# Guide to the SRX 600 Receiver

LOTEK
WIRELESS
FISH & WILDLIFE MONITORING

# WELCOME TO THE SRX 600

The SRX 600 is used to scan frequencies and antennas (radio antennas and/or hydrophones) and record data collected from Lotek transmitters. Some of the features that are offered in the SRX 600 are as follows:

- Two serial ports for connection to computer (Serial I or II) or modem (Serial I only)

- One USB port for connection to computer

- 1 kHz channel spacing

- Non-volatile flash memory

- Rechargeable battery

- Up to 16 Mbytes of data storage capacity (more than 1 million data records)

- Able to simultaneously monitor a group of antennas

- Integrated GPS clock and ability to obtain 2D positions

- ***Ability to create Configurations that store all settings

- ***Ability to filter data by accepting or rejecting channels and/or IDs

- Includes a new SRX Host software

   Refer to Lotek's website for more details:
   http://www.lotek.com/srx600.htm.

There are many factors involved in determining how the receiver should be configured to meet the requirements of a study. These factors include:

- The number of transmitters deployed

- The size of the deployment area

- The number of frequencies

- The number of antennas (radio antennas or hydrophones)

- The amount of radio or acoustic noise in the area

# ABOUT THIS MANUAL

The manual is organized into 7 chapters.

Please also consult the **Guide to the SRX Keypad and LCD Display** manual for a flow chart style layout to all the features accessible through the receiver's keypad.

This manual does not cover communicating with the receiver using the SRX Host application. Please refer to the **Guide to the SRX600 Host Application** manual for details.

# CONTENTS

# HARDWARE DETAILS

## RECEIVER MAINTENANCE AND CARE

The SRX 600 must be protected from excessive dust and moisture. If basic cleaning is required, the housing and front panel can be cleaned using a soft cloth. For a deeper clean, wipe the housing with a soft, damp cloth using a mild solution of soap and water. Do not allow any liquid to get inside the housing. When not in use, the unit should be stored in a cool dry place.

## FRONT PANEL COMPONENTS

- A power On/Off and volume control knob (labeled **OFF/VOL**)
- A 16-key pad and 2-line by 24-character LCD display
- A standard 1/4 inch headphone jack (labeled **Headphone**)
- A jack for connecting the power cable (labeled **CHG**)
- Two LEDs labeled **B** and **F**
- A BNC jack for connecting an antenna (labeled **ANT**)
- A speaker for the broadcast of detections

### TURNING ON THE RECEIVER

Turn the OFF/VOL knob clockwise until a click is felt.

### TURNING UP THE VOLUME ON THE RECEIVER

To turn up the volume, turn the OFF/VOL knob clockwise.

# POWERING THE RECEIVER USING THE INTERNAL BATTERY

The receiver can operate continuously for up to 12 hours (light on) or 16 hours (light off) on its own battery supply, assuming it was fully charged to start. When the batteries need recharging this symbol appears in the lower right hand corner of the LCD display: ⊡.

## CHARGING THE INTERNAL BATTERY

Plug the charger supplied with the receiver into the connection labeled CHG. Plug the other end into an outlet supplying 120V of AC power. When the receiver is fast-charging the LED labeled **F** on the front panel (LED to the right of the CHG jack) glows red. When the receiver is fully charged the LED labeled **F** (LED to the right of the CHG jack) glows green.

The receiver takes approximately 8 hours to fully charge from a discharged state, as long as the charger that is supplied with the SRX 600 is used.

✐ It is not recommended to use any other charger than the one supplied. Use of other chargers could potentially reduce the effectiveness or damage the receiver.

✐ Every charger supplied by Lotek Wireless Inc. complies with UL and CSA national standards.

## MAINTENANCE AND CARE OF THE INTERNAL BATTERY

If the receiver is to be stored for extended periods (e.g. over winter) it is recommended that the battery be charged every three months.

✐ If the receiver is stored for an extended period of time without charging, performing a few (1 to 3) charge-discharge cycles often restores the main battery to a usable condition. Batteries are replaceable by Lotek Wireless Inc.

# BACK PANEL COMPONENTS

- USB cable connection

- Two serial cable connections (Serial I and Serial II)

- The receiver's serial number

- GPS antenna connection

- UUC power cable connection

- DC power DIN jack

- ASP-8 cable connection

The Serial I connection is provided for connecting the receiver to a computer or a modem.

## POWERING THE RECEIVER USING AN EXTERNAL BATTERY

The SRX 600 can operate from a regulated 11-16V DC power source, either an automobile or marine battery. Using a DC power source disables the receiver's internal battery as long as the DC voltage being supplied is above 10 volts.

> Voltage associated with unregualted power supplies, such as a solar power, can exceed 16V and potentially damage the receiver. Ensure that any solar power sources used include a 12V regulator.

If the supply voltage from an external battery goes below 10V or the power cable is not properly connected, the LED on the front panel labeled **B** turns off (LED to the left of the CHG jack) and the receiver uses the internal battery as long as it is charged enough to operate the receiver.

> The receiver internal battery cannot be charged from an external battery.

Plug the power cable, supplied by Lotek Wireless Inc., into the receiver's DIN jack on the back panel. Attach the other end to an automotive or marine battery. The LED labeled **B** on the front panel glows red (LED to the left of the CHG jack). This confirms that the receiver is now using the external battery for power.

# TYPES OF TRANSMITTERS

A transmitter is a device that uses a series of single frequency pulses to communicate with the SRX 600 receiver. Lotek radio transmitters operate over a frequency range of 140 to 174 MHz. Lotek acoustic transmitters operate at either 66 or 77 kHz.

There are three main types of transmitters:

- Coded ID Only Transmitters: identified by a group of four pulses separated by specific amounts of time, which the receiver interprets to form the ID of that transmitter.

- Coded Sensor Transmitters: identified by a group of four pulses that can vary the amount of time between each pulse to convey sensor information (e.g. temperature, pressure).

- Beeper Transmitters: identified as a single frequency pulse that is typically used in large animal studies. They are used to establish an approximate location of a collared animal, within a kilometer or so.

# THE KEYPAD AND LCD DISPLAY

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## KEYPAD AND DISPLAY STRUCTURE

The keypad and LCD display define the interface through which the receiver is programmed. The program is designed like a hierarchy. All aspects of the program are accessed through keys on the keypad.

Keys labelled **Setup, Log On, Info, Manual, Codelog** and **Set Delta** provide access to menus (note that in most cases there are also sub-menus). Three of these keys are referred to as modes: **Setup**, **Manual** and **Codelog**. Through these modes, specific aspects of the receiver's functionality can be enabled, disabled or amended.

The keypad is used to enter or select operating parameters, input data and for navigate through menus and pages. Every key, except **Light**, has two functions. Which function is accessible depends on the state of the receiver.

The LCD display is a two line display that is used to request input, either in the form of a menu selection or the entry of a numeric value. It is necessary to spread out the information, therefore the display shows what is referred to as a page, whereby a menu item can link to more than one page. Scroll through pages using the right and left arrow keys or the **END/ESC** key.

The LCD display also provides current setting information. This information depends on whether the receiver is Online or Offline.

- If the receiver is Online then the display shows current settings within brackets after the title of a page (e.g. Scan Options) and still allows a new value to be entered.

- If the receiver is Offline then the display shows current settings after the title of a page, but there is no provision for a new value to be entered.

# LOGGING ON TO THE RECEIVER

Logging on to the receiver provides the ability to change the state of the receiver. When a log on password is provided the receiver is considered Online. If no password is provided (logged off) then the receiver is Offline. The differences between Online and Offline are described below:

- Offline: the receiver allows only read access, which means that most inputs are not allowed unless a log on password is provided. The only input allowed is the Reset Password function.

- Online: the receiver allows full write access, which means that all functionality and input capability are available.

Log on to the receiver via **Log On > 1)Log On** or **Log On > 2)Log On via Factory Password**. Wait a few seconds for the changes to be accepted and then the receiver returns to the last state that was active (e.g. scan) or the start page.

> The log on password is always **123456** unless it is changed via **Setup > 3)Change Password**.

Logging on via the factory password provides the ability to log on quickly, as long as the factory password (123456) is being used. This feature is convenient for people who do not need or want to have a specific confidential password.

> Logging on can be done at any time during the operation if the receiver, except while using the **Info** key and its menu items.

## LOGGING OFF

Logging off can be done at any time during the operation of the receiver, which means that data collection can continue while limiting access to settings via a password. Logging off means the receiver is Offline.

Log off from the receiver via **Log On > 2)Log Off** or **Log On > 3)Temporarily Log Off**. Wait a few seconds for the changes to be accepted and then the receiver returns to the start page (first information shown after receiver turns on).

Temporarily logging off creates a restriction, whereby logging on is only accessible from the keypad and no longer accessible from the SRX Host software, except via the Host's Keypad Simulator.

# CHANGING A LOG ON PASSWORD

Access to this feature is only provided in **Setup Mode**. A password can be changed as long as the receiver is Online.

Changing the password requires that the old password be entered followed by the new one. The receiver automatically places a slash [/] between the two passwords as they are entered. The password must be made up of 6 numbers.

Change the password via **Setup > 3)Change Password**.

# RESETTING A LOG ON PASSWORD

Access to this feature is only provided in **Setup Mode**. A password can only be reset if the receiver is Offline.

Resetting the password is not normally used, except to provide a recovery mechanism if the current password has been lost or forgotten. In such an event, Lotek support staff can take information about the receiver's serial number and the six digit number associated with the Reset Password function and provide a password that can be used to log on to the receiver.

Go to **Setup > 3)Reset Password** to reset the password.

# USING THE INPUT KEYS

## ENTER

Once a value is entered for an input, pressing the **Enter** key causes the receiver to accept that input and save it (as long as the receiver is Online).

## END/ESC

The **END/ESC** key is used for navigation and cancelling the effect of an input.

For navigation it provides the ability to "go back" to the last menu that was accessed. For example, after enabling TOA, press **END/ESC** to go back to the Scan Options menu (where the TOA feature was accessed).

Cancelling the effect of an input takes on two forms:

- Cancelling an input before it is completely entered (e.g, while entering 148.08_). Many inputs are automatically accepted as soon as the number is fully entered. If a number is only partially entered and it is realized that the input is not desired, then press the **END/ESC** key to cancel.

- If the receiver is <u>Online</u> then the **END/ESC** key is used to stop a current active state of the receiver (e.g. GPS position acquisition or a Scan Cycle). This action is dependant on the status of the receiver. For example, if the receiver is not trying to acquire a GPS position, then the **END/ESC** key has no effect. If the receiver is Offline then the **END/ESC** key has no effect.

## NUMBERS

Any of the keys that have a number (**0** through **9**) in their lower portion are used in two ways: to select a menu item or to enter in values for an input.

In the first case, all menu items available have a number in front of them (e.g. **1) Gain**). In order to select a menu item, press the corresponding number on the keypad (e.g. press **1** to go to the Gain menu).

In the second case, for example, when prompted to enter a value for gain, use the keypad numbers to enter the desired value.

## Decimal

The lower portion of this key provides the decimal point needed for many input values.

## Plus / Minus Sign

Plus (+) or minus (-) signs are provided at the beginning of an input prompt (e.g. **>+**). Minus signs are necessary when entering the GMT correction into the receiver.

To change a sign press the **+/-** key once.

# USING THE NAVIGATION KEYS

## RIGHT ARROW AND LEFT ARROW

The **Right** and **Left** Arrow keys are used for navigating forwards and backwards through pages. If more than one page is available a "**-->**" or "**<--**" symbol appears in the lower right corner of the LCD display. Multiple pages are used to accommodate the limitations of a two-line display, so any menu items or inputs that exceed this space must be spread out.

For example, in order to see all of the menu options from the Search page in **Manual** mode, use the right arrow to scroll through the next two pages of menu options.

The only time an arrow prompt in the lower right corner is not provided is when the receiver's battery is low. In this case a small square icon is provided indicating low battery status.

## BSPACE

Backspace erases the value of an input one number/value at a time. This is similar to using the backspace key on a computer keyboard.

# USING THE INFO KEY

The **Info** key provides access to the following:

- Battery voltage (main and backup) [**1)Bat**]

- Available memory (in Kilobytes) [**2)Mem**]

- Start frequency, Intermediate Filter Frequency (I.F.) and Local Oscillator Frequency (L.O.) [**3)Freq**]

- Version numbers of the Boot Code, Master and Slave [**4)Ver**]

- Configuration settings (Scan Time and Code Set) [**5)Cfg**]

- Service information (the receiver's Serial Number and the number of hours that the receiver has been in operation since its last service) [**6)Service**]

- The factory password (123456) [**7)Factory Password**]

- Ability to answer an incoming call via the Modem [**8)Answer Incoming Call**]

The backup battery is 3.3V at full capacity. If this value should drop to 2.8V or less, the receiver should be returned for service. Regardless of the status of the battery, the receiver should be serviced every two years.

Start frequency, I.F. and L.O. are only used by Lotek Wireless Inc. for manufacturing purposes.

When accessing the **Info** key menu items it is not possible log on to the receiver; these features are mutually exclusive.

## ANSWERING AN INCOMING CALL

This feature is provided for testing and troubleshooting purposes. When a modem is being used to access the receiver it rings when a call is made. The receiver is programmed to automatically answer all calls made. If the receiver does not answer after the modem rings 4 or more times there may be a problem with the auto-answer feature.

However, the call can still be answered via **Info > 8)Answer Incoming Call**.

# ADJUSTING FREQUENCY AND GAIN

A new frequency can be selected using the **Up** or **Down Arrows**. The amount of increment or decrement is specified by Set Delta for frequency (see section called Set Delta for details).

A new gain can be selected using the **Up** or **Down Arrows**. The amount of increment or decrement is specified by Set Delta for gain (see section called Set Delta for details).

# USING NOISE BLANKING (N BLANK)

Noise blanking enhances the receiver's audio performance, especially in aircraft or other high-noise environments, by suppressing the receiver's audio response except when a signal is detected.

This also helps prevent auditory fatigue when using the receiver for extended periods of time.

Press the key labelled **NBlank** to enable and disable noise blanking.

# TURNING ON THE BACKLIGHT

Press the **Light** key once to turn on the backlight. Using the light consumes more power, but may be necessary in low light conditions to see the LCD display.

# SET DELTA

Set Delta is used to set the increments for frequency and gain so that when the **Up** and **Down Arrows** for frequency and gain adjustment are used, the receiver knows the amount it should advance up or down.

## SET DELTA FOR FREQUENCY

When incrementing frequency manually the receiver adds the Set Delta frequency increment to the frequency being used at the time the frequency is adjusted up or down. Increments are in kHz.

Set this increment via **Set Delta > 1)Freq**.

## SET DELTA FOR GAIN

When incrementing gain manually the receiver adds the Set Delta gain increment to the gain being used at the time the gain is adjusted up or down.

Set this increment via **Set Delta > 2)Gain**.

# GPS

The GPS key provides the ability to acquire a GPS fix. This data is not stored by the receiver (except if accessed in Codelog mode). It is recommended that this feature be tested before the GPS feature is enabled (see chapter Codelog Mode, section Enabling/Disabling GPS Positioning) and a scan started via **Codelog Mode**. Testing the feature ensures that the receiver is able to take a valid 2D position. When testing, ensure that the GPS antenna supplied with the receiver is connected to the receiver and that the antenna has a clear view to the sky.

✎  CRTO cannot be used with the GPS 2D positioning feature of the receiver; however it still allows the GPS clock to function.

## STARTING A GPS ACQUISITION

Start acquiring a GPS 2D position by pressing the **GPS** key on the keypad (key number **4**). While attempting to acquire a position, the display shows the number of satellites as they are found.

If a valid position is acquired the following information is provided on the display: Latitude, Longitude, current date, current GMT time, the number of satellites used, HDOP and PDOP. The display flips back and forth between showing the Latitude and Longitude for 4 seconds and the satellites, HDOP and

PDOP information for 2 seconds. Either the time or date are also shown on the display and are updated every 5 seconds.

GPS cannot be used if the receiver is logged off. However, it is possible to log off from the receiver while the receiver is attempting to acquire a GPS position. When logging back on, the display shows the results of the GPS position.

## STOPPING A GPS ACQUISITION

Press the **END/ESC** key to stop acquiring a GPS position.

# SETUP MODE

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## CHAPTER OVERVIEW

Setup Mode allows global settings to be changed and applied. Global settings are those settings that affect how the receiver operates. Setup Mode features include:

- **Configure communication settings** (serial and modem)

- Set communication settings to the default **Factory Settings**

- Enter the **Local Date, Time and GMT correction**

- Reset or change the log on **Password**

After the **Setup** key is pressed the main menu items are as follows: **1)Comm, 2)Time, 3)Reset/Change Password**. This section is organized by these three menu items.

## 1)COMM

### CONFIGURING SERIAL PORT SETTINGS

There are two serial ports available on the backpanel of the receiver: Serial I and Serial II.

Each serial port must have baud rate (for modem), parity, data bits and stop bits defined. If these settings are not changed then the default values are used, which are: baud rate=115200, parity=No, data bits=8 and stop bits=1.

The path to define each of these parameters is summarized below:

- Baud Rate: **Setup > 1)Comm > 1)Configure > 1)Serial I or 2)Serial II > 1)Baud Rate**. Select one of the nine different baud rates.

- Parity: **Setup > 1)Comm > 1)Configure > 1)Serial I or 2)Serial II > 2)Parity**. Select to have no parity, odd parity or even parity.

- Data Bits: **Setup > 1)Comm > 1)Configure > 1)Serial I or 2)Serial II > 3)Data Bits**. Select either 7 or 8 data bits.

- Stop Bits: **Setup > 1)Comm > 1)Configure > 1)Serial I or 2)Serial II > 4)Stop Bits**. Select either 1 or 2 stop bits.

  The receiver also needs to know if serial I is going to be used for connection with a modem (see Configuring Modem Settings for details).

## CONFIGURING MODEM SETTINGS

The modem must be connected to serial I. Serial I must have the appropriate baud rate so that it is compatible with the speed of the modem and it is highly recommended that the port baud rate be set at or below the actual throughput of the line, to avoid overloading the modem's internal buffers.

For example, if the modem is capable of communicating with the receiver at 115200 baud, but the actual telephone line speed is on the order of 57600, the serial I setting should not exceed 57600.

Access modem settings via **Setup > 1)Comm > 1)Configure > 1)Serial I > 5)Modem**.

There are three actions associated with the modem: assign Serial I to the modem, view the CMDS for the modem and initialize the modem. Details on these are provided below.

### ASSIGNING A MODEM TO SERIAL I

Assign a serial port via **Setup > 1)Comm > 1)Configure > 1)Serial I > 5)Modem > 1)Has Modem**. Select Yes or No.

### VIEWING THE CMDS

View the CMDS via **Setup > 1)Comm > 1)Configure > 1)Serial I > 5)Modem > ViewCMDS**. CMDS stands for Command String and is used to initialize the modem. The CMDS may need to be viewed if the modem is not working or data transfer is very slow. If the CMDS parameters are not appropriate for the modem being used they can be changed using the SRX Host software. To find out what

CMDS parameters the modem needs, consult the modem's user guide or Lotek Wireless Inc. for details.

### INITIALIZING THE CMDS FOR THE MODEM

CMDS stands for Command String and is used to initialize the modem.

As soon as a modem is connected to the receiver and the receiver is Online, the CMDS parameters are sent to the modem. If no modem is connected the following message is provided, "No Modem, please select it via Setup/Comm".

If the modem's CMDS parameters are edited via the SRX Host while the modem is connected then the modem cannot function properly. There are two ways to correct for this: initialize the modem or unplug the modem and then plug it back into the receiver. In the case of the latter, as soon as the modem is again connected to the receiver, the receiver sends the new CMDS to the modem (like a refresh).

Initialize the modem via **Setup > 1)Comm > 1)Configure > 1)Serial I > 5)Modem > 3)Initialize**.

If a strictly RF modem is being used then Serial II can be used.

## SETTING DEFAULT FACTORY SETTINGS

View the default factory settings via **Setup > 1)Comm > 2)Factory Settings**.

The factory default settings are available for Baud Rate, Parity, Data Bits and Stop Bits. The default settings are shown in brackets in the display when this menu item is selected.

Factory default settings can be set for either Serial I or Serial II (or both) via **Setup > 1)Comm > 2)Factory Settings > 1)Serial I** or **2)Serial II**.

# 2)TIME

## ENTERING THE GMT CORRECTION

In order for the GPS feature of the receiver to update its clock properly, it must know the GMT correction for the receiver's location.

Enter the GMT correction via **Setup > 2)Time > 1)GMT Correction**. The time format is in hh/mm.

## ENTERING LOCAL DATE AND TIME

The receiver uses the local time and date in combination with the GMT correction set so that data can be displayed in local time even though the receiver internally works in GMT time.

Enter in the date via **Setup > 2)Time > 2)Local Date**. The date format is in dd/mm/yy.

Enter in the time via **Setup > 2)Time > 3)Local Time**. The time format is in hh/mm/ss and is based on a 24-hour clock (a.k.a. military time).

# 3) RESET/CHANGE PASSWORD

## CHANGING A LOG ON PASSWORD

Access to this feature is only provided in **Setup Mode**. A password can be changed as long as the receiver is Online.

Changing the password requires that the old password be entered followed by the new one. The receiver automatically places a slash [/] between the two passwords as they are entered. The password must be made up of 6 numbers.

Change the password via **Setup > 3)Change Password**.

## RESETTING A LOG ON PASSWORD

Access to this feature is only provided in **Setup Mode**. A password can only be reset if the receiver is Offline.

Resetting the password is not normally used, except to provide a recovery mechanism if the current password has been lost or forgotten. In such an event, Lotek support staff can take information about the receiver's serial number and the six digit number associated with the reset password function and provide a password that can be used to log on to the receiver.

Go to **Setup > 3)Reset Password** to reset the password.

# MANUAL MODE

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## CHAPTER OVERVIEW

**Manual** mode provides the ability to collect data without using a Configuration (see the Codelog Mode chapter for details on Configurations). During manual mode data is not recorded by the receiver. Detections are indicated by pings or clicks that can be heard from the speaker on the front panel of the receiver. Adjust the volume by turning the OFF/VOL knob clockwise.

> For listening to weak signals or working in environments with a lot of ambient noise, use a pair of good quality isolating (monaural) headphones.

Some of the receiver's settings can be changed while in manual mode. After selecting the **Manual** key on the keypad, three menu items become available: **1) Code Set, 2)Search** and **3)Signal**.

The first menu item, **Code Set**, provides the ability to change the active code set. After selecting **1)Code Set**, use the keypad to select the desired code set.

The other two menu items, **Search** and **Signal**, provide two different methods of starting a scan in manual mode and changing various settings that affect the scan.

There are several settings that are the same in either Search or Signal. These are as follows:

• Start a scan

• Setting the type of transmitter to scan (Beep/ID/Sensor)

• Change the Set Delta frequency and/or gain

• Acquire a GPS 2D position

• Enter a gain

• Set the noise threshold

Settings that are unique to the Search menu item are:

- Pause or resume a scan

- Enter a minimum frequency

- Enter a maximum frequency

- Define a frequency step

- Set the scan time

Settings that are unique to the Signal menu item are:

- Change the antenna port assignment for the master radio antenna and/or hydrophone

- Change the radio frequency

- Change the acoustic frequency

# 1)CODE SET (AND DETAILS ON CODES)

A transmitter Code is made up of four pulses that occur over three pulse intervals. A pulse interval is the period of time that elapses between one pulse to the next. The three pulse intervals are unique to every transmitter so that the receiver can identify the transmitter.

In order for the receiver to interpret the pulse intervals it must reference a library, which is called the Code Set. The code set used with the receiver specifies all the different combinations of pulse intervals that can exist, as well as gives the receiver information on how to interpret tags that transmit sensor data within that code set.

The receiver is configured with the required code set(s) for a study at the time of manufacture. Current code sets are Lotek 1, Lotek 2, Lotek 3, Lotek 4 and Lotek 5. The code set must be selected before data collection can proceed.

Lotek Code Sets and Firmware[1] ("FIRMWARE") are protected by copyright laws and international treaty provisions. LOTEK owns and retains all right, title and interest in and to the FIRMWARE, including all copyrights, patents, trade secret rights, trademarks and other intellectual property rights therein. Licensee's possession, installation, or use of the FIRMWARE does not transfer any title to the intellectual property in the FIRMWARE and Licensee will not acquire any right, title or interest to the FIRMWARE except as expressly set forth in the Firmware License Agreement included with every system purchased.

1: Lotek Code Sets and Firmware includes, but is not limited by the following: Lotek-1 (also referred to as Lotek 1993 code set or 1993 code set), Lotek-2 (also referred to as Lotek 1994 code set or 1994 code set), Lotek-3 (also referred to as Lotek 2000 code set or 2K code set), Lotek-4 (also referred to as Lotek 2003 code set or 2003 code set) and Lotek-5.

## SELECTING A CODE SET

Codes sets are accessed via **Manual > 1)Code Set**. Use the keypad to select the desired code set. If the receiver is Offline then accessing the code set feature only provides current setting information.

# 2)SEARCH

## STARTING A SCAN VIA SEARCH

A scan cycle can be started via **Manual > 2)Search > 1)Start.** To stop a scan, press the **END/ESC** key.

Starting a scan from the Search menu means that the receiver scans through a range of frequencies looking for a signal, using the Frequency Step setting. The frequency step is the increment in kHz that the receiver uses to increase the frequency as a scan proceeds.

The frequency range is defined by entering a Maximum Frequency and a Minimum Frequency. After a scan is started the receiver begins scanning the minimum frequency and then increments the frequency according to the frequency step until the maximum frequency is reached.

While scanning, the LCD display provides information on the current frequency and antenna being scanned. After a valid detection is made the display also provides the transmitter's ID and the time, type of transmitter and signal strength.

If a valid detection is made on any frequency during the scan the receiver continues scanning the frequencies for that transmitter until it finds a local maximum for that frequency, at which point it stops scanning and displays the maximum signal strength and the frequency at which it was found.

The local maximum is the frequency at which the signal strength is highest for a given transmitter.

Once a scan is stopped there are four choices: exit Search, edit settings, pause the scan or resume scanning.

## SELECTING A CODE SET

Codes Sets are accessed via **Manual > 2)Search > 1)Start > 1)Code Set**. Use the keypad to select the desired code set. If the receiver is Offline then accessing the code set feature only provides current setting information.

## PAUSING A SCAN

Accessed via **Manual > 2)Search > 1)Start > 0)Pause Scan**. This function suspends the scan cycle on the frequency and antenna that was being scanned before pause was selected. This also means that the receiver does not change the frequency or antenna it was scanning when pause was selected, but it does continue logging data for that frequency and antenna.

## RESUMING A SCAN

Upon resuming a scan (**Manual > 2)Search > 1)Start > 0)Resume Scan**), the receiver uses the last settings applied during the pause, thereby replacing the previous values in the active configuration.

## SETTING THE TYPE OF TRANSMITTER TO SCAN

Via Search go to **Manual > 2)Search > 1)Start > 2) Show Beep/ID/Sensor.**

The type selected depends on the type that was selected before using this feature. For example, if the scan was showing Sensor (**SEN**) type transmitters then pressing **2)Show Beep/ID/Sensor** once causes the type to change to **Beep**. Pressing **2)Show Beep/ID/Sensor** again switches the type to **ID** and so on.

There is no indication given that the type of transmitter to scan has been changed. Press the **Left Arrow** once to go back to the first page to see that the type has been changed.

## SET DELTA FOR FREQUENCY

Set Delta is not used during a Search. Refer to section below, Defining a frequency step, for details on how to define the gain increment during a Search.

Set this increment via **Manual > 2)Search > 1)Start > 3)Set Delta > 1)Freq**.

## SET DELTA FOR GAIN

When incrementing gain manually, using the keys on the keypad, the receiver adds the Set Delta gain increment to the gain being used at the time the gain is adjusted up or down.

Set this increment via **Manual > 2)Search > 1)Start > 3)Set Delta > 2)Gain**.

## STARTING A GPS ACQUISITION

Start acquiring a GPS 2D position by pressing the **GPS** key on the keypad (key number **4**). While attempting to acquire a position, the display shows the number of satellites as they are found.

If a valid position is acquired the following information is provided in the display: Latitude, Longitude, current date, current GMT time, the number of satellites used, HDOP and PDOP. The display flips back and forth between showing the Latitude and Longitude for 4 seconds and the satellites, HDOP and PDOP information for 2 seconds. Either the time or date are also shown on the display and are updated every 5 seconds.

GPS cannot be used if the receiver is logged off. However, it is possible to log off from the receiver while the receiver is attempting to acquire a GPS position. When logging back on, the display shows the results of the GPS position.

Press the **END/ESC** key to stop acquiring a GPS position.

## ADJUSTING FREQUENCY AND GAIN

A new frequency can be selected using the **Up** or **Down Arrows**. The amount of increment or decrement is specified by Set Delta for frequency (see section called Set Delta in chapter 1 for details).

A new gain can be selected using the **Up** or **Down Arrows**. The amount of increment or decrement is specified by Set Delta for gain (see section called Set Delta in chapter 1 for details).

## ENABLING/DISABLING NOISE BLANKING (N BLANK)

Noise blanking enhances the receiver's audio performance, especially in aircraft or other high-noise environments, by suppressing the receiver's audio response except when a signal is detected.

This also helps prevent auditory fatigue when using the receiver for extended periods of time.

Press the key labelled **NBlank** to enable and disable noise blanking.

## ENTERING A SPECIFIC GAIN VALUE

During a Search the gain can be increased and decreased using the appropriate keys (see section on Adjusting Frequency and Gain above), but there are occasions where it is desired to change the gain to a specific value for the particular antenna being scanned.

Enter this specific gain value via **Manual > 2)Search > 2)Gain**. Immediately after the value has been entered the receiver returns to the Search page.

## ENTERING A MINIMUM FREQUENCY

Enter the frequency at which the scan should start via **Manual > 2)Search > 1)Start > 3)Min Freq**.

## ENTERING A MAXIMUM FREQUENCY

Enter the frequency at which the scan should end via **Manual > 2)Search > 1)Start > 4)Max Freq**. Once the maximum frequency is met the receiver starts scanning from the minimum frequency again.

## DEFINING A FREQUENCY STEP

The frequency step is the increment in kHz that the receiver uses to increase the frequency as a scan proceeds. Enter the value for the increment via **Manual > 2)Search > 1)Start > 5)Freq Step**.

Starting a scan via Search means that the Set Delta frequency is not used. For Search the frequency step option is provided to set a frequency increment.

## SETTING THE SCAN TIME

Enter a time in seconds to specify how long the receiver should scan each frequency+antenna via **Manual > 2)Search > 1)Start > 6)Scan Time**.

## SETTING THE NOISE THRESHOLD

The Noise Threshold is a minimum allowable detection signal strength. This means that if the receiver detects a pulse that has a signal strength equal to or less than the noise threshold it is rejected and not used for further code processing.

Typically the noise threshold is set to 30, but should be set to reflect the environment in which a study is taking place.

Set the noise threshold via **Manual > 2)Search > 5)Noise Threshold**. The maximum noise threshold value that can be entered is 99.

# 3)SIGNAL

## STARTING A SCAN VIA SIGNAL

Scanning using Signal means that the receiver monitors only one frequency and one antenna until they are changed manually. The scan cannot be paused using Signal.

Start a scan via **Manual > 3)Signal > 1)Start**.

## SELECTING A CODE SET

Codes sets are accessed via **Manual > 3)Signal > 1)Start > 1)Code Set**. Use the keypad to select the desired code set. If the receiver is Offline then accessing the code set feature only provides current setting information.

## SETTING THE TYPE OF TRANSMITTER TO SCAN

This is a toggle type control. Set the type of transmitter to scan via **Manual > 3)Signal > 1)Start > 2) Show Beep/ID/Sensor.**

The type selected depends on the type that was selected previously. For example, if the scan was showing sensor (**SEN**) type transmitters then pressing **2)Show Beep/ID/Sensor** once causes the type to change to **Beep**. Pressing **2)Show Beep/ID/Sensor** again switches the type to **ID** and so on.

There is no indication given that the type of transmitter to scan has been changed. Press the **Left Arrow** key once to go back to the first menu page to see that the type has been changed.

## SET DELTA FOR FREQUENCY

When incrementing frequency manually, using the keys on the keypad, the receiver adds the Set Delta frequency increment to the frequency being used at the time the frequency is adjusted up or down. Increments are in kHz.

Set this increment via **Manual > 3)Signal > 1)Start > 3)Set Delta > 1)Freq**.

## SET DELTA FOR GAIN

When incrementing gain manually, using the keys on the keypad, the receiver uses the Set Delta gain increment to advance to the next gain value.

Set this increment via **Manual > 3)Signal > 1)Start > 3)Set Delta > 2)Gain**.

## STARTING A GPS ACQUISITION

Start acquiring a GPS 2D position by pressing the **GPS** key on the keypad (key number **4**). While attempting to acquire a position, the display shows the number of satellites as they are found.

If a valid position is acquired the following information is provided in the display: Latitude, Longitude, current date, current GMT time, the number of satellites used, HDOP and PDOP. The display flips back and forth between showing the Latitude and Longitude for 4 seconds and the satellites, HDOP and PDOP information for 2 seconds. Either the time or date are also shown on the display and are updated every 5 seconds.

✎ GPS cannot be used if the receiver is logged off. However, it is possible to log off from the receiver while the receiver is attempting to acquire a GPS position. When logging back on, the display shows the results of the GPS position.

Press the **END/ESC** key to stop acquiring a GPS position.

## ADJUSTING FREQUENCY AND GAIN

A new frequency can be selected using the **Up** or **Down Arrows**. The amount of increment or decrement is specified by Set Delta for frequency (see section called Set Delta in chapter 1 for details).

A new gain can be selected using the **Up** or **Down Arrows**. The amount of increment or decrement is specified by Set Delta for gain (see section called Set Delta in chapter 1 for details).

## ENABLING/DISABLING NOISE BLANKING (N BLANK)

Noise blanking enhances the receiver's audio performance, especially in aircraft or other high-noise environments, by suppressing the receiver's audio response except when a signal is detected.

This also helps prevent auditory fatigue when using the receiver for extended periods of time.

Press the key labelled **NBlank** to enable and disable noise blanking.

## ENTERING A SPECIFIC GAIN VALUE

During a scan via Signal the gain can be increased and decreased using the appropriate keys (see section on Adjusting Frequency and Gain above), but there are occasions where it is desired to change the gain to a specific value for the particular antenna being scanned.

Enter this specific gain value via **Manual > 3)Signal > 2)Gain**. Immediately after the value has been entered the receiver returns to the Signal page.

## CHANGING THE ANTENNA PORT

To switch to another antenna/hydrophone quickly, enter in the antenna port number of the desired antenna via **Manual > 3)Signal > 3)Ant**. If the antenna is connected to the front of the receiver and not the ASP-8 then enter **0** for the port value.

The port on the front of the receiver is always called AH0.

## CHANGING THE RADIO FREQUENCY

To switch to another radio frequency, enter in the desired frequency via **Manual > 3)Signal > 4)Freq > 1)Radio**. The receiver pauses for a moment before the new frequency is accepted. Wait for the display to go back to the Signal page.

## CHANGING THE ACOUSTIC FREQUENCY

To switch to another acoustic frequency, enter in the desired frequency via **Manual > 3)Signal > 4)Freq > 2)Acoustic**. The receiver pauses for a moment before the new gain is accepted. Wait for the display to go back to the Signal page.

## SETTING THE NOISE THRESHOLD

The Noise Threshold is a minimum allowable detection signal strength. This means that if the receiver detects a pulse that has a signal strength equal to or less than the noise threshold it is rejected and not used for further code processing.

Typically the noise threshold is set to 30, but should be set to reflect the environment in which a study is taking place.

Set the noise threshold via **Manual > 3)Signal > 5)Noise Threshold**. The maximum noise threshold value that can be entered is 99.

# CODELOG MODE

# 5

## CHAPTER OVERVIEW

**Codelog** mode is initiated by pressing the **Codelog** key on the keypad. There are many features that are accessible from codelog mode.

After pressing the **Codelog** key, there are three menu items: **1)Config**, **2)Scan** and **3)Master Ftable**. Each of these menu items leads to different settings and features. This section of the manual addresses each menu item separately.

Note that **1)Config** has a lot of features and settings associated with it, therefore it is broken down into sections that cover each of its menu items separately. These sub-menu items are: **1)New CFG#, 2)Scan Settings, 3)Freq/CH, 4)Ant/Hydr, 5)Filters** and **6)Sensors**. This section also follows the structure of the SRX Host software.

## SECTION OVERVIEW

An outline of the sub-menu items and the settings available through them is as follows:

**1)New CFG**

- Select a Configuration

**2)Scan Settings**

- Select the appropriate **Code Set**
- Define the **Scan Time** and **Total Scan Time**
- Enable/Disable **TOA**
- Enable/Disable **CRTO**
- Enable/Disable **AGC**
- Enable/Disable **GPS Clock**

- Enable/Disable **GPS Positioning**

- Provide a **Site Number**

**3)Freq/CH**

- Add a Radio Frequency and Channel

- Add an Acoustic Frequency and Channel

- Modify settings for a single Frequencies

- Modify settings for all Frequencies

**4)Ant/Hydr**

- Select the **ASP-8** antenna switchbox

- Add antennas to the **Radio Antenna Group**

- Add hydrophones to the **Hydrophone Group**

- Designate a **Radio Antenna Master**

- Designate a **Hydrophone Master**

- Assign a gain value to the ASP-8

- Assign a gain value to the AH0 antenna/hydrophone

- Assign a gain value to the Radio Master Antenna

- Assign a gain value to the Hydrophone Master

- Select Frequency or Antenna Priority

- Enable/Disable Master Antenna Preview

**5)Filters**

- Assign a Filter Type for data collection

- Accept or Reject a Channel and ID combination

- Accept or Reject a transmitter ID

- Set an Echo Filter for detections

- Set a Noise Threshold for detections

- Enable/Disable the minimum Pulse Width (2ms) for detections

- Enable/Disable the maximum Signal Strength Deviation (max=18) for detections

**6)Sensors**

- Define the Sensor Class

- Select the Sensor Type

- Define parameters for each sensor type (min., max and level)

# 1)CONFIG > 1)NEWCFG

## 1)NEWCFG

Configurations are initially created by the SRX 600 Host software and are used to create a system for storing receiver settings that can be reused as often as needed, whether throughout a study or across different studies. Data collected using a configuration is saved to the receiver's flash memory.

Up to 8 configurations can be created using the SRX Host and then sent to the receiver. All configurations are sent in a single file even if all 8 are not used. Once the receiver has a configuration loaded into it, it can be selected and used. This is referred to as the active configuration. When a scan cycle is started via **Codelog** mode, the receiver uses the active configuration to apply the desired settings.

It is recommended that all settings for a configuration be initially set using the SRX Host software and then added to or amended through the receiver's keypad.

Certain settings cannot be edited in the active configuration after data has been collected, because this data exists in the receiver's flash memory and references a frequency table and its specific channel assignments. Therefore, the receiver does not allow entries in an existing frequency table to be changed if there is data in the receiver's memory. If any changes need to be made to existing references, the data in the receiver must first be downloaded and then erased from the receiver's memory (via **Codelog > 2)Scan > 2)Del all data**).

The exception to the statement above is that a new frequency can be added to the frequency table and it is also possible to remove a frequency from a frequency table. The latter is possible because the master table is unaffected.

Select a configuration via **Codelog > 1)Config > 1)NewCFG**. Enter the number of the desired configuration (between 1 and 8).

# 1)CONFIG## > 2)SCAN SETTINGS

## UNDERSTANDING SCAN CYCLES

A Scan Cycle is the time it takes for the receiver to scan all frequencies on all antennas/hydrophones in the scan order specified. The amount of time a scan cycle lasts depends on the number of frequencies and antennas/hydrophones, the scan time and Total Scan Time. It also depends on two additional features: Time-Out on Acquisition (TOA) and Master Antenna Preview.

> Frequencies and antennas (radio antennas and hydrophones) are scanned in the order they are entered into the receiver. This is referred to as the Scan Order.

> The only conditions that can terminate a scan cycle are stopping data collection, battery failure or if all available memory is filled to capacity.

The total scan time is the <u>maximum</u> amount of time a complete scan cycle can take, but the actual time to complete a scan cycle can be less than this, since other settings, like TOA, may cause the receiver to adjust the scan time adaptively.

If a scan cycle takes less than the calculated total scan time calculated then the receiver can be setup to wait until the total scan time has elapsed before it starts another scan cycle. Setting the total scan time allows multiple receivers to synchronize their scan cycles and it is a power saving option, because the receiver shuts down all antennas and lowers their gain while it waits for the total scan time to elapse.

> Any time the receiver is not actively scanning it shuts down all antennas and lowers their gain to save power.

## SELECTING A CODE SET

A transmitter code is made up of four pulses that define three pulse intervals. The time between repetitions of the code is called the Burst Interval. A pulse interval is the period of time that elapses between two consecutive pulses in a code. Every transmitter is assigned a unique code so that it, and any sensor data associated with it, can be identified by the receiver.

In order for the receiver to interpret the pulse interval sequence it must reference a library, which is called the code set. The code set used with the receiver specifies

all the different combinations of pulse intervals that can exist, and gives the receiver information on how to interpret transmitters that transmit sensor data using that code set.

The receiver is configured with the required code set(s) for the study specified at the time of purchase. Current code sets are Lotek 1, Lotek 2, Lotek 3, Lotek 4 and Lotek 5. The code set must be selected before data collection can proceed.

Lotek Code Sets and Firmware[1] ("FIRMWARE") are protected by copyright laws and international treaty provisions. LOTEK owns and retains all right, title and interest in and to the FIRMWARE, including all copyrights, patents, trade secret rights, trademarks and other intellectual property rights therein. Licensee's possession, installation, or use of the FIRMWARE does not transfer any title to the intellectual property in the FIRMWARE and Licensee will not acquire any right, title or interest to the FIRMWARE except as expressly set forth in the Firmware License Agreement included with every system purchased.

1: Lotek Code Sets and Firmware includes, but is not limited by the following: Lotek-1 (also referred to as Lotek 1993 code set or 1993 code set), Lotek-2 (also referred to as Lotek 1994 code set or 1994 code set), Lotek-3 (also referred to as Lotek 2000 code set or 2K code set), Lotek-4 (also referred to as Lotek 2003 code set or 2003 code set) and Lotek-5.

### SELECTING A CODE SET

Codes Sets are accessed via **CodeLog > 1)Config## > 2) Scan Settings > 1)Code Set**. Use the keypad to select the desired code set. If the receiver is Offline then accessing the codeset feature only provides current setting information. Code sets can also be selected via **Manual > 1)Code Set**.

### SETTING A SCAN TIME

When collecting data the receiver needs to know how long it should scan each frequency+antenna combination. This is referred to as the scan time. Scan times are typically set to the maximum transmitter burst interval plus 0.5 seconds.

Scan time can be set with a resolution of 100ms. The range is 0.1s through 99.9 seconds.

Set the scan time via **Codelog > 1)Config## > 2)Scan Settings > 2)Param > 2)Scan Time**. Scan time format is in seconds.

## SETTING TOTAL SCAN TIME

The total scan time is the <u>maximum</u> amount of time a complete scan cycle can take, but the actual time to complete a scan cycle can be less than this, since other settings, like TOA, may cause the receiver to adjust the scan time adaptively.

If a scan cycle takes less than the calculated total scan time calculated then the receiver can be setup to wait until the total scan time has elapsed before it starts another scan cycle. Setting the total scan time allows multiple receivers to synchronize their scan cycles and it is a power saving option, because the receiver shuts down all antennas and lowers their Gain while it waits for the total scan time to elapse.

Set Total Scan Time via **Codelog > 1)Config## > 2)Scan Settings > 2)Param > 2)Total Scan Time**. Total scan time format is minutes/seconds (mm/ss).

If a total scan time is not set (left as 00:00) then the receiver immediately starts another scan cycle.

If the total scan time set is less than the calculated total scan time (see below) then the value entered is ignored and the receiver treats it as if no total scan time was set.

### CALCULATING TOTAL SCAN TIME
The following formula should be used to determine the maximum amount of time a scan cycle could take. Use the results of this calculation for the Total Scan Time value.

**(# of Radio Frequencies) x (# of Radio Antennas [including Master])**

**+**

**(# of Acoustic Frequencies) x (# of Hydrophones [including Master])**

**=**

**Total Number of Scan Cycles**

**x**

**Scan Time (e.g. 15 seconds)**

**=**

*Total Scan Time*

## ENABLING/DISABLING TOA

Enable or Disable TOA via **CodeLog > 1)Config## > 2)Scan Settings > 3)Options > 1)TOA**.

TOA stands for Time-Out on Acquisition and is either enabled or disabled. With TOA enabled the receiver monitors each frequency+antenna combination until the first valid detection, thus shortening the total scan time.

TOA may therefore be used to minimize the amount of time it takes for the receiver to scan all of the available frequencies and antennas. This is not always a desirable result since it can also result in lost data by ending a scan time before other transmitters in the area can be detected on that frequency and antenna combination.

Consider the following example: TOA is enabled, the scan time is set to 20 seconds and the receiver gets a valid detection after 6 seconds. The receiver is monitoring frequency A and antenna E when it gets the detection. Immediately after the detection the receiver stops scanning frequency A and antenna E and moves on to the next frequency+antenna (depending on the scan priority that was selected).

> TOA can be enabled in conjunction with other settings like Frequency Priority, Antenna Priority and Master Antenna Preview.

If TOA is disabled, the SRX 600 scans each frequency+antenna combination for exactly the specified scan time before switching to the next frequency+antenna combination.

## ENABLING/DISABLING CRTO

The **Continuous Record Time Out** (CRTO) is used to save memory space. CRTO gives the receiver the ability to track the number of valid detections for each transmitter ID in combination with a specific frequency and antenna over a fixed period of time (CRTO Window). The CRTO Window is defined by the CRTO Timeout.

When the CRTO Window expires, the receiver stores a single record for every transmitter that was received in the following format: **Transmitter X on Frequency A and Antenna E was detected N times with an average Signal**

**Strength of S**. If the transmitter involved is a sensor transmitter then the average value of the sensor data over the CRTO Window is also provided.

Before enabling CRTO, be aware of the following:

- The receiver waits until the first valid detection is made before it opens the CRTO Window. This allows the resulting data record to be stamped with the arrival time of the first valid detection.

- When the CRTO Window elapses the time of the first valid detection is recorded along with duration information, which refers to the total amount of time between the first and last detections for each transmitter+frequency+antenna combination.

- If a transmitter+frequency+antenna combination is detected several times during the CRTO time period then the exact time of every detection for that transmitter is not recorded

- It is not possible to determine if the valid detections were evenly distributed or grouped together during the CRTO window

  If CRTO is enabled then Automatic Gain Control (AGC) is immediately disabled, because gain must be fixed for the duration of a data record.

  If CRTO is enabled then the GPS 2D positioning feature of the receiver is disabled; however it still allows the GPS clock to function.

## SETTING THE CRTO TIMEOUT

The CRTO Timeout specifies the amount of time the CRTO Window is open for. The longer the timeout, the fewer records there are per transmitter detected.

For example, a CRTO Timeout of 1 minute for a Scan Cycle that has been scanning for two minutes yields only two data records for each transmitter that is detected over that two minute period. This is because all detections during the timeout period (CRTO Window) are compressed into one record when the timeout expires.

If the CRTO Timeout for the example above was increased to 4 minutes then there would only be one record after two minute period. This demonstrates the impact of a longer CRTO Timeout.

The timeout can be set from 1 minute up to 99 minutes.

## ENABLING/DISABLING AGC

Enable or Disable AGC via **CodeLog > 1)Config## > 2)Scan Settings > 3)Options > 3)AGC**.

AGC stands for Adaptive Gain Control and gives the receiver the ability to dynamically adjust antenna gain settings to optimize performance. This feature is particularly useful when there is sporadic external noise, like turbines coming on once a day at a hydro dam. In cases like these the receiver can automatically adjust the gain when these noise events occur and then return the gain to its original set value when the noise event is over.

> CRTO cannot be used if AGC is enabled, because gain must be fixed for the duration of a data record.

## ENABLING/DISABLING THE GPS CLOCK

When the receiver begins scanning it can simultaneously update the GPS clock as long as the GPS clock is enabled. This provides a higher time resolution for data recorded by the receiver.

When the GPS clock is enabled it comes on for five minutes and updates the clock every 1 second and then it turns off for three hours. It repeats this cycle continuously until scanning is stopped. During a scan the display flashes the letter **G** to indicate that the GPS clock is enabled.

> If the GPS clock is disabled the GPS positioning feature is automatically disabled.

Enable/disable the GPS clock via **CodeLog > 1)Config## > 2)Scan Settings > 3)Options > 4)GPS > 1)En/Dis GPS Clk**. The first line in the display shows the current setting and updates accordingly when **1)En/Dis GPS Clk** is selected.

## ENABLING/DISABLING GPS POSITIONING

In order for the receiver to acquire a GPS position, the feature must be enabled.

> The GPS clock must be enabled for the GPS positioning feature to work.

Enable/disable the GPS positioning feature via **CodeLog > 1)Config## > 2)Scan Settings > 3)Options > 4)GPS > 2)En/Dis Position**. The first line in the display shows the current setting and updates accordingly when **2)En/Dis Position** is selected.

## ENTERING A SITE NUMBER

The Site Number is a 4-character numeric code that provides a way of identifying a study site. For example, if the receiver is moved several times throughout a study, the changes may be recorded using the site number. Downloaded data collected always includes the site number as part of the environment data record. Refer to the **BioMap for SRX** manual for details on how to view environment data.

Enter a site number via **CodeLog > 1)Config## > 4)Site Number**.

# 1)CONFIG## > 3)FREQ/CH

The SRX 600 scans frequencies according to how they are configured in the receiver. There are several parameters related to frequency that need to be set before data collection can begin. These are described in the following.

## CREATING A CONFIGURATION SPECIFIC FREQUENCY TABLE

A Configuration Specific Frequency Table is a group of frequencies that are assigned to a specific configuration. When a scan cycle is started the receiver scans the frequencies in the table in the order they were entered. From this point forward in the manual Configuration Specific Frequency Tables are referred to as just frequency tables.

> A configuration contains information about all settings that the receiver uses to perform a scan. Up to 8 Configurations can be created and stored in the receiver. Configurations can be initially created using ONLY the SRX Host software and then sent to the receiver. Any/all configurations created are sent to the receiver in one file.

There are several points to review about frequency tables:

* Up to 8 frequency tables can be created (one for each configuration)

* A single frequency table can contain up to 128 frequencies

* Frequency tables can be made up of radio and/or acoustic frequencies in any order

* A frequency table is not active until a configuration using that frequency table is selected

* All frequencies in all frequency tables are also copied into the master frequency table

### MASTER FREQUENCY TABLE

All Frequencies entered into the receiver are also copied into a master frequency table. Up to 128 distinct frequencies can be copied into the master table, however

the master table cannot contain frequencies that reference the same channel number or frequencies that are separated by less than 1kHz.

## ADDING A FREQUENCY/CHANNEL

Enter a frequency into the receiver via **Codelog > 1)Config## > 3)Freq/CH > 1)Add > 1)Radio** or **2)Acoustic**. The display first prompts for the frequency to be entered. The decimal point is not automatically provided; use the decimal key. After the full frequency value has been entered, the display automatically goes to the Set Ch# (set channel number) page. Enter a number for the channel that will be assigned to the frequency entered. After entering a channel number, press the **ENTER** key to apply the changes. COntinue to add frequencies+channels in this manner.

Frequencies cannot be changed through the keypad after they are added; they can only be deleted or disabled.

No two Frequencies have the same channel number. Assigning a channel number provides an easier way of referencing frequencies. For example, it is easier to say "scan channel 3" than it is to say "scan frequency 151.360".

## DELETING A FREQUENCY/CHANNEL

It is important to note that because frequencies in a frequency table are also copied into the master table, they can be deleted from a frequency table and still exist in the master table.

A frequency can be deleted from a frequency table via **Codelog > 1)Config## > 3)Freq/CH > 2)View/Modify > 1)Del**.

## ENABLING AND DISABLING A FREQUENCY/CHANNEL

Individual frequencies in a frequency table can be enabled (available for scanning) or disabled (skipped), whereby during a scan a frequency can be temporarily removed from the scan cycle until it is needed again.

The receiver only scans frequencies that are enabled. By default all frequencies entered are considered enabled.

For example, if a transmitter that uses frequency 148.360 is intentionally removed from the reception area for a period of time, there is no point in using the receiver to scan that frequency. In this case the frequency can be disabled or skipped.

A frequency can be enabled or disabled via **Codelog > 1)Config## > 3)Freq/CH > 2)View/Modify > 2)En/Dis**. The display provides the only indication that the frequency is enabled or disabled by showing EN or DIS after the frequency selected.

## ASSIGNING A TRANSMITTER TYPE TO A FREQ/CH

The receiver defaults to the ID only type for new frequency+channel assignments; others must be specifically assigned.

Assign a transmitter type to a frequency+channel via **Codelog > 1)Config## > 3)Freq/CH > 2)View/Modify > 3)ID/Sen**. The display shows the current setting for the frequency (e.g. 149.891MHz CH456 EN ID), which includes the frequency, the channel, whether the frequency is enabled or disabled and what the transmitter type is.

Use the **Right** and **Left** arrow keys to go to the next frequency in the frequency table to change its transmitter type to sensor.

## DELETING ALL FREQUENCIES IN A FREQUENCY TABLE

It is important to note that because frequencies in a frequency table are also copied into the master table, they can be deleted from a frequency table and still exist in the master table.

All frequencies in a frequency table can be deleted via **Codelog > 1)Config## > 3)Freq/CH > 2)View/Modify > 1)Del > 7)Yes or 9)No**.

## ENABLING/DISABLING ALL FREQUENCIES IN A FREQUENCY TABLE

All frequencies in a frequency table can be enabled (available for scanning) or disabled (skipped), whereby during a scan all frequencies can be temporarily

removed from the scan cycle. By default all frequencies entered are considered enabled.

The receiver only scans frequencies that are enabled.

All frequencies can be enabled via **Codelog > 1)Config## > 3)Freq/CH > 2)View/Modify > 2)EN**. Press the **END/ESC** key to go back to the Freq/Ch page.

The display shows two values in brackets after the page title (e.g. AllFreq/Ch(2, 4)). These numbers in brackets correspond to four of the menu items available: 2)EN, 3)Dis, 4)ID and 5)Sen. The first number in the brackets after the title is used to show whether the frequencies in the frequency table are enabled (2) or disabled (3). The second number is used to show if the transmitter type in use is ID only (4) or ID with Sensor (5). After a key (2, 3, 4 or 5) is pressed the number in the brackets changes accordingly.

## ASSIGNING A TRANSMITTER TYPE TO ALL FREQ/CH

The receiver defaults to the ID only type for new frequency+channel assignments; others must be specifically assigned.

Assign a transmitter type via **Codelog > 1)Config## > 3)Freq/CH > 2)View/Modify > 3)ID/Sen**.

The display shows two values in brackets after the page title (e.g. AllFreq/Ch(2, 4)). These numbers in brackets correspond to four of the menu items available: 2)EN, 3)Dis, 4)ID and 5)Sen. The first number in the brackets after the title is used to show whether the frequencies in the frequency table are enabled (2) or disabled (3). The second number is used to show if the transmitter type in use is ID only (4) or ID with Sensor (5). After a key (2, 3, 4 or 5) is pressed the number in the brackets changes accordingly.

# 1)CONFIG## > 4)ANT/HYDR

Antennas pick up signals from transmitters and delivers them to the SRX 600 receiver. A typical configuration of the SRX 600 system can accommodate up to eight antennas, which can be monitored one at a time or simultaneously. Antenna inputs accept signals from radio antennas and upconverted acoustic sources (hydrophones).

> To use more than one antenna the ASP-8 switchbox is needed. Connections to the ASP-8 are referred to as Antenna Ports and are associated with specific Port Numbers.

> A single antenna can be connected to the front of the SRX 600 receiver. It is referred to as **AH0**.

There are several parameters related to Antennas that need to be set before data collection can begin.

- **Add antennas** to an antenna group

- Enter **Gain** values for each antenna

- Enter **Antenna Port** numbers for each antenna

- (optional) Designate radio antenna or hydrophone as a master

- (optional) Assign **Frequency** or **Antenna Priority** for the scan cycle

- (optional) Enable **Master Antenna Preview**

- Set the receiver to use the ASP-8

## TYPES OF ANTENNAS

Antennas can be radio antennas or upconverted hydrophones. Radio antennas can be multi-element yagi, H-antennas, underwater antennas or whip antennas.

Antenna inputs on the ASP-8 can also be used for hydrophones (underwater microphones). In order for the SRX 600 to use hydrophones the hydrophone must be connected to a UUC (ultrasonic upconverter), which is then connected to an antenna port on the receiver's ASP-8. The UUC converts the hydrophone's acoustic signals to radio signals.

## UNDERSTANDING ANTENNA GROUPS

Antennas can be radio or upconverted hydrophones. However, they are treated as separate groups by the receiver. For example, in an 8 antenna configuration, if radio antennas are connected to antenna ports 1,2, 4 and 6 then this is referred to as the Radio Group. If the rest of the ports available (3, 5, 7 and 8) are upconverted hydrophones then they are referred to as the Hydrophone Group.

> If there are no hydrophones used then there is no hydrophone group (likewise for radio antennas).

## ADDING ANTENNAS (RADIO AND HYDROPHONE)

Antennas/hydrophones must be added in the order in which they should be scanned (scan order). However, the receiver treats the radio antennas as a radio group and the hydrophones as a hydrophone group (see Understanding Antenna Groups above for details).

For example, the radio group may be connected to antenna ports 1, 2, 4 and 6, but if they are entered into the receiver in this order: 4, 2, 1 and 6, then that is their scan order. The same scenario could apply to a hydrophone group.

Add an antenna to a group via **Codelog > 1)Config## > 3)Ant** or **4)Hydr > 1)Radio Ant Grp** or **1)Acoustic Hydr Grp**. The type of antenna must be selected first, whereby **3)Ant** goes to the Radio Antenna Group page and **4)Hydr** goes to the hydrophone group page.

> It is possible to add radio antennas and hydrophones alternately, but it requires switching back and forth between the radio antenna and hydrophone pages, which could be time consuming.

Antennas are added using antenna port numbers and should be entered in the order that they should be scanned. Available antenna port numbers are from 1 through 8. After each antenna port number is entered, a slash [/] automatically appears to separate the antennas being entered (e.g. 1/4/5/2/8/6). Press the **ENTER** key to apply the changes (do not press the END/ESC key).

## ASSIGNING A MASTER ANTENNA (OPTIONAL)

The master antenna designation is used to place a priority on a particular radio antenna and/or hydrophone so that it is scanned before all other radio antennas and/or hydrophones. Assigning a master is not required for the receiver to operate. There can only be one master designation for each group; one for radio antennas and one for hydrophones (if both types are used).

Master antennas are designated in one of two ways:

- One master per group: There is only one master associated with each group. For example, a radio antenna on antenna port 2 can be assigned as the Radio Antenna Master and a hydrophone on Antenna Port 8 can be assigned as the hydrophone master.

- All antennas are master antennas: when an antenna group is defined as the master antenna then all the antennas in that group are activated simultaneously (that is, their inputs are summed by the ASP-8). For example, if the Radio Group that uses antenna ports 1, 2, 4 and 6 is designated as the master, then all antennas in the group are scanned simultaneously. Likewise, if the hydrophone group is designated as the master hydrophone then the hydrophone ports on 3, 7 and 8 are scanned simultaneously (combined in the ASP-8).

## ASSIGNING A RADIO MASTER

Assign a radio antenna as the Radio Master Antenna via **Codelog > 1)Config## > 4)Ant/Hydr > 3)Ant > 2)Radio Master Ant**. There are three possible selections:

- Enter the value as **0** (zero) to make all radio antennas master antennas

- Enter a value from **1** through **8** to make a single antenna the master. The value entered corresponds to an antenna port number on the ASP-8.

- Enter the value as **9** to designate NO antenna as master

After a value has been entered the receiver returns to the page of menu selections.

## ASSIGNING A HYDROPHONE MASTER

Assign a hydrophone to be the master hydrophone via **Codelog > 1)Config## > 4)Ant/Hydr > 4)Hydr > 2)Acoustic Master Hydr**. There are three possible selections:

- Enter the value as **0** (zero) to make all hydrophones masters

- Enter a value from **1** through **8** to make a single hydrophone the master. The value entered corresponds to an antenna port number on the ASP-8

- Enter the value as **9** to designate NO hydrophone as master

After a value has been entered the receiver returns to the page of menu selections.

## ASSIGNING GAIN VALUES

The ASP-8 and all antennas must be assigned gain values. A typical starting gain value is 50, but should be set according to the requirements of the study.

### ASSIGNING GAIN VALUES TO ANTENNA PORTS ON THE ASP-8

Assign gain values to each of the Antenna Ports on the ASP-8 via **Codelog > 1)Config## > 4)Ant/Hydr > 4)Gain > 1)ASP-8 Gain**. Enter the number of the antenna port to provide a gain value for. The display then updates to prompt for a gain value. Immediately after the appropriate gain value has been entered the display returns to the ASP8 Gain page. After the ASP8 Gain title in the display is a series of numbers in brackets. These numbers are the current gain value settings corresponding to an antenna port. They are listed in order from 1 to 8.

### ASSIGNING A GAIN VALUE TO THE ANTENNA PORT ON THE FRONTPANEL

Assign gain values to each antenna via **Codelog > 1)Config## > 4)Ant/Hydr > 4)Gain > 2)AH0 Gain**.

## ASSIGNING GAIN VALUES TO MASTER ANTENNAS

Assign gain values to master antennas via **Codelog > 1)Config## > 4)Ant/Hydr > 4)Gain > 3)Radio Master Gain** or **4)Acoustic Master Gain**. If the master designation has been set for all radio antennas or hydrophones in either the radio or hydrophone groups, then that gain value is used for all members of the group.

## SETTING A SCAN PRIORITY

There are three scan priorities to choose from: Frequency, Master Antenna Preview and Antenna. Antenna priority is completely independent of the other two, whereas Master Antenna Preview always uses Frequency Priority first and then uses its own rules to complete a scan.

## USING FREQUENCY PRIORITY FOR A SCAN

Frequency priority is used when it is desired to scan a single frequency using every applicable antenna before moving on to the next frequency in the frequency table selected. Any valid detections of transmitters that occur during scanning are recorded.

Frequency priority is, by default, always enabled unless antenna priority is enabled.

The antenna used to begin a scan depends on the type of frequency (radio or acoustic) that was the first entered into the frequency table. If this frequency was a radio frequency then the receiver starts with either the first radio antenna or the Radio Master Antenna in the radio group. If this frequency is an acoustic frequency then the receiver starts with either the first hydrophone or the hydrophone master in the hydrophone group.

The following provides an example of how a simple configuration would proceed with scanning using frequency priority.

In this example there are three frequencies, two radio and one acoustic, in a selected frequency table (on s 1 [acoustic], 2 [radio] and 3[radio]). They were entered into the frequency table in the scan order: {2, 3 and 1}. Frequency priority has been selected and there are 2 radio antennas in the radio group (4 and 7) and 2 hydrophones in the hydrophone group (5 and 8). Antenna 4 is the radio master

antenna and antenna 8 is the hydrophone master. The scan time is set to 15 seconds. The following illustrates the order in which scanning would take place:

• Channel 2 is scanned using radio master 4 for 15 seconds

• Channel 2 is scanned using radio antenna 4 for 15 seconds

• Channel 2 is scanned using radio antenna 7 for 15 seconds

• Channel 3 is scanned using the radio master antenna 4 for 15 seconds

• Channel 3 is scanned using (radio master) antenna 4 for 15 seconds

• Channel 3 is scanned using the radio antenna 7 for 15 seconds

• Channel 1 is scanned using hydrophone master 8 for 15 seconds

• Channel 1 is scanned using hydrophone 5 for 15 seconds

• Channel 1 is scanned using hydrophone 8 for 15 seconds

• The receiver then returns to the Radio Master Antenna and repeats the cycle until the scan is stopped, the battery expires or all the receiver's data memory is used.

Frequencies are scanned according to the order in which they were entered into the receiver (scan order). This order also determines which type of device, radio antenna or hydrophone, is used first in a scan cycle.

## ENABLING MASTER ANTENNA PREVIEW

Master Antenna Preview allows the receiver to conserve its power resources while waiting for a valid detection. If Total Scan Time is also enabled then further power savings can be achieved (refer to section on Enabling Total Scan Time for details).

A Master Antenna must be defined for at least one antenna (or group of antennas) in order for Master Antenna Preview to work (refer to section above on Assigning a Master Antenna). If no master is designated for a particular group then the receiver defaults to using Frequency Priority to carry out the scan of that group.

After the first frequency to be scanned is determined (first one in the frequency table), Master Antenna Preview allows the receiver to place a priority on the appropriate Master Antenna for that frequency. When a Master Antenna is scanned, the receiver scans only the Master Antenna for the Scan Time set. If a

valid detection is received within that time the receiver proceeds with scanning all applicable antennas (the Antenna Group) for only that frequency on which the initial detection was made. When the scan is complete the receiver moves on to the next frequency in the frequency table, which determines the group (radio antenna or hydrophone) that is scanned and using which master (if one is assigned).

Below are several points that should be reviewed about Master Antenna Preview:

- If no detection is made for the frequency+Master Antenna being scanned, the receiver moves on to the next frequency in the frequency table. The next frequency determines which group is scanned and using which master (if one is assigned).

- If no master is designated for a particular group then the receiver defaults to using Frequency Priority to carry out the scan of that group. In other words, the frequency is scanned on all applicable antennas for the Scan Time set and then it moves on to the next frequency in the frequency table.

- Master Antenna Preview also works if all antennas in either a radio antenna or hydrophone group are designated as masters. If all antennas in a group are masters then the receiver simultaneously scans all antennas in that group until it receives a valid detection, then it starts scanning the group according to its scan order.

- Master Antenna Preview is automatically disabled if antenna priority is enabled.

Enable Master Antenna Preview via **Codelog > 1)Config## > 4)Ant/Hydr > 5)Priority > 2)En/Dis Master Preview**. Selecting **2)En/Dis Master Preview** changes the preview from being enabled or disabled. Watch the first line of the LCD display to know which setting is being applied.

## USING ANTENNA PRIORITY

Antenna priority is used when it is desired to scan all frequencies in a frequency table before moving on to the next radio antenna/hydrophone. Any valid detections of transmitters that occur during scanning are recorded.

In this example there are three frequencies, two radio and one acoustic, in a selected frequency table (on channels 1 [acoustic], 2 [radio] and 3[radio]). They were entered into the frequency table in the scan order: {2, 3 and 1}. Antenna priority has been selected and there are 2 antennas in the radio group (4 and 7) and 2 hydrophones in the hydrophone group (5 and 8). Antenna 4 is the radio master antenna and antenna 8 is the hydrophone master. The scan time is set to 15 seconds. The following illustrates the order in which scanning would take place:

- Radio master antenna 4 scans channel 2 for 15 seconds

- Radio master antenna 4 scans channel 3 for 15 seconds

- [radio master] antenna 4 scans channel 2 for 15 seconds

- [radio master] antenna 4 scans channel 3 for 15 seconds

- Radio antenna 7 scans channel 2 for 15 seconds

- Radio antenna 7 scans channel 3 for 15 seconds

- The receiver has now scanned both radio antennas for all radio frequencies and then moves on to the hydrophones

- Hydrophone master 8 scans channel 1 for 15 seconds

- Hydrophone 5 scans channel 1 for 15 seconds

- [hydrophone master] hydrophone 8 scans channel 1 for 15 seconds

- The receiver then returns to the radio master antenna and repeats the cycle until the scan is stopped, the battery expires or all the receiver's data memory is used

When an antenna is being scanned the frequencies are scanned according to their scan order (the order they were entered into the frequency table).

If an antenna group is designated as a master then all of the antennas/hydrophones in the group are scanned simultaneously.

When antenna priority is enabled, master antenna preview is disabled.

Assign antenna priority via **Codelog > 1)Config## > 4)Ant/Hydr > 5)Priority > 1)Freq/Ant**. Selecting **1)Freq/Ant** changes the priority between frequency and antenna. Watch the first line of the display to know which setting is being applied.

## SETTING THE RECEIVER TO USE THE ASP-8

The receiver needs to know if an ASP-8 is being used or not. Set the receiver to use an ASP-8 via **Codelog > 1)Config## > 4)Ant/Hydr > 1)Use ASP8 > 7)Yes or 9)No**.

# 1)CONFIG## > 5)FILTERS

Received signals can be qualified for storage and display using a set of filters. This section of the manual describes two filter classes, one pertaining to signals (frequency/channel and transmitter ID) and the other to signal quality (signal strength and pulse timing).

## ID FILTER

Filtering provides the ability to filter channel+ID combinations or IDs only without altering a configuration's frequency table. IDs or channel+ID combinations can be accepted or rejected by creating accept or reject lists. Each accept or reject list can have up to 100 entries.

There are four types of filters to choose from, but only one filter type can be selected at a time. Once a filter type is selected, the receiver uses the list created for that filter type to apply the settings.

### SETTING THE FILTER TYPE

Only one filter type can be selected at a time. Select the filter type via **Codelog > 1)Config > 5)Filters > 1)ID Filter**. There are four choices: **1)No Filter**, **2)Reject Ch/ID**, **3)Accept Ch/ID**, **4)Reject ID** and **5)Accept ID**.

### NO FILTER

If no filtering is desired, select **1)No Filter**.

### REJECTING CHANNEL+ID

Use this feature to create a list of channel+ID combinations that will be rejected during a scan. All channel+ID combinations added to this list are rejected (and all combinations that are not in the list are accepted). Any detections with the specified channel+ID combination in the list are NOT recorded by the receiver or displayed (in the LCD display or the SRX Host).

Add a channel+ID combination to the reject list via **Codelog > 1)Config > 5)Filters > 1)ID Filter > 2)Set Reject Ch/ID >1)Add**. Enter the channel followed by the ID. The display automatically inserts a slash [/] between the two values as

they are entered. The number in brackets in the first line of the display corresponds to the entries in the list (e.g. entry #33 in the reject list).

Any entry in the reject list can also be viewed and deleted. View an entry via **Codelog > 1)Config > 5)Filters > 1)ID Filter > 2)Set Reject Ch/ID > 2)View/Del**. The first entry is shown in the first line of the display. To view the next entry use the **Right Arrow** key to advance through the list. At any time an entry in the list can be deleted by pressing the **1** key (**1)Del**).

## ACCEPTING CHANNEL+ID

Use this feature to create a list of channel+ID combinations that should be accepted during a scan. All channel+ID combinations added to this list are accepted (and all combinations that are not in the list are rejected). Any detections with the specified channel+ID combination in the list are recorded by the receiver and displayed (in the LCD display and the SRX Host).

Add a channel+ID combination to the accept list via **Codelog > 1)Config > 5)Filters > 1)ID Filter > 3)Set Accept Ch/ID >1)Add**. Enter the channel followed by the ID. The display automatically inserts a slash [/] between the two values as they are entered. The number in brackets in the first line of the display corresponds to the entries in the list (e.g. entry #33 in the accept list).

Any entry in the accept list can also be viewed and deleted. View an entry via **Codelog > 1)Config > 5)Filters > 1)ID Filter > 3)Set Accept Ch/ID > 2)View/Del**. The first entry is shown in the first line of the display. To view the next entry use the **Right Arrow** key to advance through the list. At any time an entry in the list can be deleted by pressing the **1** key [**1)Del**].

## REJECTING ID ONLY

Use this feature to create a list of transmitter IDs that will be rejected during a scan. All IDs added to this list are rejected (and all IDs that are not in the list are accepted). Any detections with the specified ID in the list are NOT recorded by the receiver or displayed (in the LCD display or the SRX Host).

Add an ID to the reject list via **Codelog > 1)Config > 5)Filters > 1)ID Filter > 4)Set Reject ID >1)Add**. The number in brackets in the first line of the display corresponds to the entries in the list (e.g. entry #33 in the reject list).

Any entry in the reject list can also be viewed and deleted. View an entry via **Codelog > 1)Config > 5)Filters > 1)ID Filter > 4)Set Reject ID > 2)View/Del**. The first entry is shown in the first line of the display. To view the next entry use the **Right Arrow** key to advance through the list. At any time an entry in the list can be deleted by pressing the **1** key (**1)Del**).

## ACCEPTING ID ONLY

Use this feature to create a list of transmitter IDs that should be accepted during a scan. All IDs added to this list are accepted (and all IDs that are not in the list are rejected). Any detections with the specified ID in the list are recorded by the receiver and displayed (in the LCD display and the SRX Host).

Add an ID to the accept list via **Codelog > 1)Config > 5)Filters > 1)ID Filter > 5)Set Accept ID >1)Add**. The number in brackets in the first line of the display corresponds to the entries in the list (e.g. entry #33 in the accept list).

Any entry in the accept list can also be viewed and deleted. View an entry via **Codelog > 1)Config > 5)Filters > 1)ID Filter > 5)Set Accept ID > 2)View/Del**. The first entry is shown in the first line of the display. To view the next entry use the **Right Arrow** key to advance through the list. At any time an entry in the list can be deleted by pressing the **1** key [**1)Del**].

## PULSE FILTER (SIGNAL QUALITY)

There are four filters available that pertain to the signal strength and timing characteristics of pulsed signals: Echo Filter, Noise Threshold, Pulse Width and Signal Strength Deviation. All of these filters set pass/fail boundaries based on selected pulse characteristics.

### SETTING AN ECHO FILTER

The Echo Filter sets the time in milliseconds after a valid detection during which any additional detections are considered to be echos.

This filter was originally (SRX 400) provided for use with acoustic transmitters, where multipath propagation at the speed of sound can cause mirror reflections on the order of several milliseconds. However, this filter currently provides the ability to reject pulses when the time interval between two pulses is below the Echo Filter time. As a result, this feature speeds up the receiver's processing time.

Please contact Lotek Wireless Inc. for details on how to determine an appropriate Echo Filter time.

## SETTING THE NOISE THRESHOLD

The Noise Threshold is a minimum allowable detection signal strength. This means that if the receiver detects a pulse that has a signal strength equal to or less than the noise threshold it is rejected and not used for further code processing.

Typically the noise threshold is set to 30, but should be set to reflect the environment in which a study is taking place. Set the noise threshold via **Codelog > 1)Config > 5)Filters > 2)Pulse Filter > 2)Noise Threshold**. The maximum noise threshold value that can be entered is 99.

## ENABLING/DISABLING THE PULSE WIDTH FILTER

The minimum Pulse Width filter threshold is defined through the SRX Host, but us typically set to 2ms. With the filter enabled, pulses with a measured pulse width less than the pulse width filter (e.g. 2ms) are discarded.

Enable or disable this feature via **Codelog > 1)Config > 5)Filters > 2)Pulse Filter > 3)Pulse Width > 1)Enable** or **2)Disable**. The display shows the current setting in brackets using the number of the menu items available. For example, if pulse width filter is disabled then the number in brackets is **2**.

## ENABLING/DISABLING THE SIGNAL STRENGTH DEVIATION

The signal strength deviation filter applies to codes (sequences of pulses), and is used to reject codes whose individual pulses exhibit a large variance. This feature is useful for detecting code collisions, where two codes with different signal strengths are overlapped.

The maximum signal strength deviation is 18. Enable or disable this feature via **Codelog > 1)Config > 5)Filters > 2)Pulse Filter > 4)Signal Strength Dev > 1)Enable** or **2)Disable**. The display shows the current setting in brackets using the number of the menu items available. For example, if signal strength deviation is disabled then the number in brackets is **2**.

# 1)CONFIG## > 6)SENSORS

The receiver needs to know the Sensor Class and the types of sensors that are used by the transmitters in a study.

There are four types of sensors available: temperature, pressure, activity and EMG. Only three types can be used by the receiver at any given time. In order for the receiver to interpret and display the sensor data properly, it must know the sensor's range and granularity. These are characterized by three numbers: the Minimum and Maximum (measurement values) and the Level (number of measurement levels). All of these values entered here (class and type, as well as minimum, maximum and levels for all types) are normally provided on the shipping sheet that came with the transmitters from Lotek Wireless Inc.

## SETTING THE SENSOR CLASS

The sensor class is an internal parameter that the receiver needs to interpret and display sensor data. All transmitters in a study must belong to the same class.

Set the sensor class via **Codelog > 1)Config > 6)Sensors > 1)Class**. Enter a value between 0 and 9. After a value has been entered the receiver automatically returns to the Sensors page.

## SELECTING THE SENSOR TYPES

Coded transmitters equipped with sensors can combine up to three sensor types in a single transmitter. The particular sensor combination in use must be known to the receiver.

Select the sensor types via **Codelog > 1)Config > 6)Sensors > 2)Type**. The display automatically places a slash [/] between each selection (e.g. 1/2/3). A maximum of three sensor types can be entered. The number of the selection corresponds to the menu item number, for example, press key **3** to select the activity sensor type and the number 3 appears in the display. After three selections have been made the receiver automatically returns to the Sensors page. If fewer than three selections are made, press the **Enter** key to apply the changes and go back to the Sensors page.

# SETTING PARAMETERS FOR TEMPERATURE

Set the minimum temperature via **Codelog > 1)Config > 6)Sensors > 3)Param > 1)C > 1)Min**. Use the **+/-** key to change the sign of a value.

Set the maximum temperature via **Codelog > 1)Config > 6)Sensors > 3)Param > 1)C > 2)Max**. Use the **+/-** key to change the sign of a value.

Set the number of levels for temperature via **Codelog > 1)Config > 6)Sensors > 3)Param > 1)C > 3)Level**.

# SETTING PARAMETERS FOR PRESSURE

Set the minimum pressure via **Codelog > 1)Config > 6)Sensors > 3)Param > 2)PSI > 1)Min**. Use the **+/-** key to change the sign of a value.

Set the maximum pressure via **Codelog > 1)Config > 6)Sensors > 3)Param > 2)PSI > 2)Max**. Use the **+/-** key to change the sign of a value.

Set the number of levels for pressure via **Codelog > 1)Config > 6)Sensors > 3)Param > 2)PSI > 3)Level**.

# SETTING PARAMETERS FOR ACTIVITY

Set the minimum activity via **Codelog > 1)Config > 6)Sensors > 3)Param > 3)Act > 1)Min**. This value is typically set to 0 (not moving).

Set the maximum activity via **Codelog > 1)Config > 6)Sensors > 3)Param > 3)Act > 2)Max**. This value is typically set to 1 (moving).

Set the number of levels for activity via **Codelog > 1)Config > 6)Sensors > 3)Param > 3)Act > 3)Level**.

# SETTING PARAMETERS FOR EMG

Set the minimum EMG value via **Codelog > 1)Config > 6)Sensors > 3)Param > 4)EMG > 1)Min**. Use the **+/-** key to change the sign of a value.

Set the maximum EMG value via **Codelog > 1)Config > 6)Sensors > 3)Param > 4)EMG > 2)Max**. Use the **+/-** key to change the sign of a value.

Set the number of levels for EMG via **Codelog > 1)Config > 6)Sensors > 3)Param > 4)EMG > 3)Level**.

# 2)SCAN > 1)CONTINUE TO LOG DATA

The settings available under this menu item are as follows:

- Start a scan

- Delete all data from the receiver

## STARTING A SCAN CYCLE

A scan cycle is initiated via **Codelog > 2)Scan > 1)Continue to Log Data**. Once a scan is started no changes can be made to the active configuration, except when the scan is paused. The only actions that can be taken at this point are the following:

### ADJUSTING FREQUENCY AND GAIN

Go to the next/previous applicable frequency in the frequency table used by the active configuration using the **Up** or **Down Arrows**.

A new gain can be selected using the **Up** or **Down Arrows**. The amount of increment or decrement is specified by Set Delta for gain (see section called Set Delta in chapter 1 for details).

## PAUSING A SCAN

Accessed via **Codelog > 2)Scan > 1)Continue to Log Data > 0)Pause Scan**. This function suspends the scan cycle on the frequency and antenna that was being scanned when pause was selected. The receiver does not change the frequency or antenna it was scanning when pause was selected, but it does continue logging data for that frequency and antenna.

Any settings changed while paused are only applied to the frequency and antenna that the receiver was scanning when pause was selected.

## VIEWING THE DISPLAY SCROLL

As valid detections are made they are recorded by the receiver and they are also available for viewing. Up to 64 valid detections can be accumulated for viewing during a scan. After 64 initial valid detections have been made the receiver starts replacing the oldest detection with the most recent and so on (this affects viewing only).

The receiver does not stop collecting data while using this feature.

Access the display scroll via **Codelog > 2)Scan > 1)Continue to log data > 2)View > 1)Display Scroll**. To scroll through the detections use the **Right** and **Left Arrow** keys.

## CHANGING THE UNITS SENSOR DATA IS DISPLAYED IN

Temperature can be displayed in Celsius (default unit) or Fahrenheit. Pressure can be displayed in PSI (default unit) or meters. Changing the units for a sensor affects only the display of the data, it does not affect the data recorded by the receiver. Data recorded by the receiver is always in the default units (Celsius and PSI).

Change the unit for temperature via **Codelog > 2)Scan > 1)Continue to log data > 2)View > 2)Temp, pressure units > 1)C/F**. The first line in the display updates to show which unit has been selected (e.g. F).

Change the unit for pressure via **Codelog > 2)Scan > 1)Continue to log data > 2)View > 2)Temp, pressure units > 2)PSI/m**. The first line in the display updates to show which unit has been selected (e.g. PSI).

## CHANGING THE SET DELTA FREQUENCY

When incrementing frequency manually (using the keypad) the receiver uses the Set Delta frequency increment to advance to the next frequency to scan. Increments are in kHz.

Set this increment via **Codelog > 2)Scan > 1)Continue to log data > 3)Set Delta > 1)Freq**.

## CHANGING THE SET DELTA GAIN

When incrementing gain manually (using the keypad) the receiver uses the Set Delta gain increment to advance to the next gain value.

Set this increment via **Set Delta > 2)Gain**.

## STARTING/VIEWING A GPS ACQUISITION

Start acquiring a GPS 2D position by pressing the **GPS** key on the keypad (key number **4**). While attempting to acquire a position, the display shows the number of satellites as they are found.

If a valid position is acquired the following information is provided in the display: Latitude, Longitude, current date, current GMT time, the number of satellites used, HDOP and PDOP. The display flips back and forth between showing the Latitude and Longitude for 4 seconds and the satellites, HDOP and PDOP information for 2 seconds. Either the time or date are also shown on the display and are updated every 5 seconds.

> GPS cannot be used if the receiver is logged off. However, it is possible to log off from the receiver while the receiver is attempting to acquire a GPS position. When logging back on, the display shows the results of the GPS position.

> CRTO cannot be used with the GPS 2D positioning feature of the receiver, however it still allows the GPS clock to function.

## RESUMING A SCAN

Upon resuming a scan (**Codelog > 2)Scan > 0)Pause Scan > 0)Resume Scan**), the receiver uses the last settings applied during the pause, thereby replacing the original values in the active configuration.

## STOPPING A SCAN

Press the END key to stop an active scan.

# 2)SCAN > 2)DEL ALL DATA (PASSWORD)

### DELETING ALL DATA IN THE RECEIVER

Data cannot be deleted from the receiver unless the password is provided. As soon as a password is provided the receiver deletes all data. There is no warning prior to deletion.

# 3)MASTER FTABLE

The settings available under this menu item are as follows:

- Enter in the frequency to be used by any UUCs (ultrasonic upconverter) connected to the ASP-8

- View frequencies in the Master Frequency Table

### ENTERING A UUC FREQUENCY

Enter a the frequency in MHz for the UUC via **Codelog > 3)MasterFtable > 1)UUC Freq**. This frequency can be in the range of 148.000 to 152.000 MHz.

### VIEWING THE MASTER FREQUENCY TABLE

All frequencies in all frequency tables are copied into a master list called the Master Frequency Table. View this list via **Codelog > 3)MasterFtable > 2)View Master Ftable**. Use the **Right** and **Left Arrow** keys to move forward and backward through the list. The display provides the frequency and channel, as well as which Configuration(s) uses that frequency+channel.

# DOWNLOADING DATA

**6**

Please refer to the **SRX Host** manual for details on how to download data through direct Serial, USB or modem connections.

# **APPENDICES**

7

## **APPENDIX A: UNDERSTANDING THE FORMAT OF DATA RECORDS**

Data record formats vary depending on settings that are specified in the active configuration (see chapter on CodeLog Mode for details on configurations). There are three settings that affect the format and size of a data record:

- CRTO enabled or disabled

- GPS 2D position feature enabled or disabled

- Transmitters ID Only or with Sensors

While additional fields in a data record are needed to support CRTO, GPS and Sensor data (or combinations of these), there are some data fields that are always provided:

- Detection time (or start time and duration for CRTO records)

- Channel ID

- Transmitter ID

- Antenna port number

- Signal strength

Data records also include Environment Data. Environment data is related to all of the settings that influence a Scan Cycle. This data would include:

- The master frequency table (frequencies and their channel numbers)

- The configuration specific frequency tables

- All antenna port numbers, antenna types and their gain values

- The master radio antenna and master hydrophone and their gain values

- What the total scan time value is

- The scan time set for the frequencies

- Whether CRTO is enabled or disabled

- Whether AGC is enabled or disabled

- The Echo Filter time

- The code set being used

When the receiver begins collecting data a complete environment record is stored in the memory with a time stamp. After that only changes to the settings are stored with a time-stamp indicating when the change took affect.

# APPENDIX B: ADDITIONAL INFORMATION

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.

- Increase the separation between the equipment and receiver.

- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

- Consult the dealer or an experienced radio/TV technician for help.

## WARNING

Changes or modifications not expressly approved by Lotek Engineering could void the user's authority to operate the equipment.