USCGC Healy Data File Formats for HLY1002

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Publication date September, 06 2010

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Preface

Although the science component of many cruises on the Healy, including this one, are funded from various sources, science technical support is largely funded by the Logistics and Research Support within the Arctic Section of the US National Science Foundation Office of Polar Programs through grants to the Lamont-Doherty Earth Observatory of Columbia University, the University Corporation for Atmospheric Research, the Woods Hole Oceanographic Institution, Scripps Institution of Oceanography, and through congressionally mandated budget authority for the US Coast Guard polar icebreakers.

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This document was authored using SyncroSoft oXygen Version 10.2 and a DocBook V5 DTD. July 8, 2010 switched to oXygen 11.2

Chapter 1. Introduction

This document provides detailed documentation about the individual file formats for data files from the USCGC Healy. Driven by science needs and ever changing technology, the file types, formats, and contents change over time and as a result, this document is updated frequently, often for each cruise. If you have questions about a data set, please be sure that you are working with the matching format description and then don't hesitate to get in touch with us.

Since these files are frequently encountered on post-cruise data distribution disks, there is a brief overview of the file structure on these disks.

For historical and organizational reasons, digital data on Healy are logged in on two different data logging systems. Some data are logged with the NOAA Ship's Computer System (SCS) software which was implemented to replace the Wonderware system from EDI, Inc. which was provided as part the delivery by the shipyard and quickly proved to have untenable problems. The Lamont Data System (LDS) is used for a number of data types, particularly where real-time performance is required such as logging the multibeam data from the Kongsberg EM122.

In addition some data sources are logged by system-specific data logging mechanisms (e.g. UHDAS for the ADCPCs, WDS for Terrascan satellite down-link data, and Echo Control for the Knudsen 320.)

Discussion about specific systems, sensors, calibrations, offsets, logging history, and issues encountered during a cruise are covered in the data report for each cruise.

Chapter 2. End of Cruise Archive Directory Structure

This chapter provides a brief overview of the directory structure on the "*boomerang*" drive (external, USB "*pocket*" disk) that is provided to the chief scientist at the end of each cruise. There are five top-level directories on the disk. The contents of these directories are briefly described in this chapter.

More details about the content of the directories is provided along with the data file descriptions in subsequent chapters

Table 2.1. Archive Directory Structure

File/Directory Name	Description
1_Minute_Averaged_Data	Summary digital data
ice_observations	Data entered by ice observers if there are observers on board and they use our form.
LDS_Data	Data logged by LDS
master.index	Text file containing a list of all the files on the disk
master.md5	Text file continuing the MD5 checksums for all the files
Meta_Data	Directory containing descriptions about the data
plots	Directory of various kinds of data plots
Raw	Raw data from some sub-systems
Satellite_Images	Directory containing satellite images
SCS_Data	Directory of data logged by SCS
sea_ice_movie	Directory of movie(s) made from satellite images showing sea ice motion during the cruise.

One (1) Minute Averaged Data

The raw data in the LDS, SCS and Raw directories is time-stamped and logged as it is provided by the sensors and sources. In many cases data comes once per second (or faster.) For many applications a smaller data set is desirable. Therefore we provide one minute data. This data set is created by calculating the average values for each minute.

Ice Observations

This directory contains the data files recorded by ice observers using our web-based forms during the cruise. If there were no ice observers or if they did not use our forms, this directory may be empty.

LDS_Data

This directory contains all data logged by the Lamont Data System (LDS) is in subdirectories under *LDS_Data*

master.index

A text file containing a complete list of all of the files in the archive.

master.md5

A text file containing the names of all the files along with their MD5 checksums. Using the checksums you can determine if the contents of a file have been modified.

Metadata

This directory contains descriptions of the data, the data system, and data formats are included in the *Metadata*

Plots

A collection of image files containing plots of various data types.

Raw

Data that is logged to disk by sensor software (such as VMDAS for ADCPs) is found here.

Satellite Images

Image data received from Navy DMSP and NOAA HRPT satellites.

SCS_Data

All data (raw and derived) logged by SCS is in subdirectories under SCS_Data

sea_ice_movie

If there was sea ice in the area of the cruise and a movie was made, this directory contains one or more QuickTime movies from satellite image data and the source data files from which the movies were made.

Chapter 3. SCS Primary Data

This section describes the format of raw data files logged by SCS.

Overview of SCS records

In the Healy implementation most of the SCS data are received as asynchronous serial messages by way of individual RS-232-C connections from the source device to the logging computer via a serial multiplexer. Each SCS data record has a time tag prepended (added in front of the data.) Time tags are in the form:

```
MM/DD/YYYY,hh:mm:ss.sss
```

Table 3.1. SCS Time Stamp Format

Content	Description
MM	Two digit month of the year, January == 1
DD	Two digits, day of the month, January 1 == 1
YYYY	Four digit year in the modern calendar
hh	Two digits for hour of the day (0 - 23
mm	Two digits minutes of the hour: 00 - 59
ss.sss	Seconds w/ 1 millisecond resolution

SCS time stamps are derived from the underlying Windows operating system time of day clock. The operating system clock is synchronized to UTC using a pair of on board GPS station clocks and the *xntp* protocol. The accuracy of this time stamp is in the range of 50-200 milliseconds. All time stamps in SCS are in Universal Coordinated Time (UTC) sometimes known as *GMT* or *Zulu*.

The data message follows the time stamp and is terminated with a Carriage Return (*0xD*) and Line Feed (*0xA*) end of line (EOL) sequence.

The following example is the centerbeam record derived by LDS and transmitted to SCS on an RS-232-C link: (due to formatting of page and font sizes this record may wrap but it is a single "line.")

```
04/13/2007,06:49:20.920,
$SBCTR,2007,4,13,06:49:09.437,57.158792,-165.664322 ,69.15,60*00
```

Note: The "comma" after the time stamp and before the $ (dollar sign) which (in this case) is the first character of the data record. Not all data records start with a dollar sign ($).

Many but not all devices that send serial data to SCS emit more than one type of data record. For instance, most GPS receivers emit several different data records on a single serial port. SCS is configured to output each record type to a different data file. This results in many more data files and it is not always possible to accurately determine the exact time of a particular data record.

Meteorological data

Air Temperature Sensors

Meteorological data from the Bridge

Description: Air temperature, relative humidity, air pressure data from the ship's RM Young meteorological system sensors on the Flying Bridge (06.)

Directory: SCS_Data/rmyoung_air

File Name: RMYoung-Air_20090314-165026.Raw

Data Examples: (3 lines from a data file):

```
03/14/2009,16:50:31.332,$PSMEB,-15.51,80.41,1030.34,*42
03/14/2009,16:50:35.317,$PSMEB,-15.51,80.41,1030.34,*42
03/14/2009,16:50:39.334,$PSMEB,-15.51,80.41,1030.33,*45
```

Table 3.2. Meteorological data from the Bridge

Field	Description	Example	Units
1	Date	03/14/2009	Month/Day/Year
2	Time (UTC)	16:50:31.332	hh:mm:ss.sss
3	NMEA Header	$PSMEB	ASCII text
4	Air Temperature	-15.15	Degrees Celsius
5	Relative Humidity	80.41	Percent
6	Barometric Pressure	1030.34	Millibars
7	Checksum	*42	ASCII per NMEA-0183

The interface module for these measurements are installed on the starboard side of the Flying Bridge.

At the beginning of HLY1001 (July 2010) the RM-Young interface was removed by Scott Hiller (SIO/ODF) and replaced with a custom SIO interface module.

Jack Staff Air Temperature

Description: Air temperature, measured by an XXXX sensor on the top of the Jack Staff

Directory: SCS_Data/airtemp_bow

File Name: Air-temp-Bow-Jackstaff_20090314-000000.Raw

Data Examples: (3 lines from a data file):

```
03/14/2009,00:00:27.602,$PSATC,-9.53,40.703*77
03/14/2009,00:00:29.587,$PSATC,-9.53,40.702*76
03/14/2009,00:00:31.602,$PSATC,-9.53,40.701*75
```

Table 3.3. Jack Staff Air Temperature

Field	Description	Example	Units
1	Date	03/14/2009	Month/Day/Year
2	Time (UTC)	00:00:27.602	hh:mm:ss.sss
3	NMEA Header	$PSATC	ASCII text
4	Air Temperature	-9.53	Degrees Celsius
5	Relative Humidity	40.703	Measured (raw) value
6	Checksum	*77	ASCII per NMEA-0183

HCO Met3A Air Temperature, Relative Humidity, Barometric Pressure, and Precipitation

Description: Air characteristics measured by the Met3A weather station sensors on the overhead of HCO.

Directory: SCS_Data/met3a_sen

File Name: MET3A-Sen_20090129-173743.Raw

Data Examples: (3 lines from a data file):

```
01/29/2009,17:37:46.997,$PSMEA,5.23,89.90,1035.61,0.16*41
01/29/2009,17:37:48.805,$PSMEA,5.23,89.90,1035.61,0.16*41
01/29/2009,17:37:50.612,$PSMEA,5.23,89.90,1035.61,0.16*41
```

Table 3.4. HCO Met3A Air Temperature, Relative Humidity, Barometric Pressure, and Precipitation

Field	Description	Example	Units
1	Date	01/29/2009	Month/Day/Year
2	Time (UTC)	17:37:46.997	hh:mm:ss.sss
3	NMEA Header	$PSMEA	ASCII text
4	Air Temperature	5.23	Degrees Celsius
5	Relative Humidity	89.90	Percentage
6	Barometric Pressure	1035.61	Millibars
7	Liquid precipitation	0.16	Millimeters of rain
8	Checksum	*41	ASCII per NMEA-0183

Wind Sensors

Ship Wind Sensor, Port Yardarm

Description: Relative wind speed and direction data from the ship RM Young mechanical wind bird on the Port side of the main mast yardarm.

Directory: SCS_Data/rmyportwind

File Name: RMYPortWind_20070414-182437.Raw

Data Examples: (3 lines from a data file):

```
04/14/2007,18:24:38.490,$WIMWV,033,R,028.1,N,A*36
04/14/2007,18:24:39.505,$WIMWV,041,R,028.7,N,A*35
04/14/2007,18:24:40.521,$WIMWV,034,R,029.4,N,A*35
```

Table 3.5. Ship Wind Sensor, Port Yardarm

Field	Description	Example	Units
1	Date	04/14/2007	Month/Day/Year
2	Time (UTC)	18:24:38.490	hh:mm:ss.sss
3	NMEA Header	$WIMWV	ASCII text
4	Wind Direction	033	Angle from the bow in clock wise (compass direction)
5	Direction type	R	"R" == relative direction
6	Wind Speed	028.1	Speed
7	Wind speed units	K	"K" == knots (nautical miles per hour)
8	Status	A	"A" == valid reading

Field	Description	Example	Units
9	Separator	*	ASCII Astrix ("*")
10	Checksum	*36	ASCII per NMEA-0183

Ship Wind Sensor, Starboard Yardarm

Description: Relative wind speed and direction data from the ship RM Young mechanical wind bird on the Starboard side of the main mast yardarm.

Directory: SCS_Data/rmstbwind

File Name: RMYStbdWind_20070414-182437.Raw

Data Examples: (3 lines from a data file):

```
04/14/2007,18:24:38.677,$WIMWV,044,R,025.4,N,A*3E
04/14/2007,18:24:39.693,$WIMWV,045,R,025.6,N,A*3D
04/14/2007,18:24:40.724,$WIMWV,042,R,025.2,N,A*3E
```

Table 3.6. Ship Wind Sensor, Starboard Yardarm

Field	Description	Example	Units
1	Date	04/14/2007	Month/Day/Year
2	Time (UTC)	18:24:38.677	hh:mm:ss.sss
3	NMEA Header	$WIMWV	ASCII text
4	Wind Direction	044	Angle from the bow in clock wise (compass direction)
5	Direction type	R	"R" == relative direction
6	Wind Speed	025.4	Speed
7	Wind speed units	K	"K" == knots (nautical miles per hour)
8	Status	A	"A" == valid reading
9	Separator	*	ASCII "*"
10	Checksum	3E	ASCII per NMEA-0183

Ultrasonic Wind Sensor, Starboard Yardarm

Description: True and relative wind speed and direction data from the ultrasonic anemometer on the Starboard side of the main mast yardarm.

Directory: SCS_Data/wind_mid

File Name: WIND-MID_20090129-173743.Raw

Data Examples: (3 lines from a data file):

```
01/29/2009,17:37:47.026,$PSWDB,18.00,13.18,124.12,7.87*5C
01/29/2009,17:37:48.833,$PSWDB,18.00,13.18,121.95,7.98*58
01/29/2009,17:37:50.640,$PSWDB,18.08,13.23,125.38,8.01*54
```

Table 3.7. Ultrasonic Wind Sensor, Starboard Yardarm

Field	Description	Example	Units
1	Date	01/29/2009	Month/Day/Year (from SCS)

Field	Description	Example	Units
2	Time (UTC)	17:37:47	hh:mm:ss.sss
3	NMEA Header	$PSWDB	ASCII text
4	Relative Wind Direction	18.00	Angle in degrees from the bow clockwise (compass direction)
5	Relative Wind Direction	13.18	meters per second (m/s)
6	True Wind Direction	124.12	Degrees, angle from True North
7	True Wind Speed	7.87	meters per second (m/s)
8	Separator	*	ASCII "*"
9	Checksum	3E	ASCII per NMEA-0183

Ultrasonic Wind Sensor, Jack staff

Description: True and relative wind speed and direction data from the ultrasonic anemometer on the Jack staff on the bow.

Directory: SCS_Data/wind_bow

File Name: WIND-BOW_20090129-173743.Raw

Data Examples: (3 lines from a data file):

```
01/29/2009,17:37:47.026,$PSWDB,18.00,13.18,124.12,7.87*5C
01/29/2009,17:37:48.833,$PSWDB,18.00,13.18,121.95,7.98*58
01/29/2009,17:37:50.640,$PSWDB,18.08,13.23,125.38,8.01*54
```

Table 3.8. Ultrasonic Wind Sensor, Jack staff

Field	Description	Example	Units
1	Date	01/29/2009	Month/Day/Year (from SCS)
2	Time (UTC)	17:37:47	hh:mm:ss.sss
3	NMEA Header	$PSWDB	ASCII text
4	Relative Wind Direction	18.00	Angle in degrees from the bow clockwise (compass direction)
5	Relative Wind Direction	13.18	meters per second (m/s)
6	True Wind Direction	124.12	Degrees, angle from True North
7	True Wind Speed	7.87	meters per second (m/s)
8	Separator	*	ASCII "*"
9	Checksum	3E	ASCII per NMEA-0183

Ultrasonic Wind Sensor, HCO Shack

Description: True and relative wind speed and direction data from the ultrasonic anemometer atop the HCO shack.
Note: The ultrasonic anemometer was on the HCO Shack from the start of the 2009 field season to the end of the 2009 field season.

Directory: SCS_Data/wind_aft

File Name: WIND-AFT_20090129-173743.Raw

Data Examples: (3 lines from a data file):

```
01/29/2009,17:37:47.026,$PSWDB,18.00,13.18,124.12,7.87*5C
01/29/2009,17:37:48.833,$PSWDB,18.00,13.18,121.95,7.98*58
01/29/2009,17:37:50.640,$PSWDB,18.08,13.23,125.38,8.01*54
```

Table 3.9. Ultrasonic Wind Sensor, HCO Shack

Field	Description	Example	Units
1	Date	01/29/2009	Month/Day/Year (from SCS)
2	Time (UTC)	17:37:47	hh:mm:ss.sss
3	NMEA Header	$PSWDB	ASCII text
4	Relative Wind Direction	18.00	Angle in degrees from the bow clockwise (compass direction)
5	Relative Wind Direction	13.18	meters per second (m/s)
6	True Wind Direction	124.12	Degrees, angle from True North
7	True Wind Speed	7.87	meters per second (m/s)
8	Separator	*	ASCII "*"
9	Checksum	3E	ASCII per NMEA-0183

Solar Sensors

Photosynthetic Active Radiation (PAR) Sensor, HCO Shack

Description: Photosyntheticly Active Radiation (PAR) MicroEinstens/m^2/sec and volts from the sensor on top of HCO.

Directory: SCS_Data/suface_par

File Name: Surface-PAR_20080312-000000.Raw

Data Examples: (3 lines from a data file):

```
03/12/2008,22:02:46.872,$PSSPA,1749.51,1.056*4C
03/12/2008,22:02:48.872,$PSSPA,1755.43,1.060*47
03/12/2008,22:02:50.888,$PSSPA,1755.43,1.060*47
```

Table 3.10. Surface PAR

Field	Description	Example	Units
1	Date	03/12/2008	Month/Day/Year (from SCS)
2	Time (UTC)	22:02:46.872	hh:mm:ss.sss
3	NMEA Header	$PSSPA	ASCII text
4	Surface PAR	1749.51	microEinstiens/sec/m^2)
5	Sensor output (voltage)	1.056	Digitized voltage
6	Separator	*	ASCII "*"

Field	Description	Example	Units
7	Checksum	4C	ASCII per NMEA-0183

Solar Radiometers, Pyranometer and Pyrgeometer, HCO Shack

Description: Solar Radiometers data from the sensors on top of HCO. The short wave radiometer is the Pyranometer and the Long wave radiometer is the Pyrgeometer.

Directory: SCS_Data/solar_radiometers

File Name: SRM_20080314-000000.Raw

Data Examples: (3 lines from a data file):

```
03/14/2008,12:31:43.329,
$PSSRA,1.20,0.010,338.30,0.034,276.02,1.192,275.97,1.194*44
03/14/2008,12:31:45.329,
$PSSRA,1.20,0.010,338.30,0.034,276.02,1.192,275.97,1.194*44
03/14/2008,12:31:47.328,
$PSSRA,1.20,0.010,339.20,0.037,276.02,1.192,275.97,1.194*47
```

Table 3.11. Surface Solar Radiometers

Field	Description	Example	Units
1	Date	03/12/2008	Month/Day/Year (from SCS)
2	Time (UTC)	22:02:46.872	hh:mm:ss.sss
3	NMEA Header	$PSSRA	ASCII text
4	Short Wave Radiation (SWR)	1.20	Watts/m^2
5	Short wave sensor output (voltage)	0.010	millivolts, digitized value
6	Calculated Long Wave Radiation (LWR)	338.30	Watts/m^2
7	Short wave sensor output (voltage)	0.034	millivolts, digitized value
8	LWR, Dome temperature	276.02	Degrees Kelvin
9	LWR, Dome temp, RAW	1.192	Volts, digitized value
10	LWR, Body temperature	275.97	Degrees Kelvin
11	LWR, Body temp sensor output (voltage)	1.194	Volts, digitized value
12	Separator	*	ASCII "*"
13	Checksum	4C	ASCII per NMEA-0183

Oceanograpahic Data

Flow Through Sensors

Thermosalinograph (TSG), BioChem Lab

Description: Data from the Seabird SBE45 Thermosalinograph (TSG) sensors in the Bio Chem Lab.

Directory: SCS_Data/tsg

File Name: TSG-A_20080313-000000.Raw

Data Examples: (3 lines from a data file):

```
03/13/2008,04:46:03.355,$PSTSA,2.565,28.4522,31.526,1456.01*7E
03/13/2008,04:46:05.340,$PSTSA,2.566,28.4529,31.526,1456.02*75
03/13/2008,04:46:07.355,$PSTSA,2.565,28.4519,31.525,1456.01*75
```

Table 3.12. TSG, SBE-45, BioChem

Field	Description	Example	Units
1	Date	03/13/2008	Month/Day/Year (from SCS)
2	Time (UTC)	04:46:03.355	hh:mm:ss.sss
3	NMEA Header	$PSTSA	ASCII text
4	Temperature	2.565	Degrees Celsius, measured at the Conductivity cell (internal)
5	Conductivity	28.4522	milliSiemens/centimeter
6	Salinity	31.526	Practical Salinity Units (PSU) per UNESCO-XX
7	Sound Speed	1456.01	meters per second (m/s), calculated using ------, Where?
8	Separator	*	ASCII "*"
9	Checksum	3E	ASCII per NMEA-0183

Warning

The only sound speed that the SBE-45 can calculate by itself is the speed of sound inside the sensor (from the water temperature and the conductivity.) This number is useless for practical purposes such as sonar system beamformers and could easily be misleading. A sound speed that makes sense for use with sonar systems can be calculated from the salinity (derived from measured conductivity from the SBE-45) with the seawater temperature measured at (significantly nearer) the intake by the remote temperature sensor.

Second Thermosalinograph

On some (rare) cruises a second has been installed in the BioChem Lab. We intend to install a TSG when we implement the new TSG/pCO2 suite, perhaps in the fall of 2010.

Sea Surface Temperature

Description: This file contains data from a Seabird SBE-3S Sensor near the port side SSW intake to measure a closer approximation of sea surface temperature.

Directory: SCS_Data/surface_temp

File Name: Sea-Surface_20080313-000000.Raw

Data Examples: (3 lines from a data file):

```
03/13/2008,05:46:40.402,$PSSTA,2.039,2945.900*7E
03/13/2008,05:46:42.402,$PSSTA,2.039,2945.900*7E
03/13/2008,05:46:44.402,$PSSTA,2.039,2945.900*7E
```

Table 3.13. Sea Surface Temperature

Field	Data Type	Example	Units
1	SCS logged Date	03/13/2008	MM/DD/YYYY (from SCS)
2	SCS logged Time UTC	05:46:40.402	hh:mm:ss.sss
3	NMEA-like Header	$PSSTA	ASCII text
4	Surface temperature	2.039	Celsius
5	Sensor output	2945.900	millivolts
6	Separator	"*"	from NMEA-0183 standard
7	Checksum	7E	ASCII Hex per NMEA

Thermosalinograph Flowmeter, BioChem Lab

Description: This file contains data from a Flocat C-ES45-B003 flow meter in-line with the TSG in the Bio/Chem Lab. It is used for monitoring the flow through the sensor.

Directory: SCS_Data/flomet

File Name: FlowMeter_20080314-000000.Raw

Data Examples: (3 lines from a data file):

```
03/14/2008,13:44:44.640,$PSFMA,2.51,38.000*44
03/14/2008,13:44:46.624,$PSFMA,2.64,40.000*4D
03/14/2008,13:44:48.624,$PSFMA,2.64,40.000*4D
```

Table 3.14. Flow Meter

Field	Data Type	Example	Units
1	SCS logged Date	03/13/2008	MM/DD/YYYY (from SCS)
2	SCS logged Time UTC	05:46:40.402	hh:mm:ss.sss
3	NMEA-like Header	$PSFMA	ASCII text
4	Surface temperature	2.51	??
5	Sensor output	38.000	millivolts
6	Separator	"*"	from NMEA-0183 standard
7	Checksum	44	ASCII Hex per NMEA

Flowmeter, Bow Incubators

This sensor is not installed and active on all cruises, only when there are incubators on the bow.

Description: If it exists, this file contains data from a flow meter installed in the incubator water manifold on the bow and is used to monitor flow there.

Directory: SCS_Data/flomet_b

File Name: FlowMeter-BOW_20080313-000000.Raw

Data Examples: (3 lines from a data file):

```
03/13/2008,02:51:49.277,$PSFMB,2.91,15.000*44
03/13/2008,02:51:51.277,$PSFMB,2.91,15.000*44
03/13/2008,02:51:53.261,$PSFMB,2.91,15.000*44
```

Table 3.15. Flow Meter

Field	Data Type	Example	Units
1	SCS logged Date	03/13/2008	MM/DD/YYYY (from SCS)
2	SCS logged Time UTC	02:51:49.277	hh:mm:ss.sss
3	NMEA-like Header	$PSFMB	ASCII text
4	Calculated flow	2.91	Liters/minute
5	Sensor output	15.000	Frequency
6	Separator	"*"	from NMEA-0183 standard
7	Checksum	7E	ASCII Hex per NMEA

Note

Flow meters are only installed on some cruises.

Incubator Water Temperature, Bow

This sensor is not installed and active on all cruises, only when there are incubators on the bow.

Description: This file contains data from a Seabird SBE-3S Sensor near the incubator water manifold on the bow.

Directory: SCS_Data/temp_incubat

File Name: Temp-Bow-Incubator_20090416-000000.Raw

Data Examples: (3 lines from a data file):

```
04/16/2009,00:00:19.272,$PSXTA,-1.32,2966.00*58
04/16/2009,00:00:21.256,$PSXTA,-1.32,2966.00*58
04/16/2009,00:00:23.256,$PSXTA,-1.32,2966.00*58
```

Table 3.16. Bow Incubator Water Temperature Temperature

Field	Data Type	Example	Units
1	SCS logged Date	04/16/2009	MM/DD/YYYY (from SCS)
2	SCS logged Time UTC	00:00:19.272	hh:mm:ss.sss
3	NMEA-like Header	$PSXTA	ASCII text
4	Surface temperature	-1.32	Celsius
5	Sensor output	2966.00	millivolts
6	Separator	"*"	from NMEA-0183 standard
7	Checksum	7E	ASCII Hex per NMEA

Note

Temperature sensors are only installed on the incubator water by prior arrangement thorugh the cruise planning process.

Dissolved Oxygen A, BioChem lab

This sensor is normally installed and operated on all cruises.

Description: This file contains data from a Seabird SBE-43 Dissolve Oxygen (DO) sensor in the BioChem Lab.

Directory: SCS_Data/oxygen

File Name: OXYGEN_20080313-000000.Raw

Data Examples: (3 lines from a data file):

```
03/13/2008,05:25:28.371,$PSOXA,7.265,2.922,2.576,2.576*58
03/13/2008,05:25:30.386,$PSOXA,7.265,2.922,2.577,2.577*58
03/13/2008,05:25:32.371,$PSOXA,7.268,2.923,2.576,2.576*54
```

Table 3.17. Dissolved Oxygen

Field	Data Type	Example	Units
1	SCS logged Date	04/16/2009	MM/DD/YYYY (from SCS)
2	SCS logged Time UTC	00:00:19.272	hh:mm:ss.sss
3	NMEA-like Header	$PSOXA	ASCII text
4	Dissolved Oxygen	7.265	ml/l
5	Sensor output	2.922	units?
6	Water Temperature	2.576	Degrees Celsius
7	?	2.576	units?
8	Separator	"*"	from NMEA-0183 standard
9	Checksum	58	ASCII Hex per NMEA

Note

Need to verify the units and fields

Dissolved Oxygen B, BioChem lab

The second DO sensor is installed on some cruises.

Description: This file contains data from a Seabird SBE-43 Dissolved Oxygen (DO) sensor in the BioChem Lab.

Directory: SCS_Data/oxygen

File Name: OXYGEN_20080313-000000.Raw

Data Examples: (3 lines from a data file):

```
03/13/2008,05:25:28.371,$PSOXB,7.265,2.922,2.576,2.576*58
03/13/2008,05:25:30.386,$PSOXB,7.265,2.922,2.577,2.577*58
03/13/2008,05:25:32.371,$PSOXB,7.268,2.923,2.576,2.576*54
```

Table 3.18. Dissolved Oxygen

Field	Data Type	Example	Units
1	SCS logged Date	04/16/2009	MM/DD/YYYY (from SCS)
2	SCS logged Time UTC	00:00:19.272	hh:mm:ss.sss
3	NMEA-like Header	$PSOXA	ASCII text
4	Dissolved Oxygen	7.265	ml/l
5	Sensor output	2.922	units?
6	Water Temperature	2.576	Degrees Celsius
7	?	2.576	units?

Field	Data Type	Example	Units
8	Separator	"*"	from NMEA-0183 standard
9	Checksum	58	ASCII Hex per NMEA

Note

Need to check the units and fields

Fluorometer A, BioChem lab

The flourometer is normally operated on all cruises.

Description: This file contains data from a Seapoint SCF flourometer in the BioChem Lab.

Directory: SCS_Data/fluro

File Name: Fluro_20080313-000000.Raw

Data Examples: (3 lines from a data file):

```
03/13/2008,03:19:57.277,$PSFLA,0.330,0.033,0.000,0.010*49
03/13/2008,03:19:59.277,$PSFLA,0.330,0.033,0.000,0.010*49
03/13/2008,03:20:01.277,$PSFLA,0.360,0.036,0.000,0.010*49
```

Table 3.19. Sea Surface Temperature

Field	Data Type	Example	Units
1	SCS logged Date	04/16/2009	MM/DD/YYYY (from SCS)
2	SCS logged Time UTC	00:00:19.272	hh:mm:ss.sss
3	NMEA-like Header	$PSFLA	ASCII text
4	?	0.330	ml/l
5	?	0.330	units?
6	?	0.000	?
7	?	0.010	?
8	Separator	"*"	from NMEA-0183 standard
9	Checksum	49	ASCII Hex per NMEA

Note

Need to check the units and fields

Fluorometer B

Description: This file contains data from a Turner Scufa flourometer in the BioChem Lab. It is not used on all cruises.

Directory: SCS_Data/fluro_b

File Name: Fluro-B_20080313-000000.Raw

Data Examples: (3 lines from a data file):

```
3/13/2008,03:24:49.293,$PSFLB,0.910,0.091,0.200,0.020*4B
03/13/2008,03:24:51.293,$PSFLB,0.910,0.091,0.200,0.020*4B
03/13/2008,03:24:53.308,$PSFLB,0.910,0.091,0.200,0.020*4B
```

Table 3.20. Fluorometer B

Field	Data Type	Example	Units
1	SCS logged Date	3/13/2008	MM/DD/YYYY (from SCS)
2	SCS logged Time UTC	03:24:49.293	hh:mm:ss.sss
3	NMEA-like Header	$PSFLB	ASCII text
4	Flourometer	0.910	ug/l
5	Flourometer, RAW	0.091	Volts
6	Turbidity	0.200	NTU (not used)
7	Turbidity, RAW	0.020	Volts (not used)
8	Separator	"*"	from NMEA-0183 standard
9	Checksum	4B	ASCII Hex per NMEA

Note

Need to check terminology, units, and fields

ISUS Nitrate sensor small file

Note: The ISUS Nitrate sensor is not a routine instrument on Healy. It has been provided by specific science programs and logged in our data system by pre-arrangement through the cruise planning process.

Description: This file contains data from ISUS Nitrate Sensor, MBARI/Satlatic ISIS V3, in the Bio/Chem Lab. Data is logged every 5 minutes for about 30 seconds. For the times in between this the values in the volts columns are 0.0 in the BioChem Lab. It is not used on all cruises.

Directory: SCS_Data/isus

File Name: Isus_20080422-000000.Raw

Data Examples: (3 lines from a data file):

```
04/22/2008,00:04:31.275,$PSNTA,-0.308,0.478*75
04/22/2008,00:04:33.275,$PSNTA,-0.308,0.478*75
04/22/2008,00:04:35.275,$PSNTA,-0.308,0.478*75
```

Table 3.21. ISUS Nitrate sensor small file

Field	Data Type	Example	Units
1	SCS logged Date	04/22/2008	MM/DD/YYYY (from SCS)
2	SCS logged Time UTC	00:04:31.275	hh:mm:ss.sss
3	NMEA-like Header	$PSNTA	ASCII text
4	ISUS Aux 1	-0.308	Volts
5	ISUS Aux 1	0.478	Volts
6	Separator	"*"	from NMEA-0183 standard
7	Checksum	75	ASCII Hex per NMEA

ISUS Nitrate Sensor 3V large file

Note: The ISUS Nitrate sensor is not a routine instrument on Healy. It has been provided by specific science programs and logged in our data system by pre-arrangement through the cruise planning process.

Description: This file contains data from an ISUS Nitrate Sensor 3V, MBARI/Satlatic ISIS V3, instrument in the Bio/Chem Lab. Data is logged every 5 minutes for a few seconds. The data only gets the SCS time stamp at the start of data being sent in that time window. These files are very large. A more complete description of this format is contained in the Satlantic Operation Manual's format section. The example of the data below only shows the first 6 columns of data. NOT currently collected. It is not used on all cruises.

Directory: SCS_Data/isus

File Name: ISUSV3_20080422-000000.Raw

Data Examples: (3 lines from a data file):

```
04/22/2008,00:00:53.167,,4623,9021,....   w/   SCS   time   stamp
SATNLF0141,2008112,23.928082,-4.82,19.99,407.63,...
SATNLF0141,2008112,23.928759,-4.65,20.32,403.75,...
SATNLF0141,2008112,23.928759,-4.65,20.32,403.75,...
SATNLF0141,2008112,23.929436,-5.05,20.59,405.80,...
```

Table 3.22. ISUS Nitrate Sensor 3V large file

Field	Data Type	Example	Units
1	Instrument	SATNLF0141	ASCII Text
2	Date	2008112	YYYYDDD (Year, day of year)
3	Time	23.928082	decimal hours of the day
4	Nitrate Concentration	-4.82,	uMol/L
5	Aux 1	19.99	Volts
6	Aux 2	407.63	unknown
7-n	See Operation Manual		

SSW Pressure, BioChem Lab

Description: This entry describes the format of data from a pressure sensor on the Science SeaWater (SSW) system in the Bio_Chem lab approx. 30 linear feet upstream of the TSG.

Directory: SCS_Data/pressure_sen

File Name: Seawater-Pressure-Sensor_20080428-000000.Raw

Data Examples: (3 lines from a data file):

```
04/28/2008,00:00:03.401,$PSPSA,25.88,2.588*41
04/28/2008,00:00:05.401,$PSPSA,25.86,2.586*41
04/28/2008,00:00:07.401,$PSPSA,25.92,2.592*41
```

Table 3.23. SSW Pressure

Field	Data Type	Example	Units
1	SCS logged Date	04/28/2008	MM/DD/YYYY (from SCS)
2	SCS logged Time UTC	00:00:03.401	hh:mm:ss.sss
3	NMEA-like Header	$PSPSA	ASCII text
4	Pressure	25.88	Pounds Per Square Inch (PSI)

Field	Data Type	Example	Units
5	Sensor output	2.588	Volts
8	Separator	"*"	from NMEA-0183 standard
9	Checksum	41	ASCII Hex per NMEA

Sonar Data

SeaBeam 2112 Center Beam (SCS)

Note: The SeaBeam 2112 multibeam bottom mapping sonar was removed from the Healy during the CY2009-2010 drydock. Center beam records starting in 2010 are forthe EM122 in a different format.

Description: This entry describes the format of data sent to SCS from LDS. LDS assembles this message from the real-time SB2112 data.

Directory: SCS_Data/seabeam_center

File Name: Seabeam-Centerbeam_20070414-182437.Raw

Data Examples: (3 lines from a data file):

```
04/14/2007,18:24:38.427,
$SBCTR,2007,4,14,18:24:35.713,58.119110,-169.839278,70.70,60*00
04/14/2007,18:24:40.177,
$SBCTR,2007,4,14,18:24:37.213,58.119152,-169.839367,70.49,61*00
04/14/2007,18:24:40.615,
$SBCTR,2007,4,14,18:24:38.734,58.119193,-169.839452,70.92,60*00
```

Table 3.24. SB2112 Center Beam

Field	Data Type	Example	Units
1	SCS logged Date	04/14/2007	MM/DD/YYYY (from SCS)
2	SCS logged Time UTC	18:24:38.427	hh:mm:ss.sss
3	NMEA-like Header	$SBCTR	ASCII
4	Ping Year	2007	YYYY (UTC)
5	Ping Month	4	D or DD (per NMEA)
6	Ping Day	14	------"-------
7	Ping Time	18:24:35.713	hh:mm:ss.sss
8	Ping Latitude	58.119110	decimal degrees, N is +
9	Ping Longitude	-169.839278	decimal degrees, E is +
10	Ping depth	70.92	corrected meters
11	Number of beams	60	ASCII
8	Separator	"*"	from NMEA-0183 standard
9	Checksum	00	Not calculated, place holder only

Kongsberg EM122 Center Beam (SCS)

Note: The Kongsberg EM122 multibeam bottom mapping sonar was installed on the Healy during the CY2009-2010 drydock. Center beam records are generated by the Lamont Data System (LDS) and available to SCS via UDP broadcast datagrams. At present SCS has not been able to log them. The same data record is available in the LDS data records.

Description: This entry describes the format of data sent to SCS from LDS. LDS assembles this message from the real-time EM122 data.

Directory: SCS_Data/emctr

File Name: EM122-Centerbeam_20100414-182437.Raw

Data Examples: (1 line from a data file):

```
04/14/2007,18:24:38.427,
$EMCTR,2010,07,05,23:59:58.504,71.524119,-163.097659,41.15,376*5F
```

Table 3.25. EM122 Center Beam

Field	Data Type	Example	Units
1	SCS logged Date	04/14/2007	MM/DD/YYYY (from SCS)
2	SCS logged Time UTC	18:24:38.427	hh:mm:SS.sss
3	NMEA-like Header	$EMCTR	ASCII
4	Ping Year	2010	YYYY (UTC)
5	Ping Month	07	D or DD (per NMEA)
6	Ping Day	05	------"-------
7	Ping Time	23:59:58.504	hh:mm:ss.sss
8	Ping Latitude	71.524119	decimal degrees, N is +
9	Ping Longitude	-163.097659	decimal degrees, E is +
10	Ping depth	41.15	corrected meters
11	Number of beams	376	ASCII
8	Separator	"*"	from NMEA-0183 standard
9	Checksum	5F	NMEA-0183 style checksum

Knudsen 320 PKEL (SCS)

Description: This entry describes the format of data in the Knudsen "PKEL" format from the Knudsen 320 B/R via RS-232C serial output. This format can be changed too easily. As a result users should be careful using this format page without verifying that the coulomns desired are the right ones. More info is available from the Knudsen manuals.

Directory: SCS_Data/knudsen

File Name: Knudsen_20070414-182437.Raw

Data Examples: (1 line from a data file):

```
04/14/2007,18:24:38.099,
$PKEL99,  ,14042007,182524.248,00192,HF,00.00,0,+008.50,LF,73.24,1,
+008.50,1500, , ,58 07.123897N,169 50.315830W,1060*12
```

Table 3.26. Knudsen PKEL recor

Field	Data Type	Example	Units
1	SCS logged Date	04/14/2007	MM/DD/YYYY (from SCS)
2	SCS logged Time UTC	18:24:38.099	Hour:Minute:Second.fraction
3	NMEA-like Header	$PKEL99	ASCII

Field	Data Type	Example	Units
4	??		
5	Ping date	14042007	DDMMYYYY
6	Ping time	182524.248	hhmmss.sss
7		00192	
8	Frequency key	HF	HF = 12 kHz
9	HF Depth	00.00	Meters, corrected for draft
10	HF Depth Valid	0	1 == valid
11	HF Draft	+008.50	Meters, used for draft correction
12	Frequency key	LF	Subbottom
13	LF Depth	73.22	Meters using sound speed
14	LF Depth Valid	1	1 == valid
15	LF Draft	+008.50	Meters
16	Sound speed	1500	meters/second
17			
18			
19	Ping Latitude	58 07.128948N	DD MM.MMMMMM
20	Ping Longitude	169 50.326409W	DDD MM.MMMMMM
21	Position Latency	1078	units?
22	Separator	"*"	from NMEA-0183 standard
23	Checksum	12	Not calculated, place holder only

Winches

Starboard A-Frame Winch Wire Data (SCS)

Description: This entry describes the format of data sent to SCS from the winch system through the SIO/ODF interface.

Directory: SCS_Data/stbd_a_frame

File Name: Winch-Control-Stbd_20070418-000000.Raw

Data Examples: (3 lines from a data file):

```
04/18/2007,06:13:18.281,01, 36, , -27, ,0000
04/18/2007,06:13:19.250,01, 890, , 35, , -28, ,0000
04/18/2007,06:13:20.235,01, 900, , 35, , -28, ,0000
```

Table 3.27. Starboard Winch Wire

Field	Data Type	Example	Units
1	SCS logged Date	04/14/2007	MM/DD/YYYY (from SCS)
2	SCS logged Time UTC	18:24:38.427	hh:mm:ss.sss
3	Sensor number	01	Indicates which TOTCO the data is from
5	Wire tension	900	Pounds

Field	Data Type	Example	Units
6	blank		
7	Wire out	35	Meters
8	blank		
9	Wire Speed	-28	Meters/Minute (- == out)

Aft A-Frame Winch Wire Data (SCS)

Description: This entry describes the format of data sent to SCS from the winch system through the SIO/ODF interface.

Directory: SCS_Data/stbd_a_frame

File Name: Winch-Control-Aft_20070418-000000.Raw

Data Examples: (3 lines from a data file):

```
04/18/2007,06:13:18.281,01, 36, , -27, ,0000
04/18/2007,06:13:19.250,01, 890, , 35, , -28, ,0000
04/18/2007,06:13:20.235,01, 900, , 35, , -28, ,0000
```

Table 3.28. Aft Winch Wire

Field	Data Type	Example	Units
1	SCS logged Date	04/14/2007	MM/DD/YYYY (from SCS)
2	SCS logged Time UTC	18:24:38.427	hh:mm:ss.sss
3	Sensor number	02	Indicates which TOTCO the data is from
5	Wire tension	900	Pounds
6	blank		
7	Wire out	35	Meters
8	blank		
9	Wire Speed	-28	Meters/Minute (- == out)

Navigational Data

POS/MV

POS/MV GGA (SCS)

Description: This entry describes the format of data from the POS/MV-320 as logged by SCS. The POS/MV uses the WGS-84 datum.

Directory: SCS_Data/posmv_gga

File Name: POSMV-GGA_20070415-000000.Raw

Data Examples: (3 lines from a data file):

```
04/15/2007,00:00:03.052,
$INGGA,000002.737,5830.47054,N,17012.64182,W,2,08,1.0,1.80,M,,,4,0297*07
```

```
04/15/2007,00:00:04.052,
$INGGA,000003.737,5830.47385,N,17012.64365,W,2,08,1.0,1.76,M,,,5,0297*0A
04/15/2007,00:00:05.052,
$INGGA,000004.737,5830.47716,N,17012.64550,W,2,08,1.0,1.71,M,,,6,0297*07
```

Table 3.29. POS/MV GGA Record (SCS)

Field	Data Type	Example	Units
1	SCS logged Date	04/15/2007	MM/DD/YYYY (from SCS)
2	SCS logged Time UTC	00:00:03.052	hh:mm:ss.sss
3	NMEA Header	$INGGA	NMEA-0183
4	Position Time (UTC)	000002.737	hhmmss.sss
5	Latitude	5830.47054	DDMM.mmmmm
6	Latitude hemisphere	N	[N|S] N=North
7	Longitude	17012.64182	DDMM.mmmmm
8	Longitude hemisphere	W	[E|W]
9	GPS Quality	2	1=GPS, 2=DGP
10	Number of satellites used	08	
11	HDOP	1.0	Horizontal Dilution of Precision
12	Height	1.8	see Height units
13	Height units	M	M=Meters
14	Geoidal Height		Height of the Master Reference Point in IC/Gyro
15	Geoidal height units		M=meters
16	DGPS Station ID	0297	Reference?
17	Separator	"*"	NMEA-0183
18	Checksum	07	NMEA-0183

Note

Check: line 15 (could be a typo) probably not two units. Check terminology for Geoidal height. Verify that "height" is really the fix height not the antenna height.

POS/MV Pseudo range Noise Statistics (SCS)

Description: This entry describes the format of data from the POS/MV-320 pseudo noise range error statistics. These numbers are very useful for estimating the quality of attitude and position data.

Directory: SCS_Data/posmv_gst

File Name: POSMV-Pseudo-Noise_20070415-000000.Raw

Data Examples: (3 lines from a data file):

```
04/15/2007,00:00:02.990,
$INGST,000002.737,,0.6,0.4,22.3,0.4,0.6,0.8*63
04/15/2007,00:00:03.990,
$INGST,000003.737,,0.6,0.4,22.3,0.4,0.6,0.8*62
04/15/2007,00:00:04.990,
$INGST,000004.737,,0.6,0.4,22.3,0.4,0.6,0.8*65
```

Table 3.30. POS/MV Pseudo range noise statistics (SCS)

Field	Data Type	Example	Units
1	SCS logged Date	04/15/2007	MM/DD/YYYY (from SCS)
2	SCS logged Time UTC	00:00:02.990	hh:mm:ss.ss
3	NMEA Header	$INGST	NMEA-0183
4	Position Time (UTC)	000002.737	hhmmss.sss
5	blank		
6	Semi major axis	0.6	meters
7	semi minor axis	0.04	DDMM.mmmmm
8	Longitude hemisphere	W	[E|W]
9	GPS Quality	2	1=GPS, 2=DGP
10	Number of satellites used	08	meters
11	HDOP	1.0	Horizontal Dilution of Precision
12	Height	1.8	see Height units
13	Height units	M	M=Meters
14	Geoidal Height		see Geoidal height units
15	Geoidal height units		M=meters
16	DGPS Station ID	0297	Reference?
17	Separator	"*"	NMEA-0183
18	Checksum	07	NMEA-0183

Note

Check: line 15 (could be a typo) probably not two units. Check terminology for Geoidal height. Verify that "height" is really the fix height not the antenna height.

POS/MV HDT (SCS)

Description: This entry describes the format of heading data from the POS/MV-320 heading records as logged by SCS.

Directory: SCS_Data/posmv_hdt

File Name: POSMV-HDT_20090806-133536.Raw

Data Examples: (3 lines from a data file):

```
08/06/2009,17:30:00.565,$INHDT,345.9,T*2E 08/06/2009,17:30:01.565,
$INHDT,345.8,T*2F 08/06/2009,17:30:02.565,$INHDT,345.7,T*20
```

Table 3.31. POS/MV Heading (SCS)

Field	Data Type	Example	Units
1	SCS logged Date	08/06/2009	MM/DD/YYYY (from SCS)

Field	Data Type	Example	Units
2	SCS logged Time UTC	17:30:00.565	hh:mm:ss.ss
3	NMEA Header	$INHDT	NMEA-0183
4	Vessel heading	345.9	Degrees
5	Heading reference	T	True north
17	Separator	"*"	NMEA-0183
18	Checksum	2E	NMEA-0183

POS/MV PASHR (SCS)

Description: This entry describes the format of data from the POS/MV-320 pitch and roll records in NMEA PASHR-format as logged by SCS.

Directory: SCS_Data/posmv_pashr

File Name: POSMV-PASHR_20070415-000000.Raw

Data Examples: (3 lines from a data file):

```
08/06/2009,17:40:00.374,
$PASHR,174000.190,313.58,T,-0.17,-0.23,0.02,0.018,0.018,0.011,2,1*10
08/06/2009,17:40:01.374,
$PASHR,174001.190,313.59,T,-0.15,-0.25,0.02,0.018,0.018,0.011,2,1*14
08/06/2009,17:40:02.374,
$PASHR,174002.190,313.54,T,-0.13,-0.14,0.03,0.018,0.018,0.011,2,1*1F
```

Table 3.32. POS/MV PASHR (SCS)

Field	Data Type	Example	Units
1	SCS logged Date	08/06/2009	MM/DD/YYYY (from SCS)
2	SCS logged Time UTC	17:30:00.565	hh:mm:ss.ss
3	NMEA Header	$INHDT	NMEA-0183
4	Vessel heading	345.9	Degrees
5	Heading reference	T	True north
17	Separator	"*"	NMEA-0183
18	Checksum	2E	NMEA-0183

POS/MV VTG (SCS)

Description: This entry describes the format of data from the POS/MV-320 course and speed over ground in NMEA VTG-format as logged by SCS.

Directory: SCS_Data/posmv_vtg

File Name: POSMV-VTG_20070415-000000.Raw

Data Examples: (3 lines from a data file):

```
08/06/2009,18:50:00.372,$INVTG,326.5,T,,M,5.5,N,10.2,K*41
08/06/2009,18:50:01.388,$INVTG,327.5,T,,M,5.5,N,10.3,K*41
08/06/2009,18:50:02.388,$INVTG,326.2,T,,M,5.5,N,10.3,K*47
```

Table 3.33. POS/MV VTG (SCS)

Field	Data Type	Example	Units
1	SCS logged Date	08/06/2009	MM/DD/YYYY (from SCS)
2	SCS logged Time UTC	18:50:00.372	hh:mm:ss.ss
3	NMEA Header	$INVTG	NMEA-0183
4	Vessel heading	326.5	Degrees
5	Heading reference	T	T=True north
6	Vessel Heading		not used
7	Heading reference	M	M=Magnetic
8	Vessel speed	5.5	see speed units field
9	Sped units	N	N=Knots
10	Vessel speed	10.2	see speed units field
11	Speed units	K	K=km/hr
11	Separator	"*"	NMEA-0183
12	Checksum	41	NMEA-0183

POS/MV ZDA (SCS)

Description: This entry describes the format of data from the POS/MV-320 precision time record in NMEA ZDA-format as logged by SCS.

Directory: SCS_Data/posmv_zda

File Name: POSMV-ZDA_20070415-000000.Raw

Data Examples: (3 lines from a data file):

```
08/06/2009,20:19:59.275,$INZDA,201959.0026,06,08,2009,,*71
08/06/2009,20:20:00.275,$INZDA,202000.0025,06,08,2009,,*74
08/06/2009,20:20:01.275,$INZDA,202001.0025,06,08,2009,,*75
```

Table 3.34. POS/MV ZDA (SCS)

Field	Data Type	Example	Units
1	SCS logged Date	08/06/2009	MM/DD/YYYY (from SCS)
2	SCS logged Time UTC	20:19:59.275	hh:mm:ss.ss
3	NMEA Header	$INZDA	NMEA-0183
4	Time (UTC)	201959.0026	HHMMSS.ssss
5	Day	06	DD
6	Month	08	MM
7	Year	2009	YYYY
8	Local zone hours		HH
9	Local zone minutes		MM
11	Separator	"*"	NMEA-0183
12	Checksum	71	NMEA-0183

Ashtech ADU5 (SCS)

Ashtech ADU5 Attitude (SCS)

Description: This entry describes the format of attitude data from the Thales (ex Ashtech) ADU5 GPS receiver's GPS receiver in NMEA GPATT-format as logged by SCS.

Directory: SCS_Data/ashtech_attiude

File Name: Ashtech-Attitude_20090806-133536.Raw

Data Examples: (3 lines from a data file):

```
08/06/2009,20:29:59.428,
$GPPAT,202959.00,7132.00906,N,15751.83798,W,00025.84,337.6729,-000.00,000.21,0.
08/06/2009,20:30:00.428,
$GPPAT,203000.00,7132.00913,N,15751.83882,W,00025.89,337.5929,-000.02,000.21,0.
08/06/2009,20:30:01.428,
$GPPAT,203001.00,7132.00920,N,15751.83963,W,00025.86,337.5559,000.10,000.27,0.0
```

Table 3.35. ADU5 Attitude (SCS)

Field	Data Type	Example	Units
1	SCS logged Date	08/06/2009	MM/DD/YYYY (from SCS)
2	SCS logged Time UTC	20:29:59.428	hh:mm:ss.ss
3	NMEA Header	$GPPAT	NMEA-0183
4	Time of the position	202959.00	HHMMSS.ssss
5	Latitude	7132.00906	DDMM.mmmmm
6	Latitude hemisphere	N	N=North
7	Longitude	15751.83798	DDMM.mmmmm
8	Longitude hemisphere	W	W= West
9	Altitude	00025.84	Meters
10	Heading	337.6729	Degrees ref. True North
11	Pitch	-000.00	Degrees (1)
12	Roll	000.21	Degrees (1)
13	Attitude phase measurement RMD error (MRMS)	0.0013	Meters
14	Attitude baseline length RMS error (BRMS)	0.0147	Meters
15	Attitude reset flag	0	0=good, 1=rough or bad
20	Separator	"*"	NMEA-0183
21	Checksum	71	NMEA-0183

Warning

1) Add reference frame info (e.g. port up, bow up) for attitude data

Ashtech (ADU5) GGA (SCS)

Description: This entry describes the format of data from the Thales (ex. Ashtech) ADU5 GPS receiver's NMEA-GGA position data as logged by SCS.

Directory: SCS_Data/ashtech_gga

File Name: Ashtech-GGA_20090806-133536.Raw

Data Examples: (3 lines from a data file):

```
08/06/2009,20:49:59.279,
$GPGGA,204959.00,7132.93308,N,15753.94937,W,1,12,0.7,21.05,M,-0.49,M,,*5C
08/06/2009,20:50:00.279,
$GPGGA,205000.00,7132.93494,N,15753.95250,W,1,12,0.7,21.03,M,-0.49,M,,*57
08/06/2009,20:50:01.279,
$GPGGA,205001.00,7132.93680,N,15753.95554,W,1,12,0.7,20.96,M,-0.49,M,,*5F
```

Table 3.36. ADU5 GGA Record (SCS)

Field	Data Type	Example	Units
1	SCS logged Date	08/06/2009	MM/DD/YYYY (from SCS)
2	SCS logged Time UTC	20:49:59.279	hh:mm:ss.ss
3	NMEA Header	$GPGGA	NMEA-0183
4	Position Time (UTC)	204959.00	hhmmss.ss
5	Latitude	7132.93308	DDMM.mmmmm
6	Latitude hemisphere	N	[N|S] N=North
7	Longitude	15753.94937	DDMM.mmmmm
8	Longitude hemisphere	W	[E|W]
9	GPS Quality	1	1=GPS, 2=DGP
10	Number of satellites used	12	Integer
11	HDOP	0.7	Horizontal Dilution of Precision
12	Height	21.05	see Height units
13	Height units	M	M=Meters
14	Geoidal Height	-0.49	see Geoidal height units
15	Geoidal height units	M	M=meters
17	Separator	"*"	NMEA-0183
18	Checksum	07	NMEA-0183

Note

Add reference the user/operator/ICD manual

Ashtech (ADU5) GLL (SCS)

Description: This entry describes the format of data from the Thales (ex. Ashtech) ADU5 GPS receiver's NMEA-GLL position data as logged by SCS.

Directory: SCS_Data/ashtech_gll

File Name: Ashtech-GLL_20090807-000000.Raw

Data Examples: (3 lines from a data file):

```
08/07/2009,13:00:00.162,
$GPGLL,7124.44850,N,15719.02547,W,130000.00,A,A*7B
08/07/2009,13:00:01.162,
$GPGLL,7124.44732,N,15719.01959,W,130001.00,A,A*71
08/07/2009,13:00:02.162,
$GPGLL,7124.44614,N,15719.01368,W,130002.00,A,A*7F
```

Table 3.37. ADU5 GLL Record (SCS)

Field	Data Type	Example	Units
1	SCS logged Date	08/07/2009	MM/DD/YYYY (from SCS)
2	SCS logged Time UTC	13:00:00.162	hh:mm:ss.ss
3	NMEA Header	$GPGLL	NMEA-0183
4	Latitude	7124.44850	DDMM.mmmmm
5	Latitude hemisphere	N	[N|S] N=North
6	Longitude	15719.02547	DDMM.mmmmm
7	Longitude hemisphere	W	[E|W]
8	Time of position (UTC)	130000.00	hhmmss.ss
9	Data status	A	A== valid
10	Mode indicator	A	A== autonomous
11	Separator	"*"	NMEA-0183
12	Checksum	07	NMEA-0183

Note

Add reference the user/operator/ICD manual.

Ashtech (ADU5) HDT (SCS)

Description: This entry describes the format of data from the Thales (ex. Ashtech) GPS ADU5 GPS receiver's NMEA-HTD heading data as logged by SCS.

Directory: SCS_Data/ashtech_hdt

File Name: Ashtech-HDT_20090807-000000.Raw

Data Examples: (3 lines from a data file):

```
08/07/2009,12:59:59.412,$GPHDT,131.108,T*3F
08/07/2009,13:00:00.412,$GPHDT,131.138,T*3C
08/07/2009,13:00:01.412,$GPHDT,131.172,T*32
```

Table 3.38. ADU5 GLL Record (SCS)

Field	Data Type	Example	Units
1	SCS logged Date	08/07/2009	MM/DD/YYYY (from SCS)
2	SCS logged Time UTC	12:59:59.412	hh:mm:ss.ss
3	NMEA Header	$GPHDT	NMEA-0183

Field	Data Type	Example	Units
4	Heading	131.108	Degrees
5	Heading Reference	T	T== True North
6	Separator	"*"	NMEA-0183
7	Checksum	07	NMEA-0183

Note

Add reference the user/operator/ICD manual.

P-Code (SCS)

Centurion P-Code (Aft) GGA (SCS)

Description: This entry describes the format of data from the Trimble Centurion GPS receiver's NMEA-GGA position data as logged by SCS.

Directory: SCS_Data/pcode_aft_gga

File Name: PCode-AFT-GGA_20090807-000000.Raw

Data Examples: (3 lines from a data file):

```
08/07/2009,13:09:58.221,
$GPGGA,130957.414,7123.6883,N,15715.5548,W,1,06,1.2,015.7,M,-000.5,M,,*51
08/07/2009,13:09:59.221,
$GPGGA,130958.414,7123.6869,N,15715.5490,W,1,06,1.2,015.8,M,-000.5,M,,*51
08/07/2009,13:10:00.221,
$GPGGA,130959.414,7123.6856,N,15715.5432,W,1,06,1.2,015.8,M,-000.5,M,,*54
```

Table 3.39. Centurion (Aft P-Code) GGA Record (SCS)

Field	Data Type	Example	Units
1	SCS logged Date	08/06/2009	MM/DD/YYYY (from SCS)
2	SCS logged Time UTC	13:09:58.221	hh:mm:ss.ss
3	NMEA Header	$GPGGA	NMEA-0183
4	Position Time (UTC)	130957.414	hhmmss.ss
5	Latitude	7123.6883	DDMM.mmmmm
6	Latitude hemisphere	N	[N|S] N=North
7	Longitude	15715.5548	DDMM.mmmmm
8	Longitude hemisphere	W	[E|W]
9	GPS Quality	1	1=GPS, 2=DGP
10	Number of satellites used	6	Integer
11	HDOP	1.2	Horizontal Dilution of Precision
12	Height	015.7	see Height units
13	Height units	M	M=Meters
14	Geoidal Height	-000.5	see Geoidal height units
15	Geoidal height units	M	M=meters

Field	Data Type	Example	Units
16	Differential reference station		no DGPS input
17	Separator	"*"	NMEA-0183
18	Checksum	07	NMEA-0183

Note

Add reference the user/operator/ICD manual

Centurion P-Code (Aft) GLL (SCS)

Description: This entry describes the format of data from the Trimble Centurion GPS receiver's NMEA-GLL position data as logged by SCS.

Directory: SCS_Data/pcode_aft_gll

File Name: Pcode-AFT-GLL_20090807-000000.Raw

Data Examples: (3 lines from a data file):

```
08/07/2009,13:10:00.283,
$GPGLL,7123.6856,N,15715.5432,W,130959.414,A*2D
08/07/2009,13:10:01.283,
$GPGLL,7123.6843,N,15715.5374,W,131000.414,A*28
08/07/2009,13:10:02.283,
$GPGLL,7123.6829,N,15715.5316,W,131001.414,A*21
```

Table 3.40. Centurion P-Code GLL Record (SCS)

Field	Data Type	Example	Units
1	SCS logged Date	08/07/2009	MM/DD/YYYY (from SCS)
2	SCS logged Time UTC	13:00:00.162	Hour:Minute:Second.fraction
3	NMEA Header	$GPGLL	NMEA-0183
4	Latitude	7124.44850	DDMM.mmmmm
5	Latitude hemisphere	N	[N|S] N=North
6	Longitude	15719.02547	DDMM.mmmmm
7	Longitude hemisphere	W	[E|W]
8	Time of position (UTC)	130000.00	hhmmss.ss
9	Data status	A	A== valid
10	Mode indicator	A	A== autonomous
11	Separator	"*"	NMEA-0183
12	Checksum	07	NMEA-0183

Note

Add reference the user/operator/ICD manual.

Centurion P-Code (Aft) VTG (SCS)

Description: This entry describes the format of data from the Trimble Centurion P-Code GPS receiver's Course and Speed over ground in NMEA VTG-format as logged by SCS.

Directory: SCS_Data/pcode_aft_vtg

File Name: Pcode-AFT-VTG_20090807-000000.Raw

Data Examples: (3 lines from a data file):

```
08/07/2009,13:30:00.323,$GPVTG,125.1,T,100.6,M,008.1,N,015.0,K*43
08/07/2009,13:30:01.323,$GPVTG,125.5,T,101.1,M,008.1,N,015.0,K*41
08/07/2009,13:30:02.323,$GPVTG,124.5,T,100.1,M,008.1,N,015.0,K*41
```

Table 3.41. Centurion VTG (SCS)

Field	Data Type	Example	Units
1	SCS logged Date	08/07/2009	MM/DD/YYYY (from SCS)
2	SCS logged Time UTC	13:30:00.323	Hour:Minute:Second.fraction
3	NMEA Header	$GPVTG	NMEA-0183
4	Vessel heading	125.1	Degrees
5	Heading reference	T	T=True north
6	Vessel Heading	100.6	Degrees
7	Heading reference	M	M=Magnetic
8	Vessel speed	008.1	see speed units field
9	Sped units	N	N=Knots
10	Vessel speed	015.0	see speed units field
11	Speed units	K	K=km/hr
11	Separator	"*"	NMEA-0183
12	Checksum	43	NMEA-0183

Centurion P-Code (Aft) ZDA (SCS)

Description: This entry describes the format of data from the Trimble Centurion GPS receiver's precision time record in NMEA ZDA-format as logged by SCS.

Directory: SCS_Data/pcode_aft_zda

File Name: Pcode-AFT-ZDA_20090807-000000.Raw

Data Examples: (3 lines from a data file):

```
08/07/2009,13:30:00.057,$GPZDA,133000.00,07,08,2009,00,00,*4F
08/07/2009,13:30:01.057,$GPZDA,133001.00,07,08,2009,00,00,*4E
08/07/2009,13:30:02.057,$GPZDA,133002.00,07,08,2009,00,00,*4D
```

Table 3.42. Centurion ZDA (SCS)

Field	Data Type	Example	Units
1	SCS logged Date	08/07/2009	MM/DD/YYYY (from SCS)
2	SCS logged Time UTC	13:30:00.057	Hour:Minute:Second.fraction
3	NMEA Header	$GPZDA	NMEA-0183
4	Time (UTC)	133000.00	HHMMSS.ssss
5	Day	07	DD

Field	Data Type	Example	Units
6	Month	08	MM
7	Year	2009	YYYY
8	Local zone hours	00	HH
9	Local zone minutes	00	MM
11	Separator	"*"	NMEA-0183
12	Checksum	71	NMEA-0183

Rockwell-Collins P-Code (Bridge) GGA (SCS)

Description: This entry describes the format of data from the Rockwell-Collins GPS receiver's NMEA-GGA position data as logged by SCS. This receiver is installed on the Bridge.

Directory: SCS_Data/pcode_bridge_gga

File Name: PCode-Bridge-GGA_20090807-000000.Raw

Data Examples: (3 lines from a data file):

```
08/07/2009,13:49:58.596,
$GPGGA,134957.00,7120.604,N,15701.687,W,1,04,1.534,12.48,M,0.438,M,,*49
08/07/2009,13:50:00.596,
$GPGGA,134959.00,7120.601,N,15701.676,W,1,04,1.534,12.63,M,0.438,M,,*45
08/07/2009,13:50:02.596,
$GPGGA,135001.00,7120.599,N,15701.665,W,1,04,1.534,12.77,M,0.438,M,,*45
```

Table 3.43. Rockwell-Collins P-Code GGA Record (SCS)

Field	Data Type	Example	Units
1	SCS logged Date	08/07/2009	MM/DD/YYYY (from SCS)
2	SCS logged Time UTC	13:49:58.596	Hour:Minute:Second.sss
3	NMEA Header	$GPGGA	NMEA-0183
4	Position Time (UTC)	134957.00	hhmmss.ss
5	Latitude	7120.604	DDMM.mmmm
6	Latitude hemisphere	N	[N|S] N=North
7	Longitude	15701.687	DDMM.mmmm
8	Longitude hemisphere	W	[E|W]
9	GPS Quality	1	1=GPS, 2=DGP
10	Number of satellites used	04	Integer
11	HDOP	1.534	Horizontal Dilution of Precision
12	Height	12.48	see Height units
13	Height units	M	M=Meters
14	Geoidal Height	0.438	see Geoidal height units
15	Geoidal height units	M	M=meters
16	Differential reference station		no DGPS input
17	Separator	"*"	NMEA-0183
18	Checksum	49	NMEA-0183

Note

Add reference the user/operator/ICD manual

Rockwell-Collins P-Code (Bridge) GLL (SCS)

Description: This entry describes the format of data from the Rockwell-Collins P-Code GPS receiver's NMEA-GLL position data as logged by SCS.

Directory: SCS_Data/pcode_bridge_gll

File Name: Pcode-Bridge-GLL_20090807-000000.Raw

Data Examples: (3 lines from a data file):

```
08/07/2009,13:59:58.671,
$GPGLL,7120.231,N,15659.490,W,135957.00,A*1D

08/07/2009,14:00:00.671,
$GPGLL,7120.231,N,15659.486,W,135959.00,A*14

08/07/2009,14:00:02.655,
$GPGLL,7120.231,N,15659.483,W,140001.00,A*17
```

Table 3.44. Rockwell-Collins P-Code GLL Record (SCS)

Field	Data Type	Example	Units
1	SCS logged Date	08/07/2009	MM/DD/YYYY (from SCS)
2	SCS logged Time UTC	13:00:00.162	Hour:Minute:Second.fraction
3	NMEA Header	$GPGLL	NMEA-0183
4	Latitude	7124.44850	DDMM.mmmmm
5	Latitude hemisphere	N	[N|S] N=North
6	Longitude	15719.02547	DDMM.mmmmm
7	Longitude hemisphere	W	[E|W]
8	Time of position (UTC)	130000.00	hhmmss.ss
9	Data status	A	A== valid
10	Mode indicator	A	A== autonomous
11	Separator	"*"	NMEA-0183
12	Checksum	07	NMEA-0183

Note

Add reference the user/operator/ICD manual.

Rockwell-Collins P-Code (Bridge) VTG (SCS)

Description: This entry describes the format of data from the Trimble Centurion P-Code GPS receiver's Course and Speed over ground in NMEA VTG-format as logged by SCS.

Directory: SCS_Data/pcode_aft_vtg

File Name: Pcode-AFT-VTG_20090807-000000.Raw

Data Examples: (3 lines from a data file):

```
08/07/2009,13:30:00.323,$GPVTG,125.1,T,100.6,M,008.1,N,015.0,K*43
08/07/2009,13:30:01.323,$GPVTG,125.5,T,101.1,M,008.1,N,015.0,K*41
08/07/2009,13:30:02.323,$GPVTG,124.5,T,100.1,M,008.1,N,015.0,K*41
```

Table 3.45. Centurion VTG (SCS)

Field	Data Type	Example	Units
1	SCS logged Date	08/07/2009	MM/DD/YYYY (from SCS)
2	SCS logged Time UTC	13:30:00.323	Hour:Minute:Second.fraction
3	NMEA Header	$GPVTG	NMEA-0183
4	Vessel heading	125.1	Degrees
5	Heading reference	T	T=True north
6	Vessel Heading	100.6	Degrees
7	Heading reference	M	M=Magnetic
8	Vessel speed	008.1	see speed units field
9	Sped units	N	N=Knots
10	Vessel speed	015.0	see speed units field
11	Speed units	K	K=km/hr
11	Separator	"*"	NMEA-0183
12	Checksum	43	NMEA-0183

Glonass (SCS)

Glonass GGA (SCS)

Note: Starting in May 2009 the Glonas Receiver is no longer used.

Description: This entry describes the format of data from the ------- Glonass/GPS receiver's NMEA-GGA position data as logged by SCS.

Directory: SCS_Data/glonass_gga

File Name: Glonass-GGA_20090807-000000.Raw

Data Examples: (3 lines from a data file):

```
08/07/2009,14:39:59.311,
$GPGGA,143959.00,7119.309245,N,15651.055941,W,1,06,1.6,15.893,M,-0.40,M,,*6E
08/07/2009,14:40:00.311,
$GPGGA,144000.00,7119.309154,N,15651.054451,W,1,06,1.6,15.655,M,-0.40,M,,*66
08/07/2009,14:40:01.327,
$GPGGA,144001.00,7119.309055,N,15651.053065,W,1,06,1.6,15.442,M,-0.40,M,,*67
```

Table 3.46. Centurion (Aft P-Code) GGA Record (SCS)

Field	Data Type	Example	Units
1	SCS logged Date	08/07/2009	MM/DD/YYYY (from SCS)
2	SCS logged Time UTC	14:39:59.311	Hour:Minute:Second.fraction
3	NMEA Header	$GPGGA	NMEA-0183
4	Position Time (UTC)	143959.00	hhmmss.ss

Field	Data Type	Example	Units
5	Latitude	7119.309245	DDMM.mmmmm
6	Latitude hemisphere	N	[N|S] N=North
7	Longitude	15651.055941	DDMM.mmmmm
8	Longitude hemisphere	W	[E|W]
9	GPS Quality	1	1=GPS, 2=DGP
10	Number of satellites used	06	Integer
11	HDOP	1.6	Horizontal Dilution of Precision
12	Height	15.893	see Height units
13	Height units	M	M=Meters
14	Geoidal Height	-0.40	see Geoidal height units
15	Geoidal height units	M	M=meters
16	Differential reference station		no DGPS input
17	Separator	"*"	NMEA-0183
18	Checksum	6E	NMEA-0183

Note

Add reference the user/operator/ICD manual

Glonass/GPS GLL (SCS)

Note: Starting in May 2009 the Glonas Receiver is no longer used.

There is an amusing pun, typo, or slip in Tom's July 2009 edition in which this data type is referred to as glasnoss (almost glasnost)

Description: This entry describes the format of data from the Trimble Centurion GPS receiver's NMEA-GLL position data as logged by SCS.

Directory: SCS_Data/glonass_gll

File Name: Glonass-GLL_20090807-000000.Raw

Data Examples: (3 lines from a data file):

```
08/07/2009,14:40:00.155,
$GPGLL,7119.309154,N,15651.054451,W,144000.00,A*14
08/07/2009,14:40:01.155,
$GPGLL,7119.309055,N,15651.053065,W,144001.00,A*11
08/07/2009,14:40:02.155,
$GPGLL,7119.309063,N,15651.051727,W,144002.00,A*14
```

Table 3.47. Glonass/GPS GLL Record (SCS)

Field	Data Type	Example	Units
1	SCS logged Date	08/07/2009	MM/DD/YYYY (from SCS)
2	SCS logged Time UTC	14:40:00.155	Hour:Minute:Second.sss
3	NMEA Header	$GPGLL	NMEA-0183
4	Latitude	7119.309154	DDMM.mmmmmm
5	Latitude hemisphere	N	[N|S] N=North

Field	Data Type	Example	Units
6	Longitude	15651.054451	DDMM.mmmmmm
7	Longitude hemisphere	W	[E|W]
8	Time of position (UTC)	1144000.00	hhmmss.ss
9	Data status	A	A== valid
10	Separator	"*"	NMEA-0183
11	Checksum	07	NMEA-0183

Note

Add reference the user/operator/ICD manual.

Sperry MX512

Sperry (MX512) GGA (SCS)

Description: This entry describes the format of data from the Sperry MX512 GPS receiver's NMEA-GGA position data as logged by SCS.

Directory: SCS_Data/mx512_gga

File Name: MX512-GGA_20100901-000000.Raw

Data Examples: (3 lines from a data file):

```
09/01/2010,00:00:24.754,
$GPGGA,000024,7508.5959,N,13857.8750,W,2,10,01.0,20.9,M,-3.2,M,07.0,0138*59
09/01/2010,00:00:25.770,
$GPGGA,000025,7508.5941,N,13857.8703,W,2,10,01.0,20.9,M,-3.2,M,07.0,0138*57
09/01/2010,00:00:26.785,
$GPGGA,000026,7508.5923,N,13857.8657,W,2,10,01.0,20.9,M,-3.2,M,04.0,0138*53
```

Table 3.48. MX512 GGA Record (SCS)

Field	Data Type	Example	Units
1	SCS logged Date	09/01/2010	MM/DD/YYYY (from SCS)
2	SCS logged Time UTC	00:00:24.754	hh:mm:ss.sss
3	NMEA Header	$GPGGA	NMEA-0183
4	Position Time (UTC)	000024	hhmmss.ss
5	Latitude	7508.5959	DDMM.mmmmm
6	Latitude hemisphere	N	[N|S] N=North
7	Longitude	13857.8750	DDMM.mmmmm
8	Longitude hemisphere	W	[E|W]
9	GPS Quality	2	1=GPS, 2=DGP
10	Number of satellites used	10	Integer
11	HDOP	1.0	Horizontal Dilution of Precision
12	Altitude re: mean-sea-level (geoid)	20.09	meters
13	Height units	M	M=Meters

Field	Data Type	Example	Units
14	Geoidal Separation	-3.2	meters
15	Geoidal height units	M	M=meters
16	Age of Differential GPS data	07.0	seconds
17	Differential reference station ID	0138	integer
18	separator	"*"	NMEA-0183
19	Checksum	07	NMEA-0183

Note

Add reference the user/operator/ICD manual

Sperry (MX512) GLL (SCS)

Description: This entry describes the format of data from the Sperry MX512 GPS receiver's NMEA-GLL position data as logged by SCS.

Directory: SCS_Data/mx512_gll

File Name: Pcode-AFT-GLL_20100901-000000.Raw

Data Examples: (3 lines from a data file):

```
09/01/2010,00:01:46.005,
$GPGLL,7508.4553,N,13857.4738,W,000144.714,A*28
09/01/2010,00:01:47.005,
$GPGLL,7508.4536,N,13857.4688,W,000145.714,A*20
09/01/2010,00:01:48.052,
$GPGLL,7508.4519,N,13857.4640,W,000146.714,A*2A
```

Table 3.49. MX512 GLL Record (SCS)

Field	Data Type	Example	Units
1	SCS logged Date	09/01/2010	MM/DD/YYYY (from SCS)
2	SCS logged Time UTC	00:01:46.005	hh:mm:ss.sss
3	NMEA Header	$GPGLL	NMEA-0183
4	Latitude	7508.4553	DDMM.mmmmm
5	Latitude hemisphere	N	[N|S] N=North
6	Longitude	13857.4738	DDMM.mmmmm
7	Longitude hemisphere	W	[E|W]
8	Time of position (UTC)	000144.714	hhmmss.ss
9	Mode indicator	A	A== autonomous
10	Separator	"*"	NMEA-0183
11	Checksum	07	NMEA-0183

Note

Add reference the user/operator/ICD manual.

Sperry (MX512) HDT (SCS)

Description: This entry describes the format of data from the Sperry MX512 GPS receiver's NMEA-HDT heading data as logged by SCS.

Directory: SCS_Data/mx512_hdt

File Name: MX512-HDT_20100901-000000.Raw

Data Examples: (3 lines from a data file):

```
09/01/2010,00:03:38.788,$GPHDT,142.47,T*01
09/01/2010,00:03:40.757,$GPHDT,142.47,T*01 09/01/2010,00:03:42.804,
$GPHDT,142.46,T*00
```

Table 3.50. MX512 GLL Record (SCS)

Field	Data Type	Example	Units
1	SCS logged Date	09/01/2010	MM/DD/YYYY (from SCS)
2	SCS logged Time UTC	00:03:38.788	hh:mm:ss.sss
3	NMEA Header	$GPHDT	NMEA-0183
4	Heading	142.47	Degrees
5	Heading Reference	T	T== True North
6	Separator	"*"	NMEA-0183
7	Checksum	01	NMEA-0183

Note

Add reference the user/operator/ICD manual.

Sperry (MX512) VTG (SCS)

Description: This entry describes the format of data from the Sperry MX512 GPS receiver's Course and Speed over ground in NMEA VTG-format as logged by SCS.

Directory: SCS_Data/mx512_vtg

File Name: MX512-VTG_20100901-000000.Raw

Data Examples: (3 lines from a data file):

```
09/01/2010,00:03:07.866,$GPVTG,144,T,106,M,07.7,N,14.3,K,D*26
09/01/2010,00:03:09.866,$GPVTG,145,T,107,M,07.7,N,14.2,K,D*27
09/01/2010,00:03:11.881,$GPVTG,145,T,106,M,07.8,N,14.5,K,D*2E
```

Table 3.51. MX512 VTG (SCS)

Field	Data Type	Example	Units
1	SCS logged Date	09/01/2010	MM/DD/YYYY (from SCS)
2	SCS logged Time UTC	00:03:07.866	hh:mm:ss.sss
3	NMEA Header	$GPVTG	NMEA-0183
4	Vessel heading	144	Degrees
5	Heading reference	T	T=True north

Field	Data Type	Example	Units
6	Vessel Heading	106	Degrees
7	Heading reference	M	M=Magnetic
8	Vessel speed	07.7	see speed units field
9	Speed units	N	N=Knots
10	Vessel speed	14.3	see speed units field
11	Speed units	K	K=km/hr
11	Mode Indicator	D	NMEA-0183
12	Separator	"*"	NMEA-0183
13	Checksum	26	NMEA-0183

Sperry Gyroscopes

MK27 Sperry Gyroscope

Description: This entry describes the format of data from Sperry MK27 NMEA-HTD heading data as logged by SCS.

Directory: SCS_Data/gyro_mk27

File Name: Gyro-MK27_20090807-000000.Raw

Data Examples: (3 lines from a data file):

```
08/07/2009,14:50:01.729,$HEHDT,206.79,T*15
```

```
08/07/2009,14:50:01.823,$HEHDT,206.80,T*13
```

```
08/07/2009,14:50:01.933,$HEHDT,206.77,T*1B
```

Table 3.52. MK27 Gyro Record (SCS)

Field	Data Type	Example	Units
1	SCS logged Date	08/07/2009	MM/DD/YYYY (from SCS)
2	SCS logged Time UTC	14:50:012	Hour:Minute:Second.fraction
3	NMEA Header	$GPHDT	NMEA-0183
4	Heading	206.79	Degrees
5	Heading Reference	T	T== True North
6	Separator	"*"	NMEA-0183
7	Checksum	15	NMEA-0183

Note

Add reference the user/operator/ICD manual.

MK39 Sperry Gyrocompass

Description: This entry describes the format of data from the Sperry MK39 Gyro's NMEA-HTD heading data as logged by SCS.

Directory: SCS_Data/gyro_mk39

File Name: Gyro-MK39_20090807-000000.Raw

Data Examples: (3 lines from a data file):

```
08/07/2009,14:50:01.933,$INHDT,206.11,T*11

08/07/2009,14:50:02.026,$INHDT,206.10,T*10

08/07/2009,14:50:02.136,$INHDT,206.10,T*10
```

Table 3.53. MK39 Gyro Record (SCS)

Field	Data Type	Example	Units
1	SCS logged Date	08/07/2009	MM/DD/YYYY (from SCS)
2	SCS logged Time UTC	14:50:01.933	Hour:Minute:Second.fraction
3	NMEA Header	$INHDT	NMEA-0183
4	Heading	206.11	Degrees
5	Heading Reference	T	T== True North
6	Separator	"*"	NMEA-0183
7	Checksum	11	NMEA-0183

Note

Add reference the user/operator/ICD manual.

IBS way points (SCS)

Description: This entry describes the format of data from the Integrated Bridge System (IBS) NMEA-NVWPL way point data as logged by SCS.

Directory: SCS_Data/ibs_waypoints

File Name: IBS-WayPoints_20070415-000000.Raw

Data Examples: (3 lines from a data file):

```
04/15/2007,00:00:03.193,$NVWPL,6152.68,N,17402.58,W,62*51
04/15/2007,00:00:04.193,$NVWPL,6156.58,N,17422.68,W,63*56
04/15/2007,00:00:05.193,$NVWPL,6202.16,N,17439.96,W,64*52
```

Table 3.54. IBS way points Record (SCS)

Field	Data Type	Example	Units
1	SCS logged Date	04/15/2007	MM/DD/YYYY (from SCS)
2	SCS logged Time UTC	00:00:03.193	Hour:Minute:Second.fraction
3	NMEA Header	$NVWPL	NMEA-0183
4	Latitude	6152.68	DDMM.mm
5	Latitude Hemisphere	N	N==North
6	Longitude	17402.58	DDDMM.mm
7	Longitude Hemisphere	W	W==West
8	way point Number	62	ASCII Integer
9	Separator	"*"	NMEA-0183

Field	Data Type	Example	Units
10	Checksum	51	NMEA-0183

Note

Add reference the user/operator/ICD manual.

Sperry SRD500 Doppler Speed Log (SCS)

Note

The Sperry SRD500 installation was not designed with an ice window to protect the transducer so, after damaging two transdcuers, we normally retract the transducer when operating in or near ice to prevent damage. Therefore there are often long periods, sometimes whole cruises, when there is no data from the SRD500.

Description: This entry describes the format of data from the Sperry SRD500 doppler speed log's NMEA-VDVBW ground and water speed data as logged by SCS.

Directory: SCS_Data/sperry_speedlog

File Name: Sperry-Speedlog_20070415-000000.Raw

Data Examples: (3 lines from a data file):

```
04/15/2007,00:00:02.755,$VDVBW,12.32,0.85,A,12.43,0.66,A*5A
04/15/2007,00:00:03.271,$VDVBW,12.33,0.80,A,12.44,0.66,A*59
04/15/2007,00:00:03.771,$VDVBW,12.34,0.78,A,12.45,0.68,A*56
```

Table 3.55. SRD500 Record (SCS)

Field	Data Type	Example	Units
1	SCS logged Date	04/15/2007	MM/DD/YYYY (from SCS)
2	SCS logged Time UTC	00:00:02.755	Hour:Minute:Second.sss
3	NMEA Header	$VDVBW	NMEA-0183
4	Fore/aft water speed	12.32	Knots, - = Astern
5	Stbd/port water Speed	T	Knots, - = Stbd
6	Water Speed Flag	A	A= Data Valid V=Invalid
7	Fore/aft bottom speed	12.43	Knots, - = Astern
8	Stbd/port bottom speed	0.66	Knots, - = Stbd
9	Bottom Speed Flag	A	A=Data Valid V=Invalid
10	Separator	"*"	NMEA-0183
11	Checksum	11	NMEA-0183

Note

Add reference the user/operator/ICD manual.

SV2000 (SCS)

Note: The SV2000 installed in the ADCP150 well was only used for the BB150 ADCP. Since the BB150 was replaced with an OS150 (on loan from UAF) in April 2010, this sensor is no longer necessary so it is no longer in operation.

This sensor is installed inside the ADCP150 transducer well and measures the speed of sound in the fluid in the well. These measurements should only be used for processing ADCP150 data.

Description: This entry describes the format of data from the ODEC SV2000 direct measuring acoustic velocimeter data as logged by SCS.

Directory: SCS_Data/sv2000

File Name: Sound-Velocimeter_20080314-000000.Raw

Data Examples:(3 lines from a data file):

```
03/14/2008,00:00:24.999, 1470.87

03/14/2008,00:00:55.030, 1470.87

03/14/2008,00:01:25.045, 1470.87
```

Table 3.56. SV2000 Record (SCS)

Field	Data Type	Example	Units
1	SCS logged Date	08/07/2009	MM/DD/YYYY (from SCS)
2	SCS logged Time UTC	14:50:01.933	Hour:Minute:Second.fraction
3	Sound speed	1470.87	dddd.dd, meters/second
4	Separator	"*"	NMEA-0183
5	Checksum	11	NMEA-0183

Note

Add reference the user/operator/ICD manual.

Chapter 4. RAW Data files

This chapter describes the format of directories and files in the RAW directories. This content is typically written by special purpose, system-specific, applications. Some (most) of these applications are provided by the system vendors as binary code and include more or less clear and complete documentation some of which is readilly available.

ADCP DATA

UHDAS ADCP Data

This section describes the raw data for ADCP data collected with the University of Hawaii's acquisition system. It includes a mix of raw and derived (processed) products.

Note

Starting in 2010 ADCP data on the Healy is collected and logged with the University of Hawaii's UHDAS package.

The top level directory structure of UHDAS data

UHDAS Directory Structure

This section provides an overview and description of the directory structure of ADCP data collected by UHDAS on Healy. The top two levels of directory structure (from *tree -d -L 2*)are shown below and described in the following table.

```
|-- gbin
|   |-- os150
|   `-- os75
|-- proc
|   |-- os150bb
|   |-- os150nb
|   |-- os75bb
|   `-- os75nb
|-- raw
|   |-- ashpaq5
|   |-- config
|   |-- gpsnav
|   |-- gyro
|   |-- gyro2
|   |-- os150
|   |-- os75
|   `-- posmv
|-- rbin
|   |-- ashpaq5
|   |-- gpsnav
|   |-- gyro
|   |-- gyro2
|   `-- posmv
`-- tsgmet
```

There are three categories of data, all located in the logging directory, /home/data/CRUISEID. The cruise DVD shoule contain the entire /home/data/CRUISEID directory. This table is a short description of the contents:

Table 4.1. Top Level UHDAS Directory Structure: Data for Scientists

subdirectory	contents	importance	back up for ...
raw	all raw data	critical	archiving
rbin	intermediate files	nice to have	anyone who gets ‘raw’
gbin	intermediate files	nice to have	anyone who gets ‘raw’
proc	**processed data** codas database underway figure archive matlab files	final at-sea product	science CD after cruise

RDI VMDAS ADCP Data

This section describes the data format for files logged with the RDI VMDAS Windows application. Starting in 2010 ADCP data on the Healy is collected and logged with the University of Hawaii's UHDAS package.

75 kHz RDI ADCP (OS75)

Description: The shipboard ADCP system measures currents in the depth range from about 30 to 300 m -- in good weather. In bad weather or in ice, the range is less, and sometimes no valid measurements are made. ADCP data collection occurs on the Healy for the benefit of the scientists on individual cruises and for the long-term goal of building a climatology of current structure in the ocean. The ADCP 75 data set collected during this cruise are placed in the directory ./Raw/adcp75. The files are named by the cruise, HLY0902, a three place number of the sequence in the files, then an extra “_000000”, and then an extention for the kind of data in the file. An example of the files for one set is shown in the table below.

Directory: Raw/adcp75

ADCP75 Files

Table 4.2. ADCP 75 File Types

Item	File Name	Extension	Content
1	HLY0901022_000000		Raw Binary ADCP Data
2	HLY0901022_000000	.ENS	Binary Adcp Data
3	HLY0901022_000000	.ENX	Binary Ensemble Data
4	HLY0901022_000000	.STA	Short Term Averages
5	HLY0901022_000000	.LTA	Long Term Averages
6	HLY0901022_000000	.N1R	Raw NMEA ASCII input
7	HLY0901022_000000	.N2R	Raw NMEA ASCII input
8	HLY0901022_000000	.NMS	Averaged Nav Data
9	...		
12	HLY0901*	.INI	Configuration File

RDI 150 kHz ADCP (OS150)

This section describes the data format for ADCP data logged with the RDI VMDAS Windows application.
Starting in 2010 ADCP data on the Healy is collected and logged with the University of Hawaii's UHDAS package.

Description: The shipboard ADCP system measures currents in the depth range from about 30 to 300 m -- in good weather. In bad weather or in ice, the range is less, and sometimes no valid measurements are made. ADCP data collection occurs on the Healy for the benefit of the scientists on individual cruises and for the long-term goal of building a climatology of current structure in the Ocean. The ADCP150 data set collected during this cruise are placed in the directory ./Raw/adcp150. The files are named by the cruise, HLY0902, a three place number of the sequence in the files, then an extra "_000000", and then an extent for the kind of data in the file. An example of the files for one set is shown in the table below.

Directory: Raw/adcp150

Table 4.3. ADCP 150 File Types

Item	File Name	Extension	Content
1	HLY0901022_000000		Raw Binary ADCP Data
2	HLY0901022_000000	.ENS	Binary Adcp Data
3	HLY0901022_000000	.ENX	Bniary Ensemble Data
4	HLY0901022_000000	.STA	Short Term Averages
5	HLY0901022_000000	.LTA	Long Term Averages
6	HLY0901022_000000	.N1R	Raw NMEA ASCII input
7	HLY0901022_000000	.N2R	Raw NMEA ASCII input
8	HLY0901022_000000	.NMS	Averaged Nav Data
9	...		
12	HLY0901*	.INI	Configuration File

Bathymetry Data

Kongsberg EM122 multibeam

Verification of real-time logging of EM122 data is still in process. Until this data stream is validated, the raw data files as logged on the Kongsberg SIS Hyrdographic Workstation (HWS) is included in the "raw" section of the data distribution.

Description: The Kongsberg EM122 multibeam bottom mappig sonar was installed on the Healy during the CY2009-2010 maintenance period at Todd Pacific Shipyard in Seattle, WA. This sonar routinely collects bathymetry and seafloor image data as well as water column. It is also capable of collecting raw "stave" (or hydrophone data) but this is not done routinely.

Directory: Raw/EM_122_RawData/HLY1001_01/

Within this directory, there are separate directories for each "survey" collected by the SIS application. Survey's tend to end when the SIS is restarted for some reason. Under special circumstances, survey's may be used to separate data from different events. Survey directories are named: HLY1001_01/

Table 4.4. Kongsberg EM122 Raw data file types

Item	File Name	Extension	Content
1	0000_20100619_233632_Healy	.all	Binary Kongsberg ".all" format. MB-System type 58 file or .mb58
2	0000_20100619_233632_Heal	.wcd	Binary Kongsberg water column data

KNUDSEN 320B/R

Description: The Knudsen 320B/R depth sounder has two independent transceivers. One is tuned for and connected to an ODEC TC12/36 hull mounted transducer. The other is matched to an array of 16 tr-109 subbottom transducers. It is capable of simultaneously operating at 12 kHz and as a subbottom profiler in either tone burst (3.5 kHz) or "chirp" (3-6kHz) mode. The Healy routinely operates the 3 - 6kHz "chirp" (Sub Bottom Profile) mode except in special situation such as communicating with and, or ranging on acoustic releases or bottom tracking pingers. We do not operate the 12 kHz sounder as it interferes with the multibeam. Historically, Knudsen data has been saved in all of the formats that the Knudsen can record data in. These files are ASCII, mixed ASCII/Binary and binary format (see the table below). In the future we may elect to drop logging the Knudsen binary data and continue logging the SEG-Y formatted data. The nominal, uncorrected, water depth is also logged as an ASCII NMEA data type by SCS.

Directory: Raw/knudsenraw

Table 4.5. Knudsen File Types

Item	File Name	Extension	Content
1	2007_102_0005_004	.keb	Binary Knudsen format
2	2007_102_0005_004	.kea	Log file of configuration data, ASCII
3	2007_102_0005_HF_001	.sgy	SEG-Y subbottom data, Mixed

CTD

Description: Data for the each CTD cast are contained in subdirectories under this directory. These files are in the native format written by SeaBird's SeaSave application format. Each cast is in a separately numbered subdirectory. The Names of the files vary by cruise but file extent examples below will be consistent.

Directory: Raw/ctd

Table 4.6. CTD File Types

Item	File Name	Extension	Content
1	021	.BL	Bottle firing info
2	021	.CON	Configuration File
3	021	.HDR	Header information for the cast

Item	File Name	Extension	Content
4	021	.btl	ASCII averaged bottle data
5	021	.cnv	ASCII, converted output data
6	021	.hex	ASCII hexadecimal encoded raw data
7	021	.jpg	Screen shot of the cast
8	021	.ros	Bottle trip information
9	021	.avg.cnv	ASCII, meaned, 1/2 meter dat afrom the downcast

Environmental_sensors

Description: This directory contains the log files for the temperature probes recording the cold room and freezer temperatures. The files are all in ASCII. A list of the current files is below. These can be plotted with any simple plotting program or Spread sheet program. There is a header that tells what the columns a

Directory: Raw/environmental_sensors

Table 4.7. Environmental Chamber Status Files

Item	File Name	Extension	Content
1	Biochem_RH	.txt	Relative Humidity in BioChem Lab
2	Biochem_Temp	.txt	Temperature
3	CC1_temp	.txt	Temperature
4	CC2_temp	.txt	Temperature
5	Port_Temp	.txt	Temperature
6	StbdReefer_temp	.txt	Temperature
7	Previous Data		Directory

Expendable Bathythermograph (XBT) Data

There are two XBT systems on Healy. A Sippican Model: xxxxxx and a Turo Devil. The Devil unit can only handle XBT probes while the Sippican can handle XBTS, XCDT, and XSVs. Data file descriptions are provided for both types in the following sections.

Sippican MK21 files (XBT, XCTD, etc.) Files

This section descirbes the directory and file namving for data collected with the Sippican deck unit for exptendable profiling probes

Description: The file names use the sequence number of the XBT or Expendable Sound Velocimeter (XSV) in the series used for the cruise.

Directory: Raw/xbt

Table 4.8. Sipppican XBT File Types

Item	File Name	Extension	Content
1	T7_00036	EDF	T7 XBT data in Export Data Format (ASCII)
2	T7_00036	RDF	T7 XBT data in Sippican proprietary Raw Data Format

An example of an Export Data File is shown here:

```
// This is a MK21 EXPORT DATA FILE  (EDF)
//
Date of Launch:  07/06/2010
Time of Launch:  05:49:51
Sequence #    :  45
Latitude      :  71 50.45264N
Longitude     :  165 10.30078W
Serial #      :  00000000
//
// Here are the contents of the memo fields.
//
HLY1001
//
// Here is some probe information for this drop.
//
Probe Type       :  T-7
Terminal Depth   :  760 m
Depth Equation   :  Standard
Depth Coeff. 1   :  0.0
Depth Coeff. 2   :  6.691
Depth Coeff. 3   :  -0.00225
Depth Coeff. 4   :  0.0
Pressure Pt Correction:  100.0%
//
Raw Data Filename:  C:\Program Files\Sippican\WinMK21\DATA\T7_00045.RDF
//
Display Units    :  Metric
//
// This XBT export file has not been noise reduced or averaged.
//
// Sound velocity derived with assumed salinity: 34.00 ppt
//
Depth (m) - Temperature (<B0>C) - Sound Velocity (m/s)
0.0     1.30    1453.67
0.7     1.22    1453.36
1.3     1.15    1453.05
2.0     1.10    1452.84
2.7     1.09    1452.81
3.3     1.07    1452.72
4.0     0.97    1452.29
4.7     0.89    1451.95
5.4     0.88    1451.87
```

Sippican MK21 files XCTD Files

This section describes the directory and file naming for data collected with the Sippican MK21 deck unit for eXpendable CTD profiling probes

Description: The file names use the sequence number of the probe in the series used for the cruise.

Directory: Raw/xctd

Table 4.9. Sipppican XBT File Types

Item	File Name	Extension	Content
1	C3_00021	EDF	XCTD data in Export Data Format (ASCII)
2	C3_00021	RDF	XCTD data in Sippican proprietary format

An example of an Export Data File is shown here:

```
// This is a MK21 EXPORT DATA FILE  (EDF)
//
Date of Launch:  07/05/2010
Time of Launch:  17:44:03
Sequence #    :  34
Latitude      :  71 23.83252N
Longitude     :  162 15.91797W
Serial #      :  08112231
//
// Here are the contents of the memo fields.
//
HLY1001
//
// Here is some probe information for this drop.
//
Probe Type       :  XCTD-1
Terminal Depth   :  1100 m
Depth Equation   :  Standard
Depth Coeff. 1   :  0.0
Depth Coeff. 2   :  3.425432
Depth Coeff. 3   :  -0.00047
Depth Coeff. 4   :  0.0
Pressure Pt Correction:  100.0%
//
Raw Data Filename:  C:\Program Files\Sippican\WinMK21\DATA\C3_00034.RDF
//
Display Units    :  Metric
//
// This XCTD export file has not been noise reduced or averaged.
//
Depth (m) - Temperature (<B0>C) - Conductivity (mS/cm) - Salinity (ppt) - Sound Velocity (m/s) - Density (kg/m<B3
0.0     3.60    17.02   17.41   1442.29 1013.84
0.1     3.61    27.24   29.09   1457.35 1023.12
0.3     3.61    29.01   31.19   1460.06 1024.79
0.4     3.61    29.50   31.76   1460.80 1025.25
0.5     3.61    29.99   32.35   1461.57 1025.72
0.7     3.61    30.17   31.19   1460.07 1024.80
0.8     3.60    30.28   31.76   1460.77 1025.25
1.0     3.58    30.31   32.36   1461.45 1025.73
1.1     3.58    30.34   32.59   1461.75 1025.92
1.2     3.59    30.37   32.73   1461.97 1026.02
```

Turo Devil XBT files

Description: The file names use the sequence number of the XBT or Expendable Sound Velocimeter (XSV) in the series used for the cruise.

Directory: Raw/xbt

Table 4.10. Devil XBT File Types

Item	File Name	Extension	Content
1	drop001	asc	ASCII data file
2	drop001	csv	CSV data file
3	drop001	jjv	?
4	drop001	nc	NetCDF file
5	drop001	xbt	ASCII header file

Expendable CTD (XCTD)

Description: The file names use the sequence number of the XCTD in the series used for the cruise.

Directory: Raw/xctd

Table 4.11. XBT File Types

Item	File Name	Extension	Content
1	drop001	asc	ASCII data file
2	drop001	csv	CSV data file
3	drop001	jjv	?
4	drop001	nc	NetCDF file
5	drop001	xbt	ASCII header file

Chapter 5. Lamont Data System (LDS) Primary Data

Many of the data types logged by LDS are also logged by SCS. There are two primary differences:

1. LDS uses a different format of time stamp
2. LDS does not separate different records from the same device into different data files the way SCS does.

The format descriptions of many of the LDS files will be added in a later version.

Navigational Data

Thales (Ashtech) ADU5 GPS

The ADU5 is an upgraded version of the original ADU2 3D GPS orignally introduced by Ashtech. The ADU 2 was replaced with the ADU 5 in ~2005. Ashtech was bought by Thales.

Description: This entry describes the format of data from the Thales ADU5 GPS receiver's NMEA-GGA position data as logged by LDS.

Directory: LDS_Data/adu5

File Name: HLY1001-adu5.y2010d190

Data Examples: A typical sequence from the a data file:

```
adu5                                              2010:190:17:50:01.1917
$GPGLL,7144.88657,N,15600.29039,W,175001.00,A,A*78              adu5
2010:190:17:50:01.2447
$GPGGA,175001.00,7144.88657,N,15600.29039,W,1,11,0.7,22.03,M,-0.89,M,,*55
adu5                                              2010:190:17:50:01.2977
$GPVTG,106.86,T,086.14,M,000.29,N,000.54,K,A*2B                 adu5
2010:190:17:50:01.4038
$GPPAT,175001.00,7144.88657,N,15600.29039,W,00021.14,135.9840,000.12,000.63,0.0
adu5 2010:190:17:50:01.4177 $GPHDT,135.984,T*37
```

Ashtech (ADU5) $GPGLL Message format

```
adu5                                              2010:190:17:50:01.1917
$GPGLL,7144.88657,N,15600.29039,W,175001.00,A,A*78
```

Table 5.1. ADU5 GLL Message

Field	Data Type	Example	Units
1	Tag	adu5	Data type/source ID in LDS
2	LDS logged date & Time	2010:190:17:50:01.1917	YYYY:DDD:HH:MM:SS.ssss
3	NMEA Header	$GPGLL	NMEA-0183
4	Latitude	7144.88657	DDMM.mmmmm
5	Latitude hemisphere	N	[N|S] N=North
6	Longitude	15600.29039	DDMM.mmmmm
7	Longitude hemisphere	W	[E|W]

Field	Data Type	Example	Units
8	Fix Time	175001.00	HHMMSS.ss
9	Fix Status	A	Status of the position fix (always A): A = valid V = invalid
10	Positioning system mode indicator:	A	A: Autonomous mode D: Differential mode E: Estimated (DR) mode M: Manual input mode S: Simulator mode N: Data not valid
11	Separator	"*"	NMEA-0183
12	Checksum	55	NMEA-0183

Ashtech (ADU5) $GPVTG NMEA Message format

```
adu5                                          2010:190:17:50:01.2977
$GPVTG,106.86,T,086.14,M,000.29,N,000.54,K,A*2B
```

The VTG message contains the actual track (COG) and speed (SOG) over the ground.

Table 5.2. ADU5 $VTG Message

Field	Data Type	Example	Units
1	Tag	adu5	Data type/source ID in LDS
2	LDS logged date & Time	2010:190:17:50:01.2447	YYYY:DDD:HH:MM:SS.ssss
3	NMEA Header	$GPVTG	NMEA-0183
4	Course	106.86	Decimal degrees
5	Course Refernece	T	Always T=True North
6	Course over the ground	086.14	Decimal degrees
7	Course reference	M	Always M=Magnetic North
8	Speed over the ground	000.29	Speed
9	Speed Units	N	Speed units = Knots
10	Speed	000.54	Speed
11	Speed units	K	k=Kilometers/hour
12	Positioning system mode indicator	A	A—Autonomous mode D—Differential mode E—Estimated (DR) mode M—Manual input mode S—Simulator mode N—Data not valid
13	Separator	"*"	NMEA-0183
14	Checksum	55	NMEA-0183

Ashtech (ADU5) $GPGGA NMEA Message format

```
adu5                                          2010:190:17:50:01.2447
$GPGGA,175001.00,7144.88657,N,15600.29039,W,1,11,0.7,22.03,M,-0.89,M,,*55
```

Table 5.3. ADU5 $GPGGA Message

Field	Data Type	Example	Units
1	Tag	adu5	Data type/source ID in LDS
2	LDS Time Stamp	2010:190:17:50:01.2447	YYYY:DDD:HH:MM:SS.ssss
3	NMEA Header	$GPGGA	NMEA-0183
4	Position Time (UTC)	175001.00	hhmmss.ss
5	Latitude	7144.88657	DDMM.mmmmm
6	Latitude hemisphere	N	[N|S] N=North
7	Longitude	15600.29039	DDMM.mmmmm
8	Longitude hemisphere	W	[E|W]
9	GPS Quality	1	1=GPS, 2=DGP
10	Number of satellites used	11	Integer
11	HDOP	0.7	Horizontal Dilution of Precision
12	Height	22.03	see Height units
13	Height units	M	M=Meters
14	Geoidal Height	-0.89	see Geoidal height units
15	Geoidal height units	M	M=meters
17	Separator	"*"	NMEA-0183
18	Checksum	55	NMEA-0183

Ashtech (ADU5) $GPHDT NMEA Message format

```
adu5                                                2010:190:17:50:01.4038
$GPPAT,175001.00,7144.88657,N,15600.29039,W,00021.14,135.9840,000.12,000.63,0.0
```

Table 5.4. ADU5 HTD Record (SCS)

Field	Data Type	Example	Units
1	LDS ID	adu5	MM/DD/YYYY (from SCS)
2	LDS Time Tag	2010:190:17:50:01.4177	YYYY:DDD:HH:MM:SS.ssss
3	NMEA Header	$GPHDT	NMEA-0183
4	Heading	135.984	Degrees
5	Heading Reference	T	T== True North
6	Separator	"*"	NMEA-0183
7	Checksum	07	NMEA-0183

Ashtech (ADU5) $GPPAT NMEA Message format

This section describes the $GPPAT, the Ashtech proprietary position and altitude message .

```
adu5                                                2010:190:17:50:01.4038
$GPPAT,175001.00,7144.88657,N,15600.29039,W,00021.14,135.9840,000.12,000.63,0.0
```

Table 5.5. ADU5 GPPAT Record Format (LDS)

Field	Data Type	Example	Units
1	LDS ID	adu5	MM/DD/YYYY (from SCS)

Field	Data Type	Example	Units
2	LDS Time Tag	2010:190:17:50:01.4038	YYYY:DDD:HH:MM:SS.ssss
3	NMEA Header	$GPPAT	NMEA-0183
4	Time	175001.00	HHMMSS.ss
5	Latitude	7144.88657	DDMM.mmmmm
	Latitude Hemisphere	N	N: North S: South
	Longitude	15600.29039	DDD.MM.mmmmm (Degrees, Minutes)
	Longitude Hemisphere	W	W: West E: East
	Altitude	00021.14	+/-mmmm.mm (Meters)
	Heading	135.9840	Degrees relative True North
	Pitch	000.12	+/-ddd.dd (Degrees)
	Roll	000.63	+/-ddd.dd (Degrees)
	Attitude phase measurement RMS error, MRMS	0.0016	m.mmmm, (Meters)
	Attitude baseline length rms error, BRMS	0.0161	m.mmmm(Meters)
	Attitude reset flag	0	0:good attitude 1:rough estimate or bad attitude
6	Separator	"*"	NMEA-0183
7	Checksum	65	NMEA-0183: Hexadecimal checksum computed by exclusive ORing all bytes between, but not including, $ and *

Trimble AG132 Differential Global Positioning System (GPS)

The Trimble AG132 is single frequency (L1) GPS receiver with two DGPS receivers. DGPS corrections can be received from the 100 kHz USCG reference stations or from corrections broadcast by satellite. USCG corrections are general not available in Healy's areas of science operation. Satellite DGPS corrections require a subscription which has to be arranged well in advance of use.

Description: This entry describes the format of data from the Trimbel AG132 DGPS receiver's data as logged by LDS.

Directory: LDS_Data/aggps

File Name: HLY1001-aggps.y2010d191

Data Examples: A typical sequence from the a data file:

```
aggps                                          2010:191:12:40:55.2310
$GPGGA,124055.00,7203.058972,N,15607.704972,W,1,10,0.7,23.34,M,0.04,M,,*70
aggps                                          2010:191:12:40:55.2810
$GPGLL,7203.058972,N,15607.704972,W,124055.00,A,A*71          aggps
2010:191:12:40:55.3310      $GPVTG,291.4,T,,,000.51,N,000.94,K,A*47
aggps                                          2010:191:12:40:55.4060
```

```
$GPGSV,3,1,10,32,27,222,46,28,25,289,45,11,48,257,50,17,18,323,45*74
aggps                                          2010:191:12:40:55.4811
$GPGSV,3,2,10,19,24,191,46,27,25,012,47,09,28,024,49,24,16,124,40*74
aggps                                          2010:191:12:40:55.5310
$GPGSV,3,3,10,14,44,125,49,22,33,085,50,,,,,,,,*7E             aggps
2010:191:12:40:55.6071
$GPGSA,A,3,32,28,11,17,19,27,09,24,14,22,,,2.4,0.7,2.3*38      aggps
2010:191:12:40:55.6320  $GPZDA,124055.13,10,07,2010,00,00*66  aggps
2010:191:12:40:55.7071
$GPRMC,124055,V,7203.058972,N,15607.704972,W,000.51,291.4,100710,27.8,E,N*1B
aggps 2010:191:12:40:55.7381 $PTNLDG,,291.5,,1,2,,,,,*27
```

Trimble AG132 $GPGGA NMEA Message format

```
aggps                                          2010:191:12:40:55.2310
$GPGGA,124055.00,7203.058972,N,15607.704972,W,1,10,0.7,23.34,M,0.04,M,,*70
```

Table 5.6. AG132 $GPGGA Message

Field	Data Type	Example	Units
1	Tag	aggps	Data type/source ID in LDS
2	LDS Time Stamp	2010:191:12:40:55.2310	YYYY:DDD:HH:MM:SS.ssss DDD is Day of the Year. January 1 is 001
3	NMEA Header	$GPGGA	NMEA-0183
4	Position Time (UTC)	124055.00	hhmmss.ss
5	Latitude	7203.058972	DDMM.mmmmmm
6	Latitude hemisphere	N	[N|S] N=North
7	Longitude	15607.704972	DDMM.mmmmmm
8	Longitude hemisphere	W	[E|W]
9	GPS Quality	1	0: fix not valid 1: GPS fix 2: DGPS fix
10	Number of satellites used	10	Integer
11	HDOP	0.7	Horizontal Dilution of Precision
12	Height	23.34	Antenna Height re: Mean Sea Level
13	Height units	M	M=Meters
14	Geoidal Height	0.04	+/-mm.mmGeoidal separation
15	Geoidal height units	M	M=meters
	Age of DGPS data		Seconds or empty when no DGPS
	Base Station ID		ID or blank when on DGPS
17	Separator	"*"	NMEA-0183
18	Checksum	70	NMEA-0183 Checksum

Trimble AG132 $GPGGA NMEA Message format

```
aggps                                          2010:191:12:40:55.2310
$GPGGA,124055.00,7203.058972,N,15607.704972,W,1,10,0.7,23.34,M,0.04,M,,*70
```

Table 5.7. AG132 $GPGGA Message

Field	Data Type	Example	Units
1	Tag	aggps	Data type/source ID in LDS
2	LDS Time Stamp	2010:191:12:40:55.2310	YYYY:DDD:HH:MM:SS.ssss DDD is Day of the Year. January 1 is 001
3	NMEA Header	$GPGGA	NMEA-0183
4	Position Time (UTC)	124055.00	hhmmss.ss
5	Latitude	7203.058972	DDMM.mmmmmm
6	Latitude hemisphere	N	[N|S] N=North
7	Longitude	15607.704972	DDMM.mmmmmm
8	Longitude hemisphere	W	[E|W]
9	GPS Quality	1	0: fix not valid 1: GPS fix 2: DGPS fix
10	Number of satellites used	10	Integer
11	HDOP	0.7	Horizontal Dilution of Precision
12	Height	23.34	Antenna Height re: Mean Sea Level
13	Height units	M	M=Meters
14	Geoidal Height	0.04	+/-mm.mmGeoidal separation
15	Geoidal height units	M	M=meters
	Age of DGPS data		Seconds or empty when no DGPS
	Base Station ID		ID or blank when on DGPS
17	Separator	"*"	NMEA-0183
18	Checksum	70	NMEA-0183 Checksum

Trimble AG132 $GPGLL Message format

```
aggps                                    2010:191:12:40:55.2810
$GPGLL,7203.058972,N,15607.704972,W,124055.00,A,A*71
```

Table 5.8. AG132 GLL Message

Field	Data Type	Example	Units
1	Tag	aggps	Data type/source ID in LDS
2	LDS logged date & Time	2010:191:12:40:55.2810	YYYY:DDD:HH:MM:SS.ssss
3	NMEA Header	$GPGLL	NMEA-0183
4	Latitude	7203.058972	DDMM.mmmmm
5	Latitude hemisphere	N	[N|S] N=North
6	Longitude	15607.704972	DDMM.mmmmm
7	Longitude hemisphere	W	[E|W]
8	UTC Fix Time	124055.00	HHMMSS.ss

Field	Data Type	Example	Units
9	Fix Status	A	A = valid V = invalid Always A
10	Positioning system mode indicator	A	A: Autonomous mode D: Differential mode N: Data not valid
11	Separator	"*"	NMEA-0183
12	Checksum	55	NMEA-0183

Trimble AG132 $GPGSV NMEA Message format

```
aggps                                              2010:191:12:40:55.4060
$GPGSV,3,1,10,32,27,222,46,28,25,289,45,11,48,257,50,17,18,323,45*74
aggps                                              2010:191:12:40:55.4811
$GPGSV,3,2,10,19,24,191,46,27,25,012,47,09,28,024,49,24,16,124,40*74
aggps                                              2010:191:12:40:55.5310
$GPGSV,3,3,10,14,44,125,49,22,33,085,50,,,,,,,*7E
```

The GSV message identifies the number of Space Vehicles (SVs) in view, the PRN (Satellite) numbers, elevation, azimuth and Signal to Noise Ratio (SNR) values. Multiple $GPGSV messages may be transmitted in a single data cycle in order to accommodate data from all of the satellites currently being tracked by the receiver.

Table 5.9. AG132 $GPGSVMessage

Field	Data Type	Example	Units
1	Tag	aggps	Data type/source ID in LDS
2	LDS logged date & Time	2010:191:12:40:55.4060	YYYY:DDD:HH:MM:SS.ssss
3	NMEA Message Type	$GPGSV	NMEA-0183
4	Total number of GSV messages in this "cycle"	3	Integer
5	Message number (in this cycle)	1	Integer
6	Total number of SVs visible	10	Integer
7	SV PRN	32	Integer indicating which satellite
8	SV Elevation	27	Degrees above horizontal (0<n<90.5)
9	SV Azimuth	222	Degrees from True North
10	SV SNR	46	00-99 dB (null when no satellite)
	Fields 7,8,9, & 10 (PRN, Elevation, Azimuth and SNR) repeat up to three more times in each message		
	Multiple GSV messages are sent in one "cycle" to accommodate the number of satellites being tracked.		
	Separator	"*"	NMEA-0183
	Checksum	47	NMEA-0183

Trimble AG132 $GPZDA Message Format

The ZDA message identifies UTC time, day, month, and year, local zone number and local zone minutes.

```
aggps 2010:191:12:40:55.6320 $GPZDA,124055.13,10,07,2010,00,00*66
```

Table 5.10. Trimble AG132 ZDA (LDS)

Field	Data Type	Example	Units
1	LDS Tag	aggps	
2	LDS Time Stamp	2010:191:12:40:55.6320	YYYY:DDD:HH:MM:SS.ssss
3	NMEA Header	$GPZDA	NMEA-0183
4	Time (UTC)	133000.00	HHMMSS.ssss
5	Day	10	DD
6	Month	07	MM
7	Year	2010	YYYY
8	Local zone hours	00	HH
9	Local zone minutes	00	MM
11	Separator	"*"	NMEA-0183
12	Checksum	66	NMEA-0183

Trimble AG132 $GPRMC NMEA Message format

```
aggps                                                    2010:191:12:40:55.7071
$GPRMC,124055,V,7203.058972,N,15607.704972,W,000.51,291.4,100710,27.8,E,N*1B
```

The RMC message identifies the UTC time, status, latitude, longitude, speed over ground (SOG), date, and magnetic variation of the position fix. It is the "Recommended Minimum Content" NMEA message for GPS receivers.

Table 5.11. AG132 $GPRMC Message

Field	Data Type	Example	Units
1	Tag	aggps	Data type/source ID in LDS
2	LDS Time Stamp	2010:191:12:40:55.7071	YYYY:DDD:HH:MM:SS.ssss DDD is Day of the Year. January 1 is 001
3	NMEA Header	$GPRMC	NMEA-0183
4	Position Time (UTC)	124055	hhmmss
5	Status	V	A: Valid V: Navigation Receiver Warning (V is output whenever the receiver suspects something is wrong)
6	Latitude	7203.058972	DDMM.mmmmmm
7	Latitude hemisphere	N	[N|S] N=North
8	Longitude	15607.704972	DDMM.mmmmmm
9	Longitude hemisphere	W	[E|W]
10	Speed Over Ground	000.51	Knots kkk.kk
11	Course Over Ground	291.4	Degrees relative to True North
12	Date	100710	DDMMYY

Field	Data Type	Example	Units
13	Magnetic Variation	27.8	Degrees
14	Direction of Magnetic Variation	E	E: Easterly variation from True course (subtracts from True course) W: Westerly variation from True course (adds to True course)
15	Status (Mode)	N	A: Autonomous D: Differential N: Data not valid
16	Separator	"*"	NMEA-0183
17	Checksum	70	NMEA-0183 Checksum

Trimble AG132 $PTNLDG Message Format

The PTNLDG message is a Trimble proprietary message for identifying the DGPS receiver channel strength, channel SNR, channel frequency, channel bit rate, channel number, channel tracking status, RTCM source, and channel performance indicator for either beacon DGPS or satellite DGPS.

```
aggps 2010:191:12:40:55.7381 $PTNLDG,,291.5,,1,2,,,,,*27
```

Table 5.12. Trimble AG132 PTNLDG (LDS)

Field	Data Type	Example	Units
1	LDS Tag	aggps	
2	LDS Time Stamp	2010:191:12:40:55.7381	YYYY:DDD:HH:MM:SS.ssss
3	NMEA Header	$PTNLDG	Trimble proprietary NMEA-0183
4	Channel signal strength		1 dBuV/m. For beacon, this is the electromagnetic field intensity level. For satellite, this is the ADC input voltage level.
5	Channel signal to noise (SNR)		dB
6	Channel frequency		kHz
7	Channel bit rate		Bits per Second (bps)
8	Channel Number		Integer: 00-99
9	Channel tracking status		0: Channel idle 1: Wideband FFT search 2: Searching for signal 3: Channel has acquired signal 4: Channel has locked on signal 5: Channel disabled
10	Separator	"*"	NMEA-0183
11	Checksum	66	NMEA-0183

Applanix POS/MV-320 Global Positioning System (GPS)

Applanix POS/MV-320 GPS aided inertial navigation system.

With the installation of the EM122 multibeam the output of the POS/MV Attitude is in a binary format at a very high (100 Hz) update rate so it is not logged. Attitude data is logged in the EM122 multibeam data records

Description: This entry describes the format of data from the POSMV data as logged by LDS.

Directory: LDS_Data/posnav

File Name: HLY1001-posnav.y2010d192

Data Examples: A typical sequence from the a data file:

```
posnav  2010:192:03:02:14.2871  $INZDA,030214.0042,11,07,2010,,*70
posnav                                          2010:192:03:02:15.0571
$PASHR,030214.964,345.27,T,1.15,0.04,0.04,0.018,0.018,0.011,2,1*1E
posnav  2010:192:03:02:15.0701  $PRDID,0.04,1.15,345.27*7F  posnav
2010:192:03:02:15.1261
$INGST,030214.964,,1.9,1.2,3.8,2.0,2.2,4.5*55               posnav
2010:192:03:02:15.1941
$INGGA,030214.964,7211.52499,N,15628.25084,W,1,11,0.7,4.28,M,,,,*3E
posnav     2010:192:03:02:15.2181     $INHDT,345.3,T*24     posnav
2010:192:03:02:15.2631 $INVTG,345.4,T,,M,7.4,N,13.7,K*40
```

Applanix POS/MV $GPZDA

The ZDA message identifies UTC time, day, month, and year, local zone number and local zone minutes.

```
posnav 2010:192:03:02:14.2871 $INZDA,030214.0042,11,07,2010,,*70
```

Table 5.13. Applanix POS/MV-320 ZDA (LDS)

Field	Data Type	Example	Units
1	LDS Tag	posnav	
2	LDS Time Stamp	2010:192:03:02:14.2871	YYYY:DDD:HH:MM:SS.ssss
3	NMEA Header	$INZDA	NMEA-0183
4	Time (UTC)	030214.0042	HHMMSS.ssss
5	Day	11	DD
6	Month	07	MM
7	Year	2010	YYYY
8	Null		blank
9	Null	00	blank
11	Separator	"*"	NMEA-0183
12	Checksum	70	NMEA-0183

Applanix POS/MV $PASHR

Description: This entry describes the format of data from the POS/MV-320 pitch and roll records in NMEA PASHR-format as logged by LDS.

Directory: LDS_Data/posnav

File Name: HLY1001-posnav.y2010d192

Data Examples

```
posnav                                          2010:192:03:02:15.0571
$PASHR,030214.964,345.27,T,1.15,0.04,0.04,0.018,0.018,0.011,2,1*1E
```

Table 5.14. POS/MV PASHR (LDS)

Field	Data Type	Example	Units
1	LDS Tag	posnav	ASCII text
2	LDS Timestamp	2010:192:03:02:15.0571	YYYY:DDD:HH:MM:SS.ssss
3	NMEA Header	$PASHR	NMEA-0183
4	UTC Time	030214.964	HHMMSS.sss
6	Heading	345.27	DDD.dd degrees
6	Heading reference	T	True north
7	Roll	1.15	+/-dd.dd degrees
8	Pitch	0.04	+/-00.00 degrees
9	Heave	0.018	+/-00.00 meters
10	Roll Accuracy	0.018	0.000 degrees
11	Pitch Accuracy	0.018	0.000 degrees
12	Heading Accuracy	0.011	0.000 degrees
13	Flag - accuracy heading	[0 | 1 | 2]	0 = no aiding 1 = GPS aiding 2 = GPS & GAMS aiding
14	Flag - IMU	[0|1]	0 = IMU out 1 = IMU satisfactory
15	Separator	"*"	NMEA-0183
16	Checksum	2E	NMEA-0183

Applanix POS/MV $PRIDD

Description: This entry describes the format of data from the POS/MV-320 attitude data PRIDD-format as logged by LDS.

Directory: LDS_Data/posnav

File Name: HLY1001-posnav.y2010d192

Data Examples

```
posnav 2010:192:03:02:15.0701 $PRDID,0.04,1.15,345.27*7F
```

Table 5.15. POS/MV PRIDD (LDS)

Field	Data Type	Example	Units
1	LDS Tag	posnav	ASCII text
2	LDS Timestamp	2010:192:03:02:15.0701	YYYY:DDD:HH:MM:SS.ssss
3	NMEA Header	$PRDID	NMEA-0183
4	Pitch	0.04	+/-dd.dd Degrees
6	Roll	1.15	+/-ddd.dd Degrees
6	Heading	345.27	ddd.dd Degrees True north

Field	Data Type	Example	Units
7	Separator	"*"	NMEA-0183
7	Checksum	2E	NMEA-0183

Applanix POS/MV $INGST

Description: This entry describes the format of data from the POS/MV-320 pseudorange noise statistics as logged by LDS.

Directory: LDS_Data/posnav

File Name: HLY1001-posnav.y2010d192

Data Examples

```
posnav                                          2010:192:03:02:15.1261
$INGST,030214.964,,1.9,1.2,3.8,2.0,2.2,4.5*55
```

Table 5.16. POS/MV INGST (LDS)

Field	Data Type	Example	Units
1	LDS Tag	posnav	ASCII text
2	LDS Timestamp	2010:192:03:02:15.1261	YYYY:DDD:HH:MM:SS.ssss
3	NMEA Header	$INGST	NMEA-0183
4	UTC Time	030214.964	HHMMSS.sss
6	Null		empty
6	Standard deviation of semi-major axis of error ellipse	1.9	Meters
7	Standard deviation of semi-minor axis of error ellipse	1.2	Meters
8	Orientation of semi major axis of error ellipse	3.8	Degrees from True North
9	Standard deviation of latitude	2.0	Meters
10	Standard deviation of longitude	2.2	Meters
11	Standard deviation of altitude	4.5	Meters
12	Separator	"*"	NMEA-0183
13	Checksum	55	NMEA-0183

Applanix POS/MV $GPGGA

posnav 2010:192:03:02:15.1941 $INGGA,030214.964,7211.52499,N,15628.25084,W,1,11,0.7,4.28,M,,,,*3E

Table 5.17. POS/MV $INGGA Message

Field	Data Type	Example	Units
1	Tag	posnav	Data type/source ID in LDS

Field	Data Type	Example	Units
2	LDS Time Stamp	2010:192:03:02:15.1941	YYYY:DDD:HH:MM:SS.ssss (DDD is Day of the Year, January 1 is 001)
3	NMEA Header	$INGGA	NMEA-0183
4	Position Time (UTC)	030214.964	hhmmss.ss
5	Latitude	7211.52499	DDMM.mmmmmm
6	Latitude hemisphere	N	[N|S] N=North
7	Longitude	15628.25084	DDMM.mmmmmm
8	Longitude hemisphere	W	[E|W]
9	GPS Quality	1	0 = fix not available or invalid 1 = C/A standard GPS; fix valid 2 = DGPS mode; fix valid 3 = GPS PPS mode; fix valid 4 = RTK fixed 5 = RTK float 6 = free inertial
10	Number of satellites used	11	Integer
11	HDOP	0.7	Horizontal Dilution of Precision
12	Altitude	4.28	Height of the Healy's Master Reference Mark (in IC/Gyro) above/below re: Mean Sea Level in Meters
13	Height units	M	M=Meters
14	Null		
15	Null		
16	Age of DGPS data		Seconds since last RTCM-104 correction message or Nul
17	Base Station ID		ID (0<= x ,= 1023) or blank when no DGPS
18	Separator	"*"	NMEA-0183
19	Checksum	70	NMEA-0183 Checksum

Applanix POS/MV $GPHDT

```
posnav 2010:192:03:02:15.2181 $INHDT,345.3,T*24
```

Table 5.18. POS/MV HTD Record (LDS)

Field	Data Type	Example	Units
1	LDS ID	posnav	MM/DD/YYYY (from SCS)
2	LDS Time Tag	2010:192:03:02:15.2181	YYYY:DDD:HH:MM:SS.ssss
3	NMEA Header	INPHDT	NMEA-0183
4	Heading	345.3	Degrees
5	Heading Reference	T	T== True North
6	Separator	"*"	NMEA-0183

Field	Data Type	Example	Units
7	Checksum	24	NMEA-0183

Applanix POS/MV $GPVTG

```
posnav 2010:192:03:02:15.2631 $INVTG,345.4,T,,M,7.4,N,13.7,K*40
```

The VTG message contains the actual track (COG) and speed (SOG) over the ground.

Table 5.19. POS/MV $VTG Message

Field	Data Type	Example	Units
1	Tag	adu5	Data type/source ID in LDS
2	LDS logged date & Time	2010:190:17:50:01.2447	YYYY:DDD:HH:MM:SS.ssss
3	NMEA Header	$GPVTG	NMEA-0183
4	Course	106.86	Decimal degrees
5	Course Refernece	T	Always T=True North
6	Course over the ground	086.14	Decimal degrees
7	Course reference	M	Always M=Magnetic North
8	Speed over the ground	000.29	Speed
9	Speed Units	N	Speed units = Knots
10	Speed	000.54	Speed
11	Speed units	K	k=Kilometers/hour
12	Positioning system mode indicator	A	A—Autonomous mode D—Differential mode E—Estimated (DR) mode M—Manual input mode S—Simulator mode N—Data not valid
13	Separator	"*"	NMEA-0183
14	Checksum	55	NMEA-0183

Bridge IBS Navigation System Way Points

This section describes the file format of records logged by LDS from the Sperry integrated navigation system on the bridge of the Healy. This system is referred to as the IBS or sometimes as the Vessel Management System (VMS.) The IBS waypoint data consists of several different messages that arrive on a single asynchronous serial data connection.

Description: This entry describes the format of LDS centerbeam record derived from the EM122.

Directory: LDS_Data/ibs_waypoints

File Name: HLY1001-ibs_waypoints.y2010d192

Data Examples: A typical sequence from the a data file:

```
ibs_waypoints                                   2010:192:16:10:56.7268
$NVRTE,01,01,w,2010_HLY-10-01_11JUL.PLN,9,10,11,12,13,14,15,16,17,18*6D
ibs_waypoints  2010:192:16:10:57.5118  $NVXDR,D,3696.82,M,WPTDTG*75
ibs_waypoints   2010:192:16:10:57.5717   $NVXDR,G,36410.3,,WPTTTG*28
ibs_waypoints                                   2010:192:16:10:57.6428
```

```
$NVWPL,7157.73,N,15633.85,W,9*60                        ibs_waypoints
2010:192:16:10:58.5148  $NVXDR,D,3696.82,M,WPTDTG*75  ibs_waypoints
2010:192:16:10:58.5748 $NVXDR,G,36410.3,,WPTTTG*28
```

Sperry IBS $NVRTE (LDS)

```
ibs_waypoints                                    2010:192:16:10:56.7268
$NVRTE,01,01,w,2010_HLY-10-01_11JUL.PLN,9,10,11,12,13,14,15,16,17,18*6D
```

Table 5.20. Sperry IBS NVRTE Record (LDS)

Field	Data Type	Example	Units
1	LDS ID	ibs_waypoints	ASCII
2	LDS Time Tag	2010:192:16:10:56.7268	YYYY:DDD:HH:MM:SS.ssss
3	NMEA Header	$NVRTE	NMEA-0183
4		01	
5		01	
6		W	
7		2010_HLY-10-01_11JUL.PLN	
8		9	
9		10	
10		11	
11		12	
12		13	
13		14	
14		15	
15		16	
16		17	
17		18	
18	Separator	"*"	NMEA-0183
19	Checksum	6D	NMEA-0183

Sperry IBS $NVXDR (LDS)

Need some words for this one

```
ibs_waypoints 2010:192:16:10:57.5118 $NVXDR,D,3696.82,M,WPTDTG*75
```

Table 5.21. Sperry IBS NVXDR Record (LDS)

Field	Data Type	Example	Units
1	LDS ID	ibs_waypoints	ASCII
2	LDS Time Tag	2010:192:16:10:56.7268	YYYY:DDD:HH:MM:SS.ssss
3	NMEA Header	$NVXDR	NMEA-0183
4		D	[D|G] D: ????? G: ??????
5		3696.82	

Field	Data Type	Example	Units
6		M	
7		WPTDTG	
8	Separator	"*"	NMEA-0183
9	Checksum	75	NMEA-0183

Sperry IBS $NVWPL (LDS)

Need some words for this one

```
ibs_waypoints                                    2010:192:16:10:57.6428
$NVWPL,7157.73,N,15633.85,W,9*60
```

Table 5.22. Sperry IBS NVWPL

Field	Data Type	Example	Units
1	LDS ID	ibs_waypoints	ASCII
2	LDS Time Tag	2010:192:16:10:57.6428	YYYY:DDD:HH:MM:SS.ssss
3	NMEA Header	$NVWPL	NMEA-0183
4	Way Point Latitude	7157.73	DDMM.mm
5	Latitude Hemisphere	N	[N|S]
6	Latitude Longitude	15633.85	DDDMM.ss
7	Longitude Hemisphere	W	[W|E]
8	Waypoint Number	9	Integer
10	Separator	"*"	NMEA-0183
11	Checksum	60	NMEA-0183

Automatic Identification System (AIS) (LDS)

This section describes the data from a receive-only AIS receiver on Healy. The AIS data allows us to plot the location of nearby ships on our real-time GIS. This situational information is particularly useful when we are operating with other ships which is relatively common in the Arctic. More information about AIS is available from US Coast Guard site:

```
http://www.navcen.uscg.gov/marcomms/ais.htm
```

The full text for the AIS standard: “RECOMMENDATION ITU-R M.1371-1 - Technical characteristics for a universal shipborne automatic identification system using time division multiple access in the VHF maritime mobile band” is at:

```
http://www.itu.int/rec/recommendation.asp?type=items&lang=E&parent=R-REC- M.137
```

Description: This entry describes data from the Milltech Marine SMART RADIO SR161 Science AIS receiver as logged by LDS.

Directory: LDS_Data/ais

File Name: HLY1001-ais.y2010d189

Data Examples: A typical sequence from the a data file:

```
ais                        2010:189:23:57:25.1091                          !
AIVDM,1,1,,B,14Qle<000JDW0H8`Wt3jrDdh0<00,0*41                          ais
```

```
2010:189:23:57:30.3792                                                  !
AIVDM,2,1,0,B,54Qle<000000pE12221E<<L>0PD4iV222222220S2P:235L80KPDPm2@,0*37
ais  2010:189:23:57:30.3792  !AIVDM,2,2,0,B,p88888888888880,2*6F  ais
2010:189:23:57:45.1884                                                  !
AIVDM,1,1,,B,14Qle<000IDW0U8`Wt:C3TiH06sT,0*2E
```

The AIS messages are ASCII-encoded binary data with the content often spread across multiple messages. LDS uses Kurt Schwer's python application `http://vislab-ccom.unh.edu/~schwehr/ais/` to parse these messages in real-time.

Multibeam Data

Real-time position for the SeaBeam

Prior to 2010 LDS generated a reformatted position data from the POS/VMV-320 in real-time to satisfy the navigation input requirement for the SB2112

Starting in 2010 (after we replaced the SeaBeam 2112 multibeam with a Kongsberg EM122 multibeam) we no longer produce a special output from LDS for the multibeam. The POS/MV-320 provides navigation and attitude data directly to the EM122.

Raw Multibeam data

Raw data from the Kongsberg EM122 multibeam is logged in real-time by LDS over a network connection. Two types of files are logged: bathymetry and watercolumn data.
Verification of real-time logging of EM122 data is still in process. Until this data stream is validated, the raw data files as logged on the Kongsberg SIS Hyrdographic Worksatin (HWS) is included in the "raw" section of the data distribution.

Description: Raw data from the Kongsberg EM122 multibeam is logged by LDS in two types of files. Files ending in .mb58 contain traditional multibeam data in the manufacturer's "Raw.all" format which is defined in MB-System `http://www.ldeo.columbia.edu/MB-System` as type 58. These files have a file name extenion of *.mb58*. The EM122 also generates beam formed water column data which is logged in files with a ".wcd" extension.

Water column data is very voluminous and is not normally included in the end of cruise distribution provided to the departing chief scientist. It is archived ashore and can be provided by request.

Directory: LDS_Data/em122

File Names:

HLY1001-em122.20100711_1400.mb58
HLY1001-em122.20100711_1400.wcd

Multibeam Center Beam (LDS)

Central beam water depth extracted in real-time from the Kongsberg EM122 data.

Description: This entry describes the format of LDS centerbeam record derived from the EM122.

Directory: LDS_Data/emctr

File Name: HLY1001-emctr.y2010d192

Data Examples: A typical sequence from the a data file:

```
emctr                                                2010:192:14:31:00.5425
$EMCTR,2010,07,11,14:30:59.922,71.952202,-156.542031,69.88,432*56
emctr                                                2010:192:14:31:01.0698
$EMCTR,2010,07,11,14:31:00.441,71.952202,-156.542031,69.82,425*5F
emctr                                                2010:192:14:31:01.0863
$EMCTR,2010,07,11,14:31:00.465,71.952202,-156.542031,69.85,427*5C
```

Table 5.23. LDS Kongsberg EM multibeam center beam Message

Field	Data Type	Example	Units
1	Tag	emctr	Data type/source ID in LDS
2	LDS logged date & Time	2010:192:14:31:01.0698	YYYY:DDD:HH:MM:SS.ssss
3	NMEA Header	$EMCTR	NMEA-0183
4	Year	2010	UUUU
5	Month	07	MM
6	Day	11	DD
7	Time of the ping	14:30:59.922	HH:MM:SS.sss
8	Latitude	71.952202	Decimal Degrees (+/- DD.ddddd)
9	Longitude	-156.542031	Decimal Degrees (+/- DDD.ddddd)
10	Depth	69.82	Meters
11	Number of reported beams	432	Integer.
12	Separator	"*"	NMEA-0183
13	Checksum	55	NMEA-0183

Sound Speed at the keel

sound speed at the keel formatted in real-time for the EM122 real-time input by LDS.

Description: This entry describes the format of LDS centerbeam record derived from the EM122.

Directory: LDS_Data/emsv

File Name: HLY1001-emsv.y2010d192

Data Examples: A typical sequence from the a data file:

```
emsv          2010:192:14:51:15.7117          $KSSIS,80,1435.79,-1.37,
emsv     2010:192:14:51:17.6958     $KSSIS,80,1435.79,-1.37,     emsv
2010:192:14:51:19.7098 $KSSIS,80,1435.78,-1.37,
```

Table 5.24. LDS sound speed at the keel for the Kongsberg EM122 multibeam

Field	Data Type	Example	Units
1	Tag	emsv	Data type/source ID in LDS
2	LDS logged date & Time	2010:192:14:31:01.0698	YYYY:DDD:HH:MM:SS.ssss
3	NMEA Header	$KSSIS	NMEA-0183
4	EM datagram type	80	hexadecimal
5	Speed of sound	1435.79	meters/second
6	Water Temperature	-1.37	degrees Celsius

BGM-3 Gravity Meter data

At present there are two Bell BGM-3 marine gravity meters on the Healy. They are identified by their serial numbers: 221 and 222. One of them is destined for the Alaska Region Research Vessel, *Sikuliaq*. The interface to the BGM-3 meters is a second (third?) generation of the original interface designed by Joe Stennett at Lamont in the 1980s.

Description: This entry describes the format of the gravity meter as logged by LDS.

Directory: LDS_Data/bgm222 or LDS_Data/bgm221

File Name: HLY1001-bgmSSS.y2010d192 (where SSS is the serial number of the meter.)

Data Examples: A few lines from a data file:

```
bgm222      2010:192:21:10:06.6352      04:025444      00      bgm222
2010:192:21:10:07.6262  04:025444  00  bgm222  2010:192:21:10:08.6319
04:025444 00
```

Table 5.25. BGM3 Gravity meter log file format

Field	Data Type	Example	Units
1	Tag	bgm222	Data type/source ID in LDS
2	LDS logged date & Time	2010:192:21:10:06.6352	YYYY:DDD:HH:MM:SS.ssss
3	Interface Counter periods	04	Seconds = 0.25 seconds the value. 4= 1 second count window
4	Separator	:	Always = ":"
5	Raw meter counts	025444	Integer
6	Eror Flags	00	00 = No errors 01: Failure 10: DNV

LDS Events

The *events* directory contains one file for each LDS logger that is launched. If a logger is restarted, there will be more than one event file for each start. Event files have he same naming convention as data files with the addition of a "-ev" in front of the device, for instance: *HLY1001-ev-bgm222.y2010d163* is the event file for the logger that is handling data from the BGM3 serial number 222.

Images

Aloft Con Images

There is an digital camera mounted in the overhead in Aloft Con looking forward over the bow to the horizon. Pictures are taken from this camera are in the directory named: *LDS_Data/AloftConnCam* within that directory there are subdirectories for each day. The subdirectories are named with the four digit year and three digit day of the year, for instance: *2010192*. Each photograph is named according to the time and date, for instance: *2010-192-235900.jpg*.

Fantail Images

There is an digital camera mounted in the overhead in Aft Con looking out over the fantail. Pictures are taken from this camera are in the directory named: *LDS_Data/FantailCam* within that directory

there are subdirectories for each day. The subdirectories are named with the four digit year and three digit day of the year, for instance: *2010192*. Each photograph is named according to the time and date, for instance: *2010-192-235900.jpg*.

SIO TSG and MET Data

All SIO TSG and MET Data

Description: All of the data from the SIO TSG and Meteorological Sensors are sent in one serial line from an SIO PC. All of these data have different NMEA strings and formats. This is a single file for all these data. All of these data are also in the SCS data sections above in the Meteorological section. The NMEA striigs shown here can be found in the SIO MET Data formats document and by looking in the file format descriptions above.

Directory: LDS_Data/tsg_met

File Name: HLY0801-tsg_met.y2008d082

Data Examples: A typical sequence from a data file:

```
tsg_met                    2008:082:00:00:00.3272
$PSSRA,501.80,4.190,349.54,0.257,261.02,1.951,261.51,1.922*4E
tsg_met   2008:082:00:00:00.3275   $PSSPA,1665.98,1.006*43   tsg_met
2008:082:00:00:00.3542  $PSMEA,-11.56,87.90,1022.45,0.03*51  tsg_met
2008:082:00:00:00.3543  $PSWDA,240.50,11.88,243.30,11.08*5C  tsg_met
2008:082:00:00:00.3872  $PSWDB,234.33,10.31,233.57,11.74*57  tsg_met
2008:082:00:00:00.4142       $PSSTA,-1.721,2708.200*52       tsg_met
2008:082:00:00:00.4143      $PSTSA,-1.274,27.0231,33.728,1441.48*5C
tsg_met      2008:082:00:00:00.4432      $PSTSB,,,,*46      tsg_met
2008:082:00:00:00.4432  $PSOXA,7.350,2.768,-1.274,-1.274*5F  tsg_met
2008:082:00:00:00.4433 $PSOXB,,,,*56 tsg_met 2008:082:00:00:00.4732
$PSFLA,0.300,0.030,0.000,0.013*4A   tsg_met   2008:082:00:00:00.5012
$PSFLB,1.150,0.115,0.430,0.043*4B   tsg_met   2008:082:00:00:00.5013
$PSNTA,0.000,0.000*58         tsg_met         2008:082:00:00:00.5311
$PSFMA,3.04,46.000*4C         tsg_met         2008:082:00:00:00.5313
$PSFMB,3.30,17.000*4C         tsg_met         2008:082:00:00:00.5371
$GPZDA,000000.00,22,03,2008,00,00*6F
```

SIO TSG data from BioChem Lab

Description: This data is directly from the TSG sensors in the BioChem Lab to the LDS logging program.

Directory: LDS_Data/tsg

File Name: HLY1002-tsg.y2010d232

Data Examples: A typical sequence from a data file:

```
tsg  2010:232:00:25:53.0612  -0.6029,  2.10927,  25.1380,  1433.110
tsg 2010:232:00:26:03.0614 -0.6036, 2.10912, 25.1367, 1433.105 tsg
2010:232:00:26:13.0615 -0.6040, 2.10898, 25.1352, 1433.101
```

Table 5.26. All SIO TSG and MET Data

Field	Data Type	Example	Units
1	Data Stream Name	tsg	ASCII text

Field	Data Type	Example	Units
2	LDS logged Time GMT	2010:232:00:25:53.0612	yyyy:ddd:hh:mm:ss.ssss
3	Temperature	-0.6029	Degrees Celcius
4	Conductivity	2.10927	S/m
5	Salinity	25.1380	PSU
6	Sound Velocity	1433.110	meters / second

Winches

Starboard Winch

Description: This entry describes the format of winch wire data from the Starboard Winch as logged by LDS

Directory: LDS_Data/winch_stb

File Name: HLY1001-winch_stb.y2010d192

Data Examples: A typical sequence from a data file:

```
winch_stbd  2010:192:21:10:30.3421  02,  33,  ,  -11,  ,  0.0,  ,0000
winch_stbd  2010:192:21:10:30.5861  02,  33,  ,  -11,  ,  0.0,  ,0000
winch_stbd 2010:192:21:10:30.8331 02, 28, , -11, , 0.0, ,0000
```

Table 5.27. Data from the Aft winch (LDS)

Field	Data Type	Example	Units
1	Tag	winch_stb	Data type/source ID in LDS
2	LDS logged date & Time	2010:192:21:00:23.6660	YYYY:DDD:HH:MM:SS.ssss
3	??	01	??
4	Wire tension	-40	pounds
5	??	??	??
6	Wire speed	-5	meters/minute
		0.0	
	Wire out	0000	Meters

Aft Winch

Description: This entry describes the format of winch wire data from the Aft Winch as logged by LDS

Directory: LDS_Data/winch_aft

File Name: HLY1001-winch_aft.y2010d192

Data Examples: A typical sequence from a data file:

```
winch_aft  2010:192:21:00:23.6660  01,  -40,  ,  -5,  ,  0.0,  ,0000
winch_aft 2010:192:21:00:23.9120 01, -40, , -5, , 0.0, ,0000 winch_aft
2010:192:21:00:24.1580 01, -40, , -5, , 0.0, ,0000
```

Table 5.28. Data from the Aft winch (LDS)

Field	Data Type	Example	Units
1	Tag	winch_aft	Data type/source ID in LDS
2	LDS logged date & Time	2010:192:21:00:23.6660	YYYY:DDD:HH:MM:SS.ssss
3	??	01	??
4	Wire tension	-40	pounds
5	??	??	??
6	Wire speed	-5	meters/minute
		0.0	
	Wire out	0000	Meters

C-Nav Globally Corrected Differential GNSS

C-Nav Globally Corrected Differential GNSS - Starboard

Description: This is the experimental C-Nav 3050 Globally Corrected Differential GNSS positioning system data as logged by LDS. The Starboard side is using the standard integrated L-band antenna. This is an experimental system.

Directory: LDS_Data/cnavs

File Name: HLY1002-cnavs.y2010d243

Data Examples: A typical sequence from a data file:

```
cnavs                                                2010:243:00:00:01.4389
$PNCTMDE,235946.00,84,0,-0.237,26.439,-1.115,-0.969,-3.805*46 cnavs
2010:243:00:00:01.5139
$GNGGA,235947.00,7722.309376,N,13651.379450,W,1,12,0.8,24.331,M,-7.2,M,,*4E
cnavs  2010:243:00:00:01.5639  $GNVTG,191.6,T,,M,0.30,N,0.56,K,A*1C
cnavs                                                2010:243:00:00:01.6389
$GNGBS,235947.00,0.7025,0.3203,1.8495,75,0.8045,10.6333,13.5112*76
cnavs                                                2010:243:00:00:01.6889
$PNCTMDE,235947.00,02,0,-0.046,20.350,9.908,-3.945,28.030*75  cnavs
2010:243:00:00:01.7639
$PNCTMDE,235947.00,04,0,0.033,13.298,-0.614,-5.309,-5.545*6E
```

C-Nav Globally Corrected Differential GNSS - Port

Description: This is the experimental C-Nav 3050 Globally Corrected Differential GNSS positioning system data as logged by LDS. The Port side uese a separate L-band correction antenna. This is an experimental system.

Directory: LDS_Data/cnavp

File Name: HLY1002-cnavp.y2010d243

Data Examples: A typical sequence from a data file:

```
cnavp                                              2010:243:00:00:00.9689
$PNCTMDE,235943.00,32,0,0.052,12.803,-2.952,-0.163,1.024*4E    cnavp
2010:243:00:00:01.0439
$PNCTMDE,235943.00,67,0,0.135,41.463,-0.080,0.472,2.531*6C     cnavp
2010:243:00:00:01.1609
$PNCTMDE,235943.00,68,0,-0.096,300.448,-1.116,-0.710,-1.356$GPGGA,235944.00,772
cnavp  2010:243:00:00:01.2190  $GPVTG,192.0,T,,M,0.31,N,0.57,K,A*07
cnavp                                              2010:243:00:00:01.2949
$GPGBS,235944.00,0.0190,-0.1006,0.2321,76,0.8937,-3.8900,9.7613*63
cnavp                                              2010:243:00:00:01.3449
$PNCTMDE,235944.00,02,0,0.015,15.909,7.248,-1.244,15.577*5C
```

Chapter 6. SCS Derived Data

Many (most -**tbd**) of the data files generated by SCS on the Healy contain "derived" data. That is data that is calculated from other data. For instance, if the raw temperature is logged in degrees Celsius, the a file containing temperatures in Fahrenheit would be a derived data set. In fact, it is not necessary to log and derived data sets but some folks find them useful.

Air temperature (Derived)

Description: This file contains air temperature in degrees Fahrenheit calculated from the measured temperature

Directory: SCS_Data/air_temp_f

File Name: AirTemp-F_20070413-000000.Raw

Data Examples: (3 lines from a data file):

```
04/13/2007,00:00:02.074,$DERIV,28.83,-1.76,
04/13/2007,00:00:05.074,$DERIV,28.62,-1.88,
04/13/2007,00:00:08.074,$DERIV,28.62,-1.88,
```

Note

These derived records are supposed to be formated as NMEA-0183 records but the checksum field is missing and there is a dangling comma.

Table 6.1. Derived air temperature

Field	Description	Example	Units
1	Date	03/14/2009	Month/Day/Year
2	Time (UTC)	00:00:02.074	Hour:Minute:Second.fraction
3	NMEA Header	$DERIV	ASCII text (like NMEA-0183)
4	Calculated Air Temperature	28.83	Degrees Fahrenheit
5	Measured Air Temperature	-1.76	Degrees Celsius
7	-	-	(missing)

The sensors for this measurement are installed on the starboard side of the Flying Bridge.

HCO Met3A Air Temperatures (Derived)

Description: This file contains derived data From the HCO Met3A weather station temperature sensor. Temperature is reported in degrees Fahrenheit and Celsius.

Directory: SCS_Data/air_temp3a_f

File Name: Met3a-Air-Temp-F_20090129-173743.Raw

Data Examples: (3 lines from a data file):

```
01/29/2009,17:37:47.068,$DERIV,41.41,5.23, 01/29/2009,17:37:50.683,
$DERIV,41.41,5.23, 01/29/2009,17:37:54.297,$DERIV,41.41,5.23,
```

Note

These derived records are supposed to be formated as NMEA-0183 records but the checksum field is missing and there is a dangling comma.

Table 6.2. HCO Met3A Air Temperatures (Derived)

Field	Description	Example	Units
1	Date	01/29/2009	Month/Day/Year
2	Time (UTC)	17:37:50.683	Hour:Minute:Second.fraction
3	NMEA Header	$DERIV	ASCII text (like NMEA-0183)
4	Calculated Air Temperature	41.41	Degrees Fahrenheit
5	Measured Air Temperature	5.23	Degrees Celsius
7	-	-	(missing)

The sensors for this measurement are installed on the starboard side of the overhead of HCO.

Note

These derived records are supposed to be formated as NMEA-0183 records but the checksum field is missing and there is a dangling comma.

True Wind, Ship's Port Yardarm (Derived)

Description: Calculated True wind speed data derived from the POS/MV-320 HDT (heading), SOG (speed over the ground) and COG (course over the ground) data messages and the *rmyportwind* data from the ship weather vane on the port side of Main mast yardarm.

Directory: SCS_Data/True_wind_port

File Name: PortWnd-T_20070415-000000.Raw

Data Examples: (3 lines from a data file):

```
04/15/2007,00:00:03.927,$DERIV,18.59,4.57,30.6,12,12.5,343.7,344.2,
04/15/2007,00:00:05.927,
$DERIV,19.69,10.28,31.4,16,12.5,344.2,344.2,
04/15/2007,00:00:07.927,$DERIV,19.85,3.73,31.8,12,12.4,344.1,344.2,
```

Table 6.3. True Wind, Ship Port Yardarm (Derived)

Field	Description	Example	Units
1	Date	04/15/2007	Month/Day/Year
2	Time (UTC)	00:00:03.927	Hour:Minute:Second.fraction
3	NMEA Header	$DERIV	ASCII text
4	Calculated Wind Speed	18.59	Knots
5	Calculated True Wind Direction	4.57	Angle, compass, relative to True North
6	Measured (relative) Wind Speed	30.6	Knots

Field	Description	Example	Units
7	Measured (relative) Wind Direction	12	Angle, compass, relative to the ship's bow
8	Ship speed over the ground (from POS/MV)	12.5	Knots
9	Ship course over the ground (from POS/MV)	343.7	Degrees of angle, compass, relative to True north
10	Ship heading (from POS/MV)	344.2	Degrees of angle, compass, relative to True north
11	missing	-	-
10	missing	-	-

Note

These derived records are supposed to be formated as NMEA-0183 records but the checksum field is missing and there is a dangling comma.

True Wind, Ship's Starboard Yardarm (Derived)

Description: Calculated True wind speed data derived from the POS/MV-320 HDT (heading), SOG (speed over the ground) and COG (course over the ground) data messages and the *rmystbdwind* data from the ship weather vane on the port side of Main mast yardarm.

Directory: SCS_Data/True_wind_stbd

File Name: StbdWnd-T_20070415-000000.Raw

Data Examples: (3 lines from a data file):

```
04/15/2007,00:00:03.396,$DERIV,17.33,3.47,29.4,11,12.5,343.7,344.2,
04/15/2007,00:00:05.396,
$DERIV,17.05,15.29,28.5,18,12.5,344.2,344.2,
04/15/2007,00:00:07.396,
$DERIV,19.99,13.31,31.4,18,12.4,344.1,344.2,
```

Table 6.4. True Wind, Ship Starboard Yardarm (Derived)

Field	Description	Example	Units
1	Date	04/15/2007	Month/Day/Year
2	Time (UTC)	00:00:03.927	Hour:Minute:Second.fraction
3	NMEA Header	$DERIV	ASCII text
4	Calculated Wind Speed	19.99	Knots
5	Calculated True Wind Direction	13.31	Angle, compass, relative to True North
6	Measured (relative) Wind Speed	30.6	Knots
7	Measured (relative) Wind Direction	18	Angle, compass, relative to the ship's bow
8	Ship speed over the ground (from POS/MV)	12.4	Knots

Field	Description	Example	Units
9	Ship course over the ground (from POS/MV)	344.1	Degrees of angle, compass, relative to True north
10	Ship heading (from POS/MV)	344.2	Degrees of angle, compass, relative to True north
11	missing	-	-
10	missing	-	-

Note

These derived records are supposed to be formated as NMEA-0183 records but the checksum field is missing and there is a dangling comma.

Shipboard Automated Meteorological and Oceanographic Systems (SAMOS) derived data

Healy routinely sends data in SAMOS format by email to ------- under a program coordinated by Shawn Smith of **whatever**. This section describes the data formats for the files created by SCS from which data is taken to construct these messages.

Example SAMOS format (scalar)

Description: Example file using the Oxygen data

Directory: SCS_Data/SAMOS

File Name: SAMOS-OX_20080325-000000.Raw

Data Examples: (3 lines from a data file):

```
03/25/2008,00:00:04.710,$DERIV,7.71,7.712,215.893,28,
03/25/2008,00:00:06.132,$DERIV,7.71,7.712,223.605,29,
03/25/2008,00:00:07.475,$DERIV,7.71,7.709,223.605,29,
```

Table 6.5. Example SAMOS data record (scalar)

Field	Description	Example	Units
1	Date	03/25/2008	Month/Day/Year (from SCS)
2	Time (UTC)	00:00:04.710	Hour:Minute:Second.fraction (from SCS)
3	NMEA Header	$DERIV	ASCII text
4	Mean value (calculated)	7.71	Need to define the period over which this is calculated
5	Last value used	7.712	meters per second (m/s)
6	Sum of values	124.12	Degrees, angle from True North
7	number of values	7.87	meters per second (m/s)

Field	Description	Example	Units
8	missing	-	-
9	missing	-	-

Example SAMOS format (data in degrees)

Description: Example file using the Jack Staff True Wind data

Directory: SCS_Data/SAMOS

File Name: SAMOS-TIB_20080326-000000.Raw

Data Examples: (3 lines from a data file):

Get THE RIGHT EXAMPLE DATA

Table 6.6. Example SAMOS data record (degrees)

Field	Description	Example	Units
1	Date	03/26/2008	Month/Day/Year (from SCS)
2	Time (UTC)	00:00:04.561	Hour:Minute:Second.fraction (from SCS)
3	NMEA Header	$DERIV	ASCII text
4	Arctangent of the sums	79.39	Need better description or reference
5	Last value used	93.174	Need better description or reference
6	Mean of the Sines()	57.4453621646971	Need better description or reference
7	Mean of the Sines()	10.7645427712987	Need better description or reference
8	Number of values	59	-

SAMOS Data Designator Keys

The SAMOS data file names are constructed by including a multi-letter key to indicate the data type. This section describes those keys.

Description: E The data filenames each have a 2 (or more) letter data type designator. Files names are composed shown in the following table.

Table 6.7. SAMOS File Name Components

Component	Example	Comment
Identifier	SAMOS-	Fixed for SAMOS records
XX[X]	Key	From the designators shown in the table below
YYYMMDD	Date	Year Month Day
.Raw	Extension	Fixed for SAMOS records

Directory: SCS_Data/SAMOS

File Name: SAMOS-OX_20080325-000000.Raw

Table 6.8. SAMOS Data Types

Parameter	Designator	Source Data File Identifier
Air Temperature	AT	
Air temperature)	AT1	$PSMEA(2
Atmospheric Pressure	BP	
Atmospheric. Pressure	BP1	$PSMEA(4)
Conductivity	TC	$PSTSA(3)
Course over ground	CR	
Depth to Surface	BT	
Dew point temperature	DP	
Earth relative wind direction	TIP	
Earth relative wind direction	TIB	$PSWDA(4)
Earth relative wind direction	TIS1	$PSWDB(4)
Earth Relative Wind Direction Stbd	TIS	
Earth relative wind speed	TKP	
Earth relative wind Speed	TWB	$PSWDA(5)
Earth relative wind speed	TWS	$PSWDB(5)
Earth Relative Wind Speed Stbd	TKS	
Flow through TSG	FI	$PSFMA(2)
Heading	GY	
Heave	VH	
Latitude	LA	
Longitude	LO	
Longitudinal Water Speed Fore - Aft	SL	
Long wave radiation	LW	$PSSRA(4)
Long wave radiation	LD	$PSSRA(6)
Long wave radiation	LB	$PSSRA(8)
Oxygen	OX	$PSOXA(2)
Oxygen	OT	$PSOXA(4)
Photo synthetically Active Radiation	PA	$PSSPA(2)
Pitch	VP	
POS-MV Heading	SH	
Precipitation	PR	$PSMEA(5)
Relative humidity	RH	
Relative humidity	RH1	$PSMEA(3)
Roll	VR	
Salinity	$PSTSA(4)	SA

Parameter	Designator	Source Data File Identifier
Sea Surface Temp	ST	$PSSTA(2)
Ship relative wind direction	WDP	
Ship relative wind direction	WDB	$PSWDA(2)
Ship Relative Wind Direction Stbd	WDS	
Ship relative wind speed	WKP	
Ship relative wind speed	WSB	$PSWDA(3)
Ship relative wind speed	WSS	$PSWDB(3)
Ship Relative Wind Speed Stbd	WKS	
Shortwave radiation	SW	$PSSRA(2)
Speed over ground	SP	
Transverse Water Speed Port to Stbd	SX	
TSG Fluorescence	FL1	$PSFLA(2)
TSG Fluorescence	FL	$PSFLB(2)
TSG internal water temperature	TT	$PSTSA(2)
Turbidity	TB	$PSFLB(4)

Appendix A. Revision History

Table A.1. Revision History of the Healy Data Formats Document

Date	Version	Author	Comment
-	1	Tom Bolmer	The original version was part of the mondo MS-Word file -Tom
July 2009	1.01	Tom Bolmer	HTML-only version for HLY0902 -Tom
August 1-6, 2009	2.01	Dale Chayes	Converted to XML and DocBook 5.0 for HLY0904 (Pickart - ONR/NSF) -Dale
Fri, 09 Jul 2010	5	Dale	Very early in the switch to Subversion during HLY1001 (Arrigo - NASA) -Dale
Sat, 10 Jul 2010	10	Dale	Significantly further down the road but not quite done. Finish up and then have others review it.
11 Jul 2010	12	Dale	First pass through with raw entry and construction
12 Jul 2010	14	Dale	Fixing layout issues: converting "literal" to "literallayout".
Mon, 30 Aug 2010	16	dale	Incorporate comments from Steve Robers. Still working on how to layout the examples.
Tues, 31 Aug 2010	18	Tom	Add TSG section to LDS. General editing. Add short CNAV in LDS section. Add MX512 section. Reorganized sections.
Wed, 1 Sept 2010	19	Tom	Add actual data to MX512 section. More organizing.
Fri, 3 Sept 2010	20	Tom	Fix paths. Revision history should be at the bottom - need to figure that out. Note that the XCTD section sems a bit mixed up - we need to check it.
Sat, 4 Sept 2010	21	Tom	Placed Revision history at the bottom.