
Days into 2007 (5th of March is not yet finished)	63 days
Total days	**9925 days**
Deduct 5 days: (Jan. 1 – 5, 1980)	9920 days

GPS Week: 9920 x 86400 sec. per day = 857088000 sec. / 604800 sec. per week = **1417**

Seconds into week: 1 day + 14.5 hrs x 3600 sec./hr **138600** seconds

GPS time of week: **Week 1417, 138600 seconds**

APPENDIX G

Receiver Service Procedure

If an OmniSTAR receiver unit fails to perform, contact the OmniSTAR office within the region, after following the procedural checks. We wish to hear about frequently experienced problems and your assistance will help by copying the form on the next page, filling in the details requested and faxing or mailing the form to the OmniSTAR office for on-forwarding to Product Marketing.

The most common problems are interfacing, and usually occur at installation time. If you have an interfacing connection not covered in this manual we would like to assist you and produce another technical bulletin that may assist other users in the future.

If a problem appears that you think may be caused by a system performance problem, contact the OmniSTAR office in your region for any system aberrations that may have been experienced.

We are sensitive to our customers' needs and we want to assure specified system performance at all times. There could, however, be situations where conditions are below par, such as fringe area operations, radio communication disturbance etc., and, as an OmniSTAR receiver monitors the system performance continuously, these conditions would be noted.

APPENDIX H

OmniSTAR Receiver Problem Report Form

Please copy this form and report problem with as much detail as possible.

Problem with: **Signal Y/N** **Manual Y/N** **OmniSTAR Y/N** **Receiver Y/N**	**Date:**
Description of problem:	
Person Reporting:	**Contact Phone #:**
Model #:	**Serial #:**
Customer Name:	**Customer Address:**
Customer Phone #:	
Date purchased: / /	**Dealer:**
GPS Receiver used:	**Serial #:**
Area of operations:	
Symptoms from display (if any):	

User Notes