

SonicWorks™

Acoustic Position and Navigation System (APNS) True Robot Guidance and Control

APNS Performance Overview:

The New **SonicWorks™ Acoustic Position and Navigation System (APNS™)** uses a combination of enhanced computation techniques for precise measurement and tracking in a 3-dimensional network

SonicWorks APNS is a flexible baseline, short to long baseline system, operating on a multi-frequency basis and achieving ranges of from 3 to 1000 meters. Update rates of up to 50 times per second, with total cycle times dependent on total range. The system utilizes frequency-hopping within discrete bands in the 100 to 600 kHz range and programmable power control to achieve precision measurement and excellent range. Digital Signal Processing (DSP) is used to achieve a typical accuracy of $\pm 3\text{mm}$ at 300kHz over a 100 meter range. Dual Calculation ability (time of arrival and time differential) allows tracking of SonicWorks components and independent sources, as well as other manufacturer's components. The frequency and power control agility of the APNS allows the system to be used effectively in a wide range of environments from closed tanks to vessels at anchor to the open ocean.

Application include: underwater archeology, environmental survey, precision bathymetric mapping and inspection, precision measurement of equipment location/placement, and precision underwater inspections using ROVs and divers.

A motion compensation feature corrects for changes in current and motion of the system elements, and system design addresses typical variables affecting accurate measurement. A sound velocity meter, hydrophone, and sound source analysis capability are built into the system. The system's net components monitor water temperature and element depth directly.

Order of Magnitude Improvement over Existing Technology

- **Accuracy 1 cm**
- **Resolution 2 mm**
- **Speed: 50 reports per second**

Cellphone network like configuration

- **Covers any volume of water**

Standard System Configuration:

- **Four Transceivers**
Connect up to 12 transceivers to controller
- **Four 100 meter cables and spoolers**
- **Controller/Computer/SVGA display**
- **Software and Operations Manual**
- **Speed of Sound Adapter**
- **Project Management**
Mission recording and playback



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General Technical Specifications:

Controller / Computer:

Dimensions:	Rack Unit - 4U type, 51 x 46 x 20 cm (20 x 18 x 7.75 in) cabinet with 48.26-cm (19 in) rack-mount computer insert with slides, optional 2U Box with laptop for diver operations
Weight:	Cabinet 7.26 kg (16 lb.), Computer 6.81 kg (15 lb.)
Power	100-240 VAC, 47/63 Hz, and 80 Watts (Isolated)
Resolution:	250 nanosecond, 0.375 mm in seawater
Range:	32-bit clock, greater than 1 Kilometer in seawater
Number of Channels:	Up to 12 per controller and 192 stations per controller
I/O Interface:	RS 232, RS 422, RS 485, Ten-base T, and optional Fiber Optic interface
Computer	RISC/DSP based micro controllers and Pentium based industrial computer, 256 MB RAM, 80 GB Hard Drive,
Display:	SVGA video monitor, (optional Ruggedized sunlight readable LCD display)

Transceivers/Stations:

Case Material:	304 Stainless Steel (2000 meters), Carbon Fiber (1000 meters)
Dimensions:	Bottle is 31.75 cm L x 5.72 O.D. cm (12.5 L x 2.25 O.D. in)
Weight:	304SS 2.27 kg (5 lb.), Carbon Fiber .6kg (1.3 lb.)
Power:	Supplied by Controller @ 24 VDC
Depth Rating:	Std 1000 m (3300 ft), HD 2000 m (6600 ft),(option to full ocean depth)
Frequency:	100 to 600 kHz, selectable
Operating Range:	1 m (3.3 ft), to 1 kilometer, (optional to greater than 1 kilometer, cellular)
Range Accuracy:	+/- 2 mm (.066 in) @ 600 kHz to cm accuracy @ 100 kHz, (typical +/- 3 mm (.098 in) @ 300 kHz)
Sensors	Active depth and temperature monitoring.

ROV Module:

Multifrequency and power control, Pinger module. Subsea power 5 to 32 V @ 2 amps. Optional Depth Sensor, Standard interface RS485/RS422, optional Ethernet wire or fiber

Compensation Module:

Motion compensation unit, mechanical and magnetic mounts. Powered supplied by controller.

Diver Cursor:

Simple Cursor and Readout Diver Cursor with response system for direct measurement, annotation and diver communication. Optional support interface, data, video and voice.

Cables:

Standard Length:	100 m (328 ft.), (optional to 10 kilometers)
Construction:	Custom cable, Polyurethane abrasion resistant jacket with Kevlar strength member. (250 kg (550 lb.) Breaking strength or 22.7 kg (50 lb.) Dead load
Cable Reels:	Carbon fiber reinforced polyethylene, standard capacity of 500 m (1,640 ft) cable.

Wireless versions of components available

Software:

Operating System:	NT Embedded and Windows 2000
Operator Control:	Output power, System sensitivity, T/R frequencies from 100 to 600 kHz, programmable frequency hopping sequence, Acoustic modem messaging and control.
Software Tools:	Auto-Cal., Speed of Sound, Tracker (3-D virtual reality display), Diagnostics (hydrophone status & TDR cable tester), Benchmark (relate net coordinates to external benchmark, Data & Format editing), Project management with data and video storage, retrieval and editing.
Graphics:	SVGA or VGA
Data Storage:	Microsoft Access compatible – 3-D position data, Background inputs for Tracker (3DS, DXF, VRML, and Inventor)
Data Rates:	Typical 40 Hz @ 300 kHz, 100-m range

Technical Specification subject to change without notice!

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