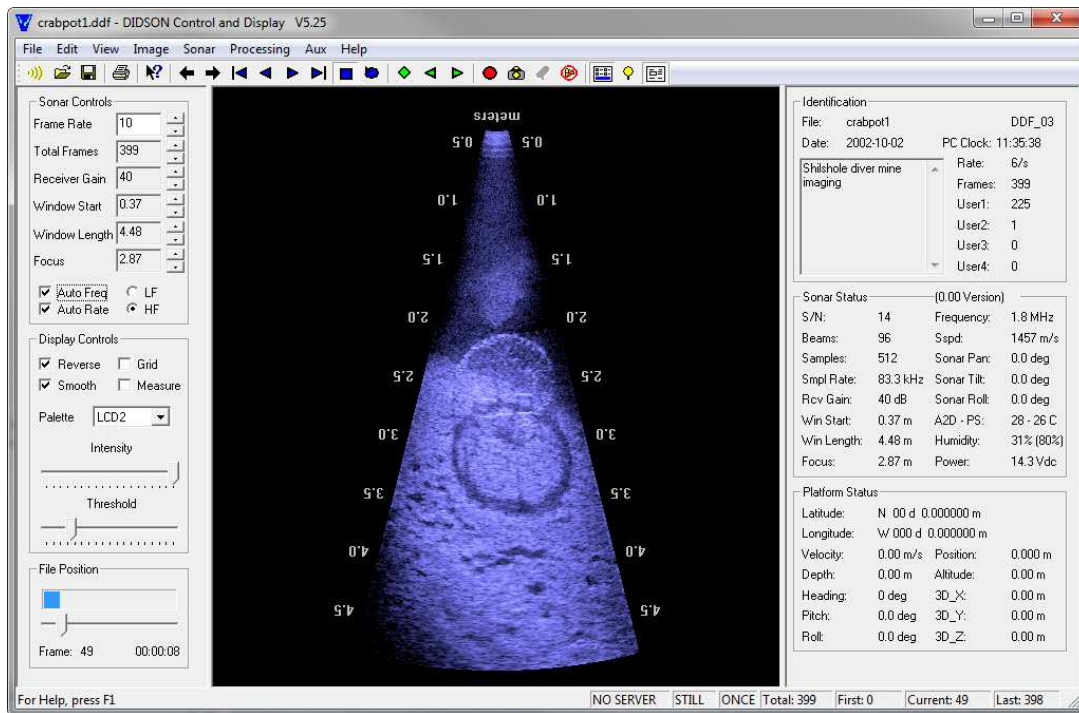


Sound Metrics Corp.

*Using sound to make sound measurements*

## Dual-Frequency Identification Sonar DIDSON

Software Manual V5.26  
28 August 2017



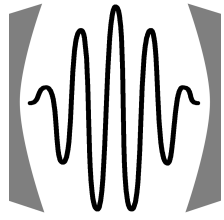
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**Sound Metrics Corp.**

*Using sound to make sound measurements*

**Dual-Frequency Identification Sonar  
DIDSON**

**Software Manual**

*Use with firmware revision 6-18 or higher*

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# 1 Command Summary

## 1.1 Menu/Toolbar Commands

Menus are listed at the top left of the screen and from left to right are **File, Edit, View, Image, Sonar, Processing, Aux** and **Help**. Toolbar icons are in a row just below the menus. They allow shortcuts to many of the menu commands. Some commands also have a keystroke alternative. For example opening a new file has three alternatives: 1) Click on **File**, then click on **Acquire Data**, or 2) Click on the **Sonar Ping** icon, or 3) press the keystroke **Ctrl+A**. These alternatives are listed with the *File - >New* definition in the summary below.

### File Menu

*Acquire Data* Keystroke: **Ctrl+N** Toolbar Icon: 

Use this command to close any currently displayed image files and restart real-time image acquisition and display from the DIDSON sonar.

*Open* Keystroke: **Ctrl+O** Toolbar Icon: 

Open a previously stored file for playback.

*Previous* Keystroke: **None** Toolbar Icon: 

**Left-click:** when a *.ddf* file is opened, a complete list of *.ddf* files contained within the current folder is saved. This command opens the previous file from that list, relative to the currently open playback file.

**Shift-left-click:** when an *.ech* file is opened, a complete list of *.ech* files contained within the current folder is saved. This command opens the previous file from that list, relative to the currently open playback file.

*Next* Keystroke: **None** Toolbar Icon: 

**Left-click:** when a *.ddf* file is opened, a complete list of *.ddf* files contained within the current folder is saved. This command opens the next file from that list, relative to the currently open playback file.

**Shift-left-click:** when an *.ech* file is opened, a complete list of *ech* files contained within the current folder is saved. This command opens the next file from that list, relative to the currently open playback file.

*Save* Keystroke: **Ctrl+S** Toolbar Icon: 

Save the file currently opened for playback to itself. Use this command to truncate a long file to a desired frame range, or to retain changes made to the *Header ID* field, or other editing tasks such as the additional of audio notes.

Data frames collected in real-time are saved when the record button is pressed (see *Image->Capture->Record*, *Image->Capture->Record Options*, and *Image->Capture->Timer Recording* for more information on various recording modes).

See *Set Endpoints*, under the *Image->Playback* sub-menu, and the *File->Save Options* sub-menu for additional possibilities using this command.

Default file name examples: *2001-06-26\_#003\_HF.ddf* (using sequence numbers) or *2001-06-26\_1745\_HF.ddf* (using current time).

Save as            Keystroke: **None**        Toolbar Icon: **None**

If you choose *.ddf* as the file type (*default*), you will save the currently opened file to a new filename. If you choose *.avi*, you will save the current movie (with current endpoints) in an *.avi* format. This will allow you to play the movie on other machines without requiring the DIDSON software. The *.avi* files can be huge. You can crop the image by drawing the measure rectangle around what you want to save (see *Measure* under *Display Controls*). Also, be sure to set the endpoints to cover only the time (frames) you want. The third file type option is for compressed files (*.zip*); you will be prompted for choices on bundling audio files and/or moving the source file into the *.zip* file if these flags are not already set in the *File->Save Options* sub-menu.

Another option for making *avi* files is to use third party software such as SNAGIT® during file playback.

The current display settings for *Threshold* and *Intensity* are written to the new file, and will be set accordingly when opening the file if both the *Image->Configure->Auto Threshold/Intensity* and *Image->Configure->Reset Frame Rate* flags are checked.

There is an option to save motion corrected data to *.ddf* files when using this command. If motion correction is enabled the user is prompted whether to apply same to the saved data. The force velocity value is used if the manual override flag is set in the *PMC Parameters* dialog, otherwise the velocity is taken from the frame header as for displayed data.

If the *Image->Capture->Record Options->Save Only Displayed Data* flag is set, then the playback file will be saved with the displayed image data overwriting the default raw data samples, preserving the output of any enabled processing functions, such as *Background Subtraction* and *Detect Motion*.

Set Save Directory            Keystroke: **None**        Toolbar Icon: **None**

Set the working directory (folder) for saving *.ddf* files. Also gives the option of replacing the default *\_HHMMSS* in the filename with a sequence number *\_#NNN*, and sets a flag to append (or not) the frequency designation (*\_LF*, *\_HF*) to automatically generated filenames.

Set Aux File Dir to...            Keystroke: **None**        Toolbar Icon: **None**

Controls the location of auxiliary files, such as fixed backgrounds, fish

counts, depth profiles, and JPEG output. If *Image Open Dir* is selected, then the files will be saved to the same folder as the image file currently (or last) opened for playback. Selecting *Image Save Dir* causes these files to be saved to the folder set with the *File->Set Save DirName* command (defaults to *C:\Didson Data*). If a file is opened from a read-only source such as a CD, the auxiliary files are automatically directed to the current save directory.

*Print*                    Keystroke: **Ctrl+P**     Toolbar Icon: 

Print the image with header information (local printers only).

*Recent Files*        Keystroke: **None**        Toolbar Icon: **None**

The four most recently viewed files are listed and may be opened.

*Exit*                    Keystroke: **Ctrl+X**     Toolbar Icon: **None**

Exit the application.

### Merge Sub-Menu

Use these commands to stitch together a sequence of individual files for further processing on the entire image record, such as when recording to a local hard drive in *Autonomous* mode, or to save 24 hourly files to a full day's record. The base filename and path are as specified by the *File->Set Save Directory* command.

*All Files to New File*        Keystroke: **None**        Toolbar Icon: **None**

Combine all files in the current (or last) open folder to a new *.ddf* file. The identifier *\_Merged* is inserted before the optional frequency designation string (*\_LF*, *\_HF*).

*Append Open File to Existing File*        Keystroke: **None**        Toolbar Icon: **None**

Append the file currently opened for playback to an existing *.ddf* file. Use this command to piece together image files from different folders (or the same folder) into a single image file.

*Selected Files to New File*        Keystroke: **None**        Toolbar Icon: **None**

Combine any subset of all files in the current open folder to a new *.ddf* file. A range of files may be selected by clicking the first file in the *File Open* dialog, then *Shift->*clicking the last file in the range. Files may be added to or deleted from the list by *Ctrl->*clicking on individual filenames. The identifier *\_Merged* is inserted before the optional frequency designation string (*\_LF*, *\_HF*).

If the *File->Save Options->Move Files* flag is set, the original file(s) will be deleted after merging to the new or existing image file.

## Save Options Sub-Menu

*Bundle Audio* Keystroke: **None**      Toolbar Icon: **None**

Set this flag to add all files starting with the currently open image file base name when compressing to a *.zip* file (i.e. the zip file would contain *ImageFile.ddf* plus *ImageFile\_Audio[000..nnn].mp3* (or other audio file type) files). This flag works in concert with the *File->Save*, *File->Save As*, and *Image->Capture->Record* commands.

*Compress* Keystroke: **None**      Toolbar Icon: **None**

Set this flag to compress the currently open image file to a *.zip* file when saving. This flag works in conjunction with the *File->Save*, *File->Save As*, and *Image->Capture->Record* commands.

*Move Files* Keystroke: **None**      Toolbar Icon: **None**

Set this flag to delete the original source file(s) when compressing to a *.zip* file. This flag works along with the *File->Save*, *File->Save As*, and *Image->Capture->Record* commands. Selecting a compressed file with *File->Open* will automatically extract the compressed file(s) to the same folder, and open the contained image file (of the same file name) for playback.

*Prompt for  
Avi Compressor* Keystroke: **None**      Toolbar Icon: **None**

Set this flag to prompt for a choice of codecs when converting a *.ddf* file to a *.avi* file with the *File->Save As* command. When this flag is unchecked the default *Microsoft Video 1* codec is used. Some codecs, though present on the computer, may not work with the *.avi* conversion library functions, in which case you will get an error message.

*VERSION\_  
DDF\_03* Keystroke: **None**      Toolbar Icon: **None**

Set the recorded file version to *VERSION\_DDF\_03*. This version has a 512-byte master header, followed by frame data with each frame starting with a 256-byte frame header. Selecting this version while connected to the sonar will also direct the sonar to record internal files in *VERSION\_DDF\_03*. This is the default file version, compatible with all earlier *Sound Metrics* topside software.

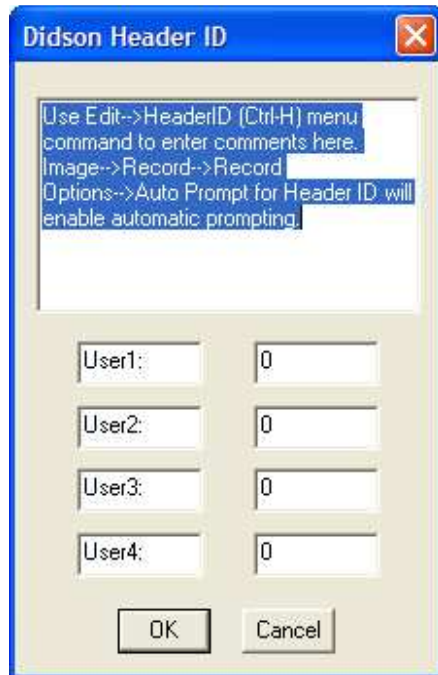
*VERSION\_  
DDF\_04* Keystroke: **None**      Toolbar Icon: **None**

Set the recorded file version to *VERSION\_DDF\_04*. This version has a 1024-byte master header, followed by frame data with each frame starting with a 1024-byte frame header. Selecting this version while connected to the sonar will also direct the sonar to record internal files in *VERSION\_DDF\_04*. This is used when larger headers are required to store auxiliary (non-image) data, and also allows for a variable number of samples per channel (e.g. variable frame lengths) for future hardware upgrades.

## Edit Menu

*Header ID*      Keystroke: **Ctrl+H**      Toolbar Icon: **None**

Enter or change the *Header ID* string (256 characters maximum) for the currently opened file. Also, enter or change one to four user-named data constants. The default labels are User1...User4. You may change the labels as well as the constant values. The labels are stored in the *DidsonAppV5.ini* file and reappear the next time the application is called. The data for these fields are interpreted as 32-bit integers and stored in the file header.



## Application Sub-Menu

*Load App Settings*      Keystroke: **None**      Toolbar Icon: **None**

This command loads all parameters stored in the *DidsonAppV5.ini* file from a user-specified file (see *Application Initialization* section).

*Save App Settings*      Keystroke: **None**      Toolbar Icon: **None**

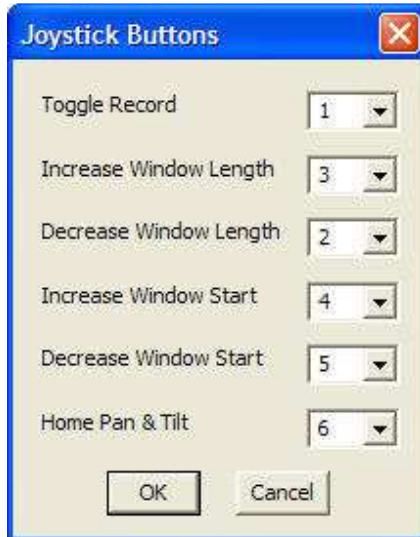
This command saves all parameters stored in the *DidsonAppV5.ini* file to a user-specified file (see *Application Initialization* section).

*Restore App Defaults*      Keystroke: **None**      Toolbar Icon: **None**

This command resets all parameters stored in the *DidsonAppV5.ini* file to system defaults (see *Application Initialization* section). It also resets the application window size and position to default values.

*Joystick Buttons*      Keystroke: **None**      Toolbar Icon: **None**

Map joystick buttons to sonar control functions as seen below. If the joystick buttons are not numbered and no manual is available, try each button in *Demo Mode* to see which button corresponds to a given number. Setting the number to 0 for a given function will disable that function via joystick control.





*Keymap*

Keystroke: **None**      Toolbar Icon: **None**

Displays a dialog showing keystroke commands to change window length, focus, etc. The keys are active only after the left (control/display) window in sonar display has been “clicked” with a mouse so that it is “active.”



*Control Enables*

Keystroke: **None**      Toolbar Icon: **None**

Displays a dialog allowing individual sonar and display controls to be enabled or disabled to customize or simplify the look of the control window.

**Mode Sub-Menu**

*Master*

Keystroke: **None**      Toolbar Icon: **None**

If checked, the application will allow the user to control the sonar.

*Slave*

Keystroke: **None**      Toolbar Icon: **None**

If checked, the application will allow the user to view sonar images anywhere on the network so long as the sonar is set to *Broadcast* mode.

*Command Only*

Keystroke: **None**      Toolbar Icon: **None**

This flag enables Ethernet frame rate and data acquisition control without data retrieval, for use with video output when Ethernet bandwidth or noise limitations prevent reliable two-way Ethernet communication with the sonar. It sends ping commands at the current frame rate, with no request for returned data. Sonar control commands such as *Gain*, *Window Start*, etc. may be used to change data acquisition parameters, but no image files may be saved as no acoustic data will be returned.

### Sync Sub-Sub-Menu

The *Sync* modes enable multiple DIDSONs (or 3<sup>rd</sup>-party equipment) to operate in either a *Simultaneous* or *Sequential* transmit mode. For a multiple DIDSON setup, the host PCs must have sequential fixed IP addresses (e.g. 128.95.97.200, 128.95.97.201, 128.95.97.202, etc.), with the sync master (*Output* flag set) using the lowest address. The host PCs and associated sonars must **not** be in broadcast mode.

*Input*

Keystroke: **None**      Toolbar Icon: **None**

Wait for a *COMM\_SYNC* message from another DIDSON (or 3<sup>rd</sup>-party) application before sending a frame request to the sonar. Use the *Set Mode* command to choose the type of sync (*Simultaneous* or *Sequential*) and the *Trigger on* sequence number *N*.

*Output*

Keystroke: **None**      Toolbar Icon: **None**

Send a *COMM\_SYNC* message to all sonars (uses broadcast address) in *Simultaneous* mode, or to sonar IP *XXX.XXX.XXX.XXX+N* of *Sequence Length* sonars in *Sequential* mode.

*Set Mode*

Keystroke: **None**      Toolbar Icon: **None**

*Trigger on*

Transmit on the indicated sequence number. *Output* mode sonars always transmit on sequence 0, while *Input* mode sonars will transmit on sequence 1 to *Sequence Length* – 1.

*Sync Record*

Applications synced on input follow the record state of the master output application. In addition, the master PC's frame times are inserted into the slave PC's recorded frame headers.

*Simultaneous*

All sonars transmit at the same time, with a *COMM\_SYNC* message broadcast at the current frame rate.

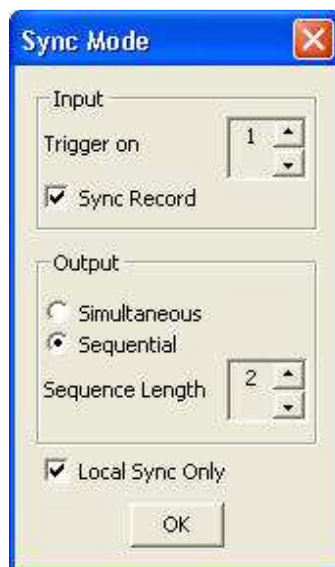
*Sequential*

Sonars transmit in a round-robin format, with a

COMM\_SYNC message sent to successively incremented IP addresses up to *Sequence Length* – 1 at the current frame rate.

*Sequence Length* The number of sonars to be synced in *Sequential* mode.

*Local Sync Only* Multiple sonars will be controlled from multiple Instances of the DIDSON software on a host PC. COMM\_SYNC messages are sent to the host local IP address on sequential Port numbers in *Sequential* mode, or broadcast in *Simultaneous* mode.



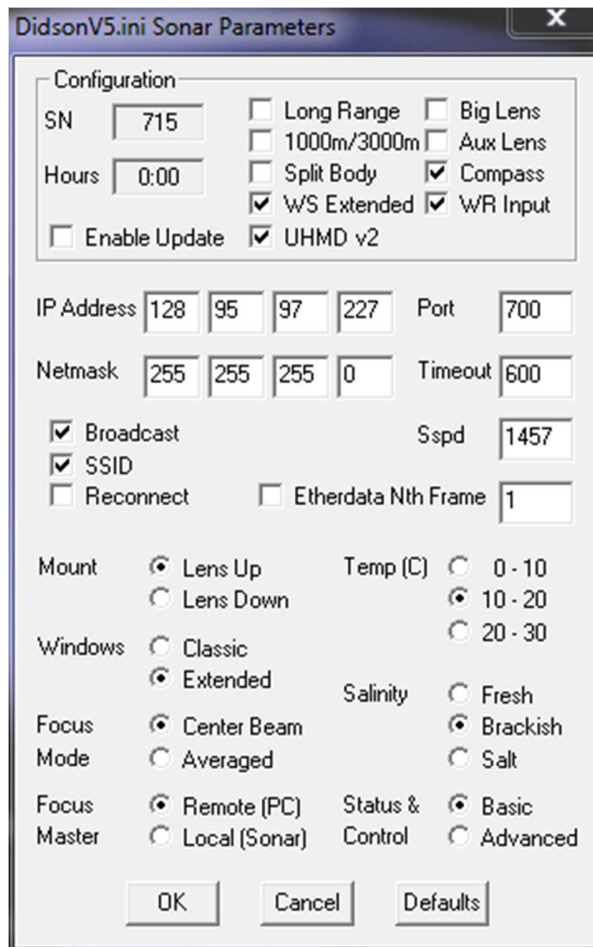
*Demo* Keystroke: **None** Toolbar Icon: **None**

If checked, the topside software will allow the user to exercise sonar-related controls with no sonar attached.

### Sonar Sub-Menu

*DIDSONV5.ini File* Keystroke: **None** Toolbar Icon: **None**

Sonars with firmware Rev 5.04 and higher keep the sonar configuration data (serial number and {Long Range, 3000m, Split Body, WR Input, WS Extended, Big Lens, Aux Lens, Compass} options) in a permanent **Config.ini** file. Subsequent firmware upgrades may be made without the need to reset these parameters, and the topside application will display the sonar firmware revision number in the *View->Header* pane under *Sonar Status*. Upgrading to sonar firmware Rev 5.04 or higher from Rev 4.69 or earlier will require a one-time setting of these values via the *Edit->Sonar->DidsonV5.ini File* dialog.



Sonars with firmware Rev 5.04 and higher keep the sonar configuration data (serial number and {Long Range, 3000m, Split Body, HR Lens, Compass} options) in a permanent **Config.ini** file. Subsequent firmware upgrades may be made without the need to reset these parameters, and the topside application will display the sonar firmware revision number in the *View->Header* pane under *Sonar Status*. Upgrading to sonar firmware Rev 5.04 or higher from Rev 4.69 or earlier will require a one-time setting of these values via the *Edit->Sonar->DidsonV5.ini File* dialog.

#### Configuration Parameters

|               |  |
|---------------|--|
| Enable Update | Check this box to enable changes in sonar configuration. |
| Long Range    | Sonar is a DIDSON-LR (1.2/7 MHz operation).              |
| 1000m/3000m   | Sonar has a 1000m/3000m depth rating.                    |
| Split Body    | Sonar is a Split-Body model                              |
| WS Extended   | Sonar has A/D programmed for extended Window Start       |
| Big Lens      | Sonar is mounted with Hi-Resolution (Big) Lens           |
| Aux Lens      | Sonar has Aux Lens mounted on swing arm                  |
| Compass       | Sonar has internal compass installed                     |
| WR Input      | Sonar has >= Rev 3-8B power supply (9-36Vdc input)       |
| UHMD v2       | Check when using DIDSON-DH with v2 OLED display          |

**The DIDSON sonar serial number must be entered here for correct operation for units earlier than SN20.** Mechanical and software differences between different DIDSON units necessitate changes in focus and range calculations between units. Check boxes for *Long Range* and other model options should be set appropriately.

This release of the topside application and associated sonar firmware now includes the default use of *Broadcast* mode, which is enabled by checking the *Broadcast* box in the *Edit->Sonar->DidsonV5.ini File* dialog, and also checking *Edit->Sonar->Broadcast Commands*. This allows the topside PC to use the standard DHCP address protocol, or to run with a different fixed IP subnet address than the sonar.

The topside computer's IP address must be fixed (e.g. do not use DHCP) if not using the *Broadcast* mode (sonar default). Use this command to change the sonar IP address and subnet mask and copy these parameters and the sonar Ethernet port number (must remain 700 for *Broadcast* mode), sound velocity, Ethernet timeout value and sonar serial number to the *Didson.ini* file on the sonar CompactFlash drive, if currently connected to the sonar.

In cases where the PC operates on a matching fixed IP subnet, the *Broadcast* box may still be checked for the sonar, which will allow multiple viewing stations on the network (one *Master* and N *Slave* applications, see *Edit->Mode->Master/Slave*).

The *SSID* flag enables the sonar to broadcast its own serial number, IP Address, Ethernet Port, and Broadcast status to the network. Any number of sonars with unique IP addresses may be run from one or multiple PCs topside. The command *Edit->Sonar->Discover Network* will display all sonars currently powered up on a network with *SSID* enabled. The information is broadcast while waiting for a topside Ethernet connection after power-up, and every 3 seconds thereafter. Leaving this flag set (default) make troubleshooting connection issues easier.

The *Reconnect* flag directs the sonar to test for an Ethernet command once every 60 seconds while in *Autonomous Mode*. This will result in a "freeze" of the image for 1 second per minute while the sonar tests for a topside command. Check this flag if you wish to reconnect the sonar after using in *Autonomous Mode* without having to power cycle the unit (unchecked by default).

Updating the sonar network information requires sonar firmware V4.26 or higher. If the sonar network information is different from that present in the topside *DidsonV5.ini* file (or unknown), the application will broadcast a request for sonar network information. If the sonar is powered up and physically connected it should return its network information in a broadcast packet. Then either the topside PC may be reconfigured to match the sonar, or the topside network settings may be uploaded to the sonar. Changing the sonar network settings will not take effect until after the sonar has been power-cycled.

The *Etherdata* checkbox should be selected if you desire image data to be broadcast via Ethernet while operating in *Autonomous* mode. The associated *Nth Frame* parameter sets the rate at which the image is output. Input a larger number to limit Ethernet bandwidth requirements.

Select the appropriate *Mount* option; *Lens Up* or *Lens Down*. *Lens Up* refers to an orientation where sonar rests above the mounting fixture, secured with screws coming up from underneath, while *Lens Down* indicates that the sonar is being “hung” from the mounting fixture. An incorrect selection will cause a left-right reversal in the acoustic image.

The *Extended* window options are available for DIDSON sonars with serial numbers 19 and higher. The extended windows use a slightly lower frequency clock to control sample rates (Window Length) and delay periods (Window Start), allowing reliable operation at the shortest HF window length (1.25m), and extending the other windows to even lengths of 2.5m, 5m, 10m 20m, and 40m. The clock setting is saved in the sonar *Didson.ini* file and also recorded in the frame headers. Extended windows require sonar firmware 4.30 or higher.

The *Focus Master (Remote (PC) or Local)* setting directs the responsibility for sonar focusing (while connected via Ethernet) to the remote controller (e.g. topside PC application or embedded CPU), or the sonar itself. For systems using the *DIDSON* topside software, this should be left in the *Remote* position. Users employing an embedded controller (e.g. an AUV) have the option of *Local* control to relieve the controller of calculating focus position. *Focus* commands may still be sent via Ethernet to override the *Local* focusing defaults.

Three parameters are available to optimize the automatic focus control: water temperature range, water type (salinity), and focus mode (center beam or averaged). The water temperature range and water type allow the calculation of sound velocity, and hence index of refraction, of both the water and the lens materials. The focus mode allows the user a choice between optimizing the image in the center of the field-of-view, or for the best focus across the entire field-of-view. It should be noted that at close ranges (< 5m) the depth-of-field can become shorter than the window length, and manual focus override is available to sharpen details at the beginning or end of the window (the automatic focus is set for the center of the window’s range).

The *Status & Control* options control the default sonar NTSC video and/or VGA output screen when operating in autonomous (no Ethernet connection) mode. The *Basic* mode displays only the acoustic image, range markers, frequency mode, and window start/length values, while the *Advanced* mode adds additional status and control parameters. *Advanced* mode also allows access to the system page when operating in switch control mode (SW1+SW3 simultaneously).

*Load Sonar Settings*

Keystroke: **None**      Toolbar Icon: **None**

Loads all parameters stored in the *DidsonV5.ini* file from a user-specified file.

*Save Sonar Settings*

Keystroke: **None**      Toolbar Icon: **None**

This command saves all parameters stored in the *DidsonV5.ini* file to a user-specified file. This is useful for storing multiple configurations for a single sonar, or default configurations for multiple sonars.

*Command Only*

Keystroke: **None**      Toolbar Icon: **None**

This flag enables Ethernet frame rate and data acquisition control without data retrieval, for use with video output when Ethernet bandwidth or noise limitations prevent reliable two-way Ethernet communication with the sonar. It sends ping commands at the current frame rate, with no request for returned data. Sonar control commands such as *Gain*, *Window Start*, etc. may be used to change data acquisition parameters, but no image files may be saved as no acoustic data will be returned.

*Broadcast Commands*

Keystroke: **None**      Toolbar Icon: **None**

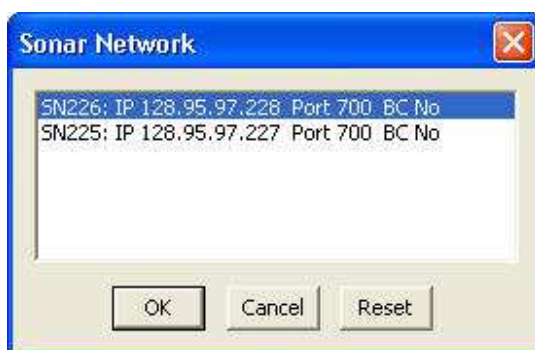
Set this flag to use the IP broadcast address (255.255.255.255) for all Ethernet communication with the sonar. This guarantees that the sonar will receive the network information query even if its IP settings are mismatched with the PC client. Check the *Broadcast* box in the *Edit->Sonar->DidsonV5.ini File* dialog so that the returned data may be displayed on the client PC.

Clear this flag if there is more than one DIDSON on the network; then the network commands will be directed to the current sonar IP address only, preventing changing parameters on multiple sonars with a single command.

*Network Discovery*

Keystroke: **None**      Toolbar Icon: **None**

This command directs the topside application to listen for all sonars currently powered on and with *SSID* enabled (see *Edit->Sonar->DidsonV5.ini File*). Any sonar in the list may be selected, and the application will shift to communication with that sonar. Selecting a sonar will automatically update the network information also found in the *DidsonV5.ini File* dialog. Sonars with *SSID* enabled will broadcast their serial number, IP Address, Ethernet Port and Broadcast status as seen below:



**Units Sub-Menu**

*Feet*

Keystroke: **None**      Toolbar Icon: **None**

Use English units for control & display (feet, feet/sec, deg F).

*Yards*

Keystroke: **None**      Toolbar Icon: **None**

Use English units for control & display (yards, feet/sec, deg F).

*Meters*      Keystroke: **None**      Toolbar Icon: **None**

Use Metric units for control & display (meters, meters/sec, deg C).

## View Menu

### Toolbar Sub-Menu

All the toolbars are dockable, which means they may be moved by dragging the toolbar by grabbing the raised ridge at the left edge with the left mouse button, and moved to various positions within the main application window, where they will remain during main window moving and resizing operations. They may also be dragged to any position over the main window or on the desktop.



*Combined*      Keystroke: **None**      Toolbar Icon: **None**

All control buttons from the following three toolbars are displayed.



*FOV-PTR*      Keystroke: **None**      Toolbar Icon: **None**

Controls relating to the wide field of view display modes are displayed.



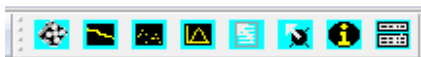
*Fish Processing*      Keystroke: **None**      Toolbar Icon: **None**

Controls relating to fish post-processing modes are displayed.



*Image Processing*      Keystroke: **None**      Toolbar Icon: **None**

Controls relating to basic image processing modes are displayed.



*Special Processing*      Keystroke: **None**      Toolbar Icon: **None**

Controls relating to special image processing commands are displayed.



*Status Bar*      Keystroke: **None**      Toolbar Icon: **None**

Toggles the status bar on and off. The status bar is at the bottom of the window. The bar has the following fields:

*Left side:* A description of the command selection currently under the mouse pointer.

*NO SERVER, CONNECTED or DEMO MODE:* Status of Ethernet connection between topside computer and underwater unit. Accept a minute or so wait after power-up before the connection occurs. DIDSON has to go through a boot sequence before it connects the Ethernet. The connection is inactive in *DEMO MODE*.

*PAUSE or RUN (real-time), STILL or MOVIE (playback):* Status of the communication link in real-time mode. Display a single frame or a sequence of frames in playback mode.

*ONCE or LOOP (playback):* Run through the frame sequence once or loops until asked to stop.

*Total xxx:*      The playback file has xxx frames.

*First x:*      The first frame in the sequence is x in the file.

*Current y:*      The frame imaged is y in the file.

*Last z:*      The last frame in the sequence is z in the file.

*Controls*      Keystroke: **None**      Toolbar Icon: 

Show or hide the *Control/Display/File Position* pane.

*Header*      Keystroke: **None**      Toolbar Icon: 

Toggles to display or not display the File Header window. The File Header window is the text-filled window on the right side of the display. The File Header displays parameters that are given once at the beginning of the file such as filename, date, and collection parameters. When the file is first stored or later displayed, the operator has the option to enter a short Header ID string up to 256 characters long. The file also has a frame header for each frame in the file. These data are updated as the new frames are displayed. Platform status values must be supplied and merged by the platform software as part of the data storage procedure.

*Keep on Top*      Keystroke: **None**      Toolbar Icon: **None**

Set this flag to keep the DIDSON application visible when it loses focus (e.g. after clicking on another window or application icon).

*Palette*      Keystroke: **None**      Toolbar Icon: **None**

Toggles the display of the current palette, scaled by the current values of *Intensity* and *Threshold*. The total width of the window represents 90 dB of dynamic range.

*User Params* Keystroke: **None**      Toolbar Icon: **None**

Brings up a dialog that displays up to 8 user-defined *float* variables stored in the DIDSON *.ddf* frame headers (requires a custom embedded controller). The labels and display precision values may be edited and are stored in the *DidsonAppV5.ini* file..

## Image Menu

### Capture Sub-Menu

*Record*      Keystroke: **w**      Toolbar Icon: 

Data is recorded into files with a default naming convention of *yyyy-mm-dd\_#nnn\_xF.ddf*, where *yyyy* is the year, *mm* is the month, *dd* is the day, *nnn* is a sequence number starting at 000 for any given day, and *x* is either L (for 1.1MHz operation) or H (for 1.8MHz operation).

#### Recording during playback:

When a file is open for playback, pressing the record button marks the start of a frame subset, and pressing the record button a second time marks the end of a frame subset. The frame subset is saved to a new file with the string *\_Snnn* appended to the default filename, where *nnn* is a sequence number for snippet files taken from the master source file. For example, suppose the file *2001-11-06\_#023\_HF* is open for playback. The record button is pressed at frame 16 during playback and pressed again at frame 25; the range of frames (inclusive) will be saved to the file *2001-11-06\_#023\_HF\_S000.ddf*. The record button is pressed again at frame 35 during playback and again at frame 67; the range of frames (inclusive) will be saved to the file *2001-11-06\_#023\_HF\_S001.ddf*.

The start and ending frames are recorded into the master header, and the source file frame number is displayed below the progress indicator during file playback. The source file frame time is displayed in the Header View window.

If the flag *Image->Capture->Record Options->Auto Prompt for Header ID* is set, then the user will be prompted for new Header ID information before each file snippet is saved.

#### Real-time recording:

If the *Total Frames* parameter is equal to 0, then recording will continue until the control is activated again to disable recording.

If the *Total Frames* parameter is non-zero, then recording will stop after the indicated number of frames have been written to the data file. If the *Image->Capture->Record Options->Repeat Total Frames* flag is set, then additional files of *Total Frames* length will be generated as long as the record mode is active.

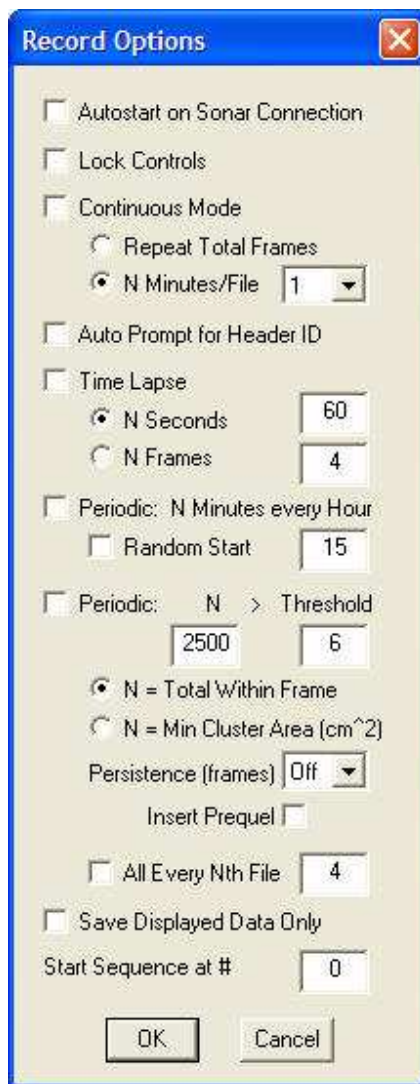
Changing parameters such as *Window Start* or *Window Length* is allowed during (real-time) recording. However, if the *Auto Resolution* box is checked,

such that changing the data acquisition window forces a change in transmit frequency, the current file will be closed and a new file opened using automatic filename generation without interrupting the recording process. This is necessary because file playback depends on calculating frame offsets from the beginning of a file, and since LF and HF frames have differing lengths, mixing frequencies within a given file would generate seek errors.

Note that the sequence numbers of the files representing a single continuous recording at changing frequencies will most likely not match, as the numbers depend on previously recorded data at each frequency within the current working directory.

*Record Options*

Keystroke: **None**      Toolbar Icon: **None**



*Autostart Record on Sonar Connection*  
When this flag is set recording will start automatically 10 seconds after connecting to the sonar in whatever mode has been set (frames may not be immediately written to the image file if conditional parameters such as *Record over Threshold* are enabled).

*Lock Controls*  
Disables *Frame Rate*, *Frame Total*, *Receiver Gain*, *Window Start*, *Window Length* and *Focus* during recording when set. The controls are automatically re-enabled when recording stops.

*Continuous Mode*  
Toggles *Continuous Mode* on and off. If *Repeat Total Frames* is selected, recording stops and a new file is started after *Total Frames* are received. If *N Minutes per File* is selected, then new files are started every N minutes, and synchronized to the top of the hour. This process continues until *Continuous Mode* or *Record* is toggled off.

*Auto Prompt for Header ID*  
When checked, the edit window to write a new Header ID string is launched whenever a new file is started except in auto repeat files mode.

*Time Lapse*  
Use this flag to enable time lapse recording. When set, frames will be **saved** every N seconds (or N frames) regardless of frame rate, where N is a minimum of 1 second (or 2 frames) and a maximum of 864,000 seconds (one frame per day). The **displayed** frame rate remains controlled by the *Sonar Control Frame Rate*. This control is useful for Time Lapse Acoustography where slow changes

such as sediment distribution or crustacean populations are monitored, , or for maintaining a high frame rate for user observation while recording a subset of the images for post-processing. Used only for realtime recording.

*Periodic: N Minutes every Hour*

Use this flag to enable periodic recording. When set, frames will be saved for *N* minutes out of every hour. If the *Time Lapse* flag is also set, then time lapse recording will be enabled for *N* minutes out of every hour. Used only for realtime recording. If *Randomize Start* is checked, then the start time for each record segment will be randomly generated at the top of each hour (the first segment always starts at 0 minutes). If used in conjunction with *Continuous Mode* then a new file will be generated for each segment, assuming that *N Minutes per File* equals *N Minutes every Hour*.

*N Samples Over Threshold (N Total Within Frame)*

Use this flag to enable periodic, *on detection* recording. If the *Detect Motion* command has been invoked, then frames will be saved when *N* samples of the processed image are non-zero (the *Threshold* parameter controls the convolution algorithm, and mirrors the parameter in *Processing->Show Parameters*. If not, then a processing routine counts all samples greater than *Threshold* and frames are saved when *N* samples exceed that value. If the *N Minutes every Hour* flag is also set, then *on detection* recording will be enabled for that period only.

*N Samples Over Threshold (N Minimum Cluster Size)*

When this option is selected (only available when *Detect Motion* has been invoked) then frames will be saved when the largest contiguous cluster in the current frame matches or exceeds the *N Samp* parameter (mirrored in the *Processing->Show Parameters* dialog).

*N Samples Over Threshold (Persistence (frames))*

When on, any frame meeting the minimum threshold and cluster size requirements will trigger a contiguous save of *N* frames (retriggerable within the *N* frame period). Also available in the *Processing Parameters* dialog for *CSOT* processing. This may be useful when background subtraction leaves little or no "noise" in the image, when weaker target returns are not consistent, filling in the gaps where the threshold and/or cluster size requirements are not met.

*Insert Prequel*

Use this flag to insert *N* (persistence) frames before the trigger (over threshold) frame for each threshold event. This makes the output file larger, but gives a more continuous look to the output file. Used for both real-time *Over Threshold* recording and *CSOT* processing when *Persistence* is enabled.

*All Every Nth File*

Use this flag to record all frames every *N*th file, regardless of threshold or cluster size requirements. Only effective when used in conjunction with *Continuous Mode* recording.

*Periodic: While Fish are Detected*

Use this flag to enable periodic, *on detection* recording. The *Count Fish* command must be invoked before this flag takes effect. Frames will be saved whenever the fish counting routine has at least one "potential fish" within the

counting window. If the *N Minutes every Hour* flag is also set, then *on detection* recording will be enabled for *N* minutes out of every hour. If this flag is set when counting fish in a file during playback mode, then a new *.ddf* file with the identifier **FC\_** prepended to the filename will be written to disk as the file is processed.

#### *Save Displayed Data Only*

Use this flag to save processed data as displayed in the image window, rather than the default raw data samples. This is primarily intended to enable saving motion-detected data for subsequent file compression, but may be used to store any data as displayed (e.g. background data, transmission loss corrected data, etc.)

#### *SequenceStart at #*

A starting filename sequence number may be entered here. For instance, if images are being stored on portable media and each disk holds 80 (#000...079) files, then entering **80** before starting to record to the second disk will preserve the file sequence across disks, to avoid the duplication of file sequence numbers which would occur if the second disk started at sequence #000. This value must be updated before each disk change (e.g. 80, 160, 240...) to provide contiguous, unique filenames. The default filename algorithm uses time (YYYY-MM-DD\_HHMMSS) instead of sequence number (\_#NNN) which guarantees unique filenames.

#### *Timer Recording*

Keystroke: **None**      Toolbar Icon: **None**

Set this flag to enable programmed timer recording, using the information previously entered with the *Timer Data Entry* command. The timer mode works much as a standard VCR, recording files of *N* minutes with predetermined sonar parameters at {*Hourly, Daily, Once*} intervals.

#### *Timer Data Entry*

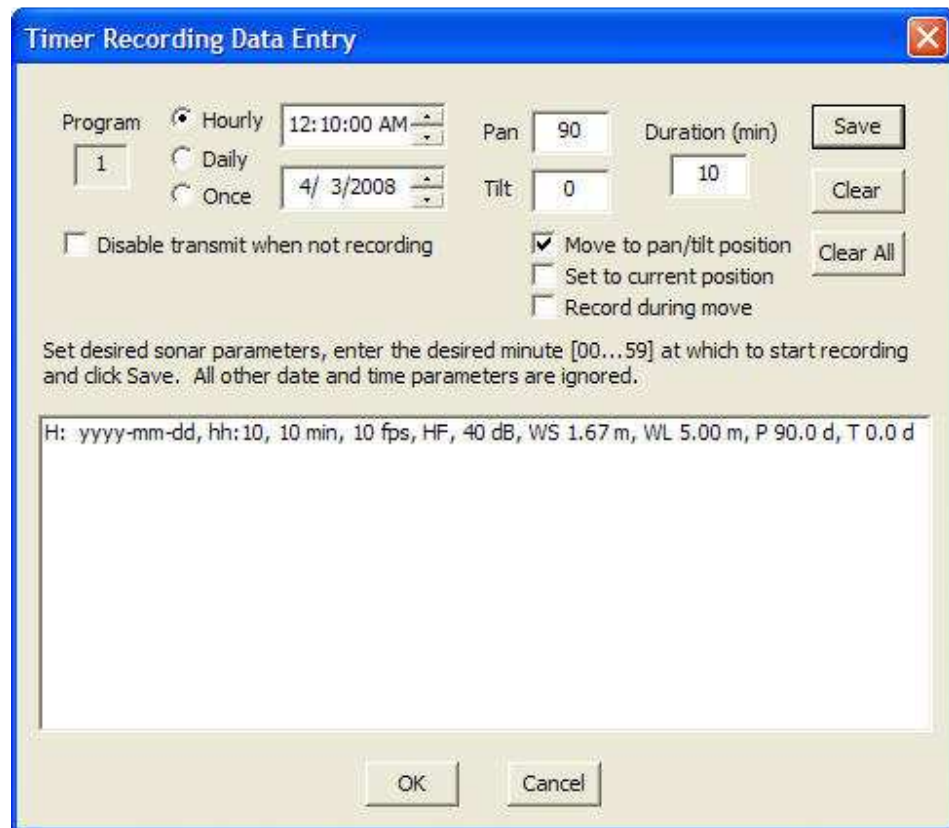
Keystroke: **None**      Toolbar Icon: **None**

Allows the user to save (and clear) preprogrammed sonar and time parameters for unattended recording. The programs may be stored in one of three modes: *Hourly, Daily* and *Once*. The *Hourly* mode saves files of a specified duration starting at the indicated minute of each hour. The *Daily* mode saves files of a specified duration once a day starting at the indicated hour and minute. The *Once* mode does a one-time-only recording at the indicated date and time. The current values of *Frame Rate, Receiver Gain, Window Start, Window Length, Focus* and the *LF/HF* setting are also saved with the mode and time parameters. The programs may be set up either in *Demo Mode* or while connected to the sonar. A maximum of 256 programs may be saved.


Setting the *Disable transmit when not recording* flag allows multiple sonars to record during non-overlapping periods without acoustic interference, and also may be used to conserve power.

When the *Move to pan/tilt position* flag is checked, a connected and enabled ROS or Sidus pan/tilt unit will be commanded to move to the indicated position (entered through either the *Pan/Tilt* edit boxes or from the *Set to current position* flag) at the beginning of the timer recording period. Setting the *Record during move* flag starts saving frames immediately upon entering the timer

recording period, otherwise recording is held off until the physical pan and/or tilt move is complete.



Take  
Snapshot

Keystroke: **Ctrl+T**    Toolbar Icon: 

Use this command to save the current frame as a single frame *.ddf* file (assuming the following flags are not set) using the current filename set with *File->Set Save Dir/Name*.

If the *Export->Save as Jpg* flag is set, then the current frame is exported to a *.jpg* file using the current filename. The currently displayed image is saved as a *jpg* file named *{CurrentFile}\_Frame\_N.jpg*. Only the image visible in the display pane will be saved, so if the file header information is currently displayed and obscures some of the image, it must first be deselected with the *View->Header* command in order to save the entire image. If the *Measure* tool is active, the area saved is limited to that bounded by the measure box

If the *Export->Save only Image Data* flag is set, only the acoustic data array is saved to a *.dat* file using the current filename.

In playback mode the frame number is appended to the base filename. The data is saved as displayed, e.g. if using motion correction then the corrected data array is saved to the file.

*Save Only  
Image Data*

Keystroke: **None**      Toolbar Icon: **None**

Toggles whether to save file header with snapshot or not. If only image data are saved, then only the 96 by 512 bytes or 48 by 512 bytes are saved in the snapshot. This makes it easier to use the data in an analysis program such as MATLAB.

*Record  
During Pause*

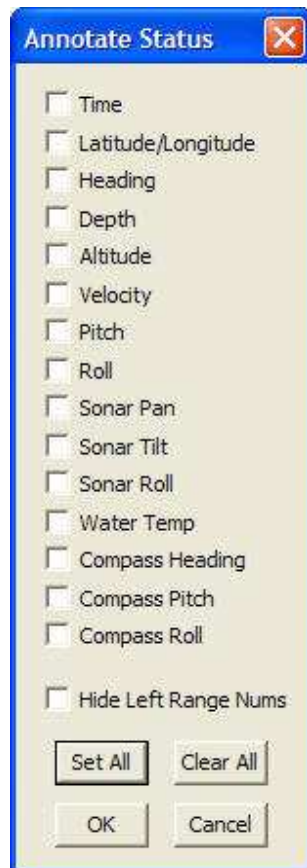
Keystroke: **None**      Toolbar Icon: **None**

When set, this flag causes the application to continue retrieving image data and recording frames (during normal record operations), but the image display will not be updated to allow for inspection of a single frame without interrupting recording. If cleared, then pausing (clicking *Still Mode*) during recording will suspend frame acquisition.

### Configure Sub-Menu

*Annotate  
Status*

Keystroke: **None**      Toolbar Icon: **None**



Display status information (*Time, Latitude/Longitude, Heading, Depth, Altitude, Velocity, Pitch, Roll, Compass Heading/Pitch/Roll, Sonar Pan/Tilt/Roll, H2O Temp*) in the image window, individually selectable from a dialog opened by the command. The *Hide Left Range Numms* flag may be set to prevent interference between the range numbers and the status data overlay on left side of image window.

*Auto Threshold/Intensity*      Keystroke: **None**      Toolbar Icon: **None**  
When set, this flag sets the display *Threshold* and *Intensity* values to default values depending on the currently selected processing options. Clear this flag to maintain fixed values for display *Threshold* and *Intensity* regardless of processing, opening new files, etc.

#### **Boat Icon Sub-Sub-Menu**

*Boat Length*      Keystroke: **None**      Toolbar Icon: **None**  
Set the icon to represent a boat of 5, 10 or 15 meter length.

*Pan Zero Direction*      Keystroke: **None**      Toolbar Icon: **None**  
Set the nominal *zero pan* direction to *Aft, Forward, Port or Starboard*.

*Sonar Mount*      Keystroke: **None**      Toolbar Icon: **None**  
Set the nominal sonar mount position to *Aft, Forward, Port or Starboard*.

*Show Boat*      Keystroke: **None**      Toolbar Icon: **None**  
Enable the display of the boat icon, which when using the sonar from a boat with pan&tilt control, this allows the display of the image window size and position in relation to the boat. The image window icon is yellow at zero tilt, and fills in progressively with red when tilting up, turning completely red at +30 degrees upward tilt. The icon turns progressively green with downward tilt (fully green at -30 degrees).

#### **Display Time from... Sub-Sub-Menu**

*PC Clock*      Keystroke: **None**      Toolbar Icon: **None**  
Check this flag to display time recorded from the PC clock.

*Sonar Clock*      Keystroke: **None**      Toolbar Icon: **None**  
Check this flag to display time recorded from the sonar clock in the Header pane. The sonar clock is set to the PC clock time when first connected by default (see *Sonar->Configure->Set Clock*). The sonar clock has resolution to .01 seconds, which is displayed when image playback is paused.

*GPS Clock*      Keystroke: **None**      Toolbar Icon: **None**  
If the ZDA aux input is active (or was when an image file was recorded), then setting this flag will display the time and date from the GPS clock.

#### **Horizon Data from... Sub-Sub-Menu**



*Platform...*      Keystroke: **None**      Toolbar Icon: **None**

Artificial horizon displays platform orientation when checked.

*Sonar...*      Keystroke: **None**      Toolbar Icon: **None**

Artificial horizon displays sonar orientation when checked.

*Load Custom Palette*      Keystroke: **None**      Toolbar Icon: **None**

Select an ASCII file (.dcp) as the default CUSTOM palette. This ASCII file should contain 256 lines of 8-bit RGB values, e.g.:

```
0     0     0
2     0     0
4     1     0
255  255  255
```

The filename is saved as the default palette for the CUSTOM entry in the palette selection control, and is loaded automatically on each subsequent launch of the application.

#### **Platform Location as... Sub-Sub-Menu**

*Lat/Long*      Keystroke: **None**      Toolbar Icon: **None**

Latitude and longitude information from the frame header are displayed in the Platform Status group within the Header pane.

*X/Y Offset*      Keystroke: **None**      Toolbar Icon: **None**

X and Y Offset information from the frame header are displayed in the Platform Status group within the Header pane.

#### **L/L Display Format... Sub-Sub-Sub-Menu**

*dd.dddddd*      Keystroke: **None**      Toolbar Icon: **None**

Latitude and longitude information from the frame header are displayed as (fractional) degrees.

*dd mm.mm*      Keystroke: **None**      Toolbar Icon: **None**

Latitude and longitude information from the frame header are displayed as degrees and (fractional) minutes.

*Use L/L As X/Y*      Keystroke: **None**      Toolbar Icon: **None**

Generate relative X/Y location from UTM translation of L/L data. Set this flag to write *SonarX* and *SonarY* frame header data drawn from the *Latitude/Longitude* values to enable plotting 3D bathymetry data without

full vehicle instrumentation. It may also be used to navigate within a predefined area using a GPS location as the origin.

**Reset Frame Rate**    Keystroke: **None**    Toolbar Icon: **None**

Use this flag to reset the playback frame rate to the originally recorded frame rate when playing back image files. Clear this flag for reviewing multiple files at a uniform frame rate.

**Show Horizon**    Keystroke: **None**    Toolbar Icon: **None**

Display an artificial horizon icon within the image pane showing the attitude and heading of the sonar as indicated by the compass data.

### Export Sub-Menu

**Remove Bmp File**    Keystroke: **None**    Toolbar Icon: **None**

All files exported in *jpg* format create an intermediate *bmp* file, which is automatically removed by default. Clear this flag to retain the *bmp* file for higher resolution and color accuracy. The *bmp* file is generally much larger (as much as 20x) than the *jpg* output.

**Save as Jpg**    Keystroke: **None**    Toolbar Icon: **None**

Set this flag to direct the *Capture->Take Snapshot* command to export the current frame as a *.jpg* file.

**Save as Text**    Keystroke: **None**    Toolbar Icon: **None**

This command saves the displayed image in *txt* format which may be imported into many third-party spreadsheet applications.


**White Background**    Keystroke: **None**    Toolbar Icon: **None**

When set this flag remaps the background to white for the *Save Frame as {Type}* commands.

### Index Sub-Menu

**Clear All**    Keystroke: **None**    Toolbar Icon: **None**

Clear all index marks in the current playback file. If the playback file contains audio notes, you must reaffirm your choice to delete all audio note index marks and associated files. Otherwise, just the frame index marks will be removed.

**Next Mark**    Keystroke: **None**    Toolbar Icon: 

Advance frame counter to the next index mark (frame or audio) in the current playback file. See *Stop on Index Mark* for additional behavior.

In *Echogram* mode, the next marked fish is selected as indicated by a green circle on the display. This is particularly useful for long files with few detected fish, where it would otherwise be necessary to page through many screens of blank data to find the next fish. If viewing the source image in *Echogram* mode, the image loop advances to the next marked fish.


*Previous Mark*

Keystroke: **None**      Toolbar Icon: 

Set frame counter to the previous index mark (frame or audio) in the current playback file. See *Stop on Index Mark* for additional behavior.

In *Echogram* mode, the previous marked fish is selected as indicated by a green circle on the display. This is particularly useful for long files with few detected fish, where it would otherwise be necessary to page through many screens of blank data to find the last fish. If viewing the source image in *Echogram* mode, the image loop rewinds to the previous marked fish.

*Toggle Mark*

Keystroke: **None**      Toolbar Icon: 

Toggle index mark at the current position in the current playback file. If the *Activate Audio Recording* flag is set, you will be asked if you'd like to insert an existing audio file at the current position. This file must be of the same audio type (.mp3, .wav, .wma, etc.) as that selected in the *Aux->Setup Audio* dialog.

*Auto Index Marks*

Keystroke: **None**      Toolbar Icon: **None**

For real-time recording, setting this flag will insert index marks whenever succeeding frame times differ by more than 1 second. This allows easy marking of subsections formed within image files from *Periodic Record*, etc.

For playback, set this flag to automatically insert index marks into the source file at each frame marked by CSOT, echogram, or mark fish processing. Any existing index marks are cleared before recalculating the echogram, or when importing an echogram count file.

*Stop on Index Mark*

Keystroke: **None**      Toolbar Icon: **None**

Automatically pause at each index mark (frame or audio) during playback. If this flag is cleared and the index mark is also an audio mark, then clicking on *Next Mark* will advance to the next audio mark, play the audio note, and also play the image file in the forward direction. The *Previous Mark* command will move the frame index to the previous audio mark and play the audio note, but image playback will be paused.

## Playback Sub-Menu

*Rewind To Start*


Keystroke: **Home**      Toolbar Icon: 

Sets the frame number to zero (or to the start-point set with the *Set Endpoints* command). It is active in Playback only.

*Play Reverse*

Keystroke: **←**      Toolbar Icon: 

Plays the currently open movie file in reverse direction. If in *Still Mode*, it displays the previous frame. If viewing snapshots, it will display the previous snapshot. It is active in Playback only.

*Play Forward* Keystroke: →      Toolbar Icon: 

Plays the currently open movie file in forward direction. If in *Still Mode*, it displays the next frame. If viewing snapshots, it will display the next snapshot. It is active in Playback only.

*Fast Forward To End* Keystroke: **End**      Toolbar Icon: 

Sets frame number to the last frame in the file (or to the endpoint set with the *Set Endpoints* command). It is active in Playback only.

*Still Mode* Keystroke: [**Space, p**] Toolbar Icon: 

Toggles between still mode (single frame advance) and movie mode (continuous play) in playback mode. Release the “Pause” button to restart the movie. You may also have to click the direction arrows (▶ or ◀) to start the movie. In real-time mode, it suspends new frame requests to the sonar, pausing recording (if enabled) and leaving the last received frame displayed until toggled back to *RUN*. You will see “Pause” on the bottom right of the screen. **Space** only enabled for playback; use ‘**p**’ to pause during record.

*Go to Frame* Keystroke: **None**      Toolbar Icon: **None**

User sets requested frame number in currently open playback file. It is active in Playback only.

*Set Endpoints* Keystroke: **None**      Toolbar Icon: **None**

User sets desired start and end frame numbers for currently open playback file. Use this command to limit display range or to truncate a file with a *File->Save* or *File->Save As* command. Check the *Loop on Still for +/-* box to automatically loop over *N Frames* when “paused” during playback while the CTRL key is held down, or to change the default 2s loop time in *Echogram Source View* mode. The SPACE bar mirrors the *Image->Still Mode* command toggle. Active in Playback only.

*Loop* Keystroke: **None**      Toolbar Icon: 

Toggle loop mode on and off. Loop mode continuously plays the movie when on. Otherwise, the movie plays once and stops at the last frame.

*Random Clip* Keystroke: **None**      Toolbar Icon: 

Play a 1 second clip in the current file centered on a random frame number. Sets *Loop* mode and *Play Forward* automatically. Open a text file *RandomFrames\_filename.txt* (if not already open) and write the random frame number to the file, one per line. A new text file is opened for each new playback file.

### Rotate Display Sub-Menu

*0 Deg*      Keystroke: **None**      Toolbar Icon: **None**

Set display orientation so increasing range runs from bottom to top in the image window. The *Measure* tool will work accurately for any window size.

*90 Deg*      Keystroke: **None**      Toolbar Icon: **None**

Set display orientation so increasing range runs from left to right in the image window. The *Measure* tool will work accurately for any window size or orientation.

*180 Deg*      Keystroke: **None**      Toolbar Icon: **None**

Set display orientation so increasing range runs from top to bottom in the image window. The *Measure* tool will work accurately for any window size or orientation.

*270 Deg*      Keystroke: **None**      Toolbar Icon: **None**

Set display orientation so increasing range runs from right to left in the image window. The *Measure* tool will work accurately for any window size or orientation.

*Wide FOV*      Keystroke: **None**      Toolbar Icon: **None**

Bring up the *Wide FOV* control dialog. This allows the DIDSON to act as a combination forward-looking and sector scan sonar, with user control over many parameters:



#### **Total FOV**

The total FOV sets the overall angular width of the expanded sonar image.

- 15 Degrees* Set total display FOV to 15 degrees (Hi-Res lens default FOV).
- 30 Degrees* Set total display FOV to 30 degrees (Std lens default FOV).
- 60 Degrees* Set total display FOV to 60 degrees.
- 90 Degrees* Set total display FOV to 90 degrees.
- 120 Degrees* Set total display FOV to 120 degrees.

**Active FOV**

The active FOV determines the portion of the sonar's native FOV that is used during pan sweeps as the expanded FOV image is built up. A smaller value will result in a brighter overall expanded image, but limits the real-time FOV.

- 5 Degrees* Set active FOV to 5 degrees.
- 10 Degrees* Set active FOV to 10 degrees.
- 15 Degrees* Set active FOV to 15 degrees.
- 30 Degrees* Set active FOV to 30 degrees.

**Scan Mode Mosaic**

Rebuilds the sample→pixel map at an interval of every *N* degrees, and refreshes the sonar image at the same rate. This results in a faster compilation of the expanded image, at the expense of a blockier appearance.

**Scan Mode Smooth**

Rebuilds the sample→pixel map every frame while panning, for the smoothest appearance during expanded image formation. Frame rates may be limited by the PC speed as this is a computationally intensive operation.

**Interval**

When using *Mosaic* mode, the interval should normally be set to 1 degree less than the active FOV, but may be overridden if desired.

- 4 Degrees* Set refresh interval to 4 degrees.
- 9 Degrees* Set refresh interval to 9 degrees.
- 14 Degrees* Set refresh interval to 14 degrees.
- 29 Degrees* Set refresh interval to 29 degrees.

**Control Compass**

Control the expanded image mapping via compass output. Use this option when not mechanically panning the sonar. Noise and nonlinearities in the compass output may introduce some distortion in the expanded sonar image.

**Control Pan Value**

Control the expanded image mapping via pan motor feedback output. Use this option when mechanically panning the sonar, for the least amount of distortion in the expanded sonar image.

**Reference Direction**

Use the **Current** button to set the current heading or pan value to be the reference direction (e.g. center the expanded image around this value). For live data, this defines "straight ahead". For playback files, this should be set at the frame containing the midrange value of pan or heading. A specified reference direction may be entered into the edit box before clicking the **Apply** button.

**Clear**

Clear the display outside of the currently active FOV.

**Apply**

Use the displayed settings to generate the wide FOV display.

**OK**

Save the displayed settings to the *DidsonAppV5.ini* file and close the dialog.

*Rectangular Display*

Keystroke: **None**      Toolbar Icon: **None**

Show image in a rectangular format of N parallel beams. This display mode will distort the field of view, but allows closer inspection of image details at short ranges, especially when using a very short window start. The *Measure* tool will display the beam under the cursor while the left mouse button is depressed.

**Zoom Range Sub-Menu***1 meter*

Keystroke: **None**      Toolbar Icon: **None**

Set image window to a 1 meter vertical range on a *right-click* zoom command.

*2 meter*

Keystroke: **None**      Toolbar Icon: **None**

Set image window to a 2 meter vertical range on a *right-click* zoom command.

*3 meter*

Keystroke: **None**      Toolbar Icon: **None**

Set image window to a 3 meter vertical range on a *right-click* zoom command.

*4 meter*

Keystroke: **None**      Toolbar Icon: **None**

Set image window to a 4 meter vertical range on a *right-click* zoom command.

*Zoom*

Keystroke: **None**      Toolbar Icon: 

When enabled this mode zooms in within the boundary of a cursor-drawn box, using the range extent of the box exactly, and preserving the original aspect ratio of the image in the azimuth direction. A mouse left-click returns to the original image from the zoomed image. The "Measure" range function only works for the default application window size (e.g. not maximized), but the width and height values will be correct.

**Sonar Menu***Mouse Extensions*

Keystroke: **None**      Toolbar Icon: **None**

Enables or disables *Mouse Controls* (see Section 7.4). Default is ON.

*Update Firmware*

Keystroke: **None**      Toolbar Icon: **None**

Use this command to upload new sonar firmware. The new sonar firmware will overwrite the present control program on the internal CompactFlash card. The new program will not take effect until the sonar has been power-cycled. This command requires sonar firmware V4.26 or higher.

The local sonar *Didson.ini* file is automatically deleted when downloading new firmware to ensure compatibility. On the first power-up the firmware will use default values to generate a new *Didson.ini* file. You should use the *Edit->Sonar->DidsonV5.ini File* command to reload your individual serial number, model type (standard or long-range) and other parameters immediately after the first power-up cycle. Then use the *Sonar->Reset to Topside Parameters* command to re-sync the sonar with the topside application.

## Configure Sub-Menu

### Command Protocol Sub-Sub-Menu

*Ethernet*      Keystroke: **None**      Toolbar Icon: **None**

Sets the application for Ethernet commands and data transfer.

*RS-232C*      Keystroke: **None**      Toolbar Icon: **None**

Sets the application for serial commands and video output only (*not implemented*).

*Settings*      Keystroke: **None**      Toolbar Icon: **None**

Allows choice of COM port and baud rate for RS-232C control (*not implemented*).

### Ethernet Transfer Mode Sub-Sub-Menu

*By Packet Request*      Keystroke: **None**      Toolbar Icon: **None**

Breaks Ethernet data transfer into [1k,2k,4k,8k,12k] packets for multi-user Ethernet. Use the 12k setting for Patton media extenders.

*By Frame Request*      Keystroke: **None**      Toolbar Icon: **None**

The default *Frame* mode sends maximum size packets for optimum data transmission rate.

The increase in data transfer can be significant when using Frames. You can try each case and note the change in displayed frame rate for your case. If the topside computer and sonar are the only ones using the Ethernet the *Frame* mode will usually be the fastest.

*Burst Mode*      Keystroke: **None**      Toolbar Icon: **None**



If the *Burst Mode* flag is set, a single request for data is sent to the sonar, and the sonar then returns the entire frame (LF or HF) broken into packets with a variable delay between packet transmissions, whose value is entered when setting the flag (1...100, *default 10*). This mode allows higher frame rates while still maintaining small packet sizes, but does not allow for dropped packets to be detected and retransmitted.

Setting the *Burst Mode* flag with *by Packet Request* enabled will send frame requests at every ping interval regardless of previous reception status. This increases effective frame retrieval over noisy connections.

### Gain Mode Sub-Sub-Menu

*Manual*      Keystroke: **None**      Toolbar Icon: **None**

Breaks Ethernet data transfer into customary packets for multi-user Ethernet.

### Auto Sub-Sub-Sub-Menu

*Low Threshold*      Keystroke: **None**      Toolbar Icon: **None**

If *Manual* flag is cleared, decreases gain until less than 1% of samples within the center 16 beams are greater than 75 dB intensity, or increases gain to maximum if this threshold is not exceeded.

*Medium Threshold*      Keystroke: **None**      Toolbar Icon: **None**

If *Manual* flag is cleared, decreases gain until less than 3% of samples within the center 16 beams are greater than 75 dB intensity, or increases gain to maximum if this threshold is not exceeded.

*High Threshold*      Keystroke: **None**      Toolbar Icon: **None**

If *Manual* flag is cleared, decreases gain until less than 10% of samples within the center 16 beams are greater than 75 dB intensity, or increases gain to maximum if this threshold is not exceeded.

*Compass Settings*      Keystroke: **None**      Toolbar Icon: **None**

Direct the sonar to store heading information as either *True North* or *Magnetic* or *Magnetic North*. Enter the correction *Declination (Variation)* for *True North* data recording and display.

*Compass Status*      Keystroke: **None**      Toolbar Icon: **None**

Retrieve current compass status (including last compass compensation quality factor) and display in the image pane for 5 seconds. This command is automatically sent when first connected to the sonar (if the *Compass* option is

checked in the *DidsonV5.ini* file) to initialize data for the *Compass Settings* dialog.

*Compensate  
Compass*

Keystroke: **None**      Toolbar Icon: **None**

Perform compass compensation to adjust for the local magnetic environment of the sonar. For best results the sonar should be mounted in its deployed configuration, and the entire mount/platform/vehicle must be slowly rotated through 360 degrees, taking at least one minute, while the compensation factors are being measured and computed. When finished the quality factor of the compensation will be displayed in the image pane (a value of less than 300 indicates an acceptable calculation). The display will remain until the *Compensate Compass* flag is unchecked to return to frame acquisition. If the command is unchecked before the compensation process is finished, image frames will not be returned until the calculations are complete.

*Zero Tilt/Roll  
Offsets*

Keystroke: **None**      Toolbar Icon: **None**

Direct the sonar to use the current sonar attitude as mechanical zero with respect to sonar tilt and sonar roll. The resulting offset correction factors are stored in the sonar *Config.ini* file.

*Auto Retract*

Keystroke: **None**      Toolbar Icon: **None**

Retracts lens focus arm on program exit.

*Auto  
Resolution*

Keystroke: **None**      Toolbar Icon: **None**

If checked, the sonar switches automatically between operating frequencies (hence changing beam resolution) as a function of max displayed range. The default for Ethernet operation is off (unchecked).

*Go  
Autonomous*

Keystroke: **None**      Toolbar Icon: **None**

Switch sonar to *Autonomous* mode while ending connection. If the *Etherdata* checkbox is selected in *Edit->Sonar->DidsonV5.ini File*, then the application is automatically set to *Slave* mode.

*Patch Beam*

Keystroke: **None**      Toolbar Icon: **None**

Allows beam selection for adding/removing sonar image patching, interpolating data over inoperative sonar channels.

*Reset to  
Topside  
Parameters*

Keystroke: **None**      Toolbar Icon: **None**

Loads current topside sonar control parameters into underwater unit.

*Restore  
Defaults*

Keystroke: **None**      Toolbar Icon: **None**

Command the sonar to delete its local *Didson.ini* and *Basic.ini* files, and rewrite them with system default values. This command is always *Broadcast*, so it

should only be used with a single sonar on the network. It may help with restoring connection due to corrupt *.ini* files.

*Set Clock*      Keystroke: **None**      Toolbar Icon: **None**

Synchronize sonar clock with topside PC clock on first connection.

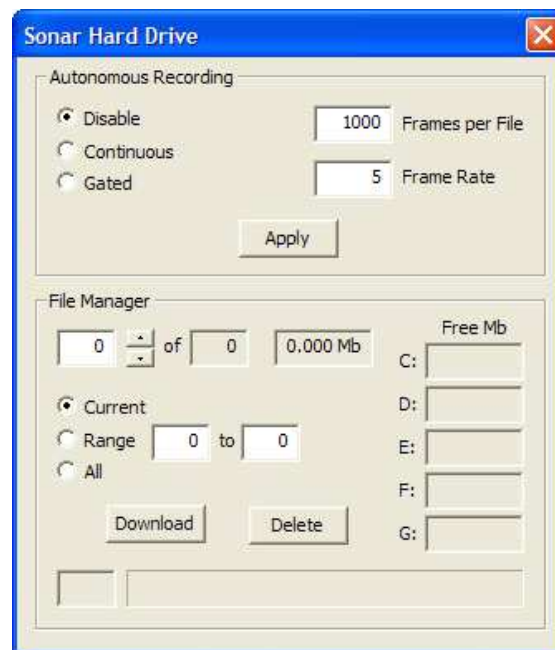
*Transmit Enable*      Keystroke: **None**      Toolbar Icon: **None**

If not checked, transmit is turned off.

## Files Sub-Menu

*HD Record /Download*      Keystroke: **None**      Toolbar Icon: **None**

Enables control of hard disk recording in sonar autonomous mode. The sonar is set to the desired operating parameters while connected to the client PC.



Then on the next power-up cycle, after timing out with no connection, the sonar will record data into *.ddf* files on the local hard drive. After establishing a connection on the subsequent power-up cycle, the files may be downloaded to the client PC and/or erased off the sonar hard drive. Use the *Edit->Sonar->DidsonV5.ini File* command to set the timeout to the desired value after power-up (e.g. 30 seconds).

Recording mode (disabled, continuous or gated), frames per file and frame rate may be set while connected to the sonar by clicking the *Apply* button.

*Continuous* mode recording will save files whenever the sonar is powered up and taking data. If power is switched off while recording in *Continuous* mode, the file currently being written will be lost, and the corresponding amount of disk space will no longer show as available.

*Gated* mode recording will save files when a logic HI signal (nominal 5Vdc, minimum 3.0Vdc) is present on the *HD\_Enable* pin 6 of the MHDG-16-BCR sonar bulkhead connector. The gate may be applied any time after main power is turned on, and should be removed before the main power is switched off, which will close the currently recording file with no loss of data. The standard DIDSON cable does not have a conductor for the gate signal, so using this function will require a custom cable.

### Older Sonars (S/N < 20)

The *Gated* mode of operation is incompatible with Thinnet data transmission mode (the sonar hard drive replaces the Thinnet converter board). For gated HD recording the Thinnet output line is used as an input where a HI logic level (5V) will enable recording.

#### *Format Sonar HD*

Keystroke: **None**      Toolbar Icon: **None**

Reformat internal sonar hard drive (does not reformat CompactFlash drive C:). This can be useful if many large files have been lost due to power failure during recording; the *Delete* command alone will not recover the affected disk space.

### **Lens Sub-Menu**

*Aux Lens Up*    Keystroke: **None**      Toolbar Icon: **None**

Raise (and lower) remote auxiliary lens when enabled.

*Focus*            Keystroke: **Ctrl+F**      Toolbar Icon: **None**

Force lens to focus at default setting (mid-range) for the current window.

*Retract Lens*    Keystroke: **Ctrl+R**      Toolbar Icon: **None**

Move focusing element to rear position and thus minimize the length of the shaft open to the environment. This also allows access to the linkage retention screw, which must be extracted before removing the rear endcap.

### **Test Sub-Menu      (*not used in normal operation*)**

*Compute  
Statistics*        Keystroke: **None**      Toolbar Icon: **None**

Generates a file of received signal statistics (minimum, maximum and average of N samples) for each beam and the sonar as a whole. The measurements are calculated as a 10-frame average. When transmit is disabled, or the sonar is out of the water, this provides a convenient method for noise measurements. If the measure box is checked, statistics will be computed for the range of samples contained within the displayed box. Target strengths may be calculated by drawing the measure box around a feature of interest, and checking the maximum levels for the appropriate beams.

Statistics may be run on playback files as well as during real-time data acquisition. The results are written to the file *Didson\_Statistics\_SNsss\_n.txt*, where *sss* is the sonar serial number and *n* is a sequence number for a particular directory.

*Display  
Debug Info*      Keystroke: **None**      Toolbar Icon: **None**

Check to display Ethernet timing and reliability information. The statistics may be reset (to allow for frames dropped during program initialization) with the *Sonar -> Zero Transfer Counts* command. When the *Detect Motion* processing flag is set, the number of convolved samples over threshold (CSOT) will be

displayed. This aids in setting the value of *N* in the *Image->Capture->Record Options->Periodic: Record N Samples over Threshold*.

*Exit to DOS*    Keystroke: **None**    Toolbar Icon: **None**

Force the sonar to quit the DIDSON application and return to the DOS prompt. For authorized repair personnel only.

*Fill Frame Header*    Keystroke: **None**    Toolbar Icon: **None**

Test flag for inserting simulated data into the sonar frame header. For embedded control software development use only.

*Query Test*    Keystroke: **None**    Toolbar Icon: **None**

This is a test command for Ethernet communication and is not used in normal operation.

*Record PS Voltage*    Keystroke: **None**    Toolbar Icon: **None**

Setting this flag opens a file *BatteryLifeTest.txt* that records the voltage of a *DIDSON-DH* battery once per minute over time to determine its capacity. The file is closed when the flag is cleared.

*Zero Transfer Counts*    Keystroke: **None**    Toolbar Icon: **None**

Zeros the Ethernet timing and reliability information. The timing and reliability information is routinely part of the error log and can be displayed by clicking on *Edit Menu > Display Debug Info*.

## Video Sub-Menu

*Change Palette*    Keystroke: **None**    Toolbar Icon: **None**

This command launches a dialog allowing the selection of palette, range color and status color values for sonar video output. The values are stored both in the topside *DidsonAppV5.ini* file and the sonar *Didson.ini* file, and so changes will persist across sessions and sonar power cycles.

Choose from 10 different color palettes for the sonar NTSC video output. Choose 1 of 15 different colors for the range labels and status information. Set independently from the topside display palette.



*Correct  
For TL*

Keystroke: **None**      Toolbar Icon: **None**

This works identically to the topside application transmission loss algorithm, but may be turned on and off independently. The sonar algorithm uses the temperature range and salinity settings from the *Edit->Sonar->DidsonV5.ini File* parameters.

### **Resolution Sub-Sub-Menu**

*SVGA*

Keystroke: **None**      Toolbar Icon: **None**

Set sonar video output to SVGA 800x600 resolution.

*VGA*

Keystroke: **None**      Toolbar Icon: **None**

Set sonar video output to VGA 640x480 resolution.

*Show  
Controls*

Keystroke: **None**      Toolbar Icon: **None**

If checked, the underwater unit lists the sonar controls on the left side of the video image. This is used when switches control the sonar or to verify settings when the primary display is a NTSC video monitor.

*Show Data*

Keystroke: **None**      Toolbar Icon: **None**

If checked, the underwater unit processes the data and generates a sector display which can be converted to NTSC video and cabled to the surface. If not checked, the underwater unit simply collects the returns and sends them by Ethernet topside in the form of byte arrays. The reduced computational load when not checked slightly increases the frame rate.

*Show Grid*

Keystroke: **None**      Toolbar Icon: **None**

When checked, the underwater unit adds a measurement grid to the video display.

*Show Range*

Keystroke: **None**      Toolbar Icon: **None**

When checked, the underwater unit adds range information to the video display.

*Show Status*

Keystroke: **None**      Toolbar Icon: **None**

When checked, the underwater unit adds status information to the video display.

*Smooth  
Image*

Keystroke: **None**      Toolbar Icon: **None**

Smooths the data displayed in the NTSC video output by generating additional virtual beams via interpolation.

## Processing Menu

*Batch Mode*    Keystroke: **None**    Toolbar Icon: **None**

Set this flag before invoking the commands described below to apply the indicated command to all *.ddf* files within the current playback folder.

Set before doing a *File->Save As->Type .avi* command to convert all *.ddf* files in the current playback folder to *.avi* files. In this case the *Measure Box* cropping function is ignored.

This flag also directs the processing of all image files in the the current playback folder when invoking the *Processing->CSOT->Export CSOT Frames* command.

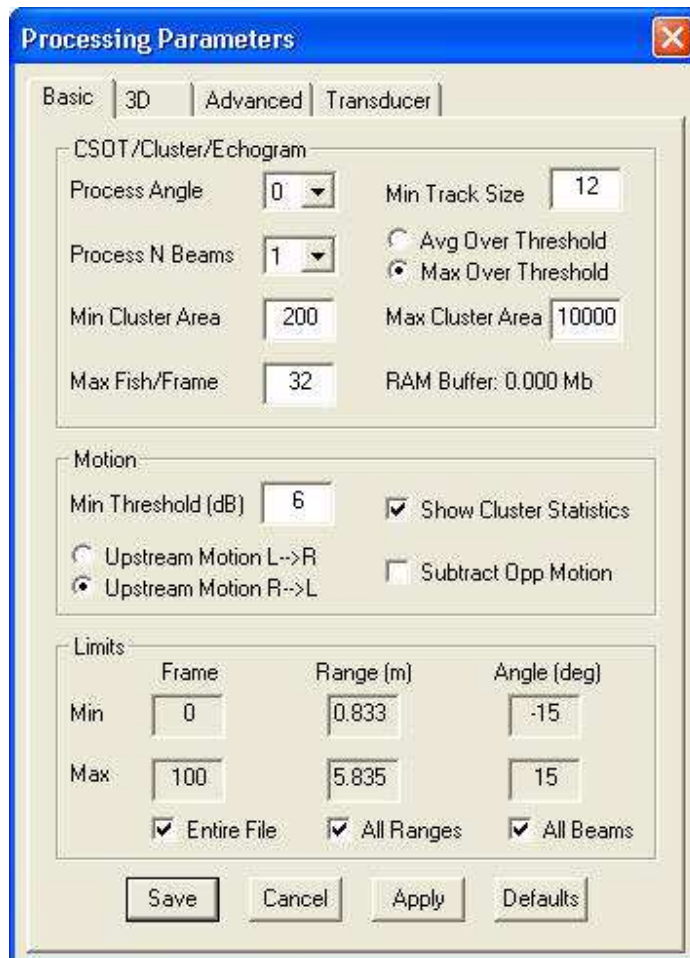
If this flag is set when running the *Processing->Echogram->View Echogram* command, all image files contained within the current playback folder will be processed as an echogram or clustergram. The output image will be saved as an *.ech* file, and count files (*FC\_\**) will be saved in both binary (*.dat*) and text (*.txt*) formats.

*Background Subtraction* and *Detect Motion* processing will be automatically applied when running echograms or clustergrams in *Batch Mode*.

The resulting *.ech* files may be opened with the *File->Open* (choose *File Type* as *.ech*) command. This also loads the original source image file and imports the associated *FC\_\** count file for review or editing. Thus echogram or clustergram output may be reviewed without reprocessing the image source file.

Show  
Parameters

Keystroke: **None**    Toolbar Icon: **None**



### **CSOT/Cluster/Echogram**

- Process Angle**      Set azimuthal angle for echogram detection beam. Only fish that cross the process angle with acoustic returns above minimum motion threshold will be counted.
- Min Track Size**      Minimum [samples\*frames] cluster size for counting. The Echogram track represents the acoustic return of each fish in the “process angle” beam(s) built up over the range of frames where the signal level is above the minimum *Motion* threshold.
- Process N Beams**      Set effective beamwidth for echogram detection. When *Detect Motion* is enabled, each process angle beam output is the OR'd combination of *N* beams, increasing the likelihood of detection, but also possibly overestimating the fish size and length. When *Detect Motion* is not enabled, the process angle beam output is either the maximum of *N* beams at each sample range (*Max Over Threshold* selected), or the average of *N*



|                  |   |
|------------------|---|
|                  | beams at each sample range ( <i>Avg Over Thresh</i> selected).  |
| Avg Over Thresh  | Average <i>N beams</i> over <i>Min Threshold</i> for each sample range.   |
| Max Over Thresh  | Use maximum within <i>N beams</i> over <i>Min Threshold</i> for each sample range.  |
| Min Cluster Area | Minimum area of a cluster in cm <sup>2</sup> for frame export.  |
| Max Fish/Frame   | Set the RAM buffer size for statistics calculations. For low fish passage rates, set this to a lower number if needed to conserve memory. Otherwise, set above the highest number of fish expected in a single frame. |

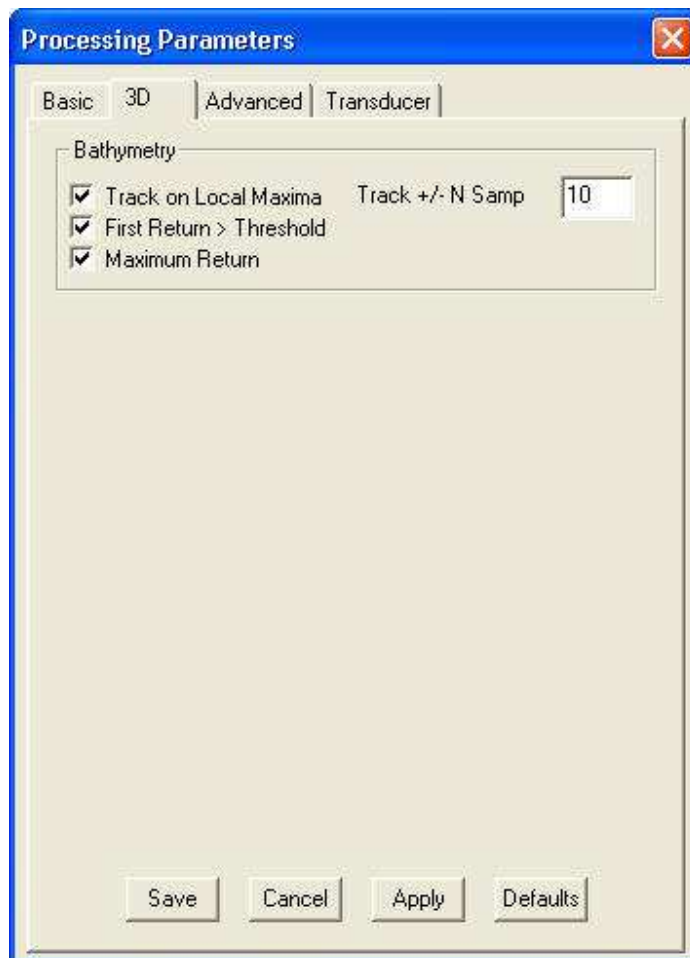
### ***Detect Motion***

|                  |   |
|------------------|---|
| Min Threshold    | Minimum threshold for <i>Detect Motion</i> image processing. Samples with an acoustic return above this level after <i>Background Subtraction</i> will be convolved and their color set to red.   |
| Show Statistics  | When this flag is set the the largest cluster meeting <i>Min Cluster Area</i> will be colored green, and all other clusters meeting <i>Min Cluster Area</i> are colored cyan. Clusters over <i>Min Threshold</i> but not meeting <i>Min Cluster Area</i> are left red. In addition, the size of the largest cluster in the current frame, largest cluster in the history of displayed frames, total number of clusters meeting <i>Min Cluster Area</i> , and total "biomass" (integrated cluster area) for the current frame will be displayed in the image window. These numbers are useful in setting the best values for <i>Min Threshold</i> and <i>Min Cluster Area</i> , based on the desired size of targets for CSOT frame export or <i>Add Fish in Frame</i> operations. |
| Upstream Mot L→R | Set the upstream direction of fish motion for counting to L→R.  |
| Upstream Mot R→L | Set the upstream direction of fish motion for counting to R→L.  |
| Subtract Opp Mot | Subtract downstream fish from total fish count in count file.   |

### ***Limits***

|             |   |
|-------------|---|
| Min Frame   | Minimum source file frame number to process.              |
| Max Frame   | Maximum source file frame number to process.              |
| Entire File | Set <i>Min Frame</i> and <i>Max Frame</i> to file limits. |

|            |   |
|------------|---|
| Min Range  | Minimum range to process.                                   |
| Max Range  | Maximum range to process.                                   |
| All Ranges | Set <i>Min Range</i> and <i>Max Range</i> to window limits. |
| Min Angle  | Minimum angle in degrees (over threshold).                  |
| Max Angle  | Maximum angle in degrees (over threshold).                  |
| All Beams  | Set <i>Min Angle</i> and <i>Max Angle</i> to sonar FOV.     |



### **3D**

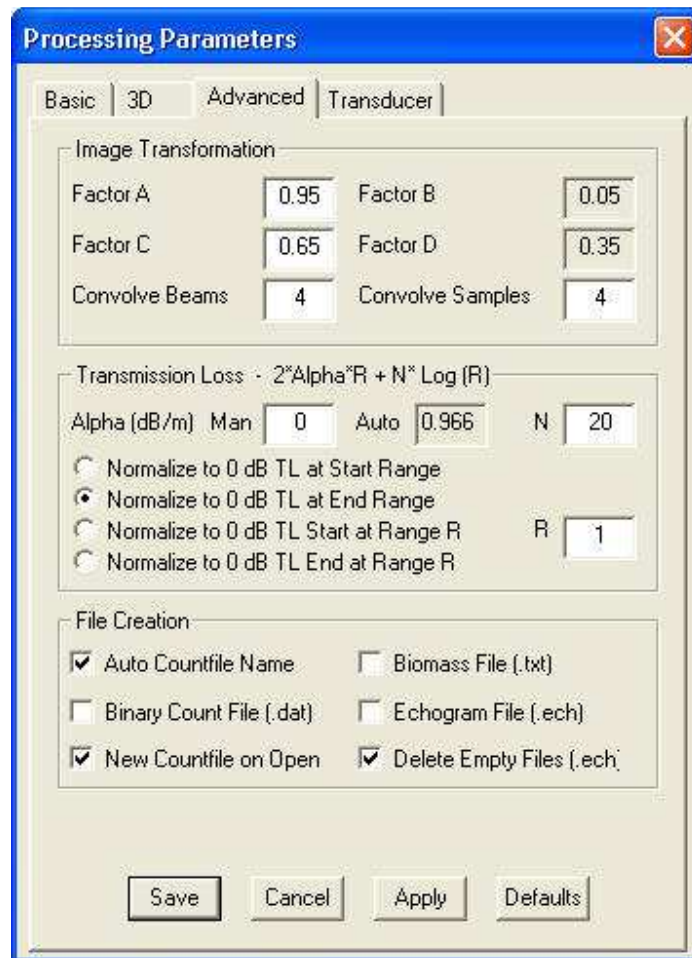
#### **Bathymetry** (modes may be simultaneously selected)

Track on Local Max produce profile by recursively finding the brightest return in the current frame, then following the line of brightest returns to the left and right until all "sub-profiles" have been traced.

Track +/-N Samp      number of samples to search in each adjacent beam when tracing local profile lines, starting at the sample range of the previous beam processed.

First Return > Thresh      produce profile by zeroing all samples under the current *Display Threshold* in each beam up to the first sample over *Display Threshold*, and then zeroing all succeeding sample to the end of the window range.

Maximum Return      color the maximum sample red in each beam, and zero all other samples.



### **Image Transformation**

Factor A      (0.0 to 1.0) this controls the weight given to the averaged data subtracted from displayed image. A value of 1.0 stops updates to the averaged data. The default value is 0.95. Another way of thinking about these parameters is that as A goes to one, the “memory” of the averaged data increases and is less affected by current data values.

|                  |  |
|------------------|--|
| Factor B         | (1.0 - Factor A) the weight given to the updates to the averaged data. Factor A and Factor B are used by the <i>Background Subtraction</i> algorithm.                            |
| Factor C         | (0.0 to 1.0) this controls the weight given to new data averaged with the displayed image. A value of 1.0 stops averaging and displays only new data. The default value is 0.65. |
| Factor D         | (1.0 - Factor C) the weight given to the updates to the foreground smoothed data. . Factor C and Factor D are used by the <i>Foreground Smoothing</i> algorithm.                 |
| Convolve Beams   | The number of beams used in the convolution algorithm of the <i>Detect Motion</i> routine. The default value is 4, and legal values range from 2 to 16.                          |
| Convolve Samples | The number of samples used in the convolution algorithm of the <i>Detect Motion</i> routine. The default value is 4, and legal values range from 2 to 16.                        |

### ***Transmission Loss***

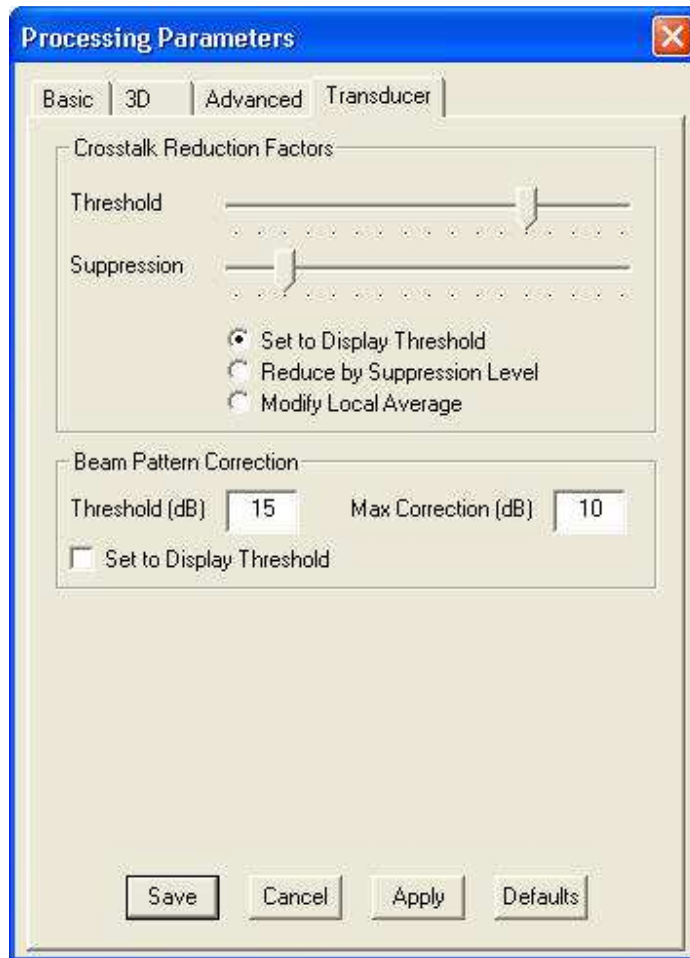
|  |  |
|--|--|
| N                                      | Enter N for $N \cdot \log R$ spreading factor.   |
| Man                                    | Enter a non-zero number to manually replace the calculated value of the absorption factor <i>alpha</i> . |
| A (Auto)                               | Shows calculated absorption factor <i>alpha</i> .  |
| Normalize to 0 dB TL at Start Range    | Increase software gain at far range.   |
| Normalize to 0 dB TL at End Range      | Decrease software gain at near range.  |
| Normalize to 0 dB TL Start at Range R  | Increase software gain at far range relative to R.   |
| Normalize to 0 dB TL at End at Range R | Decrease software gain at near range relative to R.  |
| R                                      | TL normalization range in current units.   |

### ***File Creation Parameters***

|                       |   |
|-----------------------|---|
| Auto Count Name       | Automatically generate names for fish count files.  |
| Binary Countfile      | Save count data in binary format for PC processing or later editing in <i>Echogram</i> mode.                |
| New Countfile on Open | Start a new countfile automatically whenever a new .ddf file is opened (default). When this flag is cleared |

all fish counts will be appended to the currently open countfile, with annotation describing the source file for a particular fish.

- Biomass File** Save biomass statistics on all frames exported during CSOT to a text file. This is meant to estimate the total number of fish when the fish density is sometimes too great to resolve individual fish within each frame. Frames that contain defineable individual fish are processed to form an average fish cluster area, and average number of frames for each fish tracked. Then the total accumulated cluster area for the file is divided by [average fish cluster \* average fish frame count] to form an estimate of the total number of fish in the file. (Under development)
- Echogram File** Save the echogram image output as an *.ech* file which may be reopened for later review or editing without recalculating the echogram. Enabling this option also automatically sets the *Binary Countfile* option, so existing echogram counts may be reloaded along with the echogram image using *File->Open (files of type .ech)*.
- Delete Empty Files** When this option is checked, *.ech* files with no valid tracks are not saved.



### **Crosstalk Reduction Factors**

|                            |  |
|----------------------------|--|
| Threshold generating       | Minimum value of acoustic return to assume to be crosstalk.  |
| Suppression samples        | When <i>Reduce by Suppression Level</i> is selected, all considered to be crosstalk are reduced by this amount.  |
| Set to Disp Thresh current | All samples considered to be crosstalk are set to the display threshold.   |
| Reduce by S Level          | Crosstalk reduction factor in dB.  |
| Modify Local Avg           | Crosstalk samples are set to the average value of the three preceding neighbor values minus the suppression level. This attempts to preserve the level of the surrounding background to avoid a “holey” appearance in the image. |

### **Beam Pattern Correction**

|                         |  |
|-------------------------|--|
| Threshold (dB)          | Minimum value of sample for applying correction factor. This keeps noise below the threshold value from being increased above the threshold value. |
| Max Correction (dB) and | The correction curve is set to 0 dB at the center beams, and maximizes at this level at the outer edges of the image.                              |
| Set to Disp Thresh      | Automatically set the correction threshold to the current display threshold.   |

*Load Parameter File*

Keystroke: **None**      Toolbar Icon: **None**

Replaces current processing parameters from a custom file *filename.prm*. The custom file may have parameters tuned for a particular location for real-time processing, or even a particular file for post processing.

*Save Parameter File*

Keystroke: **None**      Toolbar Icon: **None**

Saves the current processing parameters to a custom file *filename.prm*. The processing parameters may be tuned for a particular location for real-time processing, or even a particular file for post processing. Then future processing is done more easily by using the *Load Parameter File* command.

**3D Sub-Menu** (*functions require software license from ScienceGL*)

*Open Plot Window*

Keystroke: **None**      Toolbar Icon: 

Start the 3D rendering application from *ScienceGL*. The application renders DIDSON image data taken with the 1 degree concentrator lens into 3D images. Data may be rendered in real-time or from *.ddf* source files. The 3D image is static, and requires either a fixed or very stable mount for the sonar, or sonar location and orientation information written into the frame headers, such as when integrated within an *HAUV* or *ROV* platform. Basic sonar configuration and orientation information may be entered or overridden in the 3D->*Show Parameters* dialog, and an assumed velocity may be set for bathymetry or other "3D strip" applications where *X position* data is not present in the frame headers.

If rendered from a *.ddf* source file, the 3D image may be recalculated for the best resolution, edited, output as a *.jpg* or *.avi* file, etc. The 3D rendering application may also be used in a stand-alone mode for post-processing 3D DIDSON files.

The required software license may be purchased as either a PC-specific *seat* or a hardware dongle for enabling the application on any PC.

*Plot File*

Keystroke: **None**      Toolbar Icon: 

Start the 3D rendering application (if not already open) and plot the currently open *.ddf* image file as a 3D image. The *.ddf* source file must have been recorded using the 1 degree concentrator lens.

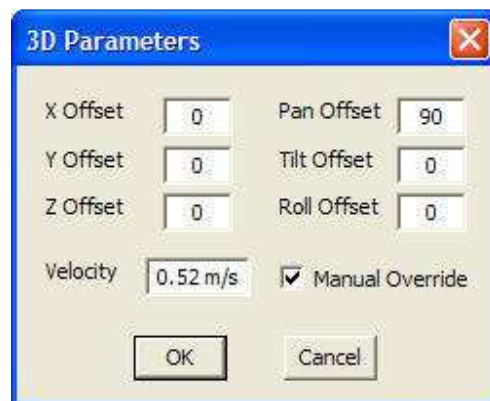
*Plot Real-Time Data*

Keystroke: **None**      Toolbar Icon: 

Start the 3D rendering application (if not already open) and plot real-time data as a 3D image. The image data must be taken using the 1 degree concentrator lens, in either a *rotation sweep* (panning the sonar horizontally with a 90 degree roll, or vertically with a 0 degree roll) or *translation* (passing over the volume of interest in a linear motion with the lens orientated perpendicular to the direction of motion) mode.

*Show Parameters*

Keystroke: **None**      Toolbar Icon: 



This dialog allows the entry of the sonar position and orientation on a vehicle or fixed mount, as well as setting a fixed velocity for bathymetry or other “3D strip” applications where *X position* data is not present in the frame headers. Setting the *Manual Override* flag directs the application to replace the corresponding parameters in the frame headers with this data. If a non-zero velocity is entered, then the *Sonar X Position* frame header parameter will be overwritten with an assumed distance based on velocity, frame number, and frame rate.

### Background Sub-Menu

*Background Subtraction*

Keystroke: **None**      Toolbar Icon: 

Enables background subtraction processing. When the sonar is operated from a fixed or extremely stable mount, background subtraction will remove the static portion of the acoustic image, showing only objects that move. This is useful for applications such as counting fish (enabled automatically by the *Count Fish* command) or intruder detection in waterside security.

See the *Show Parameters* command for a description of processing variables.

*Auto Fix Background*

Keystroke: **None**      Toolbar Icon: **None**



Runs *Background Subtraction* on the current playback file over enough “empty” (no clusters over *Minimum Cluster Size*) frames to generate a stable background, and then sets the *Fixed Background* flag.

*Auto Fix on File Open*      Keystroke: **None**      Toolbar Icon: **None**

Set this flag to run *Auto Fix Background* whenever opening a new file for playback, including *Batch Mode* operations.

*Detect Empty Frames*      Keystroke: **None**      Toolbar Icon: **None**

When *Background Subtraction* is used in conjunction with the *Detect Motion* command, the background buffer is updated only when frames have no clusters exceeding the minimum cluster size set in Processing Parameters. This allows background adaptation without suffering from "shadow blooming", and makes the *Fixed Background* command mostly obsolete. It slows down processing compared to "brute force" (all frames) *Background Subtraction*, so a *Fixed Background* may still be desired when appropriate for very long files or *Batch Mode* processing.

*Fixed Background*      Keystroke: **None**      Toolbar Icon: **None**

Uses a very slow update factor (*Factor A = .999*) to effectively freeze the background used in the *Background Subtraction* routine, allowing for only very gradual changes. This is particularly effective in reducing background “blooming” from the aftereffects of shadows thrown by objects (e.g. *fish*) passing in front of the sonar. Used in conjunction with the *Save Background File* and *Load Background File* commands.


*Load Background File*      Keystroke: **None**      Toolbar Icon: **None**

This command loads a previously saved background file for use with the *Fixed Background* command.

*Save Background File*      Keystroke: **None**      Toolbar Icon: **None**

This command exports the current background data array to a named file (*Filename.bgd*). The background file should be created from an image file with no moving targets during background initialization (50 – 100 frames). Then the file may be later recalled to process image files with moving targets (e.g. *fish*) without “blooming” interfering with *Detect Motion* processing.

## CSOT Sub-Menu

*Export CSOT Frames*      Keystroke: **None**      Toolbar Icon: 

Use this command to reduce the number of frames to view when looking for moving targets against a reasonably static background. The current playback file is processed with *Background Subtraction* and *Detect Motion/Foreground Smoothing* processing enabled, and all frames containing *Min Cluster Size* convolved samples over *Min Threshold* in a contiguous cluster are saved to the output file *CSOT\_openfilename*, to the folder directed by the *File->Save Aux File Dir to...* command. The *Min Cluster Size* and *Min Threshold* parameters

are taken from the *Echogram Counter* subsection in the *Fish Parameters* dialog. The *Processing Limits* parameters also apply.

The *Min Cluster Size* parameter refers to the maximum number of non-zero contiguous samples in a given frame after background subtraction and convolution. Only one cluster must match or exceed this parameter.

Typical values for *Min Cluster Size* will vary depending on target size and the dynamic nature of the background image, but 30 or so would work well for 50 cm fish against a quiet background. A good default value for *Min Threshold* is 6 dB, same as for *Echogram* processing.

The *Background Subtraction* parameter *Factor A* may work better with a value such as **.98**, rather than the default **.95** for images with few moving targets. Files with many moving targets may benefit from the *Fixed Background* command.

Exported frames with a time difference greater than 1 second since the last exported frame are given an *Index Mark* if the *Auto Index Marks* flag is set, and the image display updates at each new *Index Mark*.

*Insert  
Prequel*

Keystroke: **None**      Toolbar Icon: **None**

Check this flag to insert a prequel of N (*Persistence value*) frames prior to the first frame in each sequence of frames meeting cluster minimum threshold and size requirements. This provides additional separation between fish detected during the *Export CSOT Frames* command. It mirrors the identical option found in *Image->Capture->Record Options* under the *Periodic: Over Threshold* heading.

#### **PersistenceSub-Sub-Menu**

|                  |                        |                           |
|------------------|------------------------|---------------------------|
| <i>Off</i>       | Keystroke: <b>None</b> | Toolbar Icon: <b>None</b> |
| <i>2 Frames</i>  | Keystroke: <b>None</b> | Toolbar Icon: <b>None</b> |
| <i>4 Frames</i>  | Keystroke: <b>None</b> | Toolbar Icon: <b>None</b> |
| <i>8 Frames</i>  | Keystroke: <b>None</b> | Toolbar Icon: <b>None</b> |
| <i>12 Frames</i> | Keystroke: <b>None</b> | Toolbar Icon: <b>None</b> |
| <i>16 Frames</i> | Keystroke: <b>None</b> | Toolbar Icon: <b>None</b> |

When on, any frame meeting the minimum threshold and cluster size requirements will trigger a contiguous save of N frames (retriggerable within the N frame period). Also available in the *Record Options* dialog for image capture. This may be useful when background subtraction leaves little or no "noise" in the image, when weaker target returns are not consistent, filling in the gaps where the threshold and/or cluster size requirements are not met.

*Under  
Threshold*

Keystroke: **None**      Toolbar Icon: **None**

Setting this flag directs the application to export all frames during CSOT processing with a maximum cluster size less than *Min Cluster Size* to an output file prefixed with *CSUT\_*. This allows checking for unintended "discarded" frames of a file processed with normal CSOT processing.

#### **Echogram Sub-Menu**

### Marker Sub-Sub-Menu

|               |                        |                           |
|---------------|------------------------|---------------------------|
| <i>Small</i>  | Keystroke: <b>None</b> | Toolbar Icon: <b>None</b> |
| <i>Medium</i> | Keystroke: <b>None</b> | Toolbar Icon: <b>None</b> |
| <i>Large</i>  | Keystroke: <b>None</b> | Toolbar Icon: <b>None</b> |

These commands allow the selection of *Small*, *Medium* or *Large* echogram marker boxes. The default is *Medium*. Long range counting with very high fish density may require the *Small* size, and visibility will be enhanced with the *Large* markers on short range image files, where individual fish may take up a significant fraction of the image area.

*Show Hours* Keystroke: **None** Toolbar Icon: **None**

When this flag is set before running an echogram, a vertical indicator line will be written into the echogram output at each hour transition.

*Show Length* Keystroke: **None** Toolbar Icon: **None**

When this flag is set, all marked fish lengths are displayed below the marker, otherwise, only the currently selected fish mark length is displayed.

*Show Tail* Keystroke: **None** Toolbar Icon: **None**

Set this flag to add a “tail” indicating direction of fish travel to the echogram marker. The “tail” pointing up indicates downstream travel, and the “tail” pointing down indicates upstream travel. Clear this flag to hide the “tail” on the marker. Fish of unknown travel direction will never display a “tail”.

### Scroll Speed Sub-Sub-Menu

|           |                        |                           |
|-----------|------------------------|---------------------------|
| <i>x1</i> | Keystroke: <b>None</b> | Toolbar Icon: <b>None</b> |
| <i>x2</i> | Keystroke: <b>None</b> | Toolbar Icon: <b>None</b> |
| <i>x4</i> | Keystroke: <b>None</b> | Toolbar Icon: <b>None</b> |
| <i>x8</i> | Keystroke: <b>None</b> | Toolbar Icon: <b>None</b> |

Use this parameter to control the scrolling speed of the echogram when using *Image->Playback->Play Forward* and *Image->Playback->Play Reverse* commands. The echogram will scroll at *Frame Rate* times the speed factor (*x1/x2/x4/x8*) selected here. The keyboard playback shortcut controls (*cursor Up/Down/Left/Right* and *Space*) work as with normal image files. *Up/Down* control *Frame Rate*, *Left/Right* control direction, and *Space* toggles *Still/Movie* mode.

### Split Size Sub-Sub-Menu

|                   |                        |                           |
|-------------------|------------------------|---------------------------|
| <i>Auto</i>       | Keystroke: <b>None</b> | Toolbar Icon: <b>None</b> |
| <i>200 Frames</i> | Keystroke: <b>None</b> | Toolbar Icon: <b>None</b> |
| <i>400 Frames</i> | Keystroke: <b>None</b> | Toolbar Icon: <b>None</b> |
| <i>600 Frames</i> | Keystroke: <b>None</b> | Toolbar Icon: <b>None</b> |

Use this parameter to control the proportion of echogram view versus source image view when using *Split Screen* echogram mode.

### Time Scale Sub-Sub-Menu

*Fixed*                      Keystroke: **None**                      Toolbar Icon: **None**  
*Sliding*                     Keystroke: **None**                      Toolbar Icon: **None**

The fixed time scale shows the exact frame times at fixed intervals across the echogram. The sliding time scale shows the frame times at multiples of 15 seconds (mm:00, mm:15, mm:30, mm:45) that move in one-second jumps as the echogram is played.

*Auto Export*                      Keystroke: **None**                      Toolbar Icon: **None**


This will overwrite the current fish count files with current data after every edit ('f' key or *Enter* button) in echogram mode. This will prevent the loss of edited data if the computer or application should crash during an echogram edit session.

*Calculate Statistics*                      Keystroke: **None**                      Toolbar Icon: **None**

Examines image data (requires *Detect Motion* processing) after marking the echogram array, extracting fish length estimates and direction of travel.

*Display Range Labels*                      Keystroke: **None**                      Toolbar Icon: **None**

Show or hide range labels in echogram mode.

*Display Split Screen*                      Keystroke: **None**                      Toolbar Icon: 

When enabled the application will display both the source image view and echogram view in a split (*left/right*) window. *Measure* functions may be applied to either view, but *Zoom* will only apply to the source image view.

A right-click within the echogram view will cause the source view to loop around the cursor location similarly to switching to the source view display from the full window echogram. Another right-click will return to the default split view, which displays the frame indicated by the cursor position within the echogram view.

If the echogram is put in motion, the source image view displays the frame at the cursor position within the echogram view, or the frame at the left side of the echogram view if the cursor is not found within the echogram view. When the echogram view is static, the source view will update to reflect the indicated frame as the cursor is moved within the echogram view.

All of the editing functions described below in *View Echogram* will also work in *Split Screen* mode, in either view.

*Export Echogram Counts*                      Keystroke: **None**                      Toolbar Icon: **None**


This command exports the internal echogram fish count buffer to the named files (*Filename.txt* and *Filename.dat*). The *.txt* file is designed for reports and human readability, while the *.dat* file is saved for possible recall and modification with the *Import Echogram Counts* command.

*Export Echogram*                      Keystroke: **None**                      Toolbar Icon: **None**

*as Jpg* This command exports the internal echogram fish count buffer to the default file *EG\_FileName.jpg*. The entire echogram is exported without annotation, except for fish markers when the *Detect Motion* switch is set.

*Import Echogram Counts* Keystroke: **None**      Toolbar Icon: **None**  
 Previously exported echogram count files (*Filename.dat*) may be recalled for review, updated using the echogram marking/clearing tools, and saved to the same (or a different) file. Importing a count file will immediately clear any existing count data for the currently displayed echogram.

*Use Cluster Data* Keystroke: **None**      Toolbar Icon: **None**  
 Setting this flag overrides the normal “detect within N beams” echogram processing, and replaces it (for each frame) with the maximum output for each range bin of all samples exceeding the *Min Threshold* (RED) and belonging to clusters meeting the minimum *Cluster Area* requirement (CYAN). The resulting echogram clusters (tracks) meeting the minimum *Track Size* and both previous criteria are colored GREEN.  
 This option is most useful for “rare event” files where fish may not cross the standard echogram detect beam(s) while meeting the *Min Threshold* criterion.

*View Echogram* Keystroke: **None**      Toolbar Icon:   
 The *Echogram* mode provides a view of *N* (1...5) averaged beams in the center of the sonar image versus time. It is enabled for playback only. The echogram image may be modified with the standard processing options *Background Subtraction* and *Detect Motion*. When the *Detect Motion* mode is selected, fish detected above the *Minimum Threshold* value as entered in the *Processing->Show Parameters* dialog will be automatically counted as controlled by the *Cluster Size* parameter in the aforementioned dialog, which also allows selection of the *Average Over N Beams* parameter.  
 Counts and the echogram display buffer are cleared upon loading a new file, or changing the processing options or parameter values for the currently open image file. The entire file is processed, and pages of 800 frames are available for display. When in echogram mode the large left and right arrow toolbar buttons (*File->Next* and *File->Previous*) change function from stepping through image files in the current playback folder to stepping through pages in the current echogram buffer, 800 frames per page.  
 The standard image playback controls (e.g. *File Position*, *Play Forward*, *Play Reverse*, *Rewind*, *FF*, etc.) serve to control scrolling the viewable (800 frame maximum) portion of the echogram.  
 Mouse functions are overridden when in echogram mode. A left-click will mark a fish location and add its frame number and range to an internal data buffer, resulting in the overlay of a white-framed circle on the display whose size may be selected with the *Processing->Echogram->Echogram Marker Size* command. A left-click within an existing marker box or circle will clear the mark and the entry in the internal count array.

The **Shift** and **Ctrl** keys modify mouse left-clicks in echogram mode. The modifier key must be pressed and released before entering the mouse click. A **Shift**-left-click will force a marked target to the upstream direction (yellow, with "tail" pointing down), while a **Ctrl**-left-click changes the direction of travel to downstream (blue, with "tail" pointing up). Pressing the **Ctrl** key before drawing a box (with *Measure* off) around a group of marked fish will delete all marks within the box.

Marked fish may be manually edited in echogram mode while viewing the source images. Press **Shift**, then click anywhere to indicate upstream (yellow, with "tail" pointing down). Press **Ctrl**, then click anywhere for downstream (blue, with "tail" pointing up). Click along a fish (with *Measure* off) from head to tail to edit the length of the current mark. Double-click or press '**f**' on the keyboard to end the measurement and enter the new fish length. As with manual fish sizing, the command '**u**' will undo the fish length measurement one segment at a time, or use the command '**d**' to delete all segments.

You may also draw a line along a fish (with *Measure* off) from head to tail to edit the length of the current mark. Press **Esc**, then click anywhere to remove current mark. Draw a line along a fish (with *Measure* off) to enter a manually sized mark at the current frame. Press **Shift** or **Ctrl** before or after to indicate direction. *Measure* must be off.

When using *Detect Motion*, the '**f**' keyboard command will replace the current fish length with the current frame cluster length. Use this technique to manually select the best frame of automatically measured fish lengths.


A mouse right-click will return the view to the original DIDSON image file, which will loop for +/- 1 second about the selected echogram frame. The range at selection will be indicated on the image display by a green box around the center detection beam. This allows the examination of small targets which may be fish just entering or leaving the vertical field-of-view. Should this prove to be true, the location may be marked with a mouse left-click after returning to the echogram view from the image view, by right-clicking anywhere within the image window. Drawing a box with the left mouse button (*Measure* off, and no CTRL modifier) will switch to the image view over the range of frames contained within the drawn box.

After most of the fish have been processed and counted in the *Detect Motion* mode, small clusters may be marked manually after studying the corresponding image frames as detailed above, and the counts and fish frame/range locations will be appended to the auto-count data. Similarly, very large clusters are probably two or more fish overlapping within the field-of-view, which may be confirmed with the image mode display. Then the original auto-count mark may be cleared by left-clicking within the yellow box, and the actual two (or more) fish marked and stored by left-clicking the appropriate locations in the echogram view.

If the *Insert Index Marks* flag is set, index marks are written and cleared into the image file frame headers as fish are counted or manually marked and/or edited. See the *Image->Index* sub-menu for additional details.

See also the entries for *Import Echogram Counts* and *Export Echogram Counts* below.

*View Histogram*

Keystroke: **None**      Toolbar Icon: 

This command provides a histogram view of fish length distribution contained within the currently calculated *Echogram*. It offers auto or fixed scaling, and variable length bin sizes. It may be updated after manual editing of fish lengths within the current *Echogram*.

There is no print function, but screen capture utilities may be used to save the displayed information.

## Fish Sub-Menu

### Audio Cues Sub-Sub-Menu

*Fish Counted*      Keystroke: **None**      Toolbar Icon: **None**

Enables audio cues during *Count Fish* processing. When a valid fish is counted, the system will play the audio file *FishCount.wav* located in the default working directory (e.g. {*Drive:*}\*Didson Data*). You may customize the sound by renaming any audio file to *FishCount.wav* and overwriting the default file.

*Fish Detected*      Keystroke: **None**      Toolbar Icon: **None**

Enables audio cues during *Count Fish* processing. When a valid fish is registered, the system will play the audio file *FishDetect.wav* located in the default working directory (e.g. {*Drive:*}\*Didson Data*). You may customize the sound by renaming any audio file to *FishDetect.wav* and overwriting the default file.

*Periodic Record*      Keystroke: **None**      Toolbar Icon: **None**


Enables audio cues during periodic recording. On each instance of recording startup, the system will play the audio file *PeriodicRecord.wav* located in the default working directory (e.g. {*Drive:*}\*Didson Data*). You may customize the sound by renaming any audio file to *PeriodicRecord.wav* and overwriting the default file.

*Add Fish in Frame*

Keystroke: **None**      Toolbar Icon: 

When *Background Subtraction* and *Detect Motion* are enabled, this command creates a fish count file and automatically measures and adds all fish in the current frame to the count file. It does not calculate direction, but does process several frames around the current frame for each fish to determine its best length measurement.

*Mark Fish*

Keystroke: **None**      Toolbar Icon: 

Enables manual counting of fish in playback files. A dialog box will appear showing the fish number, range, length and thickness (see below). Also, the

*Zoom* mode is automatically invoked. Right-clicking a fish will expand the image for an automatic range window of *Image->Zoom Range->1/2/3/4* meters, with height/width aspect retained, centered around the clicked location. Drawing a zoom box with the right mouse button will zoom into the box area. A subsequent right-click will return to the un-zoomed (full-frame) image.

If the *Rapid Entry* flag is not set, click on a fish to mark its range and bearing (range will show up in the dialog box). After selecting a fish, use the cursor to measure the length of the fish. Draw (multiple, if desired) line segments, or simply click along the length of the fish to mark its length. Start at the head and proceed to the tail to enable determination of *Upstream/Downstream* motion. Double-click the left mouse button to finish, and the length parameter will change to a gray background in the dialog box. Click the *Enter* button to add the fish (with zero thickness) immediately to the count file, or use the cursor to draw a single line across the desired width of the fish. When the left button is released the width parameter will change to a gray background. Click *Enter* to accept the current parameters and add the fish to the fish count file.

Click *Clear* to delete the current measurement and select a different fish.

See *Rapid Entry* for the measurement procedure when this flag is set.

Filled circle icons are added to the display in *Still Mode*, with yellow indicating *Upstream* fish, cyan showing *Downstream* fish, and white representing fish of indeterminate direction. Current fish counts are updated immediately in the image display. This allows counting all the fish in a single frame.



*Rapid Entry*    Keystroke: **None**    Toolbar Icon: **None**

This flag changes the procedure for manually counting and sizing fish. When set, fish may be measured by simply dragging the mouse across the fish from



head to tail with the left button depressed (you may also use a series of clicks or drags as in the standard manual operation). If the length path is not satisfactory, use the *u* key (default, see *Edit->Application->Keymap*) to erase individual segments, or the *d* key to clear the current fish measurement. Pressing the *f* key will record the current fish size and range into the fish count file.


Checking the *Show All* box enables annotation of each (or all) fish measured with entries for *Species*, *Motion*, *Quality*, *Repeat Count* and a general *Comment* string, with all information written to the count file for every fish added.

There is no *Thickness* measurement in *Rapid Entry* mode.


*Stop Counting Fish*      Keystroke: **None**      Toolbar Icon: **None**

This command closes any currently open fish count file, and is normally used when finished with a series of *Add Fish in Frame* commands.

### Image Sub-Menu

*Correct for Beam Pattern*      Keystroke: **None**      Toolbar Icon: 

Use this command to correct the displayed image for the typical loss of sensitivity at the edges of the image. See the *Beam Pattern Correction* parameters under the *Show Parameters* command for more details.

*Correct for Transmission Loss*      Keystroke: **None**      Toolbar Icon: 

Use this command to correct the displayed image for acoustic transmission loss. The algorithm adds a range-dependent offset to the data based on the formula :  $TL = 2 * \alpha * R + N * \log_{10}(R)$

where *alpha* is the sound absorption coefficient, N is the spreading factor (20 is default) and R is the range in meters. The offset correction values are normalized to 0 dB at the end of the window, to minimize noise “blooming” with range.

You must set the appropriate parameters using *Edit->Sonar->DidsonV5.ini* and *Show Parameters* for the correction to be valid. These include settings for fresh or salt water, approximate water temperature (from 5C to 20C) and the desired spreading factor (e.g. 20), and the coefficient of absorption *alpha*.

*Measure Box Statistics*      Keystroke: **None**      Toolbar Icon: **None**

Use this command to calculate the minimum, average and maximum sample values inside the yellow outlined measure box. For file playback it will also calculate the average of these values over the entire file. You must start playback at frame 0 to get accurate results.

*Cursor Statistics*      Keystroke: **None**      Toolbar Icon: **None**

Use this command to will show the pixel intensity and (if enabled) transmission loss and transmission loss correction values in dB at the current cursor position when *Measure* is enabled..

*Display Background*

Keystroke: **None**      Toolbar Icon: **None**

Displays the static acoustic image removed with the Background Subtraction command. This averaged image shows more detail than a single frame.

*Display Raw Data*

Keystroke: **None**      Toolbar Icon: 

Displays the standard acoustic image while continuing to process data in the background. This allows the comparison of raw and processed data without interrupting the processing routines. When this flag is set before calculating an *Echogram* with *Detect Motion* enabled, an additional image buffer is formed which allows switching between a background subtracted *Echogram* view and the motion detected view.

*Display Subtracted Data*

Keystroke: **None**      Toolbar Icon: **None**

Modifies the *Display Raw Data* flag when *Detect Motion* is enabled to display subtracted data (background removed) in place of convolved (motion detected) data.

### Filter Options Sub-Sub-Menu

*Mask with Detected Clusters*

Keystroke: **None**      Toolbar Icon: **None**

When *Detect Motion* and *Display Raw Data* are enabled, the detected clusters are used as a mask for the raw data, e.g. only raw data samples contained within the detected clusters are displayed against a black background. This flag is mutually exclusive with *Overlay Detected Clusters*.

*Overlay Detected Clusters*

Keystroke: **None**      Toolbar Icon: **None**

When *Detect Motion* and *Display Raw Data* (or *Display Background*) are enabled, the detected clusters are overlaid on top of the raw data, to give high contrast to moving objects against the displayed background. This flag is mutually exclusive with *Mask with Detected Clusters*.

*Use Cluster Outline*

Keystroke: **None**      Toolbar Icon: **None**

Set this flag to use the cluster outline, instead of a solid cluster, for display when the *Overlay Detected Clusters* flag is enabled.

*Reduce Crosstalk*

Keystroke: **None**      Toolbar Icon: **None**

This processing is meant primarily for the reduction of artifacts in 3D image processing, and has mainly aesthetic value for 2D imaging. It is not recommended for fish counting and/or sizing applications. The processing algorithm looks for bright spots in the image, and reduces the brightness of samples located at the same range in the beams affected by acoustic crosstalk. See the *Crosstalk Reduction Factors* section under the *Show Parameters* command for more information.

### Select Processed Display Sub-Sub-Menu

|                   |   |
|-------------------|---|
| <i>Background</i> | time-averaged background image            |
| <i>Convolved</i>  | motion-detected cluster image             |
| <i>Foreground</i> | time-averaged background-subtracted image |
| <i>Outline</i>    | cluster outline image                     |
| <i>Profile</i>    | bathymetry mode image (3D pre-processing) |
| <i>Subtracted</i> | raw data minus background data image      |

Keystroke: **None**      Toolbar Icon: **None**

Selecting various image processing options generates corresponding display buffers. Use this command to override the default display buffer selection to display a different active display buffer. The *Processing->Image->Display Raw Data* flag overrides any processed display buffer selection.

### Motion Sub-Menu

*Detect Motion*      Keystroke: **None**      Toolbar Icon: 

Enables motion detection processing. When the sonar is operated from a fixed or extremely stable mount, the motion detection routine first invokes *Background Subtraction* to remove the static portion of the acoustic image, and then performs foreground smoothing (if enabled), followed by a convolution on the image. The resulting data are compared to the *Minimum Threshold* processing variable and set to 0 if less than or equal to that value, and 128 (fixed 1-bit color) if above it.

The resulting image may be further processed by the *Count Fish* command, and/or the *Image->Capture->Record Options->Periodic Record on N Samples over Threshold* flag may be used to only save data containing moving objects larger in aggregate than *N* samples (in this case the *Threshold* parameter is ignored, as the data have already been processed to a binary value using the above-mentioned *Minimum Threshold* parameter).

*Foreground Smoothing*      Keystroke: **None**      Toolbar Icon: **None**

Works with the *Detect Motion* command to further process a background subtracted image, removing transient noise (speckle) from the displayed image. The default state of this flag is *TRUE*, but it may be disabled to observe its effect on the data.

*Platform Motion Correction*

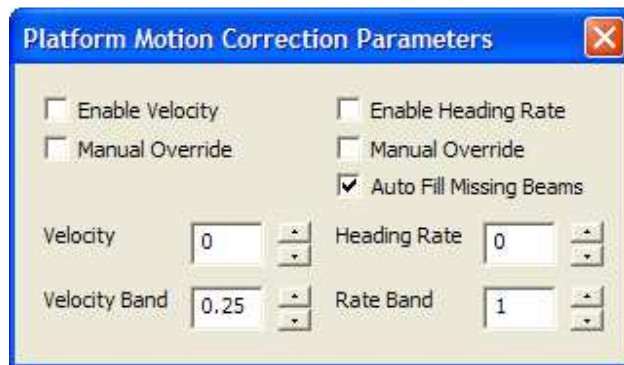
Keystroke: **None**      Toolbar Icon: 

Enables image correction due to platform motion. Because a single image frame is made up of 8 (HF) or 4 (LF) consecutive ping cycles, platform motion will introduce a skew between individual beams in the displayed image. Correcting for forward (or reverse) motion involves sliding each beam in range relative to the first received ping in the frame acquisition cycle. Correcting for changes in heading requires remapping beam data in azimuth.

*Show PMC Parameters*

Keystroke: **None**      Toolbar Icon: **None**

Brings up a window that allows viewing and changing current processing parameters for the *Platform Motion Correction* command.



**Enable Velocity**      Enables velocity correction.

**Manual Override**      Forces value for velocity correction.

**Enable Heading Rate**      Enables heading rate correction.

**Manual Override**      Forces value for heading rate correction.

**Auto Fill**      In any given frame, sets of beams may have no acoustic data due to rotational platform motion. When checked, this option fills in the image with data interpolated from neighboring beams.

**Velocity**      When *Manual Override* is selected, this value (in m/s) will be used for motion correction. This is most useful for post-processing data taken from a moving platform with no integrated velocity information.

**Velocity Band**      When the difference between the current processing velocity and the current platform velocity exceeds this number (in meters/second), the current processing velocity will be reset to the current platform

velocity, and the image mapping will be recalculated accordingly.

**Heading Rate** When *Manual Override* is selected, this value (in m/s) will be used for heading rate correction. This is most useful for post-processing data taken from a moving platform with no integrated heading rate information.


**Head Rate Band** When the difference between the current processing heading rate and the current platform heading rate exceeds this number (in meters/second), the current processing heading rate will be reset to the current platform heading rate, and the image mapping will be recalculated accordingly.

### Special Sub-Menu


*Auto Export Jpg* Keystroke: **None** Toolbar Icon: **None**

This flag when set writes a *.jpg* file of the image once per second, along with a corresponding *.hdr* file containing the frame header data in binary format. The files are exported when connected to the sonar or in playback mode, independent of the *Image->Capture->Record* flag.

The file names are in the form *yyyy-mm-dd\_hhmmss.jpg* and *yyyy-mm-dd\_hhmmss.hdr* for easy access via a reference time. The time values will depend on the *Image->Configure->Display Time from...* setting (PC, Sonar, or GPS). The file folder location will depend on the *File->Set Aux Dir to...* flag (*File Save Dir* or *Image Open Dir*, as desired).

*Bathymetry Mode* Keystroke: **None** Toolbar Icon: 

This command enables up to three profiling algorithms in any combination for the purpose of generating bathymetry data for 3D rendering. It also has the effect of greatly reducing the number of samples in each frame, so that processed image files may be subsequently compressed by factors of 100 or better. See the *Bathymetry* group on the *3D* tab of the *Show Parameters* dialog for more information.

*Cursor Tracking* Keystroke: **None** Toolbar Icon: 

The cursor tracking function stores cursor position versus frame number for up to 512 tracks, useful for recording and analysis of target motion (e.g. fish). Dual text and binary files that record the track number, frame number, target range and bearing, and other parameters may be exported and later imported for viewing and/or editing.



Each track may be recorded for up to 512 frames, and if the *Auto...* feature is checked, will automatically generate contiguous multi-track segments. The tracks are displayed 2

seconds ( $2 * \text{frame rate frames}$ ) prior to the first frame within a track until 2 seconds after the last frame of a track. Tracks may be individually displayed, hidden or cleared.

Selecting this command generates a pop-up dialog containing the following controls:

|                      |   |
|----------------------|---|
| <i>Track</i>         | Selects active track from N total tracks.   |
| <i>Interval</i>      | Display every Nth track point.  |
| <i>Max Len</i>       | Display a maximum of N points for each track.   |
| <i>Hide All</i>      | Hide all tracks (retains all track information).  |
| <i>Show</i>          | Display (checked) or hide (unchecked) current track.  |
| <i>All</i>           | Display all tracks.   |
| <i>Auto...</i>       | Generate new track on each new mouse left-click.  |
| <i>Add</i>           | Manually start new track.   |
| <i>Center Window</i> | Reset zoom coordinates for each frame to keep current frame track point in center of window (automatically clears <i>Auto...</i> function). |
| <i>Clear</i>         | Clear current track from memory.  |
| <i>Clear All</i>     | Clear all tracks from memory.   |
| <i>Import</i>        | Load track memory from previously exported file.  |
| <i>Export</i>        | Save track memory to text and binary files.   |

Cursor tracking operates in either *Auto...* or manual mode. In *Auto...* mode, each mouse left-click starts a new track, and the mouse button is held down as the file plays and a desired target is tracked with the cursor. This will quickly generate rough tracks of targets, which may be subsequently edited in manual mode. The *Add* button will generate a new track in manual mode.

The usual procedure is to record target tracks at the centroid of each target (usually a fish); then sub-tracks of nose and tail position may be added to an existing track by using *Shift-Left* and *Shift-Right* mouse buttons respectively. When track files are exported the sub-tracks are converted to target length and aspect angle (in the text file; the original position information is retained in the binary file). An aspect angle of zero degrees is defined as a fish swimming directly downrange. Positive angles up to 180 degrees are calculated when the

nose is at a more positive bearing with respect to the tail location, and vice versa for negative aspect angles.

When frames are not advancing (*Pause* or *Still Mode*) the mouse functions (assuming *Measure* is off) are:

|                    |  |
|--------------------|--|
| <i>Left</i>        | Erase current point (centroid, nose and tail) if clicked on<br>Enter/replace current centroid point in blank space |
| <i>Shift-Left</i>  | Enter/replace nose point   |
| <i>Shift-Right</i> | Enter/replace tail point   |

While file is playing, the mouse functions (assuming *Measure* is off) are:

|                  |   |
|------------------|---|
| <i>Left</i>      | Enter/replace current centroid point                |
| <i>Ctrl-Left</i> | Erase current track point (centroid, nose and tail) |

In either case the following functions are active:

|                             |  |
|-----------------------------|--|
| <i>Right (unzoomed)</i>     | Zoom to 1.25m range window centered on cursor      |
| <i>Right (unzoomed box)</i> | Zoom into subrange defined by box length           |
| <i>Right (zoomed)</i>       | Return to full window range                        |
| <i>Ctrl-Right</i>           | Select current track (click on any point in track) |

The current track will be automatically cleared when the last point is erased using either the single point *Left* or continuous (*Ctrl-Left*) functions.

Tracks in memory may be exported to a disk file using the *Export* button. The file names default to *OpenFileName.log* and *OpenFileName.dat* for text and binary file types, respectively. Selecting an existing file will overwrite the file.

Tracks may be imported for viewing or editing using the *Import* button, which will overwrite any track information in memory up to the length of the imported file. The user selects an existing *CursorTrackFile.log* file, and the corresponding *CursorTrackFile.dat* file is read into the cursor track structure in memory. The encoded source filename is compared against the currently open playback file, and an error message is generated if they do not match.

## Export Frame Headers Sub-Sub-Menu

### *First Frame Only*

Keystroke: **None**      Toolbar Icon: **None**

This flag when set will export header information from the first frame only of each file when the *Run Batch* flag is set before starting the export operation. Use this option when the parameter(s) of interest is slowly changing, such as water temperature or humidity.

### *Generate .csv File*

Keystroke: **None**      Toolbar Icon: 

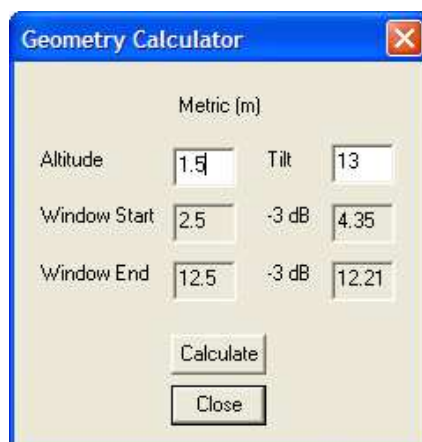
Use this command to export parameters from the *.ddf* or *.aris* file frame headers to a *.csv* (comma-separated value) format file that may be opened directly into *Microsoft Excel* or other spreadsheet applications for plotting or otherwise analyzing the data. The subset of parameters exported comprise *Date, Time, Go Time, Go Delta, Humidity, Focus, Depth, Heading, Pitch, Roll, Latitude, Longitude, Rot Pan, Rot Tilt, Rot Roll, Water Temp, CPU Temp, Battery Voltage, Main Voltage* and *Current Focus*. Some parameters are only available in *.aris* files.

If the *Batch Mode* flag is set before setting this flag, the frame header parameters from all files in the current playback folder will be automatically exported to a single output *.csv* file.

## *Geometry Calculator*

Keystroke: **None**      Toolbar Icon: **None**

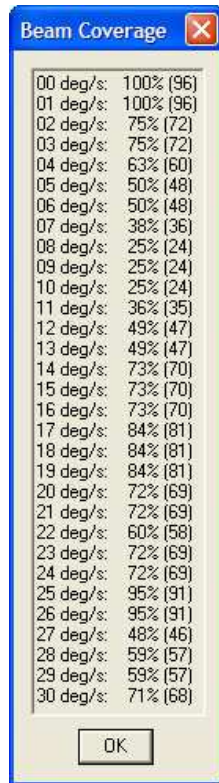
Use this command to estimate the optimal geometry for the sonar altitude as a function of sonar tilt, or sonar tilt as a function of altitude. The calculations assume the imaged area is level, and determine the best altitude(tilt) or tilt(altitude) based on the current settings of *Window Start* and *Window Length*. Tilt is measured in degrees (positive) down from the horizontal. Altitude will be indicated in meters or feet depending on the current state of the *Units* flag.





Heading Rate Keystroke: **None**  
Calculator

Toolbar Icon: **None**



| Heading Rate (deg/s) | Beam Coverage (%) | Count |
|----------------------|-------------------|-------|
| 00                   | 100%              | (96)  |
| 01                   | 100%              | (96)  |
| 02                   | 75%               | (72)  |
| 03                   | 75%               | (72)  |
| 04                   | 63%               | (60)  |
| 05                   | 50%               | (48)  |
| 06                   | 50%               | (48)  |
| 07                   | 38%               | (36)  |
| 08                   | 25%               | (24)  |
| 09                   | 25%               | (24)  |
| 10                   | 25%               | (24)  |
| 11                   | 36%               | (35)  |
| 12                   | 49%               | (47)  |
| 13                   | 49%               | (47)  |
| 14                   | 73%               | (70)  |
| 15                   | 73%               | (70)  |
| 16                   | 73%               | (70)  |
| 17                   | 84%               | (81)  |
| 18                   | 84%               | (81)  |
| 19                   | 84%               | (81)  |
| 20                   | 72%               | (69)  |
| 21                   | 72%               | (69)  |
| 22                   | 60%               | (58)  |
| 23                   | 72%               | (69)  |
| 24                   | 72%               | (69)  |
| 25                   | 95%               | (91)  |
| 26                   | 95%               | (91)  |
| 27                   | 48%               | (46)  |
| 28                   | 59%               | (57)  |
| 29                   | 59%               | (57)  |
| 30                   | 71%               | (68)  |

Use this command to calculate beam coverage versus heading rate. If the sonar platform has control over heading rate, the images may be optimized for the current settings of *Window Start* and *Window Length*.

Mark  
Depth Profile

Keystroke: **None**

Toolbar Icon: 

This command allows the manual processing of an image file generated in a vertical lens orientation, such that the bottom return will show up as a line running down the length of the image. When first invoked a reminder dialog will appear to prompt for proper the *Reverse* setting. Then a *Profile Data* dialog will accept values for lens depth (in inches or cm) and lens tilt (in degrees). Next the user clicks along the bottom image from minimum range to maximum range until the bottom profile is marked satisfactorily. A previously entered mark may be removed by clicking on it.

A right-click will process the marked profile and display the data both numerically and graphically. The profile may be saved using the *Image->Capture->Save Frame as Jpg* command. The user is queried on saving the depth data as a comma-delimited text file on exiting the *Mark Depth Profile* mode. Selecting an existing file will append the current data.

Mark  
Fish Profile

Keystroke: **None**

Toolbar Icon: 

This command allows the manual marking of fish within an image file generated in a vertical lens orientation, such that the bottom return will show up as a line running down the length of the image. When first invoked a reminder dialog will appear to prompt for proper the *Reverse* setting. Then a *Profile Data* dialog will accept values for lens depth (in inches or cm) and lens tilt (in degrees). Next the user clicks each fish to be recorded into a text file. A mark whose size is

set by *Processing->Echogram->Marker->{Small, Medium, Large}* will be displayed for +/- *Frame Rate* frames around the marked frame. A previously entered mark may be removed by clicking on it.

A right-click will process the marked vertical fish distribution and display the data both numerically and graphically. Another right-click reverts back to normal image display. The profile plot may be saved using the *Image->Capture->Save Frame as Jpg* command. On exiting the *Mark Fish Profile* mode, a text file named *FishProfile\_filename.txt* will be written to the current aux output folder.

*Mark Targets* Keystroke: **None**      Toolbar Icon: 

Opens or creates a target file, and enables target marking (recording). In playback mode, targets are marked within a given frame by first drawing across the width of the target with the mouse, and then drawing down the length of the target shadow. The estimated target width and height will be displayed in the *Mark Target* dialog. Clicking the *Record* button will write the target information to the file. Up to 16 targets may be marked in any given frame, and mistakes may be erased by using the *Clear* button (clears only those targets marked in the current frame, one at a time). Changing the current frame will clear the target markings.

In real-time mode, targets are marked with a single mouse click at the range and bearing desired. Then the target type, confidence and annotation information may be entered before clicking the *Record* button.

In either mode, clicking *Record* will also automatically export a *.jpg* of the current frame with the filename in the form *TGT\_CurrentFile\_FrameN\_TargetN\_Type\_ConN*.

## Modify Frame Headers Sub-Sub-Menu

*Copy PC Clock->Sonar Clock*

Keystroke: **None**      Toolbar Icon: **None**

This flag when set allows files with missing or corrupted sonar clock data to be rewritten with values from the PC clock parameter. Use "File->Save" or "File->Save As" to rewrite the clock information to the same or new file, respectively.

If the *Batch Mode* flag is set before setting this flag, all files in the current playback folder will be automatically corrected to new filenames with the addition of a *\_Fix* suffix.

*Fix 4-Beam Offset*

Keystroke: **None**      Toolbar Icon: **None**

Use this command to correct image files recorded with software version V5.18.xx which incorrectly wrote the image data 4 bytes early relative to the start of each frame. First set this flag, then use the *File->Save As* command to rewrite the image file to a new filename. Verify the image beam mapping correction, and then delete the original *.ddf* image file.

If the *Batch Mode* flag is set before setting this flag, all files in the current playback folder will be automatically corrected to new filenames with the addition of a *\_Fix* suffix.

### **Force Mixed Format Sub-Sub-Sub-Menu**

*Type 1/2/3*

This enables forced adjustment of data alignment in *.ddf* files recorded with mismatched topside software and sonar firmware. Normally this should be detected and corrected automatically, but some combinations may not be handled automatically. If setting one of these flags allows an image file to be played normally, then the *File->Save As* command may be employed to rewrite the file in a "pure" DDF\_03 or DDF\_04 file format.

*Interpolate Lat/Long Data*

When this flag is set during file playback, the latitude and longitude data recorded in the frame headers N seconds apart (see next entry) is used to calculate interpolated position data so that each frame will contain a unique latitude/longitude position, effectively increasing the GPS output rate.

### **Interpolation Period Sub-Sub-Sub-Menu**

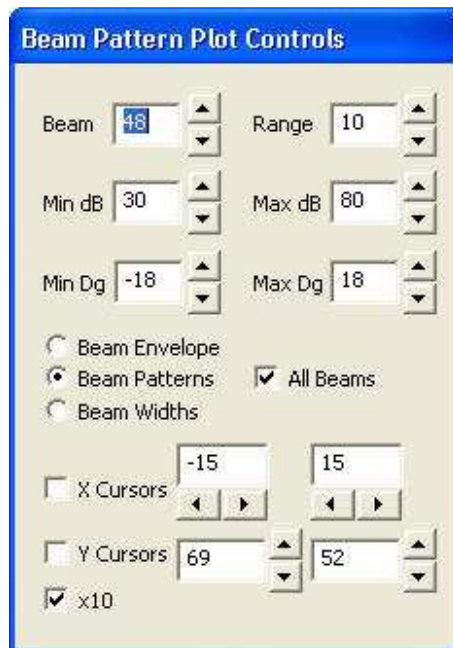
*1/2/5/10 Seconds*

Sets the period between GPS interpolation endpoints. A larger value will ensure smoother motion between frames, but may not be as accurate if the sonar velocity is not constant.

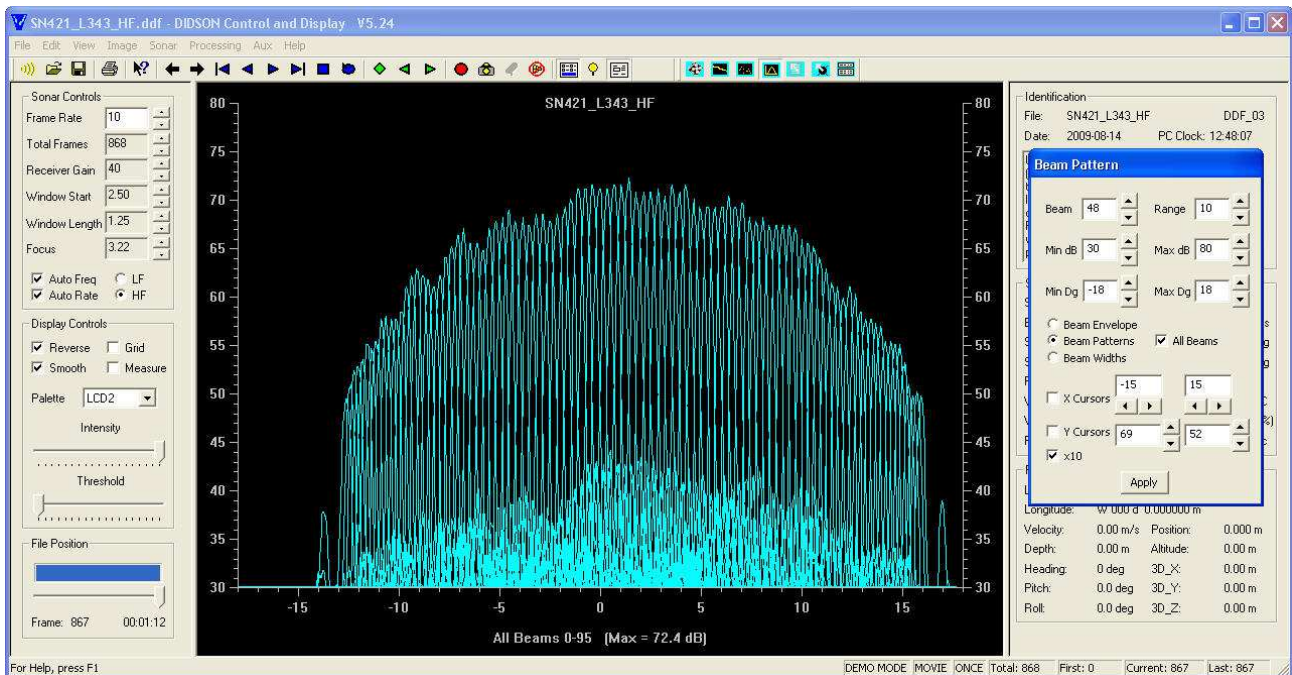
*Plot Beam Patterns*

Keystroke: **None**      Toolbar Icon: **None**

This command processes calibration .ddf files recorded at Sound Metrics for validating the performance of acoustic lenses. A reference target is suspended in a fixed location in the water column, and the sonar is rotated while recording data such that the target image sweeps across the entire field-of-view, recording the angular orientation of the sonar into each frame header. When the file has been opened for playback, executing this command processes the image data for plotting in three views: *Envelope*, *Beam Patterns*, and *Beam Widths*. Scaling controls and measurement cursors are available to examine the pattern data in detail.



- |                      |  |
|----------------------|--|
| <i>Beam</i>          | Select single beam number ( <i>All Beams</i> unchecked)    |
| <i>Range</i>         | Data for each beam are plotted +/- <i>Range</i> /2 degrees |
| <i>Min dB</i>        | Minimum value for Y axis scaling in dB                     |
| <i>Max dB</i>        | Maximum value for Y axis scaling in dB                     |
| <i>Min Dg</i>        | Minimum value for X axis scaling in degrees                |
| <i>Max Dg</i>        | Maximum value for X axis scaling in degrees                |
| <i>Beam Envelope</i> | Plot maximum intensity of beam versus angle                |
| <i>Beam Patterns</i> | Plot intensity of [One/All] beams versus angle             |
| <i>Beam Widths</i>   | Plot 2-way beamwidths at the -3, -6 and -20 dB levels      |
| <i>X Cursors</i>     | Enable X Cursors with position readouts/controls           |
| <i>Y Cursors</i>     | Enable Y Cursors with position readouts/controls           |
| <i>X10</i>           | Multiple cursor movement increment by 10                   |



*Beam Pattern Plot of All Beams*

*Track Target* Keystroke: **None**      Toolbar Icon: **None**

After automatically enabling *Foreground Smoothing* and *Detect Motion* processing and setting a minimum cluster size and minimum threshold in "Processing->Show Parameters", playing back the file will acquire and track a single target (assumes no other targets in the image), and write the range and bearing to the target (also target present) in the frame header. Use "File->Save" or "File->Save As" to retain the new header information.

## Aux Menu

*Audio Record* Keystroke: **None**      Toolbar Icon: 

Use this command start and stop manual audio recording. If recording in *Voice Activated* mode, the audio file will be opened immediately, but actual recording will not commence until the input exceeds the previously calculated threshold volume (see *Audio Setup* below).

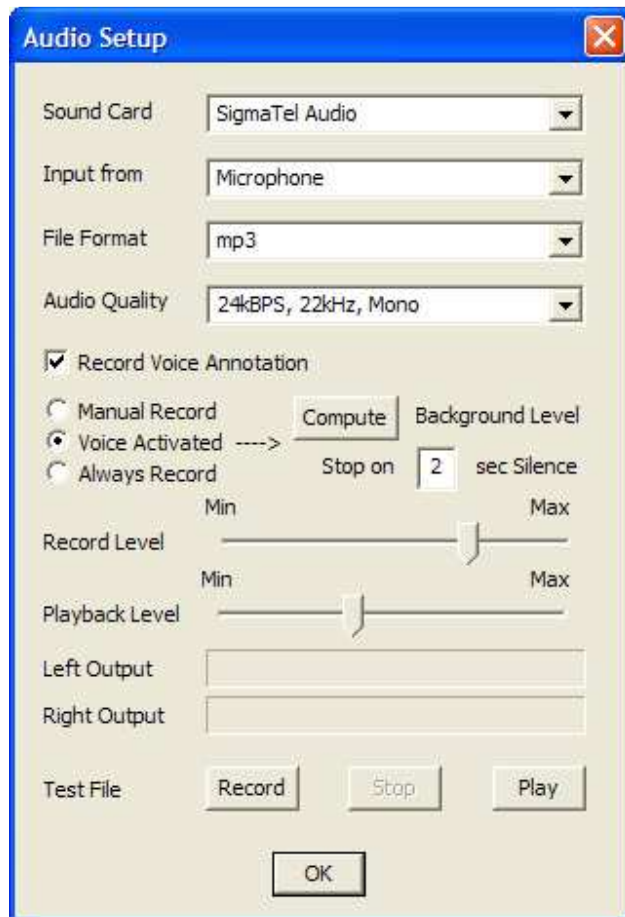
*Audio Setup* Keystroke: **None**      Toolbar Icon: **None**

Use this command to launch the *Audio Setup* dialog.

The *Sound Card* parameter allows the selection of any installed audio device.

The *Input From* parameter selects the audio source for recording.

Choose the audio file type with the *File Format* parameter, such as *.mp3*, *.wav*, *.wma*, etc.



The *Audio Quality* list shows the available recording modes for the selected file format.

Check the *Record Voice Annotation* box to enable audio note recording into the current (real-time or playback) file.

Select the recording mode from *Manual* (toggle on/off with *Aux->Audio Record* command), *Voice Activated* (starts on input over threshold as defined by the *Compute Background Level* function; stops on N seconds of silence), or *Always* (record audio continuously whenever image frames are being recorded).

The two sliders enable control over *Record Level* and *Playback Level*. If using the *Voice Activated* mode, always click on *Compute Background Level* after changing the *Record Level* value. The *Left Output* and *Right Output* meters monitor the input levels during computation of background levels and test file recording. Use the *Record*, *Stop*, and *Play* buttons to record a test file using the current settings, to check for the appropriate trade-off between audio quality and file size.

*Mute Audio*

Keystroke: **None**

Toolbar Icon: 

## Playback

Use this command to prevent the playback of audio notes when index marks are encountered in the frame headers. Any currently playing audio note will stop when this flag is set.

## Rotator Control

Keystroke: **None**      Toolbar Icon: **None**

This dialog allows control of a *Sound Metrics X2*, *Remote Ocean Systems PT-10/PT-25* or *Sidus Solutions SS250* pan and tilt unit. For ROS and Sidus rotators, the manufacturer and communication parameters are set in the *Aux->Select* dialog. The SMC X2 rotator has a different dialog interface (see below).

**Pan & Tilt Control**

Pan 0.4 deg      Tilt 19.8 deg

Apply

Show All

**Pan Motor**

|               |             |   |
|---------------|-------------|---|
| Left Limit    | Right Limit | <input checked="" type="checkbox"/> Rev L-R |
| Factory: -180 | 180         | <input checked="" type="radio"/> Absolute   |
| User: -120    | 120         | <input type="radio"/> Relative              |
| Velocity: 10  | Brake%: 10  | <b>GO</b>                                   |
| Position: 0.4 | Go to...: 0 |   |

**Tilt Motor**

|                |             |   |
|----------------|-------------|---|
| Up Limit       | Down Limit  | <input checked="" type="checkbox"/> Rev U-D |
| Factory: 90    | -90         | <input checked="" type="radio"/> Absolute   |
| User: 30       | -30         | <input type="radio"/> Relative              |
| Velocity: 5    | Brake%: 10  | <b>GO</b>                                   |
| Position: 19.8 | Go to...: 0 |   |

**Test Controls**

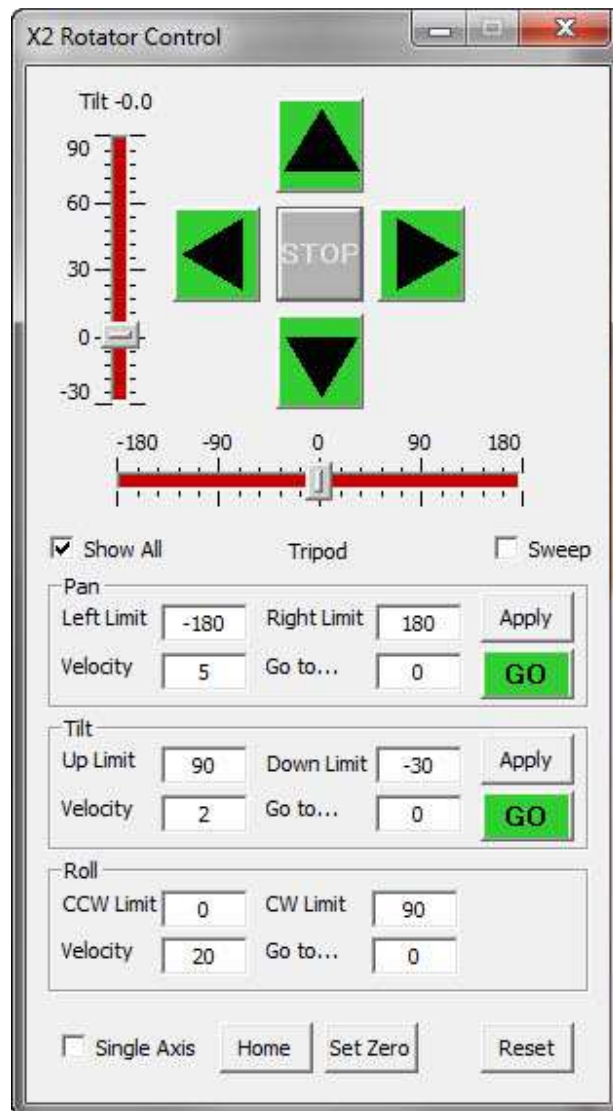
Cycle      Home      Start BP       Horizontal

Single Axis       Stall Check       Vertical

|                       |  |
|-----------------------|--|
| Factory CCW Limit     | factory limit for CCW rotation (-180 degrees)  |
| Factory CW Limit      | factory limit for CW rotation (+180 degrees)   |
| User Left/Right Limit | user set limits, must be between factory settings  |
| User Up/Down Limit    | user set limits, must be between factory settings  |
| Velocity              | ROS: rotation speed in degrees/second [0.5 – 20.0 for the PT-10, and 0.5-10.0 for the PT-25] in 0.5 deg steps.<br><br>Sidus: rotation speed in degrees/second [0.1 – 20.0]<br><br>SMC: rotation speed in degrees/second [0.0 – 40.0] |
| Brake                 | brake force in percent [0=no brake, 100=max brake]   |
| Position              | current rotation position in degrees   |
| Go to                 | enter desired position in degrees  |
| Rev L-R/U-D           | reverse sense of rotation to account for sonar mount   |
| Cycle                 | move between user set limits (loops)   |
| Single Axis           | first pan, then tilt for combination moves   |
| Stall Check           | monitor position and stop motor if stalled   |
| GO                    | rotate from current position to desired position   |
| Up Arrow              | tilt up while button is pressed  |
| Down Arrow            | tilt down while button is pressed  |
| Left Arrow            | pan left while button is pressed   |
| Right Arrow           | pan right while button is pressed  |
| Apply (STOP)          | update settings – limits, speed, brake, etc. The settings may also be updated with <i>Enter</i> (stop rotation during GO command)  |

In addition, the keyboard arrow keys will control *Up/Down/Left/Right* motion, while the space bar invokes the *Stop* command.



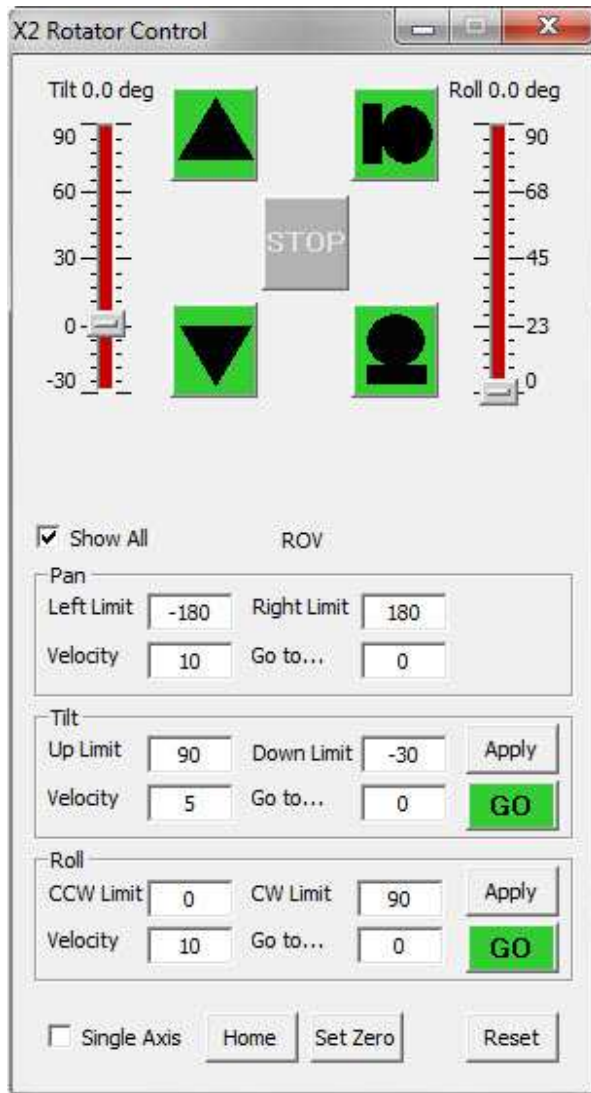


*Tripod or Pole mount control dialog*

|                 |  |
|-----------------|--|
| Up Arrow        | tilt up while button is pressed  |
| Down Arrow      | tilt down while button is pressed  |
| Left Arrow      | pan left while button is pressed   |
| Right Arrow     | pan right while button is pressed  |
| STOP (when red) | stop rotation during <i>Go to...</i> or <i>Sweep</i> command   |
| Sweep           | moves to left pan limit, then moves to the right pan limit in increments set by the <i>Active FOV</i> control in the <i>Image-&gt;Wide FOV</i> dialog. The rotator tilts alternately to the up and down limits at each pan |

|                   |   |
|-------------------|---|
|                   | increment to cover a desired volume for 3D rendering. (loops)   |
| Show All          | display entire dialog. This is cleared by default for a simple interface showing just the controls listed above.  |
| Left/Right Limits | user set limits, between -180 and 180 degrees   |
| Up/Down Limits    | user set limits, between 90 and -30 degrees for <i>Tripod</i> mount, and between 30 and -90 degrees for <i>Pole</i> mount   |
| CCW/CW Limits     | not applicable for <i>Tripod</i> or <i>Pole</i> mounts  |
| Velocity          | rotation speed up to 40 degrees/second on any axis  |
| Apply             | set user limits and velocity for <i>Go to...</i> moves, including slider drag moves. Arrow controls will respond immediately to new velocity values with no <i>Apply</i> necessary                                      |
| Go to             | enter desired position in degrees   |
| GO                | rotate from current position to desired position  |
| Single Axis       | first pan, then tilt for combination moves to limit maximum power draw (including <i>Home</i> command)  |
| Home              | return to Pan = 0, Tilt = 0   |
| Set Home          | set the current position to Pan = 0, Tilt = 0. The user limits remain the same, so be careful to observe mechanical rotation constraints and change user limits as necessary to prevent damage to the sonar or rotator. |
| Reset             | clears any motor fault caused by a stall or excessive loading and resets user limits and velocity values  |

In addition, the keyboard arrow keys will control *Up/Down/Left/Right* motion, while the space bar invokes the *Stop* command, even when not active (gray).



ROV mount control dialog

|                    |  |
|--------------------|--|
| Up Arrow           | tilt up while button is pressed  |
| Down Arrow         | tilt down while button is pressed  |
| 'Vertical Sonar'   | roll towards lens vertical while button is pressed   |
| 'Horizontal Sonar' | roll towards lens horizontal while button is pressed   |
| STOP (when red)    | stop rotation during <i>Go to...</i> or <i>Sweep</i> command   |
| Sweep              | not applicable for ROV mount orientation   |
| Show All           | display entire dialog. This is cleared by default for a simple interface showing just the controls listed above. |

|                   |  |
|-------------------|--|
| Left/Right Limits | not applicable for <i>ROV</i> mounts   |
| Up/Down Limits    | user set limits, between 30 and -90 degrees  |
| CCW/CW Limits     | not applicable for <i>Tripod</i> or <i>Pole</i> mounts   |
| Velocity          | rotation speed up to 40 degrees/second on any axis   |
| Apply             | set user limits and velocity for <i>Go to...</i> moves, including slider drag moves. Arrow controls will respond immediately to new velocity values with no <i>Apply</i> necessary                                       |
| Go to             | enter desired position in degrees  |
| GO                | rotate from current position to desired position   |
| Single Axis       | first tilt, then roll for combination moves to limit maximum power draw (including <i>Home</i> command)  |
| Home              | return to Tilt = 0, Roll = 0   |
| Set Home          | set the current position to Tilt = 0, Roll = 0. The user limits remain the same, so be careful to observe mechanical rotation constraints and change user limits as necessary to prevent damage to the sonar or rotator. |
| Reset             | clears any motor fault caused by a stall or excessive loading and resets user limits and velocity values   |

In addition, the keyboard arrow keys will control *Up/Down/Roll CCW/Roll CW* motion, while the space bar invokes the *Stop* command, even when not active (gray).

### **X2 Rotator Sub-Menu**

*Auto Home*    Keystroke: **None**    Toolbar Icon: **None**

Set this flag to return the X2 rotator to its home position (Pan = 0, Tilt = 0, Roll = 0) upon application exit, before powering down the system. The X2 rotator will always read its position as home when powered up, so to maintain a consistent orientation it needs to be returned to the home position before powering down. A new home position may be designated with the *Set Home* button on the rotator control dialog. Any physical orientation may be set as *Home*, but be careful to observe any mechanical constraints on rotation when adjusting the *Home* position or changing the user rotation limits.

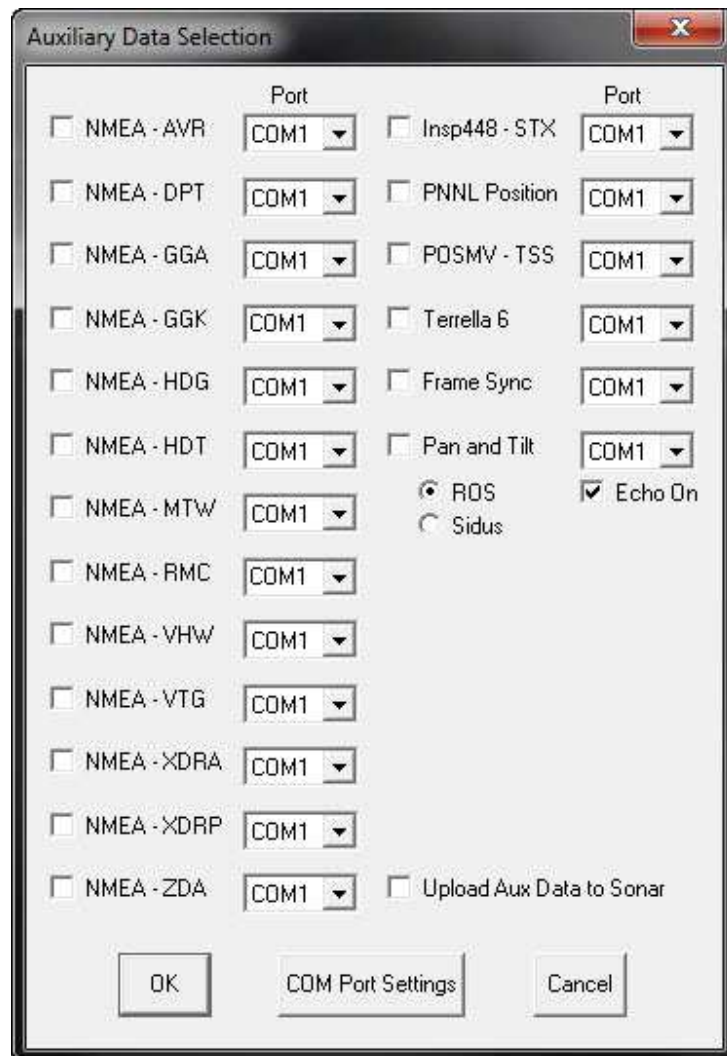
*Detected*    Keystroke: **None**    Toolbar Icon: **None**

This flag is set when an X2 rotator is sensed by the DIDSON on power-up. The rotator control dialog is automatically enabled (but not launched until requested).

*Setup*                      Keystroke: **None**                      Toolbar Icon: **None**

This dialog allows selection of the X2/DIDSON mount orientation as a *Tripod*, *Pole* or *ROV* configuration. Check the *Set Defaults* box before clicking one of the buttons to restore maximum range on rotation limits for the indicated mount orientation.

*Select*                      Keystroke: **None**                      Toolbar Icon: **None**



Use this command to select auxiliary data input via the client PC serial port(s), whether physical or mapped as a virtual USB COM port. The data will be stored in the frame headers at the appropriate locations.

An arbitrary number of NMEA input messages may be multiplexed on a single COM port. All other inputs/controls must have a unique COM port assignment. If multiple messages are selected containing the same data (e.g. *velocity*,

*heading, water temperature, etc.*) then the frame headers will be overwritten with message data in alphabetical order.

The command *Sonar->Test->Display Debug Data* will generate test messages which will be output on the indicated COM port.

Setting the *Upload Aux Data to Sonar* flag will enable the transmission of selected aux input data to the sonar with every frame request. If the sonar is operating in *Broadcast* mode then any active *Slave* applications will have access to the same aux input data as the *Master* application/PC.

## Help Menu

|                         |   |
|-------------------------|---|
| <i>Topics</i>           | Keystroke: <b>None</b> Toolbar Icon: <b>None</b>                      |
|                         | Display table of contents for online help.                            |
| <i>Index</i>            | Keystroke: <b>F1</b> Toolbar Icon: <b>None</b>                        |
|                         | Gives brief descriptions of software controls by function.            |
| <i>About<br/>DIDSON</i> | Keystroke: <b>None</b> Toolbar Icon: <b>None</b>                      |
|                         | Software version and contact information for help from SMC personnel. |

## 1.2 Sonar controls

Each control has an edit box that allows the user to type in a value or activate the up/down arrow that increments/decrements the edit box value. The arrows are activated by a mouse click. When typed, the command is executed when *Enter* on keyboard is pressed.

### **Frame Rate**

Sets the real-time or playback frame rate in frames/s. Real-time rates are limited by the settings of *Window Start* and *Window Length* settings. Generally the farther the max range, the slower the frame rate due to increased time for sound to get to the maximum range and return. A frame rate is calculated and inserted by the program each time the *Window Start* or *Window Length* setting is changed if the *Auto Rate* box is checked. The user can modify the suggested value. If the frame rate is set too fast, a red square will blink on the lower left side of the displayed image. This indicates that a frame has not been received within the expected period because the frame rate is set too fast. When the computer sets the frame rate, it will monitor late frames and incrementally lower the frame rate until frames are kept in sync with frame requests.

**Auto Rate** adjusts the frame request period in increments smaller of ~2.5%, resulting in non-integer frame rate values. The actual rate is displayed in the *Header* pane, and the *Control* pane rate will update to a rounded integer representation of the true frame rate. Unchecking *Auto Rate* will restrict operation to integer values for *Frame Rate*. A parameter in the frame header records the true update period in milliseconds, so that actual frame rates may be displayed on file playback.

Playback rates may go from 1 to 100 frames/s. In Playback mode, the cursor controls ↑ and ↓ may also be used to control the frame rate (the *Shift* modifier sets the rate increment or decrement factor to 10.

**Total Frames**

Sets the number of frames to record into the next disk file in real-time mode. It displays the total number of frames in playback mode. The total frames may be between 1 and 99999. HOWEVER, you may get a lower number due to available disk space on your computer. When you enter a file length, the application checks available space and may return with a reduced number of allowed frames.

If *Total Frames* is set to zero, then the number of frames stored in the current file is limited only by disk space available. Recording will continue into the current file until toggled off, or the disk is full.

**Receiver Gain**

Sets the sonar receiver gain to a relative value between 0 and 40 dB. Displays the current value of the receiver gain. The transmit power cannot be changed. It is always at maximum. **Reducing the receiver gain instead of transmit power is the best way to maintain the best overall signal-to-noise ratio.**

**Window Start**

Sets the beginning range (in meters) of the displayed data. The accepted parameters vary from .38m to 11.6m in 0.38m steps in the high frequency mode and vary from 0.75m to 23.25m in 0.75m steps for the low frequency mode (standard windows), or from .42m to 13.02m in 0.42m steps in the high frequency mode and vary from 0.84m to 26.04m in 0.84m steps for the low frequency mode (extended windows). These numbers are entered by clicking the up or down arrows. Values can be typed as well. The closest legal value will replace the typed value.

**Window Length**

Sets the length of the sector display. The accepted values are listed below along with the associated down range resolution and sampling.

| Standard Length<br>(m) |           | Range bin length<br>(mm) | $F_{\text{samp}}$<br>(kHz) |
|------------------------|-----------|--------------------------|----------------------------|
| 36.0                   | (LF only) | 70                       | 10                         |
| 18.0                   | (LF only) | 35                       | 20                         |
| 9.0                    |           | 18                       | 41                         |
| 4.5                    |           | 9                        | 83                         |
| 2.25                   | (HF only) | 4.5                      | 166                        |
| 1.13                   | (HF only) | 2.2                      | 333                        |

| Extended Length<br>(m) |           | Range bin length<br>(mm) | $F_{\text{samp}}$<br>(kHz) |
|------------------------|-----------|--------------------------|----------------------------|
| 40.0                   | (LF only) | 80                       | 9                          |
| 20.0                   | (LF only) | 40                       | 18                         |
| 10.0                   |           | 20                       | 37                         |
| 5.0                    |           | 10                       | 74                         |
| 2.5                    | (HF only) | 5                        | 149                        |
| 1.25                   | (HF only) | 2.5                      | 298                        |

On the sector display, the minimum range is the *Window Start* setting and the maximum range is *Window Start + Window Length*.

**Focus** Sets the focus of the sonar. Scales from 1.0 m to Infinity (which is typically about 32 m). The sonar will automatically set the focus to the mid-range of the selected display window. The operator can override the auto focus by entering a new focus parameter.

**Auto Freq** When checked, the sonar will switch between high frequency and low frequency as a function of maximum selected range. The switching point is 15 m. When not checked, the sonar will stay in the selected HF or LF mode for all ranges.

**Auto Rate** When checked, the sonar will calculate the highest theoretical frame rate for any *Window Start/Window Length* combination, and set the current *Frame Rate* to that value (maximum of 10). The rate may be adjusted manually up to 30 frames/sec at any time, subject to acoustic travel time and data processing/transfer limitations.

### 1.3 Display Controls

**Reverse** Reverses left and right on the display. This allows the sonar to be mounted right side up or up side down on a vehicle or shaft and still maintain correct orientation on the display.

**Grid** Toggles a grid, which is a set of arcs equally spaced in range (0.5 or 1.0 m) and radial lines spaced 4° in azimuth. This helps specify the location of an object on the display.

**Smooth** Selecting *Smooth* interpolates between the 96 or 48 beams. Depending on the display settings, *smooth* will interpolate and map double or quadruple the number of physical beams. If doubled, summing the beams on either side of the interpolated line with weights (.50, .50) at each range bin derives the interpolated beam. If quadrupled, the three interpolated beams between two beams have weights of (.75, .25), (.50, .50), and (.25, .75) of the beam values on each side. Interpolation reduces the blocky appearance of the image and generally makes it more pleasing to the eye.

**Measure** Enables the user to make measurements on, and calculate ranges to, displayed objects. Place the mouse cursor at the upper left corner of a rectangle you wish to form around an object or between two objects. Drag the mouse to the lower right corner and release the left button. A rectangle will remain overwritten on the display. Below the display, you will see the length, width, and diagonal of the box expressed in meters with resolution of 0.01 m. Simply clicking the mouse within the display window (without forming a box) will display the range to that point, which remains as a yellow dot.

**Palette** Changes the display between *CRT* (blue → white → red), *GRAY* (black → gray → white), *LCD* (blue → white → red), *RED* (red → white) and other palettes. Clicking *View->Palette* will display the currently selected palette of colors scaled by the *Intensity* and *Threshold* values. Another click on *View->Palette* will return to the sector display.



**Intensity** Scales the top end of the palette. Values may be changed from 10 dB to 90 dB. Decreasing the intensity value will brighten the image. For example, if *Intensity* is set to 70, echo returns 30 dB below receiver saturation will be displayed in the color at the “top” (far right) of the palette.

On playback the current *Intensity* setting is replaced with the value found in the file data. The stored setting may be changed by selecting the desired value with the control, and then using *File*→*Save As* to rewrite the original data.

**Threshold** Scales the bottom end of the palette. Values may be changed from 0 dB to 80 dB. Increasing the threshold value will remove small returns and noise marks from the image.

On playback the current *Threshold* setting is replaced with the value found in the file data. The stored setting may be changed by selecting the desired value with the control, and then using *File*→*Save As* to rewrite the original data.

#### 1.4 Real-time Mouse Control of the Image Window

When the *Sonar->Mouse Extensions* flag is set and not in *Measure* mode, the mouse may be used to re-center and/or rescale the data acquisition window. These actions only work in *Demo Mode* or while the sonar is connected (e.g. not for use during playback).

A simple left-click will re-center the current window length around the clicked (vertical) position in the window. If the end range crosses the crossover point with *Auto Freq* enabled, then the frequency will automatically change to reflect the new end range value.

Left-clicking and dragging will draw a box in the display window. When the left mouse button is released, the window will re-center and zoom in to the closest window length approximating the height of the drawn box. If the sonar is currently in LF mode and the requested window length is less than the shortest LF window (5.00m), then the sonar will switch to the 5.00m HF window, assuming that *Auto Freq* is enabled and that the new end range is less than the crossover point.

Right-clicking the mouse will re-center the display window around the clicked (vertical) position and zoom out to the next window length. If *Auto Freq* is enabled then the sonar will switch to LF when the new end range passes the crossover point, even if the window length is available as a HF choice.

These controls may be enabled/disabled with the *Sonar->Mouse Extensions* flag.

#### 1.5 File Header

File header information is displayed on the right side of the display window. In real time, this gives the current settings of the system. In playback it gives the settings when the data were stored. The definitions of the parameters follow:

##### Identification

|            |  |
|------------|--|
| File:      | Current file name                                    |
| Date:      | Date file was made                                   |
| Time:      | Time (real-time = current, playback = when recorded) |
| Header ID: | Text entered by the user when file was made.         |
| ID1:       | (user-labeled) 32-bit integer identifier             |
| ID2:       | (user-labeled) 32-bit integer identifier             |

ID3: (user-labeled) 32-bit integer identifier  
 ID4: (user-labeled) 32-bit integer identifier  
 Rate: Rate frames were stored in frames/s  
 Frames: Total frames in file

Sonar Status ( firmware revision )

Serial Number: Sonar serial number  
 Beams: Number of beams: 48 (LF) or 96 (HF)  
 Samples: Number of range bins sampled in each beam.  
 Smpl Rate: Sampling rate of down-range samples  
 Rcv Gain: Receiver Gain setting during data collection  
 Win Start: Data window start range in display  
 Win Length: Data window length in display  
 Focus: Focus range in data window  
 Frequency: Sonar frequency  
 Sspd: Assumed sound velocity to determine range of echoes.  
 Sonar Pan/Heading: Compass heading (if installed) or pan of sonar from rotator  
 Sonar Tilt: Absolute pitch of sonar (if compass installed) or tilt from rotator  
 Sonar Roll: Roll of sonar from compass (if installed) or rotator  
 A/D Temp: Internal temperature of sonar in Celsius on A/D board  
 PS Temp: Internal temperature of sonar in Celsius on PS board  
 Humidity: Relative humidity of sonar in percent. A leak increases humidity.  
 Power: DC voltage at input to sonar Power Supply board.

Platform Status

Latitude: (filled through *Aux->Select* or user inserted as type *double*)  
 Longitude: (filled through *Aux->Select* or user inserted as type *double*)  
 Velocity: (filled through *Aux->Select* or user inserted as type *float*)  
 Depth: (filled through *Aux->Select* or user inserted as type *float*)  
 Heading: (filled through *Aux->Select* or user inserted as type *float*)  
 Pitch: (filled through *Aux->Select* or user inserted as type *float*)  
 Roll: (filled through *Aux->Select* or user inserted as type *float*)  
 Position: (filled through *Aux->Select* or user inserted as type *float*)  
 Altitude: (filled through *Aux->Select* or user inserted as type *float*)  
 3D\_X: (user inserted as type *float*)  
 3D\_Y: (user inserted as type *float*)  
 3D\_Z: (user inserted as type *float*)