

RV Langseth Data Reduction Summary

MGL1112

Dutch Harbor, AK – Dutch Harbor, AK

V1.4, 2012-02-14
Lamont-Doherty Earth Observatory, Columbia University

Sunday Aug 14 2011 08:00:00L

Date	Julian Date	Time	Port
2011-09-06	2011-249	1600 UTC, 0800L	Dutch Harbor, AK
2011-10-09	2011-282	1656 UTC, 0856L	Dutch Harbor, AK

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Table of Contents

Table of Contents	4
I. Background and Scientific Objectives.....	7
Figure 1 – Cruise Track	8
Figure 2 – Cruise Track, Sonobuoy drops	9
Figure 3 – Chukchi Plate, Alaska Topography & Bathymetry	10
II. Personnel	11
III. Instrumentation Summary.....	13
IV. Seismic Summary	28
A. Acquisition Parameter Table.....	28
B. Seismic Overview.....	36
V. RV Langseth Gravity Tie Information	38
VI. Archive Contents	38
VII. Data Formats	40

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

I. Background and Scientific Objectives

The primary purpose of this cruise is to collect Multi-Channel Seismic Reflection (MCS) data across the transition from the Chukchi Shelf to the Chukchi Borderland. These data will serve two purposes;

- 1) By imaging the transition between these two continental blocks, we will constrain the history and timing of relative motion between them.
- 2) By collecting continuous MCS data from exploration wells drilled by Shell on the Chukchi shelf in the late 80's, following the thickest sediment section, we will be able to establish the time stratigraphy along our profiles and other profiles we cross.

By imaging the transition from the shelf to the Borderland and the structures within the basin and developing age estimates for the stratigraphic reflectors it will be possible to estimate the age and orientation of motion across these structural boundaries, constraining relative motion among the various continental blocks in the survey area. This information will establish new constraints on the timing and distribution of deformation in the development of the Amerasia Basin and provide a test of the windshield wiper model of basin opening.

Figure 1 – Cruise Track

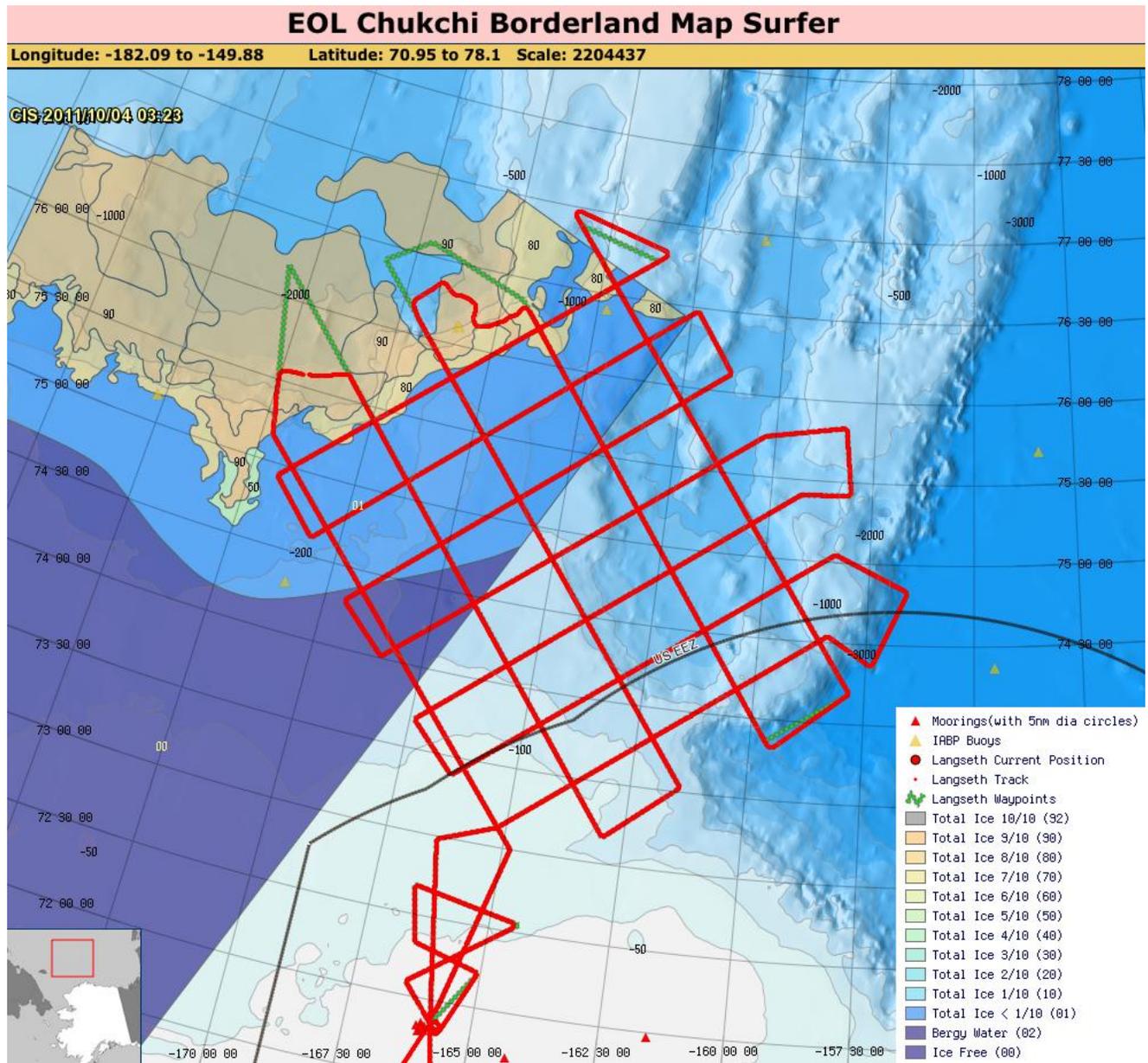


Figure 2 – Cruise Track, Sonobuoy drops

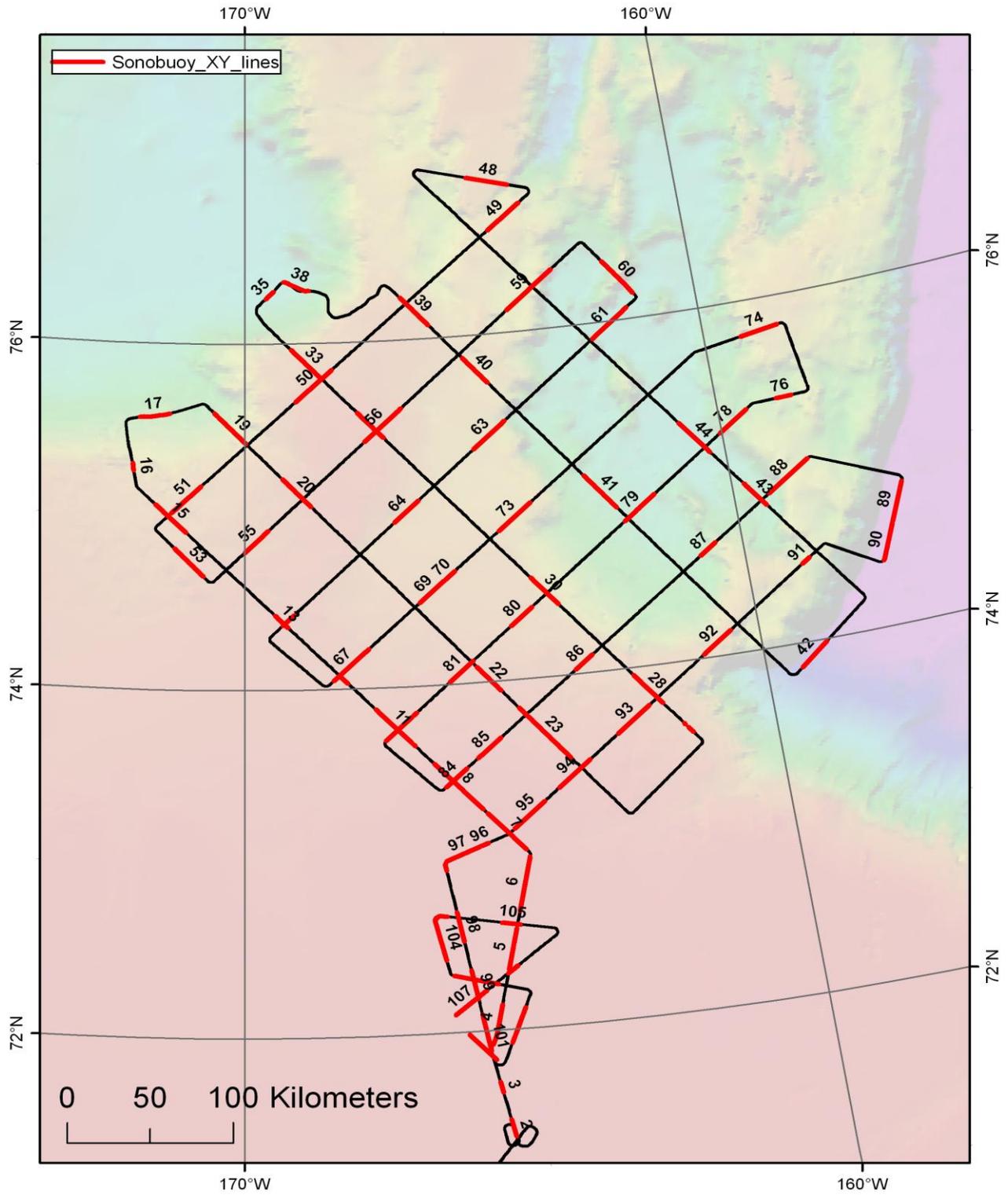
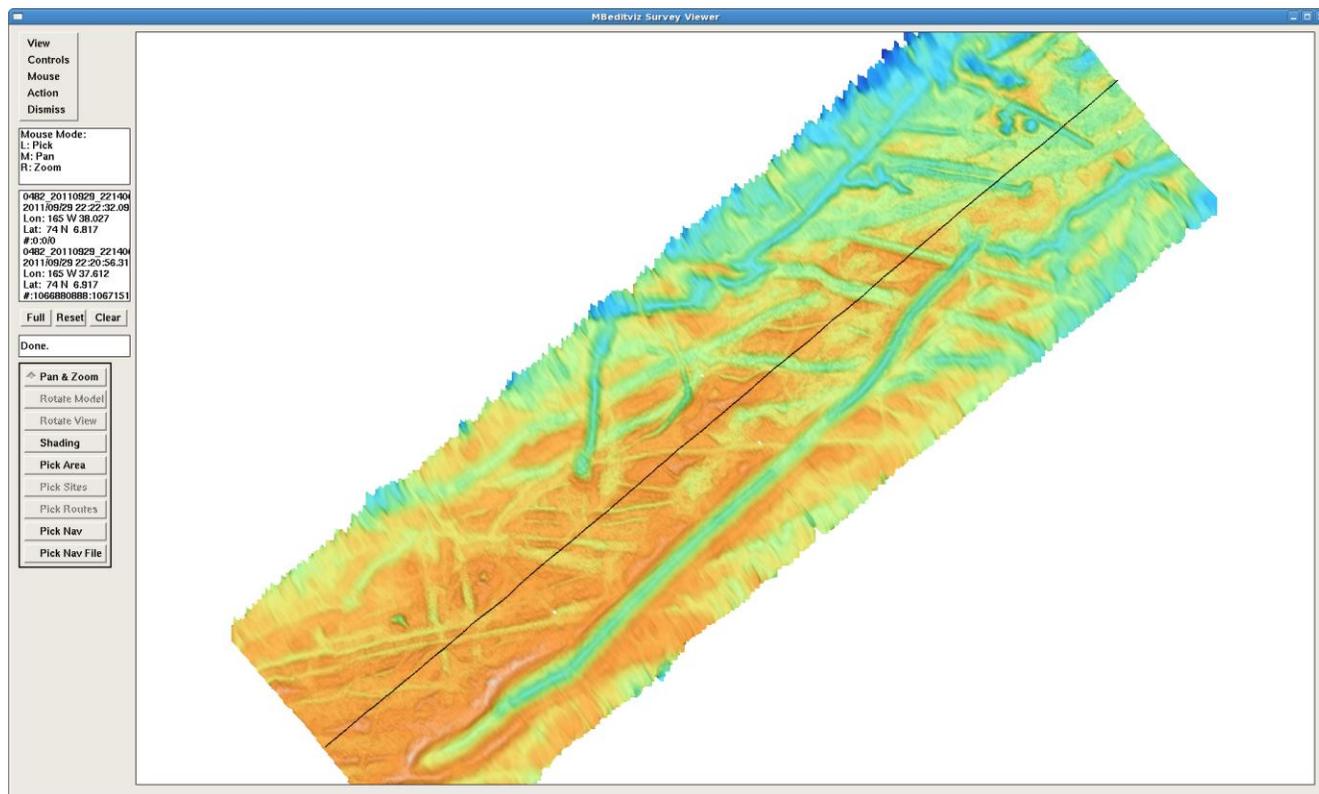


Figure 3 – Chukchi Plate, Alaska Topography & Bathymetry



II. Personnel

Shipboard Technical Staff

1	Robert Steinhaus	Chief Science Officer
2	Ryan Eaton	IT/Navigation/Acquisition
3	Mark Wooley	Acquisition
4	Bernard McKiernan	Acquisition/Watch Leader
5	Mike Martello	Navigation
6	Bruce Felix	UNOLS Floating Tech- ET/IT
7	Tom Spoto	Chief Sound Source Mechanic
8	Mike Tatro	Sound Source Mechanic
9	Weston Groves	Sound Source Mechanic

Ship's Crew

1	Mark Landow	Captain
2	Tony Bijan	Chief Mate
3	Breckenridge Crum	2 nd Mate
4	West Wilson	3 rd Mate
5	Jason Wronowicz	Bosun
6	Ben Nadler	AB
7	Pete Piscitello	AB
8	Inocencio Rimando	AB
9	Jun Matires	OS
10	Joshua Schaffner	OS
11	Steve Pica	Chief Engineer
12	Matt Tucke	1 st Asst. Engineer
13	Mike Romero	2 nd Asst. Engineer
14	Tim Tygielski	3 rd Asst. Engineer
15	Mike Blackburn	Electrician
16	Jack Billings	Oiler
17	Fernando Uribe	Oiler
18	Jesse Huettl	Oiler
19	Hervin McLean Fuller	Steward
20	Ricardo Rios	Cook

MMO

1	Heidi Ingram	PSO
2	Emily Ellis	PSO
3	Amanda Harrison	PSO
4	Meghan Piercy	PSO
5	Dara Cameron	PSO

Science Party

1	Bernie Coakly	Chief Scientist	UAF
2	Dayton Dove	Post-Doc	UAF
3	Melissa Johnson	PhD Student	UAF
4	Anne Hegewald	PhD Student	UAF
5	Ibrahim Ilhan	PhD Student	UAF
6	Rachel Grat	Grad Student	OSU
7	Sookwan Kim	Grad Student	KoPri
8	Korina Monsen	Grad Student	UTromso
9	Grant Cain	Undergrad Student	UAF
10	Emily Decker	Undergrad Student	UAF
11	Margot Swank	Undergrad Student	Stanford
12	Janet Scannell	Ice Observations	UCAR
13	Reynold Aveoganna (RJ)	Alaskan Native Observer	UIC

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	Full	serial logs	MGL-bath01.*	1s
EM122	Kongsberg EM122 Multibeam Sonar	Full	raw output to file	See below	variable
			centerbeam serial logs	MGL-bath02.*	variable
KNUDSEN	Knudsen Engineering 3260 Sub-bottom Profiler	Full	KEA, KEB, SEG-Y	See below	variable
DS50	Furuno DS50 Doppler Speedlog	Full	serial logs	MGL-slog01.*	1s
XBT	Sippican MK21 XBT/XCTD Launcher	21	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 SBE-45 Thermosalinograph	Full	raw serial logs	MGL-tsgraw.*	1s
			converted data	MGL-tsgconv.*	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	On Deploy	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	Full	serial logs	MGL-posmv.*	1s
SEAPATH	Kongsberg SeaPath Integrated Nav System	Full	serial logs	MGL-seapath.*	1s
STU	Sercel Streamer Tension	Full	serial logs	MGL-stu1.*	15s
TAGGER	Spectrum Instruments intelligent reference	None	serial logs	MGL-tagger01.*	shot
			filtered logs	MGL-shot01.*	shot
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
MICROSV	Applied Microsystems Sound Velocity USS Unit	Full	serial logs	MGL-svuss01.*	1s

SBE38	SeaBird SBE38 Pod Thermometer Pod Unit #1	Full	serial logs	MGL-temppod01.*	1s
SBE38	SeaBird SBE38 Pod Thermometer Pod Unit #2	Full	serial logs	MGL-temppod02.*	1s
PCO2	LDEO PCO2 System	Full	serial logs	MGL-pco2.*	~180s
Sonobuoy	SBLogger	Full	Converted data	mgl1112-sb*.sgy	shot

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
2011:249:16:00:00:00.3311	Start	Logging officially started
2011:259:03:45:08.2510 - 2011:259:07:42:42.1417	Missing data	Depth > 800m
2011:262:07:41:16.4598 - 2011:262:21:32:32.2118	Missing data	Depth > 800m then off for remainder of period.
2011:263:06:13:44.6086 - 2011:263:23:14:01.6215	Missing data	Depth > 800m
2011:265:19:01:39.7609 - 2011:265:22:25:07.8147	Missing data	Depth > 800m
2011:266:00:13:18.3875 - 2011:266:03:51:03.3277	Missing data	Depth > 800m then off for remainder of period.
2011:266:04:07:20.8092 - 2011:266:09:14:50.6912	Missing data	Depth > 800m
2011:266:12:44:25.7647 - 2011:266:14:16:05.6089	Missing data	Depth > 800m
2011:268:12:29:30.0265 - 2011:268:14:14:08.8898	Missing data	Depth > 800m
2011:271:00:46:08.6036 - 2011:271:15:54:05.4031	Missing data	Depth > 800m
2011:272:15:38:08.4335 - 2011:272:17:05:14.5990	Missing data	Depth > 800m
2011:275:08:12:34.6379 - 2011:275:10:59:12.7603	Missing data	Depth > 800m
2011:275:11:54:37.2924 - 2011:275:13:25:36.9618	Missing data	Depth > 800m
2011:282:14:33:52.1696 - 2011:282:15:34:08.4671	Missing data	Depth > 800m
2011:282:16:57:11.2374	End	Logging officially ended

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 MGL1112/raw/multibeam. Center beam depth is recorded separately to serial log. The MicroSV (svpod01) probe in the pod supplied sound velocity to the EM122.

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
2011:251:15:49:06.5984	Start	Logging officially started
2011:251:15:49:06.5984 - 2011:251:15:51:47.4463	Missing Data	
2011:251:16:24:04.2319 - 2011:251:16:53:31.7844	Missing Data	BIST
2011:251:17:43:07.9125 - 2011:251:18:00:13.3296	Missing Data	BIST
2011:252:20:36:33.3902 - 2011:252:20:44:46.5992	Missing Data	BIST
2011:253:21:31:31.2010 - 2011:253:21:46:38.7820	Missing Data	BIST
2011:255:21:22:22.1986 - 2011:255:21:29:47.4716	Missing Data	BIST
2011:257:05:28:18.0602 - 2011:257:05:37:11.4750	Missing Data	BIST
2011:258:17:28:49.5473 - 2011:258:17:36:12.3730	Missing Data	BIST
2011:259:05:28:51.8698 - 2011:259:05:39:33.0321	Missing Data	BIST
2011:260:17:56:23.0431 - 2011:260:18:05:39.8927	Missing Data	BIST
2011:262:09:17:09.4443 - 2011:262:09:24:20.9567	Missing Data	System started losing
2011:262:15:17:59.8766 - 2011:262:15:20:03.5308	Missing Data	swath display and was
2011:262:15:41:57.8159 - 2011:262:15:45:00.0394	Missing Data	rebooted.
2011:262:15:47:18.5274 - 2011:262:15:51:21.5027	Missing Data	After reboot, the
2011:262:16:20:03.4429 - 2011:262:16:24:56.8603	Missing Data	processed swath would
2011:262:21:19:56.3036 - 2011:262:21:24:42.0287	Missing Data	not display. System
2011:262:22:03:30.7476 - 2011:262:22:09:00.3827	Missing Data	turned on and off several
2011:262:22:21:35.9537 - 2011:262:22:26:05.7742	Missing Data	times in troubleshooting.
2011:265:15:36:43.7732 - 2011:265:16:03:18.4859	Missing Data	BIST
2011:266:00:28:09.0201 - 2011:266:00:36:25.7753	Missing Data	BIST unsaved
2011:268:03:23:14.3893 - 2011:268:03:31:00.9853	Missing Data	BIST
2011:269:08:42:21.3942 - 2011:269:08:50:04.7289	Missing Data	BIST
2011:270:14:37:29.0578 - 2011:270:14:45:22.3570	Missing Data	BIST

2011:271:02:31:21.1266 - 2011:271:02:38:54.7160	Missing Data	BIST
2011:272:10:05:57.1837 - 2011:272:10:13:54.1371	Missing Data	??? Unsaved BIST?
2011:273:16:20:36.6338 - 2011:273:16:28:05.1439	Missing Data	BIST
2011:273:18:52:16.5658 - 2011:273:18:56:59.7229	Missing Data	BIST
2011:273:18:57:48.9220 - 2011:273:19:15:23.0591	Missing Data	System restarts
2011:274:10:29:30.9199 - 2011:274:10:55:45.9542	Missing Data	BIST
2011:275:18:23:55.7637 - 2011:275:18:31:27.7390	Missing Data	BIST
2011:277:11:55:39.1526 - 2011:277:12:06:51.7114	Missing Data	BIST
2011:282:16:56:10.9878	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
bath02	2008:192:00:00:46.5831	\$KGDPT,2958.32,0.0,12000.0*4a
bath02	2008:192:00:01:03.0606	\$KGDPT,2954.18,0.0,12000.0*4e

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.

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
2011:249:16:00:00.7730	Start	Logging officially started
2011:282:17:16:00.0591	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
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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.

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

Log Date	Event	Comment
2011:249:16:00:00.7950	Start	Logging officially started
2011:282:16:56:59.5839	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

CNAV

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
2011:249:16:00:00.0641	Start	Logging officially started
2011:282:16:56:59.9889	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.

Due to the large amount of CNAV3050 errors, all errors are attached in a file as
MGL1112_checktimes_cnav3050_10092011_final.txt

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
2011:249:16:00:00.0341	Start	Logging officially started
2011:282:21:31:54.9455	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	\$HEHDT,005.8,T*22
gy01	2008:231:00:00:00.6396	\$HEROT,-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.

The PosMV operated normally during the cruise.

File id: posmv

Logging interval: 1 second

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

Log Date	Event	Comment
2011:249:16:00:00.0151	Start	Logging officially started
2011:266:00:32:33.8856 - 2011:266:00:33:59.4352	Missing data	NAV Drop
2011:282:16:56:59.2679	End	Logging officially ended

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 integrated navigation system. It was in operation for the length 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
2011:249:16:00:00.4761	Start	Logging officially started
2011:254:22:10:42.8978 - 2011:254:22:11:29.8949	Missing data	NAV drop
2011:266:00:28:50.2781 - 2011:266:00:29:32.8699	Missing data	NAV drop
2011:273:18:52:35.6087 - 2011:273:18:54:06.2155	Missing data	NAV drop
2011:273:19:02:58.5874 - 2011:273:19:03:42.3483	Missing data	NAV drop
2011:282:16:56:59.8079	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. It was in operation while streamers were deployed.

Logging interval: 30 seconds

File id: stu1

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

Log Date	Event	Comment
2011:256:17:00:07.3097	Start	Logging officially started
2011:280:17:29:36.4422	End	Logging officially ended

Streamer deployment gaps greater than thirty seconds are displayed in the following table.

Time	Event
	Streamer deployment
	Streamer deployment

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					

Spectrum Instruments TDM-4 Event Logger (not in operation for this cruise)

The Event logger time stamps time-break triggers from DigiShot in all fire modes. This instrument was not used on this cruise, and instead recorded a different set of serially logged data.

File id: tagger01

Logging interval: 1 second

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

Log Date	Event	Comment
2011:249:16:00:00:00.0289	Start	Logging officially started
2011:282:16:14:00:00.0289	End	Logging officially ended

tagger1 data format:

tagger1	2008:231:00:00:00.0383	#51,08182008,000001
tagger1	2008:231:00:00:00.2027	#79,00000000
tagger1	2008:231:00:00:00.2948	#68,2
tagger1	2008:231:00:00:00.3689	#70,0
tagger1	2008:231:00:00:00.4010	#56,-00000
tagger1	2008:231:00:00:00.4210	#72,FF

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.

Magnetometer Deployment Notes

Time	Event
2011-09-12T17:03	Maggie is recording, on board ** data invalid **
2011-09-24T10:33	Magnetometer caught in source array 3
2011-09-30T05:01	Maggie in water at stern (turn precaution)
2011-09-30T06:04	Magnetometer redeployed and in position
2011-10-02T14:24	Maggie is on board
2011-10-02T19:58	Maggie is in position and logging
2011-10-05T04:38	Maggie is off

Logging interval: 1 second

File id: mag01

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

Log Date	Event	Comment
2011:255:17:03:02.2812	Start	Logging officially started
2011:275:15:11:48.0031 - 2011:275:19:59:19.6103	Missing data	Onboard for inspection
2011:278:04:38:23.8028	End	Logging officially ended

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-23 Thermosalinograph

The Seabird TSG output is logged by LDS to the “tsg” set. Output is also converted in real-time and recorded to the “tsgconv” data 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
2011:251:16:26:20.3807	Start	Logging officially started
2011:282:16:09:58.0634	End	Logging officially ended

tsgraw data sample:

tsgraw	2008:231:00:00:01.9179	B479CB5528A6D6ABFB2D
tsgraw	2008:231:00:00:11.9187	B474CB5428A799ABBB2D
tsgraw	2008:231:00:00:21.9176	B46FCB5328A70CAB8B2D

File id: tsgconv

Logging interval: 1 second

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

Log Date	Event	Comment
2011:251:16:26:20.3807	Start	Logging officially started

2011:282:16:09:58.0634	End	Logging officially ended
------------------------	-----	--------------------------

tsgconv data sample:

tsgconv	2008:231:00:00:01.9179	B479CB5528A6D6ABFB2D	1531.59	28.85	24.35	5.53	33.74
tsgconv	2008:231:00:00:11.9187	B474CB5428A799ABBB2D	1531.61	28.85	24.36	5.53	33.74
tsgconv	2008:231:00:00:21.9176	B46FCB5328A70CAB8B2D	1531.60	28.85	24.35	5.53	33.74

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
2011:249:16:00:00.7281	Start	Logging officially started
2011:282:21:22:59.9534	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
2011:249:16:00:00.3881	Start	Logging officially started
2011:282:16:59:59.4706	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
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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
2011:249:16:00:00.3371	Start	Logging officially started
2011:282:16:59:59.8037	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
2011:249:16:00:00.2841	Start	Logging officially started
2011:282:16:59:59.4596	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
2011:249:16:00:00.5181	Start	Logging officially started
2011:282:16:59:59.7717	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
2011:251:17:12:44.8604	Start	Logging officially started
2011:282:16:10:11.7450	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	0
Equil						
pco2	2011:130:00:30:00.5374	2011130.02198	2370.02	37.53	1007.14	
	404.42	28.46	386.8	5000.00	19	0
Equil						

Mk21 XBT System

Files: *.RDF,*.EDF

Twenty three XBT drops (9x T-5, 15x T-7) were made during this cruise. The data set are saved to the raw/XBT directory in the cruise archive. Refer to the MGL1112_Expendable_Drops.xls spreadsheet in the docs/operations directory of the cruise archive for more information.

SONOBUOY TYPES

One Hundred and Eight Sonobuoys were launched during this cruise. The data sets were saved locally to a computer using a software suite of SBLogger. This machine was provided by USGS and stored its data in .sgy format.

Two types of Sonobuoys were launched during the MGL1112 cruise:

Vendor	Model
Sparton	AN/SSQ-57SPC
Sonobuoy Tech Systems	AN/SSQ-53F

IV. Seismic Summary

A. Acquisition Parameter Table

Acquisition Parameter Table	
AcquisitionParameterID	MGL1112_ACQ01
FieldActivityID	MGL1112
ReceiverType	Sentry Solid Streamer
SourceType	Airgun
Acquisition System Name	WINRADIO/Sercel Syntrak 960
Acquisition System Type	Sonobuoy/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	83.3m (Source String 3)
Source_to_Near_Channel	206.67m (Source String 3)
Number_of_channels_recorded	468
Number_of_cables	1
Number_of_channels_each_cable	468
Channel_length	12.5 m
Cable_length	6.0 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	1830 cu in
Source_pressure	2000 psi nominal
Source_make,model	Bolt 1500LL & 1900LL
Source_number	10
Source_depth	9.0m
Shot_control	Distance
Shot_Interval	37.5 m
Sample_interval	2ms
Record_length	12s
Compass_birds	23 Digicourse 5011
Recording_delay	N/A

Acquisition Parameter Table

AcquisitionParameterID	MGL1112_ACQ02
FieldActivityID	MGL1112
ReceiverType	Sentry Solid Streamer
SourceType	Airgun
Acquisition System Name	WINRADIO/Sercel Syntrak 960
Acquisition System Type	Sonobuoy/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	103.3m (Source String 4)
Source to Near_Channel	226.67 (Source String 4)
Number_of_channels_recorded	468
Number_of_cables	1
Number_of_channels_each_cable	468
Channel_length	12.5 m
Cable_length	6.0 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	1830 cu in
Source_pressure	2000 psi nominal
Source_make,model	Bolt 1500LL & 1900LL
Source_number	10
Source_depth	9.0m
Shot_control	Distance
Shot_Interval	37.5 m
Sample_interval	2ms
Record_length	12s
Compass_birds	23 Digicourse 5011
Recording_delay	N/A

Acquisition Parameter Table

AcquisitionParameterID	MGL1112_ACQ03
FieldActivityID	MGL1112
ReceiverType	Sentry Solid Streamer
SourceType	Airgun
Acquisition System Name	WINRADIO/Sercel Syntrak 960
Acquisition System Type	Sonobuoy/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	83.3m (Source String 3)
Source to Near_Channel	206.67m (Source String 3)
Number_of_channels_recorded	468
Number_of_cables	1
Number_of_channels_each_cable	468
Channel_length	12.5 m
Cable_length	6.0 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	1830 cu in
Source_pressure	2000 psi nominal
Source_make,model	Bolt 1500LL & 1900LL
Source_number	10
Source_depth	6.0m
Shot_control	Distance
Shot_Interval	37.5 m
Sample_interval	2ms
Record_length	10s
Compass_birds	23 Digicourse 5011
Recording_delay	N/A

Acquisition Parameter Table

AcquisitionParameterID	MGL1112_ACQ04
FieldActivityID	MGL1112
ReceiverType	Sentry Solid Streamer
SourceType	Airgun
Acquisition System Name	WINRADIO/Sercel Syntrak 960
Acquisition System Type	Sonobuoy/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	103.3m (Source String 4)
Source to Near_Channel	226.67m (Source String 4)
Number_of_channels_recorded	468
Number_of_cables	1
Number_of_channels_each_cable	468
Channel_length	12.5 m
Cable_length	6.0 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	1830 cu in
Source_pressure	2000 psi nominal
Source_make,model	Bolt 1500LL & 1900LL
Source_number	10
Source_depth	6.0m
Shot_control	Distance
Shot_Interval	37.5 m
Sample_interval	2ms
Record_length	10s
Compass_birds	23 Digicourse 5011
Recording_delay	N/A

Acquisition Parameter Table

AcquisitionParameterID	MGL1112_ACQ05
FieldActivityID	MGL1112
ReceiverType	Sentry Solid Streamer
SourceType	Airgun
Acquisition System Name	WINRADIO/Sercel Syntrak 960
Acquisition System Type	Sonobuoy/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	103.3m (Source String 4)
Source to Near_Channel	226.67m (Source String 4)
Number_of_channels_recorded	468
Number_of_cables	1
Number_of_channels_each_cable	468
Channel_length	12.5 m
Cable_length	6.0 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	1830 cu in
Source_pressure	2000 psi nominal
Source_make,model	Bolt 1500LL & 1900LL
Source_number	10
Source_depth	6.0m
Shot_control	Time
Shot_Interval	12.8 s
Sample_interval	2ms
Record_length	10s
Compass_birds	23 Digicourse 5011
Recording_delay	N/A

Acquisition Parameter Table

AcquisitionParameterID	MGL1112_ACQ06
FieldActivityID	MGL1112
ReceiverType	Sentry Solid Streamer
SourceType	Airgun
Acquisition System Name	WINRADIO/Sercel Syntrak 960
Acquisition System Type	Sonobuoy/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	83.3m (Source String 3)
Source to Near_Channel	206.67m (Source String 3)
Number_of_channels_recorded	468
Number_of_cables	1
Number_of_channels_each_cable	468
Channel_length	12.5 m
Cable_length	6.0 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	1830 cu in
Source_pressure	2000 psi nominal
Source_make,model	Bolt 1500LL & 1900LL
Source_number	10
Source_depth	6.0m
Shot_control	Time
Shot_Interval	12.8 seconds
Sample_interval	2ms
Record_length	10s
Compass_birds	23 Digicourse 5011
Recording_delay	N/A

Acquisition Parameter Table

AcquisitionParameterID	MGL1112_ACQ07
FieldActivityID	MGL1112
ReceiverType	Sentry Solid Streamer
SourceType	Airgun
Acquisition System Name	WINRADIO/Sercel Syntrak 960
Acquisition System Type	Sonobuoy/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	103.3m (Source String 4)
Source to Near_Channel	226.67m (Source String 4)
Number_of_channels_recorded	468
Number_of_cables	1
Number_of_channels_each_cable	468
Channel_length	12.5 m
Cable_length	6.0 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	1830 cu in
Source_pressure	2000 psi nominal
Source_make,model	Bolt 1500LL & 1900LL
Source_number	10
Source_depth	6.0m
Shot_control	Time
Shot_Interval	12.0 s
Sample_interval	2ms
Record_length	10s
Compass_birds	23 Digicourse 5011
Recording_delay	N/A

Acquisition Parameter Table

AcquisitionParameterID	MGL1112_ACQ08
FieldActivityID	MGL1112
ReceiverType	Sentry Solid Streamer
SourceType	Airgun
Acquisition System Name	WINRADIO/Sercel Syntrak 960
Acquisition System Type	Sonobuoy/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	83.3m (Source String 3)
Source to Near_Channel	206.67m (Source String 3)
Number_of_channels_recorded	468
Number_of_cables	1
Number_of_channels_each_cable	468
Channel_length	12.5 m
Cable_length	6.0 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	1830 cu in
Source_pressure	2000 psi nominal
Source_make,model	Bolt 1500LL & 1900LL
Source_number	10
Source_depth	6.0m
Shot_control	Time
Shot_Interval	12.0 s
Sample_interval	2ms
Record_length	10s
Compass_birds	23 Digicourse 5011
Recording_delay	N/A

Acquisition Parameter Table	
AcquisitionParameterID	MGL1112_ACQ09
FieldActivityID	MGL1112
ReceiverType	Sentry Solid Streamer
SourceType	Airgun
Acquisition System Name	WINRADIO/Sercel Syntrak 960
Acquisition System Type	Sonobuoy/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	83.3m (Source String 3)
Source to Near_Channel	206.67m (Source String 3)
Number_of_channels_recorded	468
Number_of_cables	1
Number_of_channels_each_cable	468
Channel_length	12.5 m
Cable_length	6.0 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	1830 cu in
Source_pressure	2000 psi nominal
Source_make,model	Bolt 1500LL & 1900LL
Source_number	10
Source_depth	6.0m
Shot_control	Time
Shot_Interval	37.5 meters
Sample_interval	2ms
Record_length	12s
Compass_birds	23 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 *MGL_Single_Streamers_Arctic_MGL1112.pdf*. Additionally, the configuration for each sequence is covered in **MGL Seismic Configuration by Sequence Acquired.xls**.

Offsets

All antenna and in-water offset drawings are in the file *MGL1112_Offsets.xls*

Spectra

Spectra was used for all timing and navigation during the cruise. Shotlogs were generated from spectra header logs, P190 and P294 files using shotlog processing code contained on the archive in /supplemental/code/shotlog.

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
2011-09-03T16:27	Dutch Harbor, AK, Pier side 53 54.212 N 166 31.550 W	Midship center frame	WWII National Historic Area Dutch Harbor 16:54 UTC 53 53.684 N 166 32.357 W
10/09/11 07:10 PM	Dutch Harbor, AK, Pier side 53 54.204 N 166 31.641 W	Midship center frame	WWII National Historic Area Dutch Harbor 20:55 UTC 53 53.684 N 166 32.361 W

Please refer to the documents located under MGL1112/docs/gravity_tie for detailed records.

VI. Archive Contents

Key files are bolded.

MGL1112/docs	Cruise documents and logs
MGL1112/docs/config	Configuration archive
MGL1112/docs/elog	Cruise elog
MGL1112/docs/gravity_tie	Gravity Tie information
MGL1112/docs/map	Cruise maps, track map
MGL1112/docs/offsets	Vessel/sensor offsets
MGL1112/docs/operations/	Operations documents
MGL1112/docs/operations/Daily_Reports	Cruise Daily Reports from Chief Science Officer
MGL1112/docs/operations/NavLogs	Seismic navigation logs (spectra)
MGL1112/docs/operations/ObsLogs	Seismic acquisition logs (gun controller)
MGL1112/docs/operations/MGL1112_B15_line_log_multi_channel_seismics.xls	Master line log table
MGL1112/docs/permits	Clearance Documents
MGL1112/docs/waypoints	Waypoint files
MGL1112/docs/personnel	Personnel rosters, org chart, bunk and phone lists
MGL1112/docs/reports	Cruise Report and supplemental docs
MGL1112/docs/reports/MGL1112_DataReport_v1.0.doc	This file
MGL1112/docs/offsets/MGL1112_Offsets.xls	Vessel/sensor offsets
MGL1112/docs/screencaps	Screen captures
MGL1112/processed	Processed data
MGL1112/processed/reflex (3D data-sets only, not applicable to OBS and 2D)	Spectra reflex files
MGL1112/processed/shotlogs	Spectra shot log files

MGL1112/processed/sprint	Spectra spring files
MGL1112/processed/svp	Sound velocity profiles
MGL1112/raw	Raw data
MGL1112/raw/adcp	Raw ADCP data
MGL1112/raw/knudsen	Raw Knudsen sub-bottom profiler data
MGL1112/raw/multibeam	Raw EM122 data
MGL1112/raw/serial	Underway serial data: gps, tsg, weather, etc.
MGL1112/raw/sonobuoy	Raw sonobuoy data
MGL1112/raw/spectra/P1	Spectra underway p190
MGL1112/raw/spectra/P2	Raw seismic navigation, p294
MGL1112/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 m.mmmmm, a, ddm m.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
ddmm.mmmmm	Latitude	Degrees/Minutes/Seconds
a	Direction of Latitude N = North S = South	n/a
ddmm.mmmmm	Longitude	Degrees/Minutes/Seconds
a	Direction of Longitude E = East W = West	n/a
x	GPS Quality indicator 0 = fix not valid 1 = GPS Autonomous fix 2 = GeGPS 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 beam in use yy is the GPS correction 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 /td>
*hh	Checksum (hexadecimal representation)	n/a

\$GPGGA,hhmmss.ss, ddm m.mmmmm, a, ddm m.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
ddmm.mmmmm	Latitude	Degrees/Minutes/Seconds
a	Direction of Latitude N = North S = South	n/a
ddmm.mmmmm	Longitude	Degrees/Minutes/Seconds
a	Direction of Longitude E = East W = West	n/a
x	GPS Quality indicator 0 = fix not valid 1 = GPS Autonomous fix 2 = GeGPS 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 beam in use yy is the GPS correction 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:

- KGDPT - Depth below transducer

SDBT,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

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

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 www.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
ddd.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.dec Four fixed digits of year Three fixed digits of month Five fixed digits for 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, llll.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	
yyyyjjj.jjj	pco2 Computer Date/Time	n/a	Year/Julian Day. Four fixed digits Three fixed digits Five fixed digits 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
llll.lllllm	CNav Latitude	0 to 90, N/S	degrees/minutes
nnnnn.nnnnnno	CNav Longitude	0 to 180, E/W	degrees/minutes
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, hhhmss.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. Two fixed digits of minutes. Two fixed digits of seconds. Three digits for decimal fractions of a second.	
hhmmss.sss	UTC time of position	n/a	Degrees Minutes.decimal. Two fixed digits of degrees Two fixed digits of minutes Five digits for decimal minutes.	
llll.llll	Latitude	-90 to +90	Degrees/Minutes.decimal. Three 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. Three fixed digits of degrees. Two fixed digits of minutes. Five digits for decimal minutes.	
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 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		
t	GPS Quality Indicator			

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	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, hhmss.ss, DD, MM, YYYY,, *hh

\$INZDA-Time and date

Item	Definition	Value	Units
\$INZDA	Header	\$INZDA	
hhmss.ss	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 Thermosalinograph, Converted

Data from the Seabird TSG is output in the following format:

2008:199:02:23:43.0914 AE9FC8F927F34AA7DAC1 1527.40 27.94 23.47 5.17 31.90

yyyy:ddd:hh:mm:ss.ssss ttttccccxxxxxxvvvvvvv aaaa.aa bb.bb cc.cc d.dd ee.ee

Item	Definition	Units
yyyy	LDS Timestamp	year
ddd	LDS Timestamp	day of year
hh	LDS Timestamp	hour
mm	LDS Timestamp	minute
ss.ssss	LDS Timestamp	second
tttt	Raw internal temperature sensor data	n/a
cccc	Raw conductivity sensor data	n/a
xxxxxx	Raw external temperature sensor data	n/a
aaaa.aa	Speed of sound	m/s
bb.bb	Internal temperature	Degrees C
cc.cc	External temperature	Degrees C
d.dd	Conductivity	S/m
ee.ee	Salinity	ppm

Seabird SBE-21 Thermosalinograph Data

Data from the SBE-21 TSG is output in the following format:

2008:199:02:23:43.0914 AE9FC8F927F34AA7DAC1

yyyy:ddd:hh:mm:ss.ssss tttccccxxxxxvvvvv

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
ttt	Raw internal temperature sensor data	n/a
cccc	Raw conductivity sensor data	n/a
xxxxxx	Raw external temperature sensor data	n/a
vvvvv	Auxilliary voltage	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, hhhmss.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	
hhmmss.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.
llll.llll	Latitude	-90 to +90	DegreeslMinutes.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, 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	Carriage return and line feed	/CR/LF

Langseth Shotlog Format

Each Langseth shotlog contains shot records in the following format:

MGL1202MCS01 00924 2011:159:15:28:10.8208 152810.8208670 4059.5 565908.12N 1464326.41N
565906.79N 1464338.85N
||||||| sssss yyyy:mm:dd:hh:mm:ss.ssss hhmmss.ssssss dddd.d vv.vvvvvv www.wwwwww xx.xxxxxx
yyy.yyyyyy

Langseth shotlog format

Item	Definition	Units
	linename	n/a
ssssss	shot number	n/a
yyyy:mm:dd:hh:mm:ss.ssss	date/time	ISO8601 format
hhmmss.ssssss	time	hh = hour mm = minutes ss = seconds .ssssss = decimal seconds
ddd.d	depth	meters
vv.vvvvvv	vessel lat	degrees, WGS84
www.wwwwww	vessel lon	degrees, WGS84
xx.xxxxxx	source lat	degrees, WGS84
yyy.yyyyyy	source lon	degrees, WGS84

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

Spectrum TM-4 time and frequency system data

The TM-4 is used as an event logger to log shot times from digishot. The 'tagger' data set includes all output from the TM-4. The 'shot' data set includes only the event messages (message #62)

Spectra provides primary shot timing aboard Langseth. The TM-4 is used for qc and backup purposes.

Message descriptions

Message #	Type	Form	Explanation
50	ACKNOWLEDGE	CRLF	
51	DATE AND TIME	MMDDYYYY,HHMMSSCRLF	MMDDYYYY is UTC month, day, and year HHMMSS is UTC hours, minutes and seconds
52	POSITION	WWW.WW,X,YYYY.YY,Z,A,NCRLF	W = latitude in DDMM.MM X = hemisphere N or S Y = longitude in DDDMM.MM Z = hemisphere E or W A = GPS availability (0 = not available, 1 = available) N = number of satellites used (0-9, A[10], B[11], C[12])
53	ALTITUDE	SXXXXX,MCRLF	S = sign (+ or -) X = altitude (5 digits) M = altitude units (meters)
55	MASK ANGLE AND MAP DATUM SETTING	X,47CRLF	X = 0 for 5 degrees X = 1 for 15 degrees X = 2 for 20 degrees 47 = two digit map datum code (fixed at WGS84)
56	USER TIME BIAS	SXXXXXCRLF	S = sign (+ or -) X = bias value (5 digits)
57	TIMING MODE	XCRLF	X = 0 for Dynamic Timing Mode X = 1 for Static Timing Mode X = 3 for Auto Survey Mode
59	GEOMETRIC QUALITY AND ALMANAC STATUS	X,YCRLF	X = GQ (0-9) Y = 0 (Almanac OK) Y = 1 (no Almanac) Y = 2 (Almanac is old)
60	TIME PORT DATA RATE AND MULTIPLEXER #1 STATUS	X,YCRLF	X = 0 (1200 baud) Y = 0 for 10 MHz output X = 1 (2400 baud) Y = 1 for 5 MHz output X = 2 (4800 baud) Y = 2 for 1 MHz output X = 3 (9600 baud) Y = 3 for 100 kHz output X = 4 (19200 baud) Y = 4 for 10 kHz output X = 5 (38400 baud) Y = 5 for 1 kHz output

			<p>X = 6 (57600 baud) Y = 6 for IRIG output (if installed) X = 7 (115200 baud) Y = 7 for PPS output Y = 8 for OFF (newer TM-4's only)</p>
61	TIMING STATUS	W,CRLF	<p>W = 0 (time not valid) W = 1 (Time Valid)</p>
62	EVENT TIME-TAG	MMDDYYYY,HHMMSS.SSS SSSSCRLF	<p>MMDDYYYY = UTC date of event HHMMSS.SSSSSSS = UTC time of event</p>
63	POP/ETT STATUS	X,P,MMDDYYYY,HHMMSS. SSSSSS,RRRRRRRRCRLF	<p>X = 0 for ETT/POP OFF X = 1 for POP One-Shot X = 2 for POP Repeat X = 3 for ETT P = + for positive polarity P = - for negative polarity P = 0 when POP/ETT Mode is OFF MMDDYYYY is the POP date (UTC) HHMMSS.SSSSSSS is the POP time (UTC) RRRRRRRR is the POP repeat interval</p>
64	OSCILLATOR TUNING MODE	XCRLF	<p>X = 1 for Mode 1 (oscillator warm-up) X = 2 for Mode 2 (course adjust) X = 3 for Mode 3 (course adjust standby) X = 4 for Mode 4 (fine adjust) X = 5 for Mode 5 (fine adjust hold) Note: See OSCILLATOR MODES on page 11 of the Spectrum manual for an explanation of these Oscillator Tuning Modes.</p>
65	ALARM STATUS	X,Y,ZCRLF	<p>X = 0 for No Coast condition X = 1 for Coast Alarm condition See Message #79 for Coast Timer. Y = 0 for Antenna Good Y = 1 for Antenna Current Sense Fault condition Z = 0 for 10 MHz Frequency Output Good Z = 1 for 10 MHz Frequency Output Fault condition See HARDWARE FAULT MONITORING on page 14 of Spectrum manual for an explanation of Antenna Alarm.</p>
68	MULTIPLEXER #2 STATUS	XCRLF	<p>X = 0 for 10 MHz output X = 1 for Mux1 mirror X = 2 for PPS X = 3 for output option 1 X = 4 for output option 2</p>

			<p>X = 5 for output option 3 X = 6 for baseband IRIG (if installed) X = 7 for baseband NASA-36 (if installed) X = 8 for OFF (newer TM-4's only)</p>
69	TRACKING CHANNEL STATUS	VV,W,X,Y,... VV,W,X,Y,ZCRLF	<p>VV = PRN of satellite being tracked W = constellation status: 0 = not included in current constellation 1 = included in current constellation X = tracking status: A = acquisition/reacquisition S = searching 0-9 = SQ Y = Ephemeris status: 0 = not collected 1 = collected Z = receiver status: 2 = search the sky 3 = Almanac collect 4 = Ephemeris collect 5 = acquisition 6 = position NOTE: VV,W,X,Y repeats twelve times, corresponding to each of the twelve channels.</p>
70	SERIAL TIME MESSAGE FORMAT	XCRLF	<p>X = 0 for standard output X = 1 for NTP output (optional) X = 2 for NMEA output</p>
71	SERIAL TIME CODE FORMAT	XCRLF	<p>X = 0 for IRIG B output X = 1 for NASA-36 output</p>
72	ETT PARAMETERS	X,PCRLF	<p>X = 0 (ETT off) X = 1 (ETT on)</p>
74	POP PARAMETERS (Simultaneous ETT/POP units)	X,P,MMDDYYYY,HHMMSS.SSSSSS,RRRRRRR,W,CRLF	<p>X = 0 for POP Off X = 1 for POP One-Shot X = 2 for POP Repeat P = + for positive polarity P = - for negative polarity MMDDYYYY is the POP date (UTC) HHMMSS.SSSSSS is the POP time (UTC) RRRRRRR is the POP repeat interval in milliseconds W = 0 for 1 μs pulse width W = 1 for 10 μs pulse width W = 2 for 100 μs pulse width W = 3 for 1 ms pulse width</p>

			<p>W = 4 for 10 ms pulse width W = 5 for 50 ms pulse width W = 6 for 100 ms pulse width W = 7 for 250 ms pulse width W = 8 for Level Hold</p>
75	SPEED OVER LAND and HEADING	SSS.SS,HHH.HCRLF	<p>SSS.SS indicates speed over land in meters/sec HHH.H indicates course in degrees decimal</p>
76	ADDITIONAL NMEA INFORMATION	DDMM.MMMM,N,DDMM.MMMM,W,SAAAAA.A,M,G,UU,PP.P,ZZZ.ZZ,YYY.YCRLF	<p>DDMM.MMMM is latitude in degrees and decimal minutes N is north or south (N, S) DDMM.MMMM is longitude in degrees and decimal minutes W is west or east (W, E) S is sign of altitude above or below sea level (+,-) AAAAA.A is altitude (in meters) (0-18000) M is altitude units (meters) G is GPS status (0= fix not valid, 1= fix valid) UU is number of satellites used in navigation solution (0-12) PP.P is estimated horizontal dilution of precision (0-99.9) ZZZ.ZZ is speed over ground in knots YYY.Y is course over ground in degrees</p>
77	PHASE LOCK STATUS	X,CRLF	.
78	ADDITIONAL USER OPTION SETTINGS	A,B,C,D,E,FCRLF	<p>A = 0 for Antenna Alarm Disabled A = 1 for Antenna Alarm Enabled (default) B = 0 for PPS Source 0 (See Message #24 for definitions) B = 1 for PPS Source 1 B = 2 for PPS Source 2 B = 3 for PPS Source 3 Fields C-F are reserved.</p>
79	COAT TIMER	HHHHMMSSCRLF	HHHHMMSS = Amount of time (Hours, Minutes, Seconds) that the unit has been in Coast (Mode 3 or Mode 5)
80	PHASE LOCK STATUS	X, CRLF	.
81	LEAP SECONDS?GPS TIME	X,Y,Â±ZZCRLF	<p>X = 0 for TM-4 operation in GPS Time (reserved for future feature, currently disabled) X = 1 for TM-4 operation in UTC Time</p>

(default)

Y = 0 for Leap Second data not valid

Y = 1 for Leap Second data valid

$\hat{A}\pm ZZ$ = UTC/GPS Time Offset, in whole seconds

The difference between UTC Time and GPS Time is the number of Leap Seconds that have been introduced to UTC Time since the beginning of GPS Time. (GPS Time is never adjusted for Leap Seconds.)

The $\hat{A}\hat{A}$ -UTC Offset $\hat{A}\hat{A}$ ® from GPS Time is in the information data stream broadcast by the GPS satellites. The TM-4 stores the previously known value, but until the TM-4 makes contact with satellites and downloads the current "UTC Offset", the data cannot be considered to be valid.

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