



KONGSBERG

Seaglider Basestation

Users Guide

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Kongsberg Underwater Technology, Inc.

19210 33rd Avenue West, WA 98036-4707 Lynnwood United States of America

Telephone +1 425 712 1107 Telefax +1 425 712 1197 <http://www.km.kongsberg.com>

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Table of contents

1	OVERVIEW.....	4
2	ACRONYMS, ABBREVIATIONS, AND DEFINITIONS.....	5
3	REFERENCED DOCUMENTS.....	6
4	FLYING THE SEAGLIDER.....	7
4.1	Seaglider User Account and Control Files.....	7
4.2	Pilot User Accounts	7
4.3	Reviewing Seaglider Dive Behavior.....	8
4.3.1	Piloting Tools.....	8
4.3.2	Log file.....	8
4.3.3	Capture file.....	8
4.3.4	Communications file.....	8
4.3.5	Pilot Notifications	8
5	BASESTATION DATA PROCESSING	9
5.1	Basestation log file.....	9
5.2	Basestation Processing Options	9
5.3	Specifying Processing Options	9
5.4	Reprocessing Data	10
5.5	Resending Seaglider Data	10
5.6	Automatic FTP Delivery of Processed Data.....	11
6	CREATING SEAGLIDER AND PILOT USER ACCOUNTS.....	12
6.1	Creating Seaglider User Accounts	12
6.2	Creating Pilot User Accounts.....	12

1 OVERVIEW

The basestation is a required part of the Seaglider system. The basestation allows the pilot to control the Seaglider while it is deployed at sea. The basestation also allows the Seaglider to upload the data files it has collected while deployed so that the data can be processed.

The basestation operation is designed around the following philosophy:

Each Seaglider has its own user account and password on the basestation. It has read and write access only to its home directory.

During a deployment, the glider uses this account to log in and upload data files to its home directory.

When the glider logs in and out, scripts are executed that invoke programs on the basestation to process the glider's data files into ASCII and NetCDF formats for subsequent analysis.

The Seaglider pilot also has an account on the basestation. The pilot controls the glider's operation by editing the cmdfile, targets, and science files in the glider's home directory. After it logs in, the glider downloads these files and processes their contents in order to determine how deep it should dive, in what direction to navigate, and how often to sample its suite of sensors.

The basestation also has an Administrator account. The Administrator can add and remove Seaglider and pilot accounts as well as modify how Seaglider data is processed.

2 ACRONYMS, ABBREVIATIONS, AND DEFINITIONS

Term	Definition
nc	File extension for NetCDF files. Used as abbreviation to denote a netCDF file.
VBD	Variable Buoyance Device. This is the mechanism by which the Seaglider dives and surfaces.

3 REFERENCED DOCUMENTS

- Seaglider User Guide
- Seaglider File Formats Manual
- Extended PicoDOS Reference Manual
- Basestation Delivery Document
- Seaglider Piloting Tools User Guide

4 FLYING THE SEAGLIDER

4.1 Seaglider User Account and Control Files

If your basestation was provided by Kongsberg, then an account may have already been created for your Seaglider. Refer to the Basestation Delivery Document which accompanied your basestation for the Seaglider's password.

If you are installing your own basestation, follow the instructions in Section 6 below to "commission", i.e. create an account for, your Seaglider.

The Seaglider control files allow the pilot to manage the glider's dive behavior, navigation, and sensor data collection while it is deployed.

These control files - named cmdfile, targets, science, and pdoscmds.bat, are all edited on the basestation by the pilot and uploaded to the Seaglider when it logs in. The usage and formats of these files are described in the Seaglider User Guide and the Seaglider File Formats Manual.

The cmdfile specifies how the glider should perform during its dive. The parameters in the cmdfile determine the glider's dive angle, speed, and the maximum depth to be reached.

The targets file lists the Latitude and Longitude of waypoints that the glider should navigate towards.

The science file contains instructions for the Seaglider about when the scientific instruments should be sampled.

The pdoscmds.bat file is edited on the basestation by the pilot, and uploaded to the Seaglider when it logs in. It allows the pilot to remotely execute PicoDOS commands on the glider in order to change the glider's settings. See the Extended PicoDOS Reference Manual for details on how to use this file and what commands are available.

4.2 Pilot User Accounts

Each person that will be piloting the glider must have an account on the basestation. If your basestation was provided by Kongsberg, then a default pilot account was created for you. The user name and password for this account are listed in the Basestation Delivery Document which accompanied your Basestation. This default pilot account is provided so that you can immediately use your basestation.

If you are installing your own basestation or have more than one person piloting your Seaglider, you should follow the instructions in Section 6 below and create a user account for each person who will be piloting.

4.3 Reviewing Seaglider Dive Behavior

After each dive, the Seaglider uploads data files and log files recorded during the dive. The basestation automatically processes these files into ASCII and NetCDF file formats. This processing requires that a file name `sg_calib_constants.m` be present in the Seaglider's home directory. This file is created by Kongsberg specifically for that Seaglider and should not be modified.

4.3.1 Piloting Tools

The Piloting Tools program reads the NetCDF file and generates plots of the Seaglider's flight behavior for that dive. The pilot reviews these plots to verify that the Seaglider is flying in the desired manner. See the Seaglider Piloting Tools User Guide for instructions on using the Piloting Tools.

4.3.2 Log file

One ASCII log file (with a `.log` extension) is created for each dive. This file contains a list of all of the Seaglider's parameters and their values, as well as a list of all motor (i.e. pitch, roll, VBD) actions occurring during the dive. The contents of this file are described in the Seaglider User Guide and the Seaglider File Formats Manual.

4.3.3 Capture file

A capture (with a `.cap` extension) file is a detailed list of all the actions taken by the Seaglider during the dive. It is used mostly to diagnose error conditions. It is generally much larger than the Log file, and is only uploaded to the basestation if the `cmdfile` contains the `'$CAPUPLOAD,1'` parameter. See the Seaglider User Guide and the Seaglider File Formats Manual for when it is appropriate to upload this file.

4.3.4 Communications file

This file, `comm.log`, contains a history of all login, logout, and file transfer activity of the Seaglider. It resides in the Seaglider's home directory. The contents of this file are described in the Seaglider User Guide and the Seaglider File Formats Manual.

4.3.5 Pilot Notifications

The basestation can automatically send notifications regarding the Seaglider's GPS position or state to the pilot via email or text message. The `.pagers` file in the Seaglider's home directory controls this behavior. See the Seaglider User Guide and the Seaglider File Formats Manual for details. Note that to send emails, the basestation must have a domain name and its DNS records must indicate that it is an email server.

5 BASESTATION DATA PROCESSING

5.1 Basestation log file

While processing Seaglider data, the basestation keeps its own log of its activities in a file named `baselog.log`. This file is added to every time the Seaglider logs in, and so can become quite large. A separate log file is also generated each time the Seaglider logs in which logs only the activities for that instance. These files are named `baselog.YYMMDDHHMMSS`, where `YYMMDD` are the year, month, and day, and `HHMMSS` the hour (GMT), minute, and second of the Seaglider's log in. Both types of files generally are only reviewed in the case of a processing problem.

5.2 Basestation Processing Options

By default, the basestation will process Seaglider data into dive profiles and store them in a NetCDF file, which can be viewed in the Piloting Tools. For special cases, however, a number of processing options are available.

Option	Output
<code>--make_dive_profiles</code>	This is the default. Each dive will be processed into a single NetCDF output file.
<code>--make_dive_pro</code>	This will create an ASCII output file with a <code>.pro</code> extension which contains information from the <code>.log</code> file, quality control information, and data from the <code>.eng</code> file.
<code>--make_dive.bpo</code>	This will create an ASCII output file with a <code>.bpo</code> extension which contains information from the <code>.log</code> file, quality control information, and data from the <code>.eng</code> file, combined into depth bins. The size of the depth bins (in meters) is specified by the <code>--bin_width</code> option. If no <code>--bin_width</code> option is provided, then 5 meters is used.
<code>--bin_width</code>	Specifies the bin size (in meters) to use for binned output. Example: <code>--bin_width=2</code>
<code>--make_mission_timeseries</code>	This will process a group of dives and generate a single NetCDF output. Each dive variable (e.g. depth, salinity) in the NetCDF file will contain the combined data from all of the dives.

5.3 Specifying Processing Options

Each Seaglider has a `.logout` file in its home directory. The default contents of this file are shown below:

```
#set GLIDER_OPTIONS="-- make_mission_timeseries"
source /usr/local/basestation/glider_logout
```

This default configuration will simply execute the basestation's `glider_logout` script, which will generate a NetCDF file containing dive profiles. Un-commenting the `GLIDER_OPTIONS` line will modify how the basestation processes this Seaglider's data, depending on which option is specified between the quotes.

If you have more than one Seaglider, and want to apply the same processing option to all of the Seagliders, you can edit the `/usr/local/basestation/glider_logout` file and insert the desired option after the `--daemon` part of the following line:

```
python /usr/local/basestation/Base.py --mission_dir . --verbose --make_dive_profiles --
daemon --domain_name=sogpress.org --base_log baselog_`date +%y%m%d%H%M%S`
$GLIDER_OPTIONS >>&! baselog.log
```

5.4 Reprocessing Data

To re-process a dive and re-create the NetCDF file, use the `Reprocess.py` script. You will need to have a terminal open on the basestation and in the Seaglider's home directory. Type the following command, replacing the characters `DIVENUM` with the dive number to reprocess:

```
python /usr/local/basestation/Reprocess.py DIVENUM --mission_dir .
```

The `Reprocess.py` script also accepts the processing options listed in the table above.

5.5 Resending Seaglider Data

Satellite communication problems sometimes prevent the basestation from receiving dive data files from the Seaglider. Those missing files can be obtained by using the `resend_dive` command in the `pdoscmds.bat` file. Create the `pdoscmds.bat` file if necessary in the Seaglider's home directory and add the following line, replacing the characters `DIVENUM` with the dive number to be re-sent:

```
resend_dive DIVENUM
```

This command will re-send all of the files that would have been sent by the glider. The dive can then be processed using the `Reprocess.py` command above.

The `resend_dive` command has options that allow only a specific type of file to be re-sent. The `'/c '` option, as shown below, will send the capture file for the dive, regardless of the value of the `$CAPUPLOAD` parameter.

```
resend_dive /c DIVENUM
```

Similarly, the `'/l '` (lower-case letter l) option will re-send only the log file for the dive, and the `'/d '` option will re-send only the data file for the dive.

The `resend_dive` command will not work with logger files, but the `xs` command works fine in the `pdoscmd.bat` file to upload any file on the Seaglider to the basestation via xmodem. If the logger file has not already been uploaded, it will end with an extension of `".x"` (e.g. `se0100az.x`). If the logger file has previously been uploaded, it will have an extension of `".a"` (e.g. `se0100az.a`).

5.6 Automatic FTP Delivery of Processed Data

After the Seaglider logs out and any new data files are processed, the basestation can deliver the processed data to other computers via FTP. The type of files to be delivered is specified with the File Type Code in the table below.

File Type Code	Description
nc	the NetCDF file(s) created by default
pro	the ASCII output file(s) created by the --make_dive_pro processing option
bpo	the ASCII output file(s) created by the --make_dive.bpo processing option
mission_ts	the NetCDF file created by the --make_mission_timeseries
comm	the comm.log file
cap	the capture (.cap) file(s)
log	the log (.log) file(s)
asc	the ASCII (.asc) file(s), which are the raw data (DAT) files created on the Seaglider.
eng	the ASCII engineering (.eng) file(s), which contain the raw data converted to engineering units

To deliver data files with FTP, you must already have an FTP user account on the computer that will be receiving the data files. Edit the .ftp file in the Seaglider's home directory and add the following line:

```
USERNAME:PASSWORD@HOST:22/PATH FILETYPE
```

Replace USERNAME and PASSWORD with your FTP user account information, replace HOST with the IP address or domain name of the target computer, replace PATH with a directory on that computer where you have write permissions, and replace FILETYPE with one or more of the File Types Codes in the table above. Each File Type Code should be separated by commas, but with no spaces between the Code and the commas.

6 CREATING SEAGLIDER AND PILOT USER ACCOUNTS

6.1 Creating Seaglider User Accounts

The process of creating and initializing a Seaglider user account is called "commissioning". The basestation provides a script that performs all the necessary actions.

This script can only be executed by the Administrator user. If your basestation was provided by Kongsberg, then the user name and password for the Administrator account is listed in the Basestation Delivery Document which accompanied your basestation.

To commission a new Seaglider, log in to the basestation as the Administrator user, then open a terminal. In the terminal, type the following command:

```
cd /usr/local/basestation
```

The following command will then commission the glider. Your new Seaglider has a unique 3-digit identification number, such as '123'. Replace the letters 'ID' in the command with your Seaglider's 3-digit identification number.

```
sudo python ./Commission.py ID
```

This command will create a new Seaglider user account with a home directory of /home/sgID, where the letter 'ID' are replaced with your Seaglider's 3-digit identification number. The command will also automatically create a password for the new account and write that password to a file named password.txt in the new home directory.

If you want to specify a password to be used for the new account instead of using an auto-generated one, use the following command line and replace the letters 'PWD' with the password and the letters 'ID' with your Seaglider's 3-digit identification number.

```
sudo python ./Commission.py --glider_password PWD ID
```

6.2 Creating Pilot User Accounts

Log in to the basestation as the Administrator user, then open a terminal. In the terminal, type the following command, replacing the letters 'USR' with the name the new pilot user should log in with:

```
sudo /usr/sbin/useradd -G gliders -m USR
```

Note that the '-G gliders' part of the command adds the new pilot user to the same group that the Seaglider belongs to. This is the mechanism that allows the pilot to modify the Seaglider's control files.

You must also provide a password for the new pilot user. Type the following command, replacing the letters 'USR' with the username used above:

```
sudo passwd USR
```

You will be prompted to enter a password and then prompted to enter the password again. The passwords must match for the command to take effect.

The default shell of the new pilot user is `csch`. To use the `bash` shell instead, type the following command, replacing the letters 'USR' with the username used above:

```
sudo chsh -s /bin/bash USR
```