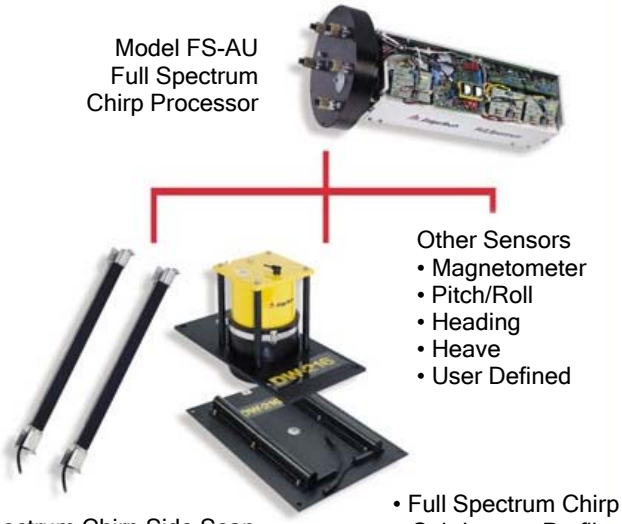
2200-M MODULAR SONAR SYSTEM

The best in side scan and sub-bottom imaging for AUV and ROV installations.



The ***EdgeTech 2200-M Modular Sonar System*** is designed for installation on an Autonomous Underwater Vehicle (AUV) or on a Remote Operated (ROV). It gathers side scan and/or sub-bottom data using EdgeTech's proprietary Full Spectrum (enhanced chirp) technology in water depths up to 6000 meters.

A modular system is provided as a complete package including sensors and pressure vessel. Alternatively, it can be integrated into the AUV pressure housing. The system can operate independent of the AUV by setting parameters before deployment, or a processor on the AUV can control it. Heave, pitch, roll, yaw, temperature and pressure are additional optional sensors.

While EdgeTech supplies its own Topside Display Processor, it is also possible to interface other 3rd Party Topsides. EdgeTech has entered into agreements with several Topside Manufactures who have agreed to support the EdgeTech Full Spectrum products.

Features:

- Full Spectrum chirp side scan sonar
- Full Spectrum chirp sub-bottom profiler
- Completely autonomous operation
- Controllable from AUV or acoustic link

Applications:

- Geo-hazard surveys
- Geological/geophysical surveys
- Buried pipeline and cable location
- Route Surveys
- Archeological surveys
- Search and recovery

AUV Features:

- Low power consumption
- Small payload
- Controllable by AUV or "autonomous" operation

ROV Features:

- Use/not use ROV supplied power
- Use/not use ROV digital link
- Link via fiber optics or coax cables

Side Scan Sonar Option

The Full Spectrum chirp side scan sonar is a calibrated wide band digital FM sonar that provides quantitative and qualitative, high resolution, low-noise side scan imagery. It simultaneously transmits linearly swept FM pulses and the user may select the combination of these frequencies as follows: 75/410 kHz, 120/410 kHz, 75/120 kHz or 300/600 kHz dual simultaneous.

A Digital Signal Processor (DSP) in the Full Spectrum (FSDW) electronics on the AUV or ROV holds the two waveforms to be transmitted. At periodic intervals, the waveforms are sent to a Digital to Analog Converter (DAC) that generates an analog pilot signal. These Frequency Modulated signals are then amplified and transmitted by a set of wide band transducers. The sampled acoustic return is sent to a Digital Signal Processor (DSP) for match filter processing.

Full Spectrum signal processing technology uses a proprietary matched filter to process wideband signals. This matched filter uses special amplitude and phase weighting functions for the transmitted pulse and a pulse compression filter that maximizes the Signal to Noise Ratio (SNR) of the acoustic images over a wide band of operating frequencies. These signal processing features provide a significant SNR improvement in the acoustic image generated by other impulse and chirp sonar with band limiting components that are limited in dynamic range.

One of the outstanding aspects of Full Spectrum signal processing is the use of a broad bandwidth transmitting pulse that sweeps out over a range of frequencies. This generates a great deal of acoustic energy in the water. Instead of trying to operate with one very sharp acoustic peak pulse, like conventional CW systems, the Full Spectrum sonar spreads the transmission out over a long time duration. In addition to the resolution improvement, the process of correlation processing achieves a signal processing gain over the background noise. To equal the typical performance of the Full Spectrum sonar pulse, conventional pulsed sonar would have to operate at a peak pulse power 100 times higher than the Full Spectrum pulse.

An additional feature of Full Spectrum side scan is the reduction of side lobes in the effective transducer aperture. The wide band and linearity of the FM sweep smears the side lobes of the transducer and thus achieves a beam pattern with virtually no side lobes.

Sub-Bottom Profiler Option

The sub-bottom profiler provides sensor packages with Full Spectrum pulses in the ranges of 4 - 24 kHz, 2 - 16 kHz and 1 – 6 kHz. The transmitter may be installed in front of or behind the receiver arrays. Separate hydrophones are mounted on the underside of the vehicle to provide a narrow acoustic beam width. The transmitters and receivers are custom designed and built to operate over a large contiguous bandwidth.

An important feature which enhances the ability of the Full Spectrum Sub-bottom Profiler system to classify sediments, is realized by the built-in de-convolution of the system response from the output pulse. The sonar's system impulse response is measured at the factory and is used to design a unique output pulse that will prevent the source from ringing. In addition to this, the Full Spectrum wavelet is weighted in the frequency domain to have a Gaussian like shape. As the Gaussian shaped spectrum is attenuated by the sediment, energy is lost but its bandwidth is preserved. Thus, even after being attenuated by 20 meters of sand, the Full Spectrum pulse has approximately the same resolution as a non-attenuated pulse.

The output of the matched filter processing in the underwater electronics is stored locally in the AUV mode. EdgeTech records the correlated data with phase information intact. Since nonlinear operations are not done on the correlated data, one can easily derive the raw data from the stored correlated data. Storage in this form allows the user the option to exercise the post-processing feature on any properly equipped computer without the unnecessary and time-consuming requirement to pass the data through a matched filter again.

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EdgeTech 2200-M Modular Sonar System installed on an AUV

Key Specifications

Side Scan Sonar Specifications

Frequencies	75/120 kHz	75/410 kHz	120/410 kHz	300/600 kHz
Modulation	Full Spectrum chirp frequency modulated pulse with amplitude and phase weighting			
Array Depression Angle	10° to 20° from horizontal, adjustable			
Array Size				
Length	99 cm (39”)	99 cm (39”)	78 cm (31”)	56 cm (22.08”)
Width	7 cm (2.75”)	7 cm (2.75”)	7.6 cm (3”)	3.8 cm (1.5”)
Depth	7.6 cm (3”)	7.6 cm (3”)	3.8 cm (1.5”)	3.12 cm (1.23”)
Array Weight in Air	16.5 kg (36.5 lbs)	16.5 kg (36.5 lbs)	7.3 kg (16 lbs)	2.6 kg (5.75 lbs)
Array Weight in Saltwater	11.6 kg (25.6 lbs)	11.6 kg (25.6 lbs)	5 kg (11 lbs)	1.8 kg (4 lbs)
Sensor Array Depth Rating	6000 meters			

Sub-Bottom Profiler Specifications

Sensor Model	**DW-106**	**DW-216**	**DW-424**
Frequency Band	1-6 kHz	2-16 kHz	4-24 kHz
Modulation	Full Spectrum chirp frequency modulated pulse with amplitude and phase weighting		
Number of Hydrophone Arrays	2		
Pulse Selections	1-6, 2-6, 1.5-4.5 kHz	2-16, 2-12, 2-10 kHz	4-24, 4-20, 4-16 kHz
Resolution	15-25 cm	6-10 cm	4-8 cm
Beam Width	28° - 36°	15° - 25°	15° - 25°
Transmitter Size (approximate)			
Height	31.8 cm	28 cm	19 cm
Diameter	26 cm	19 cm	12.7 cm
Hydrophone Size (each)			
Length	82.8 cm	54.6 cm	33.6 cm
Width	7.6 cm	7.6 cm	2.5 cm
Depth	6 cm	3.8 cm	2.5 cm
Transmitter Weight			
In Air (with plate)	40 kg	20 kg	10 kg
In Air (without plate)	33.9 kg	14.1 kg	7 kg
In Saltwater (with plate)	21.8 kg	8.8 kg	4.3 kg
In Saltwater (without plate)	14.4 kg	7 kg	4 kg
Hydrophone Weight			
Array in Air (with plate)	12.8 kg	8.6 kg	6 kg
Each in Air (without plate)	4.5 kg	1.4 kg	0.9 kg
Array in Saltwater (with plate)	7.4 kg	5.2 kg	3.2 kg
Each in Saltwater (without plate)	0.4 kg	0.3 kg	0.2 kg
Sensor Array Depth Rating	6000 meters		

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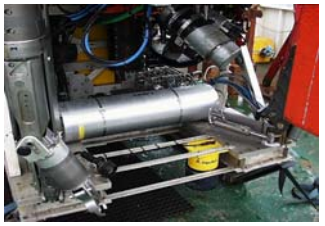

EdgeTech 2200-M Modular System installed on an ROV

FS-AU Specifications

Time Sync In- Hardware	TTL Level , minimum 5 µs pulse, triggers on negative edge, normally 1 PPS
Time Sync In- Software	Via Ethernet port, 10 ms accuracy
Triggers Hardware	3 programmable in/out TTL levels
Trigger Types	Internal, external, coupled, gated
Attitude Sensor Option	Heading Accuracy: < 1.5° RMS Heading Resolution: 0.1° Roll, pitch, angle accuracy: ± 0.4° Roll, pitch, angle repeatability: 0.2° Roll, pitch resolution: 0.1°
Options	USBL Acoustic Tracking System RS-232 Ports (4 or 6) bi-directional 19.2 K baud Power Out 12, 24, 48 or 400 VDC 400 watts Local mass storage Most customer specified sensors

StarMux Digital Link Specifications

Tow cable length (max)	10,000 meters coaxial, no limit on fiber optics version
Tow Cable Type	Coaxial or fiber optics
Physical Surface Module	
Size	3 U
Weight	7 kg (15.4 lbs)
Trigger FSK for Responder	TTL level, < 10 µs jitter
Power	105-230 VAC auto sensing, 50-60 Hz

Specifications subject to change without notice.

EdgeTech Model 2000
Topside Processor

Other EdgeTech Products

✓ Side Scan, Sub-bottom, Integrated and Modular Imaging Systems for Deep Towed, AUV, ROV and Other Applications utilizing Full Spectrum, MultiPing or Synthetic Aperture Acquisition and Processing Techniques.

EdgeTech
E-MAIL: INFO@EDGETECH.COM WEB: WWW.EDGETECH.COM
MA (USA) TEL (508) 291-0057 FL (USA) TEL (561) 995-7767