

Ventana Control System Upgrade

Test Plan

Subject: *This document defines the planned testing of the Ventana Control System (VCS) to ensure correct operation as well as compliance with the VCS System Requirements Specification.*

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Revision History

Revision 001

<i>Revision</i>	<i>Initials</i>	<i>Date</i>	<i>Comments</i>
001	jdr	2014/12/10	Initial draft

Table 1: Revision history

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Test Plan

1 Introduction

This document describes a high level sequence and plan to carry out testing of the Ventana Control System (VCS). It will be used as the basis of the formal test procedures for the QA, verification and acceptance testing. Other testing that is less formally documented will use this document to guide the strategy uses when planning and executing testing. It is intended to serve as a method of discussing and reaching agreement on the scope of planned test activities.

1.1 Testing Phases

Testing of the VCS software will be performed in phases that are discussed in the document. Different phases will have different levels of formality associated with them, but the key through the whole process is reducing risk and catching bugs at the earliest practical stage. Early testing is focused on individual component functionality and later testing verifies communication and interactions are occurring correctly, while also assuring that the component functionality is behaving as expected.

- Discretionary developer level testing
- Application level QA testing, which may involve software only, or include hardware-in-the-loop
- System level QA testing at Greensea, also referred to as Integrated Testing
- Requirement verification testing
- System level acceptance testing at MBARI

1.2 References

The following documents define the functionality of the VCS and are used

- MBARI Ventana Software Upgrade - System Requirements Specification
- MBARI Ventana Software Upgrade - Interface Control Document
- Ventana Control System Upgrade document, revised 9/15/2014, provided by MBARI
- Ventana IO Map, revised 9/30/2014, provided by MBARI

2 Testing Description

Testing of the VCS will be broken down into several broad categories with different levels of formality and documentation depending on their purpose. The rest of this section documents the testing that will be performed at Greensea prior to delivery of the system. Section 3 discusses the testing to be performed as part of the MBARI acceptance test.

2.1 Device Interface Testing

Greensea has an extensive library of device interfaces that have been previous tested and proven. If a device has an existing interface and the communications protocol will be the same, there is not generally a need to repeat testing

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with the physical device. Sending some representative device communications traffic is sufficient to ensure that the application is configured correctly and the underlying code is still functional. For devices that require a new interface to be written, a decision needs to be made on the relative risk of waiting until integration at MBARI to test for the first time, versus the cost of sending devices to Greensea to test. This section, when finalized, will capture the decisions between MBARI and Greensea regarding device testing.

<i>Device</i>	<i>Software Interface Status</i>	<i>Test with Hardware at Greensea</i>
Elo 1928L touch screens	Drivers tested with Linux Debian	Yes (complete)
Belly Pack LCD	Interface <TBD-001>	<TBD-001>
Wago 750-316 serial bus coupler	Need to write drivers	Yes, plan to ship Wago stack to Greensea
Wago 750-352 TCP bus coupler	Need to write drivers	<TBD-002>
Miranda DVI-Ramp	Interface is DVI signal only	No, but send beta version of overlay to MBARI to test prior to MBARI acceptance test
Moxa serial server	Drivers tested with Linux Debian	Each computer will be configured and tested with a Moxa that Greensea owns
Ship Gryo	NMEA sentence <TBD-003>, but anticipate it is one already supported	No, NMEA protocol is easy to test without device
Ship GPS	Standard NMEA sentences for GPS already supported	No, NMEA protocol for GPS is well tested
Sonardyne USBL	USBL supported through common NMEA sentences, plan to use GGA	No, NMEA protocol for USBL is well tested
Winch	Need to write drivers	No, protocol is straightforward to implement and can be tested sufficiently by simulating data stream
Focal Mux 903 diagnostics	Diagnostic interface is developed and tested	No, interface is sufficiently tested
Navigation serial output	Will be modified version of existing Greensea software	No, but send beta version of serial output to MBARI to test prior to MBARI acceptance test
MBARI FOMODbus Micro	Need to write drivers, but Greensea has an existing MODbus library	Yes, plan to ship FOMODbus Micro to Greensea
Paro Depth Sensor	Device interface is developed and tested	No, interface is well tested
Seabird CTD	Need to write drivers, specific model/protocol is <TBD-004>	<TBD-004> depending on protocol complexity
Octans FOG	Have existing interface for Phins, need protocol documentation for gen 3 Octans to verify appropriate sentences are supported	<TBD-005> depending on support for existing protocol
Mesotech Altimeter	Standard NMEA sentence for depth already supported, plan to use DBT	No, interface is well tested

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<i>Device</i>	<i>Software Interface Status</i>	<i>Test with Hardware at Greensea</i>
RDI DVL	Greensea typically uses PD6 protocol, if PD5 is desired, interface program would need to be revised	<TBD-006> depending on whether Greensea has access to a DVL that supports DP5.
PNI TCM XB Compass	Device interface is developed and tested, including ability to perform 2D calibration	No, interface is well tested
Insite Pacific Pegasus Camera	Need to write drivers	Prefer to test at Greensea if sending a camera is not difficult
Insite Pacific Mini Zeus Camera	Need to write drivers (basic support)	With limited interface, testing at Greensea is probably not required and could be done with beta version of software sent to MBARI if desired

2.2 openSEA Suite Testing

The openSEA suite of applications has been very thoroughly tested through simulators, in a lab environment and in open water testing. The core algorithms will not be modified in order to implement the VCS, so this is a low risk deployment and only limited testing is required. Testing will focus on changes to the software, primarily associated with communication with other applications and making sure it is correctly configured. This testing is performed through the Greensea simulator which allows complete integrated testing of the major openSEA applications including openCMD, openINS and openMNGR. During development, it will occur on an as-needed basis at the discretion of the software developers. Once the software is complete, the testing will be formalized as described in section 2.4.

2.3 Ventana-Specific Configuration and Logic Testing

Many requirements imposed on the control system are unique to the Ventana vehicle and include things like changing camera control with a selection knob or forcing only one detritus function to be active at a time. Most of this logic will be contained in the signal mapping application, although some, such as thruster mixing, will be implemented in the Ventana control application. These requirements originate from the Ventana Control System Upgrade requirements document and the Ventana IO Map. This logic will be tested incrementally as it is developed, and then checked again during integrated testing. Testing that provides verification data for closure of requirements will be formally documented.

2.4 Integrated Testing

After the complete software system is configured for the Ventana, Greensea will perform a thorough test process involving engaging every function from the user interface and simulating inputs from the physical buttons and joysticks. This testing is done with the simulator to have valid interfaces to the other openSEA applications and confirm that the entire system (minus hardware devices) is performing as designed. This testing is performed in accordance with a detailed test procedure to ensure that all necessary testing is performed and results are documented. To the extent practical, this integrated testing will also be used to verify closure of the requirements in the VCS System Requirements Specification.

A final stage of the integrated testing will be an extended duration test over 2-3 weeks to verify the stability of the software and ensure that there are no memory leaks or other issues that only reveal themselves over time. Because of the desire to conduct this testing on the delivered software, this is typically performed in parallel with the MBARI acceptance testing and if issues are uncovered, updates are provided following the acceptance testing.

2.5 Requirement Verification Testing

The majority of the requirements in the VCS System Requirements Specification will have been verified and documented through the testing described in sections 2.3 and 2.4, however some addition testing is expected to be required. All remaining open requirements will be tested to verify they have been met and the results will be formally documented.

3 MBARI Acceptance Test

The objectives and outcomes for this event are <TBD-007> and should be discussed at CDR. To determine the entire systems works when fully integrated, either a sampling or complete test of all functionality could be performed. The configuration of the vehicle and support hardware for the acceptance test needs to be defined. Is this going to occur only in the test tank, or will part of the acceptance test occur on the Rachel Carson? To what extent should navigation performance be characterized? Will accepting input via the advanced control interfaces be tested at this time?

4 Open Work

4.1 To Be Determined (TBD)

<i>TBD Number</i>	<i>Description</i>
TBD-001	Need definition of Belly Pack LCD interface and decision on whether the hardware should be sent to Greensea for testing
TBD-002	Can a Wago MODbus TCP bus coupler be sent to Greensea for testing?
TBD-003	What protocol is used by the ship gyro?
TBD-004	Greensea needs the CTD protocol and if it is complex, it may be best to send the hardware to Greensea to test
TBD-005	Need information on Octans Gen 3 protocols to decide whether Greensea recommends shipping to Greensea for testing
TBD-006	Greensea needs to see if a DVL that supports PD5 is available or if we should request it be shipped from MBARI
TBD-007	What does MBARI want to include in the scope of the acceptance test

Table 2: Summary of To Be Determined Items in the Document

4.2 To Be Resolved (TBR)

<i>TRD Number</i>	<i>Description</i>

Table 3: Summary of To Be Resolved Items in the Document

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