

SCAN'R_{tm}

Snapshot Characterization and Analysis

Version 1.8

Software Manual



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Chapter 1 : Installation

1.1 : What you should have received

The SCAN'R_{tm} package includes one SCAN'R_{tm} CD-ROM and this manual. The CD-ROM contains the software distribution along with a setup function that uses the Microsoft Windows installer.

1.2 : New Installation

Place the CD-ROM in the drive. After a short delay the CD-ROM window should open. If this does not happen, double-click the CD-ROM symbol in the *My Computer* folder.

When the CD-ROM window appears double click the *Setup* icon. This will bring up the Window Installer. Follow the directions to complete the installation.

1.3 : Updating an Older Version

Follow the same procedure as described in the section 1.2.

For reasons of safety it is good practice to create a backup of your previous data before proceeding.

It is also recommended to uninstall older versions of SCAN'R before installing new versions.

Chapter 2 : SCAN'R_{tm}

2.1 : Introduction

SCAN'R_{tm} is an automated snapshot characterization and analysis tool. It is designed to help address two main issues present in bat monitoring projects; namely 1) handling the high volume of data that is produced by modern Time Expanded (TE) and Full Bandwidth (FB) bat detectors, and 2) converting the recordings into meaningful measurements that can potentially be used to identify individual species and estimate populations.

First, SCAN'R_{tm} includes a novel bat detection technique that can distinguish between actual bat calls and false alarms which are due to insects and other noise sources. This feature is fully automated. SCAN'R_{tm} will process an entire snapshot directory and separate the files into two lists, a list of “passed” files that contain bat calls and a list of “failed” files that don't. Afterward, with a single button click, the operator can either delete all of the failed files or save all the passed files into a separate archive directory.

Second, SCAN'R_{tm} includes a fully automated characterization processor which isolates each bat vocalization and measures the relevant vocalization parameters. It supports four different base parameter sets. It currently produces base parameter sets that conform to Analook_{tm}, SonoBat-2_{tm}, the new EchoClass_{tm}, and SCAN'R_{tm} protocols. In addition SCAN'R_{tm} supports a few enhanced parameter measurements including Signal Pressure Level (SPL) and curvature, a spectral shape measurement.

Third, SCAN'R includes an enhanced Zero Crossing Detector (ZCD) file translation feature that produces high quality, AnaLook-compatible, ZCD files from recordings generated by Time Expanded and Full Spectrum recorders.

These three processing features can be employed to scan though volumes of recorded data and extract/archive only the files of interest.

Chapter 3 : Running SCAN'R

3.1 : Running from desktop

A SCAN'R_{tm} desktop icon is created and placed on your desktop during the install.

You can start SCAN'R_{tm} from the desktop by double clicking on the SCAN'R_{tm} icon illustrated by Figure 1.

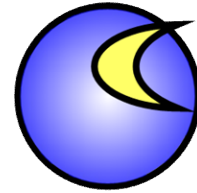


Figure 1: SCAN'R_{tm} Icon

3.2 : Running from Start Menu

SCAN'R_{tm} can also be run from the *Start* menu. You can run it by selecting *Start => All Programs => SCANR*

3.3 : Exiting

There are two ways to exit the program. The first is using the red 'X' button in the upper right corner of the window. The other way is using the *File => Exit* menu item.

3.4 : The SCAN'R Main Window

Upon startup the main window appears as shown in figure 2. The main window has two basic sections. The **file selection section** (left) allows the operator to select both input and output files. It can also be used to manually operate the scanner and select individual files to process. The **sonogram “thumbnail” section** (right) displays a sonogram for each detected bat call. It provides quick visual feedback on the progress of the scanner and allows the operator to inspect the results and/or make measurements of their own. The thumbnail section includes a view scroll bar (light green) that allows an operator to adjust the range of thumbnails that are displayed.

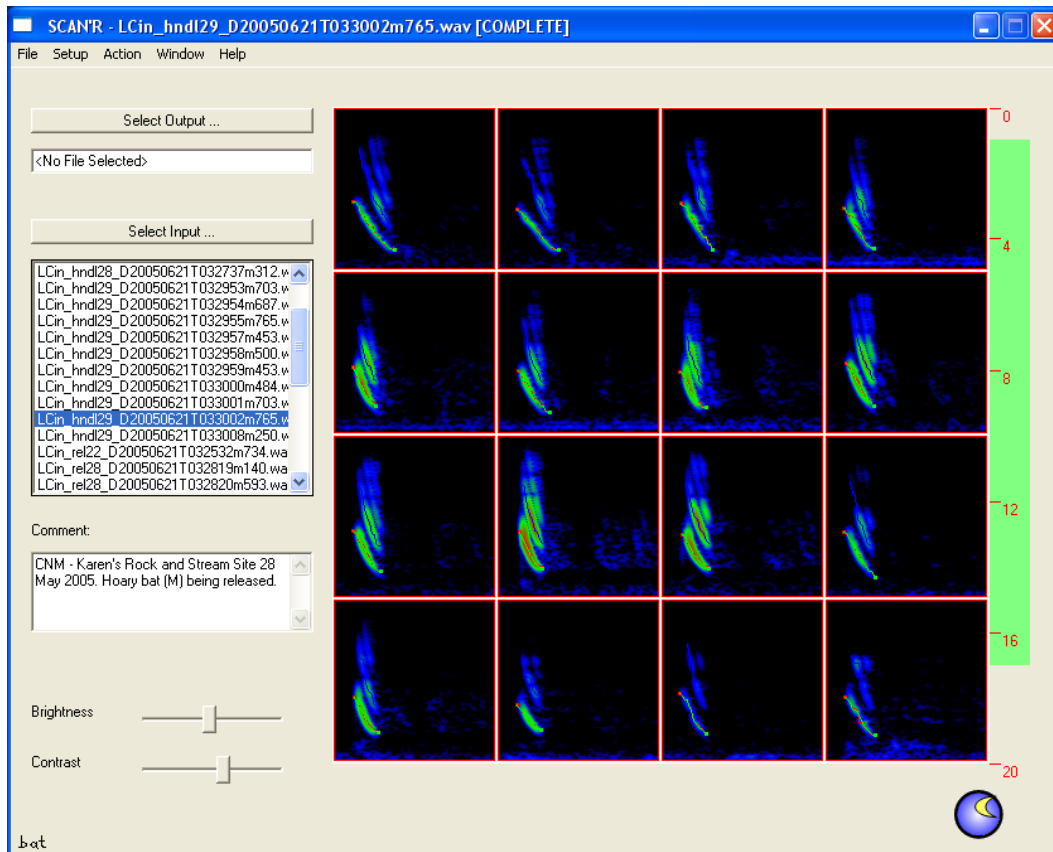


Figure 2: SCAN'R_{tm} Main Window

3.4.1 : Output File Selector

The output file selector allows the operator to specify the file that will receive the parameter measurements . Clicking on the “*Select Output...*” button will bring up a standard windows file selection tool, Figure 3. This tool allows the operator to browse existing folders, create new folders and specify an output file-name.

Keep in mind that the output file is a parameter file. As each bat call is processed, SCAN'R_{tm} will measure the relevant parameters and store them into this file using a standard tab delimited parameter file format. SCAN'R_{tm} also supports two different parameter base formats along with several different optional parameters. Use the Output Format selection window (section 3.6.1) to select the desired output format.

It is important to note that the output file is only reset at the time you select it. After this, the file will be updated with results from each new scan. This will continue until either a new file is selected or the same file is reselected. To rerun a scan, overwriting the previous results, you must first reselect the output file.

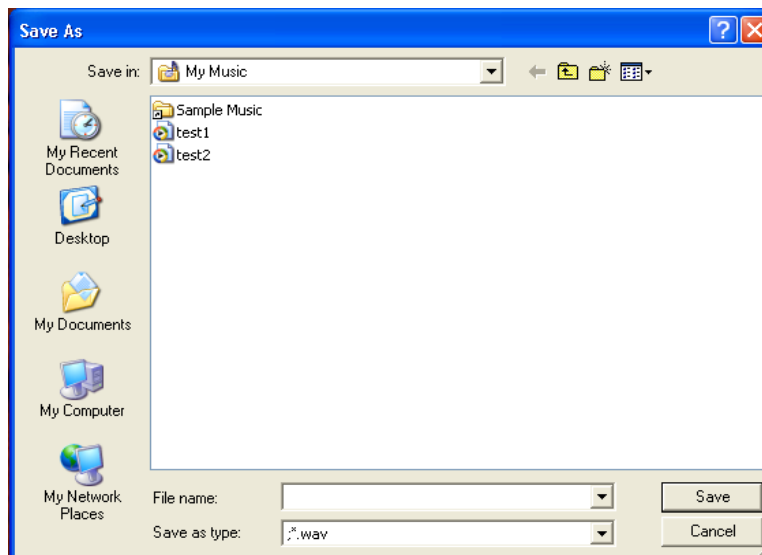


Figure 3: File selection tool

3.4.2 : Input File Selector

The input file selector operates much the same as the output file selection. Clicking on the “Select Input...” button will bring up a standard file selection window. However, rather than just selecting just a single file. The Input Selector will read in and display all of the files in the selected directory. All files will be listed and the original selected file will be highlighted as shown in figure 4.

Please note that the input selection panel includes a comment display which is updated with any SPECT'R_{tm} or SonoBat_{tm} compatible comment field that is found in the selected file.

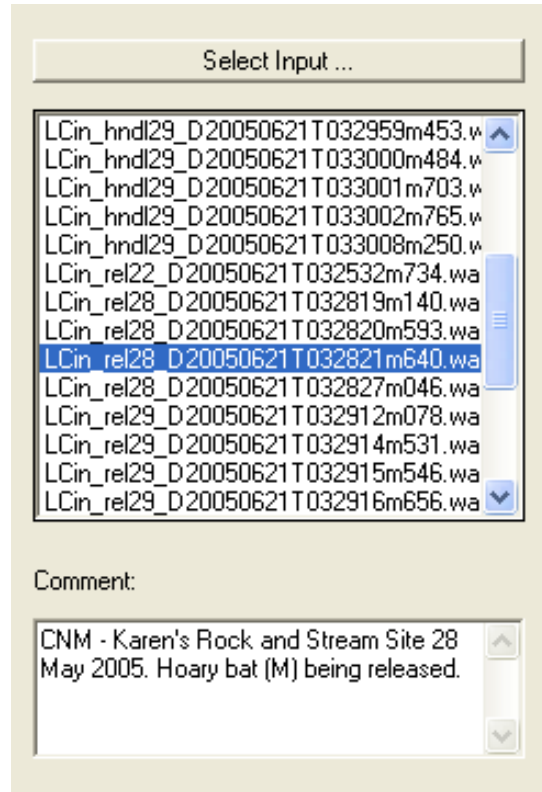


Figure 4: Input Selection

3.4.2.1 : Operating the File Selection Panel

SCAN'R_{tm} can be operated using the input file selection panel. Select the initial file and directory by clicking on the Select Input button. This will populate the list with all the files in the selected directory. Note that if the file list is too large to fit in the panel, a scroll bar will appear to allow the operator to scroll through the entire list. The selected file will be highlighted in blue. To change selection simply click on another filename in the list box. The new file will be highlighted and the comment display will be updated to reflect the new file. To manually process (or reprocess) a single file, simply double click on the file name.

3.4.3 : Sonogram “Thumbnail” Display

The thumbnail is a sixteen pane sonographic display that is organized in four rows and four columns as illustrated in figure 5. The panes are updated with each new detection. Each pane holds a single call. The update order is left-to-right and top-to-bottom.

The thumbnail display provides visual feedback of the scanner progression. It provides a mouse driven interface to allow the operator to select thumbnails of interest and inspect the results. The measurement interface is similar to SPECT'R_{tm}. The display includes measurement readouts at the bottom of the screen. Simply move the mouse over the desired region of a thumbnail. SCAN'R_{tm} senses the position of the mouse and updates the readouts accordingly. To make differential measurements, click on a point of interest and then move the mouse. The readout will now show the difference between the point originally clicked and the new location of the mouse.

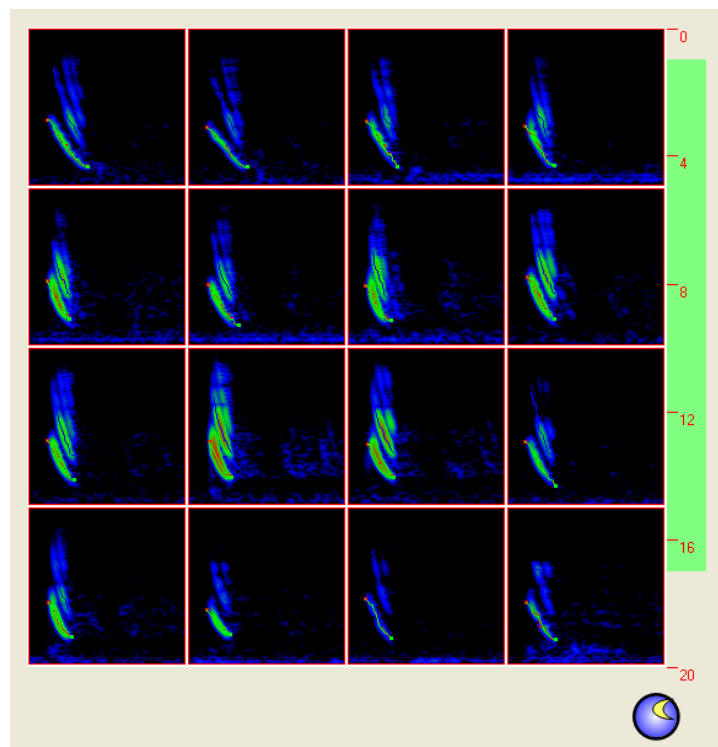


Figure 5: Thumbnail display

3.4.4 : Zooming the “Thumbnail” Display

Double click the left mouse button to zoom , on any of the sixteen thumbnails, to get a closer look. When zoomed, the resolution of the display is increased and the display is updated with the automated parameter estimates for that call. As shown in figure 6, the zoomed thumbnail is enlarged by nearly a factor of four. **To un-zoom, click the right mouse button.**

The zoomed thumbnail now includes parameter measurements in the upper right corner . A zoomed sonogram is overlaid with computer generated tracking and feature identification information to provide the operator with all of the signal characteristic information in one display. This is useful for checking the performance of the SCAN'R_{tm} against various types of bat call as well as for quick visual species identification.

Please note that the parameter measurements displayed use the same parameter set format that is selected for the output file.

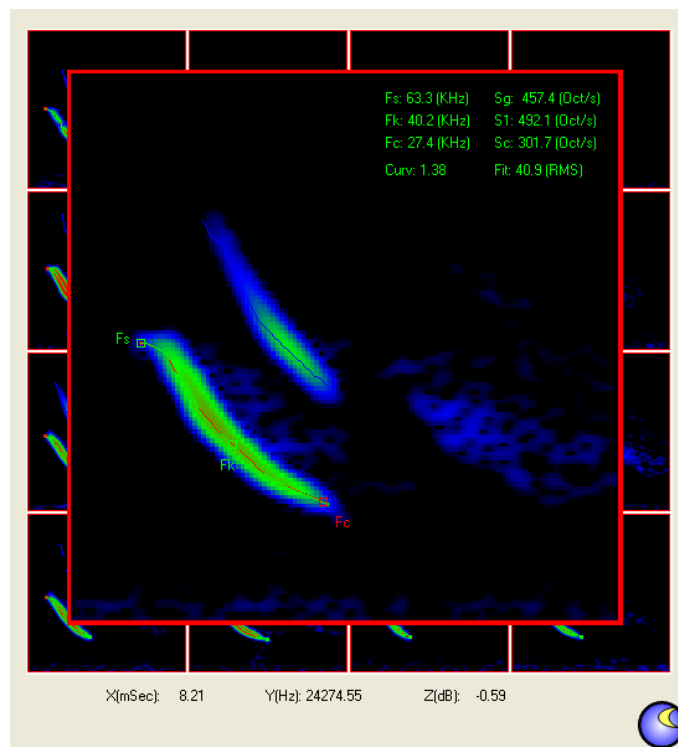


Figure 6: Thumbnail display

3.4.5 : Selecting the Range of Thumbnails

SCAN'R displays only sixteen (16) thumbnails at a time. As of version 1.2, SCAN'R includes a scrolling feature that allows the operator to select the range of 16 thumbnails to display. The scroll bar is located at the right side of the thumbnail display group.

As each file is scanned, SCAN'R creates a thumbnail for each bat call that is detected. Once the number of thumbnails increases beyond the size of the display, the scroll bar will turn light green and the scroll display will be adjusted to indicate the number of thumbnails that are available. The number of thumbnails that can be created per snapshot is limited to two hundred. Once SCAN'R reaches this limit, it will stop generating thumbnails. The limit only applies to thumbnail generation for display purposes. Note that SCAN'R will scan each snapshot to completion and it will generate parameter measurements for all bat calls detected.

To operate the thumbnail scroll bar, simply click and hold the left mouse button while the cursor is on top of the light green bar and then drag the bar to the desired position. The display updates as the bar is moved. This allows the operator to quickly scan through large numbers of thumbnails. Once the desired position is reached, simply release the left mouse button and the display will be updated with the new position.

New feature: One new feature in SCAN'R version 1.2 is that the scroll bar can also be used in zoom mode. Double click a thumbnail to bring up zoom mode. Then, as before, click and hold the left mouse button while the cursor is on top of the light green bar and then drag the bar. If you drag the bar slowly enough, the zoom window will display a progression thumbnails. This allows the operator to inspect a sequence of thumbnails more easily. This is also a good way to study bat calls in a time-sequenced "movie mode".

3.4.6 : Operating Brightness and Contrast Controls

Simply stated, the Brightness and Contrast controls allow the operator to adjust the screen appearance. Moving either slider left reduces the screen brightness/contrast, while moving the slider right increase the screen brightness/contrast.

To be more precise, the Brightness and Contrast controls actually control how the underlying sonographic data maps to the screen color and/or intensity. Explained this way, the brightness and contrast actual control the level of sonographic detail that will be mapped to the screen. The brightness control actually establishes the mean value of the display, while the contrast controls the linear range or sensitivity around the mean value.

Once you master operation of the brightness and intensity controls, you will find them a great tool to use to discover the subtle details of bat vocalizations.

3.5 : SCAN'R Menu Operation

3.5.1 : File Menu

The File menu provides 1) an alternate method to select the Input and Output files and 2) it provides the main mechanism to exit SCAN'R.

Clicking on either *Select Input...* will bring up a standard windows file selection utility and update the input file list as described in section 3.4.2. Clicking on or *Select Output...* will again bring up a standard selection utility and then update the output file as described in section 3.4.1.

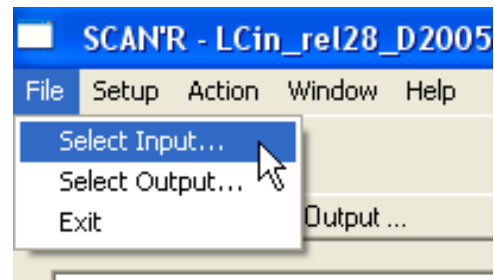


Figure 7: File Menu

3.5.2 : Setup Menu

The Scan Setup menu allows the operator to bring up the three primary control window. All of these windows contain controls that allow the operator to customize the operation of SCAN'R_{tm}.

The windows operation is described in sections that follow.

Note that SCAN'R_{tm} saves all settings and restores them next time SCAN'R_{tm} is run.

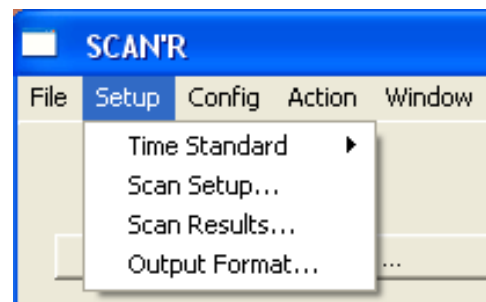


Figure 8: Setup Menu

3.5.3 : Action Menu

The Action menu provides options to start and stop file scanning operations. *Action=>Scan* initiates a scan of the currently selected file (file list box). *Action=>Scan All* initiates scanning of all files in the file list box. This effectively scans an entire directory. *Action=>Stop* terminates the current scanning operation.

Please note that the Stop operation is primarily intended to give the operator a mechanism to abort the current scanning operation. Normally this is just to test settings or to rerun the current operation.

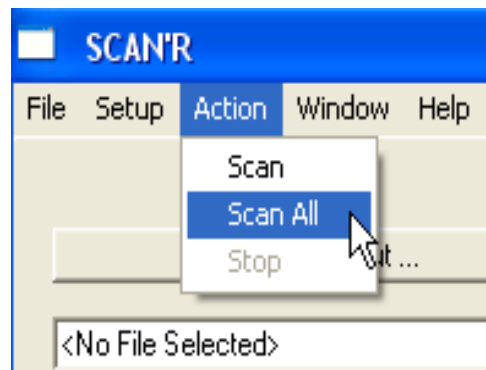


Figure 9: Action Menu

3.5.4 : Window Menu

Similar to the Scan Setup menu, the Scan Window menu also allows the operator to bring up the three primary control windows. However, it also displays a check mark next to the windows that are currently active.

The Scan Window is primarily intended to quickly bring active windows to the forefront when they are hidden behind other windows on the desktop.

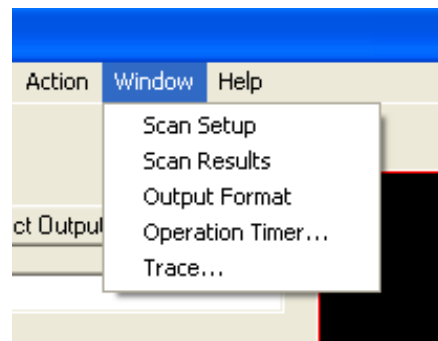


Figure 10: Window Menu

3.5.5 : Configuration Menu

The configuration menu is a special menu that appears only in the extended license version of SCAN'R. The configuration menu provides a mechanism for the operator to select default settings for reading generic wave files.

As of version 1.3.6, the configuration menu allows the operator to supply the default time expansion factor that will be used to interpret the sample rate of the file. Two time expansion factors are supported 1X and 10X. The first, 1X, supports files that were recorded in real-time using a high speed digitizer. The second, 10X, supports files that were generated using a time expanded bat detector. If the wav files were recorded with a high speed digitizer or if the files are marked with the actual sample rate, choose 1X. If the wav files were recorded using a time expanded detector and a PC audio port, choose 10X.

The default time expansion selection is only applied to generic wave files. It has no effect on recordings produced by either the SPECT'R or SonoBat recording software packages. Both of these place recording setting and other attribute information directly into the recorded files which SCAN'R will read to determine the correct time expansion setting.

3.6 : SCAN'R Setup and Operation Windows

3.6.1 : Output Format Window

The Output format window controls the format of the output parameter file. SCAN'R_{tm} supports four output format options, Analo_{tm}, SonoBat-2_{tm}, EchoClass and SCAN'R compatible base formats. It also allows the base format to be augmented with additional parameters.

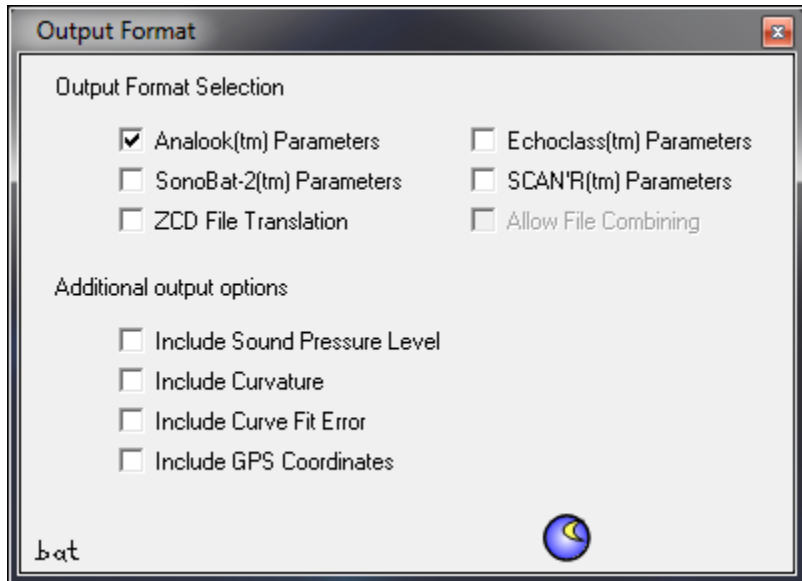


Figure 11 : Output Format Window

Click on the *Setup=>Output Format...* menu entry. This will bring up the Output Format window as illustrated in figure 11.

The top portion of the window contains six check boxes. Four of the six boxes selects the parameter base format. The fifth and sixth boxes select the new ZCD file translation feature and allow file combining into the equivalent of Anabat-style bat passes. Click on the box next to the desired selection. The checked box indicates the current selection. The selection is stored and will be remembered the next time SCAN'R_{tm} is used.

In addition to the standard formats, SCAN'R_{tm} is capable of providing additional measurements. The lower portion of the screen provides a mechanism for the operator to include these measurements in the output format. The **sound pressure level** option adds a measurement of the peak sound pressure level detected in the call. The **Curvature** selection adds the curvature measurement and the **Curvature Fit Error** adds a curve fit metric. Finally, **GPS Coordinates** passes on GPS coordinates from the recording if present.

The parameters are described in greater detail in section 3.7.

3.6.2 : Scan Setup Window

The **Scan Setup Window** is a control panel which allows the operator to setup the scanner and configure the call selection criteria. The control parameters are separated into two function groups as show in figure 12. The upper section controls the initial call detection criteria, while the lower section controls the final call filtering. The primary difference between the two is that the upper section sets the criteria used to detect the bat calls in the recording, while the lower section controls the filtering operation which filters out unwanted detections.

The upper section contains three controls, the **trigger level** setting, the **minimum and maximum frequency cutoff** settings, and the **standard view duration** setting. To detect bat calls, SCAN'R tracks the noise floor of the recording and searches for burst sound energy that is greater than the noise by at least the value set by the Trigger Level. At the same time, the scan will reject all sound energy at frequencies lower than the minimum frequency cutoff setting or higher than the maximum setting. This allow SCAN'R to immediately reject insects an other sounds that are out of the ultrasonic frequency range. Once triggered, SCAN'R will process the burst over duration selected by Standard View setting. The Standard View duration can be adjusted using a slider. This allows the operator to optimize the displays to meet the requirements of different call types.

The lower section of the **Scan Setup Window** contains a set of filtering controls. These controls are the **peak power** filter, the **minimum duration** filter , the **fit restriction** filter, the **pop filter**, and a parameter selective **filter bank** . All of these filters are applied after the initial call detection and are used to qualify the detections and/or search for calls that meet certain criteria.

At the very bottom of the **Scan Setup Window** are two buttons which allow the operator to load and/or save the currently configured settings. These are useful for maintaining settings templates for specific scan criteria.

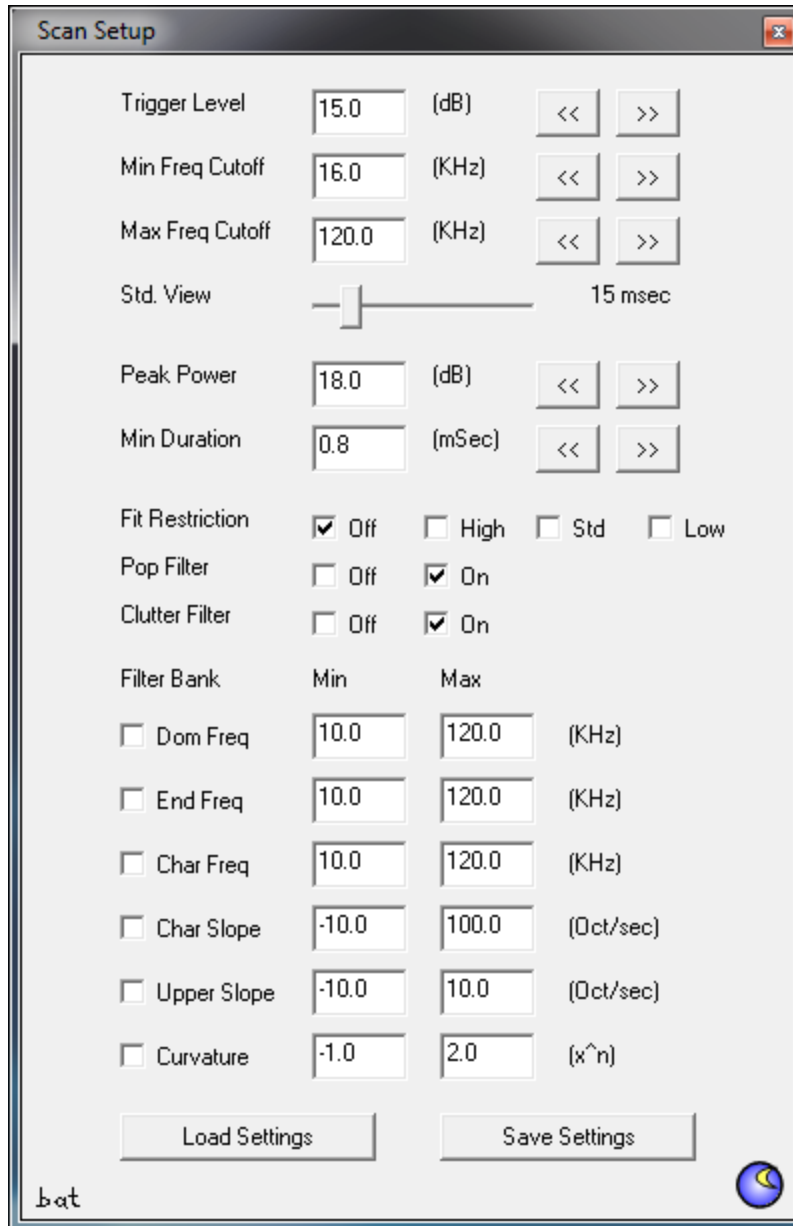


Figure 12 : Scan Setup Window

The **peak power** filter is used to reject detections that don't reach a required peak sound pressure level during the duration of the call. Like the **trigger level**, this setting is referenced to the current value of the noise floor. It should be higher than the trigger level by at least 3 dB (default is set 6dB greater).

The **minimum duration** filter is used to reject detections that don't last long enough. Many of the false detections due to insects can be considered "pop" noise. They are very short duration bursts that last only fractions of a millisecond. In comparison, even short bat calls last longer than a millisecond, and echolocation calls are normally even longer. The minimum duration is defaulted to half a millisecond. This value has proven to work well against most bug interference.

The **fit restriction** filter is used to reject detections that don't meet the selected curve fit restrictions. If the fit restriction is set to **high**, all detections are required to closely match the internal curvature model. If the fit restriction is set to **standard** (or medium), all detections are required to match the internal curve model, but with more tolerance for error. Finally, if the fit restriction is set to **low**, the fit tolerance is set low enough that most detections will pass except those that no creature could possibly create.

The **pop filter** is used to reject pop noise like static discharging, which is common in electrostatic or capacitive sensors, especially when operated in high humidity. It is also useful, for filtering out other false detections like rain drops hitting the detector.

The **clutter filter** is used to reject close-by call echos. When the clutter filter is ON, SCAN'R will not attempt to process additional calls within the displayed call window. When the clutter filter is OFF, SCAN'R will attempt to process all calls, including echos.

Finally, the **filter bank** provides a selectable set of filters that are based on the scanned parameter measurements. These are primarily intended to allow SCAN'R to be operated to search for a particular call type, because they are very selective. Please see sections 3.8.1 and 3.8.2 for a description of the parameters.

3.6.3 : Scan Results Window

The Scan Results Windows presents the final results of the scan processing. The Scan Results Window is illustrated in figure 13.

At the very top of the window is the **selection criteria** filter. This is the final filter in the selection process. SCAN'R_{tm} counts up the total number of detections in each file and compares this to the selection criteria. If the number of detections is greater than or equal to the selection criteria value, the file is moved to the “selected” file list (top list). Otherwise the file is moved to the “failed” file list (bottom list).

Scan results are updated with each file that is processed either manually (one file at a time) or automatically using the *Action=>Scan All* menu selection. It also includes counters that track the total number of passed files, the total number of detections in all of the passed files, and the number of failed files.

As of version 1.7 SCAN'R includes a “bat pass” counter. The bat pass counter applies the time duration rules used in the Titley Anabat system. Thus the bat pass count indicates the equivalent number of Anabat “bat-pass” files that are represented in the scanned data. This allows direct comparison of data sets between systems.

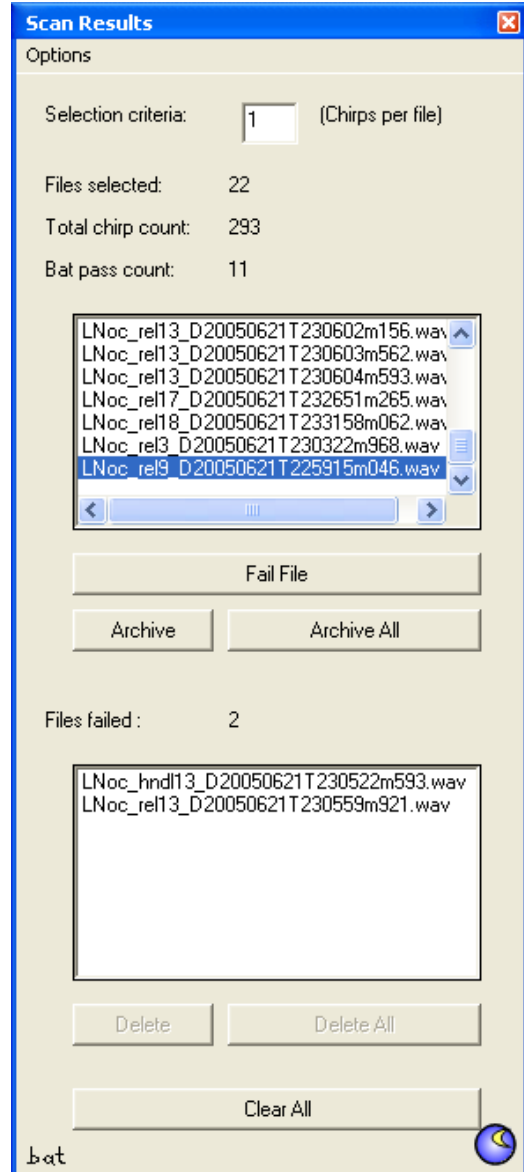


Figure 13: Scan Results Window

3.6.3.1 : Maintaining Call Archives

The Scan Results window provides flexible options to help maintain call archives and minimize disk storage by weeding out bad files. The operator is given the option to delete, move, or archive select files or groups of files.

The Scan Results window groups files into two lists, “passed” files and “Failed” files. The passed file list includes all files that meet the file selection criteria specified in the Scan Setup window. The failed file list includes all files that did not meet the file selection criteria. These lists are update as SCAN’R finishes scanning each file. Once all the files has been scanned, the operator has the option to delete, move, or archive selected files.

3.6.3.1.1 : Passed File Options

For passed files, the operator has three primary options. First, the operator can choose to archive the file. When archived, a copy of the file is placed in an archive directory. Second, the operator can choose to move the file. In this case, the file is actually moved from the original directory and placed in another directory. Finally, if the operator decides that the file should not have passed, the file can be manually moved over to the

The passed file option is selected using the *Scan Results Options* menu. The passed file option defaults to *Archive*. This setting preserves the original file. To switch the setting to *Move* click on *Options->Passed Files->Move* as illustrated in figure 14. This setting will not preserve the original file.

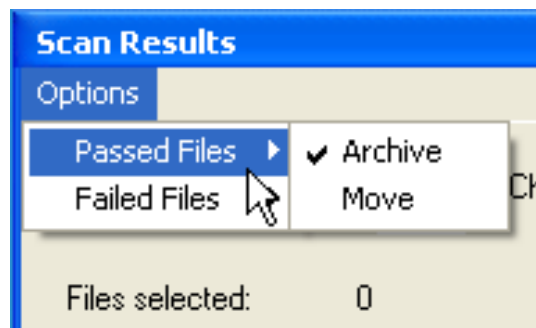


Figure 14: Passed File Options

3.6.3.1.2 : Failed File Options

For failed files, the operator has two primary options. First, the operator can choose to delete the file. Note that the deleted files are actually moved to Window's Recycle bin and won't actually be deleted until the recycle bin is emptied. This allows files to be recovered if deleted accidentally. Second, the operator can choose to move the file. In this case, the file is actually moved from the original directory and placed in another directory.

The failed file option is also selected using the *Scan Results Options* menu. The failed file option defaults to *Delete*. This setting deletes the original file and moves it to the Recycle bin. To switch the setting to *Move* click on *Options->Failed Files->Move* as illustrated in figure 15. This setting does not preserve the original file.

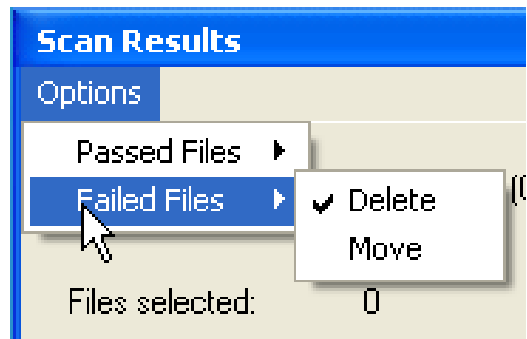


Figure 15: Passed File Options

3.6.4 : Operation Timer Window

SCAN'R includes an operation timer that can be used to perform periodic or daily automated batch processing. This is a new powerful feature that is included in version 1.5 and above. Because it is fully automated, the operation timer enables SCAN'R to be employed in remote field collection and used in conjunction with SPECT'R or SPECT'R Mobile. This provides a new data collection capability that is able to reduce data storage requirements and extend the duration of unattended recording sessions. For example, SCAN'R can prescreening the snapshot recordings to weed out bad recordings and false detections and it can process the recordings and save only the parameter sets which provides a huge reduction in the data storage requirement.

The operation timer is controller using the Operation Timer Window as illustrated in Figure 16. The window contains three main sections; the **time and status indicator** section, the **program activation method** section, and the **operation programming** section. These sections will be discussed further on the next page.

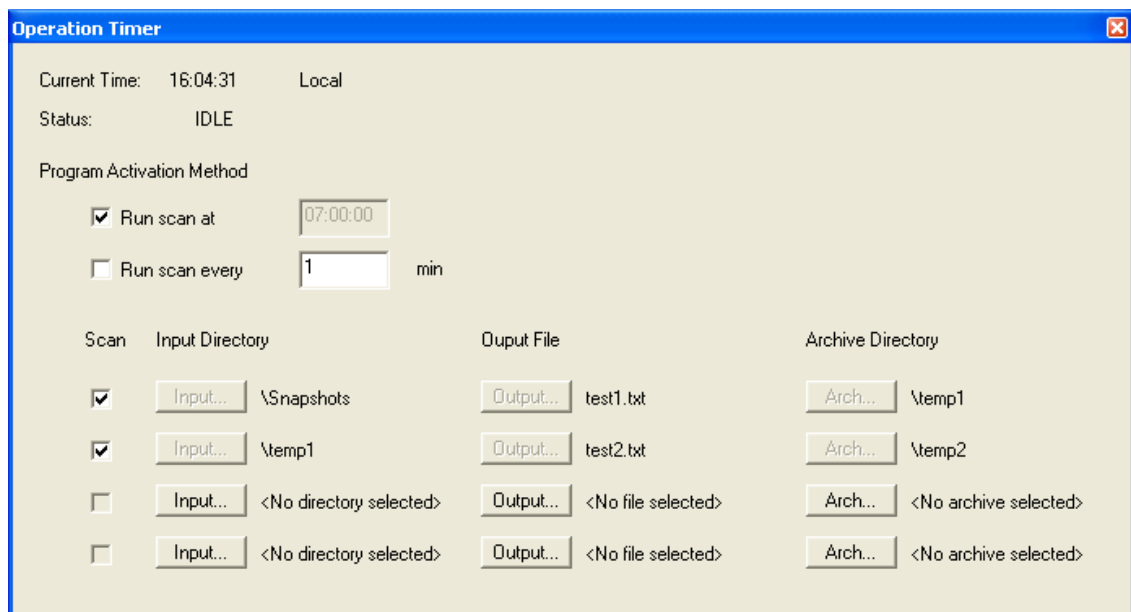


Figure 16: Operation Timer Window

3.6.4.1 : Time and Status Indicator

The time and status indicator section displays both the current time and the current status of the operation timer. The time is displayed in either UTC (universal coordinated time) or the local time. An indicator is also displayed showing which time is currently being displayed. The indicator with either be UTC or Local. The status indicator displays the current status of the operation timer.

Changing the time standard is accomplished using the *Setup=>Time Standard* menu option. Use this menu option to select the desired time standard setting. The current setting will be indicated with a check-mark.

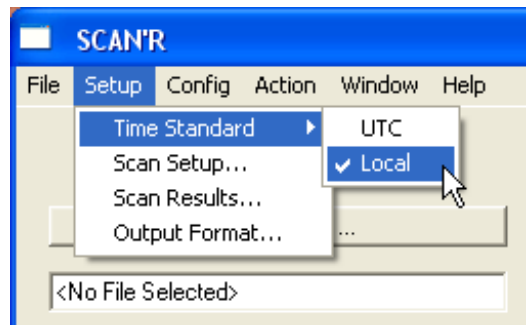


Figure 17: Passed File Options

3.6.4.2 : Program Activation Method

The program activation method section allows the operator to choose how the operation timer will activate the programs. Programs can either be activated beginning at a specific time each day or they can be activated periodically through the day with a specified interval.

To activate programs once per day, enter the start time in the time edit box and click on the corresponding check box. To activate programs periodically throughout the day, enter the activation interval in minutes into the minutes edit box and click on the corresponding check box.

To disable the operation timer, uncheck both of the options.

3.6.4.3 : Program operation section

Scan	Input Directory	Output File	Archive Directory
<input checked="" type="checkbox"/>	<input type="button" value="Input..."/> \Snapshots	<input type="button" value="Output..."/> test1.txt	<input type="button" value="Arch..."/> \temp1
<input checked="" type="checkbox"/>	<input type="button" value="Input..."/> \temp1	<input type="button" value="Output..."/> test2.txt	<input type="button" value="Arch..."/> \temp2
<input type="checkbox"/>	<input type="button" value="Input..."/> <No directory selected>	<input type="button" value="Output..."/> <No file selected>	<input type="button" value="Arch..."/> <No archive selected>
<input type="checkbox"/>	<input type="button" value="Input..."/> <No directory selected>	<input type="button" value="Output..."/> <No file selected>	<input type="button" value="Arch..."/> <No archive selected>

Figure 18: Program operation section

The program operation section allows the operator to select up to four operations to run each time the operation timer triggers. The four programs are provided to allow SCAN'R to process the snapshots from up to four AR125 ultrasonic receivers. This is the maximum number of receivers that can be run using a single computer.

The program operation section, figure 18, is composed of four rows of control entries. Each row includes an **enable check box**, an **input directory selection**, and **output file selection**, and an **archive directory selection**.

The **enable check box** activates or deactivates each program. The program is active only when the check box is checked. Clicking on the check box changes its state. Each time the operation timer is activated it will process all of the programs that are enabled in sequence, top to bottom.

The **input directory selection** allows the operator to select the directory that SCAN'R will process. The selection should be set to a directory that is being used to store snapshot recordings. To select a directory, click on the *Input...* button. This will bring up a directory browsing GUI. Navigate through the directory structure to select the desired directory. Then click on the *OK* button.

The **output file selection** allows the operator to select a directory and file name to store all of the scan parameter results. To select an output directory click on the *Output...* button and this will bring up a windows file selection GUI. Use the GUI to select an output directory and then type in the desired file name.

The file name specified in the output selection field is actually just a base file name, the beginning of a file name. SCAN'R will take this file name and append a time tag to it to for the actual file name. In effect, the base file name provides a convenient mechanism that the operator can use to track sequences of files that are created each time SCAN'R activates. The file naming convention is <base file name>_DyyyymmddThhmns,

where: yyyy=year, mm=month, dd=day,
 hh=hour, mn=minute, ss=second.

The **archive directory selection** allows the operator to select an optional archive directory. This is a directory that will be used to store all of the good snapshots after they have been processed. Again this directory is optional. If an archive directory is chosen, then all of the good file will be written to the archive directory and all of the bad files will be deleted. This in effect will weed out all of the bad files. If no archive directory is chosen, then all snapshot files will be deleted. This in effect will remove all snapshot files from the disk and only retain the scan parameters.

To select an archive directory, click on the *Arch...* button to bring up a directory browsing window. Browse through the window to select the desired directory and then click on the *OK* button.

To deselect an archive directory, click on the *Arch...* button to bring up a directory browsing window and then click on the *Cancel* button.

3.7 : Trace Window

In addition to the Sonogram, SCAN'R includes a Trace Window that allows the operator to see a time versus frequency plot of the call sequence. The time is plotted horizontally with increasing time going from left to right. The frequency is plotted vertically with increasing frequency going from bottom to the top.

The Trace Window is somewhat analogous to the bat call display of the Anabat_{tm} system (www.titley.com). The main difference is that the Trace Window displays both the fundamental frequency component (green trace) as well as the second harmonic (blue trace) if present.

The Trace Window is linked with the sonographic display so you can operate it in conjunction with the main window. If you double click the mouse on one of the calls on the trace window, then the main window will display the associated sonogram. Vice versa, if you double click on one of the thumbnails in the main window, than a cursor will highlight the associated call on the Trace Window.

The Trace Window is quite handy for maintaining a set of reference parameter calls. It allow an operator to select and save call reference sequences that can be used for call comparison and identification.

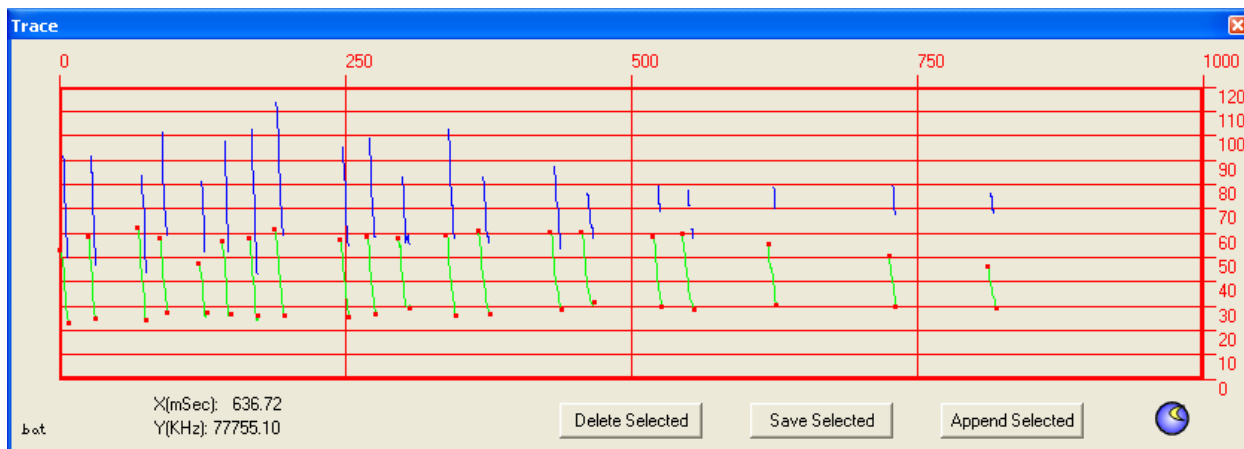


Figure 19: Trace Window

To bring up the Trace Window, select *Window=>Trace...* using the menu options at the top of the main window. The trace window will initially be blank, but it will update with call detections each time SCAN'R scans a file.

Operating the Trace Window is fairly simple:

- 1) To select a call, simply point to the call using the mouse and double click the left mouse button. This will bring up a marker to highlight the selected call and update the main display with the corresponding sonogram.
- 2) To select a group of calls, simply drag the mouse over the region of interest while holding the left mouse buttons down. This will highlight the entire area with a green background as shown in figure 20.

Once a selection is made there are three options: A) you can delete the selected entries from the call sequence by clicking on the Delete Selected button, B) you can save the selected calls to a new file by clicking on the Save Selected button, or C) you can append the selected calls to an existing file by clicking on the Append Selected button.

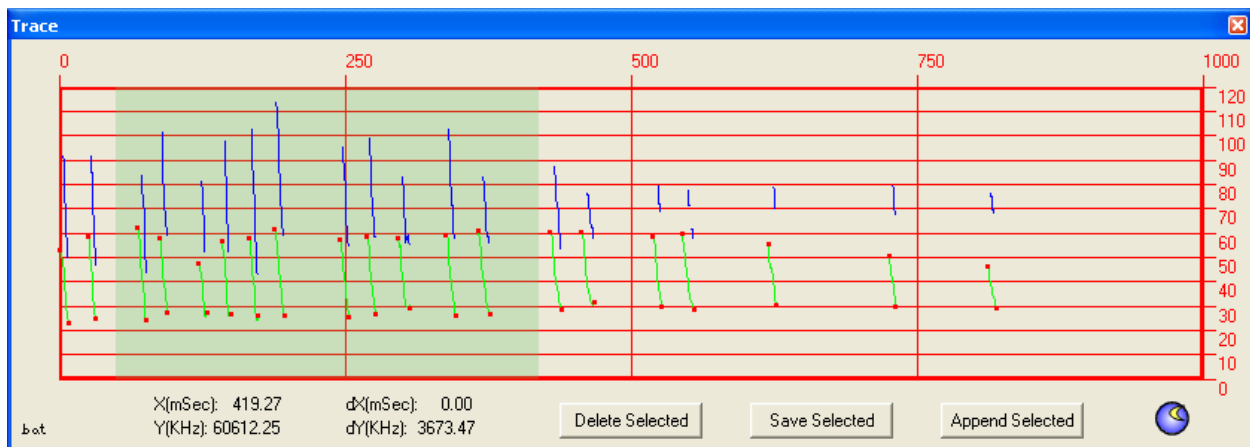


Figure 20: Trace Window

3.8 : SCAN'R Output file

If an output file is specified, SCAN'R writes the measured parameters to the output file. The output file is a tab-delimited file that conforms to the format selected by the **Output Format** window (section 3.6.1).

The ability to provides detection parameter sets provides SCAN'R with two important applications: 1) it can be used to generate call parameters that can be used for bat species identification. 2) it can also be used to compress and translate Time Expanded (TE) or Full Bandwidth (FB) detector recording into a storage format that is compatible with the ZCD (zero crossing detector) format that is employed in AnaBat_{tm}/Analog_{tm}. This second function will allow mixed detector surveys by ensuring that all results can be analyzed and archived to a common parameter format.

The output format is an open format that can be processed by second and third party applications. In addition, the format can be read into standard spreadsheet applications, such as Microsoft Excel as show in figure 20.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
1																		
2																		
3	Filename	St (ms)	Dur (ms)	Prev (ms)	Next (ms)	Fmax (KHz)	Fmin (KHz)	Fmean (KHz)	Tk (ms)	Fk (KHz)	Qk	Tc (ms)	Fc (KHz)	S1 (Oct/s)	Sc (Oct/s)	Qual	SPL (dB)	Curv (°P)
4	LCin_hndI22	363.81	1.67	0	0	54.37	26.63	41.75	0.68	46.47	0	0.99	41.01	423.6	439.19	0	39	-1.15
5	LCin_hndI22	413.29	2.05	49.48	0	59.38	26.08	45.58	0.68	53.98	0	0.99	50.89	257.83	268.36	0	42.8	-1.32
6	LCin_hndI22	478.04	1.6	64.75	0	59.54	25.44	43.68	0.61	51.66	0	0.99	39.1	606.99	634.57	0	42	-1.11
7	LCin_hndI22	564.91	1.75	86.87	0	58.86	26.35	43.82	0.68	52.47	0	1.67	26.58	659.43	694.75	0	46	-1.12
8	LCin_hndI22	608.61	1.52	43.7	0	60.51	26.01	44.59	0	60.51	0	1.29	32.69	729.05	804.35	0	44.2	-1.15
9	LCin_hndI22	668.8	1.52	60.19	0	59.03	26.42	42.57	0.99	43.89	0	0.99	43.89	399.03	396.98	0	43.8	1.01
10	LCin_hndI22	704.37	1.52	35.57	0	62.73	26.08	44.66	0.68	49.92	0	0.99	39.94	714.43	744.21	0	52.4	-1.02
11	LCin_hndI22	729.22	1.37	24.85	0	62.32	27.41	42.49	0.61	42.95	0	1.29	28.04	562.6	620.26	0	55.2	1.33
12	LCin_hndI22	752.32	1.6	23.1	0	61.44	27.18	41.42	0.99	37.91	0	1.52	27.77	843.59	1000.9	0	52.4	1.43
13	LCin_hndI22	787.36	0.99	35.04	0	43.21	27.47	36.81	0	43.21	0	0.99	27.5	656.12	693.54	0	35.5	-1.39
14	LCin_hndI22	819.51	1.75	32.15	0	56.76	27.18	42.56	0	56.76	0	1.75	27.18	603.44	734.03	0	47.6	-1.04
15	LCin_hndI22	843.07	1.75	23.56	0	58.68	24.73	41.51	0.61	44.02	0	1.52	30.42	658.6	566.33	0	58	1.05
16	LCin_hndI22	881.6	2.05	38.53	0	57.92	30.41	43.88	1.14	40.65	0	1.9	33.08	544.79	460.25	0	43.3	1.1
17	LCin_hndI22	923.7	1.75	42.1	0	58.72	28.93	43.1	1.06	38.98	0	1.67	29.49	671.53	647.31	0	48.9	1.14
18	LCin_hndI22	951.98	1.67	28.27	0	60.52	29.06	43.26	0.99	38.98	0	1.6	29.34	731.89	770.65	0	40.4	1.24

Figure 21: Output File Loaded into Excel Spreadsheet

3.8.1 : Analook_{tm} compatible format

The Analook_{tm} base parameter set consists of sixteen (16) parameters which are tab-delimited and written in the following order:

File Name	:	Name of input file
Start Time	:	Call start time (msec)
Duration	:	Call duration (msec)
Prev	:	Time elapsed since previous detection (msec)
Next	:	<Not used—set to 0>
Fmax	:	Maximum frequency detected (KHz)
Fmin	:	Minimum frequency detected (KHz)
Fmean	:	Mean or average frequency of call (KHz)
Tk	:	Time of the knee WRT the beginning of call (msec)
Fk	:	Frequency of the knee (KHz)
Qk	:	<Not used—set to 0>
Tc	:	Time of the characteristic WRT the beg call (msec)
Fc	:	The characteristic frequency (KHz)
S1	:	The initial slope at the beginning of the call (OPS)
Sc	:	The characteristic slope in octaves per second (OPS)
Qual	:	<Not used-set to 0>

3.8.2 : SonoBat_{tm} compatible format

The SonoBat_{tm} base parameter set consists of twenty two (22) parameters which are tab-delimited and written in the following order:

File Name	:	Name of input file
Time	:	Call start time (msec)
Duration	:	Call duration (msec)
prev	:	Time elapsed since previous detection (msec)
Fmax	:	Maximum frequency detected (KHz)
Fmin	:	Minimum frequency detected (KHz)
Bandwidth	:	Total BW [Fmax - Fmin] (KHz)
Dom. Freq	:	Frequency at strongest sound pressure level (KHz)
Dom F Loc	:	Location of Dom. Freq (percent of total duration)
High Fc	:	High end of characteristic (KHz) [Similar to Fk]
Low Fc	:	Low end of characteristic (KHz) [Similar to Fc]
Slope	:	Global slope of the call (KHz per msec)
Th	:	Time of the heel or High Fc (percent of duration)
Su	:	Upper slope [start to High Fc] (KHz per msec)
Sl	:	Lower slope [High Fc to Low Fc] (KHz per msec)
Heel Flag	:	1 if heel is obvious
H1	:	Fundamental frequency (KHz) *
H2	:	2nd harmonic frequency (KHz) *
H3	:	<not used, set to 0>
H4	:	<not used, set to 0>
H5	:	<not used, set to 0>
H6	:	<not used, set to 0>

* Note that the marker frequencies H1 and H2 are only used if SCAN'R detects the presence of a second harmonic. In this event, H1 and H2 are set to frequencies at the point in the call where the 2nd harmonic is strongest. Otherwise they are both set to zero.

3.8.3 : EchoClass_{tm} compatible format

The EchoClass_m base parameter set consists of thirty eight (38) parameters which are tab-delimited and written in the following order:

File Name	Name of input file
Duration (sec)	
Fmax (KHz)	
Fmin (KHz)	
Fmean (KHz)	
Tk (sec)	
Fc (KHz)	- The mean of the flattest part of the call
Tc (sec)	- The duration of the flattest part of the call
TBC (usec)	- The time between calls
%K	
Line Angle (degrees)	Units are Hz versus microsecond
S1 (OPS)	- This is the initial slope (start to knee)
Sc (OPS)	- This is the slope of the flattest part of call
R2 Linear	- Linear fit
Lin coeff	
R2 Quadrature	- Quadratic fit
Quad Coeff1	
Quad Coeff2	
R2 Cubic	- Cubic fit
Cub Coeff1	
Cub Coeff2	
Cub Coeff3	
Bend 1xd	- Bend 1
Bend 1yd	
Bend 1d	
Bend 1s	
Bend 2xd	- Bend 2
Bend 2yd	
Bend 2d	
Bend 2s	
Ni	
S1fmine	- Initial slope minimum frequency or end frequency
S1fmaxs	- Initial slope maximum frequency or start frequency
Fstart	- Starting frequency
Fend	- Ending frequency
Fc-Fmin	
Bandwidth	- Call bandwidth
Broken	- Flag if this is a broken call

3.8.3 : SCAN'R_{tm} native format

The SCAN'R_{tm} native parameter set consists of thirty six (36) parameters which are tab-delimited and written in the following order:

Filename	- Recording file name
St (msec)	- Start time
Dur (msec)	- Duration
MaxSPL (dB)	- Maximum SPL of call in dB
Max2nd (dB)	- Maximum SPL of 2nd Harmonic in dB
TBC (msec)	- Time between calls
Fstart (KHz)	- Starting frequency
Fend (KHz)	- Ending frequency
Fmax (KHz)	- Maximum frequency
Fmin (KHz)	- Minimum frequency
Fmean (KHz)	- Mean Frequency
Fdom (KHz)	- Dominant frequency
Tdom (msec)	- Time of dominant frequency in call
Fk (KHz)	- Knee frequency
Tk (msec)	- Time of knee in call
Sk (KHz/msec)	- Slope of knee in call
Fc (KHz)	- Characteristic frequency
Tc (msec)	- Time of characteristic in call
Sc (KHz/msec)	- Characteristic slope
Sgbl (KHz/msec)	- Global slope
S1 (KHz/msec)	- Initial slope
Supper (KHz/msec)	- Upper slope (start to knee)
Slower (KHz/msec)	- Lower slope (knee to end)
Se (KHz/msec)	- Ending slope
Curv (^P)	- Curvature
FitError (%)	- Curve fit error
Order (num)	- Polynomial Fit Order
Coef0	- Polynomial coefficients 0 through 8
Coef1	- (Only populated up to the Fit Order)
Coef2	
Coef3	
Coef4	
Coef5	
Coef6	
Coef7	
Coef8	

3.8.5 : Optional Parameters

Either base parameter set can be enhanced with up to three (4) additional parameters. These are also tab-delimited and are appended to the base parameter set in the following order:

SPL	:	Peak Sound Pressure Level (SPL dB)
Curv	:	Curvature measurement
Fit	:	Curvature fit error (RMS error in Hz)
GPS	:	GPS Coordinates (LAT, LON, ALT)

The **SPL** parameter is valid only when using calibrated detectors like the BAT AR125. Otherwise, it can only be considered as relative signal strength measurement that may vary from detector to detector.

The **Curvature** measurement is a novel way to characterize the shape of bat calls. This idea was described by Simon Jolly in the Australasian Bat Society Newsletter in 1997. The basic premise is that bat calls can be modeled by the equation:

$$\text{frequency} \sim \text{time}^P \quad \text{where } P \text{ is an integer value}$$

SCAN'R employs this model, but enhances it to allow a fractional exponent (P). SCAN'R also adopts a new convention to easily identify upward curving and downward curving calls.

If the call is downward curving P is positive and:

$$\text{frequency} \sim \text{time}^P \quad \text{where } P \text{ is a fractional value}$$

If the call is upward curving P is negative and:

$$\text{frequency} \sim \text{time}^{1/(-P)} \quad \text{where } P \text{ is a fractional value}$$

Thus for any value of P, P and -P reflect the same basic shape, but P curves downward while -P curves upward.

The **curve fit error** parameter is a measurement of how much error exists between the curvature model and the actual shape of the call. The measurement is the Root Mean Squared (RMS) value calculated as the difference between the frequency calculated as a function of the model compared against the frequency measurements of the data. The units are RMS Hertz.

Low values of curve fit error mean that the data is a closer match to the model. Higher values mean that the data is NOT fitting the model. As a general rule, SCAN'R_{tm} expects to see an error less than 100 Hz RMS to trust that the data fits the model.

The **GPS Coordinates** are in the form of Latitude, Longitude, and Altitude. Latitude and Longitude are in degrees, while Altitude is in meters from sea level. The GPS Coordinates are only passed if present in the attributes of the recording. SPECT'R III version 3.3.1 and above support Garmin GPS receivers and mark the recordings with the GPS coordinates of the recording.

4.0 : Further Information

For further information or trouble shooting, please contact us or visit our web site.

Web: www.binaryacoustictech.com

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