

Inertial+

**Inertial
and GPS
Measurement
System**



Inertial+ OmniStar 4305HP Integration

Confidently. Accurately.



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Introduction

This manual explains how the OmniStar 4305HP product family can be used with the Inertial+. The OmniStar 4305HP receiver uses OmniStar HP to achieve position to an accuracy of 10cm or better. Tight integration has been performed with the OmniStar 4305HP receiver and the Inertial+ is optimised to give maximum performance using this product range.

This manual also covers the OmniStar 4300HP receiver. The OmniStar 4300HP has an identical software interface to the OmniStar 4305HP receiver and appears the same to the Inertial+.



Connection Details

The Inertial+ should be connected to the OmniStar 4305HP card using RS232 Serial Ports. On the Inertial+ the “External GPS” connector is used. On the OmniStar 4305HP receiver any of the serial ports can be used. Note that the configuration description assumes that COM1 is used.

The OmniStar 4305HP is supplied with a Null Modem serial cable, suitable for connecting the OmniStar 4305HP to a standard 9-way PC serial port. This cable should be used to connect the OmniStar 4305HP to the Inertial+.

The OmniStar 4300HP is supplied with a “6-pin Switchcraft to DB9 Serial Cable” suitable for connecting the OmniStar 4300HP to a standard 9-way PC serial port. This cable should be used to connect the OmniStar 4300HP to the Inertial+.

Power to the GPS receiver and power to the Inertial+ are wired separately to each product. A common ground should be used to avoid ground problems.



Configuration

For best results you should return the OmniStar 4305HP card to the factory default settings before using it with the Inertial+. Any changes to the tracking loop or carrier phase smoothing may affect the timing degrade the performance of the Inertial+.

Consult the OmniStar documentation to find out how to communicate and configure the GPS cards.

To return the card to factory defaults enter the command:

```
freset
```

This will reboot the GPS card. The serial ports will return to their default states and it may be necessary to reconfigure the terminal (if applicable) before being able to communicate with the card again.

Configure the card with the following commands:

```
COM COM1 115200 N 8 1 N OFF ON
LOG COM1 BESTVELB ONTIME 0.1
LOG COM1 BESTPOSB ONTIME 0.5
LOG COM1 TIMEB ONTIME 1.0
LOG COM1 PSRDOPB ONTIME 1.0
LOG COM1 OMNISTATB ONTIME 1.0
LOG COM1 OMNIINFOB ONTIME 10.0
SAVECONFIG
```

If the Inertial+ is connected to a different serial port then change COM1 to the other serial port (COM2 or COM3).

If the GPS card only supports 5Hz data rates then use:

```
COM COM1 115200 N 8 1 N OFF ON
LOG COM1 BESTVELB ONTIME 0.2
LOG COM1 BESTPOSB ONTIME 0.5
LOG COM1 TIMEB ONTIME 1.0
LOG COM1 PSRDOPB ONTIME 1.0
LOG COM1 OMNISTATB ONTIME 1.0
LOG COM1 OMNIINFOB ONTIME 10.0
SAVECONFIG
```

It is essential to only use the binary logs from the OmniStar 4305HP card. Sending any ASCII logs or NMEA logs will prevent the Inertial+ from working properly.



It will be necessary to configure other settings on the GPS card, for example the OmniStar satellite to be tracked. These settings can be saved using the `SAVECONFIG` command.

Do not use faster data rates than the ones proposed above. This does not result in higher accuracy but may overload the processor in the Inertial+.



Fault Diagnosis

The Inertial+ gets different information from the different messages that the OmniStar 4305HP card outputs. Table 1 lists the information decoded in each message.

Table 1. OmniStar 4305HP Message Information

Message	Data Rate	Description
BESTPOSB	2Hz	Required for Latitude, Longitude, Altitude, Number of Satellites
BESTVEL	10Hz	Required for North, East and Down Velocity
TIMEB	1Hz	Required for UTC offset
PSRDOPB	1Hz	Required for DOP information and Number of Satellites
OMNISTATB	1Hz	Required for OmniStar tracking information
OMNIINFOB	0.1Hz	Required for OmniStar serial number

In addition, the internal GPS *must* have found time and position so that it can accurately synchronise the IMU to the external GPS. An antenna must be fitted to the Primary GPS port in order to get the Inertial+ to work.

To trouble shoot the interface between the Inertial+ and the external GPS receiver, refer to Table 2.



Table 2. Troubleshooting

Problem	Description
The system appears to work even though the External GPS is not connected	The Inertial+ is configured to use the Internal GPS, which is not as accurate.
The GPS LED is off	There is no data being received from the OmniStar 4305HP. (If corrupt data was being sent then the LED would be red).
The “External GPS Skipped Chars” field is increasing	Check that the baud rate is correct. Check that the binary, not ASCII logs are being output.
The software shows that there are some skipped chars from the External GPS	This is normal. As long as the number is not increasing then there is nothing to worry about.
The Position Mode is “None”	The BESTPOSB log is not being sent by the OmniStar 4305HP.
The Velocity Mode is “None”	The BESTVELB log is not being sent by the OmniStar 4305HP.
The Number of Satellites is not being displayed	The BESTPOSB or PSRDOPB log is not being sent by the OmniStar 4305HP.
OmniStar information is not being reported	Neither the OMNISTATB log nor the OMNIINFOB log are being output by the OmniStar 4305HP
The Inertial+ does not initialise when driving forwards	If all the data is being received from the OmniStar 4305HP then the Internal GPS is not working correctly. Check the antenna that is connected to the primary port of the Inertial+.
GPGSA and GPGSV messages have missing fields	The current implementation of the binary interface does not support all of the information required for the GPGSA and GPGSV messages so many of the fields will be blank.



Accuracy Specification

Table 3. Performance Specification for Inertial+ using OmniStar 4305HP cards

Parameter	OmniStar HP	OmniStar VBS	SPS
Positioning	OmniStar HP	OmniStar VBS	SPS
Position Accuracy	10cm for HP	0.5m CEP	1.8m CEP L1 1.5m CEP L1/L2
Velocity Accuracy	0.08 km/h RMS	0.1 km/h RMS	0.1 km/h RMS
Acceleration			
– Bias	10 mm/s ² 1 σ	10 mm/s ² 1 σ	10 mm/s ² 1 σ
– Linearity	0.01%	0.01%	0.01%
– Scale Factor	0.1% 1 σ	0.1% 1 σ	0.1% 1 σ
– Range	100 m/s ²	100 m/s ²	100 m/s ²
Roll/Pitch	0.04° 1 σ	0.05° 1 σ	0.05° 1 σ
Heading	0.1° 1 σ	0.1° 1 σ	0.1° 1 σ
Angular Rate			
– Bias	0.01°/s 1 σ	0.01°/s 1 σ	0.01°/s 1 σ
– Scale Factor	0.1% 1 σ	0.1% 1 σ	0.1% 1 σ
– Range	100°/s	100°/s	100°/s
Track (at 50km/h)	0.1° RMS	0.15° RMS	0.15° RMS
Update Rate		100 Hz	
Calculation Latency		3.9 ms	



Revision History

Table 4. Revision History

Revision	Comments
080317	Initial Version.
100716	Added clarification on the GPGSA and GPGSV messages.