

Freshwater & Marine
Radio & Acoustic

SRX_400 Receiver Systems



The SRX_400 is a rugged, 4 MHz bandwidth receiver / data logger that provides the basis for manual tracking telemetry systems, as well as cost-effective, comprehensive systems for unmanned, remote data acquisition.

Manual Tracking

Traditional manual tracking methods are often employed in studies to determine gross movement, migratory patterns, location of spawning grounds etc. Today, a greater number of researchers rely on scanning receivers for manual tracking. A scanning receiver allows researchers to automatically listen at each frequency for short, user defined periods of time. When a signal is detected, the scanning cycle can be suspended to locate the animal. Once located, the scanning routine is resumed until a signal from another individual is detected ... etc.

Automatic Data Logging

Fixed station data logging systems in wide use today were first introduced by Lotek Engineering in the late 1980's. The open architecture design of the SRX_400 was inspired by the belief that in order to provide effective tools to assist researchers, those tools must be readily adaptable to evolving research requirements.

As a result, regardless of the configuration selected, the SRX_400 receiver can be modified to address a wide variety of research applications, as dictated by the requirements of each individual project.



These field proven systems bring to the manager and researcher, multi-tasking capabilities for divergent functional applications. SRX_400 based systems, along with peripherals and a comprehensive firmware library, provide capability for:

- simultaneous monitoring of multiple frequencies
- remote, self-contained operation
- remote access and control via cellular phone, radio modem, satellite, etc.
- monitoring and identification of up to 212 individuals on a single frequency
- designation of transmitters as sensor and multi-sensor devices
- multiple antenna switching/monitoring for macro and micro scale movements
- acoustic and radio frequency monitoring using the same receiver



- Receivers
- Dataloggers
- Radio transmitters

- Acoustic transmitters
- Archival tags
- GPS systems

- Hydrophones
- Wireless hydrophones
- 2D/3D Position systems

- Sensor Transmitters
- Accessories
- Consulting

Delivering innovative solutions for a sustainable future.

SRX_400

Functional Advantages

Certain functions are configuration specific. Refer to receiver firmware chart for details.

24 CHARACTER, 2 LINE LCD SCREEN

Provides full six-digit frequency display, digital gain setting and signal strength reading, data entry, scroll through menu fields, display prompts, etc.

COMPACT FOOTPRINT

Scanning receiver/data logger functions are integrated into a single unit to maximize system reliability and to facilitate transportation and storage

SEPARATE AUDIO AND GAIN CONTROLS

Maximum detectability of signal vs. listening comfort

AUDIO NOISE BLANKING

User selectable feature virtually eliminates background noise at high gain levels

ADAPTIVE GAIN REDUCTION

Receiver can automatically adjust gain at each of up to 8 antennas to optimize signal reception; feature and increments are user definable

REMOTE COMMUNICATIONS CAPABILITY

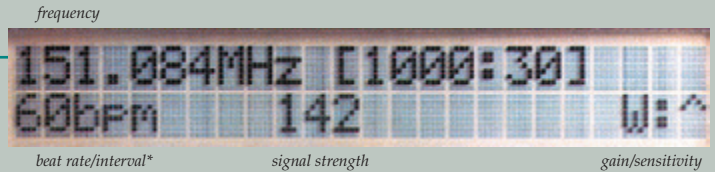
Two RS-232 ports fully configurable to provide data download/upload options direct to computer via modem

Selected Data Logging Applications

The SRX_400 receiver, with diverse operating firmware and a wide range of peripherals, allows for continuous, unmanned application to assist in addressing a variety of research objectives including:



Juvenile hawksbill turtle (*Eretmochelys imbricata*) equipped with a turtle-adapted coded radio transmitter (apex of carapace), data storage tag (left postmarginal scute) and coded acoustic transmitter (right postmarginal scute, not visible in photo).



*coded receiver configurations display transmitter codes

"SCRATCHPAD" MEMORY

User can manually enter up to 18 numeric characters per line, i.e., mercator coordinates, terrain type, which are automatically annotated to stored data to further identify detected individuals

FREQUENCY PARTITION TABLES

Frequencies can be stored in 16 non-volatile memory tables for individual or group scanning, thereby optimizing scanning efficiency, based upon the likelihood of presence of individuals and/or use of the receiver in concurrent studies

FREQUENCY COPY COMMAND

Deleted frequencies, or whole tables, can be restored from the keypad, eliminating the need to re-enter frequencies for subsequent tracking sessions.

QUANTIFIED SIGNAL STRENGTH

Signal strength can be displayed in precise digital format or graphics display.

... plus many more

- monitoring presence/absence of individual wolf (*Canis lupus*) pack members at rendezvous sites;
- measuring the energetic cost of migration at potential velocity barriers and micro scale movements of migrating Sockeye Salmon (*Oncorhynchus nerka*) through fast flowing rapids;
- monitoring presence/absence and activity of grizzly bears (*Ursus arctos horribilis*) in a remote mountain range;
- monitoring impacts of structures at hydroelectric stations on the downstream escapement of Pacific Salmon (*Salmo salar*) smolts;
- micro and macro scale monitoring of the effectiveness of mitigative processes and designs on upstream and downstream migration of Steelhead (*Oncorhynchus mykiss*) and Chinook (*O. tshawytscha*);
- monitoring spawning migration of 2000 adult Chinook (*O. tshawytscha*) and Steelhead (*O. mykiss*) through a major river system;
- assessment of Pike Minnow (*Ptychocheilus oregonensis*) movements and behaviour related to predation at hydroelectric structures and operations



Tel: 905-836-6680
Fax: 905-836-6455

Delivering innovative solutions for a sustainable future.

Web: www.lotek.com
Email: biotelemetry@lotek.com

System Peripherals

Simultaneous Analysis of 25 Frequencies

The DSP_500 Digital Spectrum Processor is a receiver/coprocessor capable of providing frequency discrimination using near real-time spectrum analysis monitoring of up to 25 frequencies virtually simultaneously. The DSP_500 is designed for use with the SRX_400 configured for coded transmitters, and is connected to the receiver via an RS-232 port.

The DSP_500 allows the SRX/DSP station to determine transmitter location relative to an array of up to seven antennas which are scanned within 7.5 ms. A DSP_500 station so configured provides the ability to monitor movements of animals at a high level of spatial and temporal resolution. Examples include:

- movements of animals relative to structures of interest, e.g., fish passage intakes and ladders, forebays, spillways, etc.
- downstream migration involving passage through river sections or anthropogenic structures inducing high flow rates, e.g., sluiceways.



Wireless Hydrophone Systems

Lotek Wireless Hydrophone Systems (WHS) represent a unique hybrid technology that brings the flexibility of radio telemetry to acoustic applications. The systems are capable of detecting underwater acoustic signals and relaying those signals through the air, in real time via VHF transmission, to the SRX_400. They can be used with **coded transmitters** to allow detection of multiple uniquely identifiable codes on a single frequency, and with **combined acoustic radio (CART) transmitters** to allow the signal mode to be optimized to water conditions.

SRX_400 remote control options allow the user to download data and upload receiver settings via land line, cellular, radio modem or MSAT link.



Multiple Antenna Switching

The ASP_8, when connected to an SRX_400 configured for automatic datalogging, provides the ability to automatically monitor, detect and log signals at each of up to eight antennas. The researcher can further choose from a variety of antenna switching strategies, i.e., priority sequential group scanning, dependent upon application requirements, antenna deployment and configuration selected. User control interfaces are via SRX_400 keypads and menu prompts provided in the software routines. The ASP_8 is supported by both SRX_400 EVENT_LOG and CODE_LOG programs.

SRX_400 Ultrasonic Capability

When plugged into the BNC antenna connector on the faceplate of the SRX_400, this small, peripheral device converts signals from ultrasonic/acoustic transmitters to radio frequencies, which are subsequently received, decoded and logged by the SRX_400 receiver.

As a result, all of the tracking advantages that the SRX_400 receiver offers researchers in freshwater RF studies, are also available to address acoustic requirements, be they deep freshwater or high conductivity applications. The capability of utilizing the same receiver for studies involving either radio or acoustic telemetry, offers significant economic advantages to researchers who may be involved in projects conducted in these environments.



Lotek offers a selection of hydrophones and transmitters specifically designed for use in acoustic applications.



- Receivers
- Dataloggers
- Radio transmitters

- Acoustic transmitters
- Archival tags
- GPS systems

- Hydrophones
- Wireless hydrophones
- 2D/3D Position systems

- Sensor transmitters
- Accessories
- Consulting

SRX_400 Specifications

General

Operating Voltage Range: 11-18 VDC
Operating Current: less than 150 mA @ 12v
Battery Life (from full charge to recharge state):
Standard:

18 hrs. @ 20°C (LCD back light off)
13 hrs. @ 20°C (LCD back light on)

Long Life Option:

32 hrs. @ 20°C (LCD back light off)
26 hrs. @ 20°C (LCD back light on)

Memory Retention Battery:

10 yrs shelf life; 6 months with main battery discharged

Operating Temperature Range:

-30°C to +50°C (LCD: -20°C)

Weight: 3.2 kg Standard

4.0kg Long Life Option

Size: 22.0 x 20.4 x 8.8 cm

Program Memory: 64K - 128 K

Data Memory: 512K / 1Mb
(receiver configuration specific)

Electrical

Operating Frequency Range: Any 4 MHz band in VHF range
Channel Spacing: 1 kHz
Frequency Stability: 5 ppm

Sensitivity:

Minimum discernible audio level - 150 dBm
Minimum discernible by software -135 dBm

Selectivity:

Adjacent channel selectivity 70 dB (10 kHz step)
Spurious Rejection -70 dB
Image -70 dB
Intermodulation Rejection -65 dB
RSSI Signal Level Response -135 dBm min.
-40 dBm max. resolution 0.25 dB

Dynamic Gain Control Range: 90 dB

Warranty: The SRX_400 receiver is warranted to be free from defects in materials and workmanship for a period of two years from date of shipment, subject to conditions outlined under Warranty Terms.

Wireless Hydrophone Specifications

Length: 19.7 in. (50.0 cm)

Diameter: 5.0 in. (12.7 cm)

Weight: 13 lbs. (5.9 kg) (incl. battery pack)

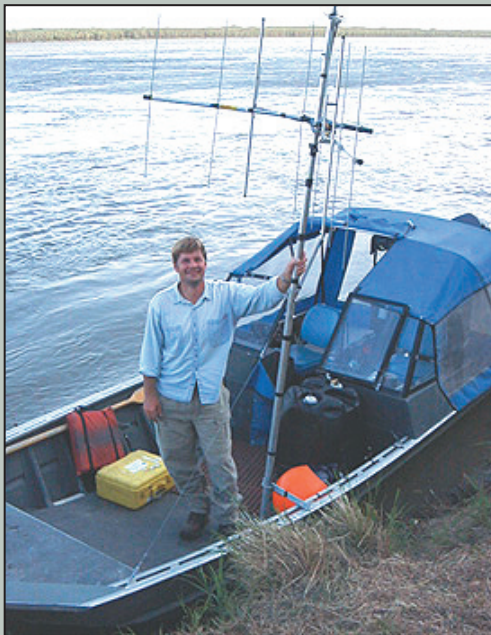
Depth rating: 328 ft. (100 m)

Battery Life: 4 - 6 mo. (WHS_1100, 1200)

Hydrophone Frequency: 65.5 - 76.8 kHz

Radio Frequency: 140.000 - 175.000 MHz (factory set)

Min. Detectable Signal: 90 dB re 1 μ Pa@76.8 kHz



Technical Support

Lotek is committed to providing top quality service to support its top quality equipment. The purchase of Lotek equipment is supported at every stage by dedicated biologists, engineers, technicians and service professionals.

Lotek also offers special design, engineering and field services to:

- determine the feasibility of using wireless technology in specific situations
- determine appropriate system specifications
- design and install systems
- provide on-site user training services

Consulting Services

Large and complex projects that employ telemetry systems for data collection, regularly benefit from experienced consulting services to optimize overall system performance. For advanced consulting requirements Lotek also offers support through Applied Biometrics Inc. (ABI), whose qualified staff of scientists and biologists can assist in all phases of a research project, from planning and implementation to data analysis

