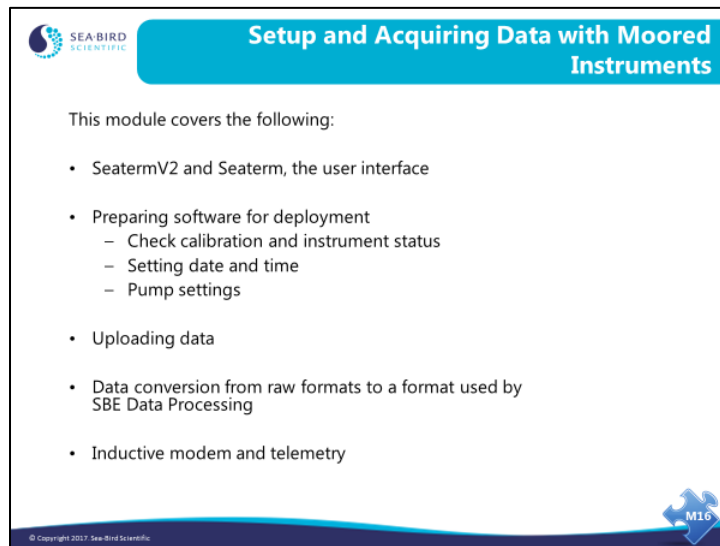




Setup and Acquiring Data with
Moored Instruments: Software
Sea-Bird Scientific University Module 16



Overview



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Setup and Acquiring Data with Moored Instruments

This module covers the following:

- SeatermV2 and Seaterm, the user interface
- Preparing software for deployment
 - Check calibration and instrument status
 - Setting date and time
 - Pump settings
- Uploading data
- Data conversion from raw formats to a format used by SBE Data Processing
- Inductive modem and telemetry

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In this module we will discuss setup of moored instruments for deployment, considering sampling theory, the user interface, and instrument status reports.

By the end of this module, you should be able to:

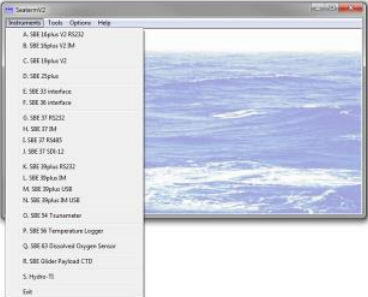
- Judge your instrument's readiness for deployment based on its status report
- Prepare your instrument for deployment
- Convert data from your instrument to a format that can be processed by SBE Data Processing


SeatermV2 and Seaterm: User Interface



**Setting up Moored Instruments:
SeatermV2 and Seaterm**

- SeatermV2 and Seaterm
 - Set up an instrument for deployment
 - Transfer data from an instrument to user's computer
 - Do data conversion for SBE 37 and SBE 39 to allow further processing with Seasoft's data processing software (SBE Data Processing)
- An introduction to SeatermV2 is given in Module 2





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Even in moorings that use inductive telemetry, the data that is stored in the instrument is of interest. There may be occasions where the link between the surface buoy and the ground station malfunctioned, or the telemetered data may be a subset of that collected by the remote instrument. SeatermV2 and Seaterm provide the facility for data transfer and for the conversion of SBE 37 and SBE 39/39*plus* data to a format that can be used by the processing programs in Seasoft.

Check Calibration Coefficients

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Check Onboard Instrument Calibration Coefficients

Confirm calibration coefficients are programmed and are from most recent calibration

- Type command in Command Window: **DC** (DisplayCoefficients)
- or**
- In Send Commands window, under Status, select *Display Calibration Coefficients* and click Execute button

In this example, coefficients have not been programmed into instrument, and must be entered.

DC
SBE37SM-RS232 v4.1 9077
temperature: not set
TA0 = 0.000000e+00
TA1 = 0.000000e+00
TA2 = 0.000000e+00
TA3 = 0.000000e+00
conductivity: not set
G = 0.000000e+00
H = 0.000000e+00
I = 0.000000e+00
J = 0.000000e+00
CPCOR = -9.570000e-08
CTCOR = 3.250000e-06
WBOTC = 0.000000e+00
pressure S/N 3537457, range = 508 psia not set
Etc.....

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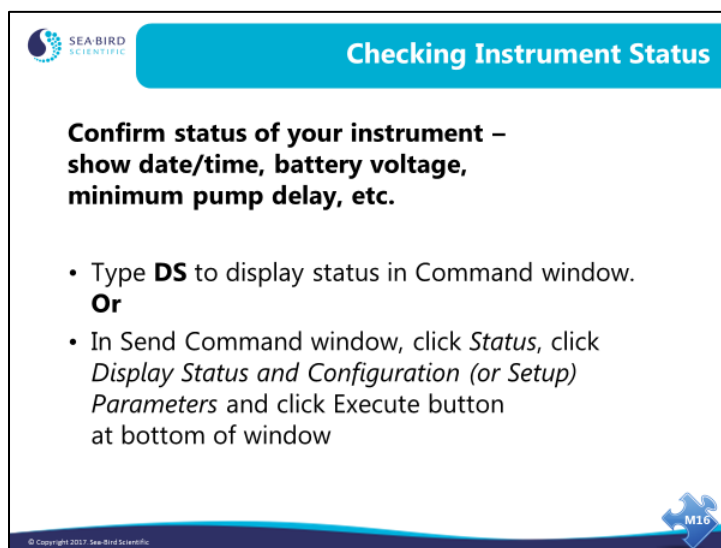
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The calibration coefficients programmed into the instrument are used if outputting data in engineering units through a terminal program. Verify the coefficients are correct, and match the most recent calibration sheets that you received from Sea-Bird.

For instruments that do not have a configuration file (SBE 37 and 39 families), these coefficients are also used to convert uploaded data from memory to engineering units.

Note that measurement data is stored in the instrument's memory in raw format, so if you discover a mistake in the calibration coefficients before you erase the memory, you can re-enter the coefficients and re-upload the data.

Checking Status Report



Checking Instrument Status

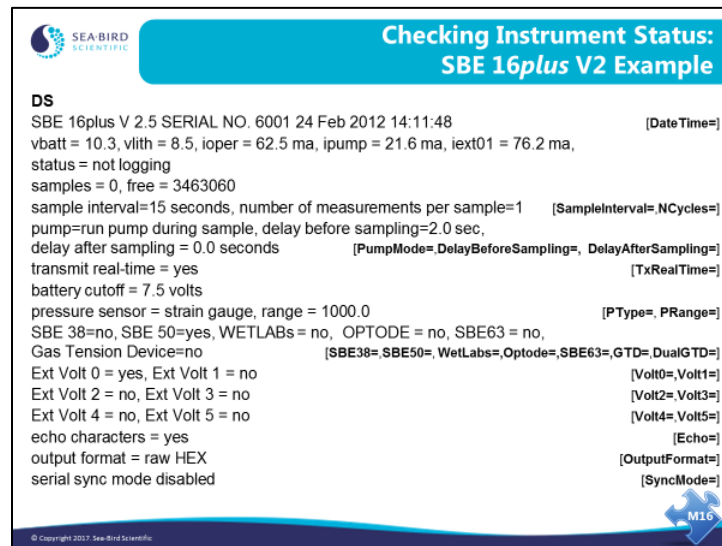
Confirm status of your instrument – show date/time, battery voltage, minimum pump delay, etc.

- Type **DS** to display status in Command window.
Or
- In Send Command window, click *Status*, click *Display Status and Configuration (or Setup) Parameters* and click Execute button at bottom of window

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The status report contains much valuable information that allows you to confirm the instrument setup before deployment.

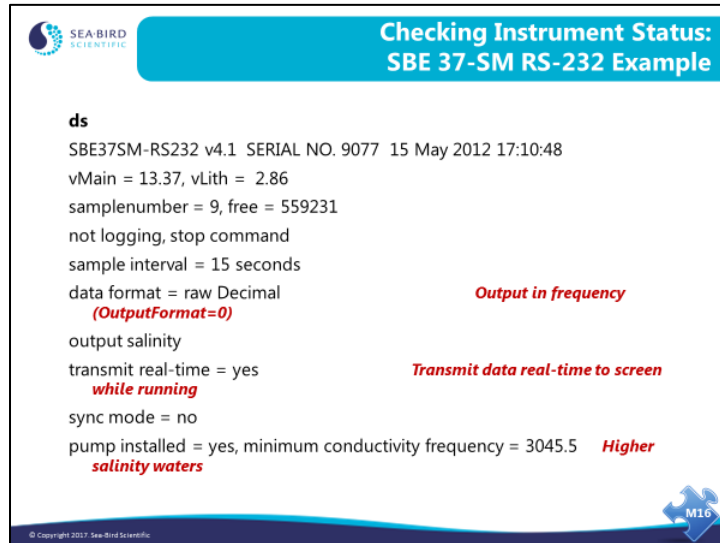
Checking Status Report (*continued*)



The 16plus V2 status report contains much valuable information:

- Instrument type, firmware revision, serial number, date and time.
- Main battery voltage and back-up battery voltage. Operating current, pump current, and current to external voltage sensors provide an indication of the battery lifetime you can expect, as well as the health of the instrument in general.
- The status entry indicates whether the instrument is logging data or not.
- Number of samples stored and amount of space free.
- Sample interval and number of measurements that are averaged to make a sample.
- Parameters related to the pump and auxiliary sensors –
 - pump mode (no pump, run for 0.5 sec before each sample, or run during each sample)
 - delay before sampling (seconds after switching on power to auxiliary sensors before measurement is made) and delay after sampling (seconds after sampling is completed before turning off power to auxiliary sensors).
- Transmit real-time data or not.
- Battery cut-off voltage, which is the power level that causes the instrument to shut itself off because it does not have sufficient power to sample.
- Pressure sensor type and range are entered at the factory.
- Which auxiliary sensor channels are enabled and logged with the CTD data.
- Whether to show entered commands on screen as you type.
- Output data format
- Serial synchronization mode enabled or disabled.

Checking Status Report (*continued*)



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Checking Instrument Status: SBE 37-SM RS-232 Example


ds
SBE37SM-RS232 v4.1 SERIAL NO. 9077 15 May 2012 17:10:48
vMain = 13.37, vLith = 2.86
samplenum = 9, free = 559231
not logging, stop command
sample interval = 15 seconds
data format = raw Decimal *Output in frequency*
(OutputFormat=0)
output salinity
transmit real-time = yes *Transmit data real-time to screen*
while running
sync mode = no
pump installed = yes, minimum conductivity frequency = 3045.5 *Higher*
salinity waters

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This is an example of a status report from an SBE 37-SMP MicroCAT.

Setting Date and Time



Setting Date and Time in SeatermV2

To set the clock to Local time or UTC, click Command menu, and select your time preference


OR

In Command window: type
DateTime=mmddyyyymmss
(real-time clock month, day, year, hour, minute, second)



OR

In Send Commands Window: Click *General Setup*, click *Set Date and Time*, enter the date and time (mmddyyyymmss), and click Execute button

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Pump Settings




In Command window, type: **MinCondFreq=x**
where x = minimum conductivity frequency (Hz)
OR

In Send Commands window, click *Pump Setup*,
click *Set Minimum Conductivity Frequency (Hz)* to
Enable Pump, enter frequency, and click *Execute*
button




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Pump Settings (*continued*)



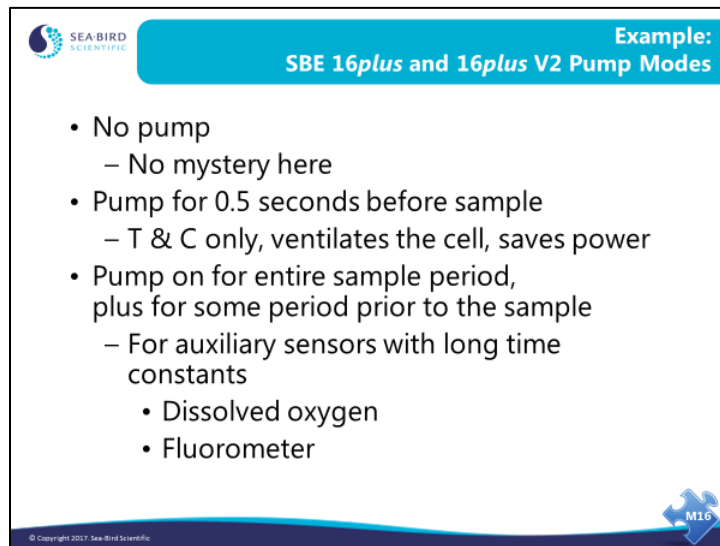
Pump Mode Settings on Moored Instruments

- If moored in an area with large thermal gradients, pump for a longer period of time to eliminate cell thermal mass effects on conductivity measurement
- Time required for DO measurement equilibration is dependent on sensor's membrane thickness and on water temperature
 - See User's Manual for your instrument about pump option settings for DO



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Pump Settings (*continued*)




The slide features the Sea-Bird Scientific logo in the top left corner. The title 'Example: SBE 16plus and 16plus V2 Pump Modes' is displayed in a blue header bar. The main content is a bulleted list of pump settings. In the bottom right corner, there is a blue arrow icon pointing to the right with the text 'M16' next to it. The bottom left corner contains the copyright notice '© Copyright 2017 Sea-Bird Scientific'.

- No pump
 - No mystery here
- Pump for 0.5 seconds before sample
 - T & C only, ventilates the cell, saves power
- Pump on for entire sample period, plus for some period prior to the sample
 - For auxiliary sensors with long time constants
 - Dissolved oxygen
 - Fluorometer

Experience with the SBE 41 Argo CTD has led Sea-Bird to adopt the protocol of ventilating the conductivity cell for a short time before measuring the conductivity, and then turning the pump off. This saves power and has the additional benefit of reducing bio-fouling inside the cell while the pump is off and the instrument is waiting for the next sample. With this protocol the power requirement is small enough to allow long-term deployment at reasonably short sampling intervals (e.g., 15 minutes).

If you are using sensors with a comparatively long time constant, run the pump throughout the sample interval. Recall from the slide that showed the 16plus V2 status report, you can set the delay from the start of the sampling period to the moment when the auxiliary sensor is measured. This allows you to give a slow sensor 5 or 6 time constants to equilibrate.


Upload Files



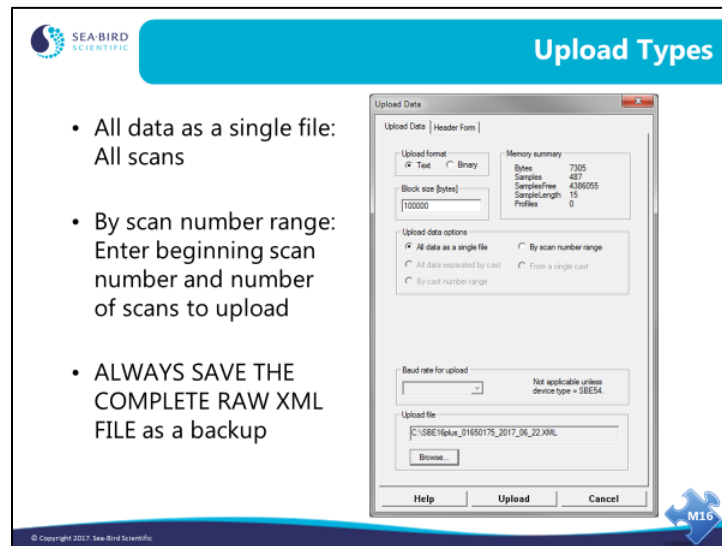
Files Created with Moored CTDs

- Older versions of firmware upload data in format that can be directly converted in Seaterm
 - These do NOT require a *.con* or *.xmlcon* (configuration) file
 - Use any configuration file...software uses internally stored coefficient data to compute engineering values
- New versions upload HEX files that are then converted with SBE Data Processing
 - These DO require a *.xmlcon* (configuration) file to convert from Hexadecimal to Engineering

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SeatermV2: Upload Types



- All data as a single file:
All scans
- By scan number range:
Enter beginning scan number and number of scans to upload
- ALWAYS SAVE THE COMPLETE RAW XML FILE as a backup

Upload Format: Seaterm232, Seaterm485, and SeatermUSB can upload in text or binary. Binary is approximately twice as fast; the resulting output file is the same, regardless of which upload method you use.

Note: Binary upload is not available with SeatermIM.

Upload Data Options: Profiling instruments usually transfer data in casts. Moored instruments typically dump all their stored data at once. Data from an internally recording profiling instrument can be transferred to your computer in one of the following ways:

- **All scans:** All scans in the instrument are transferred into 1 file.
- **By scan range:** Enter the range in the dialog box. This is useful when only part of the data is desired.

Notes for newer instruments:

- **37-IM/IMP (acquisition firmware ≥ 3.0) and all 37-IMP-IDO, 37-IMP-ODO, and 39-IM:** Data can be uploaded via RS-232 by connecting to an internal connector, providing much faster upload of large data sets.
- **39plus and 39plus-IM:** Data can be uploaded via USB by connecting to an internal connector, providing much faster upload of large data sets.

See the instrument manual for connection and upload details.

Activity: Setting Up, Logging, Uploading MicroCAT Data

1. Cable SBE 37-SM to computer.
2. Open SeatermV2. Select SBE 37 RS232; Seaterm232 opens.
3. Experiment with various ways to set date and time:
 - A. In Command menu, select *Set Local Time*. Type **DS** to see that instrument time = computer time.
 - B. In Command menu, select *Set UTC Time*. Type **DS** to see that instrument time = Greenwich Mean Time (from Seattle, +7 hours in summer, +8 hours in winter).
 - C. In Command window, type: **datetime=mmddyymmss** (without spaces, fill in: month day year hour minute second).
 - D. In Send Commands window, click *General Setup* and click *Set Date and Time*. Enter date and time (mmddyymmss) in *Argument* box, and click Execute.
4. Type in commands below (upper case or lower case, it does not matter) or send these commands using Send Commands window.

<i>Send Commands</i> CATEGORY	COMMAND	DESCRIPTION
General Setup	OutputExecutedTag=y	Enable output of executing and executed tags. This makes it easier to use the Send Commands window to transmit commands.
	TxRealTime=y	Transmit sample data as it is taken (in <i>real-time</i>).
Output Format Setup	OutputFormat=1	Output converted decimal data -- temperature, conductivity, pressure (if installed)
	OutputSal=y	Calculate and output salinity.
	OutputSV=y	Calculate and output sound velocity.
Memory Setup	InitLogging	Reset memory (SBE 37 prompts you to send command twice).
Autonomous Sampling	SampleInterval=10	Set sampling interval to 10 seconds.
Serial Line Sync	SyncMode=n	Disable serial synchronization mode.
Status	DS	Verify setup with status command.

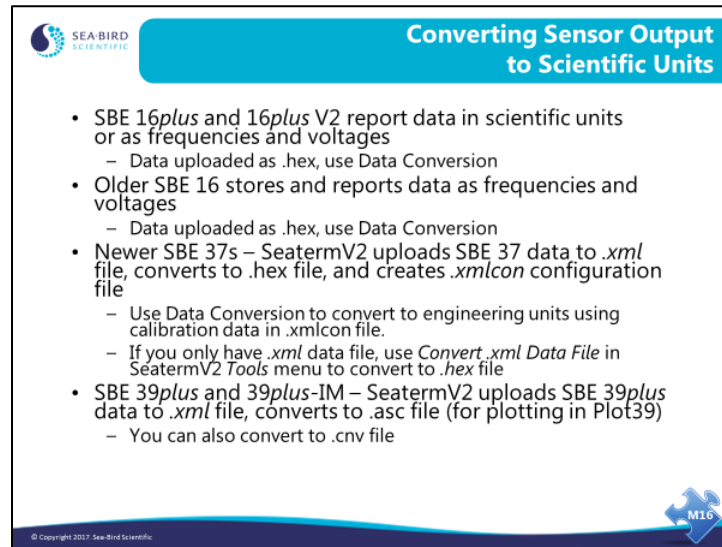
5. Start logging with **StartNow** command.
6. After a few minutes, stop logging with **Stop** command.
7. Check status with **DS** command to verify that logging has stopped.
8. Upload and review data in .xml data file.

Note about uploaded .xml file: When SeatermV2's Upload menu is used to upload MicroCAT data, SeatermV2 –

- Uploads the data to a .xml file,
- Converts the data to a .hex file and creates a .xmlcon configuration file, to provide a data file and a configuration file that is compatible with SBE Data Processing, and
- Opens SBE Data Processing's Data Conversion module, with the appropriate .hex data file and .xmlcon file already selected for you. Running Data Conversion provides a .cnv file with columns of data in engineering units, and this allows you to select any derived output variables desired.

Note: On the Data Setup tab in Data Conversion, select *Upcast and downcast* to convert all of the data.

Converting Sensor Output to Scientific Units



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Converting Sensor Output to Scientific Units

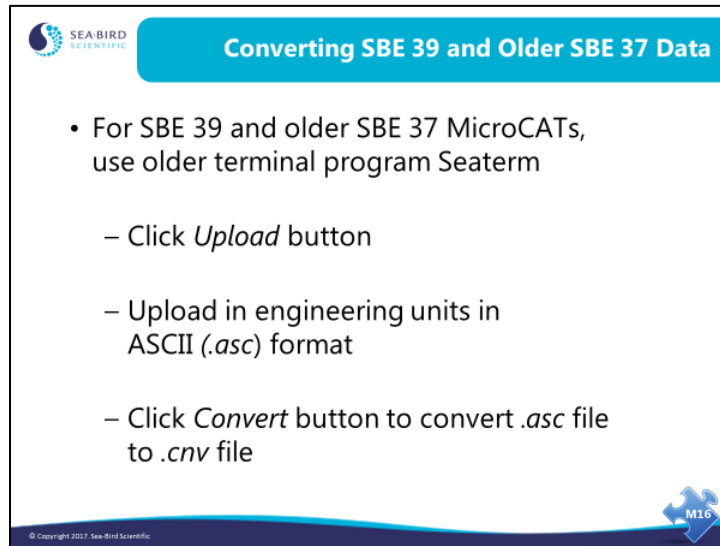
- SBE *16plus* and *16plus V2* report data in scientific units or as frequencies and voltages
 - Data uploaded as .hex, use Data Conversion
- Older SBE 16 stores and reports data as frequencies and voltages
 - Data uploaded as .hex, use Data Conversion
- Newer SBE 37s – SeatermV2 uploads SBE 37 data to .xml file, converts to .hex file, and creates .xmlcon configuration file
 - Use Data Conversion to convert to engineering units using calibration data in .xmlcon file.
 - If you only have .xml data file, use *Convert .xml Data File* in SeatermV2 Tools menu to convert to .hex file
- SBE *39plus* and *39plus-IM* – SeatermV2 uploads SBE *39plus* data to .xml file, converts to .asc file (for plotting in Plot39)
 - You can also convert to .cnv file

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- The SBE *16plus* and *16plus V2* can report data in scientific units. However, when the menu/toolbar is used to upload data, the terminal program sets the output format to raw hexadecimal, to provide a file that is compatible with SBE Data Processing. This data requires conversion with SBE Data Processing's Data Conversion module.
- The SBE 16 requires the same sort of data processing that was discussed earlier in the course, beginning with Data Conversion and ending with Bin Average.
- Newer SBE 37s (SM, SMP, IM, IMP, SI, SIP with firmware ≥ 3.0 ; all IDO and ODO versions) can report data in scientific units. However, when SeatermV2's Upload menu is used to retrieve SBE 37 data, SeatermV2 uploads the data to a .xml file, converts the data to a .hex file, and creates a .xmlcon configuration file, to provide a data file and a configuration file that is compatible with SBE Data Processing. This data requires conversion with SBE Data Processing's Data Conversion module.
- SBE *39plus* and *39plus-IM* can report data in scientific units. However, when SeatermV2's Upload menu is used to retrieve data, SeatermV2 uploads the data to a .xml file, and converts the data to a .asc file, to provide a data file that is compatible with Plot39 plotting software. You can also convert the .xml file to a .cnv file that is compatible with SBE Data Processing, for use in ASCII Out and Sea Plot modules.

SBE 39 and older SBE 37 Data Conversion Utilities



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Converting SBE 39 and Older SBE 37 Data

- For SBE 39 and older SBE 37 MicroCATs, use older terminal program Seaterm
 - Click *Upload* button
 - Upload in engineering units in ASCII (.asc) format
 - Click *Convert* button to convert .asc file to .cnv file

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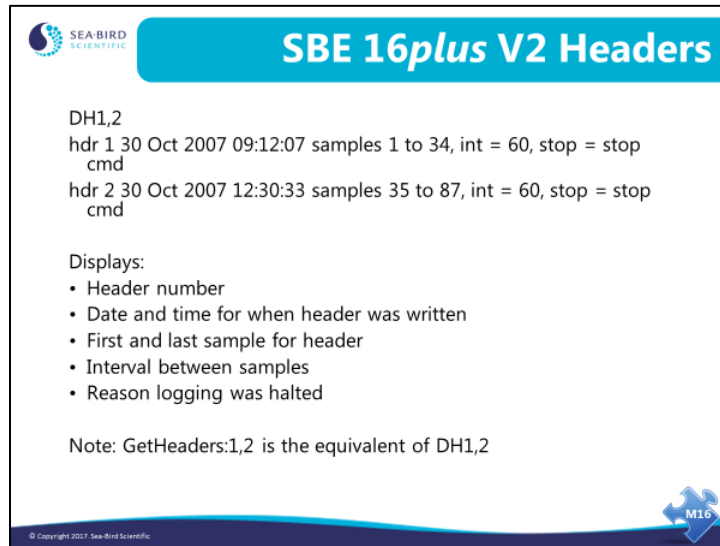
The SBE 37 and 39 can report data in scientific units.

Seaterm uploads data from SBE 39s and older SBE 37s in scientific units, to a .asc data file. This file format is not compatible with Seasoft's post-processing modules. If you wish to do any processing of this data with SBE Data Processing, you have to convert it to the .cnv file format. There is a utility in Seaterm to perform this conversion; click the Convert button on Seaterm's toolbar to create a .cnv file.

- To access the Convert button in Seaterm, you must first select the SBE 37 or SBE 39 in the Configure menu.

The .cnv file can then be processed and/or plotted using SBE Data Processing's modules.

SBE 16*plus* V2 Headers



The slide features the SEA-BIRD SCIENTIFIC logo in the top left corner. A blue header bar at the top right contains the text "SBE 16*plus* V2 Headers". The main content area lists two header entries: "hdr 1 30 Oct 2007 09:12:07 samples 1 to 34, int = 60, stop = stop cmd" and "hdr 2 30 Oct 2007 12:30:33 samples 35 to 87, int = 60, stop = stop cmd". Below this, a "Displays:" section lists four bullet points: "Header number", "Date and time for when header was written", "First and last sample for header", and "Reason logging was halted". A "Note:" section states "GetHeaders:1,2 is the equivalent of DH1,2". The bottom left corner has a small copyright notice "© Copyright 2017 Sea-Bird Scientific" and the bottom right corner has a blue arrow icon with "M16" written on it.

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SBE 16*plus* V2 Headers

DH1,2
hdr 1 30 Oct 2007 09:12:07 samples 1 to 34, int = 60, stop = stop
cmd
hdr 2 30 Oct 2007 12:30:33 samples 35 to 87, int = 60, stop = stop
cmd

Displays:

- Header number
- Date and time for when header was written
- First and last sample for header
- Interval between samples
- Reason logging was halted

Note: GetHeaders:1,2 is the equivalent of DH1,2

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Header entries have start date and time, sample range, and sample interval as well as the reason for ending data collection.

Data Format: SBE 16plus V2

SBE 16plus V2 Data Formats

- Raw data in hexadecimal
0442F20A8A7309B04A4D2C28730D24
04429D0A8A6F09B0494D4828730D42
- Converted data in hexadecimal
32505C0F51F601867A28730D24
3253760F51EA01867A28730D42
- Raw data in decimal
279282, 2698.449, 634954, 1.5073, 03 Jul 2001, 11:57:24
279197, 2698.434, 634953, 1.5094, 03 Jul 2001, 11:57:54
- Converted data in decimal
22.9737, 0.00402, -0.037, 03 Jul 2001, 11:57:24
22.9817, 0.00401, -0.038, 03 Jul 2001, 11:57:54
- Converted data in XML

```
<?xml?><datapacket><hdr><mfg>Sea-Bird</mfg>
<model>16plus</model><sn>1606001</sn></hdr>
<data><t1>22.9737</t1><c1>0.00402</c1>
<p1>-0.037</p1><v0>2007-11-
07T07:34:35</dt></data></datapacket>
```

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A complete description of these formats is found in the manual.

- **Raw data in hexadecimal example:**

With strain gauge P and 2 external voltages sampled, example scan =
 tttttccccppppppvvvvvvvvvsssssss = 0A53711BC7220C14C17D82030505940EC4270B

- **Converted data in hexadecimal example:**

With strain gauge P and 2 external voltages sampled, example scan =
 tttttccccppppppvvvvvvvvvsssssss = 3385C40F42FE0186DE030505940EC4270B

Note: some of the hex numbers are scaled. For example, in the raw hex data, conductivity frequency is multiplied by 256. In the converted hex data, T is multiplied by 100,000 and C by 1,000,000.

- **Raw data in decimal example:**

With strain gauge P and 2 external voltages sampled, example scan =
 tttttt, cccc.ccc, pppppp, v.vvvv, v.vvvv, v.vvvv, dd mmm yyyy, hh:mm:ss
 = 676721, 7111.133, 791745, 2.4514, 0.0590, 0.1089, 7 nov 2007, 07:34:35

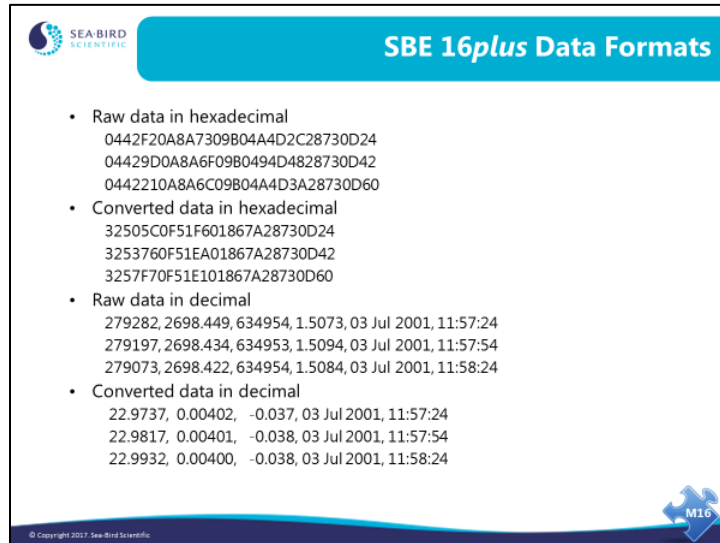
- **Converted data in decimal:**

With strain gauge P and 2 external voltages sampled, example scan =
 ttt.tttt, cc.ccccc, pppp.ppp, v.vvvv, v.vvvv, dd mmm yyyy, hh:mm:ss
 = 23.7658, 0.00019, 0.062, 0.0590, 0.1089, 7 nov 2007, 07:34:35

- **Converted data in XML:**

With strain gauge P and 2 external voltages sampled, example scan =
 <?xml?><datapacket><hdr><mfg>Sea-Bird</mfg><model>16plus</model>
 <sn>nnnnnnnn</sn></hdr><data><t1> ttt.tttt </t1><c1> cc.ccccc </c1>
 <p1> pppp.ppp </p1><v0> v.vvvv </v0><v1> v.vvvv </v1>
 <dt>yyyy-mm-ddThh:mm:ss</dt></data></datapacket>
 =
 <?xml?><datapacket><hdr><mfg>Sea-Bird</mfg><model>16plus</model>
 <sn>1606001</sn></hdr><data><t1>23.7658</t1><c1>0.00019</c1>
 <p1>0.062</p1><v0>0.0590</v0><v1>0.1089</v1>
 <dt>2007-11-07T07:34:35</dt></data></datapacket>

Data Format: SBE 16plus



A complete description of these formats is found in the manual.

- **Raw data in hexadecimal example:**

SBE 16plus with strain gauge pressure sensor and two external voltages sampled,
 example scan = tttttccccccppppppvvvvvvvvvvvsssssss
 = 0A53711BC7220C14C17D820305059425980600

- **Converted data in hexadecimal example:**

SBE 16plus with strain gauge pressure sensor and two external voltages sampled,
 example scan = tttttccccccppppppvvvvvvvvvvvsssssss
 = 3385C40F42FE0186DE0305059425980600

Note that some of the hexadecimal numbers are scaled. For example, in the raw hexadecimal data, the conductivity frequency is multiplied by 256. In the converted hexadecimal data, temperature is multiplied by 100,000 and conductivity by 1,000,000.

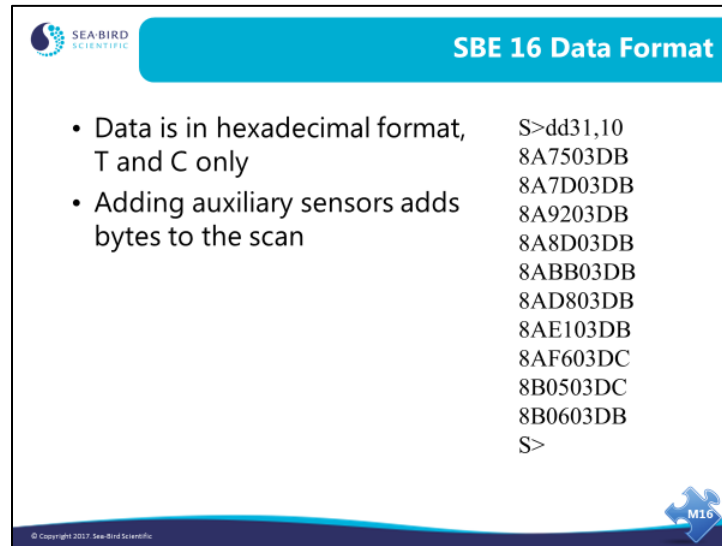
- **Raw data in decimal example:**

SBE 16plus with strain gauge pressure sensor and two external voltages sampled,
 example scan =
 ttttt, cccc.ccc, pppppp, v.vvvv, v.vvvv, v.vvvv, dd mmm yyyy, hh:mm:ss
 = 676721, 7111.133, 791745, 2.4514, 0.0590, 0.1089, 12 nov 2000, 12:23:05

- **Converted data in decimal:**

SBE 16plus with strain gauge pressure sensor and two external voltages sampled,
 example scan = ttt.tttt, cc.ccccc, pppp.ppp, v.vvvv, v.vvvv, dd mmm yyyy, hh:mm:ss
 = 23.7658, 0.00019, 0.062, 0.0590, 0.1089, 12 nov 2000, 12:23:05

Data Format: SBE 16



The slide features the SEA-BIRD SCIENTIFIC logo in the top left corner. A blue header bar at the top right contains the text "SBE 16 Data Format". The main content area contains two bullet points on the left and a list of hexadecimal values on the right. A small blue icon with "M16" is in the bottom right corner, and a copyright notice is in the bottom left corner.

- Data is in hexadecimal format, T and C only
- Adding auxiliary sensors adds bytes to the scan

S>dd31,10
8A7503DB
8A7D03DB
8A9203DB
8A8D03DB
8ABB03DB
8AD803DB
8AE103DB
8AF603DC
8B0503DC
8B0603DB
S>

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This data is an ASCII representation of hexadecimal numbers. This representation allows the data file to be readable with any text editor.

Data Format: SBE 37

SBE 16 Data Format

- Data is in hexadecimal format, T and C only
- Adding auxiliary sensors adds bytes to the scan

S>dd31,10
8A7503DB
8A7D03DB
8A9203DB
8A8D03DB
8ABB03DB
8AD803DB
8AE103DB
8AF603DC
8B0503DC
8B0603DB
S>

The basic data format is temperature, conductivity, pressure (if installed), date and time.

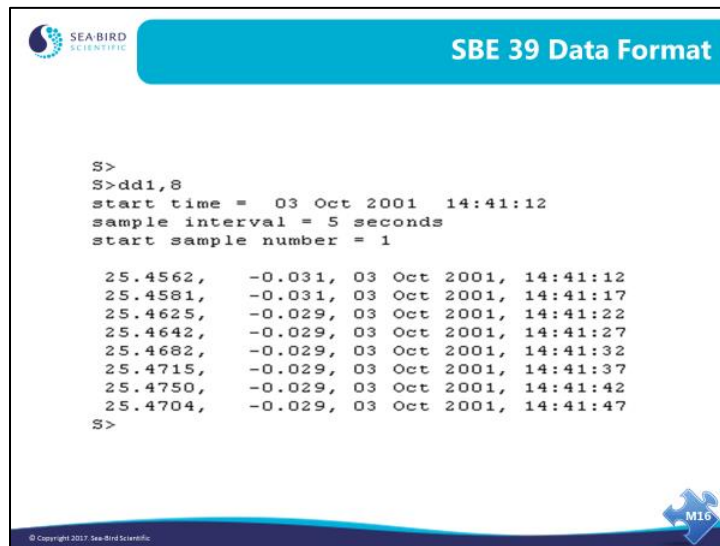
Note: IDO and ODO MicroCAT data format is not covered here.

Older MicroCATs (firmware version < 3.0) offer two date formats in the data output: dd mmm yyyy or mm-dd-yyyy. This is selected with the **Format=** command. There are some other differences in output format, depending on the specific MicroCAT model:

- 37-IM and 37-IMP: The **Format=** command also affects the output units for conductivity: S/m for **Format=1** and mS/cm for **Format=2**.
- 37-SM and 37-SMP: You can also output salinity and/or sound velocity if desired, with the use of the appropriate setup commands. You can suppress storage and output of date and time with the use of the appropriate setup command.
- 37-SI and 37-SIP: You can also output depth, salinity, sound velocity, and/or density sigma if desired, with the use of the appropriate setup commands. You can suppress output of date and time with the use of the appropriate setup command.

Newer MicroCATs (firmware version \geq 3.0) eliminate one of the date format options, but add an XML output option. With the larger memory, date and time are always stored and output.

Data Format: SBE 39

A screenshot of a terminal window titled "SBE 39 Data Format" with the SEA-BIRD SCIENTIFIC logo in the top left. The terminal shows a series of commands and their outputs. The first command is "S>", followed by "S>dd1,8". The output shows "start time = 03 Oct 2001 14:41:12", "sample interval = 5 seconds", and "start sample number = 1". Below this, there is a list of data points, each consisting of a temperature value, a pressure value, a date, and a time. The data points are: 25.4562, -0.031, 03 Oct 2001, 14:41:12; 25.4581, -0.031, 03 Oct 2001, 14:41:17; 25.4625, -0.029, 03 Oct 2001, 14:41:22; 25.4642, -0.029, 03 Oct 2001, 14:41:27; 25.4682, -0.029, 03 Oct 2001, 14:41:32; 25.4715, -0.029, 03 Oct 2001, 14:41:37; 25.4750, -0.029, 03 Oct 2001, 14:41:42; 25.4704, -0.029, 03 Oct 2001, 14:41:47. The terminal ends with "S>". In the bottom right corner, there is a blue arrow icon with "M16" and a copyright notice "© Copyright 2017 Sea-Bird Scientific" in the bottom left.

- The SBE 39 data format is temperature, pressure (if installed), date and time.
- For the SBE 39-IM and 39*plus*-IM, there are options for the date format, similar to the older MicroCATs.
- For the SBE 39*plus* and 39*plus*-IM, there are options for output units (°C or °F; dbar or psi), and the ability to output sample number with each scan.

The instrument manuals provide complete details on all the data format options.


Activity: Converting and Plotting Time Series Data

Note: This exercise uses Seaterm, **not** SeatermV2, because it is based on data uploaded from an older SBE 37.

1. Open Seaterm.
 - A. In Configure menu, select *SBE 37*. In Configuration Options dialog box, select *RS-232*, and click OK.
 - B. Click Convert button.
 - In Convert dialog box, select *C:\Data\Module11\Pacific.asc* as the input file.
 - Click *Insert deployment pressure*, and enter 50 decibars as the pressure.
 - Click OK.Seaterm will create a .cnv file, which is compatible with SBE Data Processing.
2. In SBE Data Processing, run Derive and calculate Salinity and Density (Sigma-T).
 - Use name append *D*.
 - Use any .con or .xmlcon file! (see note below)
3. In SBE Data Processing, run Sea Plot.
 - Single X (Julian days), multiple Y (Salinity and Density, Sigma-T)
 - Uncheck reverse axis box on X axis
 - Start with auto range and re-plot as appropriate

Note about configuration (.con or .xmlcon) files and data from **older** MicroCATs: The SBE 37 is not user-configurable (i.e., it cannot interface with auxiliary sensors), and it outputs converted data in engineering units (using calibration coefficients programmed into the instrument). Therefore, it does not have a configuration file (configuration file defines what sensor data is in the data stream and also defines the calibration coefficients). But, SBE Data Processing was originally written to process data from instruments that do have a configuration file, and the Derive module therefore requires the selection of a .con or .xmlcon file before it will allow you to select the variables to be derived. You can select any .con or .xmlcon file; the selection will have no impact on the results.


Preparing for Deployment: Inductive Modem Systems



Inductive Modem IDs

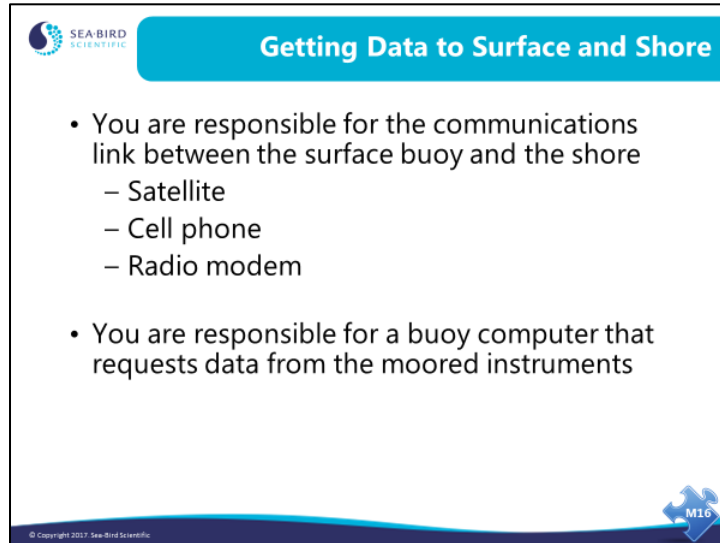
- Valid range for ID numbers is 00 – 99
- There must be only one instrument on the loop when setting IDs
- IM receiver is very sensitive; instruments not on the loop, but near the loop, will receive the ID change

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Do not change the ID of an inductive modem equipped instrument when another instrument is on the same loop; this will cause both instruments to take the same ID. The telemetry system will not work properly for those instruments, because they will try to use the link at the same time. The inductive modem receiver in the instruments is very sensitive. Two instruments that are side-by-side will take the same ID even if one of them is not connected to the loop. You must separate IM instruments by at least 1 meter when you change IDs.

Preparing for Deployment: Inductive Modem Systems (continued)



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Getting Data to Surface and Shore

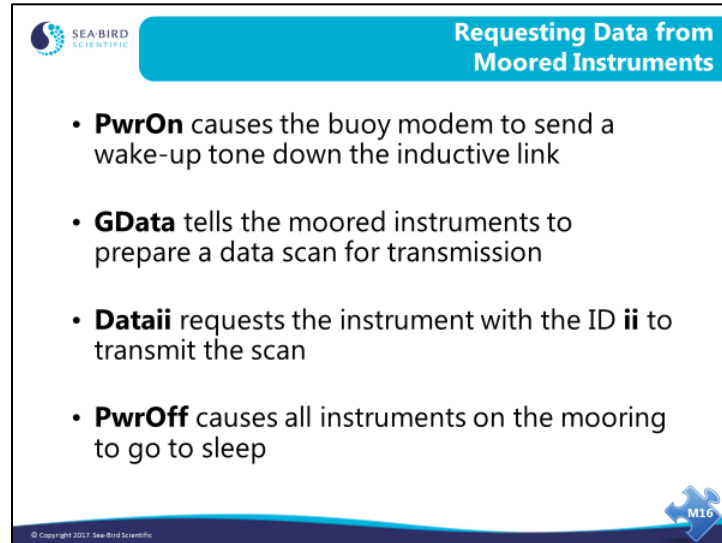
- You are responsible for the communications link between the surface buoy and the shore
 - Satellite
 - Cell phone
 - Radio modem
- You are responsible for a buoy computer that requests data from the moored instruments

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M16

The complete inductive mooring system requires a computer at the surface, to send commands to the instruments via the surface inductive modem and to communicate with the shore. Sea-Bird has customers that use satellites, some that use cell phones, and some that use radio modems. It is your responsibility to develop the hardware and software to perform these duties.

Preparing for Deployment: Inductive Modem Systems (continued)




The slide features the SEA-BIRD SCIENTIFIC logo in the top left corner. The title 'Requesting Data from Moored Instruments' is displayed in a blue header bar. A list of four bullet points is centered on the slide, and a small blue icon with 'M16' is in the bottom right corner. A copyright notice '© Copyright 2017, Sea-Bird Scientific' is at the bottom left.

- **PwrOn** causes the buoy modem to send a wake-up tone down the inductive link
- **GData** tells the moored instruments to prepare a data scan for transmission
- **Dataii** requests the instrument with the ID **ii** to transmit the scan
- **PwrOff** causes all instruments on the mooring to go to sleep

Communication with the moored instruments is simple. Sending **PwrOn** to the surface modem's serial port causes it to wake all the remote instruments with a 4800 Hz tone. Once awakened, the **GData** command causes the modems on the moored instruments to request the last sample or an average of the samples taken from their instruments (depending on the instrument and its setup). Then each instrument in turn is queried for a sample with the **Dataii** command, with **ii** being the instrument ID (for example, **data01** queries the instrument with ID=01). Finally, **PwrOff** puts all the instruments to sleep. If no **PwrOff** is issued, the instruments go to sleep after 2 minutes. Thus, if the sampling protocol requires more than 2 minutes, a **PwrOn** must be issued to make sure that none of the moored instruments has gone to sleep.


Preparing for Deployment: Inductive Modem Systems (continued)



Inductive Telemetry Troubleshooting

- Inductive communication is one way at a time (half duplex)
- Instruments with the same ID will compete for the link
- If request for data occurs during data acquisition, the request will be ignored

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The inductive link is half duplex. This means that only one device on the link may be actively transmitting data at a time. If the situation occurs where two devices are trying to transmit, the communication will be corrupt.

If two devices have the same ID, the above problem will occur whenever that ID is used.

Usually, moored instruments sample on schedule. If the inductive link becomes active while an instrument is sampling, a request for data may be ignored. This can occur because of clock drift in the buoy. If the buoy is equipped with a GPS, the GPS is a good source of time.

A final note on preparing moored instruments for deployment: **Application Note 83** provides a checklist for moored instruments, intended as a guideline to assist you in developing a checklist specific to your operation and instrument setup.

