

RV Langseth Data Reduction Summary

MGL1208

Honolulu, HI – Honolulu, HI

FINAL

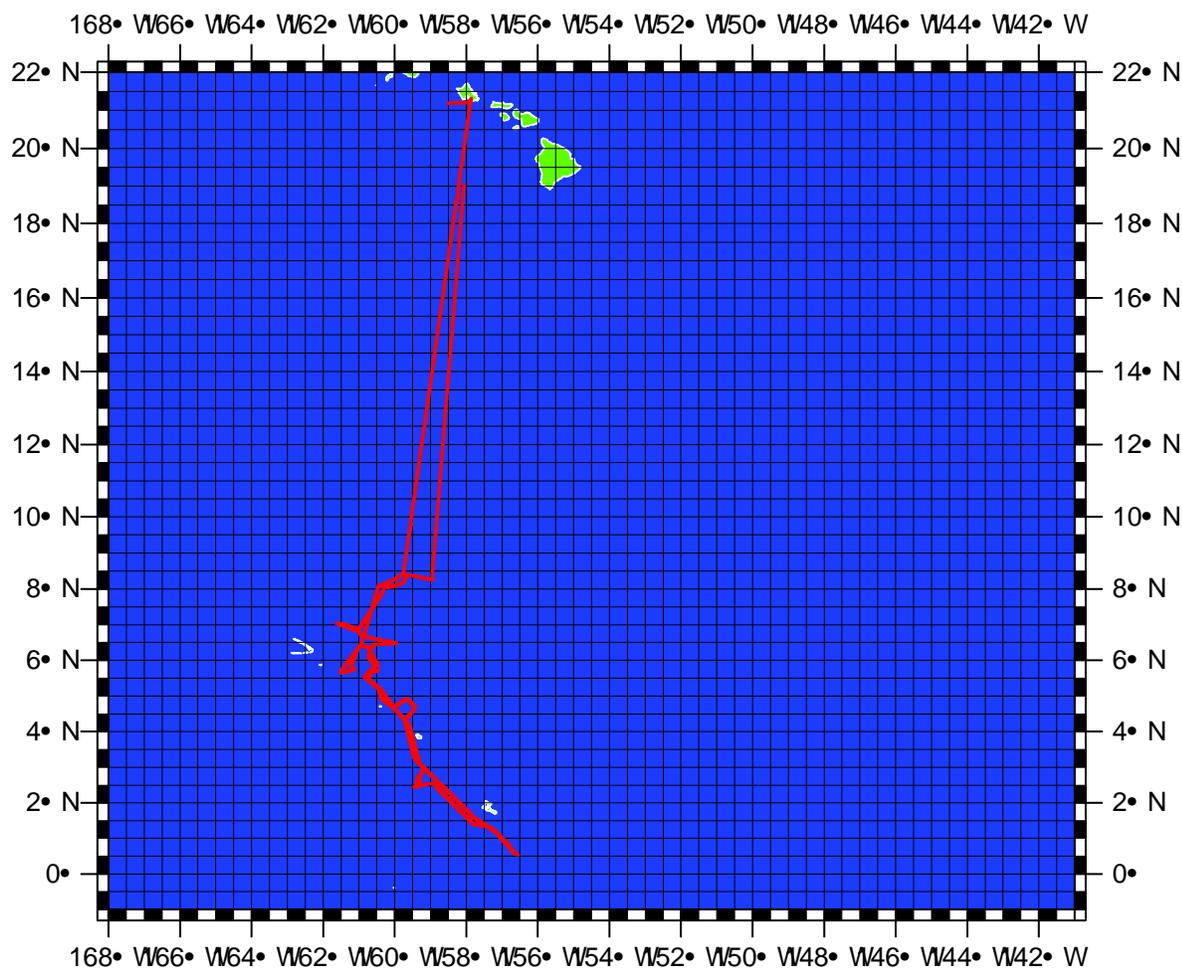
V1.1, 2012-06-21

Lamont-Doherty Earth Observatory, Columbia University

Saturday May 26th 2012 08:00:00L

Date	Julian Date	Time	Port
2012-05-01	2012-124	0000 UTC, 0200L	Honolulu, HI
2012-05-26	2012-150	1500 UTC, 0500L	Honolulu, HI

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GMD 2012 May 26 02:15:52 MGL1208 • Cruise Track

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Please refer to the Langseth Data Report Supplement for information regarding data formats.

I. Background and Scientific Objectives

(Pulled from foreign clearance application information submitted by PI)

We will survey selected areas of the Line Islands Ridge that appear promising for collecting cores suitable for paleoceanographic work. We will also collect water samples, multi-cores, gravity cores, and piston cores from a meridional transect of sites along the ridge. This new material will be used for geochemical and micropaleontological studies of past changes in the Pacific Marine Intertropical Convergence zone El Nino/Southern Oscillation over time scales of thousands to hundreds of thousands of years. Better understanding these important atmospheric phenomenon in the past can constrain the ocean-atmosphere models which predict future climatic change. In addition, the material will be used to better understand the history and controls on biological productivity in the tropical Pacific. The materials we collect will allow us to investigate the behavior of the tropical Pacific ocean-climate system during the past. Previous work using corals and Lake sediments on or near the northern Line Islands has been limited to the last 1000 years, and previous work on longer time scales has been on sediments from deeper waters which are compromised by dissolution.

II. Personnel

Shipboard Technical Staff

1	David Martinson	Chief Science Officer
2	Tom Spoto	Science Officer
3	Lisa Hawkins	Marine Tech
4	Robb Hagg	UNOLS Tech
5	Tina Thomas	Tech (Duke University)
6	Mike Martello	Navigator/Tech (Geomotive)
7	Chris Francis	Source Mechanic (Geomotive)
8	Mike Tatro	Source Mechanic (Geomotive)
9	West Groves	Source Mechanic (Geomotive)

Ship's Crew

1	Mark Landow	Captain
2	Lee Dortzbach	Chief Mate
3	Breckenridge Crum	2 nd Mate
4	West Wilson	3 rd Mate
5	Jason Woronowicz	Bosun
6	Inocencio Rimando	AB
7	Ben Nadler	AB
8	Glenice James	AB
9	Joshua Schaffner	OS
10	Joselyn White	OS
11	Steve Pica	Chief Engineer
12	Matt Tucke	1 st Asst. Engineer
13	Michael Romero	2 nd Asst. Engineer
14	Ross Himebauch	3 rd Asst. Engineer
15	Jack Schwartz	Electrician
16	Jack Billings	Oiler
17	Rudy Florendo	Oiler
18	Fernando Uribe	Oiler
19	Hervin McLean-Fuller	Steward
20	Ricardo Rios	Cook

Science Party

1	Jean Lynch-Stieglitz	Co-Chief Scientist (Georgia Tech)
2	Pratigya Polissar	Co-Chief Scientist (LDEO))
3	Mitch Lyle	Scientist (TAMU)
4	Rob Pockalny	Scientist (URI)
5	Richard Murray	Scientist (Boston U)
6	Steve Hovan	Scientist (U of Pennsylvania)
7	Samantha Bova	Grad Student (Brown)
8	Victor Castro	Post Doc (UCSC)
9	Ann Dunlea	Grad Student (Boston U)
10	Heather Ford	Grad Student (UCSC)
11	Jennifer Hertzberg	Grad Student (TAMU)
12	Allison Jacobel	Grad Student (LDEO)
13	Christina King	Grad Student (URI)
14	Ashley Maloney	Grad Student (UW)
15	Julia Shackford	Grad Student (TAMU)
16	Katherine Wejnert	Grad Student (Georgia Tech)
17	Ruifang Xie	Post Doc (TAMU)

PSO staff

1	Heidi Ingram	PSO-RPS Energy
2	Emily Ellis	PSO-RPS Energy
3	Tatiana Moreno	PSO-RPS Energy

OSU Coring staff

1	Chris Moser	OSU
2	Paul Walczak	OSU
3	Maziet Cheseby	OSU
4	Eric Arnesen	OSU

III. Instrumentation Summary

All science instruments aboard the Langseth are listed below with data formats in section VII. Summary notes on operation during this cruise are listed below. Seismic equipment is not listed here; refer to Part IV for the seismic summary. Other instruments not listed were not in operation.

Instrument Data Files

Instrument	Description	Data Set	Data Outputs	Files	Interval
FE700	Furuno FE700 Echosounder	N/A	serial logs	MGL-bath01.*	1s
EM122	Kongsberg EM122 Multibeam Sonar	Partial	raw output to file	See below	variable
			centerbeam serial logs	MGL-bath02.*	variable
KNUDSEN	Knudsen Engineering 3260 Sub-bottom Profiler	Partial	KEA, KEB, SEG-Y	See below	variable
DS50	Furuno DS50 Doppler Speedlog	Full	serial logs	MGL-slog01.*	1s
XBT/XCT	Sippican MK21 XBT/XCTD Launcher	N/A	raw output to file	See below	n/a
			converted output to file	See below	n/a
WX1	RM Young 5103 Weather Bird and	Full	serial logs	MGL-wx01.*	1s
			mwv conversion	MGL-mwv01.*	1s
TSG	SeaBird SBE45 Thermosalinograph	Full	raw serial logs	MGL-tsgraw.*	1s
CNAV	C&C Tech. CNAV 2000 DGPS Receiver	Full	serial logs	MGL-cnav.*	1s
CNAV3050	C&C Tech. CNAV 3050 DGPS Receiver	Full	raw serial logs	MGL-cnav3050all.*	1s
			converted data	MGL-cnav3050.*	1s
MAG01	GeoMetrics 882 Magnetometer	N/A	serial logs	MGL-mag01.*	1s
BGM	Bell Aerospace BGM-3 Gravimeter	Full	serial logs	MGL-vc01.*	1s
GYRO	Simrad GC80 Gyrocompass/AD100	Full	serial logs	MGL-gy01.*	1s
POSMV	Applanix POSMV Integrated Nav System	N/A	serial logs	MGL-posmv.*	1s
SEAPATH	Kongsberg SeaPath Integrated Nav System	Full	serial logs	MGL-seapath.*	1s
STU	Sercel Streamer Tension	N/A	serial logs	MGL-stu1.*	15s
MICROSV	Applied Microsystems Sound Velocity Pod Unit #1	Full	serial logs	MGL-svpod01.*	1s
MICROSV	Applied Microsystems Sound Velocity Pod Unit #2	Full	serial logs	MGL-svpod02.*	1s
SBE38	SeaBird SBE38 Pod Thermometer Pod Unit #1	Full	serial logs	MGL-tempod01.*	1s
SBE38	SeaBird SBE38 Pod Thermometer Pod Unit #2	Full	serial logs	MGL-tempod02.*	1s
PCO2	LDEO PCO2 System	Full	serial logs	MGL-pco2.*	~180s

All timestamps in this report are presented using UTC time and day of year in order to avoid confusion with local time changes.

Science Navigation Instrumentation

FE700

Logging interval: 1 second

File id: bath01

The FE700 only operated up to 800m depth. The echosounder is normally switched off before the unit goes out of depth.

Interruptions greater than ten seconds are displayed in the following table.

Log Date	Event	Comment
2012:150:13:39:29.1695 - 2012:150:14:24:10.8810	Missing data	Secured after 500 meters

bath01 data sample:

bath01	2008:220:13:45:42.0681	\$SDDBT,,,,,,
bath01	2008:220:13:45:42.0690	\$SDDBS,,,,,,
bath01	2008:220:13:45:42.0691	\$SDDPT,,0006.6*49
bath01	2008:220:13:45:42.1482	\$PFEC,Alarm,0,0*6F
bath01	2008:220:13:45:42.1483	\$PFEC,xdr,FORE,050*79

EM-122 Mutibeam

The EM122 multibeam sonar was operated throughout the cruise. The system is designed for deeper water, and does not track ground well in less than 50m of water.

EM122 swath data is saved to the cruise archive under MGL1208/raw/multibeam. Center beam depth is recorded separately to serial log. The MicroSV (svpod01) probe in the pod supplied sound velocity to the EM122. The EM122 was secured during coring and CTD operations.

Logging interval: variable with water depth

File id: bath02

Interruptions greater than one hundred and twenty seconds are displayed in the following table.

Log Date	Event	Comment
2012:121:00:00:00.6749	Start	Logging officially started
2012:150:18:39:16.5528	End	Logging officially ended

bath02 data format:

bath02	2008:192:00:00:12.6663	\$KGDPT,2938.25,0.0,12000.0*4a
bath02	2008:192:00:00:30.3301	\$KGDPT,2954.08,0.0,12000.0*4f

Knudsen Engineering 3260 Sub-bottom Profiler

File id: n/a

Logging interval: Variable with water depth

The Knudsen 3260 is a chirp echosounder/sub-bottom profiler. It was in operation for the length of the cruise. Unit was secured while on station for coring operations and CTD casts.

There are two sets of segy data recorded/processed this cruise. The segy set in the /raw/knudsen directory are generated by the knudsen software. The segy set in the /processed/knudsen directory are post-processed in the SEGY-Rev0 format.

DS50 Speedlog

File id: slog01

Logging interval: 1 second

The Furuno DS-50 is a Doppler speed log. It was in operation for the length of the cruise.

Interruptions greater than ten seconds are displayed in the following table.

Log Date	Event	Comment
2012:121:00:00:00.6749	Start	Logging officially started
2012:150:18:39:16.5528	End	Logging officially ended

slog01 data format:

slog01	2008:231:00:00:00.0744	\$VDVHW,,T,,M,09.68,N,17.93,K*4C
slog01	2008:231:00:00:00.1906	\$VDVBW,009.68,000.09,A,009.68,000.09,V*46
slog01	2008:231:00:00:00.1908	\$VDVLW,0005960.30,N,0005960.30,N*5F

RMYoung Integrated Weather

File id: wx01

Logging interval: 1 second

The weather station is used to log wind speed, direction, air temperature, and barometric pressure. The unit was functioning during the cruise. See also mww01 below.

Interruptions greater than ten seconds are displayed in the following table.

Log Date	Event	Comment
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2012:121:00:00:00.6749	Start	Logging officially started
2012:150:18:39:16.5528	End	Logging officially ended

wx01 data format:

wx01	2011:130:00:00:00.3553	19.0	18.6	19.3	22.5	328	328	2	16.6	17.1	3.7	
	21.1	355	355	0	28.2	31.1	28.0	31.2	96	85	97	1006
wx01	2011:130:00:00:01.2983	18.8	18.6	19.3	22.5	331	328	2	16.2	17.1	3.7	
	21.1	355	355	0	28.2	31.1	28.0	31.2	96	85	97	1006

File id: mwv01

Logging interval: 1 second

The weather station is used to log wind speed, direction, air temperature, and barometric pressure. The wx01 strings are converted in real-time to produce mwv strings for the DP. The mwv output is strictly a derivative of the w01 output. See also the wx01 description above.

Interruptions greater than ten seconds are displayed in the following table.

Log Date	Event	Comment
2012:121:00:00:00.6749	Start	Logging officially started
2012:150:18:39:16.5528	End	Logging officially ended

mwv01 data sample:

mwv01	2008:231:00:00:00.5173	6.1	6.6	6.6	8.8	354	321	5	0.0	0.0	0.0	
	0.0	355	355	0	*****	*****	*****	*****	8	8	8	1009.7
mwv01	2008:231:00:00:01.5172	5.9	6.6	6.6	8.8	353	321	5	0.0	0.0	0.0	
	0.0	355	355	0	*****	*****	*****	*****	8	8	8	1009.6
mwv01	2008:231:00:00:02.5190	6.3	6.6	6.6	8.8	354	321	5	0.0	0.0	0.0	
	0.0	355	355	0	*****	*****	*****	*****	8	8	8	1009.8

CNAV2000

File id: cnav

Logging interval: 1 second

The C-NAV is a global satellite-based differential receiver. This was used as a secondary GPS system on the ship. This system was operational during the cruise.

Interruptions greater than ten seconds are displayed in the following table.

Log Date	Event	Comment
2012:121:00:00:00.0259	Start	Logging officially started

2012:150:18:39:16.0928	End	Logging officially ended
------------------------	-----	--------------------------

cnav data format:

```
cnav 2008:231:00:00:00.6936
$GPGGA,000000.00,1434.94372,N,10444.85748,W,2,8,1.1,15.52,M,-20.60,M,9,0108*65
cnav 2008:231:00:00:00.7137 $GPVTG,006.5,T,,M,9.64,N,17.85,K*53
```

CNAV3050

File id: cnav3050

Logging interval: 1 second

The C-NAV 3050 is a global satellite-based differential receiver. This is the best individual receiver currently on the ship. This system was operational during the cruise.

Interruptions greater than ten seconds are displayed in the following table.

Log Date	Event	Comment
2012:121:00:00:00.6329	Start	Logging officially started
2012:150:18:39:16.0288	End	Logging officially ended

cnav3050 data format:

```
cnav3050 2011:132:00:00:00.0717
$GNGGA,000000.00,0842.538264,N,08427.839561,W,2,16,0.9,28.395,M,0.0,M,9.0,035
8*48
cnav3050 2011:132:00:00:00.0877 $GNVTG,338.4,T,,M,5.78,N,10.71,K,D*27
```

GC80 Gyrocompass

The GC80 gyrocompass is installed on the bridge and used for ship and seismic navigation.

File id: gy01

Logging interval: 1 second

Interruptions greater than ten seconds are displayed in the following table.

Log Date	Event	Comment
2012:121:00:00:00.0239	Start	Logging officially started
2012:150:18:39:16.7769	End	Logging officially ended

gy01 data format:

```
gy01 2008:231:00:00:00.4110 $PTKM,HEALM,0000,0,G1*09
gy01 2008:231:00:00:00.6395 $SHEHDT,005.8,T*22
gy01 2008:231:00:00:00.6396 $SHEROT,-005.25,A*34
```

gy01	2008:231:00:00:01.6394	\$HEHDT,005.7,T*2D
gy01	2008:231:00:00:01.6395	\$HEROT,-004.53,A*34

POSMV Integrated Nav

The POS/MV is a receiver that uses CNAV input in addition to its own antennae, an inertial sensor and optional RTG, WTC, or WAAS corrections and a Kalman filter to produce a smooth navigation output and very accurate heading. System was not in operation for MGL1208. It has been decommissioned and is awaiting upgrade.

File id: posmv

Logging interval: 1 second

Interruptions greater than ten seconds are displayed in the following table.

Log Date	Event	Comment
2012:121:00:00:00.6979	N/A	decommissioned
2012:150:18:32:11.6757	N/A	Instrument failure

posmv data format:

posmv	2008:231:00:00:00.0885	\$INGGA,235959.842,1434.95002,N,10444.85734,W,2,,1.1,12.71,M,,,9.0,0108*2E
posmv	2008:231:00:00:00.0889	\$INHDT,15.0,T*11
posmv	2008:231:00:00:00.2047	\$INVTG,7.0,T,,M,9.7,N,17.9,K*46
posmv	2008:231:00:00:00.3208	\$INGST,235959.842,,0.9,0.9,0.0,0.9,0.9,2.5*51
posmv	2008:231:00:00:00.4411	\$PASHR,235959.842,15.05,T,-
		0.58,0.48,0.15,0.069,0.069,0.045,2,0*05
posmv	2008:231:00:00:00.4412	\$INZDA,235959.0000,17,08,2008,,*73

SeaPath Integrated Nav

The Kongsberg Seapath is an inertial navigation system. Operational for the duration of the cruise.

Logging interval: 1 second

File id: seapath

Interruptions greater than ten seconds are displayed in the following table.

Log Date	Event	Comment
2012:121:00:00:00.3939	Start	Logging officially started
2012:150:18:39:16.9444	End	Logging officially ended

seapath data format:

seapath	2008:231:00:00:00.0504	\$INZDA,235959.99,17,08,2008,,*73
seapath	2008:231:00:00:00.1686	\$INGGA,235959.99,1434.953109,N,10444.859147,W,2,08,1.1,-16.30,M,,M,1.0,0291*70
seapath	2008:231:00:00:00.1687	\$INVTG,5.97,T,,M,9.7,N,,K,D*03
seapath	2008:231:00:00:00.1688	\$INHDT,5.82,T*1A

Sercel Streamer Tension Unit

The Sercel Streamer Tension Unit measures streamer tension in pounds. Not used during 1208.

Logging interval: 15 seconds

File id: stu1

Data intermittent interruptions greater than thirty seconds are displayed in the following table.

Log Date	Event	Comment
2012:121:20:03:44.1402	N/A	Not used
2012:150:16:53:53.6708	N/A	Not used

stu1 data format:

stu1	2011:130:00:02:12.8968	111	129	22	0	49	1	0	3360	3472	-179
33	1	1	3643	3643	-157	31	1	2	3964	3994	-157
34	1	3	3487	3584	-157	32					
stu1	2011:130:00:02:27.8994	111	129	22	1	4	1	0	3375	3487	-164
33	1	1	3643	3793	-157	31	1	2	3950	4002	-164
34	1	3	3509	3606	-179	32					

Geometrics 882 Magnetometer

The Geometrics 882 magnetometer is towed behind the ship. Raw serial output is logged using LDS. Deployment is dependent upon seismic operations. See the deployment notes below. For further information, see the elog files in docs/elog. Magnetometer was not deployed during MGL1208.

Magnetometer Deployment Notes

Interruptions greater than ten seconds are displayed in the following table.

Time	Event
2012:121:18:55:00.0000	Not used for MGL1208
2012:150:19:04:00.0000	Not used for MGL1208

Logging interval: 1 second

File id: mag01

mag01 data sample:

mag01	2008:185:09:45:58.1820	\$107714.673,0042,0024,0110,3533,1143
mag01	2008:185:09:46:01.0333	\$ 63703.933,0042,0024,0110,3533,1143
mag01	2008:185:09:46:04.0330	\$ 44031.029,0042,0027,0110,3533,1143

SBE-45 Thermosalinograph

The Seabird TSG output is logged by LDS to the “tsg” set.

File id: tsgraw

Logging interval: 1 second

Data intermittent interruptions greater than ten seconds are displayed in the following table.

Log Date	Event	Comment
2012:121:01:19:27.7541	Start	Logging officially started
2012:150:15:53:14.5345	End	Logging officially ended

tsgraw data sample:

tsgraw	2012:050:05:59:11.0312	27.3455,	5.52201,	34.7764
tsgraw	2012:050:05:59:21.0406	27.3435,	5.52175,	34.7760
tsgraw	2012:050:05:59:31.0341	27.3304,	5.52027,	34.7753

BGM-3 Gravimeter

The Bell Aerospace BGM-3 Gravimeter operated normally during the length of this cruise.

File id: vc01

Logging interval: 1 second

Interruptions greater than ten seconds are displayed in the following table.

Log Date	Event	Comment
2012:121:00:00:00.9419	Start	Logging officially started
2012:150:18:39:16.8808	End	Logging officially ended

vc01 data format:

vc01	2011:130:00:00:08.2866	01:024436	00
vc01	2011:130:00:00:09.2926	01:024548	00

Applied Microsystems MicroSV Pod Unit #1

The Applied Microsystems MicroSV probe #1 in the pod was functional and logging during the length of the cruise.

File id: svpod01

Logging interval: 1 second

Interruptions greater than ten seconds are displayed in the following table.

Log Date	Event	Comment
2012:121:00:00:00.3469	Start	Logging officially started
2012:150:18:39:17.1709	End	Logging officially ended

svpod01 data format:

svpod01	2011:130:00:00:08.6626	1540.52
svpod01	2011:130:00:00:09.6527	1540.53

Applied Microsystems MicroSV Pod Unit #2

The Applied Microsystems MicroSV probe #2 in the pod was functional and logging during the length of the cruise.

File id: svpod02

Logging interval: 1 second

Interruptions greater than ten seconds are displayed in the following table.

Log Date	Event	Comment
2012:121:00:00:00.4629	Start	Logging officially started
2012:150:18:39:17.3029	End	Logging officially ended

svpod02 data format:

svpod02	2011:130:00:00:08.0686	1541.87
svpod02	2011:130:00:00:09.0746	1541.88

Seabird SBE38 Temperature Probe Pod Unit #1

The Seabird SBE38 temperature probe #1 in the pod was functional and logging during the length of the cruise.

File id: temppod01

Logging interval: 1 second

Interruptions greater than ten seconds are displayed in the following table.

Log Date	Event	Comment
2012:121:00:00:00.2439	Start	Logging officially started
2012:150:18:39:17.1129	End	Logging officially ended

temppod01 data format:

temppod01	2011:130:00:00:07.0855	29.4851
temppod01	2011:130:00:00:07.9476	29.4850

Seabird SBE38 Temperature Probe Pod Unit #2

The Seabird SBE38 temperature probe #2 in the pod was functional and logging during the length of the cruise.

File id: temppod02

Logging interval: 1 second

Interruptions greater than ten seconds are displayed in the following table.

Log Date	Event	Comment
2012:121:00:00:00.8179	Start	Logging officially started
2012:150:18:39:16.8119	End	Logging officially ended

temppod02 data format:

temppod02	2011:130:00:00:07.2015	29.4884
temppod02	2011:130:00:00:08.0786	29.4883

LDEO PCO2 System

The LDEO PCO2 system output is logged by LDS to the “pco2” set.

See below for more information.

File id: pco2

Logging interval: ~180 seconds

Interruptions greater than three hundred seconds are displayed in the following table.

Log Date	Event	Comment
2012:121:02:20:50.6694	Start	Logging officially started
2012:088:02:20:50.6694 - 2012:088:02:27:35.9564	Missing data	Reason not specified
2012:088:09:02:13.0141 - 2012:088:12:40:24.2720	Missing data	USS pump failure
2012:091:08:16:47.6809 - 2012:091:08:30:51.6197	Missing data	No serial data output
2012:091:08:30:51.6197 - 2012:091:08:37:34.4209	Missing data	Restart instrument's laptop
2012:150:15:51:08.0021	End	Logging officially ended

pco2 data format:

pco2	2011:130:00:27:11.9162	2011130.02002	2370.39	37.54	1007.07
	404.51	28.42	386.9	5000.00	19
Equil					0
pco2	2011:130:00:30:00.5374	2011130.02198	2370.02	37.53	1007.14
	404.42	28.46	386.8	5000.00	19
Equil					0

Mk21 XBT System

Files: *.RDF,*.EDF

Twenty XBT drops (14x T-5 and 6x T-7) were made during this cruise (2 – T7 drops failed at shallow depths and data was discarded). The data set is saved to the raw/XBT directory in the cruise archive. Refer to the MGL1208_Expendable_Drops.xls spreadsheet in the docs/operations directory of the cruise archive for more information.

IV. Seismic Summary

A. Acquisition Parameter Table

Acquisition Parameter Table	
AcquisitionParameterID	MGL1208_ACQ01
FieldActivityID	MGL1208
ReceiverType	Sentry Solid Streamer
SourceType	Airgun
Acquisition System Name	Sercel Syntrak 960
Acquisition System Type	MCS
Seismic_Nav_System	C-Nav 3050 primary
Survey_datum	WGS84
Navigation Reference Point	Fore/Aft+29.5 m, Stb/pt +0.00 m, vertical +16.9 m Keel, centerline, ~frame 42 (Seapath 200 calculated center of gravity) waterline
NRP to source	78.00 m
Source_to_Near_Channel	151.50 m
Number_of_channels_recorded	60
Number_of_cables	1
Number_of_channels_each_cable	60
Channel_length	12.5 m
Cable_length	0.9 km
Cable_spacing	N/A
Near_Channel_Number	N/A
Cable_depth	9.0 m
Number_sources	1
Sub-arrays_per_source	1
Alternate_Shooting	No
Source_separation	N/A
Sub-array_separation	N/A
Source_volume	225 cu in
Source_pressure	2000 psi nominal
Source_make,model	GI Gun
Source_number	2
Source_depth	3.0 m
Shot_control	Distance
Shot_Interval	25 m
Sample_interval	0.5ms
Record_length	8s
Compass_birds	4 Digicourse 5011
Recording_delay	N/A

B. Seismic Overview

Physical Configuration

The towing configuration for the air guns and streamers is detailed in the document titled *MGL1208_Offsets.xls*.

Offsets

All antenna and in-water offset drawings are in the file *MGL1208_Offsets.xls*

Spectra

Spectra was used for all timing and navigation during the cruise. Spectra generated UKOOA P294 and P190 files for each MCS line acquired.

V. RV Langseth Gravity Tie Information

The Gravimeter was tied before and after the cruise at the tie point located at the pier in Kodiak.

Date / Time	Ship Location	Reference Location	Mistie
2012-04-29T19:32	Honolulu, HI, UH Marine Center 21 18.9737 N 157 53.1742 W	Honolulu, HI, UH Marine Center UH Marine Center Pierside Tiepoint 21 18.962 N 157 53.180 W	Honolulu, HI, UH Marine Center 21 18.972 N 157 53.181 W

Please refer to the documents located under [MGL1208/docs/gravity_tie](#) for detailed records.

VI. Archive Contents

Key files are bolded.

MGL1208/docs	Cruise documents and logs
MGL1208/docs/config	Configuration archive
MGL1208/docs/elog	Cruise elog
MGL1208/docs/gravity_tie	Gravity Tie information
MGL1208/docs/map	Cruise maps, track map
MGL1208/docs/offsets	Vessel/sensor offsets
MGL1208/docs/operations/	Operations documents
MGL1208/docs/operations/Daily_Reports	Cruise Daily Reports from Chief Science Officer
MGL1208/docs/operations/NavLogs	Seismic navigation logs (spectra)
MGL1208/docs/operations/ObsLogs	Seismic acquisition logs (gun controller)
MGL1208/docs/operations/MGL1208_B15_line_log_multi_channel_seismics.xls	Master line log table
MGL1208/docs/permits	Clearance Documents
MGL1208/docs/waypoints	Waypoint files
MGL1208/docs/personnel	Personnel rosters, org chart, bunk and phone lists
MGL1208/docs/reports	Cruise Report and supplemental docs
MGL1208/docs/reports/MGL1208_DataReport_v1.0.doc	This file
MGL1208/docs/offsets/MGL1208_Offsets.xls	Vessel/sensor offsets
MGL1208/docs/screencaps	Screen captures
MGL1208/processed	Processed data
MGL1208/processed/reflex (3D data-sets only, not applicable to OBS and 2D)	Spectra reflex files
MGL1208/processed/shotlogs	Shot log files
MGL1208/processed/sprint	Sprint files
MGL1208/processed/svp	Sound velocity profiles
MGL1208/raw	Raw data
MGL1208/raw/adcp	Raw ADCP data
MGL1208/raw/knudsen	Raw Knudsen sub-bottom profiler data
MGL1208/raw/multibeam	Raw EM122 data
MGL1208/raw/serial	Underway serial data: gps, tsg, weather, etc.
MGL1208/raw/spectra/P1	Spectra p190
MGL1208/raw/spectra/P2	Spectra p294
MGL1208/raw/XBT	Raw XBT data

VII. Data Formats

Gravimeter data

The gravimeter serial data is output in the following format:

01:025610 01

01:xxxxxx ff

Item	Definition	Units
01	output frequency	Hz
xxxxxx	raw counts	n/a
ff	sensor status	n/a

CNAV GPS receiver data

CNAV outputs data in NMEA 0183 compatible format. Currently* the following sentence types are enabled:

- \$GPVTG-GPS Velocity, Track made good and Ground speed data (computed by the CNAV GPS receiver).
- \$GPGGA-Global Positioning System Fix data (computed by the CNAV GPS receiver).

*Note: there are other sentence types available from CNAV. Please consult the software manual for more options.

\$GPVTG, xxx.x, T,, M, m.mm, N, n.nn, K*hh

\$GPVTG Sentence Fields

Item	Definition	Units
xxx.x	Course over ground (COG)	Degrees from True North
T	Indicates course relative to True North	n/a
M	COG	Degrees from Magnetic North
m.mm	Speed over ground (SOG)	Nautical miles per hour (knots)
N	Indicates that the speed over ground is in knots	n/a
n.nn	SOG	km/h
K	Indicates that the SOG is in km/h	n/a /td>
*hh	Checksum (hexadecimal representation)	n/a

\$GPGGA,hhmmss.ss, ddm. mmmmm, a, ddm. mmmmm, a, x, xx, x.x, xx.xx, M, xx.xx, M, x.x, xyy*hh

\$GPGGA Sentence Fields

Item	Definition	Units
hhmmss.ss	UTC time of position	Hours/Minutes/Seconds.decimal.
ddmm.mmmmm	Latitude	Degrees/Minutes.decimal.
a	Direction of Latitude N = North S = South	n/a
ddmm.mmmmm	Longitude	Degrees/Minutes.decimal
a	Direction of Longitude E = East W = West	n/a
x	GPS Quality indicator 0 = fix not valid 1 = GPS Autonomous fix 2 = GcGPS Corrected Fix	n/a
xx	Number of GPS satellites used in solution fix	n/a
x.x	Horizontal Dilution of Precision (HDOP)	n/a
xx.xx	C-NAV GPS receiver antenna altitude reference to Mean Sea Level (MSL)	n/a
M	Altitude units--M indicates meters	n/a
xx.xx	WGS-84 Geoidal separation distance from MSL based on the NIMA/NASA EGM96 15-minute (Earth Gravity Model)	Meters
M	Geosoidal separation units--M indicates meters	n/a
x.x	Age of GcGPS corrections used in solution fix	n/a
xyy	C-NAV GPS receiver reference identification	x is downlink satellite communication beam in use yy is the GPS correction signal mode/type being used
*hh	Checksum (hexadecimal representation) followed by CRLF terminator pair	n/a

CNAV 3050 GPS receiver data

CNAV 3050 outputs data in NMEA 0183 compatible format. Currently* the following sentence types are enabled:

- \$GPVTG-GPS Velocity, Track made good and Ground speed data (computed by the CNAV GPS receiver).
- \$GPGGA-Global Positioning System Fix data (computed by the CNAV GPS receiver).

*Note: there are other sentence types available from CNAV. Please consult the software manual for more options.

\$GPVTG, xxx.x, T,, M, m.mm, N, n.nn, K*hh

\$GPVTG Sentence Fields

Item	Definition	Units
xxx.x	Course over ground (COG)	Degrees from True North
T	Indicates course relative to True North	n/a
M	COG	Degrees from Magnetic North
m.mm	Speed over ground (SOG)	Nautical miles per hour (knots)
N	Indicates that the speed over ground is in knots	n/a
n.nn	SOG	km/h
K	Indicates that the SOG is in km/h	n/a
*hh	Checksum (hexadecimal representation)	n/a

\$GPGGA,hhmmss.ss, ddm. mmmmm, a, ddm. mmmmm, a, x, xx, x.x, xx.xx, M, xx.xx, M, x.x, xyy*hh

\$GPGGA Sentence Fields

Item	Definition	Units
hhmmss.ss	UTC time of position	Hours/Minutes/Seconds.decimal.
ddm. mmmmm	Latitude	Degrees/Minutes.decimal.
a	Direction of Latitude N = North S = South	n/a
ddm. mmmmm	Longitude	Degrees/Minutes.decimal
a	Direction of Longitude E = East W = West	n/a
x	GPS Quality indicator 0 = fix not valid 1 = GPS Autonomous fix 2 = GcGPS Corrected Fix	n/a
xx	Number of GPS satellites used in solution fix	n/a
x.x	Horizontal Dilution of Precision (HDOP)	n/a
xx.xx	C-NAV GPS receiver antenna altitude reference to Mean Sea Level (MSL)	n/a
M	Altitude units--M indicates meters	n/a

xx.xx	WGS-84 Geoidal separation distance from MSL based on the NIMA/NASA EGM96 15-minute (Earth Gravity Model)	Meters
M	Geosoidal separation units--M indicates meters	n/a
x.x	Age of GcGPS corrections used in solution fix	n/a
xyy	C-NAV GPS receiver reference identification	x is downlink satellite communication beam in use yy is the GPS correction signal mode/type being used
*hh	Checksum (hexadecimal representation) followed by CRLF terminator pair	n/a

EM122 Center Beam Depth

This page describes the EM122 centerbeam depth serial output, used for real-time depth display. For full multibeam data, please see the [multibeam](#) page.

The EM122 outputs serial data in the following formats:

- KIDPT - Depth below transducer

SKIDBT,x.x,x.x,x.x,*hh

SDDBT sentence format

Item	Definition	Units
x.x	Water depth	feet
x.x	Water depth	meters
x.x	Water depth	fathoms
*hh	Checksum	n/a

FE700 Navigational Echosounder data

The FE700 Navigational Echosounder outputs data in the following formats

- \$PFEC - unspecified
- \$SDDBT - Depth Below Transducer
- \$SDDBS - Depth Below Surface

\$PFEC ,aaaa,x,x*hf

PFEC sentence format

Item	Definition	Units
aaaa	unspecified	unspecified
x	unspecified	unspecified
x	unspecified	unspecified
*hf	unspecified	unspecified

\$DBT,x.x,f,x.x,M,x.x,F*hh

SDDBT sentence format

Item	Definition	Units
x.x	Water depth	feet
f	f = feet	n/a
x.x	Water depth	meters

M	M = meters	n/a
x.x	Water depth	fathoms
F	F = fathoms	n/a
*hh	Checksum	n/a

\$DBS,x.x,f,x.x,M,x.x,F*hh

SDDBS sentence format

Item	Definition	Units
x.x	Water depth	feet
f	f = feet	n/a
x.x	Water depth	meters
M	M = meters	n/a
x.x	Water depth	fathoms
F	F = fathoms	n/a
*hh	Checksum	n/a

Gyroscope data

The gyroscope serial data is output in the following sentence formats:

- PTKM,HEALM -- Unspecified
- HEHDT -- Heading - True
- HEROT -- Rate Of Turn

\$PCICM,HEALM,xxxx,x,xx*hh

ALM sentence format

Item	Definition	Units
xxxx	unspecified	n/a
x	unspecified	n/a
*hh	unspecified	n/a

\$HEHDT,xxx.x,T*hh

HDT sentence format

Item	Definition	Units
xxx.x	Heading true	degrees
T	T = true	n/a
*hh	Checksum	n/a

\$HEROT,-xxx.x,A*hh

HEROT sentence format

Item	Definition	Units
xxxx.x	Rate of turn	Degrees per minute, Note: "-" means bow turns to port
A	A = data valid	n/a
*hh	Checksum	n/a

Geometrics 882 Magnetometer Data

The magnetometer serial data is output in the following format:

\$ 53863.927,0652

\$ xxxxx.xxx,vvvv

Item	Definition	Units
xxxxx.xxx	Magnetic field intensity	nT
vvvv	Reserved for future use	n/a

RM Young Meteorological Station Data

The meteorological data from the RMYoung integrated weather station is output in the following sentence format:

12.6 13.2 12.6 16.9 1 335 2 0.0 0.0 0.0 0.0 355 355 0 -11.9 -23.8 ***** 7.3 8 4 9 1006.9
 aaa.a bbb.b ccc.c dd.d eee fff ggg hhh.h iii.i jjj.j kkk.k lll mmm nnn -oo.o -pp.p -qq.q -rr.r ss tt uu vvvv.v

Langseth WX station sentence format

Item	Definition	Units
aaa.a	bird 1 speed, instantaneous	knots
bbb.b	bird 1 speed, 60 second average	knots
ccc.c	bird 1 speed, 60 minute average	knots
ddd.d	bird 1 speed, 60 second peak	knots
eee	bird 1 direction, instantaneous	knots
fff	bird 1 direction, 60 second average	knots
ggg	bird 1 direction, 60 minute average	knots
hhh.h	bird 2 speed, instantaneous	knots
iii.i	bird 2 speed, 60 second average	knots
jjj.j	bird 2 speed, 60 minute average	knots
kkk.k	bird 2 speed, 60 second peak	knots
lll	bird 2 direction, instantaneous	knots
mmm	bird 2 direction, 60 second average	knots
nnn	bird 2 direction, 60 minute average	knots
ooo.o	temperature, instantaneous	Degrees C
ppp.p	temperature, 60 minute average	Degrees C
qqq.q	temperature, 60 minute low	Degrees C
rrr.r	temperature, 60 minute high	Degrees C
ss	relative humidity, instantaneous	%
tt	relative humidity, 60 minute low	%
uu	relative humidity, 60 minute high	%
vvvv.v	Baromoeter, instantaneous	knots

OBSIP Shotlog Format (not used on MGL1208)

Each OBSIP shotlog contains a header followed by shot records:

```
#obsipshotfile v1.0
#shotnumber date time sourceLat sourceLon shipLat shipLon waterDepth sciTag
0001280 2009-08-27 05:08:49.807873 48.495334 -129.201444 48.494097 -129.203017 2530.6 MGL0910_05
0001279 2009-08-27 05:12:33.961869 48.491860 -129.204474 48.490060 -129.205425 2526.4 MGL0910_05
0001278 2009-08-27 05:16:36.302883 48.488608 -129.206115 48.486807 -129.206944 2530.3 MGL0910_05
0001277 2009-08-27 05:19:51.053880 48.485157 -129.209212 48.483406 -129.209755 2526.1 MGL0910_05
0001276 2009-08-27 05:24:01.863875 48.480813 -129.212088 48.479293 -129.213152 2516.1 MGL0910_05
```

Shot records are in the following format:

```
0001276 2009-08-27 05:24:01.863875 48.480813 -129.212088 48.479293 -129.213152 2516.1 MGL0910_05
sssssss yyyy-mm-dd hh:mm:ss.ssssss xx.xxxxxx yy.yyyyyy vv.vvvvvv ww.wwwwww dddd.d llllllllllll
```

OBSIP record format

Item	Definition	Units
sssssss	shot number	n/a
yyyy-mm-dd	date	ISO8601 format
hh:mm:ss.ssssss	time	ISO8601 format
xx.xxxxxx	source lat	degrees, WGS84
yy.yyyyyy	source lon	degrees, WGS84
vv.vvvvvv	vessel lat	degrees, WGS84
ww.wwwwww	vessel lon	degrees, WGS84
dddd.d	depth	meters
llllllllllll	linename	n/a

LDEO PCO2 System

PCO2 outputs data in the following sentence format:

yyyyjjj.jjj aaaa.aa bb.bb cccc.cc ddd.dd e.ee fff.f gggg.gg hh i k

PCO2 Data

Item	Definition	Value	Units
yyyyjjj.jjj	pco2 Computer Date/Time	n/a	Year/Julian Day.decimal Four fixed digits of year. Three fixed digits of julian day. Five fixed digits for decimal fractions of a julian day.
aaaa.aa	CO2 Raw Signal	n/a	mVolts
bb.bb	CO2 Analyzer Cell Temperature	n/a	Celcius
cccc.cc	PCO2 Barometer	n/a	mbar
ddd.dd	VCO2	n/a	ppm
e.ee	Equilibrator Water Temp	n/a	Celcius
fff.f	pCO2	n/a	uatm
gggg.gg	Flow Controller	n/a	mVolts
hh	Flow Meter	n/a	cc/min
i	Sample ID #	0 to 16	integer
k	Sample ID	Equil, Atmos, Nitrogen, CC18798, CA07163, CC15551, or CC63668	alphanumeric

LDEO PCO2 + CNav + TSG + WX01 + SBE38 Systems

PCO2 merge is a combination of outputs of various serial data in the following sentence format:

yyyyjjj.jjj aaaa.aa bb.bb cccc.cc ddd.dd e.ee fff.f gggg.gg hh i k, lll.lllllm, nnnnn.nnnnnno, pppp.pp, q.qq, r.rr, s.ss, tt.tt, uu.u, vvv, w.w, xxx.x, y.yy, zzz.z, @@.@@@@

PCO2 Data

Item	Definition	Value	Units
yyyyjjj.jjj	pco2 Computer Date/Time	n/a	Year/Julian Day.decimal Four fixed digits of year. Three fixed digits of julian day. Five fixed digits for decimal fractions of a julian day.
aaaa.aa	CO2 Raw Signal	n/a	mVolts
bb.bb	CO2 Analyzer Cell Temperature	n/a	Celcius
cccc.cc	PCO2 Barometer	n/a	mbar
ddd.dd	VCO2	n/a	ppm
e.ee	Equilibrator Water Temp	n/a	Celcius
fff.f	pCO2	n/a	uatm
gggg.gg	Flow Controller	n/a	mVolts
hh	Flow Meter	n/a	cc/min
i	Sample ID #	0 to 16	integer
k	Sample ID	Equil, Atmos, Nitrogen, CC18798, CA07163, CC15551, or CC63668	alphanumeric
lll.lllllm	CNav Latitude	0 to 90, N/S	degrees/minutes.decimal/direction
nnnnn.nnnnnno	CNav Longitude	0 to 180, E/W	degrees/minutes.decimal/direction
pppp.pp	TSG Speed of Sound	n/a	m/s
q.qq	TSG Internal Temperature	n/a	Celcius
r.rr	TSG External Temperature	n/a	Celcius
s.ss	TSG Conductivity	n/a	S/m
tt.tt	TSG Salinity	25 to 40	ppm
uu.u	WX01 Bird 1 Wind Speed 60 sec avg	n/a	knots
vvv	WX01 Bird 1 Wind Direction 60 sec avg	0 to 360	degrees
w.w	WX01 Temperature Instantaneous	n/a	Celcius
xxx.x	WX01 Ship Barometer Instantaneous	n/a	mbar

y.yy	CNav Speed Over Ground / Speed Made Good	0 to 15	knots
zzz.z	CNav Course Made Good	0 to 360	degrees
@@.@@@@	SBE38 Temperature Probe	n/a	Celcius

POS/MV Position and Orientation System for Marine Vessels

POS/MV outputs data using the NMEA 0183 format at rates of up to fifty sentences per second. The following seven different sentence formats are available.

- 1. \$INGGA-Global System Position Fix Data
- 2. \$INHDT-Heading - True data
- 3. \$INVTG-Course over ground and Ground speed data
- 4. \$INGST-GPS pseudorange noise statistics
- 6. \$PRDID-Attitude data
- 7. \$INZDA-Time and date

\$INGGA, hmmmss.sss, llll.llll, a, yyyyy.yyyyy, b, t, nn, v.v, x.x, M,,c.c,rrrr*hh

\$INGGA-Global System Position Fix Data

Item	Definition	Value	Units
\$INGGA	Header	\$INGGA	Hours/Minutes/Seconds.decimal. Two fixed digits of hours.
hmmmss.sss	UTC time of position	n/a	Two fixed digits of minutes. Two fixed digits of seconds. Three digits for decimal fractions of a second.
llll.llll	Latitude	-90 to +90	Degrees Minutes.decimal. Two fixed digits of degrees Two fixed digits of minutes Five digits for decimal minutes.
a	N (north) or S (south)	N or S	Degrees/Minutes.decimal.
yyyyy.yyyyy	Longitude	-180 to +180	Three fixed digits of degrees. Two fixed digits of minutes. Five digits for decimal minutes.
b	E (east) or W (west)	E or W	
t	GPS Quality Indicator	0 = Fix not available or invalid 1 = CIA standard GPS; fix valid. 2 = DGS mode; fix valid. 3 = PPP mode; fix valid. 4 = RTK fixed 5 = RTK float 6 = free inertial	
nn	Number of satellites used in fix	0 to 32	
v.v	Horizontal dilution of precision		
x.x	Altitude of the IMU above or below the mean sea level. A negative value	n/a	Metres

indicates below sea level.

M	Units of measure = metres	M	
Null	Null		
Null	Null		
c.c	Age of differential corrections in records since last RTCM-104 message.	0 to 99.9	Seconds
rrr	DGPS reference station identity	0000 to 1023	
*hh	Checksum	00 - FF	
/CR/LF	Carriage return and line feed	/CR/LF	

Note that, in the case of the HDOP, IMU altitude and age of differential connections, POS/MV adds leading digits as required (i.e. if the value exceeds 9.9). Also, note that commas separate all items, including null fields. The information is valid at the location of the vessel frame.

\$INHDT, x.x, T*hh

\$INHDT-Heading - True data

Item	Definition	Value	Units
\$INHDT	Header	\$INHDT	
x.x	True vessel heading in the vessel frame	0 to 359.99	degrees
*hh	Checksum	n/a	
/CR/LF	Carriage return and line feed	/CR/LF	

\$INVTG, x.x, T,, M, n.n, N, k.k, K*hh

\$INVTG-Course over ground and Ground speed data

Item	Definition	Value	Units
%INVTG	Header	\$INVTG	
x.x	True vessel track in the vessel frame	0 to 359.99	degrees
T	True	T	
null	Not supported	null	
M		M	
n.n	Speed in the vessel frame	n/a	Knots
N	Knots	N	
k.k	Kilometres	K	
*hh	Checksum	n/a	
/CR/LF	Carriage return and line feed	/CR/LF	

Note that, in the case of the track and the speed fields, POS/MV adds the leading digits as required (i.e. if the value exceeds 9.9). Also, note that commas separate all items in the including null fields.

\$INGST, hhmmss,sss,,smjr.smjr,smnr.smnr, o.o, l.l, y.y, a.a *hh

\$INGST-GPS pseudorange noise statistics

Item	Definition	Value	Units
\$INGST	Header	\$INGST	
hhmmss.sss	UTC time of position	n/a	Hours/Minutes/Seconds.decimal.

			2 fixed digits of hours. 2 fixed digits of minutes. 2 fixed digits of seconds. Three digits for decimal fractions of a second.
null	Not supported	null	
smjr.smjr	Standard Deviation of semi-major axis of error ellipse	n/a	Metres
smnr.smnr	Standard deviation of semi-minor axis of error ellipse	n/a	Metres
o.o	Orientaion of semi-major axis ellipse	0 to 359.9	Degrees from true north
l.l	Standard deviation of latitude	n/a	Metres
y.y	Standard deviation of longitude	n/a	Metres
a.a	Standard deviation of Altitude	n/a	Metres
*hh	Checksum	n/a	
/CR/LF	Carriage return and line feed	/CR/LF	

Note that, in the case of all fields POS/MV adds leading digits as required (i.e. if the value exceeds 9.9). Also, note that commas separate all items, including null fields. The information is valid at the location of the vessel frame.

Note that commas separate all items

Two attitude data strings are available. The strings are identical except for the definition of roll and pitch angles. One string uses Tate-Bryant angles and the

other uses TSS angles. Use the POS/MV Controller program to set the required angle convention.

\$PRDID, PPP.PP, RRR.RR, xxx.xx*hh

\$PRDID-Attitude data

Item	Definition	Value	Units
\$PRDID	Header	\$PRDID	
PPP.PP	Pitch	-90.00 to +90.00	Degrees
RRR.RR	Roll	-90.00 to +90.00	Degrees
xxx.xx	Sensor heading	0 to 359.99	Degrees
*hh	Checksum	n/a	
/CR/LF	Carriage return and line feed	/CR/LF	

Note that commas separate all items

Two attitude data strings are available. The strings are identical except for the definition of roll and pitch angles. One string uses Tate-Bryant angles and the

other uses TSS angles. Use the POS/MV Controller program to set the required angle convention.

\$INZDA, hhmmss.ss, DD, MM, YYYY,, *hh

\$INZDA-Time and date

Item	Definition	Value	Units
\$INZDA	Header	\$INZDA	

hhmmss.sss	UTC time	n/a	Hours/Minutes/Seconds.decimal. 2 fixed digits of hours 2 fixed digits of minutes 2 fixed digits of seconds Three digits for decimal fractions of a second
DD	Day of month	01 to 31	
MM	Month of year	01 to 12	
YYYY	Year		
Null	Null		
Null	Null		
*hh	Checksum	n/a	/CR/LF

RM Young Rain Gauge & Eppley PSP data

RM Young Rain Gauge & Eppley PSP data is formatted in the following sentences:

x.xxxxxx,y.y

Sentence field

Instrument	Item	definition	units
Eppley PSP	x.xxxxxx	voltage	mV
RM Young Rain Gauge	y.y	amount of rain	mm

Seabird SBE-45 Thermosalinograph Data

Data from the SBE-45 TSG is output in the following format:

2012:050:06:02:01.0294 27.2958, 5.51684, 34.7768

yyyy:ddd:hh:mm:ss.ssss tttt, cccc, xxxx

Item	Definition	Units
yyyy	year	n/a
ddd	day of year	n/a
hh	hours	n/a
mm	minutes	n/a
ss.ssss	seconds	n/a
tttt	Raw internal temperature sensor data	n/a
cccc	Raw conductivity sensor data	n/a
xxxx	Raw salinity sensor data	n/a

SEAPATH 200 Inertial Navigation System

SEAPATH outputs data in NMEA format using the following sentence formats:

- 1. \$INGGA-Global System Position Fix Data
- 2. \$INHDT-Heading - True data
- 3. \$INVTG-Course over ground and Ground speed data
- 4. \$INZDA-Time and date

\$INGGA, hhmss.sss, lll.llll, a, yyyyy.yyyyy, b, t, nn, v.v, x.x, M,,c.c,rrrr*hh

\$INGGA-Global System Position Fix Data

Item	Definition	Value	Units
\$INGGA	Header	\$INGGA	
hhmss.sss	UTC time of position	n/a	Hours/Minutes/Seconds.decimal. Two fixed digits of hours. Two fixed digits of minutes. Two fixed digits of seconds. Three digits for decimal fractions of a second.
lll.llll	Latitude	-90 to +90	Degrees Minutes.decimal. Two fixed digits of degrees Two fixed digits of minutes Five digits for decimal minutes.
a	N (north) or S (south)	N or S	
yyyyy.yyyyy	Longitude	-180 to +180	Degrees/Minutes.decimal. Three fixed digits of degrees. Two fixed digits of minutes. Five digits for decimal minutes.
b	E (east) or W (west)	E or W	
t	GPS Quality Indicator	0 = Fix not available or invalid 1 = CIA standard GPS; fix valid. 2 = DGS mode; fix valid. 3 = PPP mode; fix valid. 4 = RTK fixed 5 = RTK float 6 = free inertial	
nn	Number of satellites used in fix	0 to 32	
v.v	Horizontal dilution of precision		
x.x	Altitude of the IMU above or below the mean sea level. A negative value indicates below sea level.	n/a	Metres
M	Units of measure = metres	M	
Null	Null		
Null	Null		
c.c	Age of differential corrections in records since last RTCM-104 message.	0 to 99.9	Seconds
rrr	DGPS reference station identity	0000 to 1023	
*hh	Checksum		
/CR/LF	Carriage return and line feed	/CR/LF	

\$INHDT, x.x, T*hh

\$INHDT-Heading - True data

Item	Definition	Value	Units
\$INHDT	Header	\$INHDT	
x.x	True vessel heading in the vessel frame	0 to 359.99	degrees
*hh	Checksum	n/a	
/CR/LF	Carriage return and line feed	/CR/LF	

\$INVTG, x.x, T,, M, n.n, N, k.k, K*hh

\$INVTG-Course over ground and Ground speed data

Item	Definition	Value	Units
\$INVTG	Header	\$INVTG	
x.x	True vessel track in the vessel frame	0 to 359.99	degrees
T	True	T	
null	Not supported	null	
M		M	
n.n	Speed in the vessel frame	n/a	Knots
N	Knots	N	
k.k	Kilometres	K	
*hh	Checksum	n/a	
/CR/LF	Carriage return and line feed	/CR/LF	

\$INZDA, hhmss.ss, DD, MM, YYYY,, *hh

\$INZDA-Time and date

Item	Definition	Value	Units
\$INZDA	Header	\$INZDA	
hhmss.sss	UTC time	n/a	Hours/Minutes/Seconds.decimal. 2 fixed digits of hours 2 fixed digits of minutes 2 fixed digits of seconds Three digits for decimal fractions of a second
DD	Day of month	01 to 31	
MM	Month of year	01 to 12	
YYYY	Year		
Null	Null		
Null	Null		
*hh	Checksum	n/a	
/CR/LF	Carriage return and line feed	/CR/LF	

Speed log data

Speed log data is formatted in the following sentences:

- VHW - Water speed and heading
- VBW - Dual Ground/Water Speed

\$VHW,x.x,T,x.x,M,x.x,N,x.x,K*hh

VHW sentence fields

Item	definition	units
x.x	degrees true	?
T	T=true	n/a
x.x	degrees Magnetic	?
M	M = Magnetic	n/a
x.x	Speed of vessel relative to water	Knots/hour
N	N = Nots	n/a
x.x	Speed of vessel relative to water	Km/hour
K	K = Kilometers	n/a
*hh	Checksum	n/a

\$VBW,x.x,x.x,A,x.x,x.x,A*hh

VBW sentence fields

Item	Definition	Units
x.x	Longitudinal water speed, "-" means astern	?
x.x	Transverse water speed, "-" means port	?
A	A = Data Valid	n/a
x.x	Longitudinal ground speed, "-" means astern	?
x.x	Transverse ground speed, "-" means port	?
A	A = data valid, V = data invalid	n/a
*hh	Checksum	n/a

Streamer Tension Unit Data

STU outputs data in the following sentence format:

**aaa bbb cc dd ee f g hhhh iiiii jjjj kkkk l m nnnn oooo pppp qqqq r s tttt uuuu
vvvv wwww x y zzzz !!!! @@@@ #####**

STU Data

Item	Definition	Value	Units
aaa	na	n/a	n/a
bbb	Julian Day	1 to 366	day
cc	Hour	0 to 24	integer
dd	Minutes	0 to 60	integer
ee	Seconds	0 to 60	integer
f	# 1 ID	1	integer
g	# 1 Channel #	0	integer
hhhh	# 1 Peak Tension	n/a	lbs
iiii	# 1 Average Tension	n/a	lbs
jjjj	# 1 Delta Tension	n/a	n/a
kkkk	# 1 Temperature	n/a	Celcius
l	# 2 ID	1	integer
m	# 2 Channel #	1	integer
nnnn	# 2 Peak Tension	n/a	lbs
oooo	# 2 Average Tension	n/a	lbs
pppp	# 2 Delta Tension	n/a	n/a
qqqq	# 2 Temperature	n/a	Celcius
r	# 3 ID	1	integer
s	# 3 Channel #	2	integer
tttt	# 3 Peak Tension	n/a	lbs
uuuu	# 3 Average Tension	n/a	lbs
vvvv	# 3 Delta Tension	n/a	n/a
wwww	# 3 Temperature	n/a	Celcius
x	# 4 ID	1	integer
y	# 4 Channel #	3	integer
zzzz	# 4 Peak Tension	n/a	lbs
!!!!	# 4 Average Tension	n/a	lbs
@@@@	# 4 Delta Tension	n/a	n/a
#####	# 4 Temperature	n/a	Celcius

Applied Microsystems Sound Velocity Probe Data

The sound velocity probe serial data is output in the following format:

1479.35

xxxx.xx

Item	Definition	Units
xxxx.xx	Sound Velocity	m/s

Seabird SBE38 Thermometer Probe Data

The sound velocity probe serial data is output in the following format:

8.2221

xx.xxxx

Item	Definition	Units
xx.xxxx	Temperature	Celcius

RM Young Meteorological Station Data

The meteorological data from the RMYoung integrated weather station is output in the following sentence format:

12.6 13.2 12.6 16.9 1 335 2 0.0 0.0 0.0 0.0 355 355 0 -11.9 -23.8 ***** 7.3 8 4 9 1006.9
aaa.a bbb.b ccc.c dd.d eee fff ggg hhh.h iii.i jjj.j kkk.k lll mmm nnn -oo.o -pp.p -qq.q -rr.r ss tt uu vvvv.v

Langseth WX station sentence format

Item	Definition	Units
aaa.a	bird 1 speed, instantaneous	knots
bbb.b	bird 1 speed, 60 second average	knots
ccc.c	bird 1 speed, 60 minute average	knots
ddd.d	bird 1 speed, 60 second peak	knots
eee	bird 1 direction, instantaneous	knots
fff	bird 1 direction, 60 second average	knots
ggg	bird 1 direction, 60 minute average	knots
hhh.h	bird 2 speed, instantaneous	knots
iii.i	bird 2 speed, 60 second average	knots
jjj.j	bird 2 speed, 60 minute average	knots
kkk.k	bird 2 speed, 60 second peak	knots
lll	bird 2 direction, instantaneous	knots
mmm	bird 2 direction, 60 second average	knots
nnn	bird 2 direction, 60 minute average	knots
ooo.o	temperature, instantaneous	Degrees C
ppp.p	temperature, 60 minute average	Degrees C
qqq.q	temperature, 60 minute low	Degrees C

rrr.r	temperature, 60 minute high	Degrees C
ss	relative humidity, instantaneous	%
tt	relative humidity, 60 minute low	%
uu	relative humidity, 60 minute high	%
vvvv.v	Baromoeter, instantaneous	knots