SONOTRONICS

PRODUCT OVERVIEW and PRICE LIST

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SONOTRONICS

3169 S Chrysler Ave
Tucson, AZ 85713
Email: sales@sonotronics.com
www.sonotronics.com
(520) 746-3322
Fax: (520) 294-2040

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E-mail - sales@sonotronics.com
World Wide Web - http://www.sonotronics.com

SUGGESTED READING

Several titles are available from American Fisheries Society. More information is available on the “Publications” link of the American Fisheries Society website. The URL is listed below:

http://www.fisheries.org/html/index.shtml

A recommended title:

These include Fisheries Techniques, edited by Larry Nielsen and David Johnson, and Fish-Marking Techniques edited by N.C. Parker et al.

PRODUCTS OVERVIEW

As a leader in the manufacture of ultrasonic tracking equipment since 1971, Sonotronics products traditionally fall into two categories: fisheries research and equipment marking:

Fisheries Research Products:

-Ultrasonic transmitters:

-Coded: Allows for unique identification of individuals, while determining movement, passage and location.

-Telemetry: In addition to the above, provides parametric temperature and depth data, mortality, and other environmental information.

-Acoustic and Radio: Permits tracking through different environments, even on land, using radio and acoustic transmissions, in one package with internal antenna.

-Receivers:

-Active Tracking: Manual systems allowing real-time tracking and monitoring.

-Passive Tracking: Submersible ultrasonic receivers for automated logging of fish ID along with time and date stamp for fish passage and habitat studies. Single units can mark entrances/ exits to key parts of a system, while curtains and arrays can be used for higher resolution fish movement data.

-Hydrophones: A variety of directional and omnidirectional hydrophones.

Equipment Marker Products:

-Equipment Marker Pingers: Special high output pingers with holes for ease of mounting. Various combinations of lifetime, size, range, and telemetry options available, including Tilt Angle Pingers That report their angle of orientation to gravity in real time, allowing for monitoring of tilt angle during equipment deployment applications.

-Deck Unit Receiver (MANTRAK kit): Receivers used on the search vessel to determine the vicinity and bearing to begin a dive towards target.

-Underwater Diver Receivers: UDR allows for approach directly to the target in extreme low visibility environments.

Fisheries Research Products

CODED TAGS

Below are the families of Sonotronics transmitters, listed in order of size from smallest to largest. All transmitters are coded with our unique "integrated tracking approach" algorithm, allowing thousands of transmitters to be uniquely identified by passive receivers (SURs) and while actively tracking (USR-08, DH-4).

PICO TAGS: PT series

FREQUENCY: 69 - 83 kHz
RANGE: 300—750m +

MINIATURE TAGS: IBT-96 series

FREQUENCY: 69 - 83 kHz
RANGE: 500m +

TRACKING TAGS: CT series

FREQUENCY: 32 - 40, 69 - 83 kHz
RANGE: To 1000 meters.

HIGH POWER TAGS: CHP-87 series

Similar to the CT-82, except the output power is significantly higher.

FREQUENCY: 32 - 40, 69 - 83 kHz
RANGE: To 3000 meters.

ACOUSTIC and RADIO TRANSMITTER: ART-01

Combines radio and acoustic transmitter in one package, without external antenna.

FREQUENCY: 32 - 40, 69 - 83 kHz Acoustic
150 MHz nominal RF
RANGE: To 1000 meters (RF and Acoustic)

The ART is made in conjunction with Telonics of Mesa, AZ
A Sonotronics USR-14 receiver and DH-4 hydrophone combination is recommended for acoustic tracking of the transmitter, and a Telonics TR-4 and RA-14K antenna combination the radio tracking. Information on Telonics products can be found at www.telonics.com.

NOTE: There is a small battery drain while transmitters are "sleeping": this drain may be negligible in long life transmitters, but on short lifetime transmitters this drain may be significant. If transmitters will be stored for longer than 2 months before deployment, it is recommended that the user contact Sonotronics for battery loss information. Also note that lifetimes for these tags may be increased significantly by having them pre-programmed to cycle on and off. Please contact Sonotronics for more information about this technique.

TELEMETRY TAGS

TEMPERATURE TAG: CTT-83 series

FREQUENCY: 32 - 83 kHz
RANGE: To 1000 meters.
RESOLUTION: 0.5° C.
CALIBRATION: Precalibrated for +/- 1 deg C, can be calibrated by the user to +/- .5 deg C

MINI TEMPERATURE TAG: IBTT series

FREQUENCY: 32 - 83 kHz
RANGE: To 1000 meters.
RESOLUTION: 0.5° C.
CALIBRATION: Precalibrated for +/- 1 deg C, can be calibrated by the user to +/- .5 deg C

PICO TEMPERATURE TAG: PTT series (smallest telemetry transmitters)

FREQUENCY: 32 - 83 kHz
RANGE: To 1000 meters.
RESOLUTION: 0.5° C.
CALIBRATION: Precalibrated for +/- 1 deg C, can be calibrated by the user to +/- .5 deg C

DEPTH TAG: DT-97 series

FREQUENCY: 32 - 83 kHz
RANGE: To 3000 meters.
DEPTH RANGE: 50, 100, 200, 300 & 500 PSI.
ACCURACY: Pressure, ± 1% of full scale. 0 to 35 deg.C.
RESOLUTION: 1%.
ATTACHMENT: 1/16" hole at both ends.

*Smaller size with shorter life times are available. Contact factory for details.

MINI DEPTH TAG: IBDT-97 series

FREQUENCY: 69 - 83 kHz
RANGE: 500 meters+.
DEPTH RANGE: 50 or 100 PSI.
ACCURACY: ± 1% of full scale
RESOLUTION: 1%.
ATTACHMENT: 1/16" hole at both ends.

ULTRASONIC RECEIVERS

SONOTRONICS receivers offer superb performance for both active and passive systems, and provide optimum detection ranges when used with SONOTRONICS hydrophones and sonic tags.

NARROW BAND RECEIVER: USR-14

The USR-14 offers wide tuning range and narrow band reception ideal for use in noisy environments. Housed in a Pelican 1150 case, the USR-14 receiver is available with optional dual hydrophone inputs, and with internal memory and real-time-clock for unattended data logging. The two line LCD displays both frequency and interval, as well as ID and telemetry data.

FREQUENCY: 30 - 150kHz
BANDWIDTH: 500 Hz, 7 pole response.
OUTPUT: Headphone jack, optional data ports for data logging, GPS.
POWER: Internal rechargeable batteries with charger.
SIZE: 9.3”L. x 7.8”W x 4.5”D
INPUT: BNC connector (s).
SENSITIVITY: 10 uVolts for >35 dB (S+N)/N ratio.
DISPLAY: 2 x 16 LCD.

AVAILABLE OPTIONS:

The USR-14 may be ordered with optional memory and serial interface to allow recording and subsequent downloading of detected transmitters. In addition, the logging version of the USR-14 is available with 2 hydrophone inputs for greater flexibility, and finally this dual input version is available with an external GPS receiver (Garmin GPS18x or equivalent).

MANUAL TRACKING KIT

The manual tracking kit consists of all the tools necessary for active tracking. These tools include:

- USR-14 narrow band, single input receiver
- DH-4 directional hydrophone
- professional headphones
- External speaker
- Extra battery pack (allows up to 16 hours operation—8 per battery pack)
- EMT-01-1 test transmitter
- Pelican case
- DC and AC charge/power adapters

The internal battery pack will provide 7-8 hours of operation.

*****New:** the MANTRAK-TH tracking kit contains a TH-2 omni-directional, towable hydrophone in addition to all the items listed above. This addition permits the greatest flexibility to perform active tracking of acoustic transmitters from multiple vendors.

AUDIO AMPLIFIER: HPR-95

The HPR-95 is an audio amplifier designed for use with piezo-electric hydrophones. The amplifier allows for listening and recording of underwater sounds from water animals or underwater pumps and submerged equipment.

FREQUENCY: 100 Hz to 25 kHz.
OUTPUT: “Mini” jacks for headphone and tape recorder.
POWER: Internal 9V, alkaline batteries recommended, 36 hrs. continuous use.
SIZE: 3.8 in. x 2.5 in. x 1.4 in deep, 0.7 lbs.
INPUT: BNC connector
GAIN: TAPE: 40 dB fixed, EAR: 0 - 62

HYDROPHONES

SONOTRONICS hydrophones provide outstanding sensitivity, yielding excellent detection ranges when used with SONOTRONICS receivers.

DIRECTIONAL HYDROPHONE: DH-4

The DH-4 provides the greatest range and precision in locating transmitters from 30kHz to 100kHz. The parabolic reflector provide 16db of gain over a comparable omnidirectional hydrophone, and yields a calculated DI of nearly 25db, reducing the effect of environmental noise. The DH-4 is the primary hydrophone for active tracking.

SENSITIVITY: -84 dBV ref 1 uBar. (-184 db ref 1v/uPascal)
BEAM WIDTH: +/-6 degrees at half power points.
SHAFT LENGTH: User supplies mounting shaft. (1 inch PVC)
OUTPUT: BNC connector on 10 foot coaxial cable (other lengths available).
CABLE: Replaceable RG-58 A/U

TOWED OMNI-DIRECTIONAL HYDROPHONE: TH-2

The TH-2 provides a simple method for mobile active tracking: its small size and hydrodynamic shape allows for trolling at speeds up to 5 knots, while the long cable length minimizes the affect of engine and prop noise. Eyelets allow attachment of small weights or diving lures to ensure the hydrophone is kept at depth while trolling. This design, though simple, rivals more elaborate and expensive systems in actual field trials.

. **SENSITIVITY:** -100 dBV ref 1 uBar (-200 db ref 1v/uPascal)
BEAM WIDTH: Omni-directional +/- 2 dB.
OUTPUT: BNC connector.
CABLE: 50’ polyurethane jacketed coax

****NEW: *mini*SUR: *miniature* SUBMERSIBLE ULTRASONIC RECEIVER**

The miniSUR is a submersible receiver designed to detect and log to flash memory the presence of an animal tagged with a Sonotronics ultrasonic transmitter. The miniSUR contains an integrated hydrophone, flash memory, and BlueTooth transceiver for configuration and data downloads. The miniSUR uses 3 AAA batteries (Alkaline or NiMH) for simplified deployments.

FREQUENCY: 40 - 180 kHz, user configurable
BANDWIDTH: 5 kHz
POWER: AA lithium battery, user replaceable
LIFETIME: 2.5 month typical.
SIZE: 14.5cm length, 32.5mm diameter
WEIGHT: 132g (with batteries installed), negative buoyant in water
INPUT: Onboard hydrophone; BlueTooth radio for data connection .
MEMORY: 1MByte standard (100000 + detections)

SUR-3(BT): SUBMERSIBLE ULTRASONIC RECEIVER

The SUR-3 is a submersible receiver designed to detect and log to flash memory the presence of an animal tagged with a Sonotronics ultrasonic transmitter. The SUR contains an integrated hydrophone, flash memory, and transponding feature, allowing the user to interrogate the unit from a distance and determine presence/absence of data in the unit.

FREQUENCY: 30 - 90 kHz, Programmable
BANDWIDTH: 500 Hz
POWER: 1 or 2 Lithium D Cell Batteries (SUR contains 2 D cell sockets)
LIFETIME: 10 months typical with 2 D cells.
SIZE: 36cm length, 6.1cm diameter
WEIGHT: 900g (with 2 D cells installed), positive buoyant in water
INPUT: Onboard hydrophone, RS232 or BlueTooth (BT) data connection .
MEMORY: 2MByte standard (200000 + detections)

SUR-3 Accessories:

SIT-1: SUR Interrogator Transmitter: This transmitter broadcasts at 60.0kHz: a special channel scanned by the SUR. If detected, the SUR responds with a transmission indicating the quantity of data stored in the SUR.
SURBATT: Replacement Tadiran TL-5930 battery for SUR's

Please see the SUR manual for more information.

ACCESSORIES

ATTENUATOR: ATN-95

For use in areas of high acoustic background noise, such as high flow rate streams, or for precise locating of nearby tags. The ATN-95 includes both a 6 dB and 10 dB inline coax attenuators. Attenuators are connected in between the hydrophone cable and the receiver.

MISCELLANEOUS INFORMATION

SURGERY VIDEO

A video is available for our customers on Surgical Techniques for Insertion of Ultrasonic Transmitters in fish: playing time is 20 minutes.

WEIGHTS/SIZES/RANGES/LIFETIMES

Weights of tags are in water. Ranges are in deep sea water at sea state zero. Assumes no temperature stratification. Sizes are to the closest 0.5 mm. Lifetimes are based on actual measured current consumption of individual tags, along with battery manufacture's *published* capacity ratings. SONOTRONICS does not test or guarantee these published specifications. Note that there is a small current drain when transmitters are “asleep” with their magnets on. In some cases this can significantly reduce life when tags are shelved for periods of time before the study. Please contact SONOTRONICS for more information about the particular model of transmitter. Lifetimes of transmitters are based upon a pulse repetition rate (pulse interval) of one pulse per second.

STANDARD CRYSTAL FREQUENCIES

32.0 to 40.0, 50.0, 60.0, 69.0 to 83.0 kHz in 1 kHz increments.

ATTACHMENT HOLE SIZE

Standard is 1/16". Other sizes available for a nominal charge. Any deviation in product specifications must be included on your order.

TOLERANCE

Tolerance for tag length is ± 3%.
Tolerance for tag weight is ± 10%.

ON SITE ASSISTANCE/ON SITE SURVEYS

Sonotronics provides on site assistance and surveys. This can help a project launch with more speed and ease by providing first hand explanation and demonstration into the installation and use of Sonotronics systems, and the art of tracking. Sonotronics requires 30 days notice for consideration of on site assistance.

Equipment Marker Products:

EQUIPMENT MARKER PRODUCTS

The Sonotronics Equipment Marker product line allows for the relocation of an object previously marked with a pinger in a variety of marine environments. Equipment can include submersibles, water monitoring equipment, divers, or virtually any other underwater object. Applications can include military, ocean oil drilling operations, surveying, fisheries, and many others. There are three simple steps to the implementation of the system:

1. Marking the target with a pinger: The pinger is attached to the object prior to deployment via convenient mounting holes. Pingers are activated at the time of deployment, and then are deactivated when the object returns to the boat, allowing for longer battery lifetimes.

2. Location of vicinity and dive direction: The deck unit receiver is used to determine that the object is still in the vicinity, and appropriate direction to begin the dive.

3. Approach to the target using the Underwater Diver Receiver: The diver then enters the water wearing waterproof headphones, listening to the strength of the transmissions from the pinger. Gain control and signal strength indication allows for accurate bearing as the diver approaches the object. The UDR may be programmed to scan several frequencies, allowing for many pingers to be tracked.

It is not always necessary to purchase the deck unit receiver and the underwater receiver. If equipment is in shallow, clear water, the deck unit may be sufficient. If the vicinity of the equipment to be located is established, only an underwater receiver may be necessary.

EQUIPMENT MARKER PINGERS: EMT Series

These pingers are designed and packaged specifically for the purpose of marking equipment for later recovery.

FREQUENCY: 32 - 40, 69 - 83 kHz
RANGE: 1km to 4km

EMT-01-1: 48 month, medium range transmitter (1km)
EMT-01-2: 18 month, Higher power transmitter (3km)
EMT-01-3: Extreme high power transmitter (4km), with user replaceable batteries. Various lifetime and power output combinations available. Please see EMT-01 data sheet.

UDR: UNDERWATER DIVER RECEIVER:

The UDR is a handheld diver operated receiver with waterproof headphones in pelican case. The unit will detect any Sonotronics transmitter and is used for a wide variety of applications. These applications include up close monitoring of animal habitat and behavior, recovery of tagged equipment, and many others. The unit uses audio signal strength in the headphones as the primary detection scheme.

FREQUENCY: Programmable: 30 to 90 kHz
DISPLAY: LCD: displays frequency and pulse interval.
SENSITIVITY: 20uVolts for 30 dB (S+N)/N
SIZE: 16cm x11cm x 20cm
WEIGHT(in air) : UDR:900g Headphones:415g
POWER: Internal rechargeable battery with charger.
BATTERY LIFE: 5 Hours**,** recharge time 12 hours.

DECK UNIT (USR-14) RECEIVER:

The USR-14 Receiver is used to find tagged equipment from the deck of a boat. Using a directional hydrophone the operator can determine the direction of the marked equipment. The MANTRAK kit consists of the USR-14, DH-4 directional hydrophone and useful accessories in a pelican case.

RovR: Rov mountable ultrasonic Receiver:

The RovR is a submersible receiver designed to detect ultrasonic transmitters within a wide range of frequencies. The RovR contains an integrated directional hydrophone, and provides relative signal strength, pulse interval, and detection frequency via an RS-232 data port.

FREQUENCY: 30 - 100 kHz, Programmable
BANDWIDTH: 500 Hz
POWER: 4.5-24VDC
SIZE: 24cm length, 6.4cm diameter
WEIGHT: 700g, positive buoyant in water
INPUT: Onboard hydrophone, RS232 data connection.
DEPTH: 300m (1000') - Clear Butyrate tube
(3000M with optional Titanium Housing)

PRICE LIST

MODEL	Length	OD	WT in H_20 gms	Range[1]	Autonomy[2]	Price
Coded High Powered Transmitters						
CHP-87-S	54mm	15.6mm	9g	To 3km	7 months	$325
CHP-87-L	80mm	15.6mm	12g	To 3km	18 months	$325
CHP-87-XL	99mm	33.5mm	34g	To 3km	4 years	$400
Coded Transmitters						
CT-82-1-I	38mm	15.6mm	6g	To 1km	60 days	$175
CT-82-1-E	38mm	15.6mm	6g	To 1km	60 days	$175
CT-82-2-I	53mm	15.6mm	9.5g	To 1km	14 months	$225
CT-82-2-E	54mm	15.6mm	9.5g	To 1km	14 months	$225
CT-05-36-I	63mm	15.6mm	10g	To 1km	36 months	$300
CT-05-36-E	64mm	15.6mm	10g	To 1km	36 months	$300
CT-05-48-I	79mm	15.6mm	12g	To 1km	48 months	$300
CT-05-48-E	80mm	15.6mm	12g	To 1km	48 months	$300
Coded Temperature Transmitters						
CTT-83-2-I	53mm	15.6mm	9g	To 1km	14 months	$260
CTT-83-2-E	54mm	15.6mm	9g	To 1km	14 months	$260
CTT-83-3-I	63mm	15.6mm	10g	To 1km	36 months	$325
CTT-83-3-E	64mm	15.6mm	10g	To 1km	36 months	$325
Depth Telemetry Transmitters						
DT-97-L	66mm	15.6mm	11g	To 3km	12 months	$500
Acoustic and Radio Transmitters						
ART-01	80mm	16.5mm	12g	To 1km	12 months	$500
ART-09	55mm	11mm	4.5gr	To 1km	9 months	$500

NOTES:
[1]Quoted ranges are under good conditions using a USR-14 receiver and a DH-4 hydrophone, and pertain to audio detection as opposed to automated detection..
[2]Continuous operation lifetime.

PRICE LIST (continued)

TAG MODEL	Length	OD	WT in H_20	Range	Autonomy	Price
Miniature Transmitters (Itty-Bitty)						
IBT-96-1	22(30)mm	8mm	1.4g	750m+	21 days	$295
IBT-96-2	25(33)mm	9.5mm	2.5g	750m+	60 days	$295
IBT-96-6-I	42mm	11mm	3.9g	750m+	8 months	**$365 (est)
IBT-96-6-E	45mm	11mm	4.5g	750m+	8 months	**$365 (est)
IBT-96-9-I	47mm	11mm	4g	750m+	9 months	$300
IBT-96-9-E	50mm	11mm	5g	750m+	9 months	$300
PicoTags (sub-miniature)						
PT-1	16mm	7.1mm	.7g	500m+	7 days	$325
PT-2	19mm	7.1mm	1g	500m+	12 days	$325
PT-3	19mm	7.8mm	1g	750m+	21 days	$325
PT-4	25mm	9.0mm	2.3g	750m+	90 days	$325
Miniature Temperature Sensing Tags						
IBTT-08-1	27mm	8mm	1.6	500m+	21 days	$350
IBTT-08-9-I/E	52/55mm	11mm	4.2/5.2	750m+	9 months	$350
PTT-1	21mm	7.1mm	1.0	500m+	7 days	$350
PTT-2	24mm	7.1mm	1.2	750m+	12 days	$350
PTT-3	24mm	7.8mm	1.2	750m+	21 days	$350
Miniature Depth Telemetry Transmitters (Note** smaller size, longer life)**						
IBDT-97-1	30/35mm	9.5mm	1.6g	500m+	20 days	$450
IBDT-97-2	37/42mm	9.5mm	2.5g	500m+	45 days	$450
IBDT-96-9	60mm	11.5mm	4.5g	750m+	9 months	$450

** The IBT-96-6 uses proprietary batteries: price and delivery may vary, please contact Sonotronics for current price and delivery times.

PRICE LIST (continued)

Fisheries Research Products Price List—Receivers		
MODEL	**Description**	**Price**
Active Receivers and Related Products		
****NEW:** USR-14	Active tracking receiver, Pelican case	$2250
USR-14-SL	Active tracking and data logging receiver, Pelican case	$2500
USR-14-DL	Active tracking and data logging receiver, Pelican case, Dual input	$2750
USR-14-DLG	Active tracking and data logging receiver, Pelican case, Dual input, GPS support	$3000
MANTRAK	Manual Tracking Kit (contains USR-14, DH-4, and accessories)	$3500
UDR Related Products		
UDR	Underwater Diver Receiver, Headphones, Case	$3500
UDR-HP	UDR headphones (Grey Ghost)	$275
UDR-BP	UDR Bonephone (bone conduction speaker, fits inside wetsuit hood)	$325
Passive receivers and Related Products		
****NEW: miniSUR**	***Miniature Submersible receiver***	**$695**
SUR-3	Submersible ultrasonic receiver (1-9 unit price)	$1350
SUR-3BT	Submersible ultrasonic receiver, BlueTooth interface (1-9 unit price)	$1400
SUR-EXT	Submersible ultrasonic receiver, cabled w/o battery, RS232 interface	$1750
SIT-1	SUR interrogator transmitter (interrogates SUR for presence/absence of data)	$250
SUR-BATT	SUR Replacement Battery	$30
USB Dongle	Serial to USB Dongle—allows use of USB port to communicate with SUR's	$50
Dongle BT	BlueTooth USB Dongle for PC connection to miniSUR and SUR-3BT	$50
Hydrophones		
DH-4	Directional hydrophone, with 10 ft coax ($1/ft for lengths > 10ft)	$675
TH-2	Towed Omni-directional hydrophone, with 50 ft coax	$475
Other		
ATN-95	In-line coax attenuators, 6 dB and 10 dB	$75
HPR-95 Amp	Audio Amplifier	$250
PGH	Professional Grade Headphones	$150

Instrument Marking/Oceanographic Products:						
Equipment Marker Transmitters (Weights in Air)						
EMT-01-1	99mm	19mm	40g	To 1km	48 months	$325
EMT-01-2	99mm	19mm	40g	To 3km	18 months	$375
EMT-01-3	201mm	32mm	223g	[1]To 4km	[1]Up to 6 months	$600
EMT-01-3IAL ** Immersion activation	201mm	32mm	223g	[1]To 4km	[1]Up to 6 months	$700
EMT-01-5	136mm	32mm	179g	To 4km	18 months	$500
Tilt Angle Monitoring Transmitters (Weights in Air)						
EMT-AR-1	99mm	19mm	39g	To 1km	48 months	$425
EMT-AR-2	99mm	19mm	39g	To 3km	18 months	$475
EMT-AR-3	201mm	32mm	223g	[1]To 4km	[1]Up to 6 months	$675
UDR-kit	Deck/Diver receiver Kit (contains UDR, UDR-BNC, DH-4, and accessories)					$4300
MANTRAK	Manual Tracking Kit (contains USR-14, DH-4, and accessories)					$3500
MANTRAK-TH	MANTRAK kit with TH-2 omni-directional, towable, hydrophone					$3900
MANTRAK-TT	MANTRAK kit with 2xEMT-AR-1 tilt pingers (2 pingers only)					$4000
UDR Related Products	**UDR Related Products**					
UDR	Underwater Diver Receiver, Headphones, Case					$3500
UDR-BNC	UDR BNC adapter for use with separate hydrophone					$175
UDR-HP	UDR headphones					$275
UDR-BP	UDR Bonephone (bone conduction speaker for inside wetsuit hood)					$325
ROV Related Products	**ROV Receivers**					
RovR-S	ROV mounted receiver, 1000' depth rated					$2500

[1] Depends on battery configuration: the EMT-01-3 supports 3 battery systems, allowing choices for range and lifetime.

PRICE LIST NOTES:

- Internal implant version or external mount version must be specified when ordering with an "I" or an "E" accordingly at the end of the model number. Transmitters with the "E" suffix will have a small drill hole at each end of the transmitter to aid in external mounting. Transmitters with the "I" suffix will have a round end on one end to aid in insertion during surgery. Changing the transmitter packaging may result in a change in dimensions.
- The transmitters mentioned in this catalog are a set of SONOTRONICS standards. Custom lifetimes, sizes, and ranges are possible-contact the factory for details.
- Prices are in U.S. dollars
- Autonomies are based upon 1 15ms ping per second. Faster ping rates may cause a shortening of tag lifetime.
- Achievable ranges are based upon the particular pingers output detected by a Sonotronics USR-08 receiver and DH-4 hydrophone combination, under ideal sea conditions.
- There is a small battery drain while transmitters are "asleep" with their magnets on them. This drain may be negligible in long life transmitters, but on short lifetime transmitters can reduce their remaining lifetime by 25% per 3 months, or more. If transmitters are to be stored for any period of time greater than 1 month before deployment, it is recommended that the user contact Sonotronics for battery loss information.
- There are multiple options for power output and battery life available. Please see the EMT data sheet for exact combinations. The EMT-01-3 has field replaceable batteries.

CHOOSING THE RIGHT SYSTEM

A tag, receiver and hydrophone form the basic system. The **MANTRAK Kit** includes high-quality headphones, an external speaker, a watertight Pelican case, a sample transmitter, and other accessories intended to facilitate ease in tracking. This is the Sonotronics recommended solution for active tracking.

RECEIVERS

There are two fundamental types of tracking using ultrasonic transmitters, active tracking and passive tracking.

Active tracking: Real-time tracking ultrasonic receiver to locate and identify specific animals or equipment tagged with an ultrasonic transmitter, also allowing in-situ telemetry data collection. The USR-14 narrow band receiver and DH-4 directional hydrophone is the system of choice for manual tracking. When traversing large areas, the TH-2 towed hydrophone can significantly reduce the amount of time and labor during active tracking sessions.

Diver Receiver tracking: A specific case of active tracking, use of the UDR underwater diver receiver aids monitoring fish in their microhabitat, recovery of lost transmitters, and is often used to recover equipment marked with a transmitter. With fine gain control and signal strength display, divers can often find equipment even in very poor visibility.

Passive tracking: Passive tracking involves using an automated receiver, typically the SUR submersible ultrasonic receiver, to detect and record tagged animals that pass within its detection range. Typically, these systems are deployed for extended periods of time (months) allowing for continuous tracking with minimal labor.

TRANSMITTERS

Transmitters are defined by 3 quantities: size, life and range. For animal tracking, size is limited by the weight and body geometry: generally transmitter weight in water must be < 2% of body weight. The decision on whether or not to implant usually is a function of the life-time of the study. As a general rule, a study lasting more than 3 months should consider surgical implants unless external retention methods are proven.

HYDROPHONES

Model DH-4 is the best all around hydrophone for active tracking: its narrow cone of reception gives optimum range and precision of location. A scan of the four quadrants for signal strength will provide a quick bearing, and a bit of patience can produce a precise bearing (within 10 degrees). The model TH-2 omni-directional hydrophone detect equally well in all directions, and is suitable for towing at speeds up to 5 knots.

SONOTRONICS

3169 S Chrysler Ave
Tucson, AZ 85713
Email: sales@sonotronics.com
www.sonotronics.com