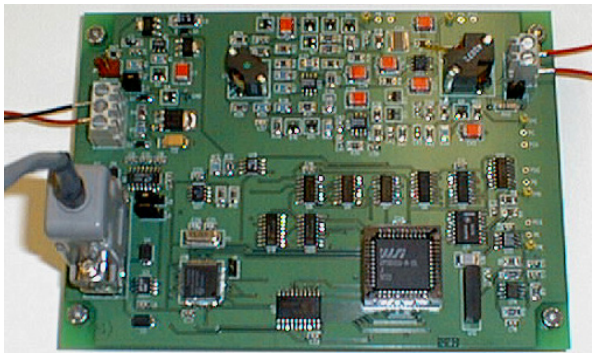
Surface Inductive Modem

SIM



The Surface Inductive Modem (SIM) is a vital link in Sea-Bird's inductive modem (IM) telemetry systems, which provide data communications without the need for underwater electrical connections. Each system requires:

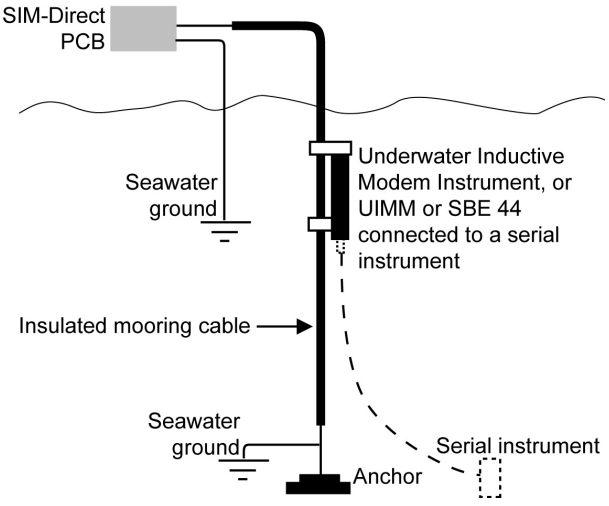
- **SIM**, housed in a buoy or on land. The SIM provides the link between the underwater IM instruments and computer / buoy controller. Communication with the computer / buoy controller is via RS-232 (optional RS-485).
- **Underwater IM instruments**. The SIM can link to up to 100 inductively coupled instruments on a jacketed mooring wire. Compatible instruments include:
  - SBE 37 MicroCAT C-T (optional pressure) Recorder – 37-IM, 37-IMP (integral Pump), or 37-IMP-IDO (integral Pump and integrated Dissolved Oxygen)
  - SBE 39-IM Temperature (optional pressure) Recorder
  - SBE 16*plus*-IM or 16*plus*-IM V2 SEACAT C-T Recorder (optional pressure), which can acquire additional data from optional auxiliary sensors (oxygen, fluorescence, etc.).
  - Underwater Inductive Modem Module (UIMM) or SBE 44 Underwater IM, which links to a current meter, Doppler profiler, etc. with a standard serial interface.
  - Instruments by other manufacturers with built-in Sea-Bird underwater IMs.

The SIM (a modem is a *modulator/demodulator*) impresses (*modulates*) the mooring cable with a DPSK signal that is encoded with the commands received from the user's computer/controller. The encoded signal is *demodulated* by underwater inductive modem instruments coupled to the mooring cable. The underwater inductive modem instrument interprets the commands and transmits replies via the mooring cable, which are *demodulated* by the SIM. The DPSK communication link between the SIM and underwater modem is half-duplex, so talking and listening is sequential only. Although the data link between the SIM and the user's computer/controller is established at 1200, 2400, 4800, or 9600 baud, the DPSK modem communication between SIM and underwater modem operates at 1200 baud.

SIM VERSIONS

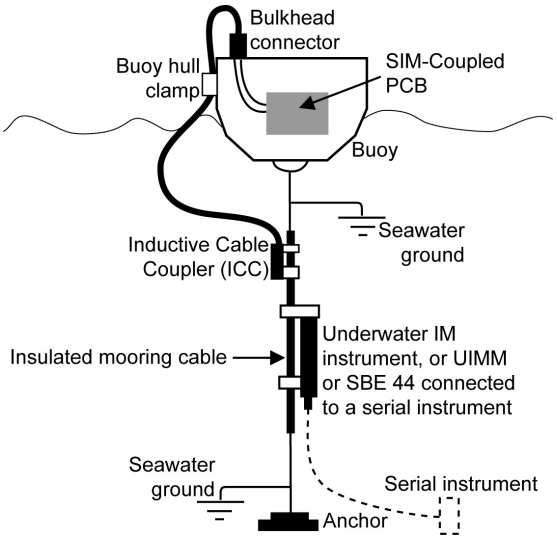
The SIM is available in two models, SIM-Direct and SIM-Coupled:

SIM-Direct: In a direct connection (typical cable to shore applications), the bottom end of the wire is grounded to seawater, and the top end remains insulated all the way to the connection to the SIM. A second wire from the SIM connects to seawater ground, completing the circuit.



SIM-Direct: Direct Connection

SIM-Coupled: In typical surface buoys it is often preferable to connect the jacketed mooring wire to the buoy with a length of chain, grounding the jacketed wire to seawater at each end. An Inductive Cable Coupler (ICC) connects the SIM to the jacketed wire above the uppermost underwater inductive instrument and below the point where the wire is grounded.



SIM-Coupled: ICC Connection

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Surface Inductive Modem SIM

DPSK (Differential Phase Shift Keyed) DATA TRANSMISSION

Sea-Bird's Inductive Modem telemetry system uses a DPSK data transmission method that overcomes most of the disadvantages of Frequency Shift Keyed (FSK) transmission, resulting in superior transmission efficiency and much lower error rates. The Sea-Bird system uses a carrier frequency of 4800 Hz, permitting four cycles of carrier frequency during the time allotted to each data bit (i.e., 1200 baud).

The encoding scheme is straightforward: if the next bit is a one, the phase of the carrier is inverted (shifted 180 degrees); if the next bit is a zero, the carrier phase does not change. With DPSK, both the modulation and demodulation hardware are extremely simple. Modulation requires only an OR gate and flip-flop, and demodulation is inherently coherent (bit energy is averaged rather than spot-sampled) using minimal hard logic, a shift register implementing a one-bit delay being the principle component. Further advantages are that the transmission of all zeros creates a single coherent frequency (4800 Hz) that is readily detected in inductive modem instruments as the *wake up* signal, and that - unlike FSK - the connection polarity of the transformers used for coupling does not matter.

COMMANDS

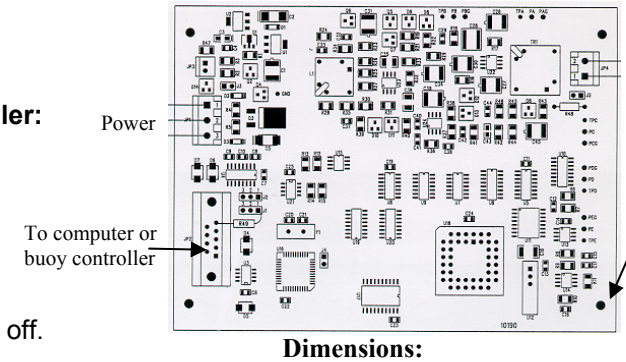
Commands sent to the SIM can be directed to the SIM, the underwater inductive modem, or the serial instrument connected to the underwater modem (if applicable). The commands below apply only to the SIM – see the appropriate underwater inductive modem manual for its commands.

COMMAND	DESCRIPTION
PwrOn	Send wakeup tone to **all** underwater modems.
PwrOff	Send power off command to **all** underwater modems, and turn off transmitter. Underwater modems enter quiescent (sleep) state. Any data in underwater modem buffer is erased.
AutoPwrOn=x	**x=Y** (default): Send **PwrOn** to underwater modems when power applied to SIM. This wakes up all UIMs on line. **x=N**: Do not send **PwrOn** to underwater modems when power applied to SIM.
DS	Display SIM firmware version and status.
Baud=x	**x** = baud rate between SIM and computer/controller (1200, 2400, 4800, 9600). Default 9600.
DataNNMax=x	**x** = timeout that applies to **Dataii** or **!iiData** only. If no reply received within **x** (0-32,767 milliseconds), control returned to computer and other commands can be sent. Default 1000 milliseconds.
RelayMax=x	**x** = timeout that applies to all other commands. If no reply received within **x** (0-3276 seconds), control returned to computer and other commands can be sent. Default 20 seconds.
EchoOn	Echo characters received from computer (default).
EchoOff	Do not echo characters received from computer.
BinaryGap=x	**x** = termination timeout (0 – 65,535 milliseconds) that applies to commands requesting binary response from SBE 44. Gap of **x** since last byte received acts as termination character. Bytes sent after gap are ignored; control is returned to computer and other commands can be sent. Default 1000 milliseconds.

Note:
When using RS-232 communication from the computer to the SIM, control of the SIM can be re-established sooner than the timeout by pressing the Esc key and then the Enter key. When the S> prompt is displayed, new commands can be sent.

SPECIFICATIONS

SIM Specifications
Sensor Interface to computer or buoy controller:
Standard: RS-232C; 1200, 2400, 4800, or 9600 baud; 8 data bits; no parity; echoing or no echoing of characters
Optional: RS-485
Current: 30 mA when communicating, 27 mA in quiescent state (**PwrOff**). With control line, < 10 microamps when turned off.
Power: 7-25 VDC



Dimensions:
PCB: 109 mm x 147.5 mm (4 1/4 x 5 3/4 inches)
Mounting holes: 90.5 mm x 138.1 mm (3 9/16 x 5 7/16 inches)

Underwater Inductive Modem Instrument Specifications –
See SBE 37-IMP, 37-IM, 37-IMP-IDO, 39-IM, 16*plus*-IM, 16*plus*-IM V2, 44, and UIMM datasheets

ICC Specifications –
See Inductive Cable Coupler datasheet

06/10

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