# AHRS

## Advanced Configuration

## User Guide

# Document Revision History

| Edition | Date | Comments |
|---|---|---|
| A | 09/2011 | First Edition |
| B | 03/2012 | iXBlue graphical chart applied to the document |
| C | 01/2015 | OCTANS NANO product added<br>Appendice B added |
| D | 03/2015 | New style guide updated to the document |
| E | 11/2015 | Input and output protocols lists updated |

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# Text Usage

| | |
|---|---|
| **bold** | Bold text is used for items you must select or click in the software. It is also used for the field names used into the dialog box. |
| `Courier` | Text in this font denotes text or characters that you should enter from the keyboard, the proper names of disk Drives, paths, directories, programs, functions, filenames and extensions. |
| *italic* | Italic text is the result of an action in the procedures. |

# Icons

The **Note** icon indicates that the following information is of particular interest and should be read with care.

**Important**

The **Important** mention indicates that the following information should be read to forbid or prevent a product dysfunction or a faulty operation of the equipment.

The **Caution** icon indicates that the following information should be read to forbid or prevent product damage.

The **Warning** icon indicates that possible personal injury or death could result from failure to follow the provided recommendation.

# Abbreviations and Acronyms

Abbreviations and acronyms are described in document *Inertial Products - Principle & Conventions (Ref.: MU-INS&AHRS-AN-003).*

# Overview of this Document

This document is the *Advanced Configuration User Guide* for the Attitude and Heading Reference Sensor (AHRS). This document is a part of the set of documentation provided with the AHRS. The set of documentation must be read and understood prior to using the AHRS.

The manufacturer shall in no case be held liable for any application or use that does not comply with the stipulations in this guide.

*AHRS – Advanced Configuration - User Guide* is divided into several parts:

- **Part 1: Introduction** – This part introduces the commands describes in this user guide.
- **Part 2: Version of Products Concerned** – This part lists all the products and the firmware version associated to which this user guide applies. This section lists the availability of the commands depending on the products.
- **Part 3: General Conventions** – This part describes command syntax and how to send and receive commands.
- **Part 4: General System Configuration** – This part lists the available commands to configure the AHRS.
- **Part 5: Interfaces Configuration** – This part describes commands to configure serial or Ethernet ports and analog Inputs and Outputs (I/O).
- **Part 6: Dynamic String Retrieve Commands:** This part describes commands to retrieve all configuration strings to dynamically get firmware feature list.
- **Appendix A: NMEA Checksum Web Page** – This appendix gives a mean to calculate the checksum (“hh” parameter) required in all transmitted sentences.
- **Appendix B: Factory Setting Details** – This appendix details the factory default settings.

A **Table of Contents** is available in the following pages to allow a quick access to dedicated information.

# Table of Contents

# 1 INTRODUCTION

This document describes the Attitude and Heading Reference Sensor (AHRS) configuration and monitoring commands which can be used during operation. These commands are sent directly through the repeater port to check settings and modify AHRS or external sensors configuration (depending of the external sensor and of the AHRS capabilities), to reset the unit, and save the configuration to PROM.

Full configuration of the AHRS, prior to operation, requires the use of the Web-based User Interface.
However, commands described below are exactly equivalent to the ones which are sent by the Web-based User Interface. They may be useful when launching and using the Web-based User Interface during operation is not possible.

# 2 VERSION AND PRODUCTS CONCERNED

The current edition of this document is applicable to the following 4th generation AHRS:

Table 1 – List of products and firmware

| Product | Firmware version |
|---|---|
| OCTANS | higher than FrmWCINT_OCT_v3.87 version |
| OCTANS 3000 | |
| OCTANS NANO | higher than FrmWCINT_INS_v5.64 version |

Refer to section 6.1 to check the firmware version currently downloaded into your unit.

Several commands described in this manual are associated with specific external sensors that may not be available on your product. Please, refer to *your Product User Manual* to check which external sensors are available.

Contact iXBlue customer support to get the updated firmware version to be downloaded into your system (see document: *Inertial Products - General Information (Ref.: MU-INS&AHRS-AN-007)* for contact information).

# 3 GENERAL CONVENTIONS

## 3.1 Command Syntax

All frames are compatible with NMEA 0183 standard and are formatted as follows:

**$CMD[,xxx,…,…y*hh<CR><LF> for configuration commands**

**$PHTXT,CMD[,xxx,…,..y]*hh<CR><LF> for configuration text retrieve commands**

$ is a header and "CMD" depends on the command

Brackets [ ] indicates optional parameters, depending on the command. Most commands can be used either to send configuration parameters "xxx,…,..y" to the system, or to ask for the current value for the parameter. In such case, the ",xxx,…,..y" should be replaced by ",,".

"hh" is the checksum of the sentence, and allows for a control during the transmission. It is calculated by exclusive-OR'ing (XOR) the 8 bits (no start bits or stop bits) of each character in the sentence, excluding "$" and "*". The hexadecimal value of the most significant and least significant 4 bits of the result are converted to two ASCII (0-9, A-F) for transmission. The most significant character is transmitted first.

The checksum field is required in all transmitted sentences. All frames should be ended by the two characters <CR><LF> (0D 0A hexadecimal).

A Web based NMEA calculator is given in Appendix A to help computing checksums.

## 3.2 How to Send and Receive Commands

The AHRS will listen for COMMAND protocol on repeater port.

On repeater port, serial configuration is fixed and set to 19200 bauds, odd parity bit, 2 stop bits. Repeater port will also output OCTANS STANDARD protocol. Answers to commands sent to this port will thus be mixed in OCTANS STANDARD output frames (refer to *AHRS Interface Library (Ref.: MU-AHRS-AN-003)* for details).

If a command is not correctly formatted, the AHRS will ignore it and no answer will be sent. If a parameter is out of allowed range, it will be ignored by the AHRS and set to default value (0 or none). Thus, to confirm that a command was correctly handled by the AHRS, the control application should systematically send the command to change a parameter, and then send the read back command to check stored value. After all changes are made, the application can send a SAVE command to store parameters in non volatile memory inside the AHRS.

# 4 GENERAL SYSTEM CONFIGURATION

## 4.1 Save to EEPROM

To save all parameters into EEPROM:

| | |
|---|---|
| **Message** | **$PHSAV,,*5C<CR><LF>** |
| **Title** | Save Configuration to EEPROM |

## 4.2 Software System Reboot

To reboot the system by software:

| | |
|---|---|
| **Message** | **$PHST_,RESET,,*39<CR><LF>** |
| **Title** | Restart AHRS algorithm |

**Warning**

Unit will restart with the configuration saved into PROM. It is recommended to perform a save to PROM command (see section 4.1) before resetting if you changed the settings and want to keep them.

## 4.3 Web MMI Passwords Reset

To reset Web MMI passwords, following command can be used:

| | |
|---|---|
| **Message** | **$PIXSE,CONFIG,PWDRST*4B<CR><LF>** |
| **Title** | Reset Web-based User Interface Passwords |

There is no password any more once this command is used.

## 4.4 Manual Position and Speeds

To enter manual position and speed:

| | | | |
|---|---|---|---|
| **Message** | **$PHMAN,x.x,y.y*hh<CR><LF>** | | |
| **Title** | Manual Position | | |
| **Data Field** | **Semantics** | **Unit** | **Type** |
| x.x | Latitude, positive north | Degree | Float |
| y.y | Speed | knots | Float |

To retrieve current manual position and speed:

**$PHMAN,,*5A<CR><LF>**

## 4.5 Axis Orientation

To enter an axis orientation (rough misalignment):

| Message | $PHORI,i*hh<CR><LF> | | |
|---|---|---|---|
| **Title** | Axis Orientation | | |
| **Data Field** | **Semantics** | **Syntax** | **Type** |
| i | Index of the rough misalignment | See Table 2 for index/orientation correspondence and checksums | int |

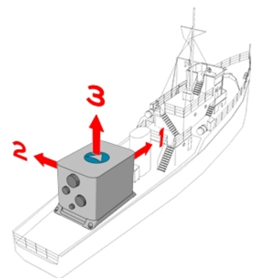
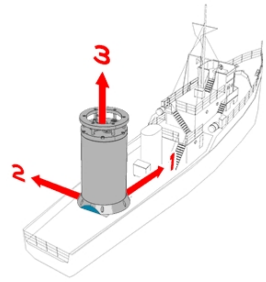
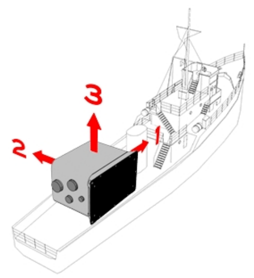
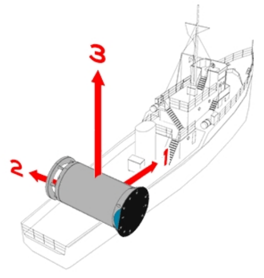
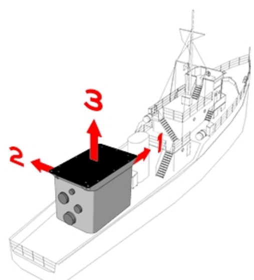
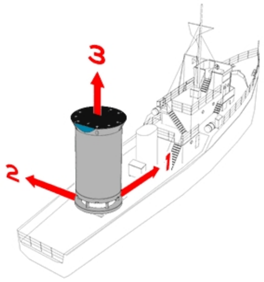
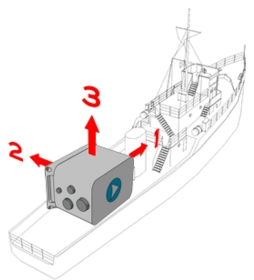
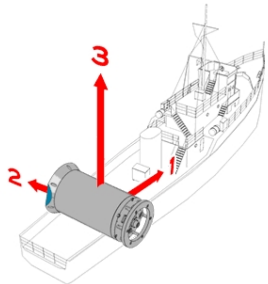
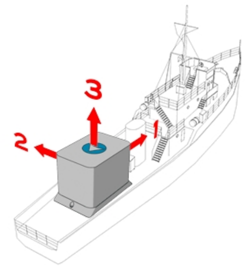
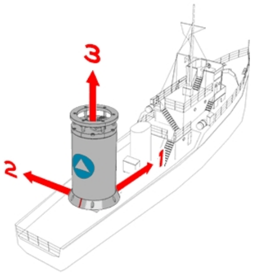
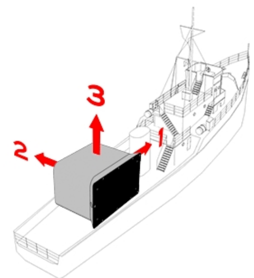
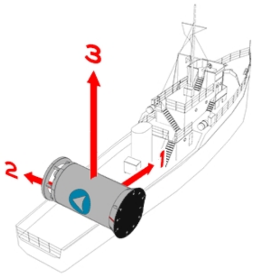
To retrieve the axis orientation – also called the rough misalignment –:

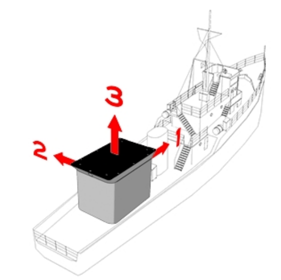
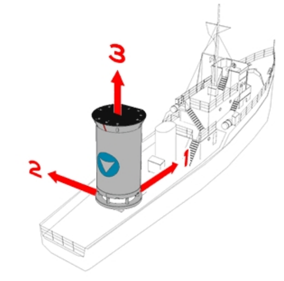
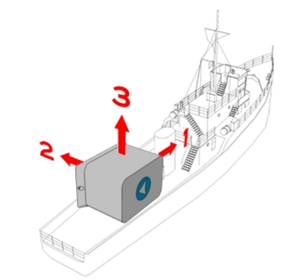
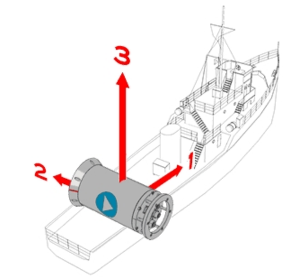
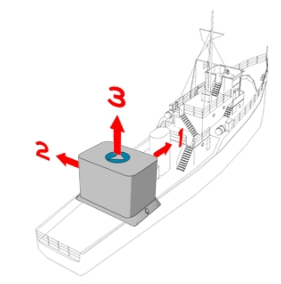
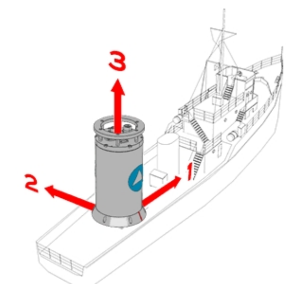
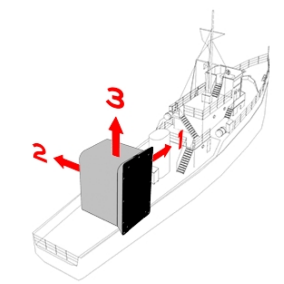
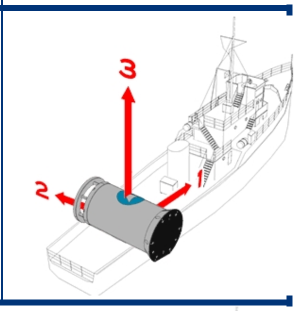
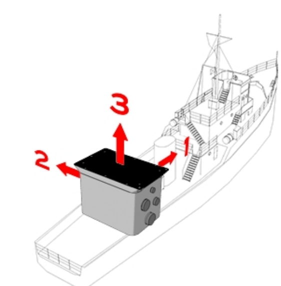
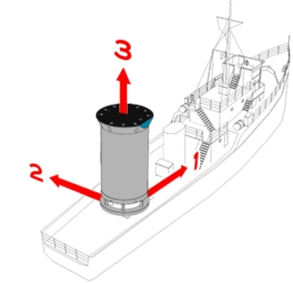
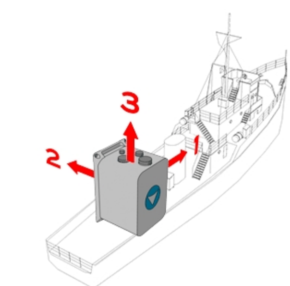
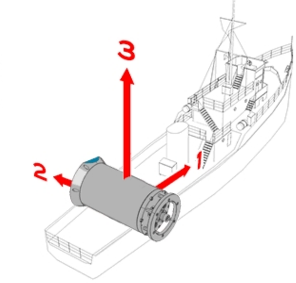
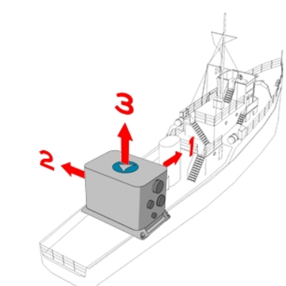
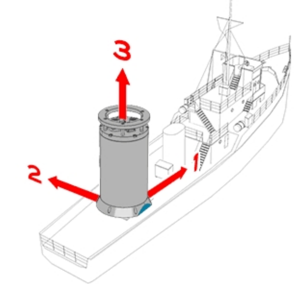
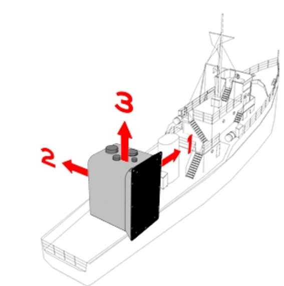
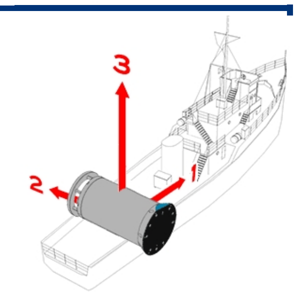
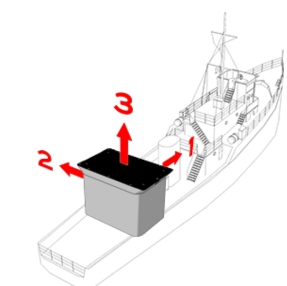
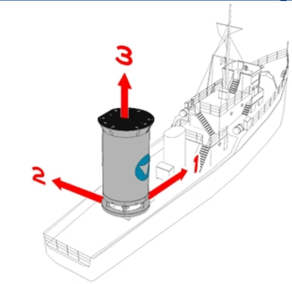
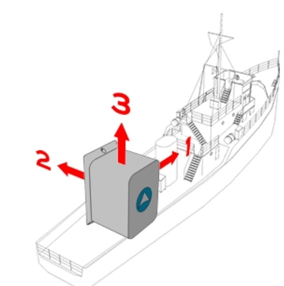
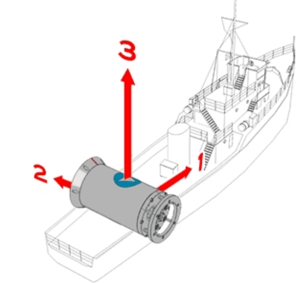
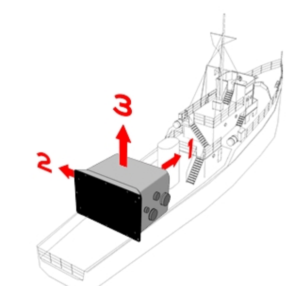
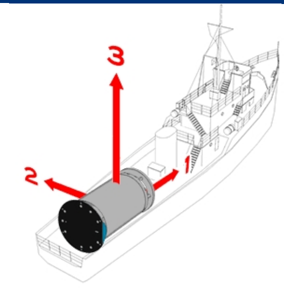
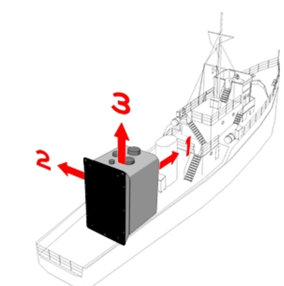
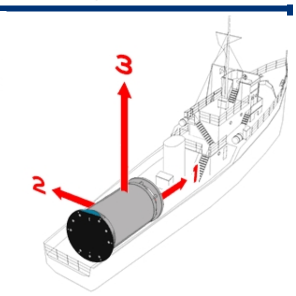
**$PHORI,,*4C<CR><LF>**

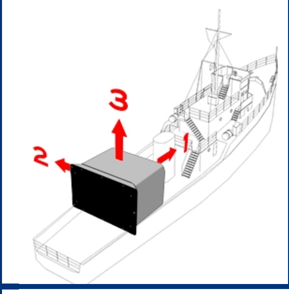
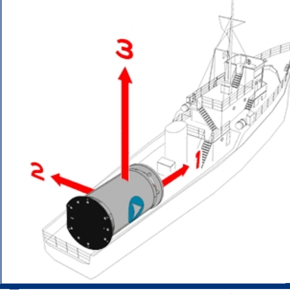
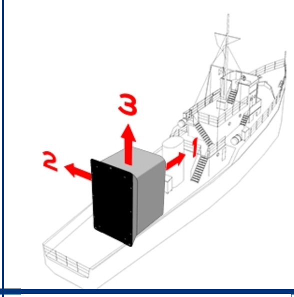
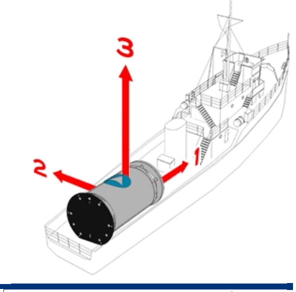
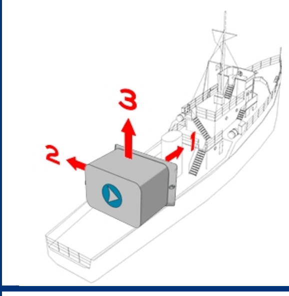
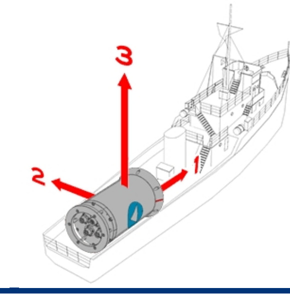
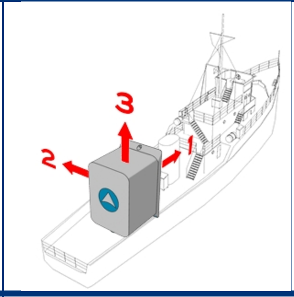
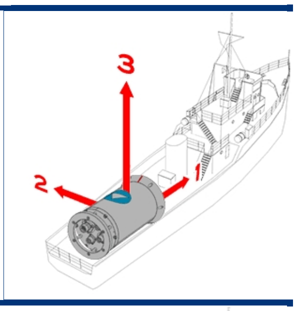
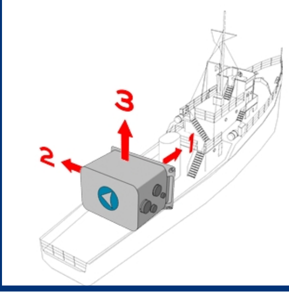
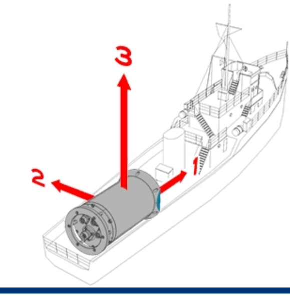
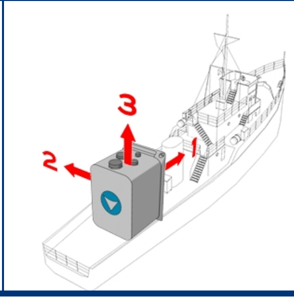
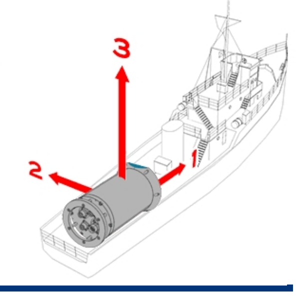
**Important**

Please: check logo and connector positions in the following table.

Table 2 - Matching between index i and AHRS axis orientation with associated checksum (hh)

| i (hh) | Orientation (Surface) | Orientation (Subsea) | i (hh) | Orientation (Surface) | Orientation (Subsea) |
|---|---|---|---|---|---|
| 0 (50) |  |  | 1 (51) |  |  |
| 2 (52) |  |  | 3 (53) |  |  |
| 4 (54) |  |  | 5 (55) |  |  |

| i (hh) | Orientation (Surface) | Orientation (Subsea) | i (hh) | Orientation (Surface) | Orientation (Subsea) |
|---|---|---|---|---|---|
| 6 (56) |  |  | 7 (57) |  |  |
| 8 (58) |  |  | 9 (59) |  |  |
| 10 (61) |  |  | 11 (60) |  |  |
| 12 (63) |  |  | 13 (62) |  |  |
| 14 (65) |  |  | 15 (64) |  |  |
| 16 (67) |  |  | 17 (66) |  |  |

| i (hh) | Orientation (Surface) | Orientation (Subsea) | i (hh) | Orientation (Surface) | Orientation (Subsea) |
|---|---|---|---|---|---|
| 18<br>(69) |  |  | 19<br>(68) |  |  |
| 20<br>(62) |  |  | 21<br>(63) |  |  |
| 22<br>(60) |  |  | 23<br>(61) |  |  |

## 4.6 Heading, Roll and Pitch angular offsets

To configure user angular offsets (fine misalignment):

| **Message** | **$PHBIA,x.x,y.y,z.z*hh<CR><LF>** | | |
|---|---|---|---|
| **Title** | Angular offsets Configuration | | |
| **Data Field** | **Semantics** | **Unit** | **Type** |
| x.x | Vehicle X1 rotation offset | Degree | Float |
| y.y | Vehicle X2 rotation offset | Degree | Float |
| z.z | Vehicle X3 rotation offset | Degree | Float |

To retrieve the angular offsets:

**$PHBIA,,*52<CR><LF>**

## 4.7 Main Lever Arm

To configure main monitoring point lever arm from the AHRS:

| **Message** | **$PHLEV,x.x,y.y,z.z*hh<CR><LF>** | | |
|---|---|---|---|
| **Title** | Lever Arms Configuration | | |
| **Data Field** | **Semantics** | **Unit** | **Type** |
| x.x | XV1 lever arm | m | Float |
| y.y | XV2 lever arm | m | Float |
| z.z | XV3 lever arm | m | Float |

To retrieve main monitoring point lever arms from the AHRS:

**$PHLEV,,*47<CR><LF>**

## 4.8 Secondary Lever Arms

To configure secondary monitoring point lever arms from the AHRS:

| **Message** | **$PHLVx,x.x,y.y,z.z*hh<CR><LF>** | | |
|---|---|---|---|
| **Title** | Lever Arms Configuration | | |
| **Data Field** | **Semantics** | **Unit** | **Type** |
| x | Lever arm (‘A’, ‘B’ or ‘C’) | N/A | Char |
| x.x | XV1 lever arm | m | Float |
| y.y | XV2 lever arm | m | Float |
| z.z | XV3 lever arm | m | Float |

To retrieve secondary monitoring point lever arms from the AHRS:

**$PHLVA,,*43<CR><LF>**
**$PHLVB,,*40<CR><LF>**
**$PHLVC,,*41<CR><LF>**

## 4.9 Center of Gravity Position

This is not available for OCTANS NANO product.

To configure center of gravity position relative to the AHRS:

| **Message** | **$PHCNF,COG___,x.x,y.y,z.z*hh<CR><LF>** | | |
|---|---|---|---|
| **Title** | Lever Arms Configuration | | |
| **Data Field** | **Semantics** | **Unit** | **Type** |
| x.x | XV1 cog | m | Float |
| y.y | XV2 cog | m | Float |
| z.z | XV3 cog | m | Float |

**(please note the 3 underscore(’’_’’) characters after COG header)**

To retrieve center of gravity from the AHRS:

**$PHCNF,COG___,,*6B<CR><LF>**

## 4.10 Heave Parameters

This is not available for OCTANS NANO product.

To define the sea state:

| **Message** | **$PHCNF,HVECNF_,i*hh<CR><LF>** | | |
|---|---|---|---|
| **Title** | Heave Parameters | | |
| **Data Field** | **Semantics** | **Syntax** | **Type** |
| i | Index | 0: Slight Sea (<1.2m)<br>1: Moderate Sea (<2.5m)<br>2: Rough Sea (>2.5m)<br>3: Harbors and Channels | int |

To retrieve the current sea state mode:

**$PHCNF,HVECNF,,*30<CR><LF>**

## 4.11 UTC (Time Synchronization) Interface

To configure the UTC interface (OCTANS interface to receive data from UTC) :

| **Message** | **$PHCNF,UTCINT,i,j*hh<CR><LF>** | | |
|---|---|---|---|
| **Title** | UTC Interface | | |
| **Data Field** | **Semantics** | **Syntax** | **Type** |
| i | Interface | 0: None<br>1: Port A<br>2: Port B<br>…<br>5 : Port E | int |
| j | (Deprecated) | 0 | int |

To retrieve the UTC interface:

**$PHCNF,UTCINT,,*6E<CR><LF>**

# 5 INTERFACES CONFIGURATION

This section describes commands to configure serial or Ethernet ports.

## 5.1 Port mapping and ID

The ports mapping from software port identification to physical port identification may differ for certain product:

- For OCTANS surface, to configure the physical serial input ports A and B use configuration commands with respectively ports D and E instead.
- For OCTANS surface, to configure the physical ethernet input ports A to D use configuration commands with respectively ports D to G instead.
- For OCTANS 3000 and OCTANS NANO, to configure an input port use the related port ID: A up to E.
- For all products, to configure output ports use the physical port ID.

## 5.2 Serial and Ethernet Commands

### 5.2.1 SERIAL I/O GENERAL PARAMETERS (PARITY, STOP BIT, LEVEL, BAUDRATE)

Used to configure the parity and stop bit for serial port X :

| **Message** | **$PHCNF,RSCM_X,i,j,k,l*hh<CR><LF>** | | |
|---|---|---|---|
| **Title** | Serial interface configuration | | |
| Data Field | Semantics | Syntax | Type |
| X | Port | OCTANS:<br>set A to C to configure output ports A to C<br>set D to G to configure input ports A to E.<br>For more explanation, refer to § 5.1.<br>OCTANS 3000: set A to E to configure Input/Output ports A to E<br>OCTANS NANO: set A to B to configure Input/Output ports A to B | int |
| i | Parity | 0: None<br>1: Even<br>2: Odd | int |
| j | Number of stop bits | 0: 0.5 stop bit<br>1: 1 stop bit<br>2: 1.5 stop bit<br>3: 2 stop bits | int |
| k | Level | 0: RS232<br>1: RS422 | int |
| l | Baudrate | 0: 600bds<br>1: 1200bds<br>2: 2400bds<br>3: 4800bds<br>4: 9600bds<br>5: 19200bds<br>6: 38400bds<br>7: 57600bds<br>8:115200bds<br>9: 230400bds<br>10: 460800bds | int |

To retrieve parity and stop bit for serial port X (checksum hh depends on port X, see below) :

**$PHCNF,RSCM_A,,*6E<CR><LF>**

**$PHCNF,RSCM_B,,*6D<CR><LF>**

**$PHCNF,RSCM_C,,*6C<CR><LF>**

**$PHCNF,RSCM_D,,*6B<CR><LF>**

**$PHCNF,RSCM_E,,*6A<CR><LF>**

### 5.2.2 SERIAL/ETHERNET INPUT PORT CONFIGURATION

To configure the input port x:

| **Message** | **$PHCNF,RSIN_x,i,j*hh<CR><LF>** | | |
|---|---|---|---|
| **Title** | Input port configuration | | |
| **Data Field** | **Semantics** | **Syntax** | **Type** |
| x | Port | (Uppercase)<br>OCTANS : set D to G to configure ports A to D.<br>For more explanation, refer to § 5.1.<br>OCTANS 3000 : set A to E to configure Port A to Port E<br>OCTANS NANO: set A to D to configure Port A to Port D | char |
| i | protocol | See Table 3 | int |
| j | RFU | Set this field to 0 | int |

The RSIN command must be used to select input protocol in Ethernet mode too.

To retrieve configuration of serial input port:

**$PHCNF,RSIN_D,,*62<CR><LF>**
**$PHCNF,RSIN_E,,*63<CR><LF>**
**$PHCNF,RSIN_F,,*60<CR><LF>**
**$PHCNF,RSIN_G,,*61<CR><LF>**

Table 3 - List and index of input protocols

OCTANS CINT firmware =< 4.00

| Index | Protocol |
|---|---|
| 0 | NONE |
| 1 | DCN_LOCH |
| 2 | DCN_NAV1 |
| 3 | GPS_GGA |
| 4 | GPS_VTG |
| 5 | GPS_GGA-VTG-ZDA |
| 6 | GPS_GLL-VHW |
| 7 | GPS_ZDA |
| 8 | AMS |
| 9 | ISRGVT |
| 10 | GPS_GGA-VTG-UTC |
| 11 | ALERT_IN |

OCTANS CINT Firmware > 4.00

| Index | Protocol |
|---|---|
| 0 | NONE |
| 1 | DCN_LOCH |
| 2 | DCN_NAV1 |
| 3 | STANDARD NMEA |

OCTANS NANO

| Index | Protocol |
|---|---|
| 0 | NONE |
| 1 | STANDARD NMEA |

### 5.2.3 User Defined Output Protocol

To configure the output port x user defined protocol:

| Message | $PHCN,RSUDPx,ssss*hh<CR><LF> | | |
|---|---|---|---|
| Title | Output port configuration | | |
| **Data Field** | **Semantics** | **Syntax** | **Type** |
| x | Port | (Uppercase)<br>OCTANS: set A to C to configure Port A to Port C<br>OCTANS 3000: set A to E to configure Port A to Port E<br>OCTANS NANO: set A to E to configure Port A to Port E | char |
| ssss | protocol | User defined protocol string | string |

### 5.2.4 Serial/Ethernet Output Port Configuration

To configure the serial/Ethernet output on port:

| Message | $PHCNF,RSOUTx,i,j,k,l,m*hh<CR><LF> | | |
|---|---|---|---|
| Title | Output port configuration | | |
| **Data Field** | **Semantics** | **Syntax** | **Type** |
| x | Port | (Uppercase)<br>OCTANS: set A to C to configure Port A to Port C<br>OCTANS 3000: set A to E to configure Port A to Port E<br>OCTANS NANO: set A to E to configure Port A to Port E | char |
| i | Protocol | See $PHCNF,**RSOUTA,,*71<CR><LF>**<br>**$PHCNF,RSOUTB,,*72<CR><LF>**<br>**$PHCNF,RSOUTC,,*73<CR><LF>**<br>**$PHCNF,RSOUTD,,*74<CR><LF>**<br>**$PHCNF,RSOUTE,,*75<CR><LF>**<br>Table 4 | int |
| j | Lever arm | 0: Main lever arm<br>1: Secondary lever arm 1<br>2: Secondary lever arm 2<br>3: Secondary lever arm 3 | int |
| k | Rate | Output rate in ms (100 = 100ms = 10 Hz)<br>Minimum value is 5 ms (200 Hz) | int |
| l | Heave | 0: Real Time Heave<br>1: Smart Heave (100s delayed)<br>For OCTANS NANO set to 0 | int |
| m | ZDA output | 0: ZDA not outputted<br>1: ZDA outputted | int |

To retrieve configuration of serial output port:

**$PHCNF,RSOUTA,,*71<CR><LF>**
**$PHCNF,RSOUTB,,*72<CR><LF>**
**$PHCNF,RSOUTC,,*73<CR><LF>**
**$PHCNF,RSOUTD,,*74<CR><LF>**
**$PHCNF,RSOUTE,,*75<CR><LF>**

Table 4 - list and index of output protocols

| Index | OCTANS 3000 | OCTANS | OCTANS NANO |
|---|---|---|---|
| 0 | NONE | NONE | NONE |
| 1 | OCTANS STANDARD | OCTANS STANDARD | OCTANS STANDARD |
| 2 | USER DEFINED | POST PROCESSING | POST PROCESSING |
| 3 | DCN_NAV1 | USER DEFINED | USER DEFINED |
| 4 | DCN_NAV10 | DCN_NAV1 | AMS |
| 5 | AMS | DCN_NAV10 | BA_CUSTOM1 |
| 6 | ATLAS_F20 | AMS | BA_CUSTOM2 |
| 7 | FMA | ATLAS_F20 | DOLOG_HRP |
| 8 | ISRGVT | FMA | GYROCOMPAS1 |
| 9 | HEHDT | ISRGVT | HEHDT |
| 10 | HEHDTFIXED | HEHDT | HEHDT_FIXED |
| 11 | BA_CUSTOM1 | HEHDTFIXED | HEHDT_HEROT |
| 12 | BA_CUSTOM2 | HEHDT_HEROT | HETHS_HEROT |
| 13 | GYROCOMPAS1 | HETHS_HEROT | ISRGVT=IG03 |
| 14 | GYROCOMPAS2 | BA_CUSTOM1 | TECHSAS |
| 15 | MOTION_SENSOR1 | BA_CUSTOM2 | PTNTHPR |
| 16 | MOTION_SENSOR2 | GYROCOMPAS1 | BROADCAST_A |
| 17 | MOTION_SENSOR3 | GYROCOMPAS2 | BROADCAST_B |
| 18 | MOTION_SENSOR4 | MOTION_SENSOR1 | BROADCAST_C |
| 19 | IXSEA_GYRO | MOTION_SENSOR2 | BROADCAST_D |
| 20 | HEAVE_POSTPROCESS | MOTION_SENSOR3 | TMS_CCVIMBAT_AHRS |
| 21 | SHINKAI_6500 | MOTION_SENSOR4 | IXSEA TAH |
| 22 | DOLOG | IXSEA_GYRO | IXBLUE STD BIN |
| 23 | ICCB1 | HEAVE_POSTPROCESS | |
| 24 | POSMV_GRP111 | SHINKAI_6500 | |
| 25 | SEATEX_DHEAVE | DOLOG | |
| 26 | TUS | ICCB1 | |
| 27 | IMU_RAW | POSMV_GRP111 | |
| 28 | IMU_BIN | SEATEX_DHEAVE | |
| 29 | HEHDT_HEROT | TUS | |
| 30 | TECHSAS | IMU_RAW | |
| 31 | TAH_BIN | IMU_BIN | |
| 32 | MAHRS | TECHSAS | |
| 33 | AHRS120 | TAH_BIN | |
| 34 | | MAHRS | |
| 35 | | AHRS120 | |
| 36 | | PAHRS | |
| 37 | | BROADCAST_A | |
| 38 | | BROADCAST_B | |
| 39 | | BROADCAST_C | |
| 40 | | BROADCAST_D | |
| 41 | | IXBLUE_STD_BIN | |
| 42 | | PSXN_019 | |
| 43 | | TMSCCVIMBAT AHRS | |
| 44 | | SEAPATH | |

### 5.2.5 OUTPUT DEVICE SELECTION

To select the device that will be used for data output on selected port:

| **Message** | **$PHCNF,EDIROx,i*hh<CR><LF>** | | |
|---|---|---|---|
| **Title** | Output device selection | | |
| **Data Field** | **Semantics** | **Syntax** | **Type** |
| x | Port | (Uppercase)<br>OCTANS: set A to C to configure Port A to Port C<br>OCTANS 3000: set A to E to configure Port A to Port E<br>OCTANS NANO: set A to E to configure Port A to Port E | char |
| i | Device | 0: No device selected<br>1: Serial output on selected port<br>2: Ethernet output on selected port<br>3: Ethernet and serial output on selected port | int |

To retrieve network configuration:

**$PHCNF,EDIROA,,*6B<CR><LF>**
**$PHCNF,EDIROB,,*68<CR><LF>**
**$PHCNF,EDIROC,,*69<CR><LF>**
**$PHCNF,EDIROB,,*6E<CR><LF>**
**$PHCNF,EDIROC,,*6F<CR><LF>**

### 5.2.6 INPUT DEVICE SELECTION

To select the device that will be used for data input on selected port:

| **Message** | **$PHCNF,EDIRIx,i*hh<CR><LF>** | | |
|---|---|---|---|
| **Title** | Input device selection | | |
| Data Field | Semantics | Syntax | Type |
| x | Port | (Uppercase)<br>OCTANS: set D to G to configure Port A to Port D<br>For more explanation, refer to § 5.1.<br>OCTANS 3000: set A to E to configure Port A to Port E<br>OCTANS NANO: set A to D to configure Port A to Port D | char |
| i | Device | 0: No device selected<br>1: Serial input on selected port<br>2: Ethernet input on selected port | int |

To retrieve network configuration on port:

**$PHCNF,EDIRIA,,*6D<CR><LF>**
**$PHCNF,EDIRIB,,*6E<CR><LF>**
**$PHCNF,EDIRIC,,*6F<CR><LF>**
**$PHCNF,EDIRID,,*68<CR><LF>**
**$PHCNF,EDIRIE,,*69<CR><LF>**

## 5.3 Ethernet Configuration

### 5.3.1 NETWORK SETUP COMMAND

Use this command to configure Ethernet network settings. These settings will be effective after next reboot only.

| Message | $PHCNF,ETHIP,D,I,N[,G][,H]*hh<CR><LF> | | |
|---|---|---|---|
| Title | Ethernet configuration | | |
| Data Field | Semantics | Syntax | Type |
| D | DHCP | 0: disable DHCP at boot time, 1: enable DHCP | Int |
| I | IP address | System IP address (ex: 192.168.36.100) | IP address |
| N | Netmask | Network mask (ex: 255.255.255.0) | IP address |
| G | Gateway | Gateway (ex: 192.168.36.254) | IP address |
| H | DNS | DNS (ex: 192.168.36.1) | IP address |
| P | GPS IP | Embedded GPS IP address | IP address |

To retrieve network configuration:

**$PHCNF,ETHIP,,*3F<CR><LF>**

### 5.3.2 IP OUTPUT CONFIGURATION

To configure the IP output settings on selected port:

| Message | $PHCNF,ELCFOx,m,i,p*hh<CR><LF> | | |
|---|---|---|---|
| Title | IP output settings | | |
| **Data Field** | **Semantics** | **Syntax** | **Type** |
| x | Port | (Uppercase)<br>OCTANS: set A to C to configure Port A to Port C<br>OCTANS 3000: set A to E to configure Port A to Port E<br>OCTANS NANO: set A to E to configure Port A to Port E | char |
| m | Mode | IP output mode:<br>0: TCP server<br>1: TCP client<br>2: UDP point to point<br>3: UDP broadcast<br>4: UDP multicast | int |
| i | Destination IP | IP address to connect to. This field is ignored in TCP server and UDP broadcast modes. | IP address |
| p | IP Port | Port to connect/listen to | int |

To retrieve IP output settings on port x, use the following command:

**$PHCNF,ELCFOA,,*7D<CR><LF>**

**$PHCNF,ELCFOB,,*7E<CR><LF>**

**$PHCNF,ELCFOC,,*7F<CR><LF>**

**$PHCNF,ELCFOD,,*78<CR><LF>**

**$PHCNF,ELCFOE,,*79<CR><LF>**

### 5.3.3 IP Input Configuration

To configure the IP input settings on selected port:

| Message | $PHCNF,ELCFIx,m,i,p*hh<CR><LF> | | |
|---|---|---|---|
| **Title** | IP input settings | | |
| **Data Field** | **Semantics** | **Syntax** | **Type** |
| x | Port | (Uppercase)<br>OCTANS:<br>set D to configure the Port A<br>set E to configure the Port B.<br>For more explanation, refer to § 5.1.<br>OCTANS 3000: set A to E to configure Port A to Port E<br>OCTANS NANO: set A to D to configure Port A to Port D | char |
| m | Mode | IP input mode:<br>0: TCP server<br>1: TCP client<br>2: UDP point to point<br>3: UDP broadcast<br>4: UDP multicast | int |
| i | Destination IP | IP address to connect to. This field is ignored in TCP server and UDP broadcast modes. | IP address |
| p | IP Port | Port to connect/listen to | int |

To retrieve IP input settings on port X, use following command:

**$PHCNF,ELCFIA,,*7B<CR><LF>**
**$PHCNF,ELCFIB,,*78<CR><LF>**
**$PHCNF,ELCFIC,,*79<CR><LF>**
**$PHCNF,ELCFID,,*7E<CR><LF>**
**$PHCNF,ELCFIE,,*7F<CR><LF>**

## 5.4 Pulses Interfaces

### 5.4.1 INPUT PULSES

To configure pulse input x:

| **Message** | **$PHCNF,PULSINx,i,x.x*hh<CR><LF>** | | |
|---|---|---|---|
| **Title** | Pulse Input | | |
| **Data Field** | **Semantics** | **Syntax** | **Type** |
| x | Port | (Uppercase)<br>OCTANS: set A to D to configure Port A to Port D<br>OCTANS 3000: set A to C to configure Port A to Port C<br>OCTANS NANO: set A to configure Port A | char |
| i | Protocol | 0: None<br>1: PPS Rising + Time<br>2: PPS Falling + Time<br>3: Time + PPS Rising<br>4: Time + PPS Falling<br>5: Output A Synchro<br>6: Output B Synchro<br>7: Output C Synchro<br>8: Output D Synchro<br>9: Output E Synchro<br>10 to 13: Reserved<br>14: Log<br>15: Odo | int |
| x.x | RFU | Set this field to 0.0 | Float |

To retrieve configuration of pulse input on port x (checksum hh depends on port x)::

**$PHCNF,PULSINx,,*hh<CR><LF>**

### 5.4.2 OUTPUT PULSES

To configure pulse output x:

| **Message** | **$PHCNF,PULSOx,i,x.x*hh<CR><LF>** | | |
|---|---|---|---|
| **Title** | Output Pulses | | |
| **Data Field** | **Semantics** | **Syntax** | **Type** |
| x | Port | OCTANS/OCTANS 3000: set A or B to configure Port A or Port B<br>OCTANS NANO: None | char |
| i | Protocol | 0 : None<br>1: SerOutput A RTC<br>2: SerOutput B RTC<br>3 SerOutput C RTC | int |
| x.x | RFU | Set this field to 0.0 | Float |

Note: the protocol parameter is only used on factory protocols for now (heading, roll, pitch trigger). When not used, this parameter can be set to 0.0.

To retrieve configuration of pulse output X:

**$PHCNF,PULSOA,,*6B<CR><LF>**
**$PHCNF,PULSOB,,*68<CR><LF>**

# 6 DYNAMIC STRING RETRIEVE COMMANDS

This section describes commands to retrieve all configuration strings to dynamically get firmware feature list.

## 6.1 Generic Text Retrieve Command

To retrieve a specific text for a command:

| **Message** | **$PHTXT,list,c,i,j*hh<CR><LF>** | | |
|---|---|---|---|
| **Title** | Text list retrieve | | |
| **Data Field** | **Semantics** | **Syntax** | **Type** |
| list | List name | Name of command associated to the list | string |
| c | Language | Only English ‘E’ is supported | char |
| i | Section index | Index of list to retrieve for this command | int |
| j | String index | Index of string in the list | int |

Example:

To retrieve first serial output protocol name, you should send:

**`$PHTXT,RSOUTX,E,1,0*13<CR><LF>`**

The AHRS will then answer:

*`$PHTXT,RSOUTX,1,0,NONE*5C<CR><LF>`*

When no string is available, the AHRS returns “________________” (16 x ‘_’ character). Thus, to retrieve all available output protocol names, you should send `$PHTXT,RSOUTX` command and increment string index until the firmware answers no string available.

Following table details all string retrieve functions and their parameters:

Table 5 - List name table

| List name | Section index | Retrieved list description |
|---|---|---|
| RSOUTX | 0 | Port output baud rate |
| | 1 | Port output protocol names |
| | 2 | *Reserved* |
| | 3 | Port output level names |
| RSCM_X | 0 | Port input/output parity |
| | 1 | Port input/output stop bits |
| | 2 | Lever arm |
| RSIN_X | 0 | Port input/output baud rate |
| | 1 | Port input protocol names |
| PPSIN_ | 0 | PPS input pulse protocols |
| SYNCIN | 0 | Synchro input pulse 1 protocols |
| PULSIA | 0 | Synchro input pulse 2 protocols |
| PULSIB | 0 | Log input pulse protocols |
| PULSOX | 0 | Output pulses protocols |
| EDIRIX | 0 | Input devices names |
| EDIROX | 0 | Output devices names |
| ELCFIX | 0 | Input Ethernet transport layer |
| ELCFOX | 0 | Output Ethernet transport layer |
| STASOR | 0 | AHRS Sensor status word bit names and attributes |
| STASYS | 0 | AHRS System status word bit names and attributes |
| STAALG | 0 | AHRS Algorithm status bit names and attributes |
| PHINF_ | 0 | AHRS User Status |
| STA_HL | 0 | AHRS High Level Status names and attributes |
| UTCINT | 0 | UTC interface names |
| GPSINT | 0 | GPS sensor interface names |
| HVEMOD | 0 | HEAVE sea levels |
| SERNUM | 0 | AHRS Serial number |
| LOADCI | 0 | AHRS CINT loader version |
| VERSIOCI | 0 | AHRS CINT firmware version |
| LOADER | 0 | AHRS DSP4 loader version |
| VERSIO | 0 | AHRS DSP4 firmware version |
| EQP__ | 0 | AHRS type name |

# Appendices

## A NMEA CHECKSUM WEB PAGE

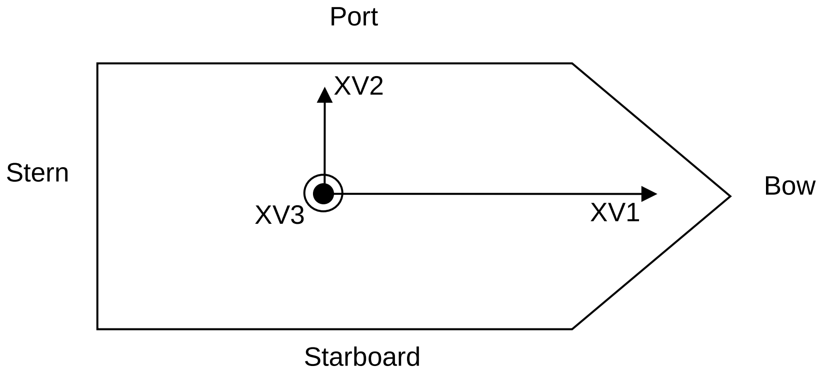
To get a simple NMEA computation tool, copy following code into a new file (nmea.html) and save it, and open this file with your internet navigator:

```
<html><head><title>NMEA MTK checksum calculator</title>
<script><!--
function updateChecksum(cmd)
{
  var checksum = 0;
  for(var i = 0; i < cmd.length; i++) checksum = checksum ^ cmd.charCodeAt(i);

  var hexsum = Number(checksum).toString(16).toUpperCase();
  if (hexsum.length < 2) hexsum = ("00" + hexsum).slice(-2);
  settext(document.getElementById("output"), "$" + cmd + "*" + hexsum);
}

function settext(span, text)
{
  if (!span.hasChildNodes()) {
    span.appendChild(span.ownerDocument.createTextNode(text));
    return;
  } else span.firstChild.nodeValue = text;
}

--></script></head><body>
<h1>MTK NMEA checksum calculator</h1>
<p>This is a simple calculator to compute the checksum field of NMEA frames.</p>
<p> The checksum is simple, just an XOR of all the bytes between the
<tt>$</tt> and the <tt>*</tt> (not including the delimiters themselves), and written in
hexadecimal.</p>
<p>For this to work you'll need to be using a browser that supports JavaScript and DHTML
(most modern browsers do).</p>
<div style="margin:1em; padding: 2em; background: #ddddff;">
<form onsubmit="document.getElementById('commandfld').select(); return false;">
<table>
<tr><th align=right>Command:</th><td><tt>$<input id="commandfld" size=80 type="text"
onchange="updateChecksum(this.value);"
value="PIXSE,CONFIG,WAKEUP">*</tt></td></tr>
<tr><th align=right>With checksum:</th><td><span id="output" style="font-family:
monospace;"></span></td></tr>
</table></form></div>
<script>updateChecksum(document.getElementById("commandfld").value);</script>
<hr></body></html>
```

# B ORIENTATION AND SIGN CONVENTIONS RECALL

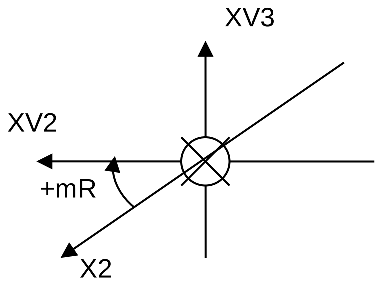
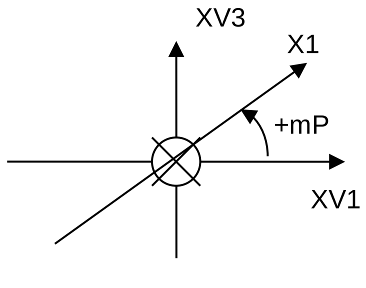
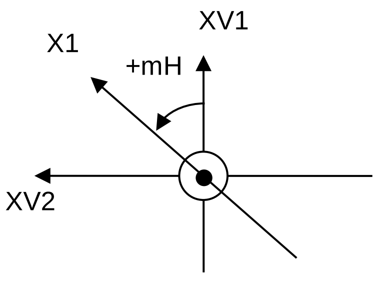
This page recaps orientation conventions for lever arms and misalignments.
Please refer to OCTANS user manuals for more details on frame transfer conventions.

**Axis direction and sign conventions for lever arms:**




- XV1 lever arm is counted positive in direction of vehicle bow and negative in direction of vehicle stern.
- XV2 lever arm is counted positive in direction of port side and negative in direction of starboard side.
- XV3 lever arm is counter positive upward, negative downward.

**Misalignments conventions:**

| Roll misalignment angle | Pitch misalignment angle | Heading misalignment angle |
|---|---|---|
|   |   |   |

The above figures are an example to recap how can be estimated the sign of the angular offsets.

Note: the roll misalignment is positive from X2 in direction to XV2, where pitch and heading misalignments are positive from XV1 to X1.

# C FACTORY SETTING DETAILS

This page details factory default settings:

- DSP settings:
  - System orientation is set to 0.
  - All system and sensors lever arms and misalignments are set to 0
  - Heave filter is set to 'Moderate Sea'
  - Manual position is set to 48.87°N latitude, 2°E longitude, 0m altitude

- MPC settings:
  - All input and output port protocols are set to 'NONE', on primary lever arm
  - All output port protocols rate are set to 0Hz
  - Ethernet output ports are set from 8111 to 8115 for port A to E
  - Ethernet input ports are set from 8117 to 8121 for port A to E
  - Ethernet input and output target IP is set to 192.168.36.102 and mode is set to "TCP server"
  - Serial settings for all ports are set to 9600 bps, none, 1 stop bit in RS232
  - UTC interface is set to '0' (disabled)
  - All pulse in and out protocols are disabled (set to '0')