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Bathyswath Omega Manual

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Voids

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List of modifications

Version	Date	Modifications	Pages	Writer	Checker
1.01	12/07/21	Updating BD992 instructions, adding Setup, Interfaces and Quick Start sections.		MFG	
1.00	07/10/20	Initial document		MFG	

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1   INTRODUCTION

1.1   REFERENCES

Ref 1 ITER Systems website, at https://www.iter-systems.com/
Ref 2 SwathRT Manual, "ETD_2020_Bathyswath_swathRT manual.pdf"
Ref 3 Hemisphere GNSS Technical Reference Manual,
    "hemispheregnss_technicalreferencemanual_v3.0_12302019.pdf" (or the latest
    version; available from https://www.hemispheregnss.com/

1.2   GLOSSARY & ACRONYMS

ACRONYMS	DEFINITION

1.3   SCOPE

This document provides information about Bathyswath-Omega systems.

See the swathRT manual [Ref 2] for instructions on setting up and using the Omega computer
system. swathRT is the program that runs on the microcomputer in the Omega box.

1.4   INTRODUCTION TO BATHYSWATH OMEGA SYSTEMS

Bathyswath Omega systems contain everything that is needed to survey in one splashproof
housing (the Omega Deck Unit), except the sonar transducers, which are (of course) mounted
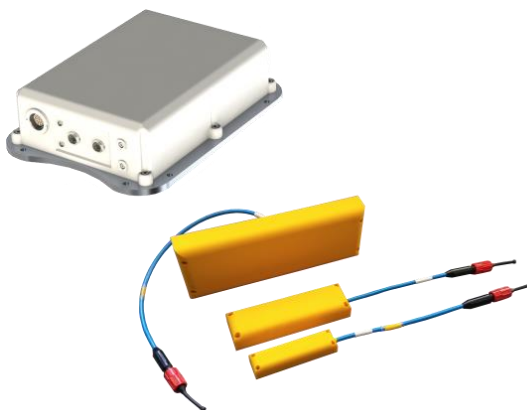underwater, and the GNSS antennas which are (also of course) mounted above the vessel.

Figure 1 Bathyswath Omega housing and transducers
Three options of Bathyswath-2 transducers shown

The Deck Unit contains:

- Sonar electronics
- GNSS electronics
- Attitude system (e.g. INS)
- Power supply and communications subsystems
- Micro computer, running control and data acquisition software

External connections on the Deck Unit are:

- Sonar transducer connections
- GNSS antenna connections
- Umbilical connector, including:
    o Power input
    o Ethernet communications
    o PPS in or out
- Serial connectors, giving communications with:
    o GNSS system, for configuration etc.
    o Other serial connections

Because the Omega Deck Unit includes the motion sensor, it is not ideal for systems where the sonar transducers are mounted on the end of a survey pole, over the side of a boat. In such cases, the transducers could move independently of the motion sensor, and so their motion would not be correctly measured. It may be possible to mount the Omega Deck Unit on the top of a stiff survey pole. Otherwise, Bathyswath-3-Alpha, Bathyswath-2-Underwater or Bathyswath-2STD with a remotely installed motion sensor are recommended.

2 SETUP

This section describes how to install a Bathyswath-2 Omega system and start to use it.

2.1 HARDWARE

2.1.1 Deck Unit

Mount the Deck Unit in a location where it is rigidly fixed relative to the sonar transducers. It is splashproof, but should not be mounted underwater.

Connect the Spider Cable to the Deck Unit. Connect its RK45 connector to an Ethernet port on an external computer or communications system. Connect the barrel connector to a DC power supply, 9 to 36 V. The centre of the barrel connector is positive.

2.1.2 Transducers

Mount the two transducers under the water surface, facing port and starboard, with a clear view to either side. Connect the two transducer cables to the Deck Unit, using extension cables of the required length.

2.1.3 GNSS antennas

Fix the two GNSS antennas at least 1 metre apart in a location where they have a clear view of the sky. Connect their cables to the connectors on the Deck Unit.

2.1.4 Remote System

You can use a Windows system ("remote computer") to monitor and control the Omega system. Connect the remote computer to the other end of the communications link to the Omega box's Ethernet port.

You can also use Linux or other operating systems to control and monitor the Omega unit, using the **swathRT_cmd** control software and the **swathDisplay** display program.

2.2 WINDOWS SOFTWARE

2.2.1 Communications

Set the IP address of the Ethernet port on the remote computer to a fixed address in the same IP domain as the Omega system. By default, this is `192.168.0.70`.

2.2.2 Bathyswath Swath Processor

The main interface to the Omega system is the Swath Processor program, which installed with the Bathyswath software, using the install tool, bathyswath_x64.msi.

To use Swath Processor with Omega:

- Click the **Sonar** button, select **Configure Sonar**, and set **Interface > Type** to **SwathRT**.
- Click the **Socket 1** button, and select **Enable, Receive, UDP/IP**, and **Bathyswath Raw**.
  - Click the **UDP Settings** button, and select **Broadcast,** and set **Port** to **52764.**
  - **Note**: you need to re-open the socket connection each time you restart Swath Processor, by clicking the **Socket 1** button and then clicking **OK**.
- The other settings are the same as for other Bathyswath systems. See the Bathyswath Getting Started manual and the Swath Processor Help system: place your mouse pointer over the section of interest in Swath Processor and press the **F1** key on your keyboard.

2.2.3 VNC Interface to the Omega microprocessor

You can access the desktop interface of the microcomputer in the Omega box using VNC Viewer. Download it from here and install it:
https://www.realvnc.com/en/connect/download/viewer/

Run VNC Viewer, if there is no Omega connection already set up, use **File > New Connection**, and enter the IP address of the Omega system, typically 192.168.0.80, although a different address may have been used to fit in with the remote system's communications network. Give the connection a name, e.g., "Bathyswath Omega". The default username and password are "pi" and "swath01".

When you make the VNC connection, you should see the desktop interface of the Raspberry Pi Linux microcomputer inside the Omega box. You should see a terminal window showing status messages from the swathRT program that interfaces to the Bathyswath hardware. You can also access the setup windows of the attitude and position systems inside the Omega box. Before turning off the Omega box, you should use the shutdown command of the Raspberry Pi, accessed through the raspberry icon in the top-left of the screen.

2.2.4 FTP file transfer program

At the end of each survey, you will need to upload the saved survey files from the Omega microcomputer. We suggest using FileZilla, obtainable from https://filezilla-project.org/.

Use Site Manager to create a new site:

- Host: 192.168.0.80
- Port: can leave blank
- Protocol: SFTP
- Logon: normal
- User: pi
- Password: swath01

2.2.5 More information

For more information see section "CONFIGURE A WINDOWS LAPTOP TO CONNECT TO RPI" in the swathRT manual, Ref 2.

2.3 OMEGA SYSTEM SOFTWARE

In many cases, you should be able to leave the software in the Omega system at its default settings, but see section "4.4 CONFIGURATION" in the swathRT manual, Ref 2 for details.

Settings are changed using the `RTSettings.ini` file. The ones that you might need to change include:

`receiverIP=192.168.0.70`   *IP address that sonar data from swathRT is sent to*

… change this if using a different IP domain

`auxSendDecimation=1`   *Send 1 in N attitude and position samples over UDP link*
`pingSendDecimation=1`   *Send 1 in N pings over UDP link (use odd number)*
`reducePingSizeForUDP=1`   *Decimate pings sent over UDP to 1 in N sonar samples*

… adjust these to suit the speed of the communications link to the Omega box. For a typical radio link, try setting all of the above to 5.

The swathRT program, which interfaces to the Bathyswath hardware in the Omega microcomputer, starts automatically when the system is powered up. You can see its status messages in a terminal window on the desktop, visible through a VNC viewer (see 2.2.3 above).

See §6.1 for more details.

2.4 ATTITUDE AND POSITION SYSTEM SETUP

The attitude and position subsystems (according to the options selected for fitting in the Omega box) are configured using web browser interfaces. Use the VNC viewer to access the Omega microprocessor desktop, and open a web browser via its icon on the toolbar or through the menu interface. Then, enter the IP address of the device to be configured in the URL box of the browser. Typically, these are:

Attitude system (e.g. Ekinox) :192.168.0.34

Position system (e.g. BD992) :192.168.0.24

See the manuals for the selected attitude and position systems for details of the configurations.

See §6.2, §6.3, §6.4, and §6.5 for more details.

2.5 MEASURING AND ENTERING OFFSETS AND OTHER SITE DATA

You will need to measure the relative positions of the following components of the system. Select a convenient common origin point on your vehicle or vessel, to measure relative to, and then use a spreadsheet to compute offsets relative to other points if necessary.

If using an Ekinox INS, you will need to enter offsets relative to that in the Ekinox configuration interface. The location of the measurement centre of the Ekinox in the Omega box is shown below.
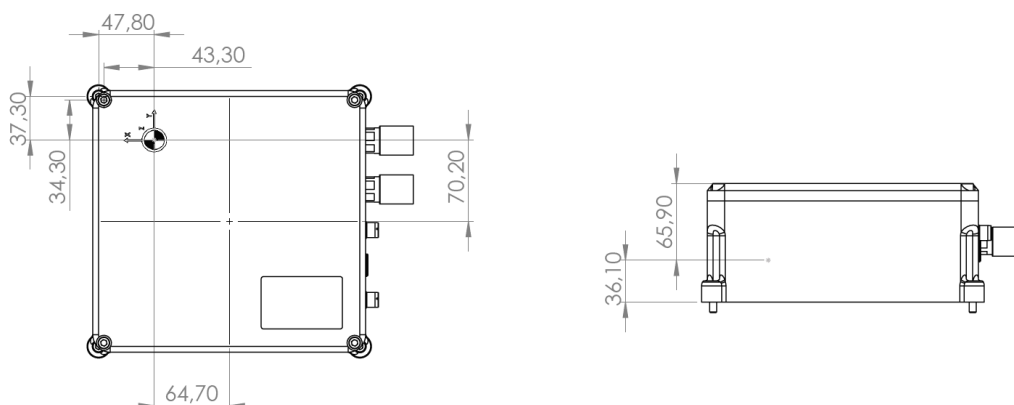
Items to measure:

- Both GNSS antennas
- Both sonar transducers
- Motion centre of INS

---

3   QUICK START

When the system has been set up, as described above, you can control and monitor it on a remote computer using Swath Processor.

A typical operation sequence would be as follows.

- Apply power to the Omega system, and wait a few minutes for everything to start up
- Use the VNC Viewer to check that the Omega computer has started. Inspect the swathRT terminal in VNC to confirm that it is running and has detected the Bathyswath hardware.
- Check that the time shown in the Omega computer desktop is correct, and set it by clicking on the desktop clock if not (most Omega systems should be set up to access current time automatically).
- Start Swath Processor on the Windows computer, and open a session file that has been configured for your system.
- Click the **Socket 1** button, and then **OK**, to open the link to the Omega system.
- Click the **Sonar** button to open the **Sonar Control** dialog, and then **Start**, to start the Bathyswath system running and collecting data. If operating in air, keep the Transmit Enable off.
- You should see:
  - Acknowledgement of the start in the swathRT terminal in the VNC viewer
  - Sonar, attitude and position data appearing in the Swath Processor windows.
- Navigate the survey vessel or vehicle along the required survey lines, using the **Start** and **Stop** buttons to break up the recorded data into separate files for simplicity of processing later.
- Using the file system tools in the Omega desktop, check that data files are being recorded to the internal SD card, usually at `/home/pi/swathRT/Data`.
- At suitable intervals, use FileZilla to upload the recorded data files to the Windows computer for later postprocessing. Use Swath Processor to inspect one or two of these to check that they have the necessary data in them.

4 INTERFACES

This section describes the interface connectors on the Deck Unit.

4.1 SONAR TRANSDUCERS

4.1.1 Bathyswath-2 Transducer connector

The Bathyswath-2 transducer connectors are as follows. They are the same as those on the Bathswath-2-STD Deck Unit.

On Bathyswath-2 systems, the transducers are fitted with Subconn MCOM16 wet-mate connectors. The same connector type is used for the transducer extension cable at both ends, and on the TIU electronics housing.

The Bathyswath-1 and Bathyswath-2 connections are compatible with each other, so that Bathyswath-2 transducer extension cables can be used to connect to Bathyswath-1 transducers.

Function	MCOM16F (Subconn)
Rx Stave A+	15
Rx Stave A-	14
Rx Stave B+	13
Rx Stave B-	12
Rx Stave C+	10
Rx Stave C-	9
Rx Stave D+	8
Rx Stave D-	7
TX +	6
TX -	16
TXDR TEST +	2
TXDR TEST 0V	5
Pre-Amp PWR +	3
Pre-Amp PWR 0V	1
Rx Screen	4
Overall screen	11
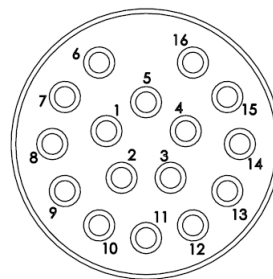
Figure 2 MCOM16F female connector (mating face)

Figure 3 MCOM16M male connector (mating face)

4.1.2 Greasing and cleaning the connectors

The Subconn connectors should be greased with "Molykote® 44 Grease, Medium", a Dow Corning product.

General cleaning and removal of any accumulated sand or mud on a connector should be performed using spray based contact cleaner (isopropyl alcohol). New grease must be applied again prior to mating.

See the MacArtney support site for more information: http://macartney.com/support .

4.2 UMBILICAL CONNECTOR AND SPIDER CABLE

4.2.1 Umbilical Connector

The Umbilical Connector is a Fischer DBPE-105-Z-102-139-2, connected as follows:

DBPE-105-Z-102-139	Function
16	Ethernet 1+ (Blue)
17	Ethernet 1- (Blue - White)
14	Ethernet 2+ (Orange - White)
15	Ethernet 2- (Orange)
12	Ethernet 3+ (Green - white)
13	Ethernet 3- (Green)
18	Ethernet 4+ (White - Brown)
19	Ethernet 4- (Brown)
20	PPS in 1+
3	Signal gnd
22	sync in 2+
3	Signal gnd
24	sync out 2+
3	Signal gnd
26	spare out 1+
3	Signal gnd
23	USB Data +
24	USB Data -
10	USB VCC +5
11	USB gnd
1	GND
2	GND
4	9-18 VDC PWR IN
5	9-18 VDC PWR IN
6	Aux power +
7	Aux power gnd
27	Chassis ground

4.2.2 Spider Cable

The Spider Cable connects to a 27-pin Fischer connector on the Deck Unit, and provides connections for Ethernet connections and power input.

Ethernet is on a standard RJ45 connector.

A mains converter and screw-terminal adaptor are provided for powering the system from mains power or batteries.

4.3 AUX CONNECTORS

The aux (auxiliary) connectors are wired as follows (connection to 15-way D-type):

Connector pin	cable	Function	D15
2	red	RxD	9
1	black	GND	7
3	green	TxD	11
1	black	GND	7
4	white	PSU 12V	14
1	black	GND	7
5		(spare)	not connected

The connector is a Fischer DBPE-103-A-054.

When connected to a 9-way D-type connector, the connections are:

Fischer DBPE	cable	Function	Samtec MMTS
1		GND	1
2		RxD	2
3		TxD	3
4		PSU 12V	4
5		(spare)	not connected
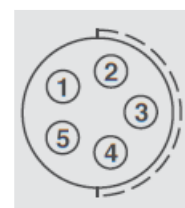
DBPE-103-A-054
pin numbers

4.4 INTERNAL CONNECTIONS

4.4.1 Hemisphere Ports

The H328 GNSS board has two serial ports, A and B

In the prototype (CPB-V2), these are connected as follows:

- Port A: on J18 on the CPB; linked to J8 on this system, giving access on /dev/ttyUSB1 in the RPi (this is usually used for the SVS, which isn't fitted to this system)
- Port B: connected to the external Aux port (the lower of the two connectors) (note: in the prototype, this connector does not have a locking clip, so can come loose).

5 COMPUTER CONFIGURATION

Bathyswath-2 Omega contains its own microcomputer, and so can run on its own without a constant connection to an external computer. See section 6.1 for instructions on setting up the internal microcomputer.

By default, the Omega microcomputer runs the Bathyswath swathRT program. See Ref 2, "Configure a Windows Laptop to Connect to RPI" for instructions on connecting an external computer to swathRT.

Typically, Omega is connected to an external computer through its Ethernet port, on the Umbilical Connector (section 4.2.1), perhaps using the Spider Cable (section 4.2.2).

The default IP address for the Omega microcomputer is 192.168.0.80, and the default IP address for the connected computer is 192.168.0.70.

6 SUBSYSTEM CONFIGURATION

6.1 MICROCOMPUTER

The Omega system contains a Raspberry Pi microcomputer, for controlling the Bathyswath sonar system and the other subsystems. It uses Raspbian, a version of the Linux operating system. The sonar and subsystem operation are controlled by a program called **swathRT**. See the swathRT manual [Ref 2] for instructions on setting up and using swathRT: this manual therefore covers most of the instructions for using Omega systems through the computer.

Users are, of course, free to install their own operating systems and programs on the internal Raspberry Pi.

6.2 GNSS SYSTEMS

Omega can be supplied with a selection of GNSS positioning systems or none. Instructions for setting up each type of GNSS system will be added to this section.

6.3 HEMISPHERE H328

The Hemisphere H328 ("H328") is an option for the dual-antenna GNSS subsystem, providing position and heading information.

The Hemisphere is configured through a serial port (see 4.4.1). Use the aux port serial connector provided to connect to a controlling computer (usually a Windows laptop). Most such computers do not have serial ports fitted, so a UDP-to-serial device can be used. The Hemisphere serial port is usually set to a baud rate of 19200.

The simplest way to do this is to use Hemisphere's PocketMax application, although configuration commands can be typed directly into the serial port. This application and its manual can ne downloaded from the Hemisphere website, www.hemispheregnss.com.

PocketMax can, in theory, also be configured to work through a UDP port. However, at the time of writing, this operation is unreliable, with intermittent reading of parameters and setting of parameters appears not to work at all.

6.3.1 Configuring Hemisphere outputs to swathRT

Omega is usually configured with the setup serial port connected to its Port B, and data output on Port A. On the prototype Omega system, the serial input from the Hemisphere is configured on Linux port */dev/ttyUSB1*. Set up the parameters for this in the `serialPortName` and `serialPortBaudRate` parameters of the `AuxDataSettings` section of the RTsettings.ini file.

Set up the Hemisphere to output:

- $GPGGA at 10 Hz
- $GPZDA at 1 Hz
- $GPHDT at 5 Hz

6.3.2 Configuring Hemisphere to collect Rinex data files

The Hemisphere can be set up to collect raw data for postprocessing ("PPK"). To do this, configure the Hemisphere to output Bin65, Bin66, Bin76, Bin94, Bin95 and Bin96, all at 1Hz. in RTSettings.ini, configure swathRT to read and store these items, using:

```
writeRinexFile=true
hsRinexIDs="Bin65,Bin66,Bin76,Bin94,Bin95,Bin96,"
```

The information contained on this sheet is subject to restrictions listed on the cover page of the document

These packets are stored to a file in the location specified by `rawFileFolder` in RTSettngs.ini. A time and date code is used in the file name. The file is opened each time that `writeRinexFile` is changed from false to true, so at program start-up or when the ini file is changed and a "re-read settings" instruction is sent.

6.4 TRIMBLE BD992-INS

6.4.1 BD992 and BD992-INS

The instructions below apply to both BD992 and BD992-INS. If a separate INS is used (e.g., SBG Systems Ellipse), then the INS function of the BD992 is disabled anyway.

6.4.2 Setup interface

To set up the BD992-INS, use VNC to access the Raspberry Pi Desktop, then use a web browser ("Chromium" is the Raspbian default). Type the IP address of the BD992-INS into the address bar of the browser (default 192.168.0.24) and enter the username and password (e.g. as below). Chromium should remember these for you after the first use.

6.4.3 First use setup

The first time that a new BD992-INS is used, log in using the default login parameters as supplied by Trimble with the system, and set:

- user name: admin
- password: ITERSystems20!
- Login
  - user name: admin
  - password: ITERSystems20!
- IP address: 192.168.0.24 (or another address or domain that suits your system)
- Gateway: the IP address of the Raspberry Pi. The standard address is 192.168.0.80. All parts of the Omega system, and the external laptop computer, need to use the same domain (first three numbers in the IP address).

6.4.4 Configuration

Configure the BD992-INS as follows:

- I/O configuration:
  - Serial COM1:
    - (for the Ekinox corrections)
    - 115200 baud
    - GGA: 20 Hz
    - GST: 20 Hz
    - HDT: 20 Hz
    - RMC: 20 Hz
    - ZDA: 1 Hz
  - Serial COM3:
    - (for the logging in swathRT and for TEM timing)
    - 38400 baud
    - GGA: 20 Hz
    - HDT: 20 Hz
    - ZDA: 1 Hz
- Data Logging
  - (for "RINEX" postprocessing)

       o   Enable the DEFAULT set when surveying

6.4.5 Getting RINEX files

Files can be uploaded from the BD992 using FTP, e.g. with Filezilla, using the login parameters listed above:

FTP to 192.168.0.24 (or to whichever domain is being used)

user name : admin

PWD: ITERSystems20!

6.4.6 Enabling RTX

RTX is a correction service that comes over L-band satellite signals.

To enable it, obtain a "option code" from Trimble (you will need to pay for this for operations) and enter it into the "option code" section at the bottom of the **Receiver Options** section. Then use **Install Option**, and reset the device using **Receiver Configuration > Reset > Reboot Receiver**.

Note: as RTX is an L-band service, received from geostationary satellites, the GNSS antennas must have a clear view towards the equator, that is, to the south when in the northern hemisphere or to the north when in the southern hemisphere.

You can disable RTX in the **MSS Corrections > Configuration** page.

6.4.7 Enabling VRS Now Corrections

When you activate the VRS Now service, Trimble will send you a username and password. Enter them in the **I/O Configuration** section of the BD992 menu.

6.4.8 To switch between RTX and VRS Now

If you have licenses for both RTX and VRS Now, then you can configure them both as described above. If both are enabled, then BD992 defaults to using VRS Now. So you can switch between them by simply enabling and disabling VRS Now in the **I/O Configuration** section of the BD992 menu.

6.4.9 Using the INS function of BD992-INS without Ekinox

The Trimble BD992 can be supplied with and without an internal INS function (BD992 or BD992-INS). When using the BD992-INS version with an external INS, such as SBG Ekinox, then the INS function must be disabled, otherwise the BD992 will not send the Ekinox the position and heading data that it needs. However, the BD992-INS can be used alone. To do that, configure the system as follows.

In the BD992 configuration:

- Use the INS Configuration part of the BD992-INS browser interface
- Select **INS Enable**
- In the **General** section, enable **GAMS** and **MAG Enable** (although the latter could be not used)


- The Graphic Prerequisites section is only used for the web interface graphics and not for the output data, so you could ignore it

- The **Mounting Angles** are usually left as zero
- Set up the offsets to the primary and secondary antennas in **GNSS Lever Arm**
- Leave the **IMU Lever Arm** as zero; we will use the centre of the BD992 as the reference point for data processing. See below for the offsets.

6.4.10 Offsets
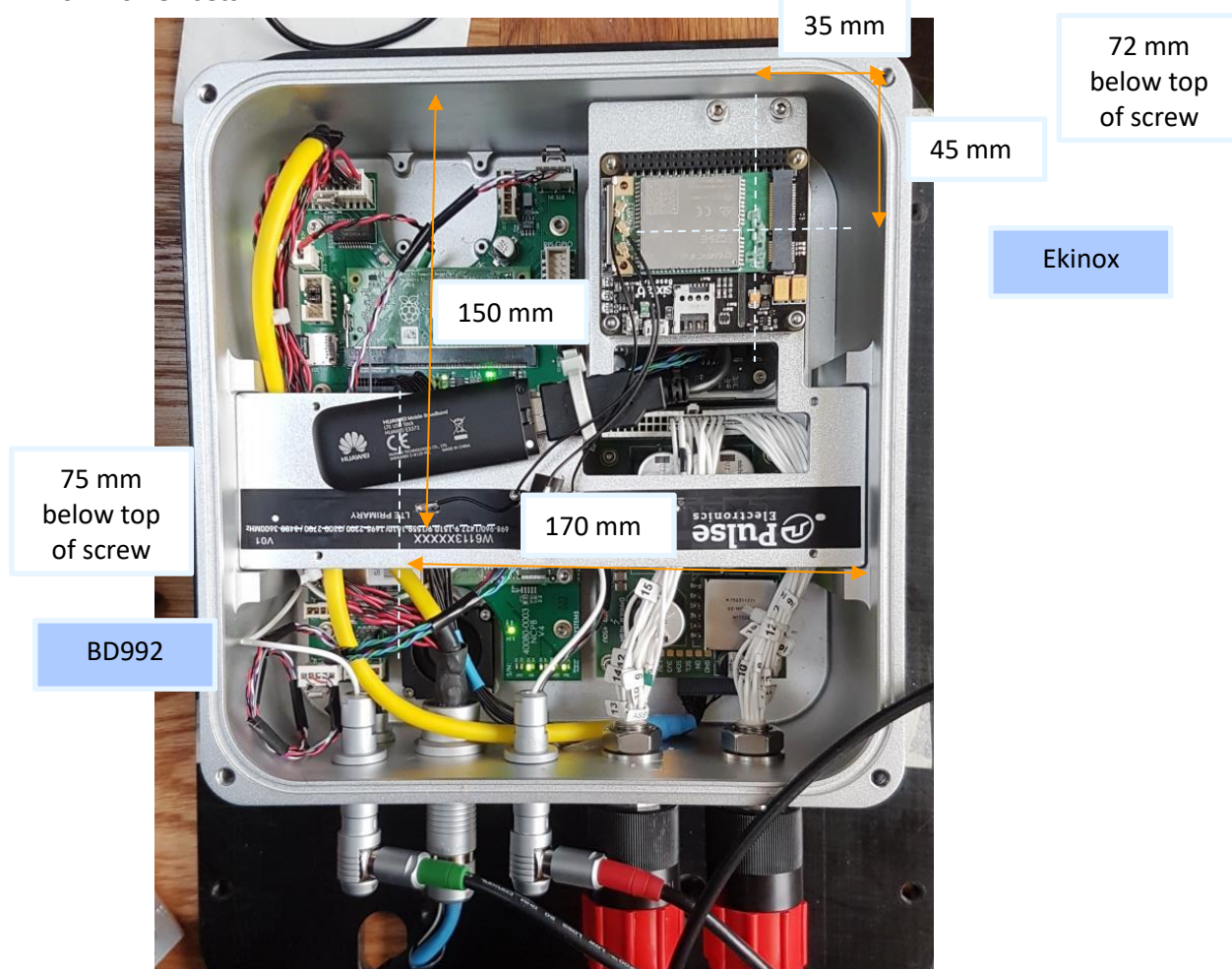
The centre of motion of the Ekinox, which the antennas need to be measured relative to, is measured relative to the top of the front-right screw of the Omega box:

- 45 mm behind (aft)
- 35 mm to the left (port)
- 72 mm below the top of the screw

The offsets for the INS part of the BD992 are:

- 150 mm behind (aft)
- 170 mm to the left (port)
- 75 mm below the top of the screw
- Data outputs
    - The data from the BD992-INS must all be sent to the swathRT program in the Raspberry Pi, nominally at 192.168.0.80 (and not to the Ekinox, if present).
    - Send position and heading data using $GPGGA and $GPHDT messages
    - Send roll and pitch using the $PTNL,AVR message.

In the swathRT configuration:

- Add the $PNTL message to the list of messages accepted as attitude strings in RTsettings.ini:
attitudeStrings= "$PTNL,AVR" … pre-pended to the existing string
  - Then use swathRT_cmd to tell swathRT to re-read its settings, or re-start swathRT.

In Swath Processor:

- Configure the attitude port to use $PTNL messages
- Configure the position port to use NMEA message, direct from the position port and not via the attitude port.

6.5   SBG SYSTEMS EKINOX

6.5.1   Configuration

If an Ekinox INS sensor is used, configure it as follows. Use a web interface (e.g. Chromium), with URL 192.168.0.34 (or the IP address set below) to access the configuration pages.

- Sensor
  - Motion Profile: Marine Surface
  - Alignment: Assuming that the Omega box is mounted with the cables at the rear, use
    - X Axis: Forward
    - Y Axis: Right
- Aiding assignment:
  - GPS 1: COM A
  - Sync / PPS: Sync in A
- Aiding setting:
  - GNSS lever arms: enter the relative locations of the primary and secondary antennas (this is essential for using heading
- Inputs/outputs
  - COM ports
    - Port A: baud 115200, Mode on
  - Ethernet
    - IP address: 192.168.0.34
    - Subnet mask 255.255.255.0
  - Eth 0
    - Protocol: UDP
    - Output IP: 192.168.0.80
    - Broadcast: off (*this stops the output Ethernet being saturated with Ekinox messages*)
    - Output port: 5000
    - Input port: 5001
  - Logic I/O
    - Sync in A: rising edge
- Data Output
  - Eth 0
    - UTC: 1 Hz

- EKF Euler: 50 Hz
- EKF Nav: 50 Hz
- Heave: 50 Hz
- Delayed heave (*optional, leave disabled unless required*)
- ZDA: disabled (*but could optionally set to 1 Hz and disable ZDA output from the GNSS, **don't enable them both***)
- o Everything else disabled

Annex A   Typical RTSettings configuration

A typical configuration for the RTsettings.ini file, which configures swathRT, is as follows:

[AuxDataSettings]
ValeportPorts=
attitudeStrings="$PASHR,$PSAT,:,SBGHead"
auxUDP_port_1=5000   [*the port that the Ekinox sends out on*]
auxUDP_port_2=0
auxUDP_port_3=0
positionStrings="$GNGGA,$GNHDT"   [*note the GN prefixes, used by Trimble*]
reportAttitude=false
reportAuxData=false
reportPosition=false
serialPortBaudRate_1=38400
serialPortBaudRate_2=19200
serialPortBaudRate_3=19200
serialPortName_1=/dev/ttyUSB0
serialPortName_2=/dev/ttyUSB1
serialPortName_3=/dev/ttyUSB2
size=0
useSerialPort_1=true
useSerialPort_2=false
useSerialPort_3=false
writeRinexFile=false

[FilterSettings]
doAmplitudeFilter=false
doPhaseConfidenceFilter=false
doRangeFilter=false
maxRange=1000
minAmplitude=500
minRange=0
phaseConfidenceLevel=60
size=0

[GeneralSettings]

```
UDPPingDelay_ms=5
attitudeSendDecimation=20
auxSendDecimation=5
commandsPort=52763
outputType=SONAR_DATA4
pingSendDecimation=5
positionSendDecimation=5
rawFileFolder=/home/pi/swathRT/Data
receiverIP=192.168.0.70
receiverPort=52764
reducePingSizeForUDP=5
reportPingStats=false
size=0
startSonarAtStart=false

[PingSettingsAuto]
LNA18dBRange=50
LNA24dBRange=100
MaxTxLen=300
MaxTxPow=100
MaxTxRange=600
MinTxLen=2
MinTxRange=20
TxMaxPowerRange=20
decimationFor100kFilter=1
decimationFor10kFilter=6
decimationFor30kFilter=4
pulseLength100=10
pulseLength30=30
size=0

[PingSettingsFixed]
autoAdjustSWGain=true
bandwidth=100
basegain=500
decimation=1
lingain=0
lnagain=1
pgagain=0
```

```
size=0
sqgain=3000
transmitPowerAttenuation_dB=0
txLength=2

[PingSettingsGeneral]
alternate=false
autoSetPingSettings=false
extTrigger=false
extTriggerInvert=false
extTriggerSource=3
pingRange=50
rxOn.0=true
rxOn.1=true
rxOn.2=false
size=0
sonarFrequency.0=468
sonarFrequency.1=468
sonarFrequency.2=0
tdcrType.0=18
tdcrType.1=18
tdcrType.2=15
triggerOut=false
triggerOutInvert=false
triggerOutSource=3
txOn.0=true
txOn.1=true
txOn.2=false

[ProcessingSettings]
ampAltSmoothingWindow=0.01
computeAmpAltitude=false
computeRangeAngle=false
maxAltRange=100
minAltRange=5
readFile=false
readFilename=
size=0
```

```
[SonarSettings]
PPSOn=true
PPSRisingEdge=false
PPSSource=3
PPSWindow=3000
maxPingRate=10
overTemperatureSleep_ms=2000
pingTimeout=500
preampPowerOn=true
shutdownTemperature=8000
size=0
```

Annex B   Testing

The following tests demonstrate the functionality of a typical Bathywath-2 Omega system.
The system tested here uses a Trimble BD992 GNSS board and an SBG Systems Ekinox INS.

Use ✓ or ✗

"RPi" is Raspberry Pi: the microcomputer in the Omega box.

6.6   TEST B2O DATA CONNECTIONS

- Laptop IP address is correct [§2.2.1] ()
- Ethernet connection to RPi is OK [§2.2.3] ()
- VNC connection from external laptop to RPi: confirm that you can access the RPi desktop with the VNC server ()
- RPi can access Internet for configuration etc. (e.g. using plug-in or GSM WiFi dongle); open a web browser on the RPi desktop and check that it can open a web page ()
- RPi time is correct; compare with the Windows laptop time ()

6.7   TEST SWATH PROCESSOR

- Check that all data can be seen (see the separate tests below) ()
- Data files can be stored on the RPi, uploaded [2.2.4], and processed in Swath Processor ()
- Save .sxs and re-open session file; confirm that the settings and views are correct ()

6.8   TEST BATHYSWATH

- TEM detected by swathRT; check the swathRT terminal window in the RPi desktop ()
- Sample of bathy data is sent to Swath Processor on remote computer, and appears correct: [§2.2.2] ()
- PPS status is good (check the PPS status light in Swath Processor) ()
- Time differences between data items are OK (check the Time section of a Swath Processor Text Window) ()
- Transducer rub test (rub the port and starboard transducers one after the other, and check that the noise is seen on the correct side in an Amplitude view) ()
- Ping test (enable transmit, and check that the pulse can be seen in an Amplitude view (in bucket of water or river) ()

6.9   TEST TRIMBLE GNSS & ATTITUDE

- Trimble configuration can be accessed via Web browser on RPi, through VNC ()
- Trimble is configured correctly (see **Error! Reference source not found.**) ()
- GNSS data is received in Swath Processor, via swathRT ()
- ZDA data is received in swathRT and used to set the TEM time (this is true when a "*Sending time to sonar*" message appears after a sonar Start) ()

- Trimble system is computing heading and sending it to the Ekinox: check the BD992 and Ekinox status windows [§6.4, §6.5] ()

6.10   TEST EKINOX

- Ekinox configuration can be accessed via Web browser on RPi, through VNC ()
- Ekinox is configured correctly (see **Error! Reference source not found.**) ()
- Attitude and position INS data is received in Swath Processor via swathRT ()
- Ekinox status reports are good (see its Web interface) ()
- Move the boat to see if the Swath Processor display goes the way that we expect (only with small, man-handleable boats, of course ()

6.11   TEST INTERNET CONNECTION TO TRIMBLE FOR CORRECTIONS

- Trimble BD992-INS GNSS can access the Internet (e.g. via GSM) to permit GNSS corrections, (only used for VRS Now; RTX uses satellite comms) ()

6.12   TRIMBLE CORRECTION SERVICES

- Enable and check VRS Now ()
- Enter license number for RTX, enable and test it ()

6.13   CONFIGURE AND TEST RINEX FILE COLLECTION

- Trimble GNSS can be configured to save RINEX data for post-processing GNSS data ()
- RINEX files are saved to the Trimble board and recovered from it using FTP (e.g. FileZilla) ()
- Check space available for RINEX data in the BD992 and delete old files. ()

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