WinFrog Device Group:	PROFILER
Device Name/Model:	SeaBat 9001
Device Manufacturer:	**RESON Inc.** (USA) Tel: +1 805 964-6260 Fax: +1 805 964-7537 E-mail: sales@reson.com http://www.Reson.com **RESON OFFSHORE Ltd.** (UK) Tel: +44 1224 727 427 Fax: +44 1224 727 428 E-mail: sales@reson.co.uk
Device Data String(s) Output to WinFrog:	Header and 60 sets of (Hex) bathymetry data. See Configuration Details section for data packet. Can obtain heave from HEAVE data type. Can obtain pitch and roll from ATTITUDE data type.
WinFrog Data String(s) Output to Device:	Nil
WinFrog Data Item(s) and their RAW record:	PROFILE 916

DEVICE DESCRIPTION:
The SeaBat 9001 Multibeam echosounder can be installed on a vessel (either over the side, or through the hull), or on an ROV, fixed structure, plough or towed sled. The 9001 collects 60 soundings/pulse forming a 90 degrees wide by 1.5 degree long cross sectional survey swath. The instrument is capable of outputting 15 profiles per second, with 100% bottom coverage, at up to 2 times the water depth. External heave and attitude data will allow the system to accurately work in dynamic environments - an advantage over other profiling data type devices accepted by WinFrog.

To ensure proper interfacing of the SeaBat unit and firmware versions being used, check that the data packet output from the unit is identical to that described in the Configuration Details section of this document.

SeaBat 9001 Processor and Transducer

DEVICE CONFIGURATION INSTRUCTIONS

WINFROG I/O DEVICES > EDIT I/O:
Baud Rate: 9600
Data Bits: 8
Stop Bits: 1
Parity: None
High speed data output is provided via RS232. The connector is a DB 9 pin with: pin 2=Rx data into processor, pin 3 Tx data out of processor, and pin 5 ground.

WINFROG I/O DEVICES > CONFIGURE DEVICE:

No configuration is required at the I/O Device window level.

WINFROG VEHICLE > CONFIGURE VEHICLE DEVICES > DEVICE DATA ITEM > EDIT:
The PROFILE data item is attached to the vehicle with the Sonar Head installation. This will initiate the logging of the type 916 record in the RAW data files. Information on the 916 record can be found in the WinFrog User's Guide. The PROFILE data is used for logging only, and is not applied in real-time.

Data item: PROFILER, SeaBat 9001, PROFILE

Graphics:
Selecting the On radio button will display the device name and a square at the location of the Transducer, within the Graphics and Bird's Eye windows.

Profiler Head ID Slot Number: This option is not used for this device.

Offsets:
The X,Y,Z Offsets are applied from CRP to the Transducer Head. These values are set similar to values that would be applied to any device offset within WinFrog. Ensure that the offsets are measured to the center of the transmitting unit. Other items under the Offsets section are as follows:

Pitch: Enter the inclination of the fore/aft axis mounting error of the transducer. Positive pitch is applied when the transducer end of the head is tilted up, or back in the case of a vertically mounted head. This value should be measured relative to the WinFrog ATTITUDE device.

Roll: Enter the inclination of the port/starboard axis mounting error of the transducer. Positive roll is applied when the left side of the head is tilted up, or back in the case of a vertically mounted head. This value should be measured relative to the WinFrog ATTITUDE device.

Azimuth: Enter the observed scan angle relative to the bow of the vessel. A positive azimuth is clockwise, with 0° referenced to a mark on the Profiling Head.

Scan Angle: This is the sector angle of coverage centered on the perpendicular to the profiling head transducer. The SeaBat 9001 swath covers 90°, therefore this angle should be no greater than 90°.

CONFIGURATION DETAILS:

System Installation:

The SeaBat Transducer Head should be carefully mounted, with the offsets described in this document, precisely measured and referenced to the diagram below. If the transducer is mounted on a pole, it is advised to install a dampening material such as neoprene between the metal of the pole and the transducer head. The system is very susceptible to vibrations and therefore the pole mounting and transducer installation should be sturdy and free of vibrations.
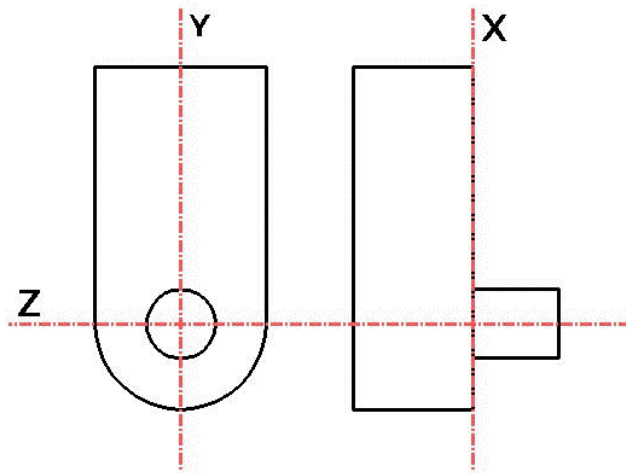
Acoustic Centre of the SeaBat 9001 Transducer

The WinFrog SeaBat 9001 device driver, as it presently exists, is only a data collector. All configurations are performed from the SeaBat Processor. Refer to the System Manual for complete installation instructions. Installation instructions and examples can also be viewed on the Reason web page.

Specifications:
Depth measurement range: 0.2 to 140 metres
Range resolution: 5 cm
Max. vessel speed: 16 Knots
Max. update rate: 15 swaths per second
Depth ratings (Tx pressurized): 350m and 500m
Frequency: 455 kHz Number of beams: 60 Beam size: 1½° x 1½°
Total swath coverage: 2x Water Depth (90°)
Transducer weight: 18½ kg (dry), 6 kg (wet)
Output Format: RS-232

Data Packet:
Firmware versions up to and including v.2.6 have only one output format on Aux#1 – X,Z coordinates at 9600-8-N-1.

Firmware version 2.7 and later provides two data output formats, while firmware version 2.13 has all three.

The Data Packet that is accepted by WinFrog is the R-Theta packet which contains a total of 140 bytes/characters and at an output rate of 19,200 baud, and has a transmit time of 0.073 seconds (10*140/19200). This is believed to be in Firmware versions 2.7 and later. In any case, the data accepted by WinFrog must match the following 140 bytes of data:

Descriptor	Description of Data
Packet Sync Header	Four 8-bit bytes (0xFF, 0xFF, 0x00, 0x00) This sequence only occurs at the header.
Packet Type and Subtype	Two 8-bit bytes (0x02, 0x00).
Year(00..99), Month(1..12), Day(1..31), Hour(0..23), Minute(0..59), Second(0..59)	Six 8-bit bytes. This is the clock inside the sonar processor. During external clock input, the year, month, and day values are forced to 99.
Sound Velocity (m/sec)	One 16-bit word, most significant byte first. This equals the value set on the sonar processor screen.
Latency (milliseconds	One 16-bit word, most significant byte first. This is the time between the sonar ping, and the time of transmission of the fourth byte of this packet's sync header. If averaging is enabled, it's the time from the first ping.
Sample Rate (hertz)	One 16-bit word, most significant byte first. This is the SeaBat's digitizing frequency for each sonar beam.
Beam Range and Quality Values	Sixty 16-bit words, most significant byte first. The upper 14 bites is the range (round trip travel time, in samples). To compute the range in meters, multiply by sound velocity, divide by sample rate, and divide by 2. Lower two bits is data quality (0 is bad, 3 is good, 1 and 2 may or may not be used at this time). See below.
Checksum	One 16-bit word. Unsigned sum of all the preceding 8-bit bytes, but not including the packet sync header.

The sixty theta values in the R-Theta output format are computed as follows:
The first beam is at bearing –44.25^o, the second is at 42.75^o, the third is at 41.25^o, and each beam following at 1.5^o graduations up to the last beam at +44.25^o. On the monitor, the first beam appears at the left of the screen, and the last beam appears at the right.

The system outputs legitimate range values at all four quality levels including quality 0. The values are as follows:
0 - poor co-linearity, poor brightness and occasional occurrence.
1 - poor co-linearity, good brightness and occasional occurrence.
2 - good co-linearity, poor brightness and occasional occurrence.
3 - good co-linearity, good brightness and frequent occurrence.