Spreadsheet

M B A R I

Interfaces on the initial (engineering) MOOS deployment

Monterey Bay Aquarium Research Institute
7700 Sandholdt Rd.
Moss Landing, CA 95039-9644

Drawn by: Lance McBride
Date: 9/11/2002
Doc. #: 1001474
Rev: D.2

Purpose
1. Reliability of data/power cable & mooring mechanical hardware
2. Reliability/feasability of ROV operations in connection to mooring

Items to monitor
1. Loads
2. Visual wear
3. Sea keeping ability
4. Riser strain releif
   a. length
   b. connection position
   c. connection wear
   d. connection movement
5. Meteorology using M2 or local NOAA

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
Responsible Engineer		**Signal Description**	**Supply voltage & current**	**Sensor interface**	**Input Sensor range / units**	**Desired Precision**	**Desired Accuracy (% error)**	**Desired ADC resolution**	**Software Sample frequencv**	**Log Interval**				**Actual Software Values**			**Software Conversion**	**Log/Display range**	**Log / Send/Event**	**Software Channel**	**Return data to shore via RF?**	**Notes**
														ADC	**ADC Range**	**ADC Precision**						
Software	Hardware	Surface side								current	min	max	avg									
Mike Risi	Ed Mellenger	*Power System – 0.1% accuracy & resolution (desired)*																				
Mike Risi	Ed Mellenger	*Seawater Battery (prototype)*																				
Mike Risi	Ed Mellenger	Battery Voltage 1 - chemistry type A	n/a	Analog	0 to 2 VDC	1mV	1%	11-bit	1/min	n/a	1 hr	1 hr	1 hr	12-bit	10V	2.441mV	Linear Scale	0 to 2 VDC	Log/Send	Serial via DPA	no	0 to 1VDC, up to 4 batteries, simple voltage across a resistor
Mike Risi	Ed Mellenger	Battery Voltage 2 - chemistry type B	n/a	Analog	0 to 2 VDC	1mV	1%	11-bit	1/min	n/a	1 hr	1 hr	1 hr	12-bit	10V	2.441mV	Linear Scale	0 to 2 VDC	Log/Send	Serial via DPA	no	0 to 1VDC, up to 4 batteries, simple voltage across a resistor
Mike Risi	Ed Mellenger	Battery Voltage 3 - chemistry type C	n/a	Analog	0 to 2 VDC	1mV	1%	11-bit	1/min	n/a	1 hr	1 hr	1 hr	12-bit	10V	2.441mV	Linear Scale	0 to 2 VDC	Log/Send	Serial via DPA	no	0 to 1VDC, up to 4 batteries, simple voltage across a resistor
Mike Risi	Ed Mellenger	Battery Voltage 4 - chemistry type D	n/a	Analog	0 to 2 VDC	1mV	1%	11-bit	1/min	n/a	1 hr	1 hr	1 hr	12-bit	10V	2.441mV	Linear Scale	0 to 2 VDC	Log/Send	Serial via DPA	no	0 to 1VDC, up to 4 batteries, simple voltage across a resistor
Mike Risi	Ed Mellenger	*Battery (possibly two battery banks up to 8 batteries)*																				
Mike Risi	Ed Mellenger	Battery Current Sensor Enable	n/a	Digital	n/a	n/a	n/a	n/a	1/day?	n/a	n/a	n/a	n/a					On/Off	n/a	Serial via DPA	no	Turns on the current sensors prior to take current measurements
Mike Risi	Ed Mellenger	Battery Current 1	n/a	Analog	10A	7.5mA	0.10%	12-bit	1/sec	n/a	1 hr	1 hr	1 hr	12-bit	10V	2.441mV	+192mV/A + 5V	-10 to +10 A	Log/Send	Serial via DPA	no	Current to voltage measurement (sensor = +5Voffset, 192mV/A 10A range)
Mike Risi	Ed Mellenger	Battery Current 2	n/a	Analog	10A	7.5mA	0.10%	12-bit	1/sec	n/a	1 hr	1 hr	1 hr	12-bit	10V	2.441mV	+192mV/A + 5V	-10 to +10 A	Log/Send	Serial via DPA	no	Current to voltage measurement - leave if we can (sensor = +5Voffset, 192mV/A 10A range)
Mike Risi	Ed Mellenger	Battery Current 3	n/a	Analog	10A	7.5mA	0.10%	12-bit	1/sec	n/a	1 hr	1 hr	1 hr	12-bit	10V	2.441mV	+192mV/A + 5V	-10 to +10 A	Log/Send	Serial via DPA	no	Current to voltage measurement - leave if we can (sensor = +5Voffset, 192mV/A 10A range)
Mike Risi	Ed Mellenger	Battery Current 4	n/a	Analog	10A	7.5mA	0.10%	12-bit	1/sec	n/a	1 hr	1 hr	1 hr	12-bit	10V	2.441mV	+192mV/A + 5V	-10 to +10 A	Log/Send	Serial via DPA	no	Current to voltage measurement - leave if we can (sensor = +5Voffset, 192mV/A 10A range)
Mike Risi	Ed Mellenger	Battery Current 5	n/a	Analog	10A	7.5mA	0.10%	12-bit	1/sec	n/a	1 hr	1 hr	1 hr	12-bit	10V	2.441mV	+192mV/A + 5V	-10 to +10 A	Log/Send	Serial via DPA	no	Current to voltage measurement - leave if we can (sensor = +5Voffset, 192mV/A 10A range)
Mike Risi	Ed Mellenger	Battery Current 6	n/a	Analog	10A	7.5mA	0.10%	12-bit	1/sec	n/a	1 hr	1 hr	1 hr	12-bit	10V	2.441mV	+192mV/A + 5V	-10 to +10 A	Log/Send	Serial via DPA	no	Current to voltage measurement - leave if we can (sensor = +5Voffset, 192mV/A 10A range)
Mike Risi	Ed Mellenger	Battery Current 7	n/a	Analog	10A	7.5mA	0.10%	12-bit	1/sec	n/a	1 hr	1 hr	1 hr	12-bit	10V	2.441mV	+192mV/A + 5V	-10 to +10 A	Log/Send	Serial via DPA	no	Current to voltage measurement - leave if we can (sensor = +5Voffset, 192mV/A 10A range)
Mike Risi	Ed Mellenger	Battery Current 8	n/a	Analog	10A	7.5mA	0.10%	12-bit	1/sec	n/a	1 hr	1 hr	1 hr	12-bit	10V	2.441mV	+192mV/A + 5V	-10 to +10 A	Log/Send	Serial via DPA	no	Current to voltage measurement - leave if we can (sensor = +5Voffset, 192mV/A 10A range)
Mike Risi	Ed Mellenger	Battery Voltage	n/a	Analog	0 to between 8 & 16 VDC	10mV	0.10%	11-bit	1/sec	n/a	1 hr	1 hr	1 hr	12-bit	10V	2.441mV	Linear Scale	0 to between 8 & 16 VDC	Log/Send	Serial via DPA	no	
Mike Risi	Ed Mellenger	Water detection 1	n/a	Analog	0 to +5V	100mV	5%	6-bit	1/sec	instantaneous	n/a	n/a	n/a	12-bit	10V	2.441mV	Linear Scale	0 to +5V	Log/Send/Event	Serial via DPA	no	Is there moisture in the battery case
Mike Risi	Ed Mellenger	Water detection 2	n/a	Analog	0 to +5V	100mV	5%	6-bit	1/sec	instantaneous	n/a	n/a	n/a	12-bit	10V	2.441mV	Linear Scale	0 to +5V	Log/Send/Event	Serial via DPA	no	Is there moisture in the battery case
Mike Risi	Ed Mellenger	Water detection 3	n/a	Analog	0 to +5V	100mV	5%	6-bit	1/sec	instantaneous	n/a	n/a	n/a	12-bit	10V	2.441mV	Linear Scale	0 to +5V	Log/Send/Event	Serial via DPA	no	Is there moisture in the battery case
Mike Risi	Ed Mellenger	Water detection 4	n/a	Analog	0 to +5V	100mV	5%	6-bit	1/sec	instantaneous	n/a	n/a	n/a	12-bit	10V	2.441mV	Linear Scale	0 to +5V	Log/Send/Event	Serial via DPA	no	Is there moisture in the battery case
Mike Risi	Ed Mellenger	Water detection 5	n/a	Analog	0 to +5V	100mV	5%	6-bit	1/sec	instantaneous	n/a	n/a	n/a	12-bit	10V	2.441mV	Linear Scale	0 to +5V	Log/Send/Event	Serial via DPA	no	Is there moisture in the battery case
Mike Risi	Ed Mellenger	Water detection 6	n/a	Analog	0 to +5V	100mV	5%	6-bit	1/sec	instantaneous	n/a	n/a	n/a	12-bit	10V	2.441mV	Linear Scale	0 to +5V	Log/Send/Event	Serial via DPA	no	Is there moisture in the battery case
Mike Risi	Ed Mellenger	Water detection 7	n/a	Analog	0 to +5V	100mV	5%	6-bit	1/sec	instantaneous	n/a	n/a	n/a	12-bit	10V	2.441mV	Linear Scale	0 to +5V	Log/Send/Event	Serial via DPA	no	Is there moisture in the battery case
Mike Risi	Ed Mellenger	Water detection 8	n/a	Analog	0 to +5V	100mV	5%	6-bit	1/sec	instantaneous	n/a	n/a	n/a	12-bit	10V	2.441mV	Linear Scale	0 to +5V	Log/Send/Event	Serial via DPA	no	Is there moisture in the battery case
Mike Risi	Ed Mellenger	*Solar panels (each of four)*																				
Mike Risi	Ed Mellenger	Array Current North	n/a	Analog	10A	2.5mA	0.10%	12-bit	1/sec	n/a	1 hr	1 hr	1 hr	12-bit	10V	2.441mV	+192mV/A + 5V	-10 to +10 A	Log/Send	Serial via DPA	no	Current to voltage measurement (sensor = +5Voffset, 192mV/A 10A range)
Mike Risi	Ed Mellenger	Array Current East	n/a	Analog	10A	2.5mA	0.10%	12-bit	1/sec	n/a	1 hr	1 hr	1 hr	12-bit	10V	2.441mV	+192mV/A + 5V	-10 to +10 A	Log/Send	Serial via DPA	no	Current to voltage measurement (sensor = +5Voffset, 192mV/A 10A range)
Mike Risi	Ed Mellenger	Array Current South	n/a	Analog	10A	2.5mA	0.10%	12-bit	1/sec	n/a	1 hr	1 hr	1 hr	12-bit	10V	2.441mV	+192mV/A + 5V	-10 to +10 A	Log/Send	Serial via DPA	no	Current to voltage measurement (sensor = +5Voffset, 192mV/A 10A range)
Mike Risi	Ed Mellenger	Array Current West	n/a	Analog	10A	2.5mA	0.10%	12-bit	1/sec	n/a	1 hr	1 hr	1 hr	12-bit	10V	2.441mV	+192mV/A + 5V	-10 to +10 A	Log/Send	Serial via DPA	no	Current to voltage measurement (sensor = +5Voffset, 192mV/A 10A range)
Mike Risi	Ed Mellenger	Array Voltage North	n/a	Analog	0 to 50 VDC	25mV	0.10%	11-bit	1/sec	n/a	1 hr	1 hr	1 hr	12-bit	10V	2.441mV	Linear Scale	0 to 50 VDC	Log/Send	Serial via DPA	no	
Mike Risi	Ed Mellenger	Array Voltage East	n/a	Analog	0 to 50 VDC	25mV	0.10%	11-bit	1/sec	n/a	1 hr	1 hr	1 hr	12-bit	10V	2.441mV	Linear Scale	0 to 50 VDC	Log/Send	Serial via DPA	no	
Mike Risi	Ed Mellenger	Array Voltage South	n/a	Analog	0 to 50 VDC	25mV	0.10%	11-bit	1/sec	n/a	1 hr	1 hr	1 hr	12-bit	10V	2.441mV	Linear Scale	0 to 50 VDC	Log/Send	Serial via DPA	no	
Mike Risi	Ed Mellenger	Array Voltage West	n/a	Analog	0 to 50 VDC	25mV	0.10%	11-bit	1/sec	n/a	1 hr	1 hr	1 hr	12-bit	10V	2.441mV	Linear Scale	0 to 50 VDC	Log/Send	Serial via DPA	no	
Mike Risi	Ed Mellenger	Load resistor (lost potential energy)	n/a	Analog	0 to 16 VDC	10mV	0.10%	11-bit	1/sec	n/a	1hr	1hr	1hr	12-bit	10V	2.441mV	Linear Scale	0 to 16 VDC	Log/Send	Serial via DPA	no	simple voltage across a resistor after a 12V zener
Mike Risi	Ed Mellenger	*Wind Turbine*																				
Mike Risi	Ed Mellenger	Load resistor (lost potential energy)	n/a	Analog	0 to 16 VDC	10mV	0.10%	11-bit	1/sec	n/a	1hr	1hr	1hr	12-bit	10V	2.441mV	Linear Scale	0 to 16 VDC	Log/Send	Serial via DPA	no	simple voltage across a resistor after a 12V zener
Mike Risi	Ed Mellenger	*Power Feed (NMC)*																				
Mike Risi	Ed Mellenger	Current	n/a	Analog	10A	2mA	0.10%	12-bit	10/sec	n/a	1hr	1hr	1hr	12-bit	10V	2.441mV	+192mV/A + 5V	-10 to +10 A	Log/Send	Serial via DPA	no	Current to voltage measurement (sensor = +5Voffset, 192mV/A 10A range)
Mike Risi	Ed Mellenger	*Cable Feed*																				
Mike Risi	Ed Mellenger	Cable Current	n/a	Analog	10A	0.25mA	0.10%	12-bit	10/sec	n/a	1hr	1hr	1hr	12-bit	10V	2.441mV	+192mV/A + 5V	-10 to +10 A	Log/Send	Serial via DPA	no	Current to voltage measurement (sensor = +5Voffset, 192mV/A 10A range)
Mike Risi	Ed Mellenger	Cable Voltage	n/a	Analog	0 to 500 VDC	1V	0.10%	9-bit	10/sec	n/a	1hr	1hr	1hr	12-bit	10V	2.441mV	Linear Scale	0 to 500 VDC	Log/Send	Serial via DPA	no	
Mike Risi	Ed Mellenger	Ground fault	n/a	Analog	-1mA to +1mA	5mV	0.10%	10-bit	interupt	instantaneous	n/a	n/a	n/a	12-bit	10V	2.441mV	Linear Scale	0 to +5V	Log/Send/Event	Serial via DPA	no	
Mike Risi	Ed Mellenger	*Environmental (power housing)*																				
Mike Risi	Ed Mellenger	Pwr Hsg Temp	n/a	Analog	TBD	2c	1%	6-bit	1/min	n/a	1 hr	1 hr	1 hr	12-bit	10V	2.441mV	Calib. Lkup Tbl	-25 to +75c	Log/Send	Serial via DPA	no	
Mike Risi	Ed Mellenger	Pwr Hsg Humidity	n/a	Analog	0-100%	5%	1%	5-bit	1/min	n/a	1 hr	1 hr	1 hr	12-bit	10V	2.441mV	Linear Scale	0 to 100%	Log/Send	Serial via DPA	no	0.8V @ 0%, 3.65V @ 100%
Mike Risi	Ed Mellenger	*Controller with data storage*																				
Mike Risi	Ed Mellenger	Pwr Sys Control Functions																				
Rich Henthorn	Mark Chaffey	Heave Wave sensor	12-14 VDC @ 45mA	Serial																Serial via DPA	yes	Triaxys
Rich Henthorn	Mark Chaffey	i Spectral Analysis Statistics																				
Rich Henthorn	Mark Chaffey	*Significant Wave Height (Hmo)*			not specified	not specified	2%	n/a	35 minutes	n/a	n/a	n/a	35 minutes					0.000 to 9.999m	Log/Send	n/a		See Triaxys manual
Rich Henthorn	Mark Chaffey	*Peak Period (Tp, Tp5)*			not specified	not specified	2%	n/a	35 minutes	n/a	n/a	n/a	35 minutes					0.000 to 9.999s	Log/Send	n/a		See Triaxys manual
Rich Henthorn	Mark Chaffey	*Mean Spectral Period (Tz)*			not specified	not specified	2%	n/a	35 minutes	n/a	n/a	n/a	35 minutes					see manual	Log/Send	n/a		See Triaxys manual
Rich Henthorn	Mark Chaffey	i Zero Crossing Statistics																				
Rich Henthorn	Mark Chaffey	*Significant Wave Height (Hs)*			not specified	not specified	2%	n/a	35 minutes	n/a	n/a	n/a	35 minutes					0.000 to 9.999m	Log/Send	n/a		See Triaxys manual
Rich Henthorn	Mark Chaffey	*Maximum Wave Height (Hmax)*			not specified	not specified	2%	n/a	35 minutes	n/a	n/a	n/a	35 minutes					0.000 to 9.999m	Log/Send	n/a		See Triaxys manual
Rich Henthorn	Mark Chaffey	*Height of Highest 10% of Waves (H10)*			not specified	not specified	2%	n/a	35 minutes	n/a	n/a	n/a	35 minutes					see manual	Log/Send	n/a		See Triaxys manual
Rich Henthorn	Mark Chaffey	*Average Wave Height (Hav.)*			not specified	not specified	2%	n/a	35 minutes	n/a	n/a	n/a	35 minutes					0.000 to 9.999s	Log/Send	n/a		See Triaxys manual
Rich Henthorn	Mark Chaffey	*Average Wave Period (Tav.)*			not specified	not specified	2%	n/a	35 minutes	n/a	n/a	n/a	35 minutes					0.000 to 9.999s	Log/Send	n/a		See Triaxys manual
Rich Henthorn	Mark Chaffey	*Average Period of H10 (T10)*			not specified	not specified	2%	n/a	35 minutes	n/a	n/a	n/a	35 minutes					see manual	Log/Send	n/a		See Triaxys manual
Rich Henthorn	Mark Chaffey	*Significant Wave Period (Ts)*			not specified	not specified	2%	n/a	35 minutes	n/a	n/a	n/a	35 minutes					0.000 to 9.999s	Log/Send	n/a		See Triaxys manual
Rich Henthorn	Mark Chaffey	*Zero Crossings*			not specified	not specified	2%	n/a	35 minutes	n/a	n/a	n/a	35 minutes					see manual	Log/Send	n/a		See Triaxys manual
Rich Henthorn	Mark Chaffey	I Power (non-directional) Spectra																				
Rich Henthorn	Mark Chaffey	*Energy for Each Frequency Band*			not specified	not specified	2%	n/a	35 minutes	n/a	n/a	n/a	35 minutes					see manual	Log/Send	n/a		See Triaxys manual
Mike Risi	Mark Chaffey	buoy tension load cell (strain guage)	13-24VDC @ ?? mA	Analog	0-10,000lb	2.5lb	0.20%	12-bit	4/sec	250ms	10 min	10 min	10 min	12-bit	4-20mA	4.88uA	T = x /1.6uA	0 to 10,000 lbs. Tension	Log/Send	Serial via DPA	yes	Wheatstone bridge - voltage measurement (measuring axial strain)
	Mark Chaffey	Environmental																				METSYS or ASIMET or other?
Tom O'Reilly	Mark Chaffey	compass	8-18 VDC @ 40mA.	Serial	current heading 0-360, turns +/-100	0.5 deg	1 deg	n/a	1/sec	n/a	n/a	n/a	1 min					current heading 0-360, turns +/-100	Log/Send	Sidekick serial	no	KVH compass
Tom O'Reilly	Lance McBride	*Turns indicator*	n/a	Software	see compass	0.1 turn	0.2 turn	n/a	1/sec	n/a	10min	10min	10min					-155..+155 turns	Log/Send	n/a	yes	**integrate the sampled compass heading. +1 for every pass of +360Ô -1 for every pass of -360Ô**
Mike Risi	Mark Chaffey	Fiber Optic Source	9V @ ?? mA																			Calibrated fiber optic laser source
Mike Risi	Mark Chaffey	Fiber Optic Receiver - Source	+4.8 to +12VDC @ <60mA	Analog	-45 to +10 dBm	0.01 dB	5%	13-bit	4/sec	250ms	1 hr	1 hr	1 hr	12-bit	10V	2.441mV	TBD	TBD	Log/Send	Serial via DPA	yes	Calibrated fiber optic receiver
Mike Risi	Mark Chaffey	Fiber Optic Receiver - Line 1	+4.8 to +12VDC @ <60mA	Analog	-45 to +10 dBm	0.01 dB	5%	13-bit	4/sec	250ms	1 hr	1 hr	1 hr	12-bit	10V	2.441mV	TBD	TBD	Log/Send	Serial via DPA	yes	Calibrated fiber optic receiver
Mike Risi	Mark Chaffey	Fiber Optic Receiver - Line 2	+4.8 to +12VDC @ <60mA	Analog	-45 to +10 dBm	0.01 dB	5%	13-bit	4/sec	250ms	1 hr	1 hr	1 hr	12-bit	10V	2.441mV	TBD	TBD	Log/Send	Serial via DPA	yes	Calibrated fiber optic receiver
	Lance McBride	MBARI wireless comms (VHF, Freewave, satellite, etc.)																				
Tim Meese	Lance McBride	- Satellite (Iridium, Orbcomm, Globalstar)	5.6-16VDC @ 1Amax	Serial	N/A	N/A	N/A	n/a	N/A	n/a	N/A	N/A	N/A					N/A	n/a	SideARM serial	no	Over the horizon comms
Tim Meese	Lance McBride	- Link strength	n/a	Software	0 to +50dbm	0.1dbm	1%	n/a	1/min	n/a	15min	15min	15min					0 to +50dbm	Log/Send	n/a	yes	Accurate report of link margin (RSSI via AT$QCSTATUS)
n/a	Lance McBride	- Local (BT console)	9-30VDC @ 500mW	Serial	N/A	N/A	N/A	n/a	N/A	n/a	N/A	N/A	N/A					N/A	n/a	SideARM serial	no	Ship to buoy comms
n/a	Lance McBride	- ARGOS transponder (ELT)	Stand Alone	Stand Alone	N/A	N/A	N/A	n/a	N/A	n/a	N/A	N/A	N/A					N/A	n/a	n/a	no	SEIMAC SMART CAT III, Sat Comms.
Kent Headley	Lance McBride	GPS	6-40VDC @ 870mWtyp	Serial	-180..+180N/S, -180..+180E/W	0.0001deg	100m	n/a	1/min	n/a	10min	10min	10min					-180..+180N/S, -180..+180E/W	Log/Send	Serial via DPA	yes	Are we implementing the 1ms (?) timing accuracy
n/a	Lance McBride	Pager (reset)	1.5V @ ??mA	2-wire differential	n/a	n/a	n/a	n/a	interupt	instantaneous	n/a	n/a	n/a					N/A	Log/Send	reset line	no	Satellite (?) reset for processor wakeup
Kent Headley	Lance McBride	SideKick																				
Kent Headley	Lance McBride	ground fault	n/a	Digital	0 or +5V	n/a	n/a	n/a	interupt	instantaneous	n/a	n/a	n/a					0 or +5V	Log/Send	Sidekick	no	
Kent Headley	Lance McBride	moisture detection	n/a	Digital	0 or +5V	n/a	n/a	n/a	interupt	instantaneous	n/a	n/a	n/a					0 or +5V	Log/Send	Sidekick	no	
		Riser cable																				
		no monitoring																				
		Benthic side																				
Mike Risi	Mark Chaffey	anchor tension load cell (strain gauge)	13-24VDC @ ?? mA	Analog	0-10,000lb	2.5lb	0.20%	12-bit	4/sec	250ms	10 min	10 min	10 min	12-bit	4-20mA	4.88uA	T = x /1.6uA	0 to 10,000 lbs. Tension	Log/Send	Serial via DPA	yes	Wheatstone bridge - voltage measurement (measuring axial strain)
n/a	Lance McBride	locator beacon, "homer" (contact Mike Conway 1wk prior to deployment)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a					n/a	Log/Send	n/a	no	Sonic location beacon (self-powered)