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# **LMG0712**

## **Palmer Station Opening**

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### **Cruise Data Report**

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**September 14 – 29, 2007**

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## Introduction

The LMG data acquisition systems continuously log data from a suite of instrumentation throughout the cruise. This document describes the format of that data and its location on the distribution CDs. It also contains important information that may affect how this data is processed such as instrument failures or other known problems with acquisition.

The data collected during this cruise is distributed on a CD-ROM written in ISO9660 level-1 format. This data format has very strict requirements on filenames and organization. However, it is readable by virtually every computing platform.

All of the data has been archived with the Unix “tar” command and/or compressed using Unix “gzip” compression. Tar files have a “.tar” extension and Gzipped files have a “.gz” extension. Tools are available on all platforms for uncompressing and de-archiving these formats. On Macintosh, Stuffit Expander with DropStuff will open a tar archive and uncompress gzipped and Unix compressed files. For Windows, WinZip, a shareware utility included on this CD (remember, it is shareware) will open these files.

In some cases to adhere to the ISO9660 format the .tar extension was removed. When we tarred the files then gzip the tar archive the name of the file became *File.tgz*. This name does not follow the 8.3 naming convention of the ISO9660 format. On Windows and Mac Platforms Winzip and Stuffit Expander handles this just fine. When they expand the *File.gz* the expanded file becomes *File.tar*, which both software packages can handle. On Unix platforms gunzip expands *File.tgz* but it does not append the .tar extension. So you may not recognize the file as a tar archive, but OS does recognize it as a tar archive. If you use the file command it will return saying it is a tar file. The below tar command will un-archive the file just fine.

***IMPORTANT: Read the last section in this document, Acquisition Problems and Events, for important information that may affect the processing of this data.***

## Archive Data Extraction

It is often useful to know exactly how an archive was produced when expanding its contents. Tar files were created using the following commands:

```
tar cvf archive-file files-to-be-archived
```

To create a list of the files in the archive:

```
tar tvf archive-file > contents.list
```

To extract the files from the archive:

```
tar xvf archive-file file(s)-to-extract
```

G-zipped files will have a “.gz” extension on the filename. These files can be decompressed after de-archiving, using:

```
gunzip filename.gz
```

## CD Directory Structure

<ul style="list-style-type: none"><li>—ADCP<ul style="list-style-type: none"><li>LMG0712.tgz</li><li>LMG0712a.tgz</li><li>LMG0712b.tgz</li></ul></li><li>—Cal<ul style="list-style-type: none"><li>InstCoef.txt</li><li>xrvdaslg.txt</li><li>CAL.zip</li></ul></li><li>—Isobars<ul style="list-style-type: none"><li>isobars.tar</li></ul></li><li>—JGOF<ul style="list-style-type: none"><li>ImgJGOF.tar</li></ul></li><li>—PCO2<ul style="list-style-type: none"><li>ImgPCO2.tar</li><li>AirNB&amp;SB.pdf</li><li>TCO2Log.xls</li></ul></li><li>—QCPlots<ul style="list-style-type: none"><li>ImgQC.tar</li></ul></li><li>—RVDAS<ul style="list-style-type: none"><li>Imguw.tar</li><li>Imgnav.tar</li></ul></li></ul>	<ul style="list-style-type: none"><li>—Utility<ul style="list-style-type: none"><li>—ACROBAT<ul style="list-style-type: none"><li>rp500enu.exe</li></ul></li><li>—WINZIP<ul style="list-style-type: none"><li>WINZIP70.EXE</li></ul></li></ul></li><li>—Report<ul style="list-style-type: none"><li>REPORT-Template2.DOC</li></ul></li><li>—Salinity<ul style="list-style-type: none"><li>LMG07-12XBTSBTrip.xls</li></ul></li><li>—XBT<ul style="list-style-type: none"><li>xbt.tar</li><li>XBTlog.pdf</li></ul></li><li>—XCTD<ul style="list-style-type: none"><li>xctd.tar</li><li>XCTDlog.pdf</li></ul></li><li>—Drifter<ul style="list-style-type: none"><li>Drift59S.pdf</li><li>Drift60S.pdf</li></ul></li></ul>
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## Distribution Contents

### ADCP

/Adcp/

This directory contains a tar file of gentoo's proc directory, which contains a database of the averaged ping data, Matlab m-files used in processing the data, and daily graphs of the currents. For more information contact Teri Chereskin at [tchereskin@ucsd.edu](mailto:tchereskin@ucsd.edu).

### Calibration

/Cal/

The tar files in the Cal directory contain images of calibration sheets for each of the following systems: Sound Velocity Probe(SVP\_CALS.TAR), Meteorological System(MET\_CALS.TAR), Underway System(UW\_CALS.TAR), and CTD\_CALS.pdf.

Refer to the InstCoef.txt file along with the specific instrument calibration sheets, both located in this directory, for information on how the RVDAS data was collected and processed.

### Isobar Charts

/Isobars/

This directory contains GIF image files. These file are an analysis of mean sea level pressure from the National Center for Environmental Prediction's Medium Range Forecast Model. They are updated every 6 hours. Naming the convention is as follows yyjjj.hh.gif where yy is the year, jjj is the day number, and hh is the hour.

### Data and Science Report

/Report/

Copies of this report in MS Word, HTML, and text formats.

### XBT

/XBT/

Expendable Bathythermographic (XBT) "Deep Blue" probes were used to obtain water column temperature profiles. The dataset includes the following files:

dat.zip	The probe drop schedule and other configuration files.
efiles.zip	The edited data files.
log.zip	The log files for drop and GPS positioning.
nav.zip	The navigation files.
sfiles.zip	The raw data files.
*.pdf	Scanned images of the paper log sheets.

## XCTD

/XCTD/

Expendable Conductivity, Temperature, and Depth (XCTD) digital probes were used to obtain water column temperature and Salinity profiles. The two files were created for each drop .RDF files contain the raw data, and the .EDF contain the exported ascii data.

## Salinity

/Salinity/

This directory contains the log sheet for the Salt sample take during the Drake Transect Sampling, also a spreadsheet containing the Salt sample and TSG comparison. These samples were analyzed with the onboard AutoSal by the MST.

## Drifters

/DRIFTERS/

This directory contains the log sheet for the drifter buoys released during the Drake Transect.

## QC Plots

/QC\_PLOTS/

Postscript files of data stored each day on RVDAS for quality control analysis during the cruise. There are 3 types of files, named metXXX.ps, navXXX.ps, and oceanXXX.ps, where XXX is represents the Julian day. Met files are a summary of the data from the meteorological instruments, Nav files are a summary of navigational data, and Ocean files are a summary of the underway seawater and bathymetry data.

## JGOFS Data Set

/JGOF/

The JGOFS data set consists of a single file produced each day named jg<julian\_day>.dat.gz where <julian\_day> is the day the data was acquired. The “.gz” extension indicates that the individual files are compressed before archiving. The daily file consists of 22 separate columnar fields in text format, which are described below. The JGOFS data set is obtained primarily by applying calibrations to raw data and decimating to whole minute intervals. However, several fields are derived measurements from more than a single raw input. *Note: Null, unused, or unknown fields are filled with 9's in the JGOFS data.*

Additionally, 3 separate QC plots are generated daily by the ET using the JGOFS data set. These plots include TSG and Bathymetry data, meteorological data, and navigation data. The files are called ocean<julian\_day>.ps, met<julian\_day>.ps, and nav<julian\_day>.ps respectively.



Field	Data	Units
01	GMT date	dd/mm/yy
02	GMT time	hh:mm:ss
03	PCOD latitude (negative is South)	Ddd.dddd
04	PCOD longitude (negative is West)	Ddd.dddd
05	Ships speed	Knots
06	GPS HDOP	-
07	Gyro Heading	Degrees (azimuth)
08	Course over ground	Degrees (azimuth)
09	Mast PAR	$\mu$ Einsteins/meters <sup>2</sup> sec
10	Sea surface temperature	°C
11	Not used	-
12	Sea surface salinity	PSU
13	Sea depth (uncorrected, calc. sw sound vel. 1500 m/s)	meters
14	True wind speed (port windbird)	meters/sec
15	True wind direction (port windbird)	degrees (azimuth)
16	Ambient air temperature	°C
17	Relative humidity	%
18	Barometric pressure	mBars
19	Sea surface fluorometry	volts (0-5 FSO)
20	Not used	-
21	PSP	W/m <sup>2</sup>
22	PIR	W/m <sup>2</sup>

## RVDAS

/rvdas/

RVDAS (Research Vessel Data Acquisition System) was developed at Lamont-Doherty Earth Observatory of Columbia University and has been used on the R/V Maurice Ewing for several years. It was adapted for use on the Nathaniel B. Palmer and her sister ship, the R/V Laurence M. Gould.

Below you will find detailed information on the data included. Be sure to read the “Significant Acquisition Events” section below for important information about data acquisition during this cruise.

### *Meteorological and Light Data*

Measurement	File ID	Collect. Status	Rate	Instrument
Air Temperature	lmet	continuous	1 sec	R. M. young 41372VC
Relative Humidity	lmet	continuous	1 sec	R. M. young 41372VC
Wind Speed/Direction	lmet	continuous	1 sec	R. M. young 5106
PIR (LW radiation)	lmet	continuous	1 sec	Eppley PIR
PSP (SW radiation)	lmet	continuous	1 sec	Eppley PSP
Photosynthetically-Available Radiation	lmet	continuous	1 sec	BSI QSR-240
Barometer	lmet	continuous	1 sec	R. M. young 61201
GUV & PUV	lguv	continuous	1 sec	GUV2511 & PUV2510

*Navigation Data*

Measurement	File ID	Collect. Status	Rate	Instrument
Attitude GPS	lash	continuous	1 sec	Ashtec ADU-2
P-Code GPS	lpcd	civilian mode	1 sec	Trimble 20636-00SM
Gyro	lgyr	continuous	0.2 sec	Anschutz Gyro
Trimble GPS	tgps	continuous	1 sec	NT200

*Geophysical Data*

Measurement	File ID	Collect. Status	Rate	Instrument
Bathymetry	lknu	variable	Varies	Knudsen 320B/R
Net Depth Sensor	lnds	variable	~1/3 sec	Omega PX-605
DUSH 11 Winch	ld11	variable	varies	Markey DUSH 11
DUSH 5 Winch	ldu5	variable	varies	Markey DUSH 5
DUSH 4 Winch	ldu4	variable	varies	Markey DUSH 4

*Oceanographic Data*

Measurement	File ID	Collect. Status	Rate	Instrument
Salinity	ltsg	continuous	6 sec	SeaBird 21
Sea S Temperature	ltsg	continuous	6 sec	SeaBird 3-01/S
Fluorometry (analog)	ltsg	continuous	6 sec	Turner 10-AU-005
ADCP	ladc	continuous	1 sec	RD Instruments
Oxygen	loxy	continuous	10 sec	

## Data File Names and Structures

RVDAS data is divided into two broad categories, **Underway** and **Navigation**. The groups are abbreviated “uw” and “nav”. Thus, these two tar files, lmguw.tar and lmgnav.tar exist under the top-level rvdas directory. The instruments are broken down as shown. Each data file is g-zipped to save space on the distribution. Not all data types are collected everyday or on every cruise.

RVDAS data files are named following the convention: LMG[FileID].dDDD.

- The FileID is a 4-character code representing the system being logged, for example: lmet (for meteorology)
- DDD is the Julian day of the data collection

Underway Data	File ID	Navigation Data	File ID
Meteorological	lmet	Gyro Compass	lgyr
Knudsen	lknu	P-CODE GPS	lpcd
Thermosalinograph	ltsg	Ashtech ADU2 GPS	lash
ADCP	ladc	Trimble NT2100 GPS	tgps
Sound Velocity Probe	lsvp		
GUV & PUV	lguv		
PCO2 System	lpcd		
Oxygen	loxy		

Data is received by the RVDAS system via RS-232 serial connections. The data files that comprise the rvdas data set are described below. A time tag is added to each line of data received and the data is written to disk.

YY+DDD:HH:MM:SS.SSS [data stream from instrument]

Where, YY: two-digit year, DDD: Julian Day, HH: 2 digit hours, MM: 2 digit minutes SS.SSS: seconds. All times are UTC.

The delimiters used to separate fields in the raw data files are usually spaces and commas, but other delimiters are used (::, =, @) and occasionally there is no delimiter. Care should be taken when reprocessing the data that the fields separations are clearly understood. An example data

### lknu

99+099:00:18:19.775 hf,305.2,lf,304.3

Field	Data	Units
1	RVDAS Time Tag	
2	hf – high frequency flag (12 kHz)	
3	high frequency depth	meters
4	lf – low frequency flag (3.5 kHz)	
5	low frequency depth	meters

### Inds

99+099:00:18:19.775 V01 00199.8

Field	Data	Units
1	RVDAS Time Tag	
2	V01 – Sensor 1	label
3	Depth	meters

### lmet

02+314:23:59:50.067 01.2 047 028 01.3 063 042 0988.8 001.7 084 -000.2192 0000.9358 0025.5875

Field	Data	Units
1	RVDAS Time Tag	
2	Port Wind Speed	m/s
3	Port Wind Direction	deg
4	Port Wind Direction (standard deviation)	deg
5	Starboard Wind Speed	m/s
6	Starboard Wind Direction	deg
7	Starboard Wind Direction (standard deviation)	deg
8	Barometer	millibars
9	Temperature	°C
10	Relative humidity	%
11	PSP (long wave radiometer)	mV
12	PIR (short wave radiometer)	mV
13	PAR (photo-synthetically available radiation, 400 - 700 nm)	mV

## Itsg

For further information on this data, check on [www.seabird.com](http://www.seabird.com) on SBE 21 Thermosalinograph

04+321:00:01:23.978 06D572EC1801D80DE4

04+321:00:01:23.978 ttttccccrrrrrr0uuu

Field	Data	Units
1	RVDAS Time Tag	
2	Internal water temperature – tttt	Hex Value
3	Conductivity - cccc	Hex Value
4	External water temperature - rrrrrr	Hex Value
5	Transmissometer signal - vvv	Hex Value

## tsgfl

04+321:00:01:23.978 -00.070 -00.089 02.8042 33.75690 0.471306 4.341880

Field	Data	Units
1	RVDAS Time Tag	
2	Internal water temperature	°C
3	External water temperature	°C
4	Conductivity	S/cm
5	Salinity	PSU
6	Transmissometer signal	Volts

## lpc0

For further information on this data, contact Tim Newberger at [tnewberg@ldeo.columbia.edu](mailto:tnewberg@ldeo.columbia.edu)

02+319:23:59:13.748 2002319.99851 7154.27 26.49 1033.6 325.79 6.74 329.3  
53.76 0 Equil

Field	Data	Units
1	RVDAS Time Tag	
2	Julian date file string	Julian
3	IR voltage reading	mV
4	Cell temperature	°C
5	Barometer	millibars
6	VCO2	mL
7	Equilibrator temperature	°C

Field	Data	Units
8	PCO2	millibars
9	Gas flow	mL/min
10	Solenoid position ID	number
11	Valve Position ID	number
12	Measured gas	name

## Iguv

03+354:15:56:13.346 122003 155612 -.00007 4.632E-4 8.417E-5 1.027E-4 3.824E-2 -4.492E-6 5.196E-4  
 5.2E-1 2.793E-3 23.876 -.804 26.812 26.852 -1.238 3.525 .000099 2.581E1 5.058E1 1.442E1 2.73E0  
 6.136E1 1.406E-1 6.187E1 39.989

### GUV only

Field	Data	Units
1	RVDAS Time Tag	
2	GUV Computer Date	mmddyy
3	GUV Computer Time	hhmmss
4	Ed0Gnd - GUV	Volts
5	Ed0320 - GUV	$\mu\text{W}/\text{cm}^2\text{nm}$
6	Ed0340 - GUV	$\mu\text{W}/\text{cm}^2\text{nm}$
7	Ed0313 - GUV	$\mu\text{W}/\text{cm}^2\text{nm}$
8	Ed0305 - GUV	$\mu\text{W}/\text{cm}^2\text{nm}$
9	Ed0380 - GUV	$\mu\text{W}/\text{cm}^2\text{nm}$
10	Ed0PAR - GUV	$\mu\text{E}/\text{cm}^2\text{sec}$
11	Ed0395 - GUV	$\mu\text{W}/\text{cm}^2\text{nm}$
12	Ed0Temp - GUV	°C

### GUV and PUV

Field	Data	Units
1	RVDAS Time Tag	
2	GUV Computer Date	mmddyy
3	GUV Computer Time	hhmmss
4	EdZGnd -PUV	Volts
5	EdZ305 -PUV	$\mu\text{W}/\text{cm}^2\text{nm}$
6	EdZ313 -PUV	$\mu\text{W}/\text{cm}^2\text{nm}$
7	EdZ320 -PUV	$\mu\text{W}/\text{cm}^2\text{nm}$
8	EdZ395 -PUV	$\mu\text{W}/\text{cm}^2\text{nm}$
9	EdZ340 -PUV	$\mu\text{W}/\text{cm}^2\text{nm}$
10	EdZPAR -PUV	$\mu\text{E}/\text{cm}^2\text{sec}$
11	LuZChl -PUV	$\mu\text{E}/\text{srm}^2\text{sec}$
12	EdZ380 -PUV	$\mu\text{W}/\text{cm}^2\text{nm}$
13	WTemp -PUV	°C
14	Depth -PUV	m
15	EdZTemp -PUV	°C
16	LuZTemp -PUV	°C
17	Tilt -PUV	Degrees
18	Roll -PUV	Degrees
19	Ed0Gnd - GUV	Volts
20	Ed0320 - GUV	$\mu\text{W}/\text{cm}^2\text{nm}$
21	Ed0340 - GUV	$\mu\text{W}/\text{cm}^2\text{nm}$
22	Ed0313 - GUV	$\mu\text{W}/\text{cm}^2\text{nm}$
23	Ed0305 - GUV	$\mu\text{W}/\text{cm}^2\text{nm}$
24	Ed0380 - GUV	$\mu\text{W}/\text{cm}^2\text{nm}$
25	Ed0PAR - GUV	$\mu\text{E}/\text{cm}^2\text{sec}$
26	Ed0395 - GUV	$\mu\text{W}/\text{cm}^2\text{nm}$
27	Ed0Temp - GUV	°C

## svp1

00+348:01:59:52.128 1539.40

Field	Data	Units
1	RVDAS Time Tag	
2	Sound velocity	m/s

**ladc**

00+019:23:59:59.099 \$PUHAW,UVH,-1.48,-0.51,250.6

Field	Data	Units
1	RVDAS Time Tag	
2	\$PUHAW	
3	UVH (E-W, N-S, Heading)	
4	Ship Speed relative to reference layer <sup>1</sup> velocity <sup>2</sup> , East vector	knots
5	Ship Speed relative to reference layer <sup>1</sup> velocity <sup>2</sup> , North vector	knots
6	Ship heading	degrees

<sup>1</sup>The reference layer is an average velocity measured in a number of depth “bins”. On the LMG, the bins are eight meters deep and bins 3-10 define the reference layer. Hence, the reference layer is the water column from 16-80 meters beneath the ship.

<sup>2</sup>The speed output is water velocity relative to the ship’s hull and is therefore opposite of the actual movement of the ship. For example, if the ship’s heading is due north, the North/South reference layer velocity is likely to be negative (southerly).

**lash****ATTD: Attitude Data**

01+081:00:00:00.806 \$PASHR,ATT,345605.0,165.03,+001.86,-01.96,0.0018,0.0173,0\*22

Field	Data	Units
1	RVDAS Time Tag \$PASHR	
2	ATT	
3	GPS Time sec. of the week	seconds
4	heading (rel. to true North)	degrees
5	pitch	degrees
6	roll	degrees
7	Measurement RMS error	meters
8	Baseline RMS error	meters
9	attitude reset flag	

01+081:00:00:00.966 \$GPGGA,235952.00,6051.7937,S,06030.2175,W,1,08,01.0,+00068,M,,M,,\*79

Field	Data	Units
1	RVDAS Time Tag \$GPGGA	
2	UTC time at position	hhmmss.ss
3	Latitude	ddmm.mmm
4	North (N) or South (S)	
5	Longitude	ddmm.mmm
6	East (E) or West (W)	
7	GPS quality (1=GPS 2=DGPS)	
8	Number of GPS satellites used	
9	HDOP	
10	Antenna Height	meters
11	M for Meters	
12	Geoidal height	meters
13	M for meters	
14	age of diff. GPS data	sss
15	differential reference station ID	aaaa

**lgyr**

02+315:23:59:58.194 \$PASVW,00.1,A\*1D

02+315:23:59:58.414 \$IIVHW,287.7,T,,M,,N,,K\*71

02+315:23:59:58.616 \$HEHDT,287.7,T\*25

02+315:23:59:58.821 \$HEROT,001.6,A\*2C

02+315:23:59:58.984 \$HCHDT,,T\*07

**HDT: True Heading**

01+083:00:00:02.893 \$HEHDT,246.3,T\*2C

Field	Data	Units
1	RVDAS Time Tag \$HEHDT	
2	Heading XXXXX = ddd.d	degrees
3	T flag for true heading, checksum	

**ROT: Rate of Turn**

01+083:00:00:03.093 \$HEROT,-006.3,A\*03

Field	Data	Units
1	RVDAS Time Tag \$HEROT	
2	Rate of turn	degrees/min
3	Status: A = data valid, checksum	

**tgps****GGA: Global Positioning Fix Data**

00+040:00:00:00.985 \$GPGGA,000003,6139.961,S,05949.422,W,1,6,001.64,-00036,M,00000,M,,

Field	Data	Units
1	RVDAS Time Tag \$GPGGA	
2	Latitude in degrees with decimal minutes	ddmm.mmm
3	North (N) or South (S)	
4	Longitude in degrees with decimal minutes	ddmm.mmm
5	East (E) or West (W)	
6	GPS quality (1=GPS 2=DGPS)	
7	Number of GPS satellites used	
8	Horizontal dilution of precision (HDOP)	
9	Antenna height above/below mean-sea-level (geoid)	meters
10	Units for antenna height (M = Meters)	
11	Geoidal Separation <sup>1</sup>	
12	Units for Geoidal Separation (M = Meters)	meters
13	Age of differential GPS data, number of seconds since last SC104 Type 1 or 9	
14	Differential reference station ID	

<sup>1</sup>Geoidal Separation: the difference between the WGS-84 earth ellipsoid and mean-sea-level (geoid). A negative value represents mean-sea-level below ellipsoid.

## GLL: Geographic Position – Latitude/Logitude

00+040:00:00:00.065 \$GPGLL,6139.96,S,05949.42,W,000002,A

Field	Data	Units
1	RVDAS Time Tag \$GPGLL	
2	Latitude	ddmm.mmm
3	North (N) or South (S)	
4	Logitude	ddmm.mmm
5	East (E) or West (W)	
6	UTC of position	hhmmss.ss
7	Status: A = Data Valid	

## VTG: Track Made Good and Speed over Ground

00+040:00:00:00.213 \$GPVTG,161,T,149,M,009.6,N,017.8,K

Field	Data	Units
1	RVDAS Time Tag \$GPVTG	
2	Track, degrees true	degrees
3	T flag for True	
4	Track, degrees magnetic	degrees
5	M flag for Magnetic	
6	Speed over Ground	knots
7	N flag for Knots	
8	Speed over Ground	kmhr
9	K flag for km/hr	

## VHW: Speed Through Water and Heading

00+040:00:00:00.212 \$GPVHW,246,T,234,M,012.3,N,022.8,K

Field	Data	Units
1	RVDAS Time Tag \$GPVHW	
2	Heading, degrees True	degrees
3	T flag for True	
4	Heading, degrees Magnetic	degrees
5	M flag for Magnetic	
6	Speed through water	knots
7	N flag for Knots	
8	Speed through water	km/hr
9	K flag for km/hr	

## ZDA: Time and Date

00+040:00:00:00.285 \$GPZDA,000002,09,02,2000,00,00

Field	Data	Units
1	RVDAS Time Tag \$GPZDA	
2	UTC time	hhmmss.ss
3	Day: 01 – 31	dd
4	Month: 01 – 12	mm
5	Year	yyy
6	Local time zone description <sup>1</sup> , 00 +/-13 hrs	
7	Local time zone minutes description, same sign as local hours	



<sup>1</sup>Zone description is the number of whole hours added to local time to obtain GMT, values are negative for East longitudes.

#### BWC: Bearing and Distance to Waypoint

00+040:00:00:00.865 \$GPBWC,000003,6209.70,S,05824.00,W,127.2,T,115.3,M,050.1,N,014

Field	Data	Units
1	RVDAS Time Tag \$GPBWC	
2	UTC of bearing	hhmmss.ss
3	Destination waypoint latitude in degrees, decimal minutes	ddmm.mmm
4	Hemisphere Flag: N or S	
5	Destination waypoint longitude in degrees, decimal minutes	ddmm.mmm
6	Hemisphere Flag: E or W	
7	Bearing, degrees true	degrees
8	T flag for True	
9	Bearing, degrees magnetic	degrees
10	M flag for Magnetic	
11	Distance to waypoint in nautical miles	nm
12	N flag for Nautical Miles	
13	Waypoint ID	

#### lpcd

##### GGA: GPS Position Fix – Geoid/Ellipsoid

00+019:23:59:59.301 \$GPGGA,235958.409,6849.6944,S,13712.8472,W,1,06,1.2,092.4,M,047.3,M,,\*67

Field	Data	Units
1	RVDAS Time Tag \$GPGGA	
2	UTC time at position	hhmmss.sss
3	Latitude	ddmm.mmm
4	North (N) or South (S)	
5	Longitude	ddmm.mmm
6	East (E) or West (W)	
7	GPS quality (1=GPS 2=DGPS 3=P-CODE)	
8	Number of GPS satellites used	
9	HDOP	
10	Antenna Height	meters
11	M for Meters	
12	Geoidal height	meters
13	M for meters	
14	Null field	
15	Checksum	

##### GLL: GPS Latitude/Longitude

00+019:23:59:59.381 \$GPGLL,6849.6944,S,13712.8472,W,235958.409,A\*35

Field	Data	Units
1	RVDAS Time Tag \$GPGLL	
2	Latitude	degrees
3	North or South	
4	Longitude	degrees

Field	Data	Units
5	East or West	
6	UTC of position	hhmmss.sss
7	status of data (A = valid)	
8	Checksum	

## VTG: GPS Track and Ground Speed

00+019:23:59:59.382 \$GPVTG,238.7,T,182.3,M,001.8,N,003.3,K\*41

Field	Data	Units
1	RVDAS Time Tag \$GPVTG	
2	Heading	degrees
3	degrees True (T)	
4	Heading	degrees
5	degrees magnetic (M)	
6	Ship speed	knots
7	N = knots	
8	Speed	km/hr
9	Checksum	

## Ifir

04+107:16:48:02.342 0 5450 :: 4/16/04 09:44:17 = 0.632 (RAW)

Field	Data	Units
1	RVDAS Time Tag	
2	Zero Field	numeric
3	Sample Number	numeric
4	Fluorometer Date	mm/dd/yy
5	Fluorometer Time	hh:mm:ss
6	Digital output of fluorometer	Volts
7	(RAW)	

## loxy

For further information on this data, contact Tim Newberger at [tnewberg@ldeo.columbia.edu](mailto:tnewberg@ldeo.columbia.edu)

```

04+117:23:57:23.504 MEASUREMENT      3830    380 Oxygen:      309.95    Saturation:
83.48  Temperature:      -1.35    DPhase:      33.41    BPhase:      32.22
      RPhase:           0.00    BAmp:        262.09    BPot:        163.00    RAMP:
0.00   RawTem.:          694.92
04+117:23:58:23.508 MEASUREMENT      3830    380 Oxygen:      309.59    Saturation:
83.38  Temperature:      -1.35    DPhase:      33.43    BPhase:      32.23
      RPhase:           0.00    BAmp:        262.14    BPot:        163.00    RAMP:
0.00   RawTem.:          694.95
04+117:23:59:23.512 MEASUREMENT      3830    380 Oxygen:      309.74    Saturation:
83.43  Temperature:      -1.35    DPhase:      33.42    BPhase:      32.22
      RPhase:           0.00    BAmp:        262.07    BPot:        163.00    RAMP:
0.00   RawTem.:          694.83

```

Field	Data	Units
1	RVDAS Time Tag	
2-4	Measurement ID, Model Number, Serial Number	alphanumeric

5	Oxygen heading	text
6	Oxygen Reading	Raw numeric
7	Saturation heading	text
8	Saturation Reading	Raw numeric
9	Temperature heading	text
10	Water Temperature	°C
11	Dphase heading	text
12	Dphase	Raw numeric
13	Bphase heading	text
14	BPhase	Raw numeric
15	Rphase heading	text
16	Rphase	Raw numeric
17	Bamp heading	text
18	Bamp	Raw numeric
19	Bpot heading	text
20	Bpot	Raw numeric
21	Ramp heading	text
22	Ramp	Raw numeric
23	RawTem heading	text
24	RawTemp	Raw numeric

## LMG Sensors

### Shipboard Sensors

Sensor	Description	Serial #	Cal. Date	Status
Port Anemometer	R.M. Young 105106	WM28394	1-Aug-2007	collected
Stbd Anemometer	R.M. Young 105106	WM57508	1-Aug-2007	collected
Barometer	R.M. Young 61201	BP00873	19-Oct-2005	collected
Humidity/Wet Temp	RM Young 41372LC	06719	4-Jan-2007	collected
PAR for Mast	Biosph. Inst. QSR-240P	6393	16-Jan-2006	collected
PIR	Eppley PIR	32031F3	3-Apr-2007	collected
PSP	Eppley PSP	31701F3	25-Apr-2007	collected
<u>GUV (Mast)</u>	<u>Biosph. Inst. GUV-2511</u>	<u>25110805127</u>	<u>16-Jan-2007</u>	<u>collected</u>
Fluorometer	WET Labs ECO-FL	FLRTD-399	20-Sep-2005	collected
Transmissometer	WET Labs C-Star 25 cm deep	CST-553DR	26-Jan-2006	collected
Fluorometer	Turner 10AU-005-CE	6592 RTX		collected
TSG	Sea-Bird 21	2110410-1789	25-Jan-2006	collected
<u>TSG</u>	<u>Sea-Bird 21</u>	<u>219209-1577</u>	<u>20-May-2006</u>	<u>collected</u>
Remote Temp	Sea-Bird 3S	34015	11-May-2007	collected
<u>Remote Temp</u>	<u>Sea-Bird 3S</u>	<u>31619</u>	<u>23-Jan-2006</u>	<u>collected</u>
<i>MicroTSG</i>	<i>Sea-Bird 45</i>	<i>200</i>	<i>21-Mar-2007</i>	<i>evaluation</i>
<i>Digital Remote Temp</i>	<i>Sea-Bird 38</i>	<i>0352</i>	<i>21-Mar-2007</i>	<i>evaluation</i>

Note: Items in *green and italics* above are running as part of a new equipment evaluation and no claims are made as to the veracity of the data collected from them.

Items red and underlined above were suspected of being at least partially faulty as explained here:

- Some GUV data was initially collected but all of it is almost certainly bogus; the instrument was disconnected mid-cruise for troubleshooting and was not restored
- Once the format of the output string was properly configured for the DAS, the first TSG unit used on this cruise appeared to be giving valid data for Internal Temperature, Salinity, and Conductivity, but bad readings for Remote Temperature; it was replaced mid-cruise with an identical unit that was removed from service due to the expiration of its calibration period; nevertheless, the replacement unit yielded highly credible readings for all parameters
- The first Remote Temperature sensor may have played a part in the bad Remote Temperature readings initially seen with the TSG. It was therefore replaced with an identical Remote Temp sensor that is in calibration as part of the troubleshooting process of the system. The initial Remote Temp sensor was not returned to service for the remainder of the cruise because suspicions remained about its reliability. Moreover, the replacement probe seemed to be working fine in conjunction with the second TSG unit resulting in a fully functional replacement system
- See the Errors and Events log following this section for more information on when the sensors were replaced

## Acquisition and Processing Information

### Processing Specifics

Refer to the InstCoef.txt file along with the specific instrument calibration sheets, both located in the Cal/ directory of the data distribution, for information on how the RVDAS data was collected and processed.

### Errors and Events

This section lists all significant events and known problems with acquisition during this cruise including instrument failures, data acquisition system failures, and other factors affecting this data set.

Date (Julian)	Time (GMT)	Event	Location
257	16:30	Depart	Punta Arenas
258	05:05	Reach Data Collection START – all instruments except GUV	68 degrees W
258	16:10	GUV data collection started after finally communicating with instrument (however, bad data suspected)	
258	22:00	ADCP Bottom Tracking OFF	> 500m depth
	22:45	Troubleshooting of TSG input string and instrument connections (suspect invalid string prior to this point; suspect invalid remote temp readings from this point until Palmer Station – all other readings seem valid)	
259	10:26	P-code and Ashtec GPS units reset	
261	17:00	ADCP Bottom Tracking ON	< 500m depth
262	12:33	Data Collection STOP – Arrive Palmer Station	Palmer Station
		Swap TSG Instrumentation: Remote Temp Probe s/n 31619 – removed s/n 34015 – installed TSG Main Unit s/n 1577 – removed s/n 1789 – installed	
267	14:19	Data Collection START – Depart Palmer Station Note: evaluation of new TSG system components ongoing	Palmer Station
267	20:59	All TSG readings appear reasonable and DAS restarted with new calibration coefficients	
268		Ashtec reset and new ADCP Cruise started	Deception Island
271	02:15	ADCP Bottom Tracking OFF	< 500m depth
271	20:22	Reach Data Collection STOP	68 degrees W