Verification Procedure & Results

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3166-70102	1-01

Test Case Name:	Test Plan Document #	Test Plan Rev.:	Test End Date:
MFM Instrument Data Acquisition and Telemetry	3166-70000	1-01	

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DOORS Verification Procedure ID	DOORS Verification Event ID	Test Results Reviewed	QA:	Date
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Test Description

This test consists of performing a series of command and controls operations to verify data transfer from all available instruments and sensors connected to the primary (ACOMM) and secondary (DOSTA, PHSEN and DOSTA) mooring controllers. Inductive modem and acoustic telemetry of data and commands will be tested. Inductive telemetry includes the CTDMO, ADCPS and communication between secondary and primary SIOC.

Requirements Addressed

L3-CG-RQ-163 CGSN platforms shall transmit data to shore.
L3-CG-RQ-164 CGSN platforms with telemetry links shall receive commands and status from CGSN shore-based assets.
L3-CG-RQ-217 Global Subsurface Flanking Moorings shall include an inductive telemetry link for transmission of data, commands and status to subsea resources not electrically connected to the mooring.
LC-CG-RQ-761 CGSN platforms shall be capable of having their sampling or operational protocols changed remotely via CGSN assets.
L3-CG-RQ-769 Global Subsurface Flanking Moorings shall include an underwater bi-directional communication capability for interfacing with assets not electrically connected to the mooring.
L3-CG-RQ-890 CGSN platforms without a CI presence and without sufficient bandwidth for real-time transfer of raw data, shall compress or decimate data.
L4-CG-PC-RQ-76 Platform Controllers shall be capable of autonomous operation based on one or more predefined missions.
L4-CG-PC-RQ-75 Platform Controllers shall be capable of initiating communications based on a predefined schedule.
L4-CG-PC-RQ-77 Platform Controllers shall be capable of responding to an external request to enable communications via an available telemetry device for that purpose.
L4-CG-PC-RQ-269 Platform Controllers shall time stamp engineering and science instrument data with a precision of 1 ms.
L4-CG-PC-RQ-625 Platform Controllers shall be capable of establishing communications with instruments on a mooring to obtain measurement data.
L4-CG-PC-RQ-626 Platform Controllers shall provide the capability to configure instrument sampling strategies, power duty cycles and operational durations.
L4-CG-PC-RQ-628 Platform Controllers shall log data from scientific instruments on the mooring.
L4-CG-PC-RQ-635 Platform Controllers shall provide the capability to compress or decimate recorded data.
L4-CG-PC-RQ-639 In the absence of GPS-based time string information, Platform Controllers shall maintain a time drift of no more than 0.16 seconds per day.
L4-CG-PC-RQ-643 Platform Controllers shall monitor and record data storage capacities.
L4-CG-PC-RQ-651 Platform Controllers shall provide access control capability for local recorded data, configuration files, and hardware settings.
L4-CG-PC-RQ-727 Platform Controllers shall provide the capability to accept mission control from the OMC.
L4-CG-PC-RQ-732 Platform Controllers shall have the capability to send platform status and data to the OMC over a telemetry link.
L4-CG-PC-RQ-738 Platform Controllers shall provide data logging capabilities for engineering sensors.
L4-CG-PC-RQ-742 Platform Controllers shall log scientific instrument data in native instrument format.
L4-CG-PC-RQ-775 Platform Controllers shall support remote operation, configuration, status reporting and scientific data retrieval when communicating via an available telemetry device for that purpose.
L4-CG-PC-RQ-840 Platform Controllers shall support an inductive bi-directional communications capability interface to communicate with assets on the mooring not electrically connected to the controller.
L4-CG-PC-RQ-861 SIO Platform Controllers shall communicate bi-directionally with Open Ocean Gliders per ICD 2103-10007

L4-CG-PC-RQ-861 SIO Platform Controllers shall communicate bi-directionally with Open Ocean Gliders per ICD 3102-10007.
L4-CG-PC-RQ-878 Platform Controllers shall be capable of receiving operational and diagnostic commands from ship/shore via any available telemetry channel.
L4-CG-PC-RQ-879 Platform Controllers shall be capable of transmitting operational and diagnostic responses and data to ship/shore.
L4-CG-MO-RQ-223 Inductive Mooring risers shall enable communications from surface or sub-surface platform controllers to sub-surface instruments mounted on the mooring riser.
L4-CG-TS-RQ-195 Inductive Telemetry components shall interface with Platform Controllers per ICD 3102-10008.
L4-CG-TS-RQ-197 Acoustic Telemetry components shall interface with Platform Controllers per ICD 3102-10009.
L4-CG-TS-RQ-198 Inductive telemetry systems shall interface to mooring riser components.
L4-CG-PC-RQ-846 The SIO Platform Controller should be capable of connecting to instruments via a serial communications interface.
L4-CG-PC-RQ-847 The SIO Platform Controller should be capable of connecting to instruments to provide power.
L4-CG-PC-RQ-631 Platform Controllers shall time stamp each engineering or science instrument data record with the platform time obtained at the time the record is read by the Platform Controller from the devi
L4-CG-PC-RQ-852 Platform Controller time stamps shall consist of a UTC entry.

Test Environment

- Main controller is located in load cage at burn-in site.
- Secondary controller is located in 64" sphere cage insert assembly at burn-in site.
- DOSTA, PHSEN, and FLORT are connected to secondary controller in 64" sphere cage insert, located at burn-in site.
- Inductive bypass cables are connected through cages and inductive instruments, all located at burn-in site.

Test Setup

Pre-Conditions:
- TC-001 has been completed and passed
- 64" sphere cage insert assembled with secondary controller and instruments
- Load cage assembled: main controller, remote acoustic modem
- Instruments and controllers are ready to be setup for test deployment mode
- All inductive cables at the MFM are connected
- Secondary controller, CTDMO instruments, ADCPS instrument and main controller are connected through inductive loop

Hardware Preparations:
- Test PC with serial RS232 port
- Local acoustic modem with transducer, RS-232-interface to test-PC
- Serial communication cables for main and secondary controller
- Open ocean glider dock server available

Software Preparation:
- Controller serial port configuration: 9600,8n1,none
- Controller terminal software: HyperTerm, RealTerm, TeraTerm
- Local acoustic modem serial port configuration: 9600,8n1,none
- OMC Dock server is ready for acoustic communications
- Printed versions of ICDs 3102-10008 and 3102-10009 are available

Test Artifacts

Test Artifacts consist of the Pass/Fail results for steps contained within this procedure as well as various log files.

Test Procedure 3166-70102 Rev 1-01				Test Results		
Step#	Instructions	Expected Results	Requirement ID	Observed Results	Pass/Fail	Notes
1	Connect serial communications cable from PC to secondary controller communications port. Start a terminal program and save the log file as follows: ***sn*_controller_*yyyymmdd*_tc002.log.**					

2	Press the <space> key to show ">" prompt. If you do not see a ">" command prompt, then press <ctrl>+x to exit sleep mode. The controller will now show a ">" command prompt. Type "0<enter>" to exit to PicoDOS. Press the <F7> key and select the right program. After the progrram is downloaded, press the"Enter" key to start the new program and follow					
3	Follow the menu and set all instrument sampling missions to default sampling scheme. Switch the SIOC to deployement mode and wait 24 hours. Type <space> then StopDeployment<enter> and download all the data from the controller. Make sure that the instruments were sampling as planned by looking at the timestamps written in the headers and data. Switch the SIOC back to deployment mode.	○ Verify the controller can power and communicate via serial and inductive and configure instruments as mentioned in ICDs. ○ Verify the time stamp of each engineering or science instrument data record correlates with the platform time obtained at the time the record is read by the Platform Controller. ○ Verify the time stamps contain a UTC entry.	L4-CG-PC-RQ-76 L4-CG-PC-RQ-75 L4-CG-PC-RQ-626 L4-CG-MO-RQ-223 L4-CG-TS-RQ-195 L4-CG-PC-RQ-846 L4-CG-PC-RQ-847 L4-CG-PC-RQ-631 L4-CG-PC-RQ-852			
4	Save and stop the log file.					
5	Let the instruments and controllers run for 2-3 days.	Platform data is logged in controller and acoustic modem.				
6	Connect serial communications cable from PC to local acoustic modem. Start a terminal program and save the log file as follows: sp_acomm_yyyymmdd_tc002.log					
7	Point the local modem towards the remote modem transducer so that they are within 4inches of each other. Create an acoustic baffle by surrounding both transducers with a single sheet of bubble wrap, leaving an opening so that the transducers have "line of sight" of each other. Turn on power to local modem (plug battery and push in power switch on modem). If you do not see the ">" prompt, then type					
8	Connect to primary controller via acoustic pass-through mode by typing: where n=acoustic ID of remote modem **at$kn<return>** type: **getstatus<return>** and wait 5 seconds for local acoustic modem to forward command to remote modem. Download the reply from the primary controller via remote modem by typing: **+++<return>** **dlfind -i p2<return>** wait 5 seconds for the local acoustic modem to forward the command to the remote modem. Remote modem will now respond with primary controller status response, thus confirming the command was	○ Verify that commands can be sent to controller via acoustic link as mentioned in ICDs.	L4-CG-PC-RQ-77 L4-CG-TS-RQ-197			
9	Connect to remote acoustic modem and query the #bytes stored in the remote modem by typing: where n=remote modem acoustic ID **AT$BNn<return>** Calculate the number of packets by: numpackets = #bytes/4096					
10	Download data from the acoustic modem by packets, "m", of remote modem by typing: where m = 0,1,2,3,...numpackets [data is logged in 4Kbyte blocks]					

11	Repeat the step above from m=0 to numpackets until all packets are received with CRC:Pass and check each steps in expected results are in accordance to ICDs	Verify that Secondary Controller ○ logs data from biochemical instruments (L4-CG-PC-RQ-76, L4-CG-PC-RQ-742) ○ logs status data (L4-CG-PC-RQ-76, L4-CG-PC-RQ-643, L4-CG-PC-RQ-738) ○ forwards all data to main controller upon request (L4-CG-PC-RQ-76) Verify that Main Controller ○ polls instruments and secondary controller over inductive link (L3-CG-RQ-217, L3-CG-RQ-769, L4-CG-PC-RQ-76, L4-CG-PC-RQ-75, L4-CG-PC-RQ-625, L4-CG-PC-RQ-628, L4-CG-PC-RQ-840, L4-CG-MO-RQ-223, L4-CG-TS-RQ-198) ○ logs data retrieved from instruments and secondary controller (L4-CG-PC-RQ-76, L4-CG-PC-RQ-742) ○ logs status data (L4-CG-PC-RQ-76, L4-CG-PC-RQ-643, L4-CG-PC-RQ-738) ○ forwards all data to remote acoustic modem in load cage (L3-CG-RQ-163, L3-CG-RQ-769) ○ accepts and response to commands trough acoustic link, both manually controlled and glider initiated ○ forwards commands retrieved through acoustic link to instruments and secondary controller via inductive link □ Acoustic modem in load cage transmits stored data to local acoustic modem (L4-CG-PC-RQ-651) ○ timestamps precisely by comparing its timestamp to	L3-CG-RQ-163 L3-CG-RQ-217 L3-CG-RQ-769 L3-CG-RQ-890 L4-CG-PC-RQ-76 L4-CG-PC-RQ-75 L4-CG-PC-RQ-269 L4-CG-PC-RQ-625 L4-CG-PC-RQ-628 L4-CG-PC-RQ-635 L4-CG-PC-RQ-639 L4-CG-PC-RQ-643 L4-CG-PC-RQ-651 L4-CG-PC-RQ-738 L4-CG-PC-RQ-742 L4-CG-PC-RQ-840 L4-CG-MO-RQ-223 L4-CG-TS-RQ-195 L4-CG-TS-RQ-197 L4-CG-TS-RQ-198			
12	Save and stop the log file.					
13	Using the glider dock server, save a log file as follows: **sn_glider_acomm_yyymmdd_tc002.log**					
14	Point the glider modem towards the remote modem transducer so that they are within 4inches of each other. Create an acoustic baffle by surrounding both transducers with a single sheet of bubble wrap, leaving an opening so that the transducers have "line of sight" of each other. Turn on power to the local glider modem If you do not see the ">" prompt, then type **+++<return>**					
15	Connect a CTDMO to the inductive line connected to the controller and program it to sample every 20 minutes. Put a glider close to the SIOC, with their respective acoustic modems facing each other. Use the glider shore server GUI to send to the SIOC **CTD:ChgPerTo5For120<return>** and wait for the command acknowledgement to arrive on the server. Wait an hour, download the data from the CTDMO and check that the sampling period was changed from 20 to 5 minutes. Check on the glider shore server data to see if all data were received. Check that the expected results are in	Verify that commands can be sent via OMC to controller via Iridium/acoustic link and instruments can be reprogrammed by the SIOC. Verify data telemetry from SIOC to shore server.	L3-CG-RQ-164 L4-CG-PC-RQ-77 LC-CG-RQ-761 L4-CG-PC-RQ-727 L4-CG-PC-RQ-775 L4-CG-PC-RQ-861 L4-CG-PC-RQ-878 L4-CG-PC-RQ-879 L4-CG-TS-RQ-197			
16	Using the glider shore server GUI, connect to remote acoustic modem and query the #bytes stored in the remote modem by typing: where n=remote modem acoustic ID **AT$BNn<return>** Calculate the number of packets by:		L4-CG-PC-RQ-861 L4-CG-PC-RQ-732			

17	Download data from the acoustic modem by packets, "m", of remote modem by typing: where m = 0,1,2,3,...numpackets [data is logged in 4Kbyte blocks]		L4-CG-PC-RQ-861			
18	Repeat the step above from m=0 to numpackets until all packets are received with CRC:Pass and check each that steps in expected results are in accordance to ICDs	Verify that Secondary Controller ○ logs data from biochemical instruments (L4-CG-PC-RQ-76, L4-CG-PC-RQ-742) ○ logs status data (L4-CG-PC-RQ-76, L4-CG-PC-RQ-643, L4-CG-PC-RQ-738) ○ forwards all data to main controller upon request (L4-CG-PC-RQ-76) Verify that Main Controller ○ polls instruments and secondary controller over inductive link (L3-CG-RQ-217, L3-CG-RQ-769, L4-CG-PC-RQ-76, L4-CG-PC-RQ-75, L4-CG-PC-RQ-625, L4-CG-PC-RQ-628, L4-CG-PC-RQ-840, L4-CG-MO-RQ-223, L4-CG-TS-RQ-198) ○ logs data retrieved from instruments and secondary controller (L4-CG-PC-RQ-76, L4-CG-PC-RQ-742) ○ logs status data (L4-CG-PC-RQ-76, L4-CG-PC-RQ-643, L4-CG-PC-RQ-738) ○ forwards all data to remote acoustic modem in load cage (L3-CG-RQ-163, L3-CG-RQ-769) ○ accepts and response to commands trough acoustic link, both manually controlled and glider initiated ○ forwards commands retrieved through acoustic link	L3-CG-RQ-163 L3-CG-RQ-217 L3-CG-RQ-769 L3-CG-RQ-890 L4-CG-PC-RQ-76 L4-CG-PC-RQ-75 L4-CG-PC-RQ-269 L4-CG-PC-RQ-625 L4-CG-PC-RQ-628 L4-CG-PC-RQ-635 L4-CG-PC-RQ-639 L4-CG-PC-RQ-643 L4-CG-PC-RQ-651 L4-CG-PC-RQ-732 L4-CG-PC-RQ-738 L4-CG-PC-RQ-742 L4-CG-PC-RQ-840 L4-CG-MO-RQ-223 L4-CG-TS-RQ-195 L4-CG-TS-RQ-197 L4-CG-TS-RQ-198		
19	Save and stop the log file.					