



Verification Procedure & Results Document No.: 3167-20104 rev A

Test Case ID: 004, Ver-CG-71	Test Case Name: VE-CG-3100 Acoustic Modem Test	Test Plan Document No.: 3167-20000	Test Plan Rev.: 2-00	Test Date:
Test Director (Print Name) Ed Dever	Signature in lieu of electronic signature	Design Engineer	Approval Signature John S. Dingess in lieu of electronic signature	Date 10-11-2012
Test Conductor (Print Name) David Neiman	Signature 	System Engineer	Approval Signature Ed Dever (in lieu of electronic signature)	Date 10/15/2012
Witnessed by (Print name)	Signature	QA/QC Engineer	Approval Signature Michael A. Zernick	Date 10/18/12

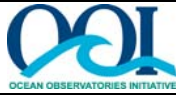
Test Class	<input checked="" type="checkbox"/> Performance	<input checked="" type="checkbox"/> Behavioral	<input type="checkbox"/> Reliability	<input type="checkbox"/> Endurance / Longevity	<input type="checkbox"/> Survivability	<input type="checkbox"/> Safety
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Test Description
The glider will communicate bidirectionally with the SM75 mooring. The mooring will be placed at ~1500m depth at ~30m above the sea floor. This test case may be a review of vendor testing.

Requirements Addressed
L4-CG-GD-RQ-148 (L3-CG-RQ-229), L4-CG-GD-RQ-149, L4-CG-GD-RQ-150, L4-CG-GD-RQ-151, L4-CG-GD-RQ-152, L4-CG-GD-RQ-154

Test Setup Glider flight and acoustic modem test documentation	Test Artifacts This document Acoustic modem communication records. Modem deployment location (lat/lon/depth/distance to bottom) and time Glider deployment location (lat/lon/time)
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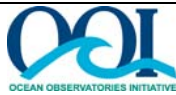
Test Procedure				Test Results		
Step No.	Instructions	Expected Results (Accept Criteria)	Requirement ID	Test Data	Pass/Fail	Notes/Waiver No.
NA	Record lat/lon/water depth/height above bottom (mooring chain link)/ deployment time for SM 75				NA	Lat 32 33.992N Lon 118 02.913W Water depth 1643m Mooring chain length 50' Deployment time 13:00 PDT
NA	Record lat/lon/water depth/ deployment time for glider				NA	Lat 32 33.992N Lon 118 02.913W Water depth 1643m Deployment time 12:29 PDT



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Test Procedure				Test Results		
Step No.	Instructions	Expected Results (Accept Criteria)	Requirement ID	Test Data	Pass/Fail	Notes/Waiver No.
4.1	Examine data files transferred acoustically from the SM75 mooring to the glider	Data files received to shore will be identical to those transferred from the mooring.	L4-CG-GD-RQ-148 (L3-CG-RQ-229)	The requirement is for the glider to transmit a subset of the mooring data to shore. The attached modem file (unit_276-2012-152-0-0.mdd) shows a file with a data range specified by the glider (blocks 0-4000) transmitted acoustically from the mooring to glider and then telemetered to shore <i>via</i> the Iridium satellite link.	Pass	See Appendix A
4.2	Compare specific data blocks to requests from shore station	The glider can specify which data blocks the mooring modem transmits.	L4-CG-GD-RQ-149	As above, the glider requested specific blocks from the mooring.	Pass	See Appendix A
4.3	Compare relative horizontal and vertical position of glider and SM75, verify the glider can send to and receive from the mooring.	The open ocean glider acoustic modem communicates bi-directionally when the glider is between the surface and 1000 meters depth and the compatible unit is at a distance of 3000 meters or less in the horizontal plane and at a depth between surface and 5000 meters.	L4-CG-GD-RQ-150	See Appendix B. Various transfers were attempted successfully. The mooring modem was at 1500m depth, and the glider depth varied between the surface and 1000m depth. The glider at the surface was used as a pass-through gateway to the submerged modem, allowing shore-to-mooring direct communication	Pass	Per note from Rob Pinelli of TWR, "Additionally there were a number of communications from the glider (in gateway mode) to the mooring modem that were needed for administration purposes: changing settings on the mooring modem, having it execute commands, etc." This demonstrates the use of the glider as a gateway to control a remote, submerged mooring. This way, commands could be sent to the Mesoscale Flanking Moorings.



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Test Procedure				Test Results		
Step No.	Instructions	Expected Results (Accept Criteria)	Requirement ID	Test Data	Pass/Fail	Notes/Waiver No.
4.4	Examine method of establishing and tearing down the acoustic link.	The open ocean glider establishes and tears down the acoustic link to the remote node.	L4-CG-GD-RQ-151	Glider starts communication to establish link. Link times out when glider stops sending send requests for data.	Pass	
4.5	Examine transfer time for several different transfers.	The open ocean glider acoustic link is capable of transferring 50 kilobytes from a remote unit in less than one hour including the time spent establishing and tearing down the link.	L4-CG-GD-RQ-152	In a test with the glider-mooring slant distance of 620m, the glider demonstrated an acoustic transfer rate of 75kB in 21 minutes (~225kB/hour)	Pass	See Appendix B, section 5.5.
4.6	Demonstrate polling of the SM-75 to request retransmit of data.	Protocols for the open ocean glider acoustic link with other acoustically-linked devices enable polling of remote devices to allow for request to re-transmit data.	L4-CG-GD-RQ-154	In modem transfer mission unit_276-2012-152-4-0, there were several instances of missed communication for which the glider was able to request retransmission.	Pass	See Appendix B, section 5.6.



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Appendix A: Sample data file from the modem.

```
the8x3_filename:      01450000
full_filename:       unit_276-2012-152-0-0
filename_extension:  mdd
fileopen_time:      Fri_Jun__1_00:22:32_2012
mission_name:       BADD2.MI
transaction_id:     16
NODE: 20
PORT: 1
STARTOFFSET: 0
ENDOFFSET: 4000
|<- P1:0!!!!!!!!!!!!{0!!!!!!!!!!!!}
|<- P1:32!!!!!!!!!!!!{32!!!!!!!!!!!!}
|<- P1:64!!!!!!!!!!!!{64!!!!!!!!!!!!}
|<- P1:96!!!!!!!!!!!!{96!!!!!!!!!!!!}
|<- P1:228!!!!!!!!!!!!{128!!!!!!!!!!!!}
|<- P1:260!!!!!!!!!!!!{160!!!!!!!!!!!!}
|<- P1:292!!!!!!!!!!!!{192!!!!!!!!!!!!}
|<- P1:424!!!!!!!!!!!!{224!!!!!!!!!!!!}
|<- P1:456!!!!!!!!!!!!{256!!!!!!!!!!!!}
|<- P1:488!!!!!!!!!!!!{288!!!!!!!!!!!!}
|<- P1:620!!!!!!!!!!!!{320!!!!!!!!!!!!}
|<- P1:652!!!!!!!!!!!!{352!!!!!!!!!!!!}
|<- P1:684!!!!!!!!!!!!{384!!!!!!!!!!!!}
|<- P1:816!!!!!!!!!!!!{416!!!!!!!!!!!!}
|<- P1:848!!!!!!!!!!!!{448!!!!!!!!!!!!}
|<- P1:880!!!!!!!!!!!!{480!!!!!!!!!!!!}
|<- P1:1012!!!!!!!!!!!!{512!!!!!!!!!!!!}
|<- P1:1044!!!!!!!!!!!!{544!!!!!!!!!!!!}
|<- P1:1076!!!!!!!!!!!!{576!!!!!!!!!!!!}
|<- P1:1208!!!!!!!!!!!!{608!!!!!!!!!!!!}
|<- P1:1240!!!!!!!!!!!!{640!!!!!!!!!!!!}
|<- P1:1272!!!!!!!!!!!!{672!!!!!!!!!!!!}
|<- P1:1404!!!!!!!!!!!!{704!!!!!!!!!!!!}
|<- P1:1436!!!!!!!!!!!!{736!!!!!!!!!!!!}
|<- P1:1468!!!!!!!!!!!!{768!!!!!!!!!!!!}
|<- P1:1600!!!!!!!!!!!!{800!!!!!!!!!!!!}
|<- P1:1632!!!!!!!!!!!!{832!!!!!!!!!!!!}
|<- P1:1664!!!!!!!!!!!!{864!!!!!!!!!!!!}
|<- P1:1696!!!!!!!!!!!!{896!!!!!!!!!!!!}
|<- P1:1828!!!!!!!!!!!!{928!!!!!!!!!!!!}
|<- P1:1860!!!!!!!!!!!!{960!!!!!!!!!!!!}
|<- P1:1892!!!!!!!!!!!!{992!!!!!!!!!!!!}
|<- P1:2024!!!!!!!!!!!!{1024!!!!!!!!!!!!}
|<- P1:2056!!!!!!!!!!!!{1056!!!!!!!!!!!!}
|<- P1:2088!!!!!!!!!!!!{1088!!!!!!!!!!!!}
|<- P1:2220!!!!!!!!!!!!{1120!!!!!!!!!!!!}
|<- P1:2252!!!!!!!!!!!!{1152!!!!!!!!!!!!}
|<- P1:2284!!!!!!!!!!!!{1184!!!!!!!!!!!!}
|<- P1:2416!!!!!!!!!!!!{1216!!!!!!!!!!!!}
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|<- P1:2448!!!!!!!!{1248!!!!!!!!}
|<- P1:2480!!!!!!!!{1280!!!!!!!!}
|<- P1:2612!!!!!!!!{1312!!!!!!!!}
|<- P1:2644!!!!!!!!{1344!!!!!!!!}
|<- P1:2676!!!!!!!!{1376!!!!!!!!}
|<- P1:2808!!!!!!!!{1408!!!!!!!!}
|<- P1:2840!!!!!!!!{1440!!!!!!!!}
|<- P1:2872!!!!!!!!{1472!!!!!!!!}
|<- P1:3004!!!!!!!!{1504!!!!!!!!}
|<- P1:3036!!!!!!!!{1536!!!!!!!!}
|<- P1:3068!!!!!!!!{1568!!!!!!!!}
|<- P1:3200!!!!!!!!{1600!!!!!!!!}
|<- P1:3232!!!!!!!!{1632!!!!!!!!}
|<- P1:3264!!!!!!!!{1664!!!!!!!!}
|<- P1:3296!!!!!!!!{1696!!!!!!!!}
|<- P1:3428!!!!!!!!{1728!!!!!!!!}
|<- P1:3460!!!!!!!!{1760!!!!!!!!}
|<- P1:3492!!!!!!!!{1792!!!!!!!!}
|<- P1:3624!!!!!!!!{1824!!!!!!!!}
|<- P1:3656!!!!!!!!{1856!!!!!!!!}
|<- P1:3688!!!!!!!!{1888!!!!!!!!}
|<- P1:3820!!!!!!!!{1920!!!!!!!!}
|<- P1:3852!!!!!!!!{1952!!!!!!!!}
|<- P1:3884!!!!!!!!{1984!!!!!!!!}
|<- P1:4016!!!!!!!!{2016!!!!!!!!}
|<- P1:4048!!!!!!!!{2048!!!!!!!!}
|<- P1:4080!!!!!!!!{2080!!!!!!!!}
|<- P1:4212!!!!!!!!{2112!!!!!!!!}
|<- P1:4244!!!!!!!!{2144!!!!!!!!}
|<- P1:4276!!!!!!!!{2176!!!!!!!!}
|<- P1:4408!!!!!!!!{2208!!!!!!!!}
|<- P1:4440!!!!!!!!{2240!!!!!!!!}
|<- P1:4472!!!!!!!!{2272!!!!!!!!}
|<- P1:4604!!!!!!!!{2304!!!!!!!!}
|<- P1:4636!!!!!!!!{2336!!!!!!!!}
|<- P1:4668!!!!!!!!{2368!!!!!!!!}
|<- P1:4800!!!!!!!!{2400!!!!!!!!}
|<- P1:4832!!!!!!!!{2432!!!!!!!!}
|<- P1:4864!!!!!!!!{2464!!!!!!!!}
|<- P1:4896!!!!!!!!{2496!!!!!!!!}
|<- P1:5028!!!!!!!!{2528!!!!!!!!}
|<- P1:5060!!!!!!!!{2560!!!!!!!!}
|<- P1:5092!!!!!!!!{2592!!!!!!!!}
|<- P1:5224!!!!!!!!{2624!!!!!!!!}
|<- P1:5256!!!!!!!!{2656!!!!!!!!}
|<- P1:5288!!!!!!!!{2688!!!!!!!!}
|<- P1:5420!!!!!!!!{2720!!!!!!!!}
|<- P1:5452!!!!!!!!{2752!!!!!!!!}
|<- P1:5484!!!!!!!!{2784!!!!!!!!}
|<- P1:5616!!!!!!!!{2816!!!!!!!!}
|<- P1:5648!!!!!!!!{2848!!!!!!!!}
|<- P1:5680!!!!!!!!{2880!!!!!!!!}
|<- P1:5812!!!!!!!!{2912!!!!!!!!}



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|<- P1:5844!!!!!!!!{2944!!!!!!!!}
|<- P1:5876!!!!!!!!{2976!!!!!!!!}
|<- P1:6008!!!!!!!!{3008!!!!!!!!}
|<- P1:6040!!!!!!!!{3040!!!!!!!!}
|<- P1:6072!!!!!!!!{3072!!!!!!!!}
|<- P1:6204!!!!!!!!{3104!!!!!!!!}
|<- P1:6236!!!!!!!!{3136!!!!!!!!}
|<- P1:6268!!!!!!!!{3168!!!!!!!!}
|<- P1:6400!!!!!!!!{3200!!!!!!!!}
|<- P1:6432!!!!!!!!{3232!!!!!!!!}
|<- P1:6464!!!!!!!!{3264!!!!!!!!}
|<- P1:6496!!!!!!!!{3296!!!!!!!!}
|<- P1:6628!!!!!!!!{3328!!!!!!!!}
|<- P1:6660!!!!!!!!{3360!!!!!!!!}
|<- P1:6692!!!!!!!!{3392!!!!!!!!}
|<- P1:6824!!!!!!!!{3424!!!!!!!!}
|<- P1:6856!!!!!!!!{3456!!!!!!!!}
|<- P1:6888!!!!!!!!{3488!!!!!!!!}
|<- P1:7020!!!!!!!!{3520!!!!!!!!}
|<- P1:7052!!!!!!!!{3552!!!!!!!!}
|<- P1:7084!!!!!!!!{3584!!!!!!!!}
|<- P1:7216!!!!!!!!{3616!!!!!!!!}
|<- P1:7248!!!!!!!!{3648!!!!!!!!}
|<- P1:7280!!!!!!!!{3680!!!!!!!!}
|<- P1:7412!!!!!!!!{3712!!!!!!!!}
|<- P1:7444!!!!!!!!{3744!!!!!!!!}
|<- P1:7476!!!!!!!!{3776!!!!!!!!}
|<- P1:7608!!!!!!!!{3808!!!!!!!!}
|<- P1:7640!!!!!!!!{3840!!!!!!!!}
|<- P1:7672!!!!!!!!{3872!!!!!!!!}
|<- P1:7804!!!!!!!!{3904!!!!!!!!}
|<- P1:7836!!!!!!!!{3936!!!!!!!!}
|<- P1:7868!!!!!!!!{3968!!!!!!!!}

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Appendix B: TWR Test report for first Acoustic Modem deep-water tests

Revision 1.0

OOI Open Ocean Glider Environmental Test Report

San Diego, California

May 31, 2012 - June 3, 2012

Authors:

Rob Pinelli Teledyne Benthos

Felipe Marcelino Teledyne Webb

John Dingess Teledyne Webb

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Appendix C: TWR Test report for second Acoustic Modem deep-water tests

OOI Open Ocean Glider Sea Test Report #2

San Diego, California

September 17, 2012 – September 26, 2012

Authors:

Rob Pinelli

Teledyne Benthos

John Dingess

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Felipe Marcelino

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