SBE 16*plus* (RS-232) SEACAT Reference Sheet
(see SBE 16*plus* [RS-232] User's Manual for complete details)

Sampling Modes

- **Autonomous sampling** - The 16*plus* takes time series measurements once every 10 seconds to once every 4 hours, stores data in FLASH memory, and powers down between samples. Data can also be simultaneously transmitted real-time.
- **Polled sampling** – The 16*plus* takes one sample. Depending on command used, the 16*plus* can store data in FLASH memory and / or transmit data to computer.
- **Serial line sync** – The 16*plus* wakes up, samples, stores data in FLASH memory, and powers off in response to a pulse on serial line. Depending on setup, the 16*plus* can transmit data to computer. This provides an easy method for synchronizing 16*plus* sampling with other instruments such as Acoustic Doppler Current Profilers (ADCPs) or current meters, without drawing on their battery or memory resources.

Communication Setup Parameters

1. Double click on SeaTerm.exe.

2. Once main screen appears, in Configure menu select *SBE 16plus*. Click on COM Settings tab in dialog box. Input:
   - Serial Port: COM1 through COM10 are available
   - Baud Rate: 9600 (or other if applicable)
   - Data Bits: 8
   - Parity: None
   - Mode: RS-232 (Full Duplex)

Deployment

1. Batteries:
   A. *Remove battery end cap*: Wipe dry housing/end cap seam. Unthread end cap by rotating counter-clockwise. Wipe dry O-ring mating surfaces in housing with lint-free cloth.
   B. *Remove and replace battery cover plate and batteries*: Remove three Phillips-head screws and washers from battery cover plate, and remove cover plate. Turn 16*plus* over and remove batteries. Install new batteries, + terminals against flat contacts and - terminals against spring contacts. Align battery cover plate with housing. Reinstall three Phillips-head screws and washers, while pushing hard on battery cover plate to depress spring contacts at bottom of battery compartment.
   C. *Reinstall battery end cap*: Remove water from O-rings and mating surfaces with lint-free cloth. Inspect O-rings and mating surfaces for dirt, nicks, and cuts. Clean/replace as necessary. Apply light coat of O-ring lubricant to O-ring and mating surfaces. Fit end cap into housing and rethread into place, using a wrench to ensure end cap is tightly secured.

2. Program 16*plus* for intended deployment (see other side of this sheet for *Command Instructions and List*):
   A. Set date and time.
   B. Ensure all data has been uploaded, and then send **InitLogging** to make entire memory available for recording. If **InitLogging** is not sent, data will be stored after last recorded sample.
   C. Establish setup and sampling parameters. If desired, use **StartMMDDYY=**, **StartHHMMSS=**, and **StartLater** to establish delayed start date and time.

3. Install a cable or dummy plug for each connector on 16*plus* sensor end cap. Install a locking sleeve over each plug/cable connector. Connect other end of cables to appropriate sensors.

4. Verify hardware and external fittings are secure.

5. Remove Tygon tubing that is looped end-to-end around conductivity cell.

6. For Autonomous sampling: If not already done, send **StartNow** or **StartMMDDYY=, StartHHMMSS=,** and **StartLater**.

Command Instructions and List

- Input commands in upper or lower case letters and register commands by pressing Enter key.
- 16*plus* sends ?CMD if invalid command is entered.
- If system does not return S> prompt after executing a command, press Enter key to get S> prompt.
- If new command is not received within 2 minutes after completion of a command, 16*plus* returns to quiescent (sleep) state.
- If in quiescent (sleep) state, re-establish communications by clicking Connect on Toolbar or pressing Enter key to get S> prompt.

Shown below are the commands used most commonly in the field. See the Manual for complete listing and detailed descriptions.

CATEGORY	COMMAND	DESCRIPTION
Status	**DS**	Display status and setup parameters.
General Setup	**MMDDYY=mmddyy**	Set real-time clock month, day, year. Must follow with **HHMMSS=**.
	DDMMYY=ddmmyy	Set real-time clock day, month, year. Must follow with **HHMMSS=**.
	HHMMSS=hhmmss	Set real-time clock hour, minute, second.
	Baud=x	**x=** baud rate (1200, 2400, 4800, 9600, 19200, 38400). Default 9600.
	Echo=x	**x=Y**: Echo characters as you type. **x=N**: Do not.
	TxRealTime=x	**x=Y**: Output real-time data. **x=N**: Do not.
	PumpMode=x	**x=0**: No pump. **x=1**: Run pump for 0.5 seconds before each sample. **x=2**: Run pump during each sample.
	NCycles=x	**x=** number of measurements to take and average for every sample.
	InitLogging	After uploading data, initialize logging to make entire memory available for recording.
	SampleNumber=x	**x=** sample number for first sample when sampling begins. After uploading data, set to 0 before sampling again to make entire memory available for recording.
	HeaderNumber=x	**x=** header number for first header when sampling begins.
	FlashInit	Map bad blocks and erase FLASH memory, which destroys all data in 16*plus*.
	QS	Place 16*plus* in quiescent (sleep) state. Logging and memory retention not affected.
Output Format	**OutputFormat=x**	**x=0**: Raw frequencies/voltages, Hex. **x=1**: Converted data, Hex. **x=2**: Raw frequencies/voltages, decimal. **x=3**: Converted data, decimal. **x=4**: Converted data, decimal, XML. **x=5**: Converted data, decimal, XML, modified.
	OutputSal=x	**x=Y**: Output salinity (psu). **x=N**: Do not.
	OutputSV=x	**x=Y**: Output sound velocity (m/sec). **x=N**: Do not.
	OutputUCSD=x	**x=Y**: Output sigma-t (kg/m^3), battery voltage, operating (mA). **x=N**: Do not.
Pressure Sensor Setup (*internally mounted*)	**PType=x**	**x=0**: No pressure. **x=1**: Strain gauge pressure sensor. **x=3**: Quartz pressure sensor with temperature compensation.
	RefPress=x	**x=** reference pressure (gauge) in db to use if 16*plus* does not include pressure sensor.
	ParosIntegration=x	**x=** integration time (seconds) for Quartz pressure sensor.
Voltage Sensor Setup	**Volt0=x Volt1=x** **Volt2=x Volt3=x**	**x=Y**: Enable external voltage (voltage 0, 1, 2, or 3). **x=N**: Do not.
	DelayBeforeSampling=x	**x=** time (seconds) to wait after switching on external voltage before sampling.
	BioWiper=x	**x=Y**: Configuration includes ECO-FL fluorometer with Bio-Wiper. **x=N**: Does not.
RS-232 Sensor Setup	**SBE38=x**	**x=Y**: Enable SBE 38 secondary temperature sensor. **x=N**: Do not.
	SBE50=x	**x=Y**: Enable SBE 50 pressure sensor. **x=N**: Do not.
	GTD=x	**x=Y**: Enable GTD (Pro-Oceanus Gas Tension Device). **x=N**: Do not.
	DualGTD=x	**x=Y**: Enable dual (2) GTDs (Pro-Oceanus Gas Tension Devices). **x=N**: Do not.
	TGTD	Measure Gas Tension Device(s), output 1 converted data sample for each GTD.
	SendGTD=command	Command 16*plus* to send **command** to GTD (any command recognized by GTD) and receive response.
Autonomous Sampling (logging)	**SampleInterval=x**	**x =** interval between samples (10 - 14,400 seconds).
	StartNow	Start autonomous sampling now.
	StartMMDDYY=mmddyy	Delayed start: month, day, year. Must follow with **StartHHMMSS=**.
	StartDDMMYY=ddmmyy	Delayed start: day, month, year. Must follow with **StartHHMMSS=.**
	StartHHMMSS=hhmmss	Delayed start: hour, minute, second.
	StartLater	Start autonomous sampling at delayed start time.
	Stop	Stop autonomous sampling or waiting to start autonomous sampling. Press Enter key to get S> prompt before entering command. Must stop sampling before uploading data.
Polled Sampling	**SL**	Output last sample from buffer and leave power on.
	SLT	Output last sample from buffer, take new sample and store data in buffer. Leave power on.
	TS	Take sample, store in buffer, output data. Leave power on.
	TSS	Take sample, **store in buffer and FLASH memory**, output data, turn power off.
	TSSOn	Take sample, **store in buffer and FLASH memory**, output data, leave power on.
Serial Line Sync	**SyncMode=x**	**x=Y**: Enable serial line sync mode. **x=N**: Do not.
	SyncWait=x	**x=** time (seconds) 16*plus* monitors line for commands after taking sample.
Coefficients	**DCal**	Display calibration coefficients.
Data Upload	**DDb,e**	Upload data from scan **b** to **e**.
	DHb,e	Upload headers from header **b** to **e**.