

# **MBARI Ventana Software Upgrade**

## *Interface Control Document*

**Subject:** *This document is a companion to the System Requirements Specification. It identifies all physical devices with a software interface to the upgraded Ventana Control System.*

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## Revision History

### Revision 010

| <i>Revision</i> | <i>Initials</i> | <i>Date</i> | <i>Comments</i>                                      |
|-----------------|-----------------|-------------|------------------------------------------------------|
| 001             | GDG             | 10/3/2014   | Initial                                              |
| 002             | GDG             | 10/6/2014   | Added content                                        |
| 003             | GDG             | 10/7/2014   | Added content                                        |
| 004             | JDR             | 10/11/2014  | Added content and content review                     |
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| 006             | GDG             | 12/1/2014   | Added content                                        |
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| 008             | GDG             | 12/3/2014   | Edited based on comments                             |
| 009             | GDG             | 12/5/2014   | Edited based on comments                             |
| 010             | JDR             | 12/8/2014   | Final review                                         |

*Table 1: Revision history*

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# MBARI Ventana Software Upgrade

## *Interface Control Document*

### 1 Introduction

This document is a companion to the System Requirements Specification. It identifies all physical devices with a software interface to the upgraded Ventana Control System. Interfaces between Greensea applications are not identified here but are described in the software architecture document.

### 2 Interfaces

The MBARI software will interface with the devices defined in this document. Simple interfaces are captured here in full and more complex interfaces are captured by reference. When multiple protocol options are available, this document describes which one Greensea plans to implement.

#### 2.1 User Interfaces

##### 2.1.1 Pilot/Copilot Touch Screen

|                     |                                                      |
|---------------------|------------------------------------------------------|
| Purpose             | Allow touch interaction with Greensea user interface |
| Interface Type      | Elo 1928L touch monitor, 1280x1024 resolution        |
| Interface Details   | Will function as mouse input                         |
| Protocol Definition | Supported by Debian Wheezy                           |

##### 2.1.2 Display LCD Heading and Depth

|                     |                                                                                  |
|---------------------|----------------------------------------------------------------------------------|
| Purpose             | Display Heading and Depth to Belly Pack operator                                 |
| Interface Type      | 2 Line, 16 characters/line LCD Display                                           |
| Interface Details   | Format Example: (units are degrees and meters respectively)<br>H: 341<br>D: 29.1 |
| Protocol Definition | <TBD-001> Need protocol definition from MBARI                                    |

#### 2.2 Topside Interface

##### 2.2.1 Pilot Station Interface

##### 2.2.1.1 WAGO 750-316 Bus Coupler

|                     |                                                                      |
|---------------------|----------------------------------------------------------------------|
| Purpose             | Connects WAGO I/O System as slave to MODBUS Fieldbus                 |
| Interface Type      | MODBUS Serial via Moxa                                               |
| Interface Details   | Packages Analog/Digital Data for communication with master device    |
| Protocol Definition | Protocols and Configuration per WAGO_750-316_protocols.pdf section 5 |

## 2.2.2 Belly Pack

### 2.2.2.1 WAGO 750-352 Bus Coupler

|                     |                                                                       |
|---------------------|-----------------------------------------------------------------------|
| Purpose             | Connects Ethernet to modular WAGO I/O System                          |
| Interface Type      | Ethernet MODBUS/TCP                                                   |
| Interface Details   | Packages Analog/Digital data to be sent over Ethernet                 |
| Protocol Definition | Protocols and Configuration per WAGO_750-352_protocols.pdf section 11 |

## 2.2.3 Miranda DVI-Ramp

|                     |                                                          |
|---------------------|----------------------------------------------------------|
| Purpose             | Create a data overlay on the main video stream           |
| Interface Type      | DVI                                                      |
| Interface Details   | Overlay constructed using MBARI Data Overlay Specs below |
| Protocol Definition | Data overlay software to be developed                    |

### 2.2.3.1 MBARI Data Overlay Specifications

- Scrolling compass strip to display current digital heading at Top Dead Center (Line 1) with auto-heading set-point directly below (Line 2).
- Display labels, channel/signal value to user defined positions (line, row) in user-customizable on-screen grid
- Display pitch (Rightmost Line 2)
- Display depth (Leftmost Line 2), Auto depth set-point directly below (Leftmost Line 3)
- Display roll (Rightmost Line 3)
- Display altitude (Leftmost Line 4), Auto altitude set-point directly below (Leftmost Line 5)
- Display date/time (Lower Left Corner)
- Display dive number (Lower Dead Center)
- Display Hydraulic Pressure (Lower Right Corner)
- Pilot/Co-Pilot input into Dive Number Field

## 2.2.4 MOXA Ethernet 16 Port Serial

|                     |                                     |
|---------------------|-------------------------------------|
| Purpose             | Data Hub                            |
| Interface Type      | Ethernet                            |
| Interface Details   | MOXA_16port.pdf                     |
| Protocol Definition | Linux MOXA drivers available/tested |

## 2.2.5 MOXA Ethernet 8 Port Serial

|                     |                                              |
|---------------------|----------------------------------------------|
| Purpose             | Manage Data from Belly Pack, Pilot LCD, DVI, |
| Interface Type      | Ethernet                                     |
| Interface Details   | MOXA_8port.pdf                               |
| Protocol Definition | Linux MOXA drivers available/tested          |

## 2.2.6 Ship Gyro

|                      |                      |
|----------------------|----------------------|
| Interfacing Hardware | NMEA compatible Gyro |
|----------------------|----------------------|

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|                        |                              |
|------------------------|------------------------------|
| Interface Type         | Serial via Moxa              |
| Software Functionality | Output Ship's Gyro data      |
| Protocol Definition    | NMEA 0183 sentence <TBD-002> |

### 2.2.7 Ship GPS

|                        |                                      |
|------------------------|--------------------------------------|
| Interfacing Hardware   | NMEA compatible GPS                  |
| Interface Type         | Serial via Moxa                      |
| Software Functionality | Output Ship's latitude and longitude |
| Protocol Definition    | NMEA GPRMC, GPGLL or GPGGA           |

### 2.2.8 Sonardyne USBL – Ranger II Software

|                        |                                                               |
|------------------------|---------------------------------------------------------------|
| Interfacing Hardware   | Sonardyne Lodestar Attitude Heading & Reference System (AHRS) |
| Interface Type         | Serial via Moxa                                               |
| Software Functionality | Outputs Latitude/Longitude, Direction of Latitude/Longitude   |
| Protocol Definition    | NMEA GGA per sonardyne_ranger_2.pdf section H.12              |

### 2.2.9 Winch: LCI-90i

|                        |                                                                                                             |
|------------------------|-------------------------------------------------------------------------------------------------------------|
| Interfacing Hardware   | LCI-90i                                                                                                     |
| Interface Type         | Serial via Moxa                                                                                             |
| Software Functionality | Take in Tension, Speed & payout data to determine tether usage, interface program to output at 1 Hz         |
| Protocol Definition    | RD, TTTT.TT-SSSS.SSS,-PPP.PPP,CCCC<cr><lf> (T-tension,S-speed,P-payout,C-checksum), checksum can be ignored |

### 2.2.10 Control System Interface WAGO Modules

#### 2.2.10.1 WAGO 750-316 Bus Coupler

|                     |                                                                      |
|---------------------|----------------------------------------------------------------------|
| Purpose             | Connects WAGO I/O System as slave to MODBUS Fieldbus                 |
| Interface Type      | MODBUS Serial via Moxa                                               |
| Interface Details   | Packages Analog/Digital Data for communication with master device    |
| Protocol Definition | Protocols and Configuration per WAGO_750-316_protocols.pdf section 5 |

### 2.2.11 Focal Mux Model 903

|                     |                                                          |
|---------------------|----------------------------------------------------------|
| Purpose             | Fiber optic transmission of video/data signals           |
| Interface Type      | Serial via Moxa                                          |
| Interface Details   | Focal 903 <TBR-001> multiplexer diagnostics              |
| Protocol Definition | Greensea has existing interface to Focal 903 diagnostics |

### 2.2.12 Navigation Serial Output

|                |                                                      |
|----------------|------------------------------------------------------|
| Purpose        | Provide navigation data to MBARI logging application |
| Interface Type | Serial via Moxa                                      |

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|                     |                                      |
|---------------------|--------------------------------------|
| Interface Details   | User selected data transmitted       |
| Protocol Definition | ASCII with comma separated variables |

## 2.3 Subsea Interfaces

### 2.3.1 Control Can

#### 2.3.1.1 WAGO 750-316 Bus Coupler

|                     |                                                                      |
|---------------------|----------------------------------------------------------------------|
| Purpose             | Connects WAGO I/O System as slave to MODBUS Fieldbus                 |
| Interface Type      | MODBUS Serial via Moxa                                               |
| Interface Details   | Packages Analog/Digital Data for communication with master device    |
| Protocol Definition | Protocols and Configuration per WAGO_750-316_protocols.pdf section 5 |

### 2.3.2 Fiber Optic Can

#### 2.3.2.1 MBARI FOModbus Micro

|                     |                                                                                                                            |
|---------------------|----------------------------------------------------------------------------------------------------------------------------|
| Purpose             | Provide digital outputs for subsea control                                                                                 |
| Interface Type      | Serial via Moxa                                                                                                            |
| Interface Details   | I/O Mapping defined in VentanIO Map09302014. Register values for retransmission of serial data to NTSC Video Mux <TBD-003> |
| Protocol Definition | Greensea has existing MODbus interface software                                                                            |

#### 2.3.2.2 MBARI NTSC Video Mux

|                     |                                                                                                         |
|---------------------|---------------------------------------------------------------------------------------------------------|
| Purpose             | Select video channels to route to surface                                                               |
| Interface Type      | Serial via Moxa                                                                                         |
| Interface Details   | Serial data contained in MODbus registers is retransmitted as a byte stream by the MBARI FOModbus Micro |
| Protocol Definition | New protocol per Video Switch Interface Guide.pdf                                                       |

### 2.3.3 Core Can

#### 2.3.3.1 WAGO 750-316 Bus Coupler

|                     |                                                                      |
|---------------------|----------------------------------------------------------------------|
| Purpose             | Connects WAGO I/O System as slave to MODBUS Fieldbus                 |
| Interface Type      | MODBUS Serial via Moxa                                               |
| Interface Details   | Packages Analog/Digital Data for communication with master device    |
| Protocol Definition | Protocols and Configuration per WAGO_750-316_protocols.pdf section 5 |

### 2.3.4 Subsea Instruments (Depth, FOG, Altimeter, (s), DVL, Compass, Cameras)

#### 2.3.4.1 Paroscientific Depth Sensor

|                      |                                                       |
|----------------------|-------------------------------------------------------|
| Interfacing Hardware | Paroscientific Depth Sensor Model 8B2000-I s/n 115847 |
| Interface Type       | Serial via Moxa                                       |

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|                        |                                                      |
|------------------------|------------------------------------------------------|
| Software Functionality | Output depth measurement                             |
| Protocol Definition    | Protocol defined per paroscientific_rs232_manual.pdf |

#### 2.3.4.2 Seabird CTD

|                        |                                            |
|------------------------|--------------------------------------------|
| Interfacing Hardware   | Seabird <TBD-007>                          |
| Interface Type         | Serial via Moxa                            |
| Software Functionality | Output conductivity, temperature and depth |
| Protocol Definition    | <TBD-007>                                  |

#### 2.3.4.3 Octans FOG

|                        |                                                        |
|------------------------|--------------------------------------------------------|
| Interfacing Hardware   | Octans FOG 1000 s/n 3453-SX-GC-01-042                  |
| Interface Type         | Serial via Moxa                                        |
| Software Functionality | Output heading, roll, pitch and acceleration           |
| Protocol Definition    | Binary protocol per octans_user_manual.pdf section 4.7 |

#### 2.3.4.4 Mesotech Altimeter

|                        |                                                                                                         |
|------------------------|---------------------------------------------------------------------------------------------------------|
| Interfacing Hardware   | Mesotech Altimeter 1007D                                                                                |
| Interface Type         | Serial via Moxa                                                                                         |
| Software Functionality | Generate Altitude and Temperature reports                                                               |
| Protocol Definition    | Altimeter telemetry per mesotech_1007D_user_manual.pdf section 4.2.1, NMEA-Depth Below Transducer (DBT) |

#### 2.3.4.5 RDI Workhorse Navigator Doppler Velocity Log

|                        |                                                                       |
|------------------------|-----------------------------------------------------------------------|
| Interfacing Hardware   | Teledyne RD Instruments DVL, WHN 1200, 1200 KHz                       |
| Interface Type         | Serial via Moxa                                                       |
| Software Functionality | X/Y/Z axis velocity reports and attitude (heading, pitch, roll, temp) |
| Protocol Definition    | RDI PD5 binary protocol per wh_data_protocols.pdf section 6           |

#### 2.3.4.6 PNI TCM XB Compass

|                        |                                                                                              |
|------------------------|----------------------------------------------------------------------------------------------|
| Interfacing Hardware   | PNI TCM XB, P/N 12810                                                                        |
| Interface Type         | Serial via Moxa                                                                              |
| Software Functionality | Read heading, pitch, roll; perform 2D field calibration; allow for factory calibration reset |
| Protocol Definition    | Serial Protocol defined per tcm_user_manual_r07.pdf section 7                                |

#### 2.3.4.7 Insite Pacific Pegasus Camera

|                        |                                          |
|------------------------|------------------------------------------|
| Interfacing Hardware   | Insite Pacific Pegasus Camera            |
| Interface Type         | Serial via Moxa                          |
| Software Functionality | Full implementation of software protocol |
| Protocol Definition    | Defined in InsitePegasus.pdf             |

#### 2.3.4.8 Insite Pacific Mini Zeus camera

|                        |                                                          |
|------------------------|----------------------------------------------------------|
| Interfacing Hardware   | Insite Pacific Pegasus Camera                            |
| Interface Type         | Serial via Moxa                                          |
| Software Functionality | Implementation of focus, zoom and static startup command |
| Protocol Definition    | Defined in Mini Zeus FCB-H10 manual.pdf                  |

### 3 Open Work

#### 3.1 To Be Determined (TBD)

| <b><i>TBD Number</i></b> | <b><i>Description</i></b>                                                                                                          |
|--------------------------|------------------------------------------------------------------------------------------------------------------------------------|
| TBD-001                  | (Section 2.1.2) LCD display communications protocol                                                                                |
| TBD-002                  | (Section 2.2.6) Specific ship gyro NMEA sentence                                                                                   |
| TBD-003                  | (Section 2.3.2.1) I/O Mapping defined in VentanIO Map09302014. Register values for retransmission of serial data to NTSC Video Mux |
| TBD-007                  | (Section 2.3.4.2) Model and protocol definition required for CTD                                                                   |

*Table 2: Table of to be determined items*

#### 3.2 To Be Resolved (TBR)

| <b><i>TBD Number</i></b> | <b><i>Description</i></b> |
|--------------------------|---------------------------|
|                          |                           |
|                          |                           |
|                          |                           |
|                          |                           |

*Table 3: Table of to be resolved items*

***End Page***

