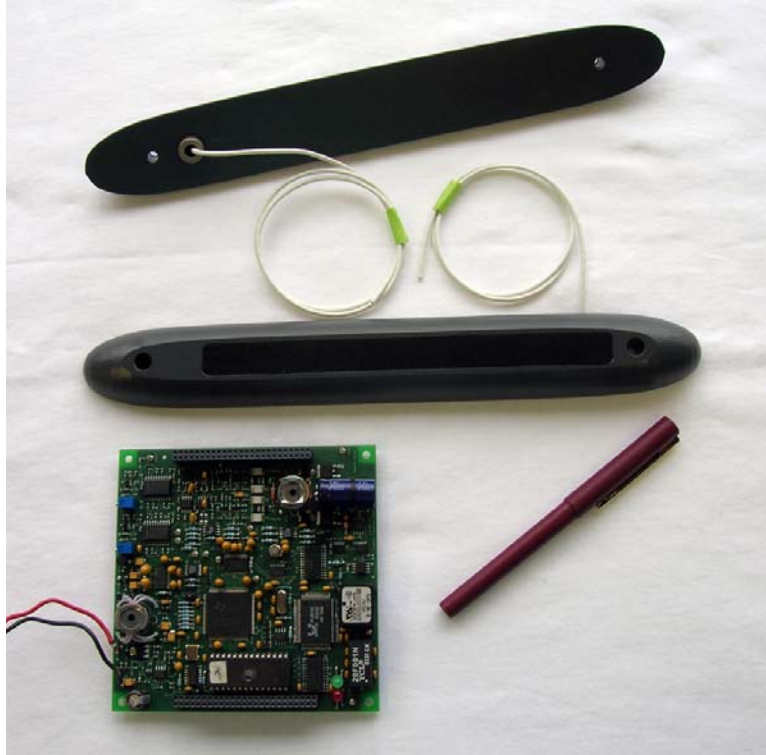


## SIDESCAN SONAR KIT (ETHERNET COMMUNICATIONS)

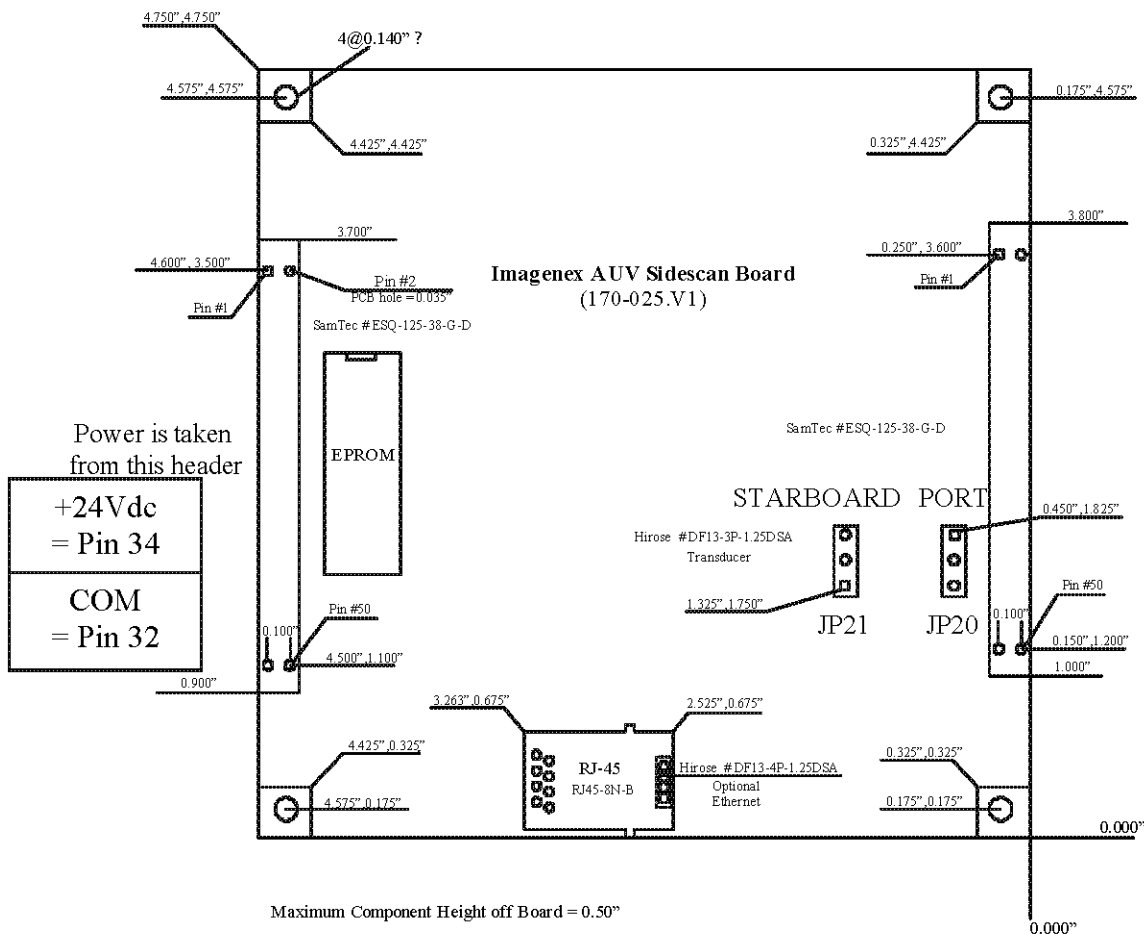


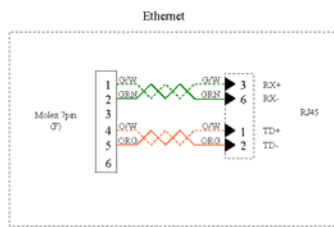
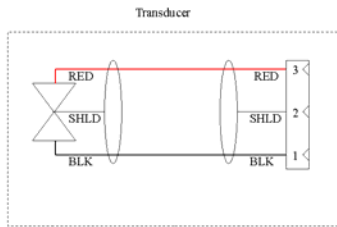
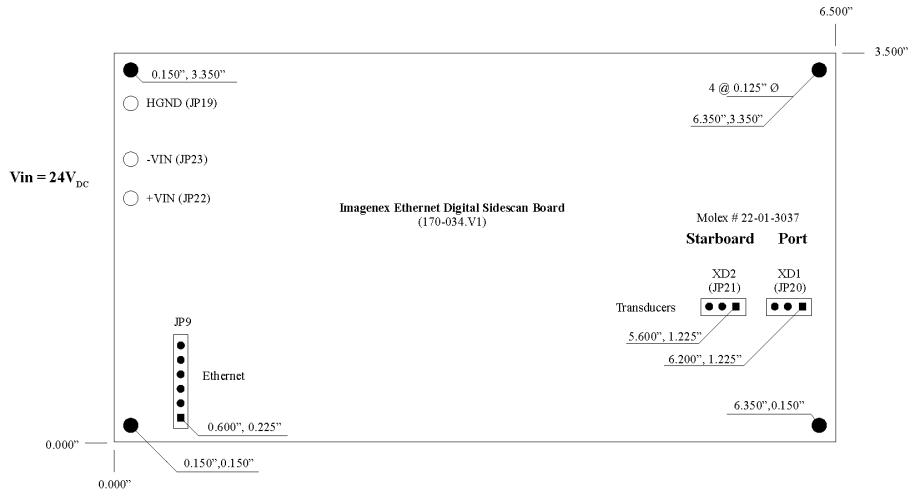
Shown with standard transducers & board

<b>HARDWARE SPECIFICATIONS:</b>	
<b>INTERFACE</b>	Ethernet
<b>FREQUENCY</b>	260 kHz / 330 kHz / 800 kHz nominal
<b>TRANSDUCER BEAM WIDTH</b>	260 kHz: 2.2° x 75° 330 kHz: 1.8° x 60° 800 kHz: 0.7° x 30°
<b>RANGE RESOLUTION</b>	Range scale ÷ 1000
<b>POWER SUPPLY</b>	Nominal 24 VDC (22 VDC – 33 VDC) at less than 2.5 Watts
<b>ELECTRONICS DIMENSIONS</b>	120.65 mm (4.75") x 120.65 mm (4.75") 111.76 mm (4.4") between mounting holes or <b>Narrow PCB Option:</b> 88.9 mm (3.5") x 165.1 mm (6.5") 81.28 mm (3.2"), 157.48 mm (6.2") between mounting holes
<b>TRANSDUCER DIMENSIONS</b>	See drawing on p. 3
<b>WEIGHT: In Air</b>	<b>Transducers</b> 385 g (0.8 lbs) each
	<b>Electronics</b> 121 g (0.3 lbs)

<b>SOFTWARE SPECIFICATIONS:</b>	<b>YellowFin_AUV.exe</b>
<b>WINDOWS™ OPERATING SYSTEM</b>	Windows™ XP, Vista, 7, 8, 10
<b>ZOOM MODES</b>	1x, 2x, 3x, 4x, and 5x dynamically moveable
<b>RANGE SCALES:</b>	10 m, 20 m, 30 m, 40 m, 50 m, 60 m, 80 m, 100 m, 125 m, 150 m, and 200 m
<b>FILE FORMAT</b>	(filename).872
<b>RECOMMENDED MINIMUM COMPUTER REQUIREMENTS:</b>	800MHz Pentium 3 256 MB RAM 2 GB Hard Disk 1024 x 768 x 256 colour graphics

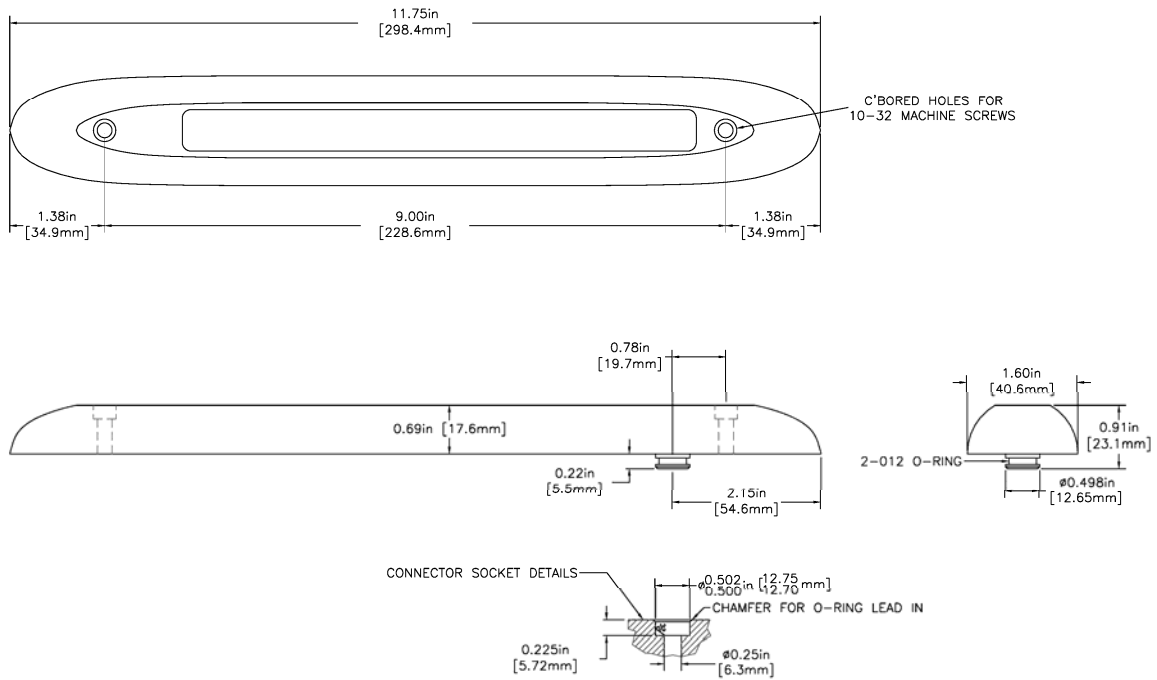
<b>COMMUNICATIONS PROTOCOL SPECIFICATIONS:</b>	
<b>ETHERNET INTERFACE SPECIFICATION (v1.00)</b>	Filename: Sidescan Ethernet Specification.pdf
<b>SOURCE CODE AVAILABLE FOR TESTING</b>	RecordData.cpp





896-000-15x-040  
Mechanical Layout  
and Wiring Connections  
#410-053-02  
May 07, 2013

### Narrow PCB Option



<b>ORDERING INFORMATION:</b>		
<b>260 kHz / 330 kHz / 800 kHz UNIT with Remote Mount Faired Transducers</b>	Standard	896-000-150
IP Address*	Option	-020
Remote Mount Transducers with 24" pigtail**	Option	-025
Remote Mount Transducers with connector**	Option	-026
Narrow PCB	Option	-040

\*Note: Standard IP Address is 192.168.0.5  
A different IP Address may be specified upon ordering.

\*\*Note: Various connector/cable configurations available to be specified upon ordering.

Product and company names listed are trademarks or trade names of their respective companies.



# Table of Contents

<b>WHAT'S NEW IN YELLOWFIN 2.0</b> .....	<b>II</b>
<b>1.0 SYSTEM DESCRIPTION</b> .....	<b>1</b>
<b>2.0 GETTING STARTED:</b> .....	<b>1</b>
2.1 SCREEN LAYOUT.....	1
2.2 OPERATIONS: .....	1
2.3 INTERROGATING THE SONAR UNIT: .....	2
2.4 FILE PLAYBACK: .....	2
2.5 SONAR IMAGE MANIPULATION.....	3
<b>3.0 MAIN MENU</b> .....	<b>4</b>
3.1 FILE MENU COMMANDS .....	4
3.2 VIEW MENU COMMANDS.....	6
3.3 COLOR TABLE MENU COMMANDS .....	8
3.4 SETTINGS MENU COMMANDS .....	8
3.5 COMMUNICATION MENU COMMANDS.....	8
3.6 MEASURE MENU COMMANDS.....	9
3.7 GPS OPTIONS MENU COMMANDS.....	11
3.8 EVENTS MENU COMMANDS ( <i>NEW</i> ).....	12
3.9 HELP MENU COMMANDS.....	15
<b>4.0 TOOLBARS AND FILE PLAYBACK PROGRESS DIALOG BAR</b> .....	<b>16</b>
4.1 MAIN TOOLBAR .....	16
4.2 FILE PLAYBACK PROGRESS DIALOG BAR .....	17
<b>5.0 DIALOG BOXES</b> .....	<b>18</b>
5.1 CONNECTION DIALOG BOX .....	18
5.2 OPEN DATA FILE DIALOG BOX.....	19
5.3 SAVE YELLOWFIN DATA FILE DIALOG BOX.....	19
5.4 SONAR SETTINGS DIALOG BOX.....	20
5.5 DIAGNOSTICS DIALOG BOX.....	21
5.6 GPS SERIAL PORT CONFIGURATION DIALOG BOX .....	23
<b>APPENDIX A – TARGET HEIGHT CALCULATION</b> .....	<b>25</b>
<b>APPENDIX B – EXTERNAL RESOURCES</b> .....	<b>26</b>
<b>APPENDIX C – DATA STORAGE FILE FORMAT (.872)</b> .....	<b>27</b>
<b>APPENDIX D – ANNOTATION FILE FORMAT (.AN)</b> .....	<b>31</b>
<b>APPENDIX E – ETHERNET INTERFACE SPECIFICATION (V1.01)</b> .....	<b>32</b>
<b>APPENDIX F – WIRING DIAGRAMS</b> .....	<b>39</b>

# Table of Figures

FIGURE 1 - YELLOWFIN MENUS.....	4
FIGURE 2 - EVENT INFORMATION ENTRY DIALOG BOX.....	13
FIGURE 3 - EVENT INFORMATION DIALOG BOX.....	13
FIGURE 4 - EVENT INFORMATION PREVIEW / EDIT DIALOG BOX .....	14
FIGURE 5 - MAIN TOOLBAR .....	16
FIGURE 6 - FILE PLAYBACK PROGRESS BAR.....	17
FIGURE 7 - CONNECTION DIALOG BOX.....	18
FIGURE 8 - SONAR SETTINGS DIALOG BOX .....	20
FIGURE 9 - DIAGNOSTICS DIALOG BOX.....	21
FIGURE 10 - GPS SERIAL PORT CONFIGURATION DIALOG BOX.....	24
FIGURE 11 - TARGET HEIGHT CALCULATION .....	25
FIGURE 12 - YELLOWFIN TOW CABLE WIRING DIAGRAM.....	39

## **What's New in YellowFin 2.0**

Numerous updates and features have been added to YellowFin version 2.0. Some of the major features are listed below.

- NEW*** • Added Event Marker capability to allow annotation of data files (See Section 3.8 on page 12).
- NEW*** • Added GPS satellite information to indicate how many satellites are detected (See Section 5.6 on page 23 ).
- NEW*** • Added Bitmap View display mode for rapid file playback (See Section 3.2 on page 6 ).
- NEW*** • Added reverse file playback mode for enhanced file playback control (See Section 3.2 on page 6 ).




## 1.0 System Description

The Imagenex Model 872 "YellowFin" is a full-featured dual channel, high-resolution, side-scan sonar. The YellowFin is an affordable, user friendly system that incorporates a high speed Ethernet connection to your Windows™ based laptop or desktop PC. Integrated power and an optional differential-ready GPS receiver complete this fantastic system. Zoom windows are available for target investigation without interrupting real-time data acquisition. Data is displayed in real-time, with or without speed correction, in 9 user selectable color tables.

## 2.0 Getting Started:

After you are sure you have correctly wired the system, turn the power on to the surface processor and

your computer. After the operating system started, double click the program icon  on your desktop screen to launch the YellowFin program. You can exit this application by clicking the close window button at the upper right corner of the screen or use the menu command "File->Exit".

YellowFin.exe is a Windows program that controls, displays and records data from the YellowFin Sidescan Sonar System. The program uses a high speed Ethernet connection (10Mbps) to communicate with the Model 872 sonar processing unit.

This document describes how to use the commands provided by the YellowFin program to control the Model 872 sonar unit and how to view the data.

### 2.1 Screen Layout



The default screen layout of YellowFin.exe program provides a vertically displayed sonar image with a user menu on top and a toolbar at left, as well as a status bar at the bottom in real-time data acquisition operation. If you run YellowFin.exe for file playback, there will be a Playback bar shown under the user menu. You can resize the sonar image display window and hide the toolbar or status bar by using the menu command: "View->Tool Bar" or "View->Status Bar" or "View->Playback Bar".

### 2.2 Operations:

When you start running the YellowFin.exe program, it first prompts you with a dialog box asking if you want to run it in real-time sonar data acquisition mode or run file playback. If you want to run real-time sonar data, please click the "YES" button. The program will try to connect to the sonar head using the specified IP address. If you only want to playback a file, please click the "NO" button and the program will not connect to the sonar head. This also saves time in case there is no Ethernet connection available.


## 2.3 Interrogating the sonar unit:

Real-time sonar data interrogation needs communication between the YellowFin program and the sonar unit. The communication protocol is based on high speed Ethernet. The YellowFin.exe program uses another thread to send operation commands to the sonar head and then receive sonar data returns.


You can save real-time data to a file by using the menu command "*File->Record Data*" or clicking the Toolbar button  for post process or later inspection. Use the menu command "*File->Stop Recording*" or clicking the Toolbar button  to quit saving data.

## 2.4 File playback:

You can also use the YellowFin program to playback data that has been recorded to a file (with file extension ".872" or ".xtf").

To open a .872 or .xtf data file to playback, use the menu command "*File->Open a file*" or click the Toolbar button . When the program is running with file playback, the frame window will show a File Playback dialogue bar under the main menu. You can drag and dock it to a convenient place on the screen. This dialogue bar lets you control the playback speed and playback file position. See the section "File Playback Progress Dialog Bar" section for details.

Once you open a sonar data file to playback, the operation of real-time sonar data acquisition will stop. You can open only one data file to play back at a time. But you can open another data file to playback during file playback, the previously opened file will be closed.

You can once again change the operation to real-time data interrogation by using the menu command "*File->Connect...*", "*Communication->Reconnect*" or click the Toolbar button . When the system starts to acquire data from sonar head, opened data file will be closed. If the Ethernet connection is lost or failed, you can use the menu command "*Communication->Reconnect*" to reconnect.



**Note:** There are several things that can cause lost or failed connection. One is that the user turned the power to the surface processor off. The other is that the Ethernet connection is not configured correctly.

The YellowFin program provides several convenient ways (menu commands, dialog boxes, and toolbar commands) to control the sonar unit's operations, operating parameters, and data display windows.

## 2.5 Sonar Image Manipulation

The YellowFin program uses a bitmap image with the size of the display screen to display the sonar image. When the program receives one sonar shot data either from real-time or playback, the data will be displayed at the top line of the image and the previous shots will be shifted down.

You can use the command "*Zoom In*" or command "*Zoom Out*" to zoom in or out the image and use the command "*Hold*" to pause the image display. When you zoom in, the image size will be larger than the display window size. Thus, some portion of the image will be hidden beyond the size of the display window. If you want to see the hidden part of the image, you can drag the image to let that part fall in the display window. You can move the image by holding down the left mouse button and dragging (moving) the image. When you release the left mouse button, the image dragging operation will stop. Use the command "*Restore Image*" to restore the sonar image to its original size and position.



**Note:** If the hold command is activated during file record, data is still recorded although the display does not move. This allows the user to inspect an area of interest without losing any data

### 3.0 MAIN MENU

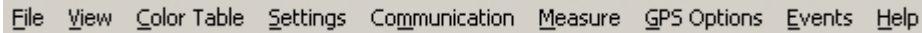










Figure 1 - YellowFin Menus

#### 3.1 File menu commands






The File menu offers the following commands:

<p><i>Connect to Sonar Head...</i></p>	<p>Use this command to establish an Ethernet connection between the sonar head and the control computer. If the connection is established successfully, the YellowFin program will start to interrogate the sonar head for data in real-time. This command is very useful when you change the operation from file playback to real-time data acquisition. If this command is disabled, which means the program is operating in real-time data acquisition mode not in file playback mode. If the connection has failed, after a minute or so, the program will display an error message "No Connection!". You can check the wiring and reconnect the network again by using the "<i>Communications-&gt;Reconnect</i>" command.</p> <p>Shortcuts</p> <p>Toolbar Button: </p> <p>Keys: Ctrl+N</p>
<p><i>Playback...</i></p>	<p>Use this command to open a previously recorded YellowFin sonar data file (with the file extension .872 or .xtf) to play back. The YellowFin program displays the File Open dialog box so you can choose which file you want to open.</p> <p>Shortcuts</p> <p>Toolbar Button: </p> <p>Keys: Ctrl+O</p>
<p><i>Record Data or Copy Start...</i></p>	<p>Use this command to save real-time sonar data to a file or copy part of a file to another one during playback. YellowFin displays the Save As dialog box so you can name your file. The file name can be any characters and digits combined. YellowFin will automatically add file name extension .872 or .xtf to your file name, depending on what file format you choose, so you don't have to type the file extension. Then YellowFin will continue interrogating the sonar unit for data and at the same time recording those data to your named file.</p> <p>You can use the Stop Recording command to quit recording data. YellowFin then closes the named file.</p> <p>During file playback, "<i>Record Data</i>" is replaced with "<i>Copy Start</i>". This allows you to copy data from one file to a separate file.</p> <p>Shortcuts</p> <p>Toolbar: </p> <p>Keys: Ctrl+S</p>

<p><i>Stop Recording or Copy Stop</i></p>	<p>Use this command to stop recording or copying sonar data to a file. YellowFin will close the file. You can use the "Playback..." command to open it for playback.</p> <p>Shortcuts</p> <p>Toolbar: </p> <p>Keys: Ctrl+Z</p>
<p><i>Settings Change Alarm</i></p> <p><b>New</b></p>	<p>Use this command to play a sound when a setting changes during file playback. Supported settings are: Range, Mode, and End of File</p>
<p><i>Save Screen</i></p>	<p>Use this command to save the whole sonar image to a named image file. The image file formats can be ".bmp", ".jpg", ".png", ".tiff", and ".gif".</p>
<p><i>Save Selected</i></p>	<p>Use this command to save part of the sonar image to a named image file. The image file formats can be .bmp, jpg, .png, .tiff, and .gif.</p> <p>Note: Before you use this command, you should use toolbar "select"  command to select an image area. Put the display on hold, then push the "select"  button and the program is in the select mode. Hold down the left button of your mouse at the start point and drag the mouse to the end point of your interested area and then release the button. The program will draw the selected area with dashed lines. If you are not satisfied about this selected area, you can select again and your first selected area will be discarded. After you selected an area, you can use this command to save it to an image file.</p> <p>You should click the "select"  button again to release this select mode so the program can respond to other commands.</p> <p>If there is no selected area available, this command will be disabled.</p>
<p><i>Exit</i></p>	<p>Use this command to terminate your YellowFin program. The system will save your display layout, sonar settings, and GPS configuration to a text file called YellowFin.ini. Next time you start the program, the system will load these settings from this file.</p> <p>Mouse: Double-click the application's Control menu button.</p>  <p>Keys: ALT+F4</p>

### 3.2 View menu commands

The View menu offers the following commands:

<p><i>Clear Screen</i></p>	<p>Use this command to clear the image in display window.</p> <p>Shortcuts</p> <p>Toolbar Button: </p> <p>Keys: c</p>
<p><i>Grid</i></p>	<p>Use this command to display and hide the vertical grid line.</p>
<p><i>Grid Text Size</i></p>	<p>Use this command to change the text size used as range text marks displayed at the bottom of the display window and measurement text marks.</p>
<p><i>Hold</i></p>	<p>Use this command to pause the image display. Toggle this command to pause or continue the image display. Note that this holds the display only. Data will still be recorded to the current file.</p> <p>Shortcuts</p> <p>Toolbar Button: </p> <p>Keys: h</p>
<p><i>Bitmap View</i></p> <p><b>NEW</b></p>	<p>Use this command to display the sonar data one screen at a time. Rather than the typical waterfall display, this display uses the standard Windows scroll bar to control the file position. Scrolling the bar up will advance the file forward, while scrolling the bar down will advance the file in reverse.</p>
<p><i>Reverse Playback</i></p> <p><b>NEW</b></p>	<p>Use this command to play the data file in reverse.</p>
<p><i>Zoom In</i></p>	<p>Use this command to zoom in the image. This command centers the zoom area on the mouse position. The zoom factors are 1x1, 2x2, 3x3, 4x4, and 5x5.</p> <p>Shortcuts</p> <p>Toolbar Button: </p> <p>Keys: z</p>
<p><i>Zoom Out</i></p>	<p>Use this command to zoom out the image.</p> <p>Shortcuts</p> <p>Toolbar Button: </p> <p>Keys: z</p>
<p><i>Restore Image</i></p>	<p>Use this command to restore the sonar image to its original size and position. When you move the image by clicking and dragging the image, and then zoom in/out on the image, the image may not be seen in the viewing window. Use this command to restore the image to its original size and position.</p> <p>Shortcuts</p> <p>Toolbar Button: </p> <p>Keys: r</p>

<i>Port Only</i>	Use this command to display only the Port channel. Note that, if recording a file, both channels are always recorded regardless of the display view.
<i>Stbd Only</i>	Use this command to display only the Starboard channel. Note that, if recording a file, both channels are always recorded regardless of the display view.
<i>Both Sides</i>	Use this command to display both Port and Starboard channels.
<i>Status bar</i>	Use this command to display and hide the status bar, which shows some of the important information in YellowFin, such as operating range, data gain, etc. A check mark appears next to the menu item when the Status bar is displayed.
<i>Toolbar</i>	Use this command to display and hide the toolbar, which includes buttons for some of the most common commands in YellowFin, such as playback and measurement commands, such as measure target height and measure distance. A check mark appears next to the menu item when the Toolbar is displayed.
<i>File Playback bar</i>	Use this command to display and hide the File Playback Progress dialog bar , which includes playback speed spin buttons and file playback progress display. A check mark appears next to the menu item when the File Playback bar is displayed.
<i>Show Range</i>	Use this command to show or hide the range display in the upper left corner of the image.
<i>Show Mark Shadow</i>	Use this command to show or hide the black background for the text marker display.
<i>Units</i>	Use this command to choose which display units you like to use. Range and distance can be displayed in meters (Metric) or feet (Imperial).
<i>Vertical Blending</i>	Use this command to blend data from adjacent pings. This technique uses the ships' speed to determine bottom coverage, and is therefore only valid if the ships' speed is not zero.
<i>Color Indicator</i>	<p>Use this command to display and hide the color table indicator bar, which displays the color table used to represent echo strength. If enabled, this color table bar is displayed on the right side of the sonar image display window. The upper level colors represent higher echo strength, and lower level colors represent lower echo strength. A check mark appears next to the menu item when color table indicator bar is displayed.</p> <p>Use the menu command ColorTable to choose your preferred colors to display the sonar image.</p>

### 3.3 Color Table Menu Commands

The Color Table menu is used to change the sonar data colour palettes for the sonar images.

YellowFin uses colours (called a colour table) to represent echo data strength (amplitude). For example: Normal High intensity color table used for mapping the echo data amplitude to 256 colors ranging from Black (low strength level) through blue, green, orange yellow white and red (highest strength level).

The Color Table menu offers the following commands:

<i>Normal High</i>	Standard colour table used for mapping the echo data amplitude to 256 colours ranging from Black (low level), through Blue, Green, Orange, Yellow, White and Red (highest level).
<i>Normal Low</i>	Same colours as Norm Hi, but uses a lower colour intensity.
<i>Green</i>	256 shades of green.
<i>Grey</i>	256 shades of gray (White on Black).
<i>Reverse Grey</i>	256 shades of gray (Black on White).
<i>Brown/Yellow</i>	256 mixed shades of brown and yellow.
<i>Green/Blue</i>	256 mixed shades of green and blue.
<i>Green/Yellow</i>	256 mixed shades of green and yellow.
<i>Blue</i>	256 shades of blue.

### 3.4 Settings Menu Commands

The Settings menu offers the following commands:

<i>Sonar Settings</i>	Display the Sonar Settings Dialog Box. If the dialog box is visible, this command will be disabled.
-----------------------	---

See Sonar Settings Dialog Box and Diagnostics Dialog Box for details about sonar settings and diagnostic items.

### 3.5 Communication Menu Commands




The Communication menu offers the following commands:



<i>Reconnect</i>	Use this command to re-establish the connection between the PC and the sonar head. This command is different from "File->Connect to Sonar Head..." which is used to change operation from file playback to real-time acquisition. The "Reconnect" command is used to reconnect the Ethernet link in real-time acquisition mode.
<i>Diagnostics</i>	Display the Diagnostics Dialog Box. If the dialog box is visible, this command will be disabled.



### 3.6 Measure Menu Commands

The Measure menu offers the following commands:

<p><i>Draw '+' Mark</i></p>	<p>This command is used to draw a mark (+) on the screen at the current mouse position by first clicking the command and then clicking the target that you want to draw the mark on. Repeat the operation to draw more marks.</p> <p>Shortcuts</p> <p>Toolbar Button: </p>
<p><i>Measure Target Height</i></p>	<p>This command is used to measure the approximate height off the bottom of a target (assuming a flat bottom). When selected, the cursor will display '<b>Click on the Target</b>'. At this point, position the target cursor on the target of interest and press the left mouse button. A Horizontal rubber-banded line is drawn from the cursor position to the beginning of the transmit pulse with the message '<b>Click on First (Bottom) Return</b>'. Position the cursor so that the end of the rubber-banded line is at the beginning of the bottom return (the end of the water column) and press the left mouse button again. The message '<b>Click on Shadow Start</b>' is now displayed. Position the cursor at the beginning of the shadow that the target has cast and press the left mouse button. The message '<b>Click on Shadow End – H = ???M</b>' is displayed. Move the cursor to the end of the shadow to display the height measurement. Press the left mouse button again to begin a new measurement.</p> <p>Shortcuts</p> <p>Toolbar Button: </p>
<p><i>Measure Range</i></p>	<p>Measures horizontal (slant) range between the sonar and the target or current mouse position. Draws a horizontal line on the screen, with the range shown.</p> <p>This command is used to measure the range from the center of the sonar to a target. When you first click on the command, the YellowFin program will draw a temporary horizontal line from the center of the sonar to the current mouse position. Move the mouse to a selected target and the temporary horizontal line moves with the mouse. Click on the target, the YellowFin.exe program will draw that horizontal line permanently. The Range mark "xxx.x m" or "xxx.x ft" is shown at the end of the line.</p> <p>Shortcuts</p> <p>Toolbar Button: </p>

<i>Measure Distance</i>	<p>Measures the distance between two targets. Draws a line on screen, with the distance shown.</p> <p>This command is used to measure the distance between two targets by clicking on one target and moving the cursor to the other target and clicking on it in the display window. This command draws a line connecting these two selected targets, a start symbol (+) and a stop symbol (+). The distance between these two targets is shown as “xxx.x m” or “xxx.x ft” at the end of the line.</p> <p><b>Note:</b> The ship (or sensor) speed is needed to measure along track distance (along the ship heading direction) correctly.</p> <p>Shortcuts</p> <p>Toolbar Button: </p>
<i>Clear Lines/Marks</i>	<p>Deletes all lines and symbols and text marks drawn on the screen.</p> <p>Shortcuts</p> <p>Toolbar Button: </p>



**Note:** Since the sonar image is displayed as a moving picture, it is highly recommended that you place the display on hold before doing any measurements and clear those lines and marks before you release the hold status. If recording to a file, data will still be saved while the display is on hold.

### 3.7 GPS Options menu commands

The Communication menu offers the following commands:

<b>Show GPS Track Plotter</b>	Use this command to open another window, which displays the sonar (or the ship) track plotted according to the GPS provided latitude and longitude information.
<b>GPS Comm Port Settings</b>	Configure the serial communication port for GPS data acquisition. The baud rate, stop bits, parity, etc. should match those of the GPS receiver.
<b>Speed Correction</b>	Use this command to enable or disable Speed Correction.  The ship's (or sensor) speed information is obtained from the system GPS receiver. The YellowFin program will use the ship's speed and slant range information to adjust the aspect ratio of the sonar image.
<b>Convert UTC to Local Time</b>	Use this command to display the UTC time in local time coordinates.
<b>Synchronize with GPS Time</b>	Use this command to adjust the computer's time to match the GPS time.
<b>Erase GPS Tracks</b> <i>New</i>	Use this command to clear the GPS track plotter window.
<b>Zoom in</b>	Use this command to zoom in the GPS track plot window using the following grid divisions: 10m, 20m, 50m, 100m, 200m, 500m, 1000m.  Shortcuts  Keys: +, =
<b>Zoom out</b>	Use this command to zoom out the GPS track plot window using the following grid divisions: 10m, 20m, 50m, 100m, 200m, 500m, 1000m.  Shortcuts  Keys: -

### 3.8 Events menu commands (*New*)

When recording real-time data to a file, events can be recorded at the same time.




**Note:** The ".AN" annotation file is linked to the ".872" data file. Do not rename one file without renaming the other. Do not edit the ".AN" file. Failure to comply will result in errors, and/or lost event markers.

The Events menu offers the following commands:

<p><b>Enable Event Input</b> <i>New</i></p>	<p>Use this command to enable / disable event recording. This menu item is only active during file playback or while real-time data is being recorded.</p>
<p><b>Hide Event Marker</b> <i>New</i></p>	<p>Use this command to enable / disable event marker display on the screen. This menu item is only active during file playback or while real-time data is being recorded.</p>
<p><b>Auto Event Info PopUp</b> <i>New</i></p>	<p>Use this command to display the Event Information Dialog Box. Descriptions about this event may be entered in the annotation area. This menu item is only active during file playback or while real-time data is being recorded.</p>
<p><b>Event Review/Edit</b> <i>New</i></p>	<p>Use this command to review, edit, or delete an event/annotation. This menu item is only active during file playback or while real-time data is being recorded.</p>

#### Real-Time

To enable event recording, click the menu item "*Events->Enable Event Input*", then "**double click**" the target of interest. The Event Information Dialog Box will appear. Descriptions about this event may be entered in the annotation area. The event information will be written to an annotation file (using the same file name as the data file but with a ".AN" as the file extension), and an event mark  will be drawn at the cursor position. For each additional Event Mark, the number inside the circle will increase. Click "**Cancel**" to discard this event. Select "*Events->Hide Event Marks*" to hide the event marks.

#### File Playback

If there is an annotation file accompanied with this playback file, the event marks will be drawn on the sonar image when the file reaches the point where the event was recorded.

More events may be added the same way as described in the real-time event recording method. Added events will be written to the same annotation file. If there is no annotation file for this data file, the program will create an annotation file and write the events info to it.

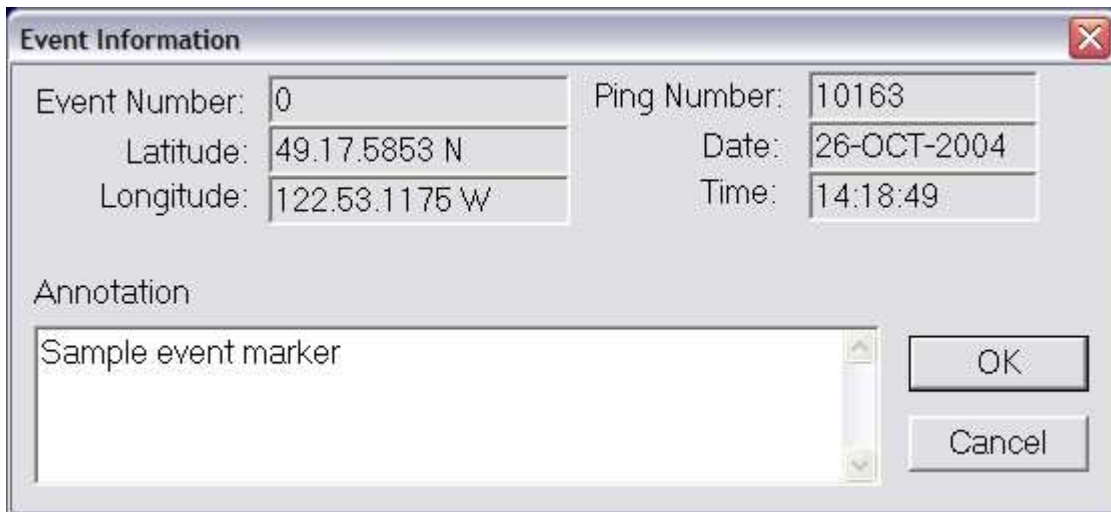


Figure 2 - Event Information Entry Dialog Box

Menu items "*Events->Auto Event Info PopUp*" and "*Events->Event Preview/Edit*" are used for file playback. When you enable "*Auto Event Info PopUp*", an event info dialog box will appear when an event marker occurs.

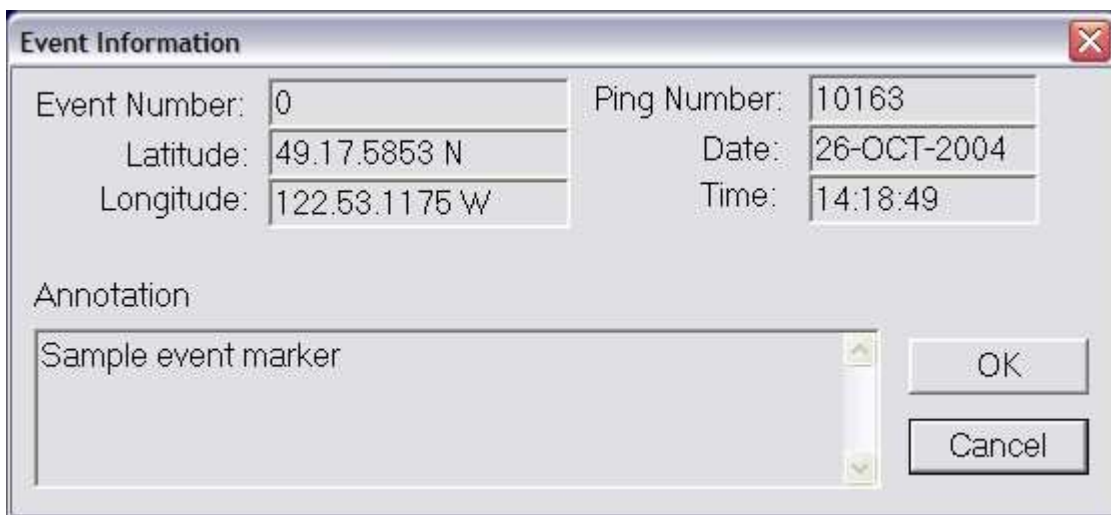


Figure 3 - Event Information Dialog Box

By selecting "*Events->Event Review/Edit*", the descriptions of the events can be edited or deleted.

The dialog box titled "Event Information" contains the following fields and controls:

- Event Number: 0
- Ping Number: 10163
- Latitude: 49.17.5853 N
- Date: 26-OCT-2004
- Longitude: 122.53.1175 W
- Time: 14:18:49
- Annotation: Sample event marker
- Navigation buttons: PREV, NEXT, EDIT, DELETE
- Action buttons: OK, Cancel


Figure 4 - Event Information Preview / Edit Dialog Box



**Note:** The Latitude/Longitude used for the event is the GPS antenna position for the selected ping (i.e. offsets to the target are not calculated).

### 3.9 Help menu commands

The Help menu offers assistance with this application:

<i>Beam Coverage</i>	Use this command to run the Sidescan beam coverage program which gives a graphical depiction of the area covered by the acoustic signal in different modes.
<i>About YellowFin</i>	Use this command to display the copyright notice and version number of your copy of YellowFin as well as contact information.  Toolbar Button: 

## 4.0 Toolbars and File Playback Progress Dialog Bar

### 4.1 Main Toolbar



Figure 5 - Main Toolbar

The main toolbar is displayed at the left of the application window. The toolbar provides quick mouse access to many tools used in the YellowFin program. To hide or display the Toolbar, choose Toolbar from the View menu.

Click To



Connect to sonar head.



Open an existing data file to play back.



Save real-time acquired sonar data to a file or copy playback data to another file.



Stop saving real-time data or stop copying playback data.



Increase operating range by one level.

Range: 10m, 20m, 30m, 40m, 50m, 60m, 80m, 100m, 125m, 150m, and 200m for **low** and **medium** frequency.

Range: 10m, 20m, 30m, 40m, and 50m for **high** frequency



Decrease operating range by one level.



Increase data (display) gain by 1% (0~100%).



Decrease data (display) gain by 1% (0~100%).



Clear the screen.



Toggle this command to pause or continue the image display.



Zoom in. The zoom factors are 1x1, 2x2, 3x3, 4x4 and 5x5



Zoom out. The zoom factors are 1x1, 2x2, 3x3, 4x4 and 5x5



Select an image rectangle area to save to an image file.



Draw a mark (+) on the screen at the current mouse position.



Measure target height.



Measure distance between two targets.



Measure slant range from the center of the sonar to the target.



Deletes all lines and marks drawn on the screen.



Restore image to its original size (1x1) and position.



Show the about dialog box displaying the copyright notice and version number of your copy of YellowFin as well as contact information.



## 4.2 File Playback Progress Dialog Bar



Figure 6 - File Playback Progress Bar

<i>File Progress</i>	A slider bar with a pointer showing file playback position. Dragging the pointer to a new position will cause the file playback to start at that position. The slider range represents the file size. Note: You should always drag the pointer to a proper file playback position and avoid clicking on the edge of the slider bar, since that will cause the pointer stop moving as the file playback goes along. In that case, the pointer position will not reflect the file playback position correctly. You can drag the pointer once again to make the pointer move correctly.
<i>Play Back Speed</i>	Pressing the spin button up or down will change the playback speed faster or slower. The speed change will show in the adjacent progress bar.

## 5.0 Dialog Boxes

### 5.1 Connection Dialog Box

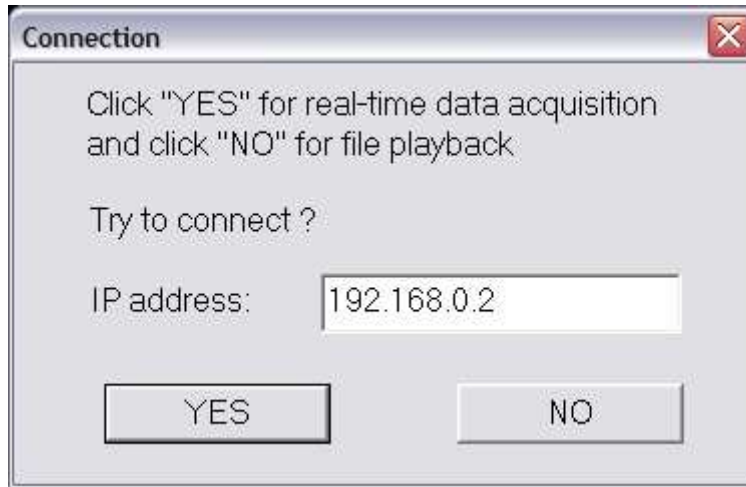


Figure 7 - Connection Dialog Box

This dialog box will appear when you start your YellowFin program. If you are ready for real-time data acquisition, click the "YES" button. The program will connect to the sonar head via an Ethernet link. If you only want to playback data files, please click "No" and the program will conveniently display the "Open Data File" dialog box for you to choose a data file to playback. Please do not change the IP address as the sonar address is statically assigned from the factory. For more information, please refer to the "*YellowFin Ethernet Setup Guide*" available from Imagenex Technology Corp.

## 5.2 Open Data File Dialog Box

The following options allow you to specify which file to open:

<i>File Name</i>	Type or select the filename you want to open. This box lists files with the extension you select in the Files of type box.
<i>Files of type</i>	Select the type of file you want to open: The supported file extensions are “.872” or “.xtf”. If opening a sonar data file. The file with file extension “.872” is the standard YellowFin recorded file format. YellowFin.exe can playback files with file extension “.xtf” (Triton Extended File Format) ONLY if the “.xtf” file is recorded by the YellowFin program.
<i>Drives</i>	Select the drive in which the YellowFin control software stores the file that you want to open.
<i>Directories</i>	Select the directory in which the YellowFin control software stores the file that you want to open.
<i>Network...</i>	Choose this button to connect to a network location where the data file resides.

## 5.3 Save YellowFin Data File Dialog Box

The following options allow you to specify the name and location of the file you're about to save sonar data into:

<i>File Name</i>	Type a new filename or select an existing file name to save sonar data into that named file.
<i>Drives</i>	Select the drive in which you want to store the document.
<i>Directories</i>	Select the directory in which you want to store the document.

### 5.4 Sonar Settings Dialog Box

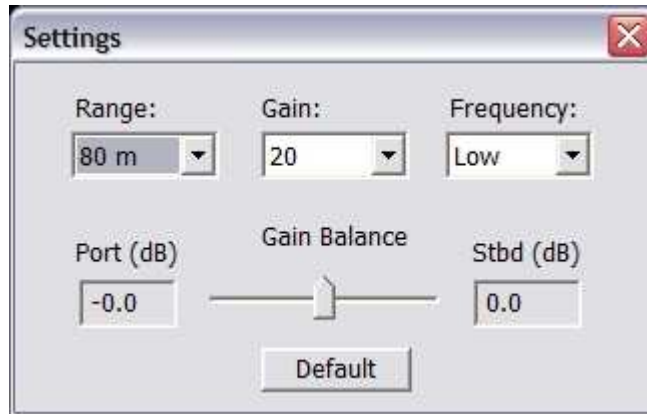


Figure 8 - Sonar Settings Dialog Box

The following options allow you to select sonar settings. These are the main parameters:

<i>Range</i>	Select the acoustic operating range. Options: Low Frequency: 10m, 20m, 30m, 40m, 50m, 60m, 80m, 100m, 150m, and 200m.  Medium Frequency: 10m, 20m, 30m, 40m, 50m, 60m, 80m, 100m, 150m, and 200m.  High Frequency: 10m, 20m, 30m, 40m, 50m
<i>Data Gain</i>	(Display Gain) Choose a Data Gain you want (from 0 to 100%). Data Gain is used to increase or decrease the intensity (color levels) of the sonar image.
<i>Mode/Freq</i>	There are three frequencies to choose from: low, medium and high.
<i>Gain Balance</i>	Gain balance is used to adjust the balance of the Port/Starboard image. Drag the gain balance slider bar to change the gain balance, which can be adjusted from -3dB to +3dB. The "Port (dB)" and "Stbd (dB)" edit boxes are only used for display purposes.

### 5.5 Diagnostics Dialog Box

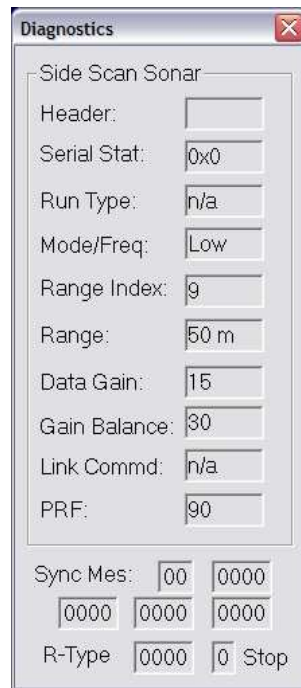


Figure 9 - Diagnostics Dialog Box

The Diagnostics Dialog Box is used to display important system variables. This dialog box is very useful when trouble shooting the system in real-time. In file playback, certain system variables such as Header, Serial Stat, and Run-Type etc. are not available to display since they are not recorded into the data file.

<i>Header</i>	Sent by the sonar head (wet end) to tell the processor what kind of data format it sent, IGX for YellowFin sonar data.
<i>Serial Stat</i>	Indicates if the communication between sonar system and processor is normal (0x40 or 0x42) or not (other than 0x40 or 0x42).
<i>Run-Type</i>	Sent by the sonar head (wet end) to tell the YellowFin program what command the sonar is responding.  0: standard sonar shot 1: set Mode/Freq 2: set Range 3: set Gain Balance
<i>Mode/Freq</i>	0: Low frequency 1: Medium frequency 2: High frequency

<i>Range Index</i>	Current YellowFin sonar operating range index. 5: 10m 6: 20m 7: 30m 8: 40m 9: 50m 10: 60m 11: 80m 12: 100m 13: 125m 14: 150m 15: 200m
<i>Range</i>	Current YellowFin sonar operating range.
<i>Data Gain</i>	Current YellowFin sonar operating Data Gain.
<i>Gain Balance</i>	Current YellowFin sonar operating Gain Balance.
<i>Link Command</i>	Sent by the YellowFin program to sonar head indicating the operating parameters are changed by the user.  0: standard sonar shot 1: set Mode/Freq 2: set Range 3: set Gain Balance
<i>PRF</i>	Milliseconds elapsed between two consecutive interrogations of the sonar head.

## 5.6 GPS Serial Port Configuration Dialog Box

The GPS Serial Port Configuration Dialog Box is used to configure the GPS serial communications on your PC.

<i>Com Port</i>	Specifies the communication serial port to be used.
<i>Baud Rate</i>	Specifies the baud rate at which the GPS communications operates. The default is set to use 4800 bits/second baud rate.
<i>Data Bits</i>	Specifies the number of bits in the bytes transmitted and received. The default is set to use 8 bits byte size.
<i>Parity</i>	Specifies the parity scheme to be used. The default is set to use No Parity scheme.
<i>Stop Bits</i>	Specifies the number of stop bits to be used. The default is set to use one stop bit.
<i>Flow Control</i>	Not used
<i>Select NMEA Sentences</i>	Specifies GPS sentence types to be used. The default is set to RMC.
<i>GPS Output Time</i>	Specifies rate at which GPS data is output to the PC. This value must be set to match actual GPS settings (The Imagenex GPS is preset to 1 second).
<i>GPS Quality / Status</i>	This diagnostic value is read from the GPS receiver and provides the quality of received GPS data.
<i>Number of Satellites in Use</i>	This diagnostic value is read from the GPS receiver and provides the number of satellites the GPS has found.

**Note.** "GPS Quality / Status" and "Number of Satellites in Use" values are dependant on the selected NMEA sentence:

*GPS Quality / Status* => GGA => 0 = Fix not available, 1 = Non-differential fix available.  
 GLL => 0 = Fix not available, 1 = Non-differential fix available.  
 RMC => A = Valid position, V = NAV receiver warning.

*Number of Satellites in Use* => GGA => 0 – 12  
 GLL => Not available.  
 RMC => Not available.

The Baud Rate, Data Bits, Parity, and Stop Bits should match those in the GPS receiver specifications.

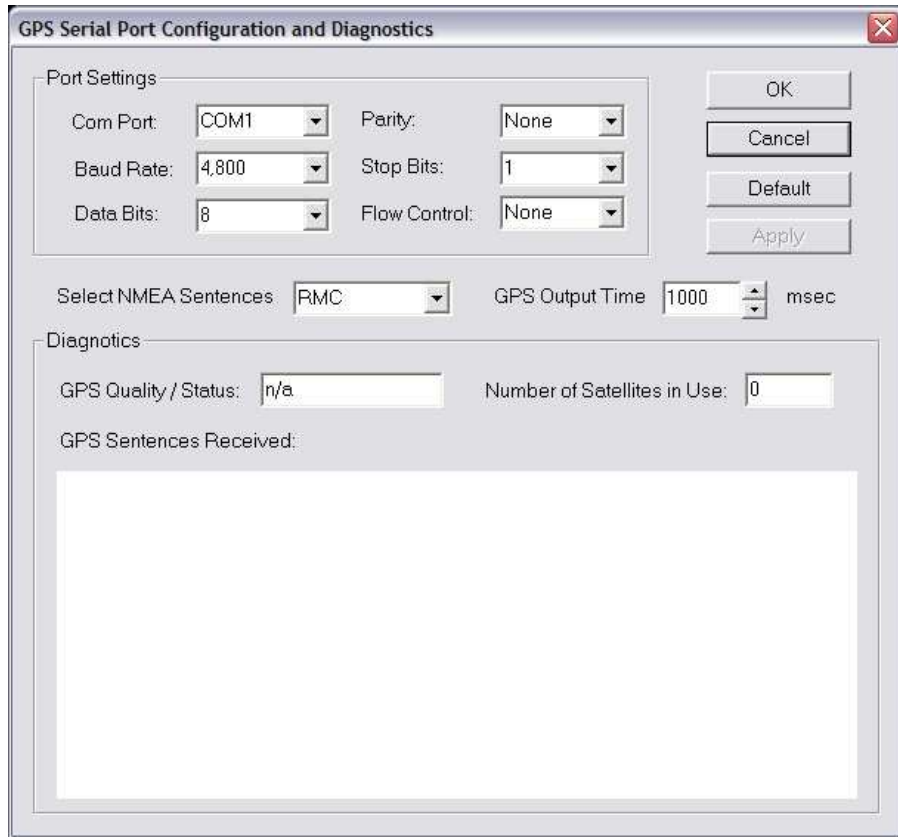


Figure 10 - GPS Serial Port configuration Dialog Box



## Appendix A – Target Height Calculation

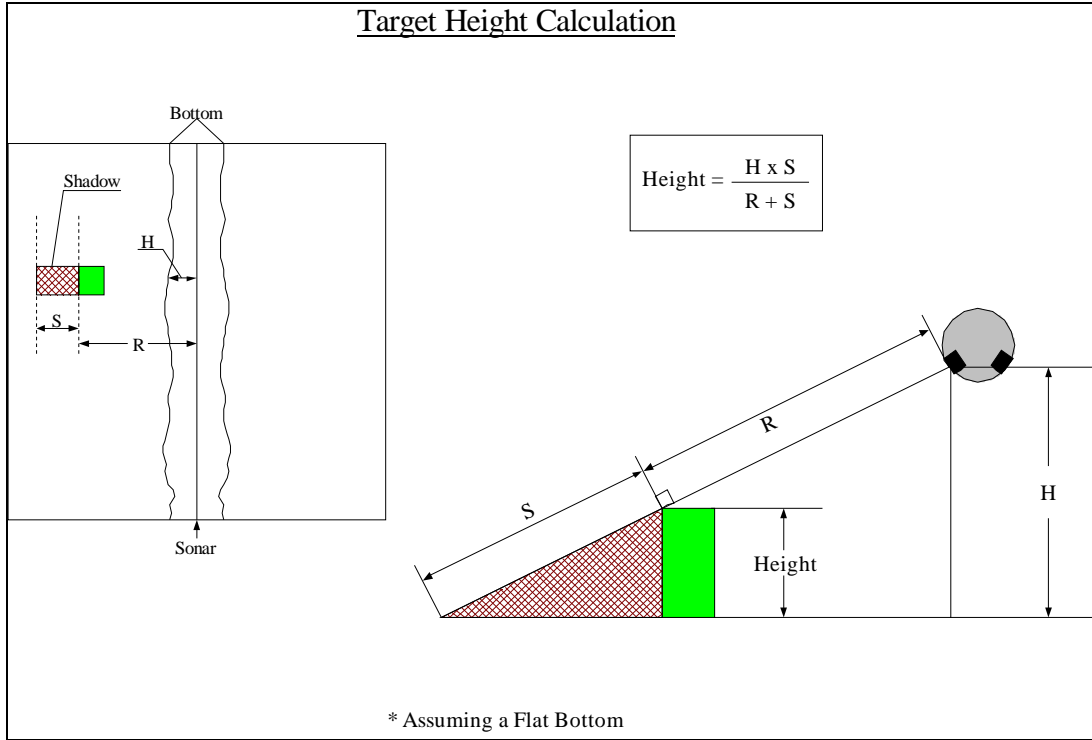


Figure 11 - Target Height Calculation

## **Appendix B – External Resources**

The YellowFin Sonar System provides several aids for post processing and/or controlling sonar data. When recording a file, one may choose to record the data in an “.xtf” or “.872” format. YellowFin.exe is able to playback an “.xtf” file that was recorded using YellowFin.exe. Also, Data from a “.872” or an “.xtf” file may be “copied” to an .xtf file using the Copy Start and Copy Stop commands in the File Menu.

Once the “.xtf” file is generated, post processing may be done on this file. The following companies provide post processing software packages:

- Chesapeake Technology, Inc. (<http://www.chesapeaketech.com>)
- HYPACK inc. (<http://www.hypack.com>)
- Quality Positioning Services (<http://www.qps.nl>)
- CARIS (<http://www.caris.com>)

## **Appendix C – Data Storage File Format (.872)**

When recording the YellowFin data to a **.872** file, the following bytes are appended and saved to the file every ping. The total number of bytes 'N' for each ping is equal to **4096**.

<b>Byte #</b>	<b>Byte Description</b>
0-999	<b>File Header</b> (1000 bytes)
1000-1999	<b>Port Channel Echo Data</b> (1000 bytes)
2000-2999	<b>Starboard Channel Echo Data</b> (1000 bytes)
3000-3nnn	<b>GPS Strings</b> (100 bytes/string)
3nnn-4093	<b>Zero Fill</b>
4094-4095	<b>Pointer To Previous Ping</b> The last 2 bytes of this ping contain a 16-Bit number that is the sum of the number of bytes for this ping and the number of bytes for the previous ping. This number can be used for reverse playback synchronization. Number of bytes to previous ping = ((Byte 4094)<<8)   (Byte 4095)

### **FILE HEADER**

Bytes 0 through 999 contain the following **File Header** information:

- Byte 0        **ASCII '8'**
- Byte 1        **ASCII '7'**
- Byte 2        **ASCII '2'**
  
- Byte 3        **872 File Version**  
 0 = v1.xx – 1000 points/channel, 8-Bit data
  
- Bytes 4-7     **Ping Number** – increment for every ping

<b>Byte 4</b>	<b>Byte 5</b>	<b>Byte 6</b>	<b>Byte 7</b>
7 - 0	7 - 0	7 - 0	7 - 0
<b>Ping Number</b>			

Bytes 8-9     **Total Bytes 'N'** - number of bytes that are written to the disk for this ping

<b>Byte 8</b>								<b>Byte 9</b>							
7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
<b>N = 4096</b>															

Bytes 10-11 **Data Points Per Channel**

Byte 10								Byte 11							
7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
<b>1000</b>															

Byte 12 **Bytes Per Data Point**  
always 1

Byte 13 **Data Point Bit Depth**  
always 8

Byte 14 **GPS Type/ Number of GPS Strings**  
GPS Type indicates which NMEA 0183 message was selected by the user and used for decoding Lat/Lng coordinates. Number of GPS Strings indicates how many GPS strings were detected and stored. Each string is stored (in ASCII) exactly as it appeared at the serial communications port during real-time data acquisition. The strings are stored in a 100 byte slots starting at GPS String File Offset (Bytes 15-16).

Byte 14							
7	6	5	4	3	2	1	0
<b>GPS Type</b>				<b>Number of GPS Strings</b>			

**GPS Type:**  
0 → \$GPGLL  
1 → \$GPGGA  
2 → \$GPRMC

**NMEA 0183 GPS Strings stored at the following offsets:**  
\$GPGLL: stored at GPS String File Offset + 0  
\$GPGGA: stored at GPS String File Offset + 100  
\$GPRMC: stored at GPS String File Offset + 200  
\$GPVTG: stored at GPS String File Offset + 300

Bytes 15-16 **GPS String File Offset**

Byte 15								Byte 16							
7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
<b>Offset = 3000</b>															

Bytes 17-18 **Event/Annotation Counter**

Byte 17								Byte 18							
7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
<b>E</b>	<b>Count: 0 to 32767</b>														

E = 0, no event, ignore count  
E = 1, new event, increment count and append annotation file  
Annotations are stored in "filename.an"  
Each annotation contains a maximum of 512 characters.

Bytes 19-30 **Date** – system date, null terminated string (12 bytes)  
"DD-MMM-YYYY"

Bytes 31-39 **Time** – system time, null terminated string (9 bytes)  
**"HH:MM:SS"**

Bytes 40-44 **Thousandths of Seconds** – system time, null terminated string (5 bytes)  
**".ttt"**

Byte 45 **Operating Frequency**  
 0 = Low Frequency  
 1 = Medium Frequency  
 2 = High Frequency

Byte 46 **Range Index** – index numbers for acoustic operating range  
 5 - 10m  
 6 - 20m  
 7 - 30m  
 8 - 40m  
 9 - 50m  
 10 - 60m  
 11 - 80m  
 12 - 100m  
 13 - 125m  
 14 - 150m  
 15 - 200m

Byte 47 **Data Gain**  
 YellowFin - 0 to 100  
 YellowFin AUV - 0 to 40

Byte 48 **Channel Balance**  
 0 to 60 → +/-3dB in 0.1dB increments  
 0 = +3dB Port / -3dB Stbd  
 30 = 0dB for both channels  
 60 = -3dB Port / +3dB Stbd

Bytes 49-50 **Repetition Rate** – Time between pings

Byte 49								Byte 50							
7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
<b>Repetition Rate (ms)</b>															

Bytes 51-52 **Sound Velocity**

Byte 51								Byte 52							
7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
<b>Sound Velocity (in meters/second) * 10</b>															

Bytes 53-65 **12 Byte File Header**. Refer to the section "*Interface Return Data*" in the document "*YellowFin Ethernet Specification*" for further details.

Bytes 66-69 **Reserved** - always 0

Byte 70 **Sonar Type**  
 0 – YellowFin  
 1 – YellowFin AUV

Byte 71                    **Real Range**  
 10, 20, 30, 40, 50, 60, 80, 100, 150, 200

Bytes 72-999            **Reserved**  
 always 0

Bytes 1000-1999        **Port Channel Echo Data**  
 1000 data points (1 byte/point)  
 first range point = 1 \* Range / 1000 in meters  
 last range point = 1000 \* Range / 1000 in meters  
 intensity: 0 – 255

Bytes 2000-2999        **Starboard Channel Echo Data**  
 1000 data points (1 byte/point)  
 first range point = 1 \* Range / 1000 in meters  
 last range point = 1000 \* Range / 1000 in meters  
 intensity: 0 – 255

Bytes 3000-3nnn        **GPS Strings** – (100 bytes/string)

Bytes 3nnn-4093        **Zero Fill**

Bytes 4094-4095        **Pointer to Previous Ping**

Byte 4094								Byte 4095							
7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
<b>Number of bytes to previous ping = 8192</b>															

## **Appendix D – Annotation File Format (.AN)**

The .AN File is generated / updated whenever an event marker is created. It is an ASCII text file which contains pointers to the location in the .872 file where the event occurs. It also contains the GPS coordinates, date and time, and user entered text. Refer to **page 12** for details on event marker creation.



**Note:** The “.AN” annotation file is linked to the “.872” data file. Do not rename one file without renaming the other. Do not edit the “.AN” file. Failure to comply will result in errors, and/or lost event markers.

**ID Number** - 0-99

**Ping number** – Ping number in the .872 file that this event is referenced to.

**X-coordinate ratio** - Location of the event in the current ping.

**Date** – System date, null terminated string (12 bytes)

"DD-**MMM**-YYYY"

**Time** – System time, null terminated string (9 bytes)

"HH:**MM**:SS"

**GPS Ships Position Latitude** – text string (14 bytes)

"\_dd.mm.xxxx\_**N**"

dd = Degrees

mm = Minutes

xxxxx = Decimal Minutes

\_ = Space

N = North or S = South

**GPS Ships Position Longitude** – text string (14 bytes)

"ddd.mm.xxxx\_**E**"

ddd = Degrees

mm = Minutes

xxxxx = Decimal Minutes

\_ = Space

E = East or W = West

**User comment** – 512bytes

## **Appendix E – Ethernet Interface Specification (V1.01)**

### **OVERVIEW**

The Interface Board (160-017.V3) communicates via an Ethernet connection to Windows™ based PC. The PC software needs to know the IP address and the correct port number of the sonar in order to create a socket. If a direct Ethernet connection is used, then the PC's Ethernet card must have a statically assigned IP and Subnet Mask matching that of the sonar. If running through a local area network, then the PC's Ethernet card may have dynamically allocated IP but the sonar's IP address MUST be reassigned to that matching the LAN.

To interrogate the underwater unit and receive echo data, a "Switch Data Command" string is sent to the interface board, which, in turn, translates the data and sends "Sonar Control Commands" to the underwater unit. When the Sonar Control Command is accepted, the sonar transmits, receives, and sends its return data back up to the interface board. The interface board then packages the received data and sends it back to the PC which, in turn, processes and plots the data.

To receive one sonar shot of acoustic data:

1. Send a TCP packet containing the Switch Data Command (with byte 18: *Packet* = 0x00).
2. Receive a TCP packet containing the Port channel's data.
3. Send a TCP packet containing the Switch Data Command (with byte 18: *Packet* = 0x02).
4. Receive a TCP packet containing the Starboard channel's data.

The Interface Return Data is the same for Port and Starboard returns. However, the packet number and actual data reflect the different channels.



## **SWITCH DATA COMMAND (PC to Interface Board)**

The interface board accepts up to 27 bytes of switch data from the PC and must see the “Switch Data Header” (2 bytes: **0xFE** and **0x44** hexadecimal) in order to process the switches. The interface board will stop accepting switch data when it sees the termination byte (**0xFD** HEX). The termination byte must be present for the interface board to process the switches.

**Note: the Termination Byte is the only switch value allowed to have a value of 0xFD. All other switches should be set higher or lower than 0xFD (253 Decimal) so they are not interpreted as a termination byte!**

Table 1 - Switch Data Command To 160-017.v1 Interface board

Byte #	Description							
0 – 7	<b>0xFE</b>	<b>0x44</b>	Reserved	Range	Reserved	Reserved	Master/Slave	Mode/Freq
8 – 15	Data Gain	Reserved	Balance Gain	Reserved	Reserved	Link Command	Reserved	Reserved
16 – 23	Reserved	Reserved	TCP Packet	Reserved	Reserved	Reserved	Reserved	Reserved
24 – 26	Reserved	Reserved	Term. <b>0xFD</b>					

### **BYTE DESCRIPTIONS**

Note: All Byte values are shown in decimal unless noted with a '0x' (hexadecimal) prefix.

Byte 0            **Switch Data Header (1st Byte)**  
Always **0xFE** (254 decimal)

Byte 1            **Switch Data Header (2nd Byte)**  
Always **0x44** (68 decimal)

Byte 2            **Reserved**  
0

Byte 3            **Range**  
0x05 – 0x0F  
Operating range: 10, 20, 30, 40, 50, 60, 80, 100, 125, 150, 200m

Byte 4            **Reserved**  
0

Byte 5            **Reserved**  
0

Byte 6            **Master/Slave**  
Not used (0x43)

Byte 7            **Mode / Frequency**  
0. Low Frequency  
1. Medium Frequency  
2. High Frequency

Byte 8        **Data Gain**  
0 – 100%

Byte 9        **Reserved**  
0

Byte 10       **Balance Gain**  
Integer values 0 through 60 decimal generates a matched gain balance in .1db increments.

$$\text{Starboard gain (dB)} = \frac{x - 30}{10}$$

$$\text{Port gain (dB)} = \frac{30 - x}{10}$$

Example x = 42

$$\text{Starboard gain (dB)} = \frac{42 - 30}{10} = 1.2dB$$

$$\text{Port gain (dB)} = \frac{30 - 42}{10} = -1.2dB$$

Byte 11 **Reserved**  
0

Byte 12       **Reserved**  
0

Byte 13 **Link Command (3 bits)**  
Down Telemetry value to YellowFin head

000	Standard Sonar Shot
001	Set Mode / Freq
010	Set Range
011	Set Gain Bal
100	Reserved
101	Reserved
110	Reserved
111	Link to Link

Byte 14       **Reserved**  
0

Byte 15       **Reserved**  
0

Byte 16       **Reserved**  
0

Byte 17       **Reserved**  
0

Byte 18	<b>TCP Packet Number (3 bits)</b> Indicates which TCP formatted packet is requested from the PC. The Sonar shot is initiated on receipt of TCP Packet number = 0x00. Data is collected for both Port and Starboard channels. Port data is then sent to the PC. On receipt of 0x02, Starboard Data (which is already collected) is sent to the PC.  0x00 - Initiate Sonar Shot and return first TCP packet (Port data) 0x01 - Reserved 0x02 - Return second TCP packet (Starboard data) 0x03 - Reserved 0x04 -> 0x07 - Reserved
Byte 19	<b>Reserved</b> 0
Byte 20	<b>Reserved</b> 0
Byte 21	<b>Reserved</b> 0
Byte 22	<b>Reserved</b> 0
Byte 23	<b>Reserved</b> 0
Byte 24	<b>Reserved</b> 0
Byte 25	<b>Reserved</b> 0
Byte 26	<b>Termination Byte</b> The Interface board will stop looking for Switch Data when it sees this byte. Always <b>0xFD</b> (253 decimal)

## INTERFACE RETURN DATA

After every shot, the interface board returns a 12 byte header, 1000 points of echo data, and a **terminating byte** value of **0xFC**. The **total number of bytes (N)**, including the 12 byte header, returned will be 1013.

Table 2 – YellowFin Return Data From 160-017.v3 Interface board to PC

Byte #	Description							
0 to 7	ASCII 'I'	ASCII 'G'	ASCII 'X'	Serial Status	Sync byte (LO)	Sync byte	Sync byte	Sync byte (HI)
8 to 11	Sync Val (LO)	Sync Val (HI)	Data Bytes (HI)	Data Bytes (LO)				
12 to (N-2)	Echo Data 1000 Data Bytes							
N-1	Term. <b>0xFC</b>							

### BYTE DESCRIPTIONS

**Note:** All Byte values are shown in decimal unless noted with a '0x' (hexadecimal) prefix.  
**N** = total number of return bytes

Byte 0 - 2      **Imagenex Return Data Header**  
 ASCII 'IGX'  
 'I' = 0x49, 'G' = 0x47, 'X' = 0x58

ASCII 'IGX'  
 N = 1013, (1000 Data Bytes, 12 header bytes, 1 termination byte)

Byte 3      **Serial Status**

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0	
1 = Character Overrun	1 = Switches Accepted	0	0	0	0	Channel		
					1 = Switch Error	0	0	Port
						0	1	Reserved
						1	0	Starboard
						1	1	Reserved

Byte 4-7 **Sync message bytes**

Byte 4								Byte 5								Byte 6								Byte 7							
7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
0	0	<b>Sync Message (LO)</b>						0	0	<b>Sync Message</b>						0	0	<b>Sync Message</b>						0	0	<b>Sync Messages (HI)</b>					

YellowFin Sync messages: 23 bits  
 YellowFin Sync messages:  
 (byte [4] & 0x3F) | (byte [5]<<6 & 0x0FFF) | (byte [6]<<12 & 0x3FFFF) | (byte [7]<<18&0x7FFFFFFF)

**Sync Messages:**

Sync Word:

22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
1	1	0	0	<b>Reserved (0's)</b>							<b>Information</b>							<b>Run Type</b>			1	

Bits 22-21: **Trigger** (11)

Bits 20-19: **Head ID** (00)

Bit 0: **Stop bit** (1)

Bits 4-1: **Run Type** (Echo's Link Control Bits)

- (0000) Sonar data
- (0001) Mode / Freq
- (0010) Range
- (0011) Gain Balance
- (0100) Reserved
- (0101) Reserved
- (0110) Reserved

Bits 12-5: **Information**

If Run Type = 0 or Run Type = 2

**Range Index:**

0x05 through 0x0F  
 Operating range: 10, 20, 30, 40, 50, 60, 80, 100, 125, 150, 200m

If Run Type = 1

**Mode / Frequency:**

- 0x00 through 0x02
0. Low Frequency
  1. Medium Frequency
  2. High Frequency

If Run Type = 3

**Gain Balance:**

Integers 0 through 60

Bits 18-13: **Reserved**

Byte 8,9 **Sync Value**

Byte 8								Byte 9							
7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
0								0 Rx							
<b>Sync Value (LO)</b>								<b>Sync Value (HI)</b>							

Sync value is used for diagnostics (normal sync value is around 800).  
 Sync Value Byte (LO), Sync Value Byte (HI)

Sync Value Byte (LO) = (Byte 9 & 0x01) << 7 | (Byte 8 & 0x7F)  
 Sync Value Byte (HI) = (Byte 9 & 0x3E) >> 1;  
 Sync Value = (Sync Value Byte (HI) << 8) | Sync Value Byte (LO)

No\_RX\_Data = Byte 9 & 0x40  
 If No\_RX\_Data = 1, low or no sync value  
 If No\_RX\_Data = 0, normal sync value

Byte 10,11 **Number of data bytes**

Number of Echo Data Bytes returned  
 Data Bytes (LO), Data Bytes (HI)

Byte 10								Byte 11							
7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
<b>Data Bytes (HI)</b>								<b>Data Bytes (LO)</b>							

Data Bytes = (Data Bytes High Byte << 8) | Data Bytes Low Byte

Byte 12 **Start of Echo Data**  
 (N-12) Bytes of data

1st Range Point = Byte 12  
 2nd Range Point = Byte 13  
 3rd Range Point = Byte 14  
 4th Range Point = Byte 15  
 etc. ...

Byte (N-2) **End of Echo Data**

Byte (N-1) **Termination Byte**  
**0xFC**

## Appendix F – Wiring Diagrams

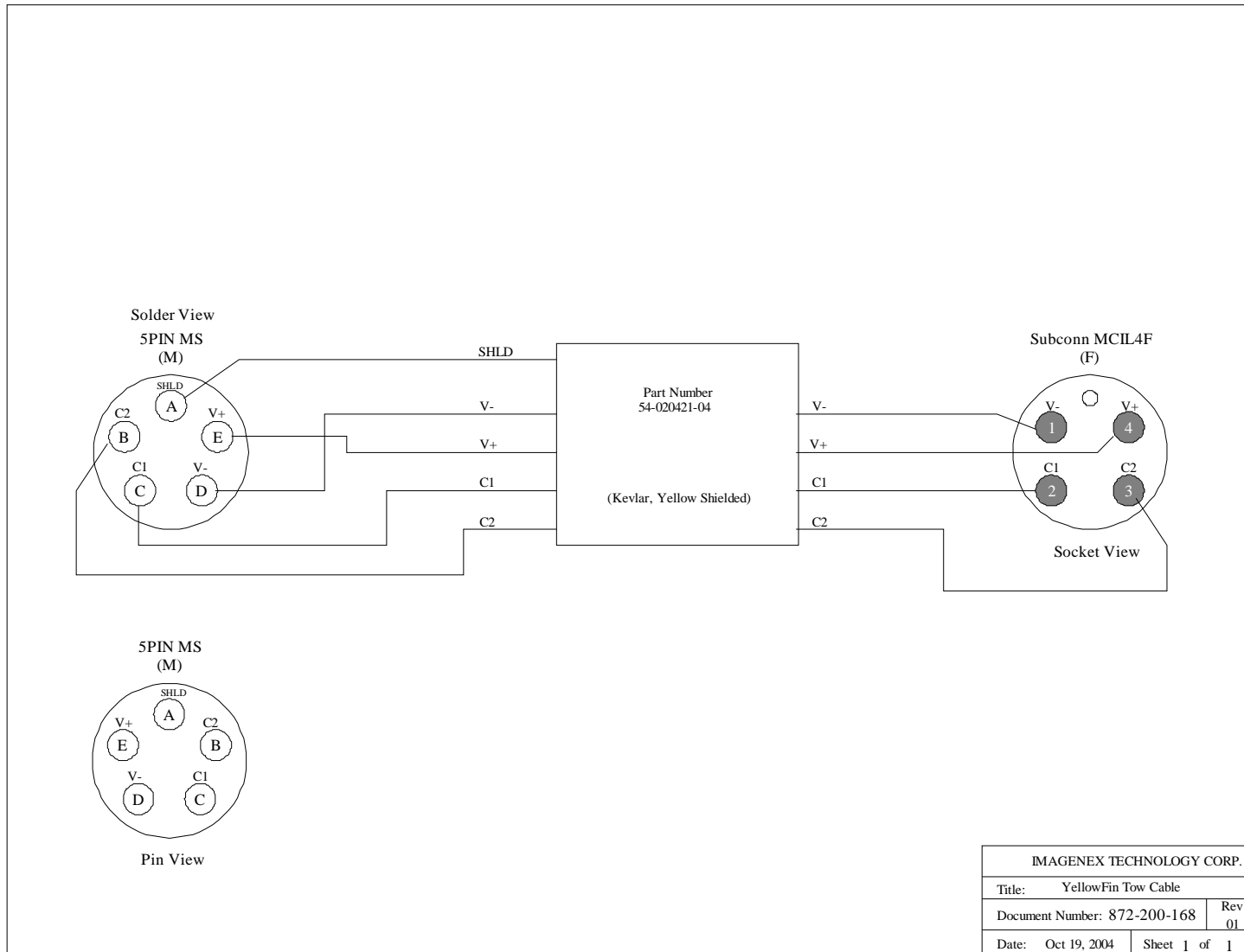


Figure 12 - YellowFin Tow Cable Wiring Diagram

# IMAGENEX TECHNOLOGY CORP.

## MODEL 872 SIDESCAN (Digital Side Scan Board) 170-025.V1

### ETHERNET INTERFACE SPECIFICATION (v1.00)

Created on  
October 16, 2007

<b>Document Number</b>	410 - 019
<b>File Name</b>	Digital 1000point Side Scan - Ethernet Specification.doc
<b>Revision</b>	<b>Date</b>
01	December 5, 2007

Specifications subject to change without notice



## **OVERVIEW**

The Side Scan Board (170-025.V1) communicates via an Ethernet connection to Windows™ based PC. The PC software needs to know the IP address and the correct port number of the sonar in order to create a socket. If a direct Ethernet connection is used, then the PC's Ethernet card must have a statically assigned IP and Subnet Mask matching that of the sonar. If running through a local area network, then the PC's Ethernet card may have dynamically allocated IP but the sonar's IP address MUST be reassigned to that matching the LAN.

To interrogate the underwater unit and receive echo data, a "Switch Data Command" string is sent to the Side Scan Board, which, in turn, transmits, receives and sends its return data back up to the PC which, in turn, processes and plots the data.

To receive one sonar shot of acoustic data:

1. Send a TCP packet containing the Switch Data Command (with byte 18: *Packet = 0x00*).
2. Receive a TCP packet containing the Port channel's data.
3. Send a TCP packet containing the Switch Data Command (with byte 18: *Packet = 0x02*).
4. Receive a TCP packet containing the Starboard channel's data.

The Interface Return Data is the same for Port and Starboard returns. However, the packet number and actual data reflect the different channels.

## **SWITCH DATA COMMAND (PC to Interface Board)**

The Side Scan Board accepts up to 27 bytes of switch data from the PC and must see the “Switch Data Header” (2 bytes: **0xFE** and **0x44** hexadecimal) in order to process the switches. The Side Scan Board will stop accepting switch data when it sees the termination byte (**0xFD** HEX). The termination byte must be present for the Side Scan Board to process the switches.

**Note: the Termination Byte is the only switch value allowed to have a value of 0xFD. All other switches should be set higher or lower than 0xFD (253 Decimal) so they are not interpreted as a termination byte!**

**Table 1 - Switch Data Command To 160-017.v1 Interface board**

Byte #	Description							
0 – 7	<b>0xFE</b>	<b>0x44</b>	Reserved	Range	Reserved	Reserved	Master/ Slave	Mode/Freq
8 – 15	Data Gain	Reserved	Balance Gain	Reserved	Reserved	Reserved	Reserved	Reserved
16 – 23	Reserved	Reserved	TCP Packet	Reserved	Reserved	Reserved	Reserved	Reserved
24 – 26	Reserved	Reserved	Term. <b>0xFD</b>					

### **BYTE DESCRIPTIONS**

Note: All Byte values are shown in decimal unless noted with a '0x' (hexadecimal) prefix.

Byte 0            **Switch Data Header (1st Byte)**  
Always **0xFE** (254 decimal)

Byte 1            **Switch Data Header (2nd Byte)**  
Always **0x44** (68 decimal)

Byte 2            **Reserved**  
0

Byte 3            **Range**  
0x0A – 0xC8  
Operating range:  
Low Frequency: 10, 20, 30, 40, 50, 60, 80, 100, 125, 150, 200m  
Med Frequency: 10, 20, 30, 40, 50, 60, 80, 100, 125, 150, 200m  
High Frequency: 10, 20, 30, 40, 50m

Bytes 4-6	<b>Reserved</b> 0
Byte 7	<b>Frequency</b> 0. Low Frequency 1. Medium Frequency 2. High Frequency
Byte 8	<b>Start Gain</b> 0 – 40dB
Byte 9-17	<b>Reserved</b> 0
Byte 18	<b>TCP Packet Number (3 bits)</b> Indicates which TCP formatted packet is requested from the PC. The Sonar shot is initiated on receipt of TCP Packet number = 0x00. Data is collected for both Port and Starboard channels. Port data is then sent to the PC. On receipt of 0x02, Starboard Data (which is already collected) is sent to the PC.  0x00 - Initiate Sonar Shot and return first TCP packet (Port data) 0x01 - Reserved 0x02 - Return second TCP packet (Starboard data) 0x03 - Reserved 0x04 -> 0x07 - Reserved
Byte 19-26	<b>Reserved</b> 0
Byte 26	<b>Termination Byte</b> The Side Scan Board will stop looking for Switch Data when it sees this byte. Always <b>0xFD</b> (253 decimal)

## INTERFACE RETURN DATA

After every shot, the Side Scan Board returns a 12 byte header, 1000 points of echo data, and a **terminating byte** value of **0xFC**. The **total number of bytes (N)**, including the 12 byte header, returned will be 1013.

**Table 2 – YellowFin Return Data from 170-025.v1 Side Scan Board to PC**

Byte #	Description							
0 to 7	ASCII 'T'	ASCII 'V'	ASCII 'X'	Serial Status	Range	Freq	Version	Reserved 0
8 to 11	Reserved 0	Reserved 0	Data Bytes (HI)	Data Bytes (LO)				
12 to (N-2)	Echo Data 1000 Data Bytes							
N-1	Term. <b>0xFC</b>							

## BYTE DESCRIPTIONS

**Note:** All Byte values are shown in decimal unless noted with a '0x' (hexadecimal) prefix.  
**N** = total number of return bytes

Bytes 0 - 2    **Imagenex Return Data Header**  
 ASCII **IVX'**  
 'T' = 0x49, 'V' = 0x56, 'X' = 0x58  
 N = 1013, (1000 Data Bytes, 12 header bytes, 1 termination byte)

Byte 3        **Serial Status**

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0	
1 = Character Overrun	1 = Switches Accepted	Packet Num Error	Gain Switch Error	Freq Switch Error	Range Switch Error	Channel		
						0	0	Port
						0	1	Reserved
						1	0	Starboard
						1	1	Reserved

Byte 4      **Range**  
 0x0A – 0xC8  
 Operating range:  
     Low Frequency: 10, 20, 30, 40, 50, 60, 80, 100, 125, 150, 200m  
     Med Frequency: 10, 20, 30, 40, 50, 60, 80, 100, 125, 150, 200m  
     High Frequency: 10, 20, 30, 40, 50m

Byte 5      **Frequency**  
 0. Low Frequency  
 1. Medium Frequency  
 2. High Frequency

Byte 6      **Firmware Version**  
 0x00

Bytes 7-9    **Reserved**  
 0

Bytes 10, 11 **Number of data bytes**  
  
 Number of Echo Data Bytes returned  
 Data Bytes (LO), Data Bytes (HI)

Byte 10								Byte 11							
7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Data Bytes (HI)								Data Bytes (LO)							

Data Bytes = (Data Bytes High Byte<<8) | Data Bytes Low Byte

Byte 12      **Start of Echo Data**  
 (N-12) Bytes of data  
  
     1st Range Point = Byte 12  
     2nd Range Point = Byte 13  
     3rd Range Point = Byte 14  
     4th Range Point = Byte 15  
     etc. ...

Byte (N-2)    **End of Echo Data**

Byte (N-1)    **Termination Byte**  
 0xFC

# IMAGENEX TECHNOLOGY CORP.

## MODEL 872 SIDESCAN (YellowFin)

### DATA STORAGE FILE FORMAT (v1.01) (.872)

<b>Document Number</b>	425-026	
<b>Revision</b>	<b>Date</b>	<b>Description</b>
00	May 14, 2007	Initial
01	October 22, 2009	Reformatted
02	January 21, 2011	Added Altitude to bytes 65-68

**OVERVIEW**

When recording the YellowFin data to a **.872** file, the following bytes are appended and saved to the file every ping. The total number of bytes ‘N’ for each ping is equal to **4096**.

Byte #	Byte Description
0-999	<b>File Header</b> (1000 bytes)
1000-1999	<b>Port Channel Echo Data</b> (1000 bytes)
2000-2999	<b>Starboard Channel Echo Data</b> (1000 bytes)
3000-3nnn	<b>GPS Strings</b> (100 bytes/string)
3nnn-4093	<b>Zero Fill</b>
4094-4095	<b>Pointer To Previous Ping</b> The last 2 bytes of this ping contain a 16-Bit number that is the sum of the number of bytes for this ping and the number of bytes for the previous ping. This number can be used for reverse playback synchronization. Number of bytes to previous ping = ((Byte 4094)<<8)   (Byte 4095)

**FILE HEADER**

Bytes 0 through 999 contain the following **File Header** information:

Byte 0           **ASCII '8'**  
 Byte 1           **ASCII '7'**  
 Byte 2           **ASCII '2'**

Byte 3           **872 File Version**  
 0 = v1.xx – 1000 points/channel, 8-Bit data

Bytes 4-7       **Ping Number** – increment for every ping

Byte 4	Byte 5	Byte 6	Byte 7
7 - 0	7 - 0	7 - 0	7 - 0
<b>Ping Number</b>			

Bytes 8-9       **Total Bytes ‘N’** - number of bytes that are written to the disk for this ping

Byte 8								Byte 9							
7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
<b>N = 4096</b>															

Bytes 10-11    **Data Points Per Channel**

Byte 10								Byte 11							
7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
<b>1000</b>															

Byte 12         **Bytes Per Data Point**  
 always 1

Byte 13         **Data Point Bit Depth**  
 always 8

Byte 14

**GPS Type/ Number of GPS Strings**

GPS Type indicates which NMEA 0183 message was selected by the user and used for decoding Lat/Lng coordinates. Number of GPS Strings indicates how many GPS strings were detected and stored. Each string is stored (in ASCII) exactly as it appeared at the serial communications port during real time data acquisition. The strings are stored in a 100 byte slots starting at GPS String File Offset (Bytes 15-16).

Byte 14							
7	6	5	4	3	2	1	0
GPS Type				Number of GPS Strings			

**GPS Type:**

- 0 → \$GPGLL
- 1 → \$GPGGA
- 2 → \$GPRMC

**NMEA 0183 GPS Strings stored at the following offsets:**

- \$GPGLL: stored at GPS String File Offset + 0
- \$GPGGA: stored at GPS String File Offset + 100
- \$GPRMC: stored at GPS String File Offset + 200
- \$GPVTG: stored at GPS String File Offset + 300

Bytes 15-16

**GPS String File Offset**

Byte 15								Byte 16							
7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Offset = 3000															

Bytes 17-18

**Event/Annotation Counter**

Byte 17								Byte 18							
7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
E	Count: 0 to 32767														

E = 0, no event, ignore count  
 E = 1, new event, increment count and append annotation file.  
 Annotations are stored in "filename.an". Each annotation contains a maximum of 512 characters.

Bytes 19-30

**Date** – system date, null terminated string (12 bytes)  
 "DD-MMM-YYYY"

Bytes 31-39

**Time** – system time, null terminated string (9 bytes)  
 "HH:MM:SS"

Bytes 40-44

**Thousandths of Seconds** – system time, null terminated string (5 bytes)  
 ".ttt"

Byte 45

**Operating Frequency**

- 0 = Low Frequency
- 1 = Medium Frequency
- 2 = High Frequency



Byte 46      **Range Index** – index numbers for acoustic operating range  
 5 - 10m  
 6 - 20m  
 7 - 30m  
 8 - 40m  
 9 - 50m  
 10 - 60m  
 11 - 80m  
 12 - 100m  
 13 - 125m  
 14 - 150m  
 15 - 200m

Byte 47      **Data Gain**  
 0 to 100 percent

Byte 48      **Channel Balance**  
 0 to 60 → +/-3dB in 0.1dB increments  
 0 = +3dB Port / -3dB Stbd  
 30 = 0dB for both channels  
 60 = -3dB Port / +3dB Stbd

Bytes 49-50      **Repetition Rate** – Time between pings

Byte 49						Byte 50					
7	6	5	4	3	2	7	6	5	4	3	2
Repetition Rate (ms)											

Bytes 51-52      **Sound Velocity**

Byte 51						Byte 52					
7	6	5	4	3	2	7	6	5	4	3	2
Sound Velocity (in meters/second) * 10											

Bytes 53-64      12 Byte File Header. Refer to the section “*Interface Return Data*” in the document “*YellowFin Ethernet Specification*” for further details.

Bytes 65-68      **Altitude**  
 4 byte floating point number (in meters)

Bytes 69-999      **Reserved** - always 0

Bytes 1000-1999      **Port Channel Echo Data**  
 1000 data points (1 byte/point)  
 first range point = 1 \* Range / 1000 in meters  
 last range point = 1000 \* Range / 1000 in meters  
 intensity: 0 – 255

Bytes 2000-2999      **Starboard Channel Echo Data**  
 1000 data points (1 byte/point)  
 first range point = 1 \* Range / 1000 in meters  
 last range point = 1000 \* Range / 1000 in meters  
 intensity: 0 – 255

Bytes 3000-3nnn      **GPS Strings** – (100 bytes/string)

Bytes 3nnn-4093      **Zero Fill**

Bytes 4094-4095      **Pointer to Previous Ping**

Byte 4094						Byte 4095					
7	6	5	4	3	2	7	6	5	4	3	2
Number of bytes to previous ping = 8192											

# IMAGENEX

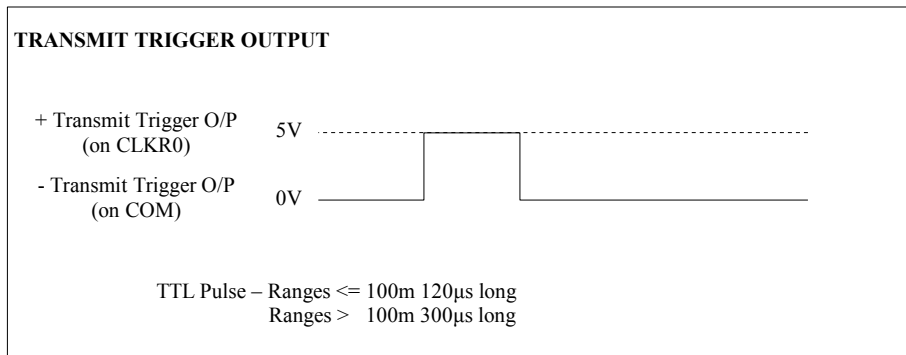
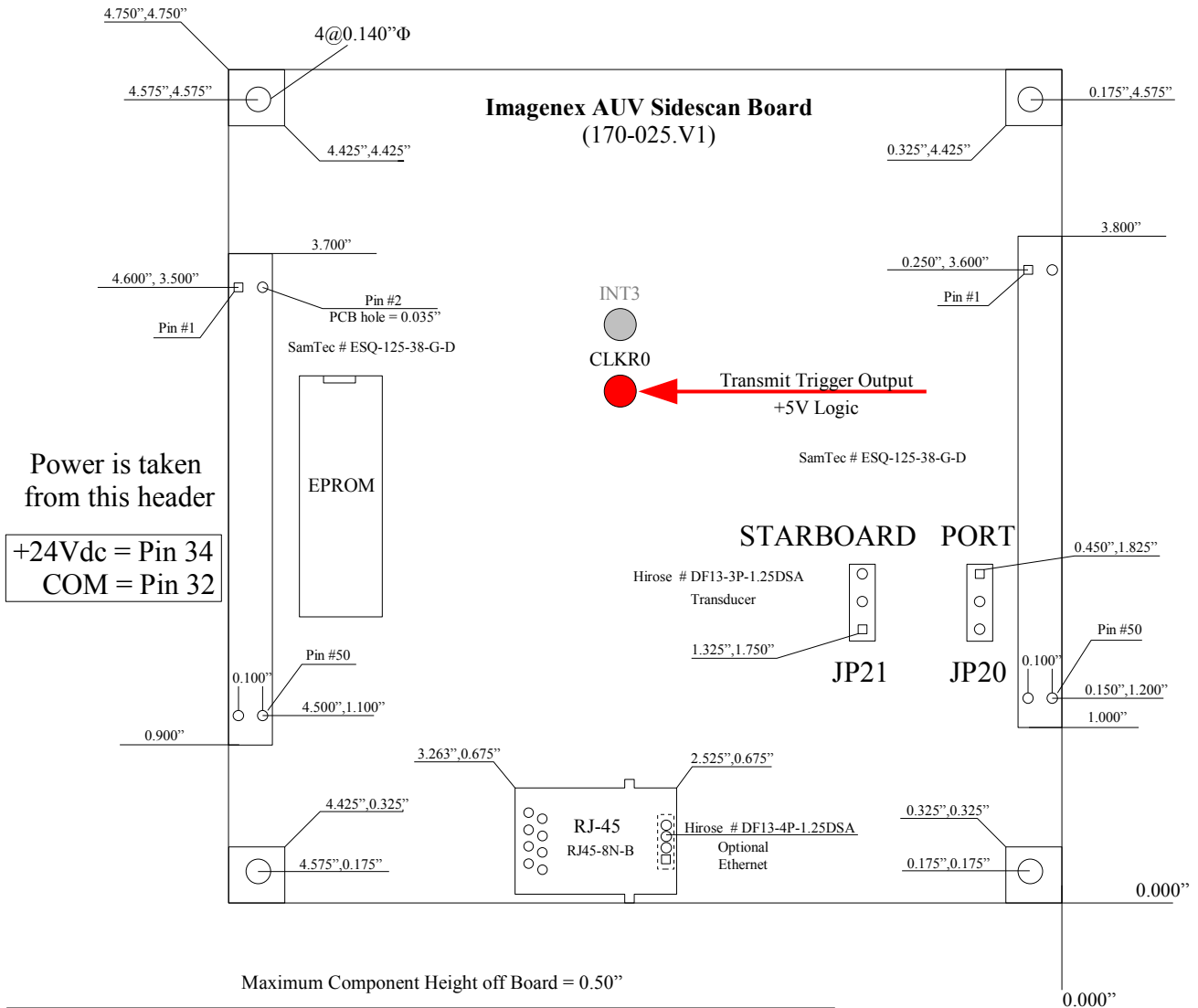
## SINGLE BOARD ETHERNET DIGITAL SIDESCAN (170-025.v1)

### PING RATES

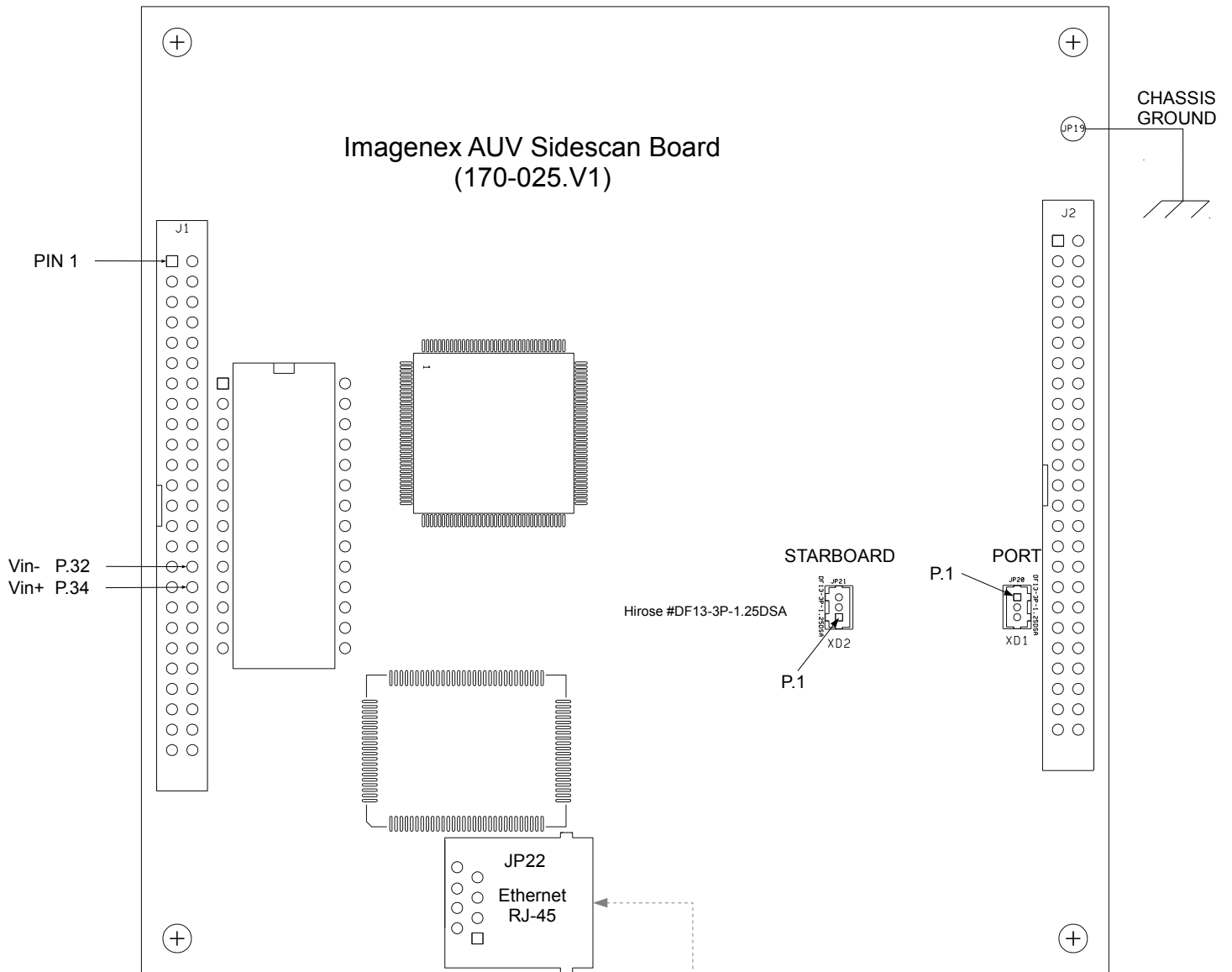
<b>RANGE</b> (Meters)	<b>Ping Rate</b> <b>(PRF)</b> (msec)	<b>STORAGE</b> (MByte/hr)
10	53	~265
20	53	~265
30	60	~235
40	73	~195
50	87	~160
60	100	~140
80	126	~110
100	154	~90
125	187	~75
150	220	~65
200	286	~50

Using YellowFin\_AUV.exe v2.008, D725SS4C, on Intel E5200 @ 2.5GHz, 2GB Ram, GeForce 7300SE running Windows XP Pro, Service Pack 2.

# Mechanical Layout of the Imagenex AUV Sidescan Board (170-025.V1) with Transmit Trigger Output



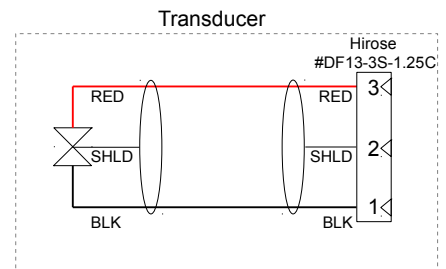
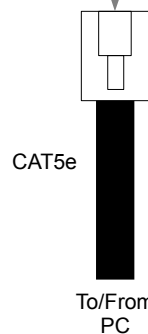
# Imagenex AUV Sidescan Board (170-025.V1) Wiring Diagram



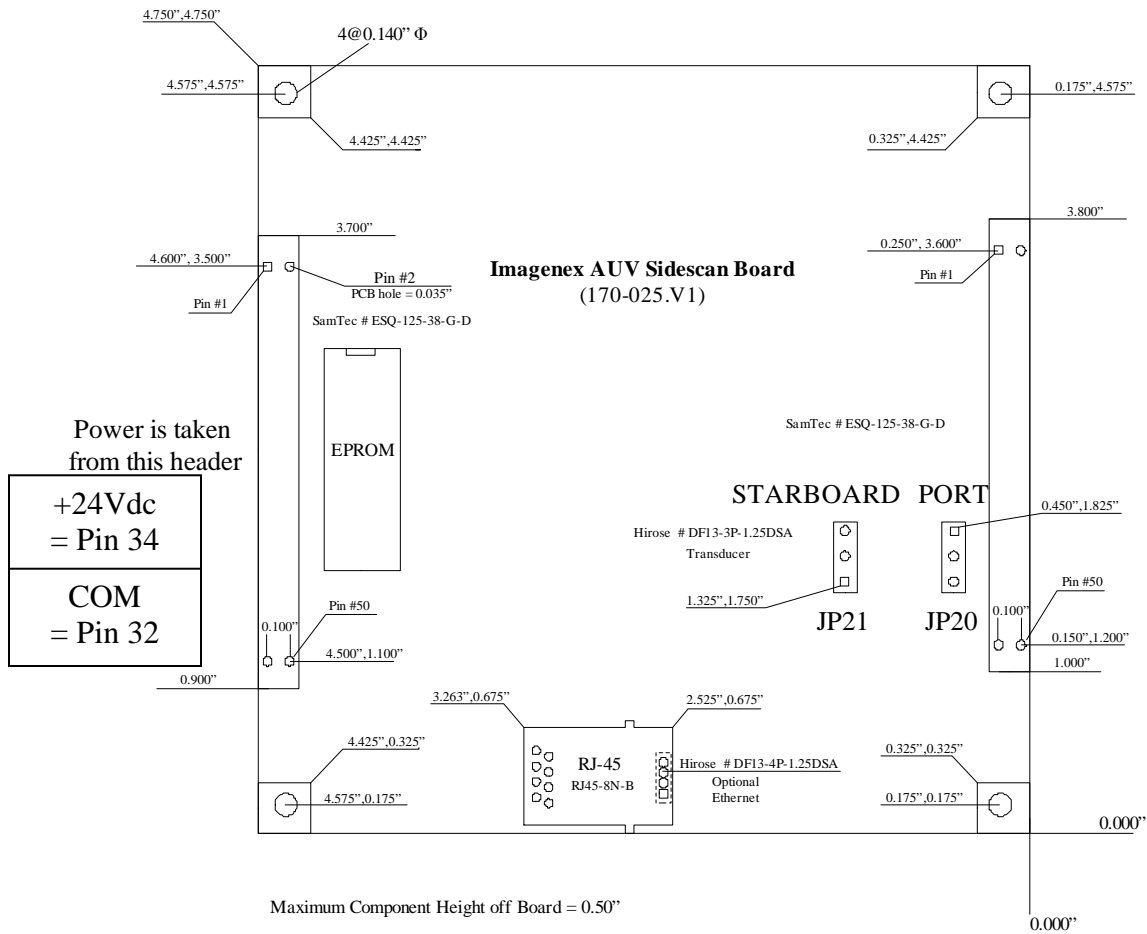
Vin = +24Vdc

Vin+ = J1 Pin 34

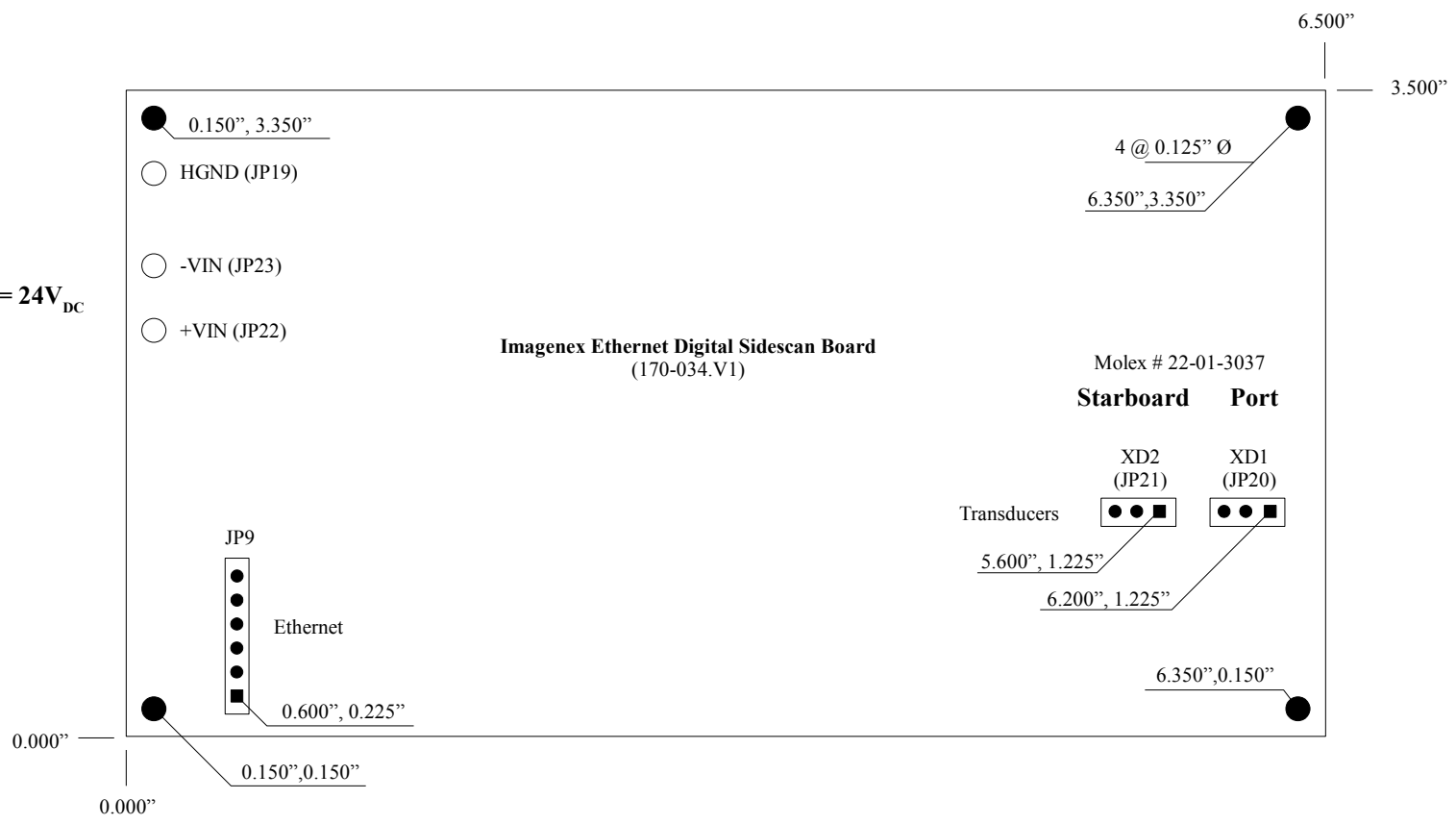
Vin- = J1 Pin 32



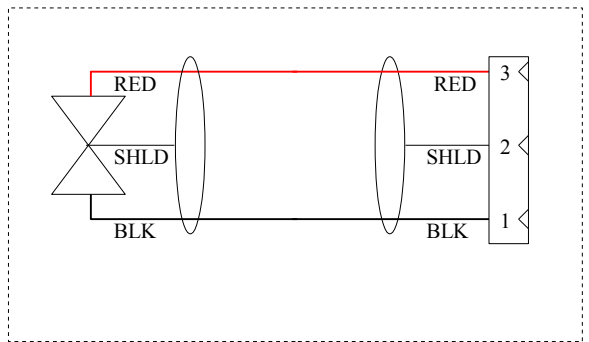
# Mechanical Layout of the Imagenex AUV Sidescan Board (170-025.V1)



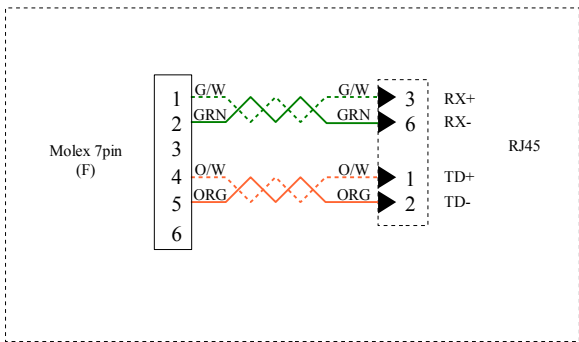
$V_{in} = 24V_{DC}$



Transducer



Ethernet



896-000-15x-040  
 Mechanical Layout  
 and Wiring Connections