Coastal Wire Following Profiler Mooring
Integration and Verification Plan

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Coastal and Global Scale Nodes
Ocean Observatories Initiative
Woods Hole Oceanographic Institution
Oregon State University
Scripps Institution of Oceanography

Revision History

Version	Description	Originator	ECR No.	Release Date
1-00	**Initial Release**	**G Cook**	**1303-00710**	**30 May 2012**

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1 Scope

1.1 Identification

This Integration and Verification Plan (IVP) applies to the Coastal Wire Following Profiler Mooring to be produced for the Coastal and Global Scale Nodes (CGSN) implementing organization (IO) of the Ocean Observatories Initiative (OOI). This plan describes the integration and test activities leading up to deployment of the CGSN Coastal Wire Following Profiler Moorings.

1.2 System Overview

The Coastal Wire Following Profiler Mooring supports sensors in a profiling body and has a frame-mounted, upward looking Acoustic Doppler Current Profiler (ADCP). The Coastal Wire Following Profiler Mooring is a conventional design from the anchor to the subsurface flotation sphere, but also includes a submersible surface buoy as a surface expression. An electromechanical (EM) stretch hose connects a small submersible surface buoy to the subsurface flotation sphere, providing compliance in the upper 15-20 m of the mooring (to accommodate tidal excursions and wave motion) while allowing the subsurface flotation sphere to maintain vertical tension in the wire-rope portion of the mooring on which the profiler rides. Profiler moorings are equipped with a McLane Moored Profiler, a wire following profiler (WFP) that translates all but the upper 15-20 m of the water column. With the exception of the Pioneer Offshore and the Endurance Washington Offshore moorings, Coastal Wire Following Profiler Moorings are also equipped with an ADCP situated near the bottom. The WFP and ADCP are self-powered and transmit data via inductive modem over the jacketed steel cable with seawater return, through conductors in the flotation sphere and stretch hose, to a receiver in the submersible surface buoy.

The Coastal Wire Following Profiler Mooring submersible surface buoy contains an inductive modem, a Sensor and Telemetry Controller (STC), low-speed satellite communication (Iridium), GPS, short-range high-speed RF (FreeWave and Wi-Fi), associated antennas, and a Radar Target Enhancer (RTE). An alkaline battery pack on the buoy provides power to RF, satellite, and inductive communications while permitting command and control from ship or shore via any available telemetry link. The buoy will also have an engineering sensor; a 3-axis motion pack to sense buoy motion. The profiler comes equipped with an inductive modem, controller, and internal battery packs. The ADCP comes equipped with a controller (including internal data storage), inductive modem, and internal battery packs.

The following moorings are members of this class.

- Pioneer Central Inshore Profiler Mooring 3604-00010
- Pioneer Central Offshore Profiler Mooring 3604-00011
- Pioneer Offshore Profiler Mooring 3604-00014
- Pioneer Upstream Inshore Profiler Mooring 3604-00012
- Pioneer Upstream Offshore Profiler Mooring 3604-00013
- Endurance Washington Offshore Profiler Mooring 3605-00001

A representative drawing of the Coastal Wire Following Profiler Mooring is shown in Figure 1-1. For detailed information, refer to the drawings listed above.

Each mooring of this class is identical with the following exceptions:

- Deployment depth – this changes the length of the wire rope on which the profiler rides
- 2 of the 6 moorings will not include an ADCP/frame (below the profiler wire rope)

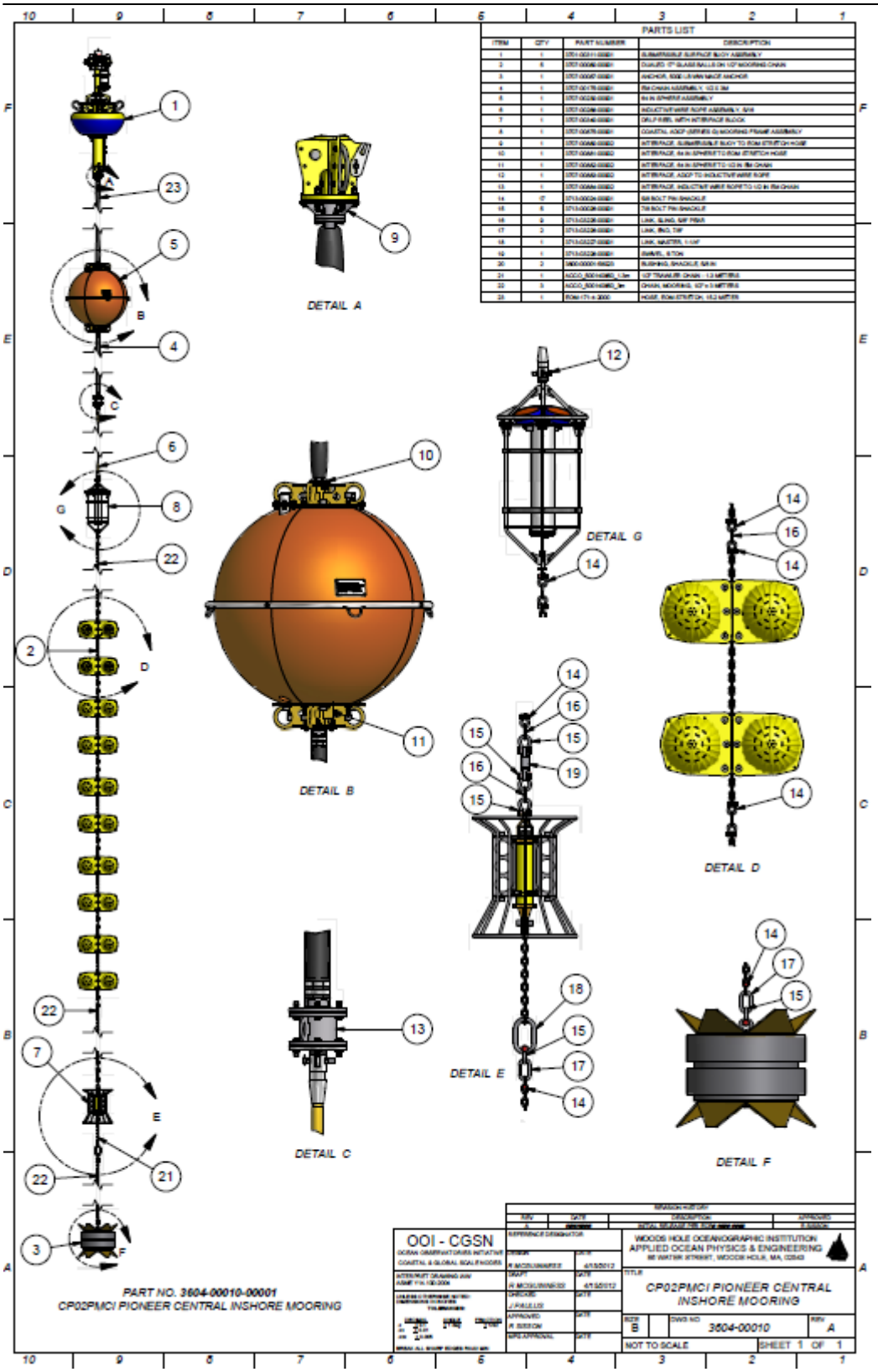


Figure 1-1 Coastal Wire Following Profiler Mooring

1.3 Document Overview

Sections 1-3 provide general information relevant to this plan. Section 4 describes the environments in which Integration and Test is executed for the Coastal Wire Following Profiler Mooring. Section 5 contains the integration plan. Section 6 contains the test plan and list of test cases to be conducted during formal test. Section 7 contains information about traceability to requirements. The integration checklist is provided in Appendix A; platform test procedures in Appendix B.

Refer to the CGSN IVP for general process description and definition of terms utilized within this document, including identification of the test events and activities described herein.

2 Referenced Documents

The following documents are referenced in this IVP. The latest revision of each applies unless noted in the text.

Table 2-1 Referenced Documents

Document Identifier	Document Title
3101-00033	CGSN Integration and Verification Plan (IVP)
3604-00010	Pioneer Central Inshore Profiler Mooring Drawing
3604-00011	Pioneer Central Offshore Profiler Mooring Drawing
3604-00014	Pioneer Offshore Profiler Mooring Drawing
3604-00012	Pioneer Upstream Inshore Profiler Mooring Drawing
3604-00013	Pioneer Upstream Offshore Profiler Mooring Drawing
3605-00001	Endurance Washington Offshore Profiler Mooring Drawing
3102-00008	CGSN Reference Designator Spreadsheet

3 Definitions & Acronyms

Acronym	Definition
ADCP	Acoustic Doppler Current Profiler
CGSN	Coastal and Global Scale Nodes
CTD	Conductivity, Temperature, Depth
EM	Electro-mechanical
GPS	Global Positioning System
HAR	Hazard Analysis Reports
ICD	Interface Control Document
IMM	Inductive Modem Module
IO	implementing organization
ISU	Iridium Subscriber Unit
IVP	Integration and Verification Plan
L4	Level 4

OMC	Operations and Maintenance Center
OOI	Ocean Observatories Initiative
PVT	Product Verification Test
RTE	Radar Target Enhancer
SBD	Short Burst Data
STC	Sensor and Telemetry Controller
TDP	Technical Data Package
WHOI	Woods Hole Oceanographic Institution
WFP	Wire Following Profiler

4 Integration and Test Environment

There will be a variety of integration and test environments for the Coastal Wire Following Profiler Mooring.

The high-bay areas, electronic labs, shore side mobile cranes, and wet-test tanks will all be available for integration and testing of the platform.

Initial electronics integration will take place in an electronics lab. As the platform integration continues, the effort will move to the high-bays to allow assembly of larger components. Once the platform is assembled, final integration and test will move to wet-test tanks.

5 Integration Plan

The integration effort described in this plan will occur on every mooring in the Coastal Wire Following Profiler Mooring class (see Section 1.2) when the moorings are initially built during the Construction phase of the OOI program as well as following mooring refurbishment during the Operations and Maintenance phase of the program.

Prior to the beginning of the mooring integration, it is assumed that every subassembly and unit is known to be good. In other words, each piece coming into the mooring integration effort has been confirmed to be free of defects and known to be functional through the manufacturing and quality processes. This includes, but is not limited to:

- Circuit cards and backplanes,
- Electrical harnesses and cables,
- Instruments and associated electronics,
- Mooring mechanical components (buoy halo down to anchor),
- Electrical components of the mooring riser,
- Power System Units.

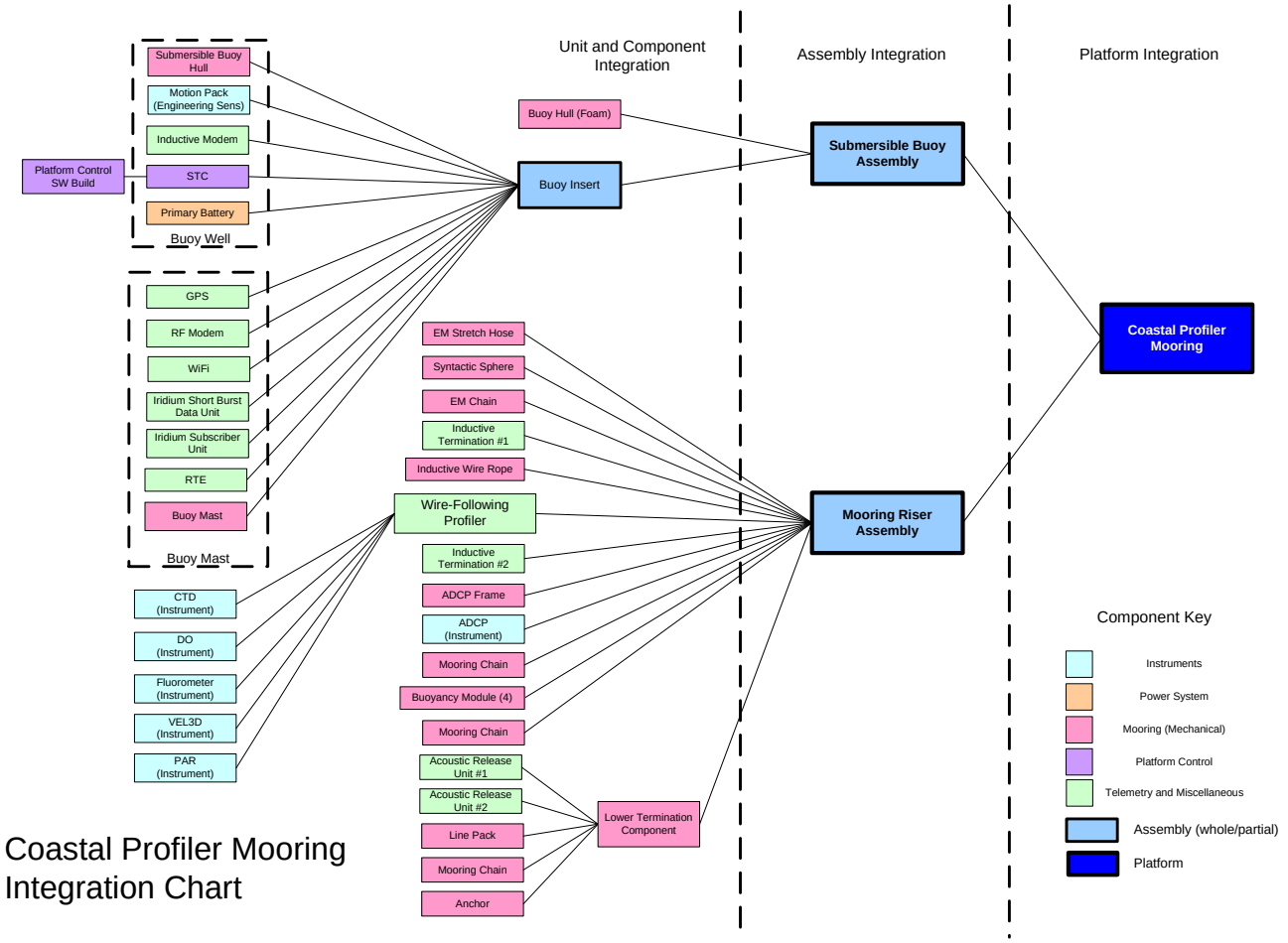


Figure 5-1 Coastal Wire Following Profiler Mooring Integration Chart

5.1 Buoy Integration

This section describes the integration of those units and components that are associated with the Submersible Buoy assembly shown in Figure 5-1 above.

Integration of the units and components associated with the mooring is a physical/mechanical integration as well as an electrical integration. The physical locations and mounting of the units and components must be well defined before electrical integration can begin.

Buoy integration is shown in Figures 5-2 through 5-5 below.

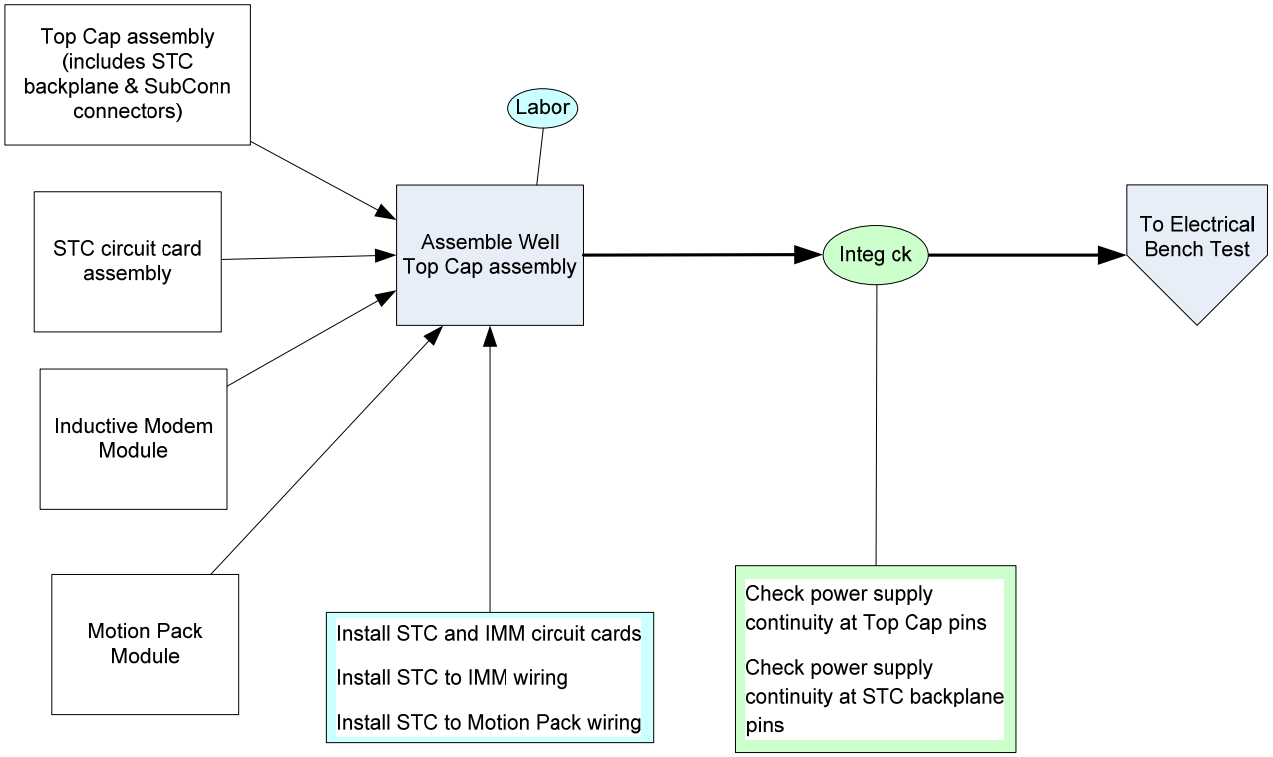


Figure 5-2 End Cap Assembly

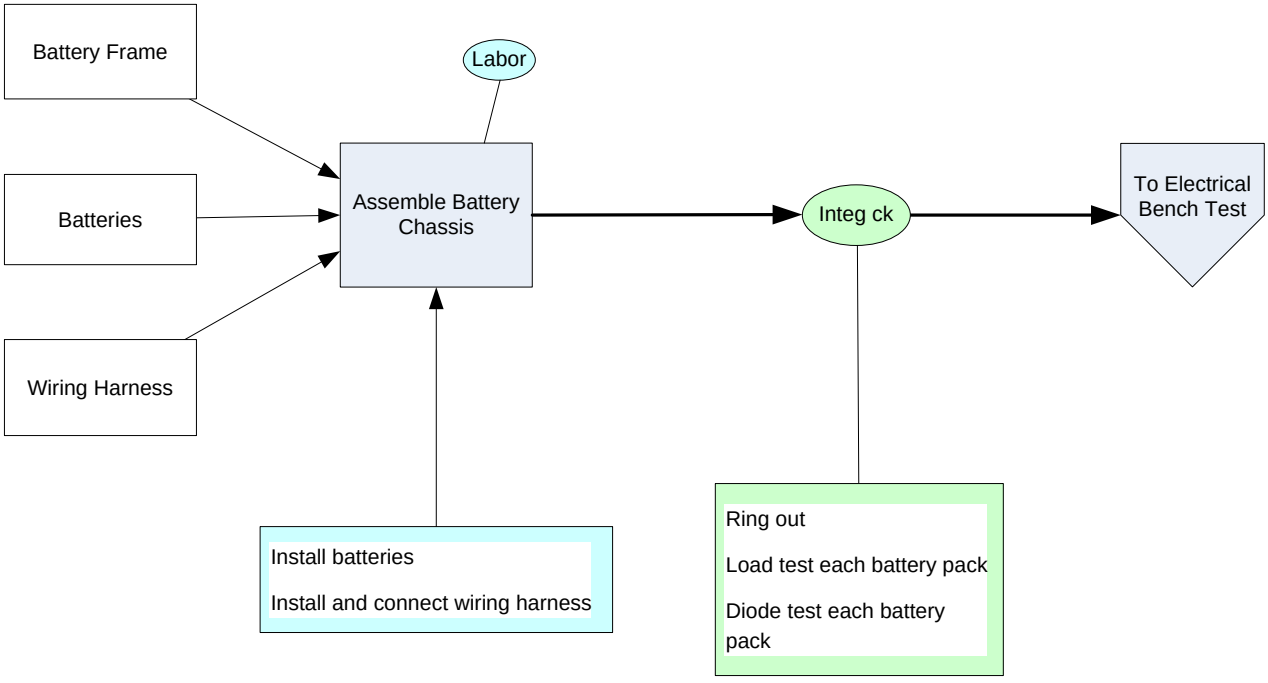


Figure 5-3 Battery Chassis Assembly

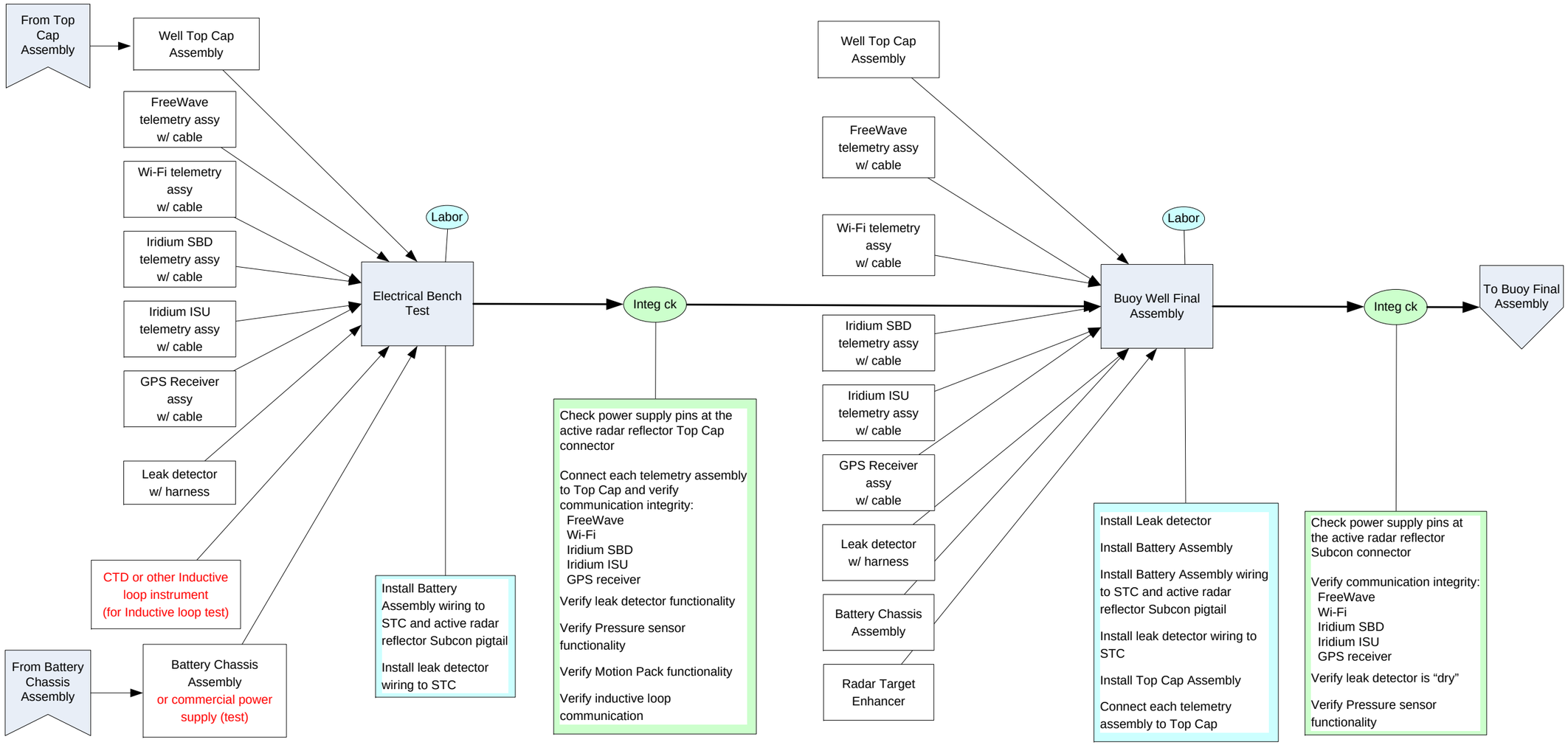


Figure 5-4 Buoy Integration

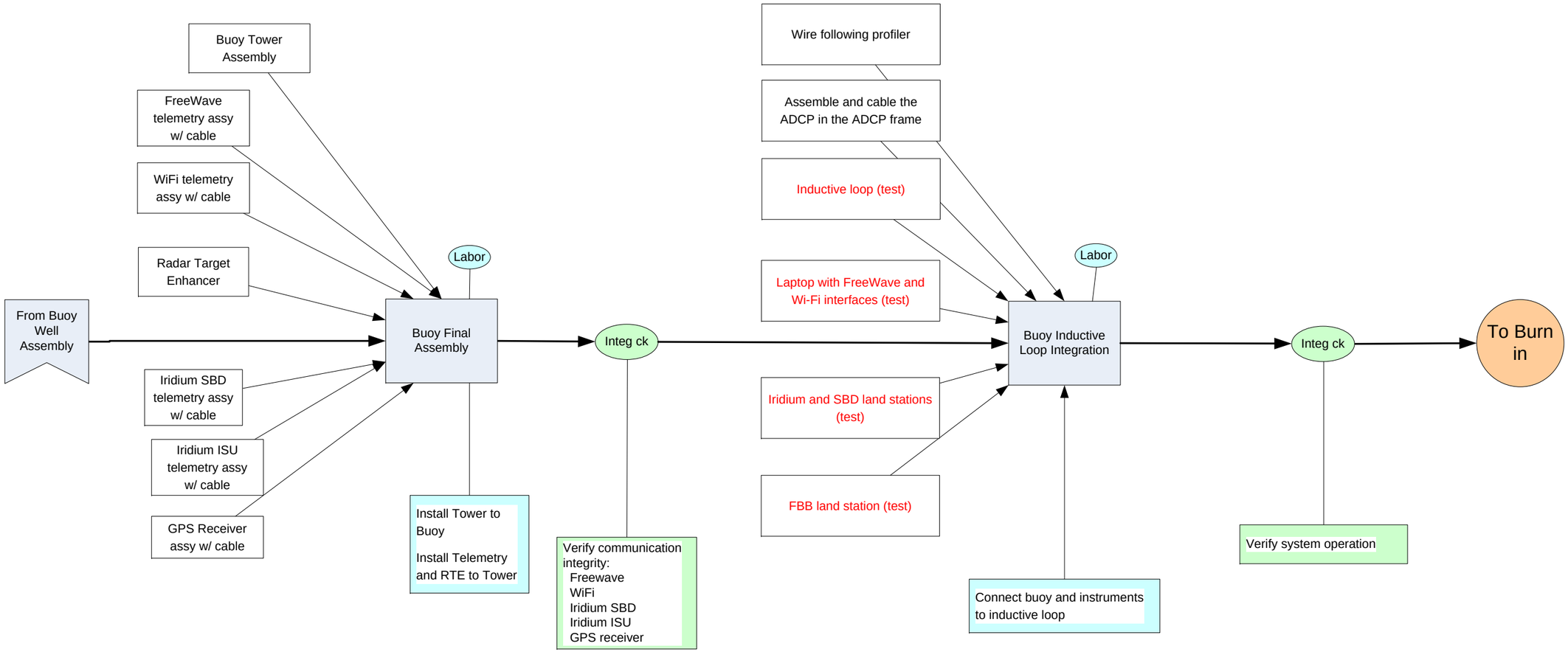


Figure 5-5 System Integration

5.1.1 Battery Chassis Assembly

The alkaline manganese battery packs are installed in a containment frame and wired to bussed terminal strips. Two battery packs are wired in parallel to power the Radar Target Enhancer; four battery packs are wired in parallel to power the remaining buoy electronics.

CAUTION

The Battery Chassis Assembly with ballast is heavy (525 lbs). Mechanical lift is required.

Entrance Criteria

- Battery Chassis frame available
- Alkaline manganese battery packs available
- Battery wiring harness available
- Buoy assembly drawings available
- Wiring diagrams available

Exit Criteria

- Batteries installed in frame and secured
- Battery harness installed
- Battery voltages verified at end of wiring harness
- Each battery pack is load tested
- Each battery pack is diode isolated

5.1.2 Buoy Well End Cap Assembly

The buoy well end cap assembly provides structural support for the Sensor and Telemetry Controller (STC) and Inductive Modem Module (IMM) circuit card assemblies. The STC circuit card is wired via Positronic backplane connectors to the SubConn submersible connectors located in the end cap and to the leak detector and battery chassis assembly. The IMM circuit card is connected to the STC via a Positronic backplane connector (serial data) and to one SubConn submersible connector (inductive loop) located in the end cap.

Entrance Criteria

- Well End Cap mechanical components available
- SubConn connector/pigtails available
- STC circuit card with production software available
- IMM circuit card available
- Wiring diagrams available

Exit Criteria

- External interface integrity verified

- Power supply voltages verified by continuity checks at all interfaces
  - FreeWave
  - Wi-Fi
  - Iridium Short Burst Data (SBD)
  - Iridium Subscriber Data (ISU)
  - Global Positioning System (GPS)
  - Radar Target Enhancer

5.1.3 Electrical Bench Test

The End Cap Assembly is interconnected to the leak detector and DC power source. The leak detector and associated wiring harness and battery power cable are deliverable items and must be completed before the leak detector and Battery Chassis can be installed in the buoy well. The DC power source may be either 1) the Battery Chassis, or 2) a commercial power supply. The End Cap Assembly is powered up and interconnected via SubConn submersible connectors and cables to telemetry and GPS devices to verify communication path integrity via inspection of log files created by the STC. The IMM is checked by communicating to a CTD clamped onto a temporary inductive loop connected to one of the SubConn submersible connectors.

Entrance Criteria

- Well End Cap Assembly available
- DC power source available
  - Batter Chassis, or
  - Commercial power supply
- Deliverable leak detector and wiring harness available
- Deliverable battery cable available
- Wiring diagrams available
- GPS available
- Telemetry devices available
- External Inductive loop and inductive CTD available

Exit Criteria

- External interface integrity verified
  - Serial communication established to all telemetry and GPS devices
    - Ethernet
      - FreeWave
    - RS-232
      - WI-FI
      - Iridium Short Burst Data (SBD)
      - Iridium Subscriber Data (ISU)

- Global Positioning System (GPS)

- Inductive Loop communication established
- Power for the Radar Target Enhancer is verified at the SubConn submersible connector

– Internal interface integrity verified

- Leak detector functionality verified

5.1.4 Buoy Final Assembly

The leak detector and wiring harness and Battery Chassis Assembly and wiring harness are loaded into the buoy well and connected to the End Cap Assembly, which is then mounted on the buoy well. The buoy mast must now be installed. The Radar Target Enhancer, GPS, and telemetry devices are mounted to the buoy tower and cabled to the End Cap Assembly. The cables leading to the telemetry canisters should not be tied down until their operation has been verified. Since the initial integration will be taking place indoors, some of the communications may not be successful (i.e. satellite comms); however, a status report of 'no signal' is a valid integration check.

Entrance Criteria

– Buoy available
– Well End Cap Assembly available
– Battery Chassis Assembly and battery cable available
– Leak detector and wiring harness available
– Radar Target Enhancer available
– GPS available
– Telemetry devices available
– External Inductive loop and inductive CTD available

Exit Criteria

– External interface functionality verified

- FreeWave
- WI-FI
- Iridium Short Burst Data (SBD)
- Iridium Subscriber Data (ISU)
- Global Positioning System (GPS)
- Inductive Loop functionality established
- Radar Target Enhancer is powered

– Internal interface integrity verified

- Leak detector indicates no leak

5.1.5 Buoy Inductive Loop Integration

The ADCP is mounted in the ADCP frame and cabled to the inductive wire assembly. The WFP is attached to the inductive wire rope. The buoy is cabled to the inductive wire assembly and communication is verified to the instruments (ADCP and WFP).

Entrance Criteria

- Buoy available w/production software
- ADCP assembled and cabled in the ADCP frame
- The ADCP compass is calibrated in the ADCP frame
- WFP is available
- Iridium connectivity available
- GPS connectivity available
- WI-FI connectivity available
- FreeWave connectivity available

Exit Criteria

- Complete buoy functionality is available

5.2 Mooring Riser Integration

This section describes the integration of those units and components that are associated with the Mooring Riser Assembly shown in Figure 5-1 above.

Electro-mechanical (EM) integrity for the EM units (stretch hose, subsurface sphere and jumper cable, EM chain, inductive termination wire assembly, and Acoustic Doppler Current Profiler (ADCP) frame is checked for each Unit individually based on Factory Acceptance Testing.

Mechanical integrity for the Units comprising the Lower Termination (mooring chains, dual acoustic release and line pack, and mace anchor) are checked based on Factory Acceptance Testing.

Instrument performance (ADCP and WFP) is checked for each Unit individually based on Factory Acceptance Testing.

No additional functional integration of these mooring riser components is planned.

5.3 Integration Testing

Integration testing is detailed in the integration checklists contained in Appendix A. These checklists include the following:

- Pre-power tests
    - Check polarity and continuity as required
- Buoy Power on and initialization checks
    - Check for absence of power faults
    - Check for proper initialization of hardware/software
    - Check for communication to/from platform controller console port
- Buoy Telemetry checks
    - Check Iridium communication (ISU and SBD)

  - Check RF Wi-Fi communication
  - Check RF FreeWave communication
  - Check GPS
  - Check Xeos beacons and flashers
- Instrument Power on and initialization checks
  - Check for absence of power faults
  - Check for proper initialization of hardware/software
  - Check for communication to/from instruments
- Buoy / Instrument communication checks
  - Check for communication between STC and inductive instruments (WFP and ADCP)
  - Check for correct data transfer

6 Test Plan

The requirement verification effort described in this plan will occur on the first mooring in the Coastal Wire Following Profiler Mooring class (see Section 1.2) when the moorings are initially built during the Construction phase of the OOI program. This will verify all of the Level 3 requirements allocated to the class.

Prior to the beginning of the mooring requirement verification effort, it is assumed that the mooring will have completed integration as described in Section 5 of this plan.

For the second and subsequent moorings of this type, a Quality Conformance Test (QCT) will be conducted following integration. The QCT will be a formalized checklist of the final integration steps verifying proper end-to-end operation of the platform.

6.1 Assembly Design Verification Tests (DVTs)

All DVTs will be completed prior to platform integration.

6.2 Platform Verification Test (PVT)

At the Platform level, it is expected that the majority of the requirements will be verified by inspection and analysis of lower level tests. Any remaining unverified requirements will be verified at the Platform level.

The platform testing follows integration and the PVT event is optionally witnessed by the Program Management Office (Ocean Leadership). The PVT primarily consists of reviewing evidence of verification at the lower levels and a comprehensive demonstration of the integrated platform. The demonstration would be ‘end-to-end’ in that the platform would be stimulated, and examined at the external interfaces and proper operation exhibited infers that the internal interfaces were operating correctly.

The platform testing will take place in dry and wet conditions. The dry testing will be conducted at the burn-in pad located behind the Clark South facility at the WHOI Quissett campus. Alternately, the dry testing can be conducted on the dock at the WHOI Village campus or at other areas as needed. The wet testing will be conducted in the test well dock at the WHOI Village campus.

6.2.1 Objectives

The objective of the PVT is to conduct the test steps necessary to verify all of the DOORS requirements allocated to the Platform.

6.2.2 Verification/Test Scenarios

6.2.2.1 Inspection and Analysis of Design Drawings and Lower Level Test Results

The test will consist of a review of: drawings, documents, and DOORS reports as needed to verify requirements.

6.2.2.2 Dry Tests

The test will exercise Platform initialization, scheduling and data flow for instruments and telemetry, and command/control/status between the Platform and shore with the Platform autonomously performing preprogrammed mission activities while on the burn-in pad.

6.2.2.3 Wet Tests

The test will exercise Platform initialization, scheduling and data flow for instruments and telemetry, and command/control/status between the Platform and shore with the Platform autonomously performing preprogrammed mission activities while in the WHOI test well.

6.2.3 Test Case Descriptions

6.2.3.1 Inspection and Analysis of Design Drawings (Ver-CG-180)

This Test Case will include inspection of assembly drawings to see that instruments called out in the assembly drawing are included in the mooring. The rest of the mooring assembly will be inspected to verify mooring line shot lengths, anchor weights/geometry, instrument cages, and other features are present per the mooring drawing.

6.2.3.1.1 Requirements Addressed

L3-CG-RQ-298, L3-CG-RQ-595, L3-CG-RQ-305, L3-CG-RQ-306, L3-CG-RQ-307, L3-CG-RQ-308, L3-CG-RQ-309, L4-CG-TS-RQ-196, L4-CG-TS-RQ-197, L4-CG-TS-RQ-199, L4-CG-PR-RQ-308

6.2.3.1.2 Pre-conditions

All mooring units are available.

6.2.3.1.3 Hardware Preparation

None

6.2.3.1.4 Software Preparation

None

6.2.3.1.5 Test Inputs

Mooring Drawings and associated documentation.

6.2.3.1.6 Expected Results

All mooring units are as shown in the mooring drawing.

6.2.3.1.7 Criteria for Evaluating Results

All mooring units are as shown in the mooring drawing.

6.2.3.2 DOORS Report – Lower Level Requirements Verified (Ver-CG-181)

This Test Case will satisfy those L3 requirements that are verified via analysis through an aggregation of lower level (L4) requirement verifications. This will be accomplished by running a DOORS script that checks the verification state of each of the L4 requirements that is associated with an L3 ‘parent’ requirement. The script displays a summary of the verification status of child L4 requirements. i.e. Passed, Failed, Waived, Incomplete.This is also known as "roll-up"; a term that has been used in the program for requirements that are verified by all of their children being verified.

Note that a general L3 requirement may not necessarily be fully verified on a single platform type. Only those child L4 requirements that are applicable to this platform will be rolled up to verify that portion of the L3 requirement that is also applicable to this platform.

6.2.3.2.1 Requirements Addressed

L3-CG-RQ-477, L3-CG-RQ-485, L3-CG-RQ-166, L3-CG-RQ-1003, L3-CG-RQ-495, L3-CG-RQ-855, L3-CG-RQ-856, L3-CG-RQ-494, L3-CG-RQ-432, L3-CG-RQ-993, L3-CG-RQ-438, L3-CG-RQ-439, L3-CG-RQ-885, L3-CG-RQ-1006, L3-CG-RQ-444, L3-CG-RQ-987, L3-CG-RQ-867, L3-CG-RQ-555, L3-CG-RQ-499, L3-CG-RQ-430, L3-CG-RQ-431, L3-CG-RQ-800, L3-CG-RQ-922, L3-CG-RQ-433, L3-CG-RQ-923, L3-CG-RQ-496

6.2.3.2.2 Pre-conditions

L4 DVTs have been completed and verification states have been updated in DOORS.

6.2.3.2.3 Hardware Preparation

None.

6.2.3.2.4 Software Preparation

None.

6.2.3.2.5 Test Inputs

DOORS L4 test results.

6.2.3.2.6 Expected Results

For each L3 requirement in this Test Case that have L4 child requirements, all L4 child requirements have been verified.

6.2.3.2.7 Criteria for Evaluating Results

The script displays a summary of the verification status of child L4 requirements. i.e. Passed, Failed, Waived, Incomplete.

6.2.3.3 Safety Hazard Mitigations (Ver-CG-182)

This test case will verify that the mitigation measures for safety hazards have been implemented on the mooring. The mooring and mooring Technical Data Package (TDP) will be inspected to verify

the mitigation steps called out in the Hazard Analysis Reports (HARs) have been implemented on the mooring.

6.2.3.3.1 Requirements Addressed

None

6.2.3.3.2 Pre-conditions

Mooring and TDP available.

6.2.3.3.3 Hardware Preparation

None

6.2.3.3.4 Software Preparation

None

6.2.3.3.5 Test Inputs

HARs are available.

6.2.3.3.6 Expected Results

Mitigation measures are implemented on the mooring.

6.2.3.3.7 Criteria for Evaluating Results

Mitigation measures are implemented on the mooring. Safety Engineer concurs.

6.2.3.4 End-to-End Demonstration (Ver-CG-183)

The End-to-End Demonstration Test Case will use modified versions of the STC mission configuration files in order to exercise different start-up options and scheduling capabilities. The Test will exercise Platform initialization; scheduling and data flow for instruments and telemetry; and command/control/status between the Platform and shore. In this case, shore may be the Operations and Maintenance Center (OMC) or a shore based proxy for the OMC. The goal is to operate the mooring through its normal and alternate communication paths. The mission will be a condensed version of the normal, at-sea, mission in that the time interval between instrument samples and telemetry communication will be shorter.

Initialization is started by removing the magnet from the buoy well end cap, allowing the mooring electronics to initialize according to previously loaded mission configuration files. Successful initialization is checked via the Platform's RF modem.

Scheduling and data flow are checked by observing the platform component activities via log files and data sent to shore via telemetry. Cross checks of the data can be made by comparing files acquired directly from the mooring via the Wi-Fi connections with those files sent to shore via satellite link. Logs and data files are time-stamped and provide a means of verifying platform activities are performed according to the schedule in the mission configuration files.

Command/control/status data are checked via telemetry messages sent between the Platform and shore. New mission configuration(s) will be sent from shore and proper Platform response is verified.

6.2.3.4.1 Requirements Addressed

L3-CG-RQ-293, L3-CG-RQ-294, L3-CG-RQ-871, L3-CG-RQ-599, L3-CG-RQ-163, L3-CG-RQ-890, L3-CG-RQ-1002, L3-CG-RQ-164, L3-CG-RQ-761, L3-CG-RQ-292, L4-CG-TS-RQ-196, L4-CG-TS-RQ-197, L4-CG-TS-RQ-199

6.2.3.4.2 Pre-conditions

Buoy and instruments are outside and in known environmental conditions.

6.2.3.4.3 Hardware Preparation

Buoy is outside to allow clear view of sky for satellite communications. Instruments are connected and in known environmental conditions allowing predictable sensor data to be confirmed.

6.2.3.4.4 Software Preparation

Condensed mission is loaded to allow for multiple cycles of instrument sampling and platform telemetry.

6.2.3.4.5 Test Inputs

- Existing environmental conditions
- Two or more condensed mission profiles; one or more to be sent from shore

6.2.3.4.6 Expected Results

- Platform sends data to shore based on mission schedule and events
- Platform correctly responds to new mission orders

6.2.3.4.7 Criteria for Evaluating Results

- Existing environmental conditions
- Mission profiles sent from shore

6.2.3.5 Inspection Test Case (Ver-CG-184)

The Inspection Test Case will consist of visual inspection of the mooring to verify those requirements that are most easily verified by simply looking for compliance.

6.2.3.5.1 Requirements Addressed

L3-CG-RQ-489, L3-CG-RQ-949, L3-CG-RQ-490, L3-CG-RQ-445, L3-CG-RQ-470, L3-CG-RQ-299, L4-CG-PS-RQ-310

6.2.3.5.2 Pre-conditions

Buoy, mooring riser, and instruments are available for inspection.

6.2.3.5.3 Hardware Preparation

None

6.2.3.5.4 Software Preparation

None.

6.2.3.5.5 Test Inputs

- None

6.2.3.5.6 Expected Results

- Visual inspection of Platform shows compliance with requirements.

6.2.3.5.7 Criteria for Evaluating Results

- Obvious visual evidence of compliance

7 Requirements Traceability

To view requirement traceability for the Coastal Wire Following Profiler Mooring; In the DOORS database, open the L3 CG System Requirements module (/L3 System/CG System/L3 CG System Requirements). Once the module is open, use the 'View' pull-down to select the "RVCM_CoastalPM" view. This view will show the CGSN L3 requirements linked to Verification Event and Verification Procedure.

Refer to the CGSN IVP (3101-00033) for a description of the requirement, event, and procedure relationships shown in the RCVM views in DOORS.

Table 7-1 Requirement to Test Case Trace

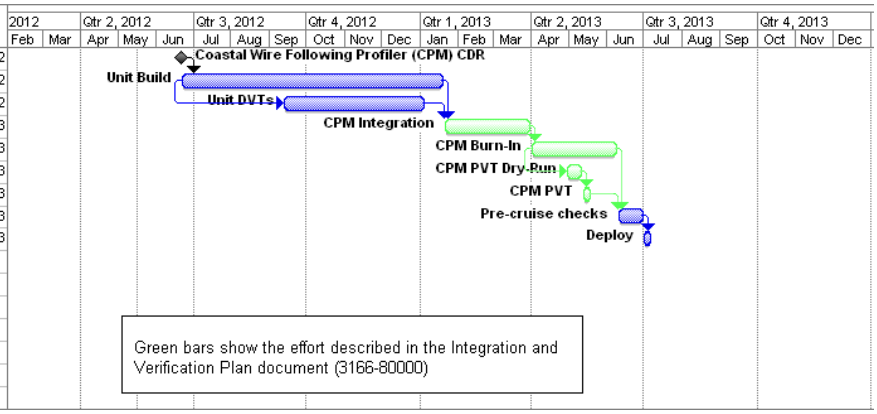
Requirement ID	Event	Test Case(s)
Provided in DOORS		

Table 7-2 Test Case to Requirement Trace

Test Case	Event	Requirement ID(s)
Provided in DOORS		

8 I&V Schedule

ID	Task Name	Duration	Start
1	Coastal Wire Following Profile	0 days	Wed 6/20/12
2	Unit Build	152 days	Thu 6/21/12
3	Unit DVTs	80 days	Thu 9/13/12
4	CPM Integration	50 days	Mon 1/21/13
5	CPM Burn-In	50 days	Mon 4/1/13
6	CPM PVT Dry-Run	10 days	Mon 4/29/13
7	CPM PVT	5 days	Mon 5/13/13
8	Pre-cruise checks	15 days	Mon 6/10/13
9	Deploy	5 days	Mon 7/1/13



APPENDIX A: Integration Checklist(s)

To be developed after CDR.

APPENDIX B: Verification Procedures

To be developed further after CDR.

Document Number	Test Procedure Shortname
3166-80101	Analysis
3166-80102	DOORS Report
3166-80103	Hazard Mitigations
3166-80104	Demonstration
3166-80105	Mooring Inspection