

Installation Report

Company: SOEST- Univ. of Hawaii
Attention of: Dr. Bruce Applegate
Email:
From: Bruce A. Francis
Date: 19 April, 2006
Ref.: POSMV Installation aboard Kilo Moana

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During the period of March 2nd through 8th, a POSMV system commissioning and calibration was conducted aboard SOEST vessel *Kilo Moana*. The following are a summary of events and final observations.

Chronology:

- March 2nd** - Travel from Houston TX to Honolulu HI via Continental Airlines
- March 3rd** - Tumble test IMU and general system inspection and setup.
- March 4th** - Processing test data, review of ship survey documentation.
- March 5th** - Depart Honolulu for at sea calibration and testing of POSMV.
- March 6th** - At sea. testing and evaluation of system performance.
- March 7th** - Ship arrives back in Honolulu, fly back to Houston early evening.
- March 8th** - Return to Houston early morning.

Calibration and testing results:

1. The GAMS calibration went very well and the observed vectors between the two GPS antennas were in close agreement with those obtained by the Blom survey. The only change made to the existing lever arm settings was in the Ref to Primary GPS Z elevation to account for the difference in height between the old Novatel and new Zephyr antennas.
2. The tumble test of IMU S/N 405011 (TH 331) indicated that the sensor was well within manufacturer specifications. No appreciable change from the last test was noted.
3. The only change to the lever arm entries was a correction to Z value for the Ref to Pri GPS antenna location. The Blom survey indicated this point was -28.969 above the granite block and when the old antenna was removed it was noted that the reflex target was fixed to the base of the shroud tip. From this we concluded that the actual phase center of the antenna was not taken into account in the initial lever arm measurement. The new antenna is mounted 21.59cm below the point where the reflex target was measured on the old antenna so as a result, the elevation value for the new antenna is now -28.754m. The rest of the lever arms are consistent with the Blom survey results.

Problems:

1. The Captain indicated that the POSMV heading was off by some 2.5 deg with respect to the gyro and range markers entering port. After making some comparisons between the gyro in use, ADU-5 and POS heading data over a 5 minute sample data set, it was clear that the POSMV and ADU-5 agreed to within a few 10ths of a degree while the Gyro read higher by about 2.5 degrees. Although this was a limited test period it suggests that the gyro alignment with the ships frame is suspect.


Recommendations:

The only significant improvement to the system configuration would be to add the P-Code position data to the POS when it becomes available. This will serve to improve the positional accuracy and will be most notable when surveying in shallow water. Otherwise the installation is well done.

Should you have any questions or can be of further assistance, please do not hesitate to contact me.



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Vessel Name	Kilo Moana	
PCS System	POSMV 320-V4	
PCS Serial number	2319	
IMU Serial number	405011- LN200	
Top Hat	331	
Hardware version	2.8-7	
Firmware version	3.22	
POS IP Address	192.168.1.40	
Subnet mask	255.255.255.0	
PC IP Address	?	
Subnet mask	255.255.0.0	
Survey software	Custom	
Multibeam system	Simrad EM 1002/120	
Single Beam system		

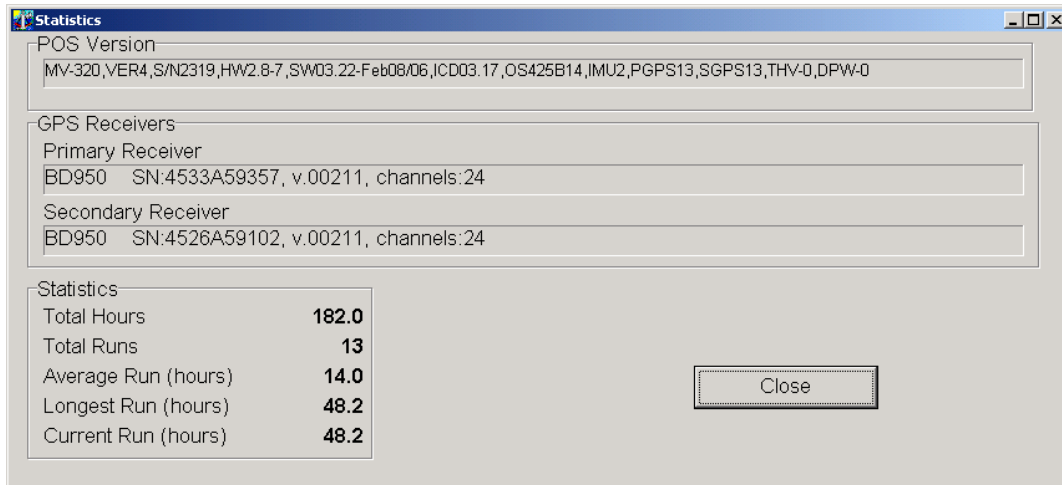
Lever Arms: (Units are in Meters)

Point	X Axis	Y Axis	Z Axis	Notes
Reference point	0.0	0.0	0.0	Granite block
Ref to IMU	1.059	-1.218	-0.431	Located in port hull
Ref to Primary GPS	6.437	6.536	-28.753	Port antenna- change in Z
Ref to Secondary GPS				Starboard antenna
Ref to AUX GPS	7.243	11.077	-23.461	P-Code (not available)
Ref to Vessel	0.0	0.0	0.0	POS NMEA, message point of validity granite block.
IMU frame w.r.t Ref frame	-0.0	-0.310	-0.460	
Ref to Heave (COR)	-9.050	8.500	-8.153	Center of gravity (rotation) Fore/Aft center of vessel
Ref to Sensor 1	0.0	0.0	0.0	Point of validity-RPH +Posn- Valid at granite block
Ref to Sensor 2	0.0	0.0	0.0	Point of validity-RPH +Posn- Valid at granite block

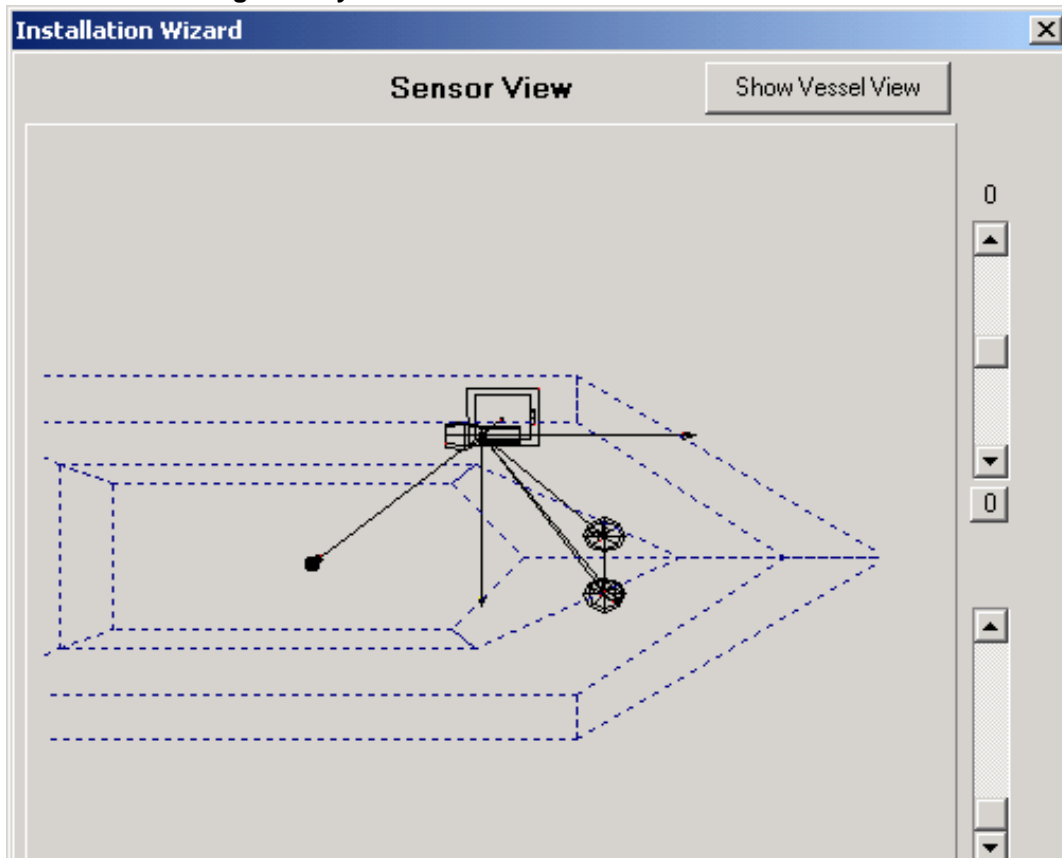
Connection Table

FROM	TO	SIGNAL	COMMENT
POSMV Com 1	Network buffer	NMEA Output 9600, 8,N,1 @1 HZ	\$INGGA; \$INHDT; \$INZDA \$INUTC; \$INGST; \$INVTG
POSMV Com 2	EM 1002	Binary Output 19200, 8,N,1 @25 HZ	Simrad 1000 message roll, pitch, heave, heading
POSMV Com 3	No connection	-----	-----
POSMV Com 4	EM 120	Binary Output 19200, 8,N,1 @25 HZ	TSS1 message- roll, pitch, heave, heading
POSMV Com 5	No connection	-----	-----
P-Code GPS	No connection	-----	Was not operational
POSMV PPS Out	?	TTL- Active low	1 PPS timing signal

General System information:
Options included- (THV-0) True Heave, (DPW-0) Password protection Disabled



Basic installation geometry:



Lever Arm installation page on POSMV controller:

Lever Arms & Mounting Angles [X]

Lever Arms & Mounting Angles | Sensor Mounting | Tags, Multipath & AutoStart

Ref. to IMU Lever Arm		IMU Frame w.r.t. Ref. Frame	
X (m)	1.059	X (deg)	0.000
Y (m)	-1.218	Y (deg)	0.310
Z (m)	-0.431	Z (deg)	-0.460

Ref. to Primary GPS Lever Arm		Ref. to Vessel Lever Arm	
X (m)	6.437	X (m)	0.000
Y (m)	6.536	Y (m)	0.000
Z (m)	-28.753	Z (m)	0.000

Notes:
 1. Ref. = Reference
 2. w.r.t. = With Respect To
 3. Reference Frame and Vessel Frame are co-aligned

Ref. to Centre of Rotation Lever Arm	
X (m)	-9.050
Y (m)	8.500
Z (m)	-8.153

Ok Close Apply View

In Navigation Mode , to change parameters go to Standby Mode !

Lever Arms & Mounting Angles [X]

Lever Arms & Mounting Angles | Sensor Mounting | Tags, Multipath & AutoStart

Ref. to Aux. 1 GPS Lever Arm		Ref. to Aux. 2 GPS Lever Arm	
X (m)	7.243	X (m)	0.000
Y (m)	11.077	Y (m)	0.000
Z (m)	-23.461	Z (m)	0.000

Ref. to Sensor 1 Lever Arm		Sensor 1 Frame w.r.t. Ref. Frame	
X (m)	0.000	X (deg)	0.000
Y (m)	0.000	Y (deg)	0.000
Z (m)	0.000	Z (deg)	0.000

Ref. to Sensor 2 Lever Arm		Sensor 2 Frame w.r.t. Ref. Frame	
X (m)	0.000	X (deg)	0.000
Y (m)	0.000	Y (deg)	0.000
Z (m)	0.000	Z (deg)	0.000

Ok Close Apply View

In Navigation Mode , to change parameters go to Standby Mode !

Observed antenna separation derived from GAMS calibration.

Calculated antenna separation (X axis) based on Blom survey = 0.031 m

Calculated antenna separation (Y axis) based on Blom survey = 3.955 m

Calculated antenna separation (Z axis) based on Blom survey = 0.005 m

GAMS Parameter Setup

Two Antenna Separation (m)

Heading Calibration Threshold (deg)

Heading Correction (deg)

Baseline Vector

X Component (m)

Y Component (m)

Z Component (m)

Multipath setting is fixed at LOW as this was deemed to be the most effective.

Lever Arms & Mounting Angles

Lever Arms & Mounting Angles | Sensor Mounting | Tags, Multipath & AutoStart

Time Tag 1

POS Time

GPS Time

UTC Time

Time Tag 2

POS Time

GPS Time

UTC Time

User Time

AutoStart

Disabled

Enabled

Multipath

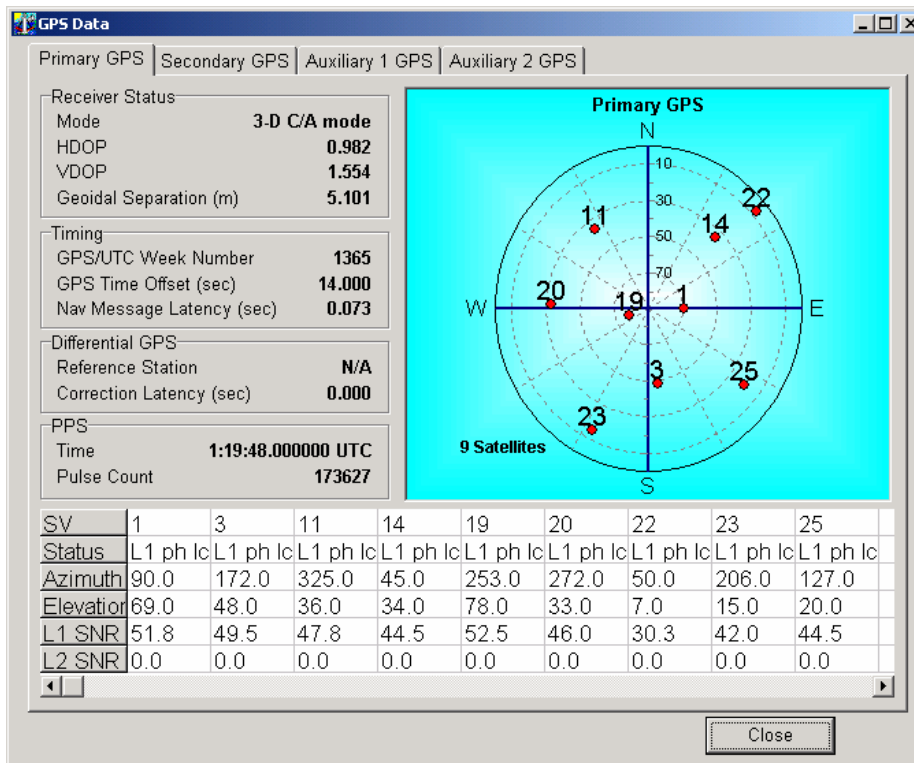
Low

Medium

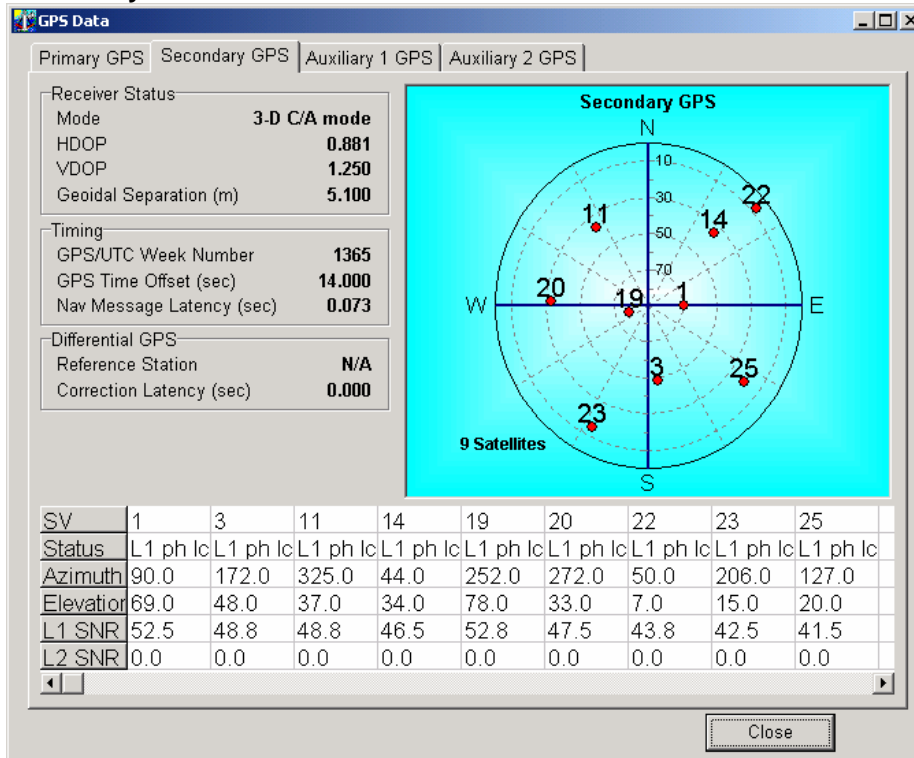
High

In Navigation Mode , to change parameters go to Standby Mode !

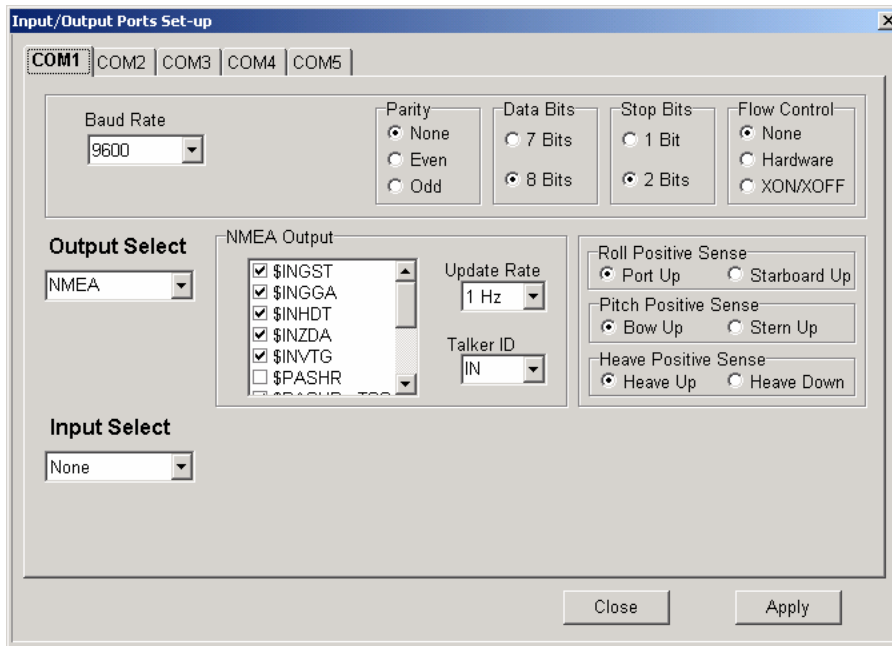
Primary GPS data observed from internal Trimble BD950 receivers.



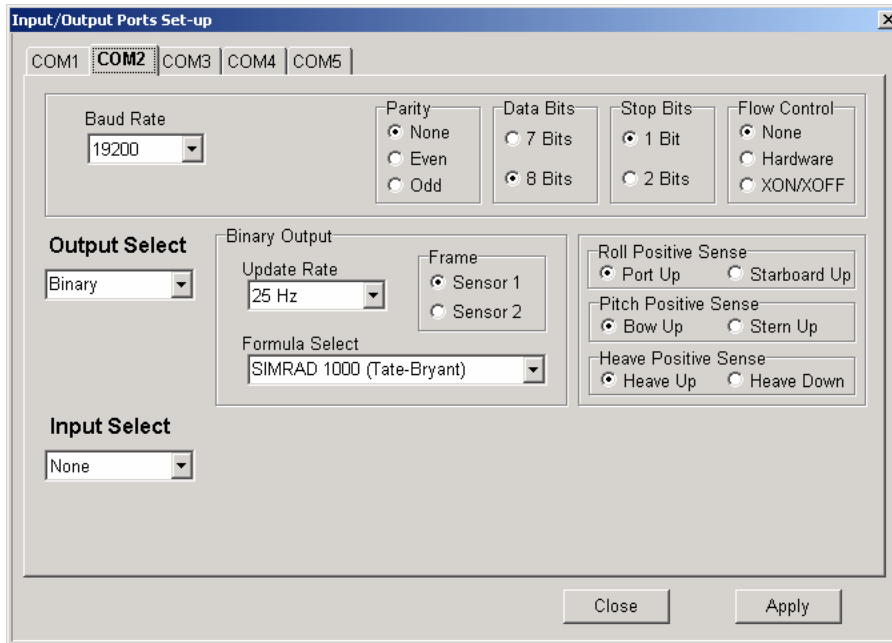
Secondary embedded GPS data:



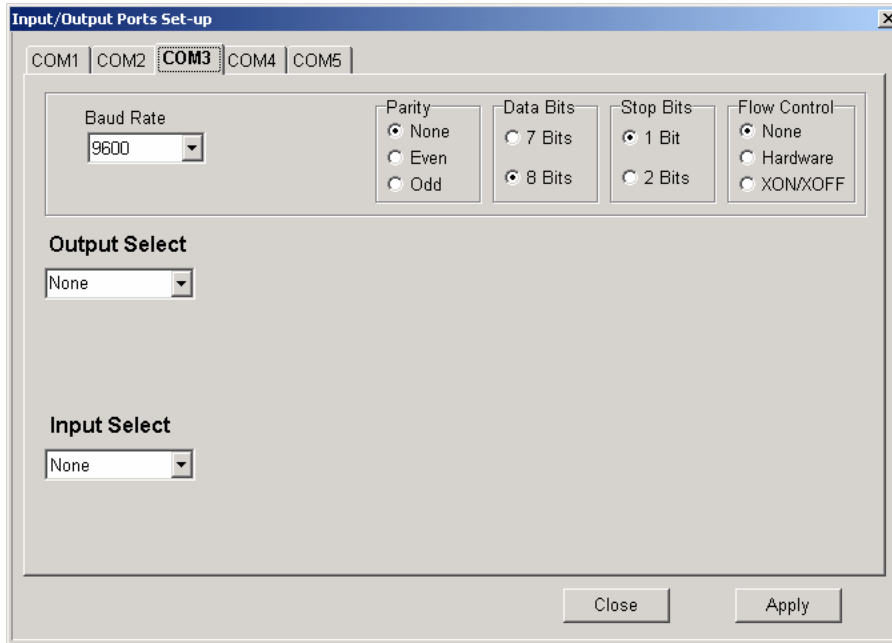
Com port #1 settings as installed: NMEA outputs to network buffer.



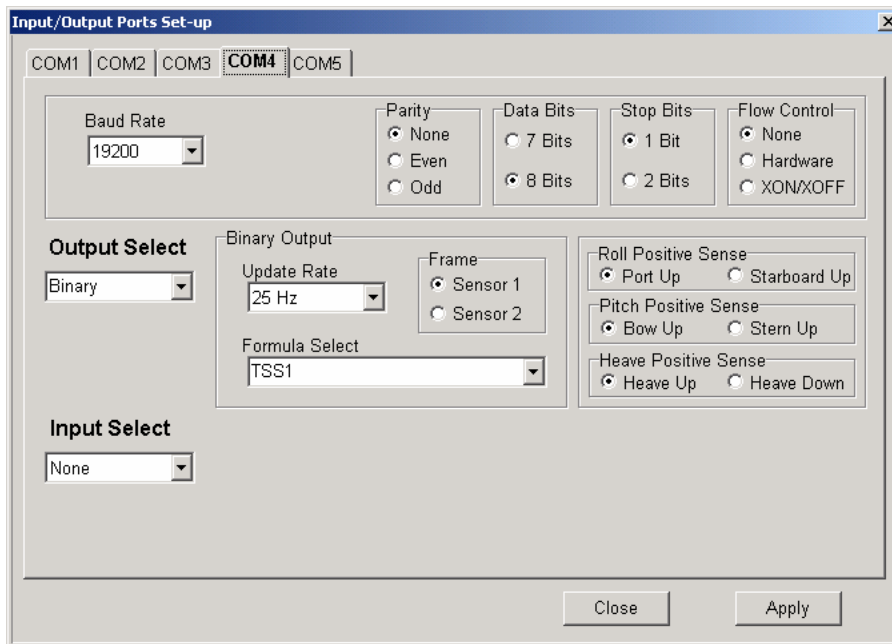
Com port #2 settings as installed: RPH data output to EM1002 sonar.



Com port #3 settings as installed: Normally to P-Code but not working.



Com port #4 settings as installed: Binary out to EM 120 sonar.



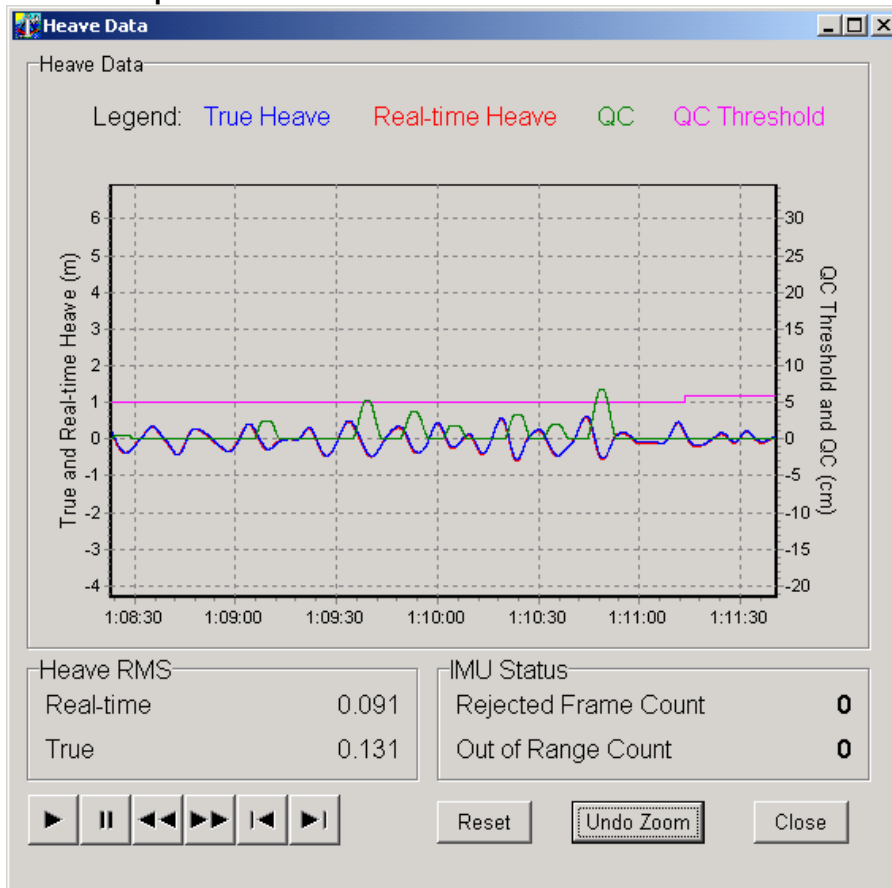
Com port #4 settings as installed: No connection.

The screenshot shows a window titled "Input/Output Ports Set-up" with a close button in the top right corner. At the top, there are tabs for COM1, COM2, COM3, COM4, and COM5, with COM5 selected. The main area contains several settings:

- Baud Rate:** A dropdown menu showing "9600".
- Parity:** Radio buttons for "None" (selected), "Even", and "Odd".
- Data Bits:** Radio buttons for "7 Bits", "8 Bits" (selected), and "9 Bits".
- Stop Bits:** Radio buttons for "1 Bit" (selected), "2 Bits", and "3 Bits".
- Flow Control:** Radio buttons for "None" (selected), "Hardware", and "XON/XOFF".
- Output Select:** A dropdown menu showing "None".
- Input Select:** A dropdown menu showing "None".

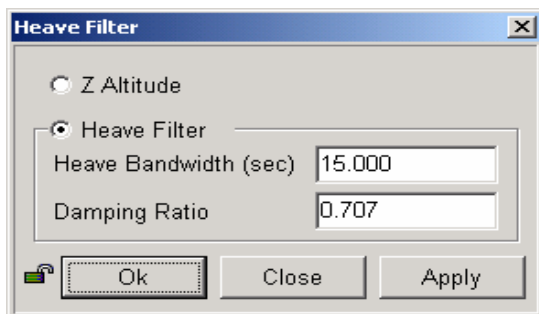
At the bottom right, there are two buttons: "Close" and "Apply".

Heave data plot:

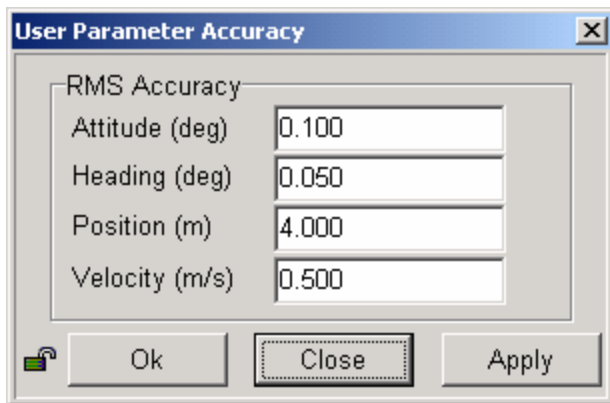


The heave plot above shows the relationship between the **Real-time (RT)** heave and the **True (or delayed TH)** heave measurements. The **green line** relates to quality control (QC) and represents the difference between the two values. When the delta between the RT and TH exceeds 5cm or 5% of total heave (**pink line**) then the radio light on the main controller screen will turn from green to red but does not affect the real-time heave data being collected. Quite often this occurs after the vessel makes a turn or an abrupt change in speed and is not necessarily cause for alarm. The heave filter has a 105 second buffer so the event which may have caused the impulse happened in the past. A red light merely calls the users attention to the difference and may also suggest that the filter settings need to be refined if the QC value is continually out of bounds.

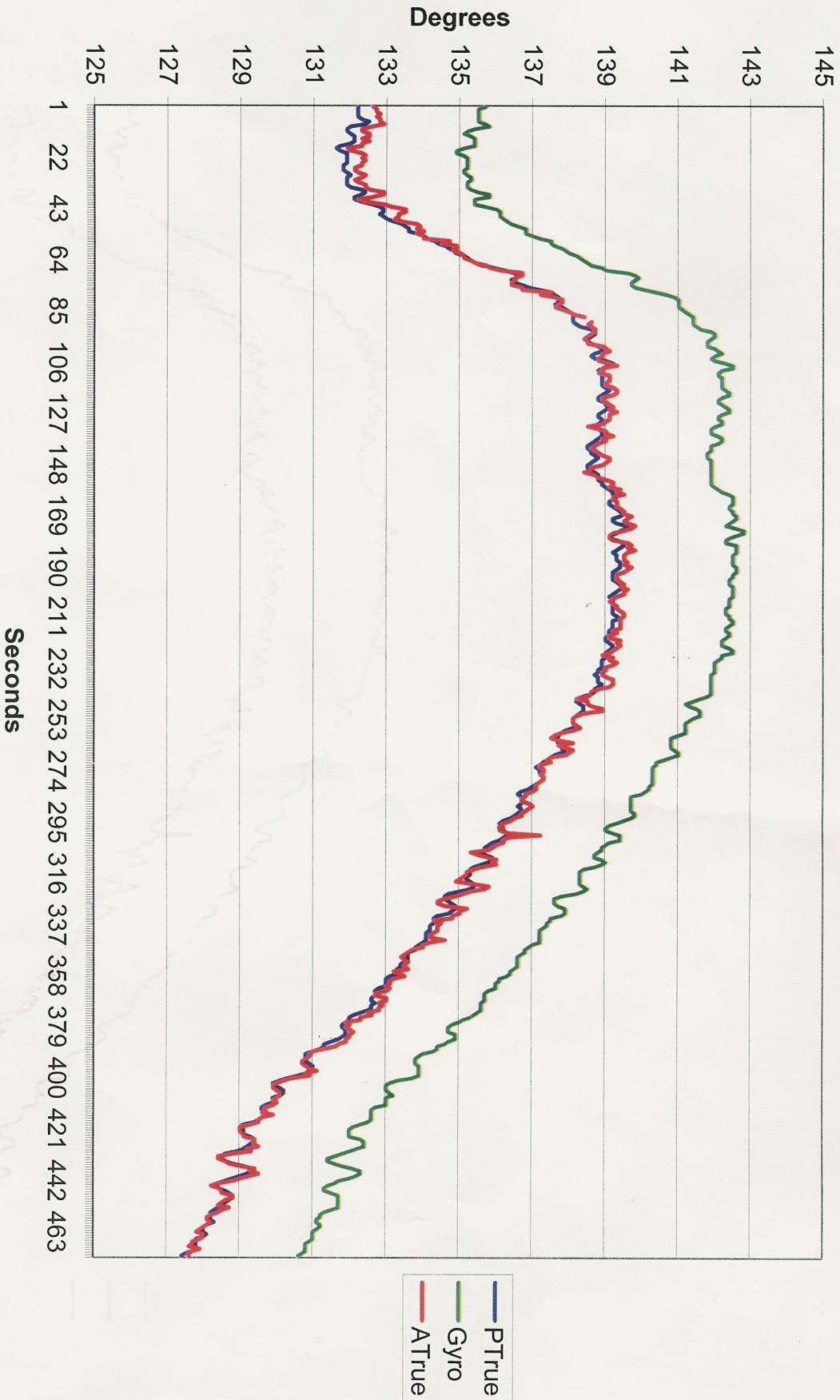
Note: The TrueHeave data filter is delayed about 3 minutes from the TH value. Also, Group 111 & 113 must be enabled in the Ethernet Real-time logging page.



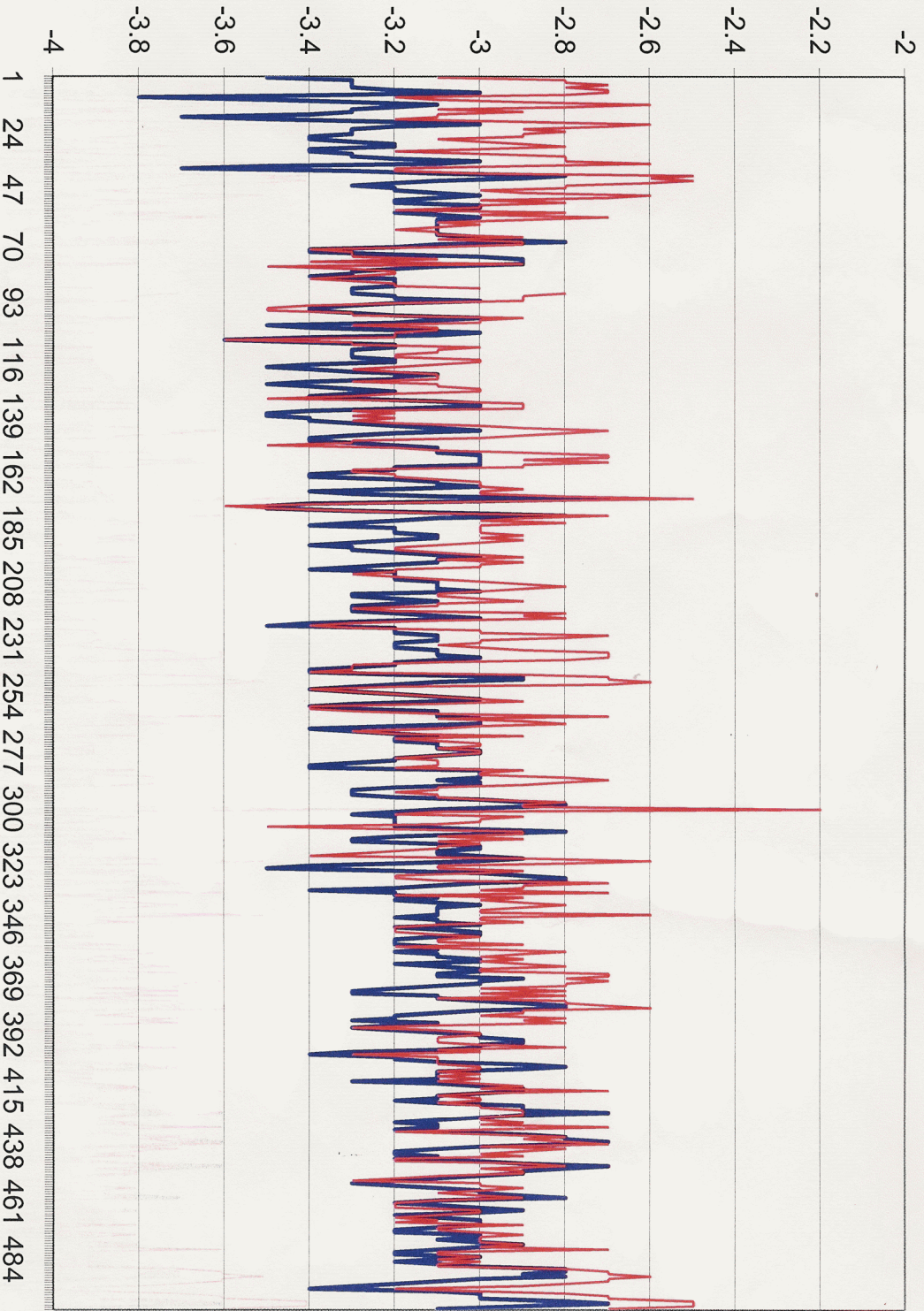
The main controller screen below shows normal POSMV operation. POS Mode is FULL indicating that all user accuracy settings have been satisfied.



Heading



Difference



— POS vs Gyro
— GPS vs Gyro