SONOTRONICS

USR-14

Ultrasonic
Active Tracking Receiver

Operation Manual

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INTRODUCTION

SONOTRONICS is a leader in the manufacture of ultrasonic tracking transmitters and receiving equipment. From its start in 1971, SONOTRONICS has earned an excellent reputation world wide for quality and performance. First to develop long-life coded ultrasonic tags, SONOTRONICS' receivers and hydrophones offer superior range and ease of use for active, passive and equipment tracking systems.

The USR-14 is an active tracking receiver, and is typically used along with a hydrophone and a pair of headphones in order to locate and identify targets while on a boat or pier or any other location that provides access to water of at least 1 meter in depth. Additionally, the integral display of the USR-14 provides ID information from ACT and Rcode transmitters, as well as decoded data from telemetry tags such as pressure or temperature, and will record these detections in its internal non-volatile memory for later retrieval. Furthermore, the rugged construction of the USR-14 and internal NiCd batteries allow operation in remote areas, away from normal power sources.

OPERATION

When operated with a directional hydrophone, the USR-14 is first preset to a particular operating frequency, then rotating the hydrophone through 360º while listening for pings with attached head-phones, and repeating this procedure for each frequency of interest. The USR-14 may also be set to scan pre-selected frequencies, significantly reducing the labor involved in tracking tags utilizing multiple frequencies. The various modes of the USR-14 are set by the 3 pushbutton switches on the front panel, and provide additional functions on the logging and GPS versions of the USR-14 (-DL, -DLG) when held for 3-4 seconds:

[S]

Initially hen this switch is pressed , "Manual" or "Next" is displayed, depending on the then current mode of the receiver. After holding this key down, the display will change to read "SCAN", and once released, the USR-14 will scan through the preset frequency list allowing hands-free tracking of multiple frequencies. A brief tone will sound every time a scan of the frequencies is complete, and a new scan is about to begin. While scanning, a momentary press of this key will cause the display to read "Manual", and upon release, the USR-14 will stop at the current frequency, allowing for prolonged tracking on this single frequency. Scanning may be resumed by again pressing and holding [S] as before, alternatively subsequent momentary presses will display "Next", and cause the USR-14 to advance, in 'single-step' fashion, through the scan list, or the FREQUENCY control knob may be turned to change to any other supported frequency. It is important to note that the LO of the USR-14 is offset by 1kHz, consequently when the receiver is set to 75kHz, a tag transmitting at 75kHz will sound in the headphone as a 1kHz note (approximately 1 octave above middle c). (Note that a setting of 32.5kHz will provide an additional 100Hz offset to allow use when listening for a Sonotronics SUR Ping and Response transducer) As in scan mode, transmissions from a tag are decoded when possible, and data is shown on the bottom line of the LCD.

[M]

When this switch is pressed quickly, "Mark" is displayed, and the USR-14 will log the time, date, frequency, Pulse Interval, and optional GPS position of the detected tag. The USR-14 allows for storage of 24 such detection in the internal EEPROM of the onboard micro-computer, and is optionally

Specifications:

FREQUENCY RANGE: 30 to 90 kHz. (500 Hz steps)
DISPLAY: 2x16 LCD
SENSITIVITY: 1.0 microvolt for 40 dB (S+N)/N ratio.
SIZE: 9.1 x 7.6 x 4.4in (Pelican 1150 case).
WEIGHT: 3 pounds (approx).
POWER: Internal rechargeable battery with charger (6xAA).
CONNECTIONS: Headphone jack (0.25in), RS-232 (Ikelite 4 pin) or Bluetooth.
Hydrophone input: BNC connector(s) GPS: Bulgin 6 pin connector (DE9 adapter available).

Data Retrieval

After placing the USR-14-DL or USR-14-DLG in setup mode as described earlier, the user may select "PC" or "Local". By choosing "PC", and connecting via either the wired RS-232 port or internal Bluetooth, additional features may be exercised, and data stored in the optional flash memory may be retrieved by using USRsoft. This software is shipped with logging versions of the USR-14, and current versions are available on the Sonotronics website: (www.sonotronics.com). Detection data saved by the USR-14 is compatible with Sonotronics's SUR submersible logging receivers, and associated tag lists and other datum. Supported features of USRsoft are detailed in its associated help files and documentation.

[]Mode

When this switch is pressed quickly, "GAIN" is displayed, and once released the FREQUENCY knob may be rotated to change the receiver gain from a value from 0 to 99. With a dual input version of the USR-14, it is possible to program different gain offsets when using the PC setup utility... this may aid tracking when using both a omni-directional hydrophone (lower gain) and a directional hydrophone (higher gain). When this switch is held, the display changes to "Setup", and the data decode type may be changed "on the fly". Its is also possible to enable or disable the internal detection beeper that sounds when the sound level of a transmitter is adequate to enable data processing.

Additionally, while pressing [Mode], if the [S] key is pressed, the internal real-time clock may be set to allow accurate time and date recording of specific detection (this time and date is held for only a few hours on non-logging versions). Furthermore, if the [M] key is pressed while holding the [Mode] key, a review of up to the last 24 detections stored in the internal EEPROM may be reviewed. While reviewing this data, subsequent toggles of [Mode] will allow progress from newest to oldest collected data.

DETECTION

When a received signal from a transmitter is of sufficient strength and duration, it is "detected" by the USR-14. The time interval between successive detections is analyzed, and pertinent data is displayed on the bottom line of the LCD. By careful use of the GAIN control of the USR-14, it is possible to both obtain telemetry information from sensing tags at long ranges, or separate signals from multiple tags transmitting on the same frequency. The GAIN setting varies how much an input signal is amplified: for tags at far distance from the receiver, the GAIN may be increased to achieve maximum amplification. Conversely, when a transmitter is very close to the receiver, or multiple tags are heard in the headphones, reducing GAIN will produce a more pleasant tone, and allow discrimination of several tags. At very close ranges, reducing the gain also increases the apparent directivity of a directional hydrophone, making locating of a target easier. In addition, in very noisy environments, detections may be increased by using a lower gain setting, thereby limiting the amount of distraction.

CONNECTIONS
Hydrophone
Please review the installation guide of the appropriate hydrophone prior to connecting it to the USR-14.

The front panel BNC connector(s) is the hydrophone input, and typically either a DH-4 directional hydrophone or TH-2 towed omni-directional hydrophone is connected. When using a dual-input receiver, sound from the "A" input is heard in the right headphone speaker, and sound from the "B" input is heard in the left. This technique allows for binaural tracking with 2 towable or directional hydrophones, and may greatly reduce the time necessary to survey a given water system.

Signals received from the hydrophone may be as small as 1 microvolt, consequently care of the coax cable between the hydrophone and the USR-14 is extremely important.

> *Use extreme care when unwinding and winding the hydrophone coaxial cable. Your successful use of the hydrophone is dependent upon a coaxial cable in perfect condition. In the salt water environment, the smallest cut or pin hole in the coax will lead to water intrusion and failure of the unit.*

The hydrophone should be laid down and the cable played out hand over hand rather than just pulling the coils off of the end. The hand over hand method eliminates kinks in the cable than can lead to it's failure. The reverse procedure should be followed when re-winding the cable.

Headphone

The headphone jack is a standard "large" (1/4 inch) stereo audio jack, and may be used with a mini-jack adapter frequently provided with stereo headphones.   Note that the volume control knob on the front panel is used to control the sound level to the headphone *only*, and has no other affect on the rest of the receiving system. Choose headphones that provide adequate comfort and reduce wind noise or other sources of distraction.

> *Use care to avoid unnecessarily loud volume setting: during normal operation the volume control should not be set past the 12 o'clock position.*

POWER

Power is supplied by 6 internal AA rechargeable NiMH batteries, and will typically operate for 8 hours on fully charged batteries. The internal NiMH are recharged via the barrel connector plug using the supplied 12VDC wall supply, or auto-power adapter, requiring 14 hours for a full charge: internal circuitry prevents the NiMH's from overcharging.

ON POWERUP

When the USR-14 is powered on, an initial status screen is displayed on the LCD:

$$U14\ vX.XX$$
$$-***\ \ +$$

The top line identifies the firmware version number of the USR-14, while the bottom line indicates the internal battery status: a display of 1 to 5 asterisks (*) form a gage where one "*" indicates minimum and five "*****" indicate full capacity.

SETUP MODE

To enter setup mode on the USR-14 press the "mode" switch while turning the unit on. Do not release the switch until the display reads "Setup". Changing settings is accomplished using the "mode" button and by using the frequency knob to change the value of individual settings. The settings available to be changed are listed below:

Setup: (Local or PC) - The following modes are entered by turning the frequency knob to switch between local or PC setup, and confirming this selection by pressing Mode. It is possible to select PC setup mode at this time, and allow both configuration and data downloads by using the PC utility "USRsoft".

Contr - Allows setting the contrast level of the LCD to either hi or low (the USR-14 must be powered off then on for this to take effect).

RxMODE - After placing the USR08 in setup mode as described earlier, the user may select "ID Tilt", "ID %FS", "ID Tc", "Rcode", or "Classic" mode. USR08 receivers have the ability to decode ACT transmitters and associated telemetry, greatly simplifying manual tracking, and additional data decoders may be added in the future.

Scan# - This is the number of channels to be scanned. If your tags are spread from 70 to 79kHz, you would choose 10. If your tags are on 74, 78, and 80kHz, you would choose 3.

Frequency on each channel: a frequency will be displayed on the top line of the display, and the channel number will be displayed on the bottom line. You can change the frequency for this particular channel by tuning the frequency knob. When you are ready to do the next channel, simply press the next button.

SDel: This is the amount of time in seconds that the receiver will spend on each channel, in multiples of .16 seconds. "Delay 100" means that in scan mode it will spend 16 seconds on each channel before moving on the next channel. Again, use the frequency know to change the setting, and the next button to cycle to the next parameter.

Fltr: The filter variable allows for better detections of transmitters in noisy environments by increasing this from a value of 5 to 30. Keeping this value small (2-5) will allow detections at longer ranges when ambient noise is not a problem

COMM: This turns off/on the com port. The USR-14 consumes more power when the comport is on, and it is only necessary when there is an external data logger attached to the USR-14.

Beep: This turns off/on the internal beeper. This is useful when testing transmitters in an office environment without the use of an external speaker or headphone. This may also be used to asses the level of ambient noise at a given location, and allow the setting maximum gain for long range detections.

[date/time]?: Allows setting of internal clock by using the Select knob and [Mode] key.

Reset M: Erases EEPROM contents.

Fac Def: Factory Defaults. This returns the unit to the settings that it had when it shipped from our factory.