Seaglider File Formats Manual
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Chapter 1
Conventions and Introduction

1.1 Conventions

Example files are given in **bold Courier font**. Direct annotations of files are given in smaller font. Parameters are in **UPPER CASE BOLD** font, and have a preceding **$**. File names that are used in Seaglider command, control, or operations are given in **lowercase bold font**. Documents and sections of documents are *italicized*.

123 is used throughout this document as a placeholder for Seaglider serial number, and 55 is used as a placeholder for dive number. Many file names include a three digit Seaglider serial number, followed by a four digit dive number, both with preceding zeros (e.g. **p1230055.log**). Numerals after the dot in a file name are represented by 0's and, when additional numerals are needed, 9's. Because they represent various meanings, numerals after the dot are always annotated the first time the file name appears, and in the file description heading.

1.2 Introduction

This manual is designed to help the Seaglider user identify and interpret files he or she will encounter on the basestation. It is to be used in conjunction with the *Seaglider User's Guide*, *Piloting Parameters Manual*, and *Extended PicoDOS Reference Manual*.

1.2.1 List of Files Found on the Basestation

(using SG132, dive 55, for example file names)

These files are described in the document below.

Files	Description
processed_files.cache **baselog_080221110101** **baselog.log** **sg_calib_constants.m** **cmdfile** **comm.log**	
p1230055.asc **p1230055.cap** **p1230055.dat** **p1230055.eng** **p1230055.log** **p1230055.pro** **p1230055.bpo** **p1230055.pvt**	***p*** indicates that these files have been processed by the basestation. They are the files that contain information from the glider, for use by the pilot, operator, and scientist.
p1230000.prm	This file is sent at the beginning of Sea Launch.. It contains a list of the parameters and their settings at the time of the Sea Launch start, and some information about the transmission of files from and to the glider during this time.
cmdedit.log **targedit.log** **sciedit.log**	These files are created by the basestation, and document each change made to the command file, targets file, and science file using cmdedit, targedit, and sciedit.
comm_merged.log	Merged comm log and history file information
history.log	Record of shell commands
cmdfile.0 **targets.0** **science.0** **p1230055.000.pdos**	Every time a **cmdfile**, **targets file**, or **science file** is taken up by the glider, it is saved on the basestation and renamed to include the dive number. **PDOS command files** are also saved, but already include the dive number, so they are saved with a serial number. If there are multiple calls on one surfacing, a **cmdfile** is sent each time, and a serial number is added after the dive number.

These files are intermediates found on the basestation. They are used to create the processed files documented in this manual. Characters in the file names indicate the following:
st : The file is from a self-test. If from a normal dive, this prefix will be *sg*
b: has had duplicate sections removed "Bogue Syndrome processing"
1a: has been stripped of the padding characters added for transmission from the Seaglider.
u: uncompressed
z: zipped
r: raw; a reconstruction of the raw ASCII text file on the glider
x: The following sequence number is in the hexidecimal system

st0055du.1a.x00
st0055du.r
st0055du.x00

d indicates that these intermediate files will be used to create a data file.

st0055lu.1a.x00
st0055lu.x00

l indicates that these intermediate files will be used to create a log file.

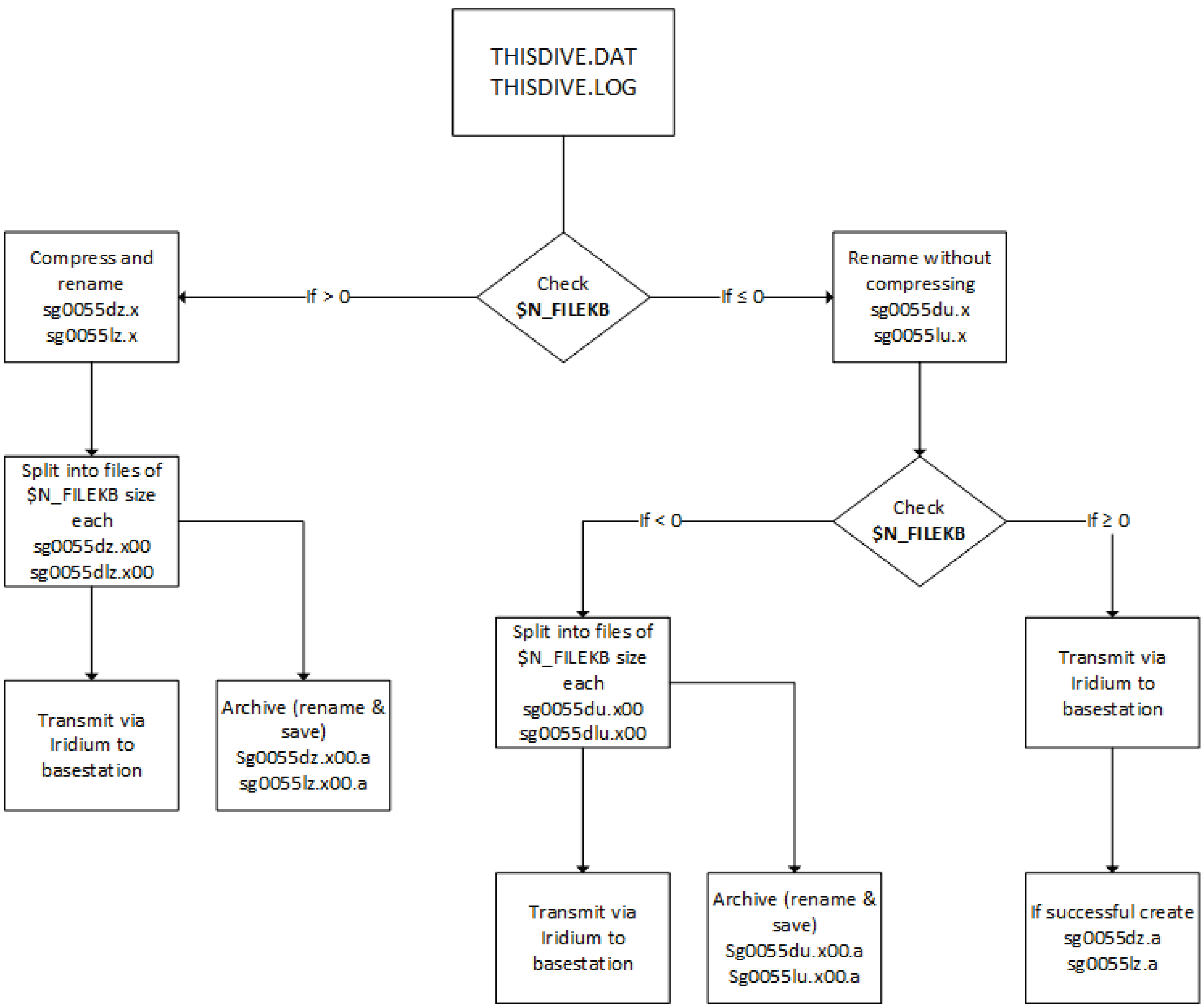
st0055kz.1a.x02
st0055kz.1a.x03
st0055kz.b.1a.x04
st0055kz.b.x04
st0055kz.r
st0055kz.x00
st0055kz.x01

k indicates that these intermediate files will be used to create a capture file.

st0055kz.x00.PARTIAL.1

Partial files appear when the basestation does not receive a complete file from the Seaglider, and is unable to process it. Transmission errors are addressed in the Communications Log section of this document, and in the Seaglider User's Guide.

1.2.2 Data Flow Map



Chapter 2
File Descriptions

This section describes the files relevant to the Seaglider user. Where appropriate, excerpts from real files, with explanatory annotation, are shown.

2.1 Processed Files

2.1.1 Log File
(p1230055.log)

One **log file** is made for each dive. The first portion of the data is a list of the Seaglider's parameters and their values for that dive. See the *Parameter Reference Manual* for more information. The second section, beginning with the entry **$GPS1**, contains information concerning the pre-dive period at the surface. The

$GC-labeled lines describe motor actions (pitch, roll, or VBD), one line per motor move. The information listed after the $GC lines are data collected at the end of the dive (surface maneuver data, final temperature reading, etc). Some of this data is from the previous surfacing (before the start of the current dive). Not all Seagliders will report all of the lines that appear in the example given here, because the devices installed vary among Seagliders.

Example Log File

version: 66.11 Seaglider operating code version
revision: 1138 Seaglider operating code revision number
glider: 566 Seaglider serial number
mission: 1 Mission number counter, settable by pilot or launch operator or automatically incremented by software
dive: 25 Dive number
start: 12 16 115 14 14 53 Date and time (UTC) of start of dive

- 53 — seconds (UTC, starting with 0)
- 14 — seconds (UTC, starting with 0)
- 14 — hour (UTC, starting with 0)
- 115 — year after 1900
- 16 — day
- 12 — month

data: Glider parameters
See the Parameter Reference Manual for information on parameters reported in the log file

```
$ID,566
$MISSION,1
$DIVE,25
$N_DIVES,30
$D_SURF,3
$D_FLARE,3
$D_TGT,150
$D_ABORT,210
$D_NO_BLEED,100
$D_BOOST,5
$T_BOOST,0
$D_FINISH,0
$D_PITCH,0
$D_SAFE,0
$D_CALL,0
$SURFACE_URGENCY,0
$SURFACE_URGENCY_TRY,0
$SURFACE_URGENCY_FORCE,0
$T_DIVE,50
$T_MISSION,65
$T_ABORT,120
$T_TURN,500
$T_TURN_SAMPINT,5
$T_NO_W,120
$T_LOITER,0
$T_EPIRB,0
```

```
$USE_BATHY,0
$USE_ICE,0
$ICE_FREEZE_MARGIN,0.30000001
$D_OFFGRID,100
$T_WATCHDOG,10
$RELAUNCH,0
$APOGEE_PITCH,-5
$MAX_BUOY,150
$COURSE_BIAS,0
$GLIDE_SLOPE,30
$SPEED_FACTOR,1
$RHO,1.0233001
$MASS,53476
$MASS_COMP,0
$NAV_MODE,2
$FERRY_MAX,45
$KALMAN_USE,2
$HD_A,0.0038360001
$HD_B,0.010078
$HD_C,9.8500004e-06
$HEADING,-1
$ESCAPE_HEADING,0
$ESCAPE_HEADING_DELTA,10
$FIX_MISSING_TIMEOUT,0
$TGT_DEFAULT_LAT,4743.1001
$TGT_DEFAULT_LON,-12223.12
$TGT_AUTO_DEFAULT,0
$SM_CC,360
$N_FILEKB,4
$FILEMGR,0
$CALL_NDIVES,1
$COMM_SEQ,0
$PROTOCOL,9
$N_NOCOMM,5
$NOCOMM_ACTION,3
$N_NOSURFACE,0
$UPLOAD_DIVES_MAX,-1
$CALL_TRIES,5
$CALL_WAIT,60
$CAPUPLOAD,1
$CAPMAXSIZE,400000
$HEAPDBG,0
$T_GPS,5
$N_GPS,20
$T_GPS_ALMANAC,0
$T_GPS_CHARGE,-2147.1975
$T_RSLEEP,3
$STROBE,0
$RAFOS_PEAK_OFFSET,1.5
$RAFOS_CORR_THRESH,60
$RAFOS_HIT_WINDOW,3600
$PITCH_MIN,298
$PITCH_MAX,3938
$C_PITCH,2663
$PITCH_DBAND,0.1
$PITCH_CNV,0.003125763
$P_OVSHOOT,0.079999998
$PITCH_GAIN,26
$PITCH_TIMEOUT,16
$PITCH_AD_RATE,175
$PITCH_MAXERRORS,1
$PITCH_ADJ_GAIN,0
$PITCH_ADJ_DBAND,0
$ROLL_MIN,208
$ROLL_MAX,3799
$ROLL_DEG,40
$C_ROLL_DIVE,1891
```

```
$C_ROLL_CLIMB,1846
$HEAD_ERRBAND,10
$ROLL_CNV,0.028270001
$ROLL_TIMEOUT,15
$R_PORT_OVSHOOT,28
$R_STBD_OVSHOOT,38
$ROLL_AD_RATE,350
$ROLL_MAXERRORS,1
$ROLL_ADJ_GAIN,0
$ROLL_ADJ_DBAND,0
$VBD_MIN,600
$VBD_MAX,3960
$C_VBD,2623
$VBD_DBAND,2
$VBD_CNV,-0.24529999
$VBD_TIMEOUT,720
$PITCH_VBD_SHIFT,0.0012300001
$VBD_PUMP_AD_RATE_SURFACE,5
$VBD_PUMP_AD_RATE_APOGEE,4
$VBD_BLEED_AD_RATE,8
$UNCOM_BLEED,60
$VBD_MAXERRORS,1
$W_ADJ_DBAND,0
$DBDW,0
$PITCH_W_GAIN,0
$PITCH_W_DBAND,0
$CF8_MAXERRORS,20
$AH0_24V,310
$AH0_10V,0
$MINV_24V,11.5
$MINV_10V,10
$FG_AHR_10V,0
$FG_AHR_24V,0
$PHONE_SUPPLY,2
$PRESSURE_YINT,-175.44975
$PRESSURE_SLOPE,0.000140579
$AD7714Ch0Gain,32
$TCM_PITCH_OFFSET,0
$TCM_ROLL_OFFSET,0
$COMPASS_USE,0
$ALTIM_BOTTOM_PING_RANGE,0
$ALTIM_TOP_PING_RANGE,20
$ALTIM_BOTTOM_TURN_MARGIN,0
$ALTIM_TOP_TURN_MARGIN,0
$ALTIM_TOP_MIN_OBSTACLE,1
$ALTIM_PING_DEPTH,100
$ALTIM_PING_DELTA,5
$ALTIM_FREQUENCY,13
$ALTIM_PULSE,3
$ALTIM_SENSITIVITY,3
$XPDR_VALID,6
$XPDR_INHIBIT,90
$INT_PRESSURE_SLOPE,0.0097660003
$INT_PRESSURE_YINT,0
$DEEPGLIDER,0
$DEEPGLIDERMB,0
$MOTHERBOARD,4
$DEVICE1,2
$DEVICE2,133
$DEVICE3,147
$DEVICE4,-1
$DEVICE5,-1
$DEVICE6,-1
$LOGGERS,0
$LOGGERDEVICE1,-1
$LOGGERDEVICE2,-1
$LOGGERDEVICE3,-1
```

```
$LOGGERDEVICE4,-1
$COMPASS_DEVICE,33
$COMPASS2_DEVICE,-1
$PHONE_DEVICE,49
$GPS_DEVICE,32
$RAFOS_DEVICE,-1
$XPDR_DEVICE,24
$SIM_W,0
$SIM_PITCH,0
$SEABIRD_T_G,0.0042689471
$SEABIRD_T_H,0.00061728043
$SEABIRD_T_I,2.1528307e-05
$SEABIRD_T_J,2.205049e-06
$SEABIRD_C_G,-9.8820391
$SEABIRD_C_H,1.1285278
$SEABIRD_C_I,-0.00050328113
$SEABIRD_C_J,0.00012978025
$GPS1,161215,140948,4743.9064,-12224.0852,2,1.1,21,16.6,0.8,238.2,8,5.3
```

- 161215 — Date (ddmmyy)
- 140948 — Time (hhmmss UTC)
- 4743.9064 — Latitude (+/- ddmm.mmm; sign: only minuses are shown, positive North)
- -12224.0852 — Longitude (+/- dddmm.mmm; sign: only minuses are shown, positive East)
- 2 — Time to first fix, in seconds
- 1.1 — HDOP (Horizontal Dilution of Precision) - a measure of the strength of the figure used to compute the GPS fix
- 21 — Total time, in seconds, to acquire fix, See $N_GPS in the Parameter Reference Manual for details
- 16.6 — Magnetic variance (degrees, positive East
- 0.8 — Estimated surface drift speed, in knots
- 238.2 — Estimated surface drift direction, in degrees true
- 8 — Number of satellites contributing to final fix
- 5.3 — Horizontal position error, in meters

`$_CALLS,1`	Total number of calls made in an attempt to connect to the basestation on the previous surfacing
`$_XMS_NAKs,0`	Total number of file transfers that ended with a NAK (No Acknowledgements) on the previous surfacing
`$_XMS_TOUTs,0`	Total number of file transfers that ended with a timeout on the previous surfacing
`$_SM_DEPTHo,1.08`	Glider measured depth, in meters, while the glider is at the surface at the end of the previous dive
`$_SM_ANGLEo,-72.5`	Glider measured angle, in degrees, at the surface at the end of the previous dive

`$GPS2,161215,141428,4743.8613,-12224.1331,4,1.0,17,16.6,1.7,55.7,9,5.0`

GPS position just prior to the start of the next dive; the format is the same as that for GPS1 above.

`$SPEED_LIMITS,0.173,0.261` — The minimum and maximum horizontal speed attainable by the Seaglider on this dive, in meters per second. These values are based on the minimum and maximum dive angles and the allowable buoyancy force. The minimum speed corresponds to the maximum dive angle; the maximum speed is obtained as the minimum value of the horizontal speed.

`$TGT_NAME,C2`	The name of the active target of this dive. See the Targets File section for details.
`$TGT_LATLONG,4744.200,-12224.000`	The latitude and longitude for the target position of this dive. Same format as GPS1
`$TGT_RADIUS,200.000`	The radius for the active target for this dive, in meters
`$KALMAN_CONTROL,0.082,0.346`	Desired glider speeds to north and east, from which heading is derived

- 0.082 — Desired speed to the north, in meters/second
- 0.346 — Desired speed to the east, in meters/second

$KALMAN_X,4116.0,-264.0,95.2,-1195.6,1396.7

- 1396.7 — X displacement from present position to predicted position due to mean, diurnal and semidiurnal components of the model
- -1195.6 — East position relative to initial position (in meters) at time tk (timestep k) due to glider speed through the water
- 95.2 — East position relative to initial position (in meters) at time tk (timestep k) due to semidiurnal current
- -264.0 — East position relative to initial position (in meters) at time tk (timestep k) due to diurnal current
- 4116.0 — East position relative to initial position (in meters) at time tk (timestep k) due to mean current

$KALMAN_Y,2153.1,115.0,-502.8,7143.4,-222.0

- -222.0 — Y displacement from present position to predicted position due to mean, diurnal and semidiurnal components of the model
- 7143.4 — North position relative to initial position (in meters) at time tk (timestep k) due to glider speed through the water
- -502.8 — North position relative to initial position (in meters) at time tk (timestep k) due to semidiurnal current
- 115.0 — North position relative to initial position (in meters) at time tk (timestep k) due to diurnal current
- 2153.1 — North position relative to initial position (in meters) at time tk (timestep k) due to mean current

$MHEAD_RNG_PITCHd_Wd,1.5,650,-18.2,-10.000,-21.00,2236

- 2236 — dB/dw (derivative of buoyancy with respect to speed). This is the gain factor applied to buoyancy when going too slowly on the ascent. It can be set manually by $DBDW but is otherwise **calculated by the glider.**
- -21.00 — Glide angle (theta$_{0}$)
- -10.000 — Desired vertical velocity on dive (in cm/sec)
- -18.2 — Desired vehicle pitch angle (degrees)
- 650 — Distance, in meters, to the target
- 1.5 — Desired magnetic heading (degrees)

$D_GRID,150 Depth, in meters, to the apogee maneuver, as read from the currently active bathymetry map

$GCHEAD,st_secs,pitch_ctl,vbd_ctl,pitch_ad_start,roll_ad_start,vbd_pot1_ad_start,vbd_pot2_ad_start,depth,ob_vertv,data_pts,end_secs,pitch_secs,roll_secs,vbd_secs,vbd_i,gcphase,pitch_i,roll_i,pitch_ad,roll_ad,vbd_ad,vbd_pot1_ad,vbd_pot2_ad,pitch_retries,pitch_errors,roll_retries,roll_errors,vbd_retries,vbd_errors,pitch_volts,roll_volts,vbd_volts

st_secs:	Elapsed time from the start of the dive to the start of GC
pitch_ctl:	Position of the pitch mass, in centimeters, relative to the $C_PITCH (positive aft)
vbd_ctl:	Position of the VBD, in cc, relative to $C_VBD (positive buoyant)
pitch_ad_start:	Position of the pitch motor, in AD counts, at the beginning of the motor move
roll_ad_start:	Position of the roll motor, in AD counts, at the beginning of the motor move
vbd_pot1_ad_start:	Position of the vbd linear potentiometer 1, in AD counts, at the beginning of the motor move
vbd_pot2_ad_start:	Position of the vbd linear potentiometer 2, in AD counts, at the beginning of the motor move
depth:	Depth at the start of GC, in meters
ob_vertv:	Observed vertical velocity, in centimeters/second
data_pts:	Number of data records collected thus far in the dive
end_secs:	Elapsed time from the start of the dive to the end of GC
pitch_secs:	Number of seconds the pitch motor was on
roll_secs:	Number of seconds the roll motor was on
vbd_secs:	Number of seconds the VBD was on
vbd_i:	Average current used by the VBD, in amps
gcphase:	GC phase is a logical 'or' of all the actions that occurred in a given active period.

- 1: pitch change
- 2: VBD change
- 4: roll
- 8: turning (passive)
- 16: passive mode (waiting)
- 32: GCPHASE_VBD_W_ADJ
- 64: GCPHASE_PITCH_W_ADJ
- 128: GCPHASE_PITCH_ADJ
- 256: GCPHASE_ROLL_POS
- 512: GCPHASE_ROLL_NEG

1024: GCPHASE_ROLL_CENTER
2048: GCPHASE_PITCH_POS
4096: GCPHASE_PITCH_NEG
8192: GCPHASE_VBD_PUMP
16384: GCPHASE_VBD_BLEED

pitch_i:	Average current used by the pitch motor, in amps
roll_i:	Average current used by the roll motor, in amps
pitch_ad:	Position of the pitch motor, in AD counts, at the end of the motor move
roll_ad:	Position of the roll motor, in AD counts, at the end of the motor move
vbd_ad:	Position of the VBD motor, in AD counts, at the end of the motor move
vbd_pot1_ad:	Position of the vbd linear potentiometer 1, in AD counts, at the end of the motor move
vbd_pot2_ad:	Position of the vbd linear potentiometer 2, in AD counts, at the end of the motor move
pitch_retries:	Number of pitch retries (instantaneous AD rate move of less than $PITCH_AD_RATE) during this motor move
pitch_errors:	Number of pitch motor errors (timeouts) during this motor move n
roll_retries:	Number of roll retries (instantaneous AD rate move less than $ROLL_AD_RATE) during this motor move
roll_errors:	Number of roll motor errors (timeouts) during this motor move
vbd_retries:	Number of VBD retries (instantaneous AD rate move less than $VBD_PUMP_AD_RATE_APOGEE, $VBD_PUMP_RATE_SURFACE or VBD_BLEED_RATE as appropriate) during this motor move
vbd_errors:	Number of VBD errors (timeouts) during this motor move
pitch_volts:	Minimum observed voltage during the pitch motor move. The value is 28.83 (high) if the pitch motor did not move in this active period.
roll_volts:	Minimum observed voltage during the roll motor move. The value is 28.83 (high) if the roll motor did not move in this active period.
vbd_volts:	Minimum observed voltage during the VBD motor move. The value is 28.83 (high) if the pitch motor did not move in this active period.

```
$STATE,12,end surface,CONTROL_FINISHED_OK
$STATE,12,begin dive
$GC,14,-0.88,-146.6,294,1880,1238,1064,0.0,0.0,0,77,0.00,0.00,-60.97,0.000,16386,
0.000,0.000,294,1881,2923,2956,2891,0,0,0,0,0,0,28.83,28.83,28.83
$GC,79,-0.88,-146.6,293,1881,2957,2891,3.3,-6.6,9,102,7.12,2.42,-6.80,0.000,18948,
0.490,0.099,2359,479,3221,3301,3142,0,0,0,0,0,0,14.53,14.69,14.91
$GC,129,-0.88,-146.6,1424,479,3284,3134,14.0,-16.3,17,138,0.00,2.38,0.00,0.000,1030,
0.000,0.050,2350,1906,3221,3304,3138,0,0,0,0,0,0,28.83,14.74,28.83
...lines omitted...
$GC,238,-0.88,-146.6,1408,1904,3285,3133,31.5,-15.8,37,246,0.00,2.35,0.00,0.000,260,
0.000,0.072,2339,3295,3221,3305,3137,0,0,0,0,0,0,28.83,14.73,28.83
$STATE,1020,end dive,TARGET_DEPTH_EXCEEDED
$STATE,1020,begin apogee
$GC,1023,-0.19,0.0,2368,1888,3305,3136,151.3,-15.0,122,1143,0.62,0.00,110.50,1.571,
10246,0.282,0.000,2588,1884,2624,2748,2501,0,0,0,0,0,0,14.79,28.83,13.73
$STATE,1144,end apogee,CONTROL_FINISHED_OK
$STATE,1144,begin climb
$GC,1145,0.88,146.6,2588,1885,2748,2501,156.6,0.0,134,1263,0.90,0.00,113.15,1.486,1024
6,0.179,0.000,2931,1884,2025,2173,1877,0,0,0,0,0,0,14.19,28.83,13.63
$GC,1381,0.88,146.6,2932,1884,2172,1877,132.8,13.6,158,1382,0.00,0.00,0.00,0.000,6,0.0
00,0.000,2932,1884,2024,2172,1877,0,0,0,0,0,0,28.83,28.83,28.83
...lines omitted...
$GC,2266,0.88,146.6,1920,1875,2117,1871,5.8,11.5,274,2273,0.00,0.00,0.00,0.000,6,0.000
,0.000,2956,1877,2024,2171,1877,0,0,0,0,0,0,28.83,28.83,28.83
$STATE,2284,end climb,SURFACE_DEPTH_REACHED
$STATE,2284,begin surface coast
$FINISH,1.9,1.020151
```

- 1.020151: Water density, in grams per cc, at the first sample taken after reaching $D_SURF (or $D_FINISH, if enabled)
- 1.9: Depth of glider, in meters, at the first sample taken after reaching $D_SURF (or $D_FINISH, if enabled)

```
$STATE,2301,end surface coast,CONTROL_FINISHED_OK
$STATE,2301,begin surface
$SM_CCo,2314,113.72,0.164,0,0,1154,360.10
```

- 360.10: Final position of the VBD after the Surface Maneuver pump, in cc's
- 1154: Final position of the VBD after the SM pump, in AD counts
- 0 (second): Number of VBD errors during the SM pump
- 0 (first): Number of VBD retries during the SM pump
- 0.164: Average current for the VBD during the SM pump, in amps
- 113.72: Time, in seconds, for the SM pump
- 2314: Time in seconds from the start of the dive to when the SM pump was started

$SM_GC,1.30,6.62,0.00,113.72,0.151,0.000,0.164,279,1877,1154,-7.33,-0.40,360.10,0,0,0,0,0,0,14.83,28.83,14.71

Glider depth at the end of the surface maneuver, in meters
Time to complete pitch surface maneuver, in seconds

Time to complete roll surface maneuver, in seconds
Time for the SM pump, in seconds
Average current for pitch during surface maneuver, in amps
Average current for roll during the surface maneuver, in amps
Average current for the VBD during the SM pump, in amps
Final position of the pitch after the surface maneuver, in AD counts
Final position of the roll after the surface maneuver, in AD counts
Final position of the VBD after the SM pump, in AD counts
Final position of the pitch after the surface maneuver, in cm
Final position of the roll after the surface maneuver, in degrees
Final position of the VBD after the Surface Maneuver pump, in cc's
Number of pitch retries (instantaneous AD rate move of less than $PITCH_AD_RATE) during this motor move
Number of pitch motor errors (timeouts) during this motor move
Number of roll retries (instantaneous AD rate move less than $ROLL_AD_RATE) during this motor move
Number of roll motor errors (timeouts) during this motor move
Number of VBD retries (instantaneous AD rate move less than $VBD_PUMP_AD_RATE_APOGEE, $VBD_PUMP_AD_RATE_SURFACE or $VBD_BLEED_RATE as appropriate) during this motor move
Number of VBD errors (timeouts) during this motor move
Minimum observed voltage during the pitch motor move
Minimum observed voltage during the roll motor move
Minimum observed voltage during the VBD motor move

$IRIDIUM_FIX,4722.92,-12217.96,121008,020227 Location obtained by the Iridium system. Can be highly inaccurate (+/- 20 km or worse)

- 020227: HHMMSS (if this value is incorrect it is likely that the epoch in iridium.c needs to be updated)
- 121008: DDMMYY (if this value is incorrect it is likely that the epoch in iridium.c needs to be updated)
- -12217.96: Longitude in degrees, decimal minutes (east in positive)
- 4722.92: Latitude in degrees, decimal minutes (north is positive)

**// as of 3 March 2015, doing the rollover to ERA2 as above static long iridium_epoch = 1399818235; // May 11, 2014, 14:23:55.00

$TT8_MAMPS,0.021721,0.021721 Power draw, in amps, measured at the end of the dive. This can be used to determine if devices are being left on.

$HUMID,42.79 Internal humidity measured when the .log file is finalized, in %
$INTERNAL_PRESSURE,7.93976 Measured when the .log file is finalized, in psia
$TCM_TEMP,16.80 Sampled every time the compass is read during the dive, the log reports the last measurement
$XPDR_PINGS,3 Number of times the transponder commanded a ping during the dive
$ALTIM_TOP_PING,50.1,20.2 Altimeter response information if valid response received when attempting to detect the surface

- 20.2: Distance between the glider's transducer and the sensed surface, in meters
- 50.1: Depth of the glider at the time of the altimeter response, in meters

$ALTIM_BOTTOM_PING,120.5,66.0 Altimeter response information if valid response received when attempting to detect the bottom

- 66.0: Distance between the glider's transducer and the sensed bottom, in meters
- 120.5: Depth of the glider at the time of the altimeter response, in meters

$SC_FREEKB,3917728 Number of kilobytes of free space on the SciCon SD card

$24V_AH,13.6,5.406

- 5.406: Number of main battery amp hours consumed since battery gauge reset
- 13.6: Minimum voltage seen on the main battery pack during the dive

$10V_AH,13.8,0.000

- 0.000 — Number of secondary battery amp hours consumed since battery gauge reset
  Note: In 15V systems where the main and secondary battery packs are bussed together, the number of amp hours consumed is recorded under the main battery amp hours used and this value remains zero.
- 13.8 — Minimum voltage seen on the secondary battery pack during the dive.

$FG_AHR_24Vo,0.000 This parameter is a remnant of UW development and is not used
$FG_AHR_10Vo,0.000 This parameter is a remnant of UW development and is not used

$DEVICES,Pitch_motor,Roll_motor,VBD_pump_during_apogee,VBD_pump_during_surface,VBD_valve,Iridium_during_init,Iridium_during_connect,Iridium_during_xfer,Transponder_ping,GUMSTIX_24V,GPS,TT8,LPSleep,TT8_Active,TT8_Sampling,TT8_CF8,TT8_Kalman,Analog_circuits,GPS_charging,Compass,RAFOS,Transponder,Compass2

Provides the "column map" for the $DEVICE_SECS and $DEVICE_MAMPS data in the next lines.

$DEVICE_SECS,15.650,51.750,223.650,113.725,0.000,22.792,29.449,137.831,2.500,0.000,18.593,710.943,657.018,456.862,865.631,38.213,0.000,803.319,0.000,637.434,0.000,14.466,0.000
The cumulative number of seconds each device was on during the last dive.

$DEVICE_MAMPS,490.365,98.685,1570.545,163.710,0.000,30.600,160.000,223.000,420.000,0.000,21.720,10.620,2.190,10.620,30.840,36.840,0.000,11.100,0.000,20.970,0.000,30.000,0.000
Current values used to calculate battery usage.
Reports a measured value (phone, motors etc.) or a value from the CURRENTS file (sensors) or a hardcoded value (if not measured and not in the CURRENTS file)

$SENSORS,SBE_CT,AA4330_CNF,WL_BBFL2,nil,nil,nil,nil,nil,nil,nil
List of the science sensors in the order of their slot assignment

$SENSOR_SECS,189.371,277.362,433.750,0.000,0.000,0.000,0.000,0.000,0.000,0.000 The cumulative number of seconds each sensor was powered on during the previous dive

$SENSOR_MAMPS,23.220,43.440,51.680,0.000,0.000,0.000,0.000,0.000,0.000,0.000
Reports a measured current value, in milliamps, or a value from the CURRENTS file or a hardcoded value (if not measured and not in the CURRENTS file) for each sensor

$MEM,351456 The available free memory. If this value drops dive over dive, then there is a memory leak.

$DATA_FILE_SIZE,20421,280

- 280 — Number of data samples taken during the dive
- 20421 — Total size of the data file in bytes

$CAP_FILE_SIZE,50860,0

- 0 — Number of critical capture lines
- 50860 — .cap file size in bytes

$CFSIZE,2097086464,2090827776

- 2090827776 — Available free space on the compact flash card
- 2097086464 — Total capacity of the compact flash card

$ERRORS,0,0,0,0,0,0,0,0,0,0,0,0,0,0,1,0

- Number of sensor timeouts
- Number of times the GPS did not provide data from $GPRMC (position and time) or $GPGGA (fix data) records within the 2 second timeout
- Number of VBD retries
- Number of roll retries
- Number of pitch retries
- Number of VBD errors
- Number of roll errors
- Number of pitch errors
- Number of CF8 retries while closing the files
- Number of CF8 retries while writing files
- Number of CF8 retries while opening files
- Number of CF8 errors while closing files
- Number of CF8 errors while writing files
- Number of CF8 errors while opening files
- Number of spurious interrupts. Spurious interrupts may result from divide by zero or memory de-reference problems. They may also arise from interrupt contention. Occasional isolated spurious interrupts are normal
- Buffer Overruns – The number of times the log file output is longer than the internal buffer length. For each of the buffer overruns, the output is truncated to fit in the buffer, resulting in lost logfile output

$CURRENT,0.224,202.1,1

- Validation value
- Depth Averaged Current direction, in degrees
- Depth Averaged Current magnitude, in meters

$GPS,161215,145611,4743.899,-12224.167,16,0.9,16,16.6

GPS position obtained at the end of the current dive, same format as GPS1 and GPS2

2.1.2 Data File
(p1230055.dat)

The **.dat file** is an ASCII text file generated by the Seaglider and transmitted to the basestation for further processing. The first line is the only actual value; all following lines are differences. It serves as the primary conduit for the science data collected by the Seaglider. Each **data file** covers one dive of information. The format is designed to minimize transmission size and, while clear text, is not intended for direct use by users.

The numbers in the data file can be interpreted by the column titles listed in the "columns" line at the beginning of the file. The meaning of each column title is summarized below. The first 10 columns ("rec" through "GC_phase") are always present. The remaining columns depend on the sensors installed on the individual glider.

rec: the record number of the individual sample
elaps_t: time since the start of the dive
depth: depth, in centimeters, at the start of the sample
heading: vehicle heading at the start of the sample, in degrees (magnetic) times 10
pitch: vehicle pitch angle at the start of the sample, in degrees times 10, positive up
roll: vehicle roll at the start of the sample, in degrees times 10, positive starboard wing down
AD_pitch: Pitch mass position, in A/D counts
AD_roll: roll mass position, in A/D counts
AD_vbd: VBD position, in A/D counts
GC_phase: GC phase, encoded as follows
- 1: Pitch change
- 2: VBD change
- 3: Roll
- 4: Turning
- 5: Roll back (to center)
- 6: Passive mode

sbe.TempFreq: Temperature, in cycle counts of 4 MHz, in 255 cycles of signal frequency
sbe.CondFreq: Conductivity, in cycle counts of 4 MHz, in 255 cycles of signal frequency
aa4330.O2: oxygen concentration, in µM units times 1000
aa4330.AirSat: air saturation, in % times 1000
aa4330.Temp: temperature, in degrees C times 1000
aa4330.CalPhase: in degrees times 1000
aa4330.TCPhase: in degrees times 1000
wlbbfl2.BB1ref: backscatter 1 reference, in A/D counts
wlbbfl2.BB1sig: backscatter 1 data, in A/D counts
wlbbfl2.FL1ref: fluorescence 1 reference, in A/D counts
wlbbfl2.FL1sig: fluorescence 1 data, in A/D counts
wlbbfl2.FL2ref: : fluorescence 2 reference, in A/D counts
wlbbfl2.FL2sig: fluorescence 2 data, in A/D counts
wlbbfl2.temp: temperature, in A/D counts
qsp.PARuV: photosynthetically active radiation, in uV

2.1.3 ASC File
(p1230055.asc)

The .asc, or ASCII, files are created on the basestation. They are essentially the reconstituted (uncompressed, reassembled, and differentially summed) versions of the data (.dat) files created on the Seaglider. See the Data File section (2.1.2) for a description of the column names. The entry NaN indicates that there was no sample returned for that sensor. Either the sensor was not installed, or the sensor was not enabled for that sample/deployment, as controlled by the Science File. The entry 9999 indicates that an installed and enabled sensor did not respond when queried by the glider. This could indicate a sensor failure and should be investigated.

2.1.4 Eng File
(p1230055.eng)

The .eng, or engineering, files are created on the basestation. They restate data contained in the .asc and .log files, but with the Seaglider control state and attitude observations converted into engineering units. The column titles are described below. The first 10 columns are always present, while the remaining 10 columns vary, depending on the installed sensors.

elaps_t_0000: Time, in seconds, since 0000UTC of the current day
elaps_t: Time, in seconds, since the start of the dive
depth: Depth, in centimeters, at the start of the sample
head: Vehicle heading, in degrees magnetic
pitchAng: Vehicle pitch at the start of the sample, in degrees; positive nose-up
rollAng: Vehicle roll at the start of the sample, in degrees; positive starboard wing down (rolled to starboard)
pitchCtl: Pitch mass position relative to **$C_PITCH**, in centimeters; positive nose up
rollCtl: Roll mass position, in degrees relative to **$C_ROLL_DIVE** or **$C_ROLL_CLIMB**; positive starboard wing down
vbdCC: VBD value relative to $C_VBD, in cc's; positive buoyant
rec: Record/sample number
sbect.condFreq: Conductivity frequency, in Hertz.
sbect.tempFreq: Temperature frequency, in Hertz.
sbe43.O2Freq: Oxygen concentration (in Hertz)
aa4330.O2: oxygen concentration, in µM
aa4330.AirSat: air saturation, in %
aa4330.Temp: temperature, in degrees C
aa4330.CalPhase: in degrees
aa4330.TCPhase: in degrees
wlbbfl2.BB1ref: backscatter 1 reference, in A/D counts
wlbbfl2.BB1sig: backscatter 1 data, in A/D counts
wlbbfl2.FL1ref: fluorescence 1 reference, in A/D counts
wlbbfl2.FL1sig: fluorescence 1 data, in A/D counts
wlbbfl2.FL2ref: : fluorescence 2 reference, in A/D counts
wlbbfl2.FL2sig: fluorescence 2 data, in A/D counts
wlbbfl2.temp: temperature, in A/D counts
qsp.PARuV: photosynthetically active radiation, in V

2.1.5 Profiles File
(p1230055.pro)

The .pro files contain the scientific data that was acquired during the dive, such as temperature and salinity. The column names are as follows:

elapse_time_s_v: time, in seconds, since the beginning of the dive (before the first sample is taken)
Pressure_v: pressure, in decibars depth_m_v: depth, in meters
TempC_Cor_v: temperature, in degrees C, corrected for 1st order time lag (response time of sensor)
Cond_Cor_v: conductivity, corrected as above
Salinity_v: salinity, calculated
SigmaT_v: density at the current temperature
dive_pos_lat_dd_v: estimated latitude, in decimal degrees. It should be noted that this position is a rough estimate based on the position at the surface, and the depth-averaged current, not an actual GPS or other reading.
dive_pos_lon_dd_v: estimated longitude (see above).

2.1.6 Binned Profiles File
(p1230055.bpo)

This is the same data as in the .pro files, but here it is "binned", or averaged, into depth intervals specified by the user.

2.1.7 Capture File
(p1230055.cap)

The capture file contains information about all of the actions the Seaglider took during the dive. It captures the output written to the console while the Seaglider is operating. Capture files are a great source of information on the glider's performance, especially in error analysis and debugging.
The format of the capture file is not as hard and fast as other file formats, but it usually conforms to that shown below:

Example Capture File

```
2966.752,N,Capture file opened
```

Descriptive text; often what action was taken, and sometimes the reason for the action.

Output level. There are three letters that can appear in this position: N, C, or D. N indicates normal output level. C stands for critical, and means that only output considered critical to glider function will be printed. For the most part, this consists of dire problems with hardware or software, like motor errors or buffer overruns. D stands for Debug, and is used for extended diagnostics. This output can be quite voluminous and it is recommended that this only be set on specific services when it is known that some needed output will be captured. Most services do not have output in this level currently, but work is ongoing to add extended diagnostics under this output level.

Time, in seconds, since the start of the dive

```
2967.080,HTT8,N,Writing  NVRAM...done.
2995.325,HGPS,N,Acquiring GPS fix ...
2998.197,HGPS,N,VVVVA
270407, 140904, 4806.097168, -12222.047852 1.500000 13/13 seconds
3009.584,HTT8,N,Updating parameter $T_GPS_CHARGE to -13320.147
```

The capture file gives the following information regarding every pitch, roll and VBD maneuver:

```
876.356,HROLL,N,Roll commanded from 39.80 deg (3384) to 0.00 deg (1976)...
877.415,HROLL,N,34.5 deg (ad: 3195) Updating parameter $R_PORT_OVSHOOT to 18
880.082,SMOTOR,N,MOTOR_DONE: ticks: 1 max 24v: 0.006A avg 24v: 0.006A
880.215,SMOTOR,N,GC TICKS/TIME: 117/119500
880.304,HROLL,N,done.
```

If problems occur, they are reported here.

```
132.434,HPITCH,N,Pitch completed from -8.87 cm (1472) to -1.24 cm (3130) took 17.0 sec
0.292A (0.377A peak) 97 AD/sec 681 ticks, 10 retries
```

The capture file also describes changes between dive phases:

```
839.259,SDIVE,N,Leaving climb state due to SURFACE_DEPTH_REACHED
839.402,SDIVE,N,Entering surface coast state
839.570,SDIVE,N,Reached SD,Wo = 0.064493,6 more points
```

Seaglider calculated that it should take this many more samples before beginning surface maneuver

Vertical velocity when surface depth reached

The capture file describes the sampling done by the SciCon (if installed) and the glider

```
29.316, HSCICON,N,sending [log sample ct 159]
```

- Capture file time stamp
- SciCon activity
- CT Data sample at 1.59m sent to glider

```
30.316, SSENSOR,N,A 27835ms 1.60m 178.8 #2
```

- Capture file time stamp
- Glider sensor activity
- Time sample acquired, glider depth, glider heading, sample number

2.1.8 NetCDF File

(p1230055.nc)

The netCDF file captures all processed files (i.e. .cap, .log and .eng), and is self-documenting. Read-write access to netCDF files is provided by the software libraries supplied by UCAR (University Corporation for Atmospheric Research). The netCDF file is meant primarily for sharing data between scientific users. This is a common data format and is supported also by MATLAB. Open source tools available for Linux & Windows machines allow for reading the contents of the file.

The NetCDF file (.nc) is generated on the basestation and captures all of the raw data collected during a dive as well as the output from data QA/QC checks done on the basestation. This file is used to generate the dive plots used by the pilots to trim the glider during flight. Information on the QA/QC process is located in the Seaglider Quality Control Manual.

2.1.9 Private File

(p1230055.pvt)

.pvt, or private, files are created on the basestation. They contain data that was originally in the logfile that could pose a security problem if propagated off of the basestation (as the logfile may well be). Thus, the data is stripped from the log file and placed in the matched pvt file. The lines in the pvt file correspond with parameters that are listed in the Parameter Reference Manual.

2.2 Processing Control Files

This section includes files that are used by the pilot to monitor and, when necessary, modify, how the basestation processes Seaglider data.

2.2.1 Communications Log

(comm.log)

The "comm log" file is appended during each communication session, and so is a complete record of the Seaglider's communications over an entire deployment. It is a plain-text file that resides in the Seaglider's home directory. Running tail -f comm.log in the Seaglider's home directory during (or while waiting for) communication sessions is a useful monitor.

comm.log header

```
Connected at Sun Dec 2 19:17:03 PST 2007 Date and time of communications session
0055:0:0:1:0:0:0:0:0:0:0:0:0:0:0:0:GPS,031207,031455,1855.179,12237.359,41,1.3,41,-2.1
```

- Dive number
- Call cycle
- Calls made
- No-comm count: number of calls since last complete data transfer
- Mission number (increments each time glider is launched)
- Reboot count (increments each time the glider code is started)
- Error code from the last call session (0 no error - non-zero error)
- AD position of the pitch motor
- AD position of the roll motor
- AD position of the vbd
- Observed pitch (measured right before the call session)
- Observed depth (measured right before the call session)
- Current 10V battery voltage (measured right before the call session)
- Current 24V battery voltage (measured right before the call session)
- Current internal pressure (measured right before the call session)
- Current internal relative humidity (measured right before the call session)
- Date, as ddmmyy(after 2000)
- Time, as hhmmss in UTC
- Latitude, as +/- ddmm.mmm (only minuses are shown; positive North).
- Longitude, as +/- dddmm.mmm; sign (only minuses are shown; positive East), degrees, minutes, and decimal minutes.
- Time to first fix, in seconds
- HDOP (Horizontal Dilution Of Precision) - a measure of the strength of the figure used to compute the fix.
- Total time to acquire fix. See $N_GPS in the Parameter Reference Manual for detatails.
- Magnetic variation

Example of comm.log when data transmitted via XMODEM. This is normally the case if the glider has an older Iridium modem that is not capable of raw data transfer using flow control.

```
ver=66.04l,rev=1243M,frag=4,launch=110908,151311
Iridium bars: 5 geolocation: 1846.424805,12238.228516,031207,020210
```

Location obtained by the iridium phone's geolocation property. This may be accurate to +/- 20km or more

```
Sun Dec 2 19:17:20 2007 [sg123] cmdfile/XMODEM: 128 Bytes, 17 BPS Received cmdfile 17
bytes
Sun Dec 2 19:17:49 2007 [sg123] sector number = 1, block length = 1024
Sun Dec 2 19:17:54 2007 [sg123] sector number = 2, block length = 1024
Sun Dec 2 19:18:00 2007 [sg123] sector number = 3, block length = 1024
Sun Dec 2 19:18:05 2007 [sg123] sector number = 4, block length = 1024
Sun Dec 2 19:18:07 2007 [sg123] received EOT and read timed out
```

Describes the transmission of the command file from the basestation to the Seaglider

These lines describe the glider sending a file to the basestation.

End of transmisstion

```
Sun Dec 2 19:18:07 2007 [sg123] sector number = -10,block length = 1024
```

Indicates end of file

```
Sun Dec 2 19:18:07 2007 [sg123] done - sending ACK
```

Acknowledgement that file was sent

```
Sun Dec 2 19:18:07 2007 [sg123] sg0055lz.x00/XMODEM: 4096 Bytes, 178 BPS
```

The name of the file is printed after the glider has finished sending it.

```
Sun Dec 2 19:18:07 2007 [sg123] Exiting (0)
Sun Dec 2 19:18:14 2007 [sg123] sector number = 1, block length = 1024
Sun Dec 2 19:18:19 2007 [sg123] sector number = 2, block length = 1024
Sun Dec 2 19:18:23 2007 [sg123] sector number = 3, block length = 1024
Sun Dec 2 19:18:28 2007 [sg123] sector number = 4, block length = 1024 Sun Dec 2
19:18:31 2007 [sg123] received EOT and read timed out
Sun Dec 2 19:18:31 2007 [sg123] sector number = -10, block length = 1024 Sun Dec 2
19:18:31 2007 [sg123] done - sending ACK
Sun Dec 2 19:18:31 2007 [sg123] sg0055dz.x00/XMODEM: 4096 Bytes, 189 BPS
Sun Dec 2 19:18:31 2007 [sg123] Exiting (0)
Sun Dec 2 19:18:38 2007 [sg123] sector number = 1, block length = 1024
Sun Dec 2 19:18:43 2007 [sg123] sector number = 2, block length = 1024 Sun Dec 2
19:18:49 2007 [sg123] timeout trying to read next sector
```

Errors in transmission are reported. If the Iridium connection drops, the communications session times out.

```
Sun Dec 2 19:18:50 2007 [sg123] finished waiting for next line - cnt = 999
Sun Dec 2 19:18:50 2007 [sg123] got 0x2d sector header
Sun Dec 2 19:18:53 2007 [sg123] finished waiting for next line - cnt = 746
Sun Dec 2 19:18:54 2007 [sg123] got 0x40 sector header
Sun Dec 2 19:18:57 2007 [sg123] finished waiting for next line - cnt = 787
Sun Dec 2 19:18:59 2007 [sg123] sector number = 3, block length = 128
Sun Dec 2 19:19:02 2007 [sg123] timeout trying to read next sector
Sun Dec 2 19:19:03 2007 [sg123] finished waiting for next line - cnt = 999
Sun Dec 2 19:19:04 2007 [sg123] got 0xe6 sector header
Sun Dec 2 19:19:06 2007 [sg123] finished waiting for next line - cnt = -1
Sun Dec 2 19:19:06 2007 [sg123] got 0xb7 sector header
Sun Dec 2 19:19:07 2007 [sg123] finished waiting for next line - cnt = 875
Sun Dec 2 19:19:08 2007 [sg123] sector number = 4, block length = 128
Sun Dec 2 19:19:10 2007 [sg123] sector number = 4, block length = 128
Sun Dec 2 19:19:10 2007 [sg123] received dup sector = 4
```

Duplicate and/or missing sector numbers indicate loss of synchronization between the Seaglider and the basestation.

```
Sun Dec 2 19:19:12 2007 [sg123] timeout trying to read next sector
Sun Dec 2 19:19:13 2007 [sg123] finished waiting for next line - cnt = 999
Sun Dec 2 19:19:13 2007 [sg123] got 0xaf sector header
```

Errors can also be caused by dropped Iridium connections. The Seaglider will automatically call back and try sending data again

```
Sun Dec 2 19:19:15 2007 [sg123] finished waiting for next line - cnt = -1
Sun Dec 2 19:19:15 2007 [sg123] got 0x59 sector header
Sun Dec 2 19:19:17 2007 [sg123] finished waiting for next line - cnt = 543
Sun Dec 2 19:19:17 2007 [sg123] got 0x59 sector header
```

```
Sun Dec 2 19:19:21 2007 [sg123] finished waiting for next line - cnt = 130
Sun Dec 2 19:19:23 2007 [sg123] sector number = 6, block length = 128
Sun Dec 2 19:19:23 2007 [sg123] sync error in protocol
Sun Dec 2 19:19:23 2007 [sg123] sg0055dz.x01/XMODEM: got error Renamed partial file sg0055dz.x01 to
sg0055dz.x01.PARTIAL.1
Sun Dec 2 19:19:23 2007 [sg123] processed partial file sg0055dz.x01 (0x0)
Sun Dec 2 19:19:23 2007 [sg123] Exiting (128)
Disconnected at Sun Dec 2 19:19:39 PST 2007
```

In this case, the glider "realizes" that the basestation did not receive a complete file. The glider will automatically resend the file on the next call.

If no error is reported, but the basestation does not receive a complete file, the pilot can command the glider to resend the dive by using a Pdos command (see *resend_dive* in the *Extended PicoDos Reference Manual*).

```
Connected at Sun Dec 2 19:21:39 PST 2007
159:0:2:0  GPS,031207,031455,1855.179,12237.359,41,1.3,41,-2.1
ver=66.03,rev=1243M,frag=4
Iridium bars: 5 geolocation: 1846.424805,12241.375977,031207,070746
Sun Dec 2 19:21:58 2007 [sg123] cmdfile/XMODEM: 128 Bytes, 14 BPS Received cmdfile 17 bytes
Sun Dec 2 19:22:28 2007 [sg123] sector number = 1, block length = 1024
Sun Dec 2 19:22:33 2007 [sg123] sector number = 2, block length = 1024
Sun Dec 2 19:22:37 2007 [sg123] sector number = 3, block length = 1024
Sun Dec 2 19:22:42 2007 [sg123] sector number = 4, block length = 1024
Sun Dec 2 19:22:45 2007 [sg123] received EOT and read timed out
Sun Dec 2 19:22:45 2007 [sg123] sector number = -10, block length = 1024
Sun Dec 2 19:22:45 2007 [sg123] done - sending ACK
Sun Dec 2 19:22:45 2007 [sg123] sg0055dz.x01/XMODEM: 4096 Bytes, 186 BPS
```

The file was successfully resent.

```
Sun Dec 2 19:22:45 2007 [sg123] Exiting (0)
Sun Dec 2 19:22:53 2007 [sg123] sector number = 1, block length = 1024
Sun Dec 2 19:22:58 2007 [sg123] sector number = 2, block length = 1024
Sun Dec 2 19:23:03 2007 [sg123] sector number = 3, block length = 1024
Sun Dec 2 19:23:07 2007 [sg123] sector number = 4, block length = 1024 Sun Dec 2 19:23:10 2007 [sg123]
received EOT and read timed out
Sun Dec 2 19:23:10 2007 [sg123] sector number = -10, block length = 1024 Sun Dec 2 19:23:10 2007 [sg123]
done - sending ACK
Sun Dec 2 19:23:10 2007 [sg123] sg0055dz.x02/XMODEM: 4096 Bytes, 186 BPS
```

Example of comm.log when raw data is transmitted using flow control. This is normally the case if the glider has an newer Iridium modem that is capable of raw data transfer using flow control.

```
Connected at Thu Feb 18 17:26:06 UTC 2016
logged in
0:0:1:0:5:396:0:818:2070:498:-57.37:0.06:10.65:26.00:8.65:42.71 GPS,180216,17151
2,4741.237,-12224.216,16,1.2,16,16.6
ver=66.11,rev=1138,frag=4,launch=020615:151827
Iridium bars: 5 geolocation: 4722.920898,-12220.666992,151208,065115
Thu Feb 18 17:26:19 2016 [sg556] Sending 468 bytes of cmdfile
Thu Feb 18 17:26:19 2016 [sg556] Sent 468 bytes of cmdfile
Thu Feb 18 17:26:44 2016 [sg556] Sending 817 bytes of targets
Thu Feb 18 17:26:44 2016 [sg556] Sent 817 bytes of targets
Thu Feb 18 17:26:53 2016 [sg556] Sending 115 bytes of science
Thu Feb 18 17:26:53 2016 [sg556] Sent 115 bytes of science
Thu Feb 18 17:26:58 2016 [sg556] Sending 14 bytes of pdoscmds.bat
Thu Feb 18 17:26:58 2016 [sg556] Sent 14 bytes of pdoscmds.bat
Thu Feb 18 17:27:08 2016 [sg556] ready to receive st0040pz.000
Thu Feb 18 17:27:10 2016 [sg556] received four size bytes 0 0 1 221
Thu Feb 18 17:27:10 2016 [sg556] Receiving 477 bytes of st0040pz.000
Thu Feb 18 17:27:11 2016 [sg556] Received 477 bytes of st0040pz.000 (353.0 Bps)
Thu Feb 18 17:27:15 2016 [sg556] ready to receive st0040lz.x00
Thu Feb 18 17:27:17 2016 [sg556] received four size bytes 0 0 7 214
Thu Feb 18 17:27:17 2016 [sg556] Receiving 2006 bytes of st0040lz.x00
Thu Feb 18 17:27:22 2016 [sg556] Received 2006 bytes of st0040lz.x00 (371.3 Bps)
Thu Feb 18 17:27:25 2016 [sg556] ready to receive st0040dz.x00
Thu Feb 18 17:27:27 2016 [sg556] received four size bytes 0 0 2 126
Thu Feb 18 17:27:27 2016 [sg556] Receiving 638 bytes of st0040dz.x00
Thu Feb 18 17:27:29 2016 [sg556] Received 638 bytes of st0040dz.x00 (353.9 Bps)
```

```
Thu Feb 18 17:27:36 2016 [sg556] ready to receive st0040kz.x
Thu Feb 18 17:27:38 2016 [sg556] received four size bytes 0 0 48 51
Thu Feb 18 17:27:38 2016 [sg556] Receiving 12339 bytes of st0040kz.x
Thu Feb 18 17:28:13 2016 [sg556] Received 12339 bytes of st0040kz.x (347.9 Bps)
0:0:1:0:5:396:1 logout
Disconnected at Thu Feb 18 17:28:17 UTC 2016
Connected at Thu Feb 18 18:14:20 UTC 2016
logged in
0:1:1:0:5:396:0:818:2070:498:-57.44:0.01:10.77:26.88:8.60:44.68 GPS,180216,18131
2,4741.235,-12224.213,14,1.5,14,16.6
ver=66.11,rev=1138,frag=4,launch=020615:151827
Iridium bars: 5 geolocation: 4722.920898,-12220.666992,151208,065201
Thu Feb 18 18:14:31 2016 [sg556] Sending 468 bytes of cmdfile
Thu Feb 18 18:14:31 2016 [sg556] Sent 468 bytes of cmdfile
Thu Feb 18 18:14:57 2016 [sg556] Sending 817 bytes of targets
Thu Feb 18 18:14:57 2016 [sg556] Sent 817 bytes of targets
Thu Feb 18 18:15:07 2016 [sg556] Sending 115 bytes of science
Thu Feb 18 18:15:07 2016 [sg556] Sent 115 bytes of science
Thu Feb 18 18:15:11 2016 [sg556] Sending 14 bytes of pdoscmds.bat
Thu Feb 18 18:15:11 2016 [sg556] Sent 14 bytes of pdoscmds.bat
Thu Feb 18 18:15:22 2016 [sg556] ready to receive sg0000pz.001
Thu Feb 18 18:15:24 2016 [sg556] received four size bytes 0 0 1 224
Thu Feb 18 18:15:24 2016 [sg556] Receiving 480 bytes of sg0000pz.001
Thu Feb 18 18:15:25 2016 [sg556] Received 480 bytes of sg0000pz.001 (356.4 Bps)
Thu Feb 18 18:15:30 2016 [sg556] ready to receive sg0000kl.x
Thu Feb 18 18:15:32 2016 [sg556] received four size bytes 0 0 18 47
Thu Feb 18 18:15:32 2016 [sg556] Receiving 4655 bytes of sg0000kl.x
Thu Feb 18 18:15:46 2016 [sg556] Received 4655 bytes of sg0000kl.x (344.6 Bps)
0:1:1:0:5:396:1 logout
```

Error code from the last call session (0 no error - non-zero error)
Reboot count (increments each time the glider code is started)
Mission number (increments each time glider is launched)
No-comm count: number of calls since last complete data transfer
Calls made
Call cycle
Dive number

2.2.1 SG Calib Constants

(sg_calib_constants.m)

The "calib constants" file contains calibration information about each of the sensors on the Seaglider. This file is created by the pilot or operator, and exists only on the basestation. It does not have a counterpart on the Seaglider. Except for the compass, all of the Seaglider's sensors come calibrated from the original manufacturer. Their calibration numbers can be found in the notebook delivered with the glider, and should be entered in this file. The compass values are recorded when the Seaglider is fully assembled, and the compass is calibrated in the presence of the batteries and other hardware. The values in this file should be checked, and changed if necessary, whenever new sensors are installed, batteries are changed, or other hardware alterations are made.

The calib_constants file is also used by various visualization tools (MATLAB, , etc.) to plot Seaglider data. Incorrect values in this file will result in incorrect scientific data in the plots.

Example Calibration Constants File

```
% Last edited on 2/5/16 ABC
% Template file for sg_calib_constants.m, Kongsberg Document No. 4000122
% Applies to SG055_trim_sheet_ocean_for_mission_xxx_yyyymmdd.xlsx

% basic glider and mission params
    id_str='055';                  Seaglider serial number
    mission_title='CHANGE THIS!';        Pilot specified, changed for each mission
```

```
    mass=52.620;% kg
    volmax=51786;% cc
    rho0=1027.5;% kg/m3
```

Glider total mass, normally only changed after refurbishment

Volume in cc the glider displaces when fully pumped

Maximum expected density of the operating area

```
% initial hydrodynamic model params
    hd_a=3.83600000E-03;
    hd_b=1.00780000E-02;
    hd_c=9.85000000E-06;
```

Seaglider hydrodynamic coefficients. For advanced piloting the a, b & c parameters can be adjusted for optimized flight performance. Normally done when you have enough flight data for regressions to be performed.

```
% pump parameters
    pump_rate_intercept=1.275;
    pump_rate_slope=-0.00015;
    pump_power_intercept=17.4033;
    pump_power_slope=0.017824;
```

These parameters are determined at the factory and not changed.

The following sections include all calibration constants for the sensors installed on the Seaglider. All potential SerDev sensors are included in the sg_calib_constants.m file, however any sensor that is not actually installed should be commented out (%).

```
% % GPCTD params
    sg_configuration=3; %  selects GPCTD configuration
    calibcomm=' GPCTD Serial #: 0179 CAL: 09-Apr-16'; % Serial # and cal date

% % Seabird CT Sail sensor cal constants
     calibcomm=' Serial #: 141  CAL: 12-Jun-2013';%  Serial # and cal date
      t_g =4.35656288E-03;
      t_h =6.31518467E-04;
      t_i =2.45210333E-05;
      t_j =2.68184128E-06;
      c_g =-9.90412383E+00;
      c_h =1.14226880E+00;
      c_i =-2.09251571E-03;
      c_j =2.42887281E-04;
      cpcor =-9.5700000E-08;
      ctcor =3.2500000E-06;
      sbe_cond_freq_min=2.94983E+00;% kHz, from cal for 0 salinity
      sbe_cond_freq_max=7.64979E+00;% kHz, est for greater than 34.9 sal max T
      sbe_temp_freq_min=2.218246E+00;% kHz, from cal for 1 deg T
      sbe_temp_freq_max=7.177719E+00;% kHz, from cal for 32.5 deg T
```

Calibration constants for the Seabird OEM CT Sail

```
% % Seabird oxygen cal constants
%     comm_oxy_type='SBE_43f';% spec "SBE_43f" or "Pumped_SBE_43f"
%     calibcomm_oxygen='Serial #: 0086  CAL: 29-Mar-2014';%  Serial # and cal date
%     Soc=2.6962E-04;
%     Foffset=-7.9809E+02;
%     o_a=-3.8512E-003
%     o_b=2.0588E-004;
%     o_c=-2.5796E-006;
%     o_e=0.036;
%     Tau20=1.83;
%     Pcor=0;
```

Calibration constants for the Seabird oxygen sensor. For this vehicle this sensor is not installed.

```
% % CONTROS Hydroflash O2 sensor cal constants:
%     comm_oxy_type =' Contros HydroFlash '; % type and model
%     calibcomm_contros_optode =' Serial #: DO-0816-008  CAL: 15-Aug-2016 '; %  Serial # and cal date
%%  Static constants used by all Contros Hydroflash
%     contopt_A_0=5.80871E+00;
%     contopt_A_1=3.20291E+00;
%     contopt_A_2=4.17887E+00;
%     contopt_A_3=5.1006E+00;
%     contopt_A_4=-9.86643E-02;
%     contopt_A_5=3.80369E+00;
%
%     contopt_B_0=-7.01577E-03;
%     contopt_B_1=-7.70028E-03;
%     contopt_B_2=-1.13864E-02;
%     contopt_B_3=-9.51519E-03;
%
```

Calibration constants for CONTROS dissolved oxygen sensor. For this vehicle this sensor is not installed

```
%     contopt_C_0=-2.75915e-07;
%
% %   Contros Hydroflash sensor serial number specific constants for SN: DO-0816-008
% %   they are used to re-compute pO2 using the glider's CTD temp
%     contopt_CC_0=8.13E-03;
%     contopt_CC_1=6.40E-05;
%     contopt_CC_2=2.30E-07;
%     contopt_CC_3=6.36E-04;
%     contopt_CC_4=-5.45E-02;
%     contopt_CC_5=2.05E-02;
%     contopt_CC_6=3.33E-06;

% % Aanderaa 3830 cal constants
%     comm_oxy_type = ' AA3830 ';  % type and model
%     calibcomm_optode = ' Serial #: 21  CAL: 26-Mar-2014 '; % serial # and cal date
%
%     optode_PhaseCoef0=-8.330956E+00;
%     optode_PhaseCoef1=1.269293E+00;
%     optode_PhaseCoef2=0.0;
```

Calibration constants for the Aanderaa model 3830 oxygen sensor. For this vehicle this sensor is not installed

```
%     optode_PhaseCoef3=0.0;
%     optode_C00Coef=4.270193E+03;
%     optode_C01Coef=-1.327236E+02;
%     optode_C02Coef=2.156297E+00;
%     optode_C03Coef=-1.402758E-02;
%
%     optode_C10Coef=-2.297296E+02;
%     optode_C11Coef=5.742421E+00;
%     optode_C12Coef=-6.853578E-02;
%     optode_C13Coef=1.886123E-04;
%
%     optode_C20Coef=5.064016E+00;
%     optode_C21Coef=-9.620849E-02;
%     optode_C22Coef=5.221808E-04;
%     optode_C23Coef=7.708897E-06;
%
%     optode_C30Coef=-5.263322E-02;
%     optode_C31Coef=7.154674E-04;
%     optode_C32Coef=3.311850E-06;
%     optode_C33Coef=-1.861240E-07;
%
%     optode_C40Coef=2.109168E-04;
%     optode_C41Coef=-1.840878E-06;
%     optode_C42Coef=-4.286455E-08;
%     optode_C43Coef=1.111203E-09;

% % Aanderaa cal constants
      comm_oxy_type=' AA4831 '; make and model e.g. AA4831 or AA4330
      calibcomm_optode=' SN: 332  CAL: 13-Feb-2014 ';%  Serial # and cal date

      optode_PhaseCoef0=0.0;
      optode_PhaseCoef1=1.0;
      optode_PhaseCoef2=0.0;
      optode_PhaseCoef3=0.0;
```

Calibration constants for the Aanderaa 4831 oxygen sensor

```
      optode_FoilCoefA0=-2.988314E-06;
      optode_FoilCoefA1=-6.137785E-06;
      optode_FoilCoefA2=0.001684659;
      optode_FoilCoefA3=-0.1857173;
      optode_FoilCoefA4=0.0006784399;
      optode_FoilCoefA5=-5.597908E-07;
      optode_FoilCoefA6=10.40158;
      optode_FoilCoefA7=-0.05986907;
      optode_FoilCoefA8=0.0001360425;
      optode_FoilCoefA9=-4.776977E-07;
      optode_FoilCoefA10=-303.2937;
      optode_FoilCoefA11=2.530496;
      optode_FoilCoefA12=-0.01267045;
      optode_FoilCoefA13=0.0001040454;
```

```
     optode_FoilCoefB0=-3.56039E-07;
     optode_FoilCoefB1=3816.713;
     optode_FoilCoefB2=-44.75507;
     optode_FoilCoefB3=0.4386164;
     optode_FoilCoefB4=-0.007146342;
     optode_FoilCoefB5=8.906236E-05;
     optode_FoilCoefB6=-6.343012E-07;
     optode_FoilCoefB7=0.0;
     optode_FoilCoefB8=0.0;
     optode_FoilCoefB9=0.0;
     optode_FoilCoefB10=0.0;
     optode_FoilCoefB11=0.0;
     optode_FoilCoefB12=0.0;
     optode_FoilCoefB13=0.0;

% % Rinko ARO-FT Dissolved Oxygen Sensor
%    comm_oxy_type = ' Rinko ARO-FT ';
%    calibcomm.aroft.optode =' SN: 0AA1011, CAL: 27-May-2016 ';
%     aroft_c0=3.020188e-03
%     aroft_c1=1.239442e-04
%     aroft_c2=3.275705e-06
%     aroft_d0=5.928457e-04
%     aroft_d1=-1.461642e-01
%     aroft_d2=1.850662e-01
%     aroft_d3=0.000000e+00
%     aroft_d4=0.000000e+00
%     aroft_e0=1.000000e+00
%     aroft_A=-1.274236e+01
%     aroft_B=1.483120e-03
%     aroft_C=-2.661703e-08
%     aroft_D=6.236005e-13
%     aroft_E=-7.944576e-18
%     aroft_F=5.142597e-23
%     aroft_G=0.000000e+00
%     aroft_H=0.000000e+00
```

Calibration constants for the JFE Rinko AROFT dissolved oxygen sensor. For this vehicle this sensor is not installed

```
% % Biospherical PAR Calibration Constants and Device Properties
%     PARCalData_manufacturer='Biospherical Instruments, Inc';% Manufacturer
%     PARCalData_serialNumber=0;%  Serial #
%     PARCalData.calDate='26-May-2011';% cal date
%     PARCalData.darkOffset=10.6;% mv
%     PARCalData.scaleFactor=6.678E+00;% Volts/uE/cm^2sec
```

Calibration constants for the Biospherical Instruments PAR sensor. For this vehicle this sensor is not installed

```
% %  WETLabs wlbb2fl calibration constants.
    WETLabsCalData_wlbb2fl_calinfo = ' SN: BB2FLVMT-1016, CAL: 31-MAR-2014 ';

    % Backscattering cal constants - wavelength 470
    WETLabsCalData.wlbb2fl.Scatter470.wavelength=470;
    WETLabsCalData.wlbb2fl.Scatter470.scaleFactor=1.255E-05;
    WETLabsCalData.wlbb2fl.Scatter470.darkCounts=47;
    WETLabsCalData.wlbb2fl.Scatter470.resolution=1.1;

    % Backscattering cal constants - wavelength 700
    WETLabsCalData.wlbb2fl.Scatter700.wavelength=700;
    WETLabsCalData.wlbb2fl.Scatter700.scaleFactor=3.303E-06;
    WETLabsCalData.wlbb2fl.Scatter700.darkCounts=48;
    WETLabsCalData.wlbb2fl.Scatter700.resolution=1.3;

    % Chlorophyll cal constants
    WETLabsCalData.wlbb2fl.Chlorophyll.wavelength=695;
    WETLabsCalData.wlbb2fl.Chlorophyll.darkCounts=46;
    WETLabsCalData.wlbb2fl.Chlorophyll.scaleFactor=1.3200E-02;
    WETLabsCalData.wlbb2fl.Chlorophyll.maxOutput=4130;
    WETLabsCalData.wlbb2fl.Chlorophyll.resolution=1;
    WETLabsCalData.wlbb2fl.Chlorophyll.calTemperature=21.0;
```

Calibration constants for the WET Labs BB2FL sensor.

```
% % WETLabs wlbb3 calibration constants.
%     WETLabsCalData_wlbb3_calinfo = ' SN: BB3IRB-991, CAL: 01-May-2014 ';
%
%     % Backscattering cal constants - wavelength 532
%     WETLabsCalData.wlbb3.Scatter532.wavelength=532;
%     WETLabsCalData.wlbb3.Scatter532.scaleFactor=7.560E-06;
%     WETLabsCalData.wlbb3.Scatter532.darkCounts=49;
%     WETLabsCalData.wlbb3.Scatter532.resolution=1.5;
%
%     % Backscattering cal constants - wavelength 650
%     WETLabsCalData.wlbb3.Scatter650.wavelength=650;
%     WETLabsCalData.wlbb3.Scatter650.scaleFactor=3.703E-06;
%     WETLabsCalData.wlbb3.Scatter650.darkCounts=43;
%     WETLabsCalData.wlbb3.Scatter650.resolution=1.2;
%
%     % Backscattering cal constants - wavelength 880
%     WETLabsCalData.wlbb3.Scatter880.wavelength=800;
%     WETLabsCalData.wlbb3.Scatter880.scaleFactor=2.139E-06;
%     WETLabsCalData.wlbb3.Scatter880.darkCounts=60;
%     WETLabsCalData.wlbb3.Scatter880.resolution=1.3;
```

Calibration constants for the WET Labs BB3 sensor. For this vehicle this sensor is not installed

```
% % WETLabs wlbbfl2 calibration constants.
    WETLabsCalData_wlbbfl2_calinfo = ' SN: BBFL2VMT-402, CAL: 03-Apr-2014 ';

    % Backscattering cal constants - wavelength 650
    WETLabsCalData.wlbbfl2.Scatter650.wavelength=650;
    WETLabsCalData.wlbbfl2.Scatter650.scaleFactor=3.869E-06;
    WETLabsCalData.wlbbfl2.Scatter650.darkCounts=50;
    WETLabsCalData.wlbbfl2.Scatter650.resolution=1.8;

    % Chlorophyll cal constants
    WETLabsCalData.wlbbfl2.Chlorophyll.wavelength=695;
    WETLabsCalData.wlbbfl2.Chlorophyll.darkCounts=48;
    WETLabsCalData.wlbbfl2.Chlorophyll.scaleFactor=1.1400E-02;
    WETLabsCalData.wlbbfl2.Chlorophyll.maxOutput=4123;
    WETLabsCalData.wlbbfl2.Chlorophyll.resolution=1.0;
    WETLabsCalData.wlbbfl2.Chlorophyll.calTemperature=21.0;

    % CDOM cal constants
    WETLabsCalData.wlbbfl2.CDOM.wavelength=460;
    WETLabsCalData.wlbbfl2.CDOM.maxOutput=4123;
    WETLabsCalData.wlbbfl2.CDOM.scaleFactor=1.785E-01;
    WETLabsCalData.wlbbfl2.CDOM.darkCounts=46;
    WETLabsCalData.wlbbfl2.CDOM.resolution=1.5;
    WETLabsCalData.wlbbfl2.CDOM.calTemperature=21.0;
```

Calibration constants for the WET Labs BBFL2 sensor.

```
% % WETLabs wlfl3 calibration constants.
%     WETLabsCalData_wlfl3_calinfo = ' SN: FL3IRB-2884, CAL: 30-Apr-2014 ';
%
%     % Chlorophyll cal constants ug/l/count
%     WETLabsCalData.wlfl3.Chlorophyll.wavelength=695;
%     WETLabsCalData.wlfl3.Chlorophyll.darkCounts=38;
%     WETLabsCalData.wlfl3.Chlorophyll.scaleFactor=1.2000E-02;
%     WETLabsCalData.wlfl3.Chlorophyll.maxOutput=4130;
%     WETLabsCalData.wlfl3.Chlorophyll.resolution=1;
%     WETLabsCalData.wlfl3.Chlorophyll.calTemperature=21.0;
%
%     % CDOM cal constants ppb/count
%     WETLabsCalData.wlfl3.CDOM.wavelength=460;
%     WETLabsCalData.wlfl3.CDOM.maxOutput=4130;
%     WETLabsCalData.wlfl3.CDOM.scaleFactor=9.8400E-02;
%     WETLabsCalData.wlfl3.CDOM.darkCounts=49;
%     WETLabsCalData.wlfl3.CDOM.resolution=1.0;
%     WETLabsCalData.wlfl3.CDOM.calTemperature=21.0;
%
%     % Phycoerythrin cal constants ppb/count
%     WETLabsCalData.wlfl3.Phycoerythrin.wavelength=570;
%     WETLabsCalData.wlfl3.Phycoerythrin.maxOutput=4130;
%     WETLabsCalData.wlfl3.Phycoerythrin.scaleFactor=4.3200E-02;
```

Calibration constants for the WET Labs FL3 sensor options. For this vehicle this sensor is not installed

```
%      WETLabsCalData.wlfl3.Phycoerythrin.darkCounts=46;
%      WETLabsCalData.wlfl3.Phycoerythrin.resolution=1.0;
%      WETLabsCalData.wlfl3.Phycoerythrin.calTemperature=21.0;
%
%      % Uranine cal constants ppb/count - wavelength 530 nm
%      WETLabsCalData.wlfl3.Uranine.wavelength=530;
%      WETLabsCalData.wlfl3.Uranine.maxOutput=4130;
%      WETLabsCalData.wlfl3.Uranine.scaleFactor=4.3200E-02;
%      WETLabsCalData.wlfl3.Uranine.darkCounts=46;
%      WETLabsCalData.wlfl3.Uranine.resolution=1.0;
%      WETLabsCalData.wlfl3.Uranine.calTemperature=21.0;
%
%      % Rhodamine cal constants ppb/count - wavelength 570 nm
%      WETLabsCalData.wlfl3.Rhodamine.wavelength=570;
%      WETLabsCalData.wlfl3.Rhodamine.maxOutput=4130;
%      WETLabsCalData.wlfl3.Rhodamine.scaleFactor=4.3200E-02;
%      WETLabsCalData.wlfl3.Rhodamine.darkCounts=46;
%      WETLabsCalData.wlfl3.Rhodamine.resolution=1.0;
%      WETLabsCalData.wlfl3.Rhodamine.calTemperature=21.0;
%
%      % Phycocyanin cal constants ppb/count - wavelength 680 nm
%      WETLabsCalData.wlfl3.Phycocyanin.wavelength=680;
%      WETLabsCalData.wlfl3.Phycocyanin.maxOutput=4130;
%      WETLabsCalData.wlfl3.Phycocyanin.scaleFactor=4.3200E-02;
%      WETLabsCalData.wlfl3.Phycocyanin.darkCounts=46;
%      WETLabsCalData.wlfl3.Phycocyanin.resolution=1.0;
%      WETLabsCalData.wlfl3.Phycocyanin.calTemperature=21.0;

% % WETLabs SeaOWL calibration constants.
%      WETLabsCalData_wlseaowl_calinfo = ' SN: SEAOWL2K-011, CAL: 12-SEPT-2016 ';
%
%      % Backscattering cal constants - wavelength 700
%      WETLabsCalData.wlseaowl.Scatter700.wavelength=700;
%      WETLabsCalData.wlseaowl.Scatter700.scaleFactor=2.521E-07;
%      WETLabsCalData.wlseaowl.Scatter700.darkCounts=48;
%      WETLabsCalData.wlseaowl.Scatter700.maxOutput=4.03e-02
%
%      % Chlorophyll cal constants
%      WETLabsCalData.wlseaowl.Chlorophyll.wavelength=690;
%      WETLabsCalData.wlseaowl.Chlorophyll.darkCounts=49;
%      WETLabsCalData.wlseaowl.Chlorophyll.scaleFactor=1.601E-03;
%      WETLabsCalData.wlseaowl.Chlorophyll.maxOutput=4130;
%      WETLabsCalData.wlseaowl.Chlorophyll.resolution=1.5;
%
%      % FDOM cal constants
%      WETLabsCalData.wlseaowl.FDOM.wavelength=460;
%      WETLabsCalData.wlseaowl.FDOM.maxOutput=1270;
%      WETLabsCalData.wlseaowl.FDOM.scaleFactor=7.935e-03;
%      WETLabsCalData.wlseaowl.FDOM.darkCounts=49;
%      WETLabsCalData.wlseaowl.FDOM.resolution=1.6;
```

Calibration constants for the WET Labs SeaOWL sensor.
For this vehicle this sensor is not installed

```
% % WETLabs wlflntu calibration constants.
%     WETLabsCalData.wlflntu.calinfo = ' SN: FLNTUIRB - 4409, CAL: 20-July-2016 ';
%
%      Chlorophyll cal constants - wavelength 695 nm
%       WETLabsCalData.wlflntu.Chlorophyll.wavelength=695;
%       WETLabsCalData.wlflntu.Chlorophyll.darkCounts=55;
%       WETLabsCalData.wlflntu.Chlorophyll.scaleFactor=1.2100E-02;
%       WETLabsCalData.wlflntu.Chlorophyll.maxOutput=4130;
%       WETLabsCalData.wlflntu.Chlorophyll.resolution=1.2;
%       WETLabsCalData.wlflntu.Chlorophyll.calTemperature=22.3;
%
%      NTU cal constants - wavelength 700 nm
%       WETLabsCalData.wlflntu.NT.wavelength=700;
%       WETLabsCalData.wlflntu.NT.maxOutput=4130;
%       WETLabsCalData.wlflntu.NT.scaleFactor=6.1000E-02;
%       WETLabsCalData.wlflntu.NT.darkCounts=50;
%       WETLabsCalData.wlflntu.NT.resolution=1.1;
%       WETLabsCalData.wlflntu.NT.calTemperature=22.3;
```

Calibration constants for the WET Labs FLNTU sensor.
For this vehicle this sensor is not installed

2.2.1 Pagers File

(.pagers)

The "dot pagers" file controls the automatic notification system. It allows any of several types of messages to be sent to any valid email address: gps, alerts, comp, critical and recov (see below). This service is run by the data conversion script, which is invoked by a glider logout or disconnection. Lines beginning with a # are comment lines, and are ignored in processing.

```
# Joe Smith
# joe@gmail.com,gps,alerts,recov
jsmith@apl.washington.edu,recov
2065551234@messaging.sprintpcs.com,recov
# Jane Jones
jsmith@kongsberg.com,gps,alerts,recov,comp,critical
```

Joe Smith will receive emails to his APL account, and text messages to his Sprint phone, but will not receive messages to his gmail account.

- critical: A warning sent when various glider performance parameters are out of spec
- comp: Sent when the basestation has completed data processing from the latest dive
- recov: If the glider goes into recovery, send the most recent GPS position and the recov code.
- alerts: Send an alert when the basestation has a problem converting a file or files.
- gps: After every dive, send the most recent GPS position and, if the glider is in recovery, the recov code.

```
#2063335555@vtext.com,gps,alerts,recov
#2061239999@vtext.com,gps,alerts
#Iridium Phone
#881645559999@msg.iridium.com,gps
```

2.2.2 .URLS

(.urls)

The "Dot URLs" file is read by the basestation, following processing of dive data (triggered by a Seaglider logout). It specifies URLs on which to run GET for each processed dive. This can be used for any supported httpd function, and is mainly used to poll for data transfers to support visualization servers. The first entry on the line is the timeout (in seconds) to wait for a response to the GET. It is separated from the URL by a tab. convert.pl adds arguments "instrument_name=sg& dive=" with the proper separator. Comments in the file are indicated by a #

Example .urls file

```
1   sgbase99.kongsberg.com/~glider/cgi-bin/update.cgi
```

2.2.3 Basestation Log

(baselog_hhmmssddmmyy, baselog.log)

The baselog_ file is produced by the basestation, and logs the output from the scripts that perform the data conversion and notification functions of the basestation. It is written during each invocation. The file name includes the hours, minutes, seconds, day, month and year for time and date as kept on the basestation.

This file is the first place to look when debugging problems with the data conversion. If the basestation cannot process a file, it sends an alert to any contact listed in the .pagers file that is designated for “alerts”.

Example baselog_ file

```
16:47:37 03 Feb 2016 UTC: INFO: BaseLog.py(77): Process id = 6727
16:47:37 03 Feb 2016 UTC: INFO: Utils.py(659): Base station version 2.8-R6
16:47:37 03 Feb 2016 UTC: INFO: Utils.py(662): Python version 2.7.3
16:47:37 03 Feb 2016 UTC: INFO: Utils.py(671): Numpy version 1.6.2


16:47:37 03 Feb 2016 UTC: INFO: Utils.py(680): Scipy version 0.9.0
16:47:37 03 Feb 2016 UTC: INFO: Base.py(1348): Invoked with command line [/usr/local/basestation/Base.py --
mission_dir . --verbose --make_dive_profiles --daemon --domain_name=sogpress.org --base_log
baselog_160203164737 ]
16:47:37 03 Feb 2016 UTC: INFO: Base.py(1350): PID:6734
16:47:37 03 Feb 2016 UTC: WARNING: BaseNetCDF.py(1292): Replacing nc metadata for sg_data_point_dive_number
16:47:37 03 Feb 2016 UTC: INFO: Base.py(1392): Started processing 16:47:37 03 Feb 2016 UTC
16:47:37 03 Feb 2016 UTC: INFO: Base.py(1418): Instrument ID = 619
16:47:37 03 Feb 2016 UTC: INFO: Base.py(902): Starting processing on .pagers for  gps recov critical
16:47:37 03 Feb 2016 UTC: INFO: Base.py(914): Processing .pagers line (4253877122@txt.att.net,gps)
16:47:37 03 Feb 2016 UTC: INFO: CommLog.py(51): prefix:dive:0 calls_made:1 call_cycle:0
16:47:37 03 Feb 2016 UTC: INFO: Base.py(976): Sending GPS (dive:0 calls_made:1 call_cycle:0 4741.2390 -
12224.2100 02/03/16 16:31:39 UTC) to 4253877122@txt.att.net
16:47:37 03 Feb 2016 UTC: INFO: Base.py(914): Processing .pagers line (lizcreed@gmail.com,gps,recov,alerts)
16:47:37 03 Feb 2016 UTC: INFO: CommLog.py(51): prefix:dive:0 calls_made:1 call_cycle:0
16:47:37 03 Feb 2016 UTC: INFO: Base.py(976): Sending GPS (dive:0 calls_made:1 call_cycle:0 4741.2390 -
12224.2100 02/03/16 16:31:39 UTC) to lizcreed@gmail.com
16:47:37 03 Feb 2016 UTC: INFO: CommLog.py(51): prefix:dive:0 calls_made:1 call_cycle:0
16:47:37 03 Feb 2016 UTC: INFO: Base.py(992): Finished processing on .pagers
16:47:37 03 Feb 2016 UTC: INFO: Base.py(1459): Processing comm_merged.log
16:47:37 03 Feb 2016 UTC: INFO: Base.py(1479): Finished processing comm_merged.log
```

The baselog.log is an accumulation of all of the basestation conversions reported in the baselog_ files, without the timestamps.

2.3 On-board Glider Information

This section includes files that are stored on the Seaglider. Most of the information in these files is used by the glider in calculations regarding navigation and energy usage.

2.2.6 Processed Files Cache

(processed_files.cache)

This file contains the dives that have been processed and the time of processing. To force a file to be re-processed, delete the corresponding line from this file. Comment lines are indicated by a #.

Example processed_files.cache

```
# Written 14:54:28 23 Feb 2008 UTC
st0007pz.000, 19:05:58 21 Feb 2008 UTC
sg0000kl, 14:54:28 23 Feb 2008 UTC
st0007du, 19:05:58 21 Feb 2008 UTC
st0007lu, 19:05:58 21 Feb 2008 UTC
st0009du, 19:40:22 21 Feb 2008 UTC
st0009kz, 19:16:44 21 Feb 2008 UTC
st0009lu, 19:37:51 21 Feb 2008 UTC
st0010du, 20:21:33 21 Feb 2008 UTC
st0010kz, 20:15:35 21 Feb 2008 UTC
st0010lu, 20:15:34 21 Feb 2008 UTC
st0011du, 14:54:28 23 Feb 2008 UTC
st0011kz, 14:30:35 23 Feb 2008 UTC
st0011lu, 14:30:35 23 Feb 2008 UTC
```

2.3.1 Bathymap

When the bathymetry map-reading function of the glider is enabled, this file contains the map. It is usually uploaded to the Seaglider's compact flash before deployment, but may be uploaded in the field if necessary.

Map files provide the glider with geographic (and sometimes temporal) environmental information. A bathymetry map provides the glider with bathymetry data about a given region of the ocean. The glider may carry up to 999 bathymetry maps (the files are named bathymap.000), but in practice far fewer are on board. These maps are not required for gliders to fly. For more details on how bathymetry maps are used, see the Navigation section of the Seaglider User's Guide.

Both kinds of maps contain a fixed-size header, followed by a variable-length data section. The header is defined as follows:

```
117 225 -123.00000  36.00000 500 0.0 0.0
```

Optional entry: end date, in decimal yeardays, for period of map use. When blank or 0.0, no date checking is performed.

Optional entry: start date, in decimal yeardays, for period of map use. When blank or 0.0, no date checking is performed.

Integer distance between grid points in meters

Longitude of the lower left corner of the map, specified in decimal degrees; positive East

Latitude of the lower left corner of the map, specified in decimal degrees; positive North

Number of columns in the data section

Number of rows in the data section

For a bathymetry map, the data section contains the depth of the bottom at each grid point, expressed in integer meters. The data is stored in column major order.

2.3.2 Battery File

(BATTERY)

The Battery File is used by the glider to keep track of power consumption by subsystems throughout the time the glider is using the battery pack. The Battery File is not intended to be edited by the user.

Example battery file

```
Pitch_motor 3041.069
```

Amp seconds drawn by this device since the battery pack power tracking was initiated

See $DEVICES and $SENSORS in the Log File section of this document.

```
VBD_pump_during_apogee 216074.641
VBD_pump_during_surface 82015.531


VBD_valve 0.000
Iridium_during_init 17540.021
Iridium_during_connect 9597.448
Iridium_during_xfer 48699.711
Transponder_ping 873.774
Mmodem_TX 0.000
Mmodem_RX 0.000
```

```
GPS 5227.668
TT8 11375.065
LPSleep 3565.161
TT8_Active 9204.906
TT8_Sampling 30932.490
TT8_CF8 25142.061
TT8_Kalman 2861.964
Analog_circuits 10045.106
GPS_charging 0.000
Compass 5552.722
RAFOS 0.000
Transponder 126.060
SBE_CT 5738.196
SBE_O2 4966.481
WL_BB2F 59876.422

Pitch_motor 165.697
Roll_motor 37.766
VBD_pump_during_apogee 3707.590
VBD_pump_during_surface 2301.392
VBD_valve 0.000
Iridium_during_init 281.459
Iridium_during_connect 602.443
Iridium_during_xfer 2647.719
Transponder_ping 25.725
GUMSTIX_24V 0.000
GPS 120.445
TT8 420.877
LPSleep 47.792
TT8_Active 184.559
TT8_Sampling 2098.736
TT8_CF8 141.948
TT8_Kalman 0.000
Analog_circuits 450.930
GPS_charging 0.000
Compass 462.710
RAFOS 0.000
Transponder 11.701
Compass2 0.000
SBE_CT 169.183
AA4330 445.621
WL_BBFL2 875.208
```

2.3.3 Compass Calibration File
(TCM2MAT.XXX)

The compass is calibrated in the assembled glider, to account for effects of the metal on the compass readings. This file is initially generated and stored on the glider by the manufacturer, and is not intended to be edited by the user. After each battery refurbishment the compass should be calibrated again. The compass calibration can also be done by the user on land prior to a mission or in the water during a mission. Refer to the compass calibration procedures for details.

The naming convention for the compass calibration file is tcm2mat.xxx where xxx is the glider's three digit serial number. A glider will only recognize a compass calibration file with this name followed by that specific glider's serial number.

Example Compass Calibration File

```
"SG506 whirly compass cal using 506composcal04062016 collected at OSB Highbay on 3/4/2016 for SN K895 (IGRF = 539.042)"
 0.0000  1.0000  0.0000  0.0000
 0.0000  1.0000  0.0000  0.0000
 0.9882 -0.0082  0.0049 -0.0004  1.0502 -0.0068 -0.0004 -0.0036  1.0376 22.7895 23.2452 23.1456
```

2.3.4 Capvec File

The Capvec File is parsed by the glider and updates one or more elements of the Capture Vector. Normally, this file is not used except for glider provisioning. See the capvec and parse_capvecfile commands in Extended PicoDOS Reference Manual for details on updating the Capture Vector, and the section Capture Files in the Seaglider User's Guide for details how and when to use capture files. The Capvec File is a line oriented format. Lines may be comment lines, in which case the first character must be a /.

2.4 Command and Control Files

These files are created by the pilot to control the Seaglider mission characteristics. Formats are given here, but usage of these files is discussed in the Seaglider User's Guide.

2.4.1 Targets File
(targets)

The Pilot creates the targets file. One target is listed per line, and the target name must be listed first. The order of the other fields does not matter. Comments can be included, preceded by a /.

SEVEN	**lat=4807.0**	**lon=-12223.0**	**radius=200**	**goto=SIX**
SIX	**lat=4806.0**	**lon=-12222.0**	**radius=200**	**goto=FIVE**
FIVE	**lat=4805.0**	**lon=-12221.0**	**radius=200**	**goto=EIGHT**
FOUR	**lat=4804.0**	**lon=-12220.0**	**radius=200**	**goto=EIGHT**
EIGHT	**lat=4808.0**	**lon=-12224.0**	**radius=200**	**goto=KAYAKPT**
KAYAKPT	**lat=4808.0**	**lon=-12223.0**	**radius=100**	**goto=KAYAKPT**
Target name - this can be any string of numbers and/or letters, without whitespace.	Latitude, in +/-ddmm.m; positive North	Longitude, in +/-dddmm.m; positive East	Radius, in meters, within which the Seaglider determines it has reached the target	Next target - this target name must be specified in the Target column

2.4.1 Science File

(science)

This file, created by the pilot, contains instructions for the Seaglider about when to sample with the scientific instruments. Comment lines are indicated by a / and columns are separated by tabs.

Example Science File

```
// Science for Port Susan

/depth time sample gcint profile
  20    5    110    60    333
  50    10   110    180   312
  200   10   120    300   330
```

The bottom limit of each depth bin

The most frequent sample interval in this depth bin

Each digit in this column corresponds to one sensor. Sensors and sensor order vary by Seaglider. Consult $SENSORS in the Log File. Multiply this digit by the number in the time column to calculate how often this sensor should sample in this depth bin.

The time interval on which the guidance and control sensors should sample during the GC phase. These values differ from regular sampling times for the sake of energy conservation. See the User's Guide for more information.

Each digit in this column corresponds to one sensor and specifies if the sensor is sampled on the downcast only (1), the up-cast only (2) or both the downcast and the up-cast (3) column to calculate how often this sensor should sample in this depth bin. Sensors and sensor order vary by Seaglider.

This row indicates that from the surface (0 meters) to 20 meters, the first and second sensors should sample every 5 seconds. The third sensor should be turned off. During GC, all GC sensors should sample every 60 seconds. The data for all three sensors is collected on the down and up-casts.

This row indicates that from 20 meters to 50 meters, the first and second sensors should sample every 10 seconds. The third sensor should be turned off. During GC, all GC sensors should sample every 180 seconds. The first sensor is sampled on the down and up-casts. The second sensor is sampled on the downcast only and the third sensor is sampled on the up-cast only.

This row indicates that from 50 meters to 200 meters, the first sensor should sample every 10 seconds, the second sensor should sample every 24 seconds and the third sensor should be turned off. During GC, all GC sensors should sample every 300 seconds. The first and second sensors are sampled on both the down and up-casts. The third sensor is not sampled on either the down or up cast.

2.4.2 Pdos Commands File

(pdoscmds.bat)

The file pdoscmds.bat is created by the pilot, and uploaded to the Seaglider. It is used as needed by the pilot to, among other things, request the glider resend data from a dive, request present battery voltage, control level of verbosity of information generated in the capture (.cap) file, and send a new file to the glider . See the Seaglider User's Guide and Extended PicoDOS Reference Manual for information.