HYPACK

a xylem brand

HYSWEEP®

QUICKSTART MANUAL

HYPACK

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CHAPTER 1

Introduction

Before you begin your work in your project area, there are several tasks to consider:

1. **Create a new project.** You can create a new project and all of the files in it by using the FILE-NEW command.

   When you create a new project, it inherits the last settings for geodesy and hardware.
2. **Check your Geodesy.** If you have not previously specified your geodesy, enter the GEODETIC PARAMETERS program and configure your geodesy.
3. **Configure and calibrate your hardware.** If you have not previously specified your sensors, configure your equipment in the HARDWARE program.
4. **Create your planned survey lines.** (Optional)

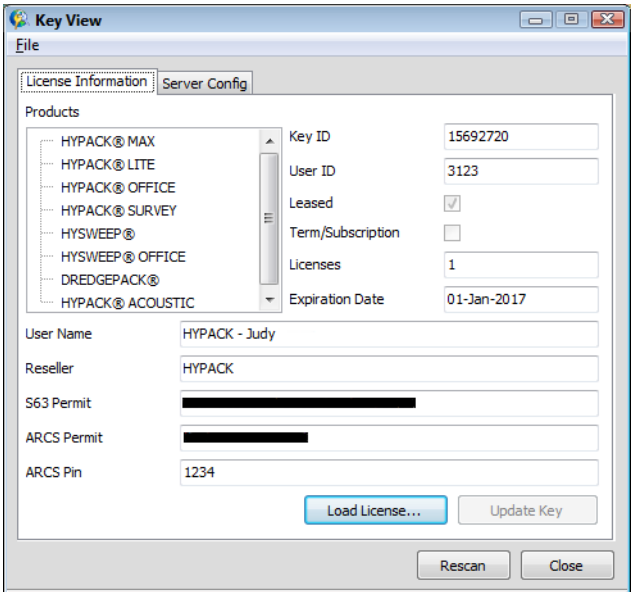
   If you are working on a new survey project, you typically create planned survey lines to assure even coverage. Create planned lines in the LINE EDITOR.
5. **Prepare and load other support files as needed**. These may include:
   > Background charts
   > Corrections files

LICENSE MANAGER

The LICENSE MANAGER reads your HYPACK® license information from your dongle and displays your dongle status.

To run the dongle test select SETTINGS-LICENSE MANAGER.

LICENSE MANAGER



The LICENSE MANAGER display includes the following:

- **All dongle types detected** are listed under Products.
- **Maintenance Plan Ends:** The expiration of your Maintenance Plan. HYPACK® continues to function, but *any program updates after this date* will not run. You can arrange with our Sales department (Sales@hypack.com) to renew your Maintenance Plan over the Internet.
- **Leased:** Leased licenses are usually for short-term use. The dongle will not be recognized and *HYPACK® will not run on leased keys after the expiration date*.
- **Term/Subscription**: The license renewal is paid annually. The Dongle will not be recognized and *HYPACK® will not run on leased keys after the expiration date*.

[Rescan] repeats the test.

HYPACK® INTERFACE

The unified HYPACK® user interface displays the data and project files included in your project.

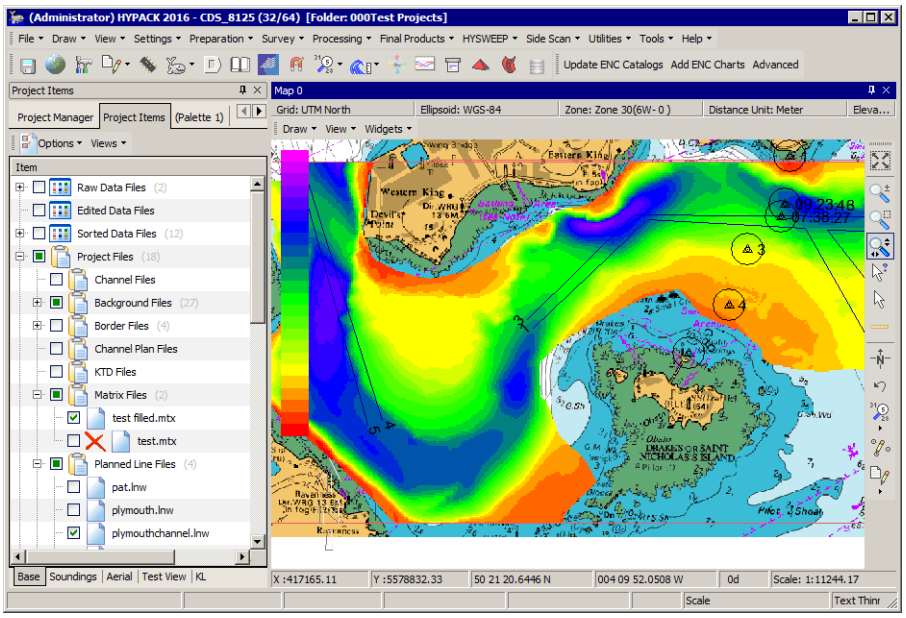
HYPACK® User Interface (Main Program)

Title Bar
Menu Bar
Toolbar

Panels:

- Project Manager
- Project Items List
- Color Editor
- Web Maps

Status Bar



Color Bar **Area Map** **Map View Tools**

All of the HYPACK® programs can be accessed from the HYPACK® shell. Start programs from either the toolbar or from the menu bar. The icons and menu selections are enabled according to your type of license (dongle).

NOTE: Some programs are available in both 32- and 64-bit versions. Where the interface of both versions are the same, HYPACK® provides only one icon or menu selection and launches the version according to your operating system.

HYPACK® FILES LIST

The HYPACK® user interface includes a tree view listing of the files associated with the current project, and each file location, called the Project Items list.

To display the Project Items list, select VIEW-PROJECT ITEMS or click the Project Items tab.

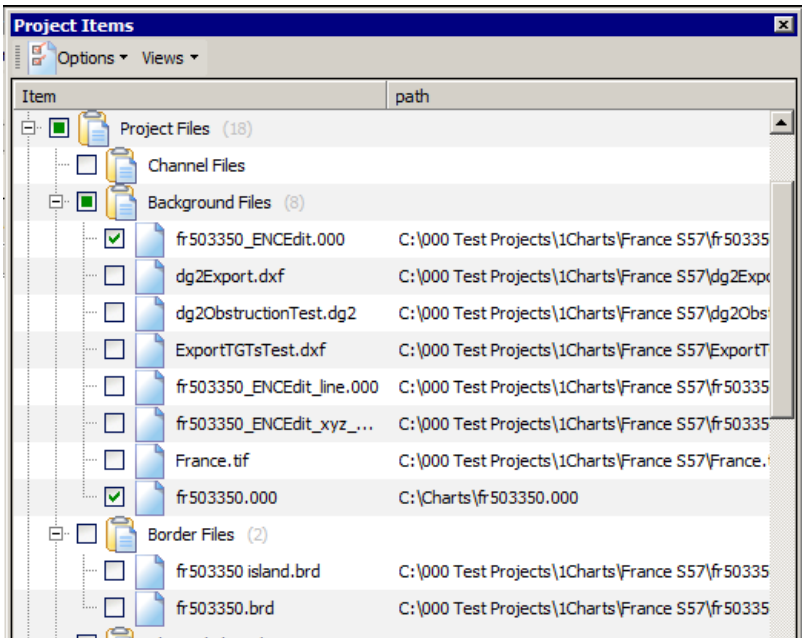
In the Project Items list, you can do any of the following:

- **Control which files are loaded to your project** and displayed in the area maps.
  - > **Checkbox checked:** File is enabled in your project (drawn to the screen).
  - > **Checkbox clear:** File is disabled.
- **Rename files** via a right-click menu. HYPACK® does not allow you to rename S57, S63, ARCS or VPF charts.
- **Collapse/expand the tree view** based on your needs by clicking the plus and minus signs on the left side.
- **Customize the folders displayed** using the Options menu selections:
  - > **Folder Visibility:** Select the project file folders to include in the File List. With these options you can omit folders that are not applicable to your project.
  - > **Hide Empty Folders:** Choose to show all folders selected under Folder Visibility, or only those that currently contain project files.
  - > **Folder Icons:** Choose traditional Windows® folder and file icons or just checkboxes.
- **Sort the display order of files in each folder.** Right-click on the folder and select Sort by and your choice of sort method: By name, date or file type.

NOTE: These sort settings remain only until you leave the project or close HYPACK®.

To widen the display area drag the right border horizontally across the screen.

Project Items



HYPACK® Tool Bars

The menu and toolbars in the HYPACK® shell access the program modules and display controls. You can toggle the toolbars on and off through a right-click menu or drag the toolbars to whatever position you prefer—even outside of the HYPACK® window.

The screen controls in each Area Map window remain docked in the window, but you can dock it to any side.

HYPACK® Menu Bar

The HYPACK® menu bar selections group all of the component programs into basic functional areas.

In addition, the File, View and Settings menu items provide tools with which you will manage your project and its display settings.

HYPACK® Icon Bar

The **toolbar** quickly launches a program with a click on its icon. As with all toolbars in HYPACK®, if you hover the cursor over an icon, a tool tip appears which describes the function of the icon.

HYPACK® *Toolbar*

To turn the toolbar display on/off, right-click in the toolbar area and select/deselect ‘HYPACK® toolbar’.

HYPACK® Screen Control Bar

The map view tools enable you to quickly adjust the HYPACK® screen display. Many of its functions are also found in the Draw and View menus for each Map window.

Zoom In/Out: When this option is selected, a left-click decreases the scale (zoom in) and a right-click increases the scale (zoom out).

Zoom Window: Select this option and drag a rectangle in the window to define the extent of your desired view. The program redraws the screen to display the defined area optimally.

Zoom Extents: Draws the display at a zoom scale that displays all enabled data.

Pan: Select this option, then click in the window and drag the cursor to the position where that point should be displayed. As you drag, the program displays the distance and azimuth of the cursor motion. When you release the mouse button the display updates accordingly.

HYPACK® Area Map

The area map displays your project items. It enables you to preview your map display as you prepare to begin a project, and to view the results of many of the files generated in post-processing.

The Map window may optionally include one or more widgets:

- The **color bar** reflects the project colors set in the Color Editor panel.
- The **status bar** below the map displays the current cursor position in X,Y and Lat./Lon. (Local Grid) coordinates, and indicates the rotation, tilt, scale and Z-scale of the area map display.

- The **geodesy bar** above the map displays the project geodesy according to current options in the GEODETIC PARAMETERS program.
- The **pan/zoom/rotate control** to adjust your map display with your mouse.

- A **north arrow**

HYPACK® provides numerous tools and settings that enable you to optimize the display of enabled project files. These settings are configured in one or more locations in the HYPACK® interface.

- In the menu and Map View tools for each Map window
- In the Control Panel
- In the Project Items List
- In the COLOR EDITOR

Display Settings in the HYPACK® Control Panel

Select SETTINGS-SETTINGS (F9) to control the presentation in the area map.

Your control panel display settings are interactive with your schemes. When you make a change through the control panel, the change will also affect the current scheme. Likewise, changes in the scheme will affect your control panel settings.

There is an additional ‘twist’ to this interaction. When you change a setting in the control panel, the corresponding change is made to the current scheme, but you will not see that change until you have either left and re-entered HYPACK®, opened a different project with the same scheme, or loaded a different scheme then the original one again. Any of these actions causes HYPACK® to re-read the scheme record and modify the display accordingly.

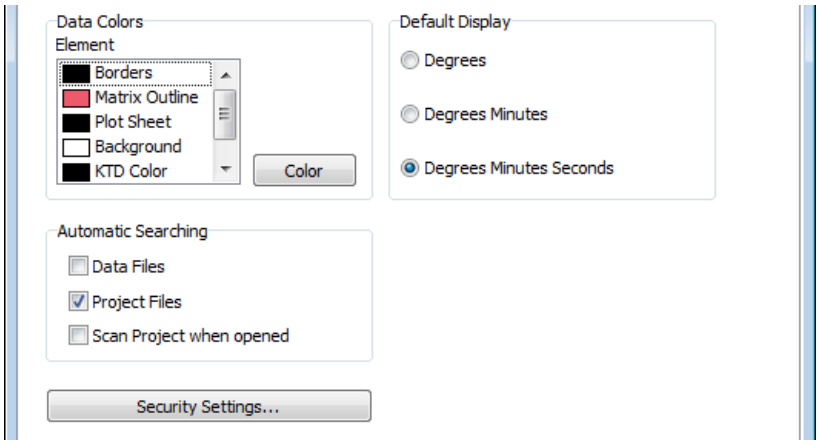
[Apply] enables you to preview your settings before exiting the Control Panel.

Set as Default saves the current settings and uses them any time you create a new project.

General Display Settings

The **General Tab** sets the display colors of several features.

Control Panel—General Tab



Data Color Control enables you to select various file types and click [Color] to specify the color used on the screen.

Default Display determines the Lat/Lon format for data input and in the HYPACK® status bar.

Automatic Searching options are used when you return to the main HYPACK® screen from one of the program modules.

- **Search Data Files** loads all Raw, Edited and Sorted data files in the project that are not currently loaded to the HYPACK® display.

> **NOTE:** To save time, it loads but does not enable HS2 or HSX files.

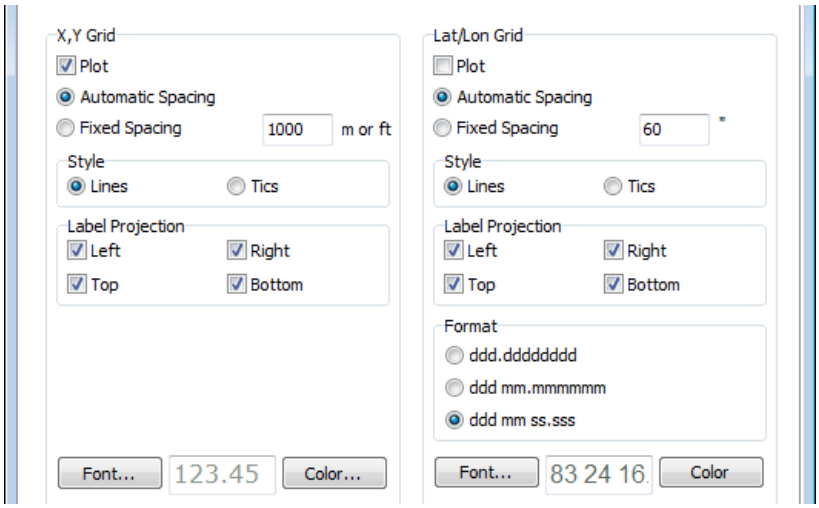
- **Search Project Files** tells HYPACK® load all project files in the project to the HYPACK® display.
- If you also check the **Scan Project When Opened** option, HYPACK® reloads the files indicated by the first two options when you enter the project.

Tip: These options are selected by default; however, if you have an excessive number of files in your project, you may want to manage the files loaded to your display manually. To do this, deselect one or both of the search options and the Scan Project option, then manually draw or remove them in the display as needed using the Load and Remove options in the right-click menu for each file type of the Project Items list.

GRID DISPLAY SETTINGS

The Grid Tab enables you to specify how HYPACK® displays projection grids and latitude-longitude (lat./lon.) grids. HYPACK® displays the lat./lon. of the local datum.

Grid Tab



Plot toggles the grid display on and off.

Automatic Spacing is the default setting to determine the spacing between projection grid lines. HYPACK® automatically changes the spacing as you zoom in/out.

Fixed Spacing specifies the meters (or feet) between projection grid lines and seconds of arc between lat/lon grid lines. This will be kept constant while you zoom in/out.

Style enables you to draw your projection grid using either lines or tics.

Label Projection enables you to assign which sides of the HYPACK® screen you wish to have the projection labels placed.

Font enables you to assign the font of the projection grid labels. Standard Windows® Color Selection and Font Selection dialogs are presented for your choices.

NOTE: Select only true type fonts to achieve the correct rotation.

Color sets the color for your projection grid lines and labels.

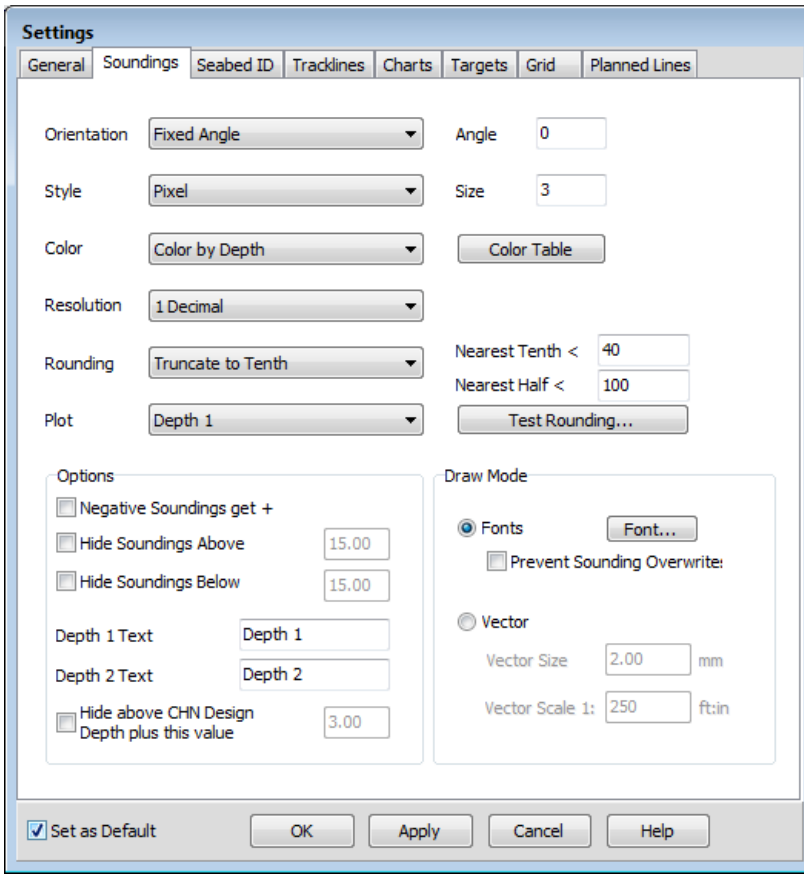
The Latitude-Longitude Grid has an additional setting to those found under Projection Grid. **Format** enables you to specify how the lat./lon. labels are written in the grid and in the HYPACK® status bar.

SOUNDINGS DISPLAY SETTINGS

The Soundings Tab enables you to set how the soundings are presented and plotted.

To toggle the display of the soundings, right-click the data file folder and select ‘Enable Soundings’.

Soundings Tab



Orientation draws XYZ data at a user-specified angle relative to the first LNW file listed in the project files list. Elect to plot soundings:

- **Perpendicular** to the planned line,
- **Parallel** to the planned line
- **At a user-defined Fixed Angle**. This is the angle the text appears relative to the map window. (It is unrelated to the map orientation.) Any angle from -360 to +360 is permissible

Style: Choose the format with which to write your sounding.

- **Decimal Point on the Mark** (USACE) option places the decimal point at the location of the sounding and writes a normal size fraction.

- **Cartographic** (IHO) centers the integer portion of the sounding at the sounding location and then writes a smaller, lower fraction.
- **Spanish Navy** (IHM) places the decimal point at the location of the sounding and then writes a smaller, lower fraction.
- **Pixel**: represent the location of each sounding with a color-coded Pixel (dot) of a user-defined size.
- **Russian**: The sounding location is marked with a dot with the sounding value from the TIN MODEL Input file to its right. If you have a second TIN model, the depth from the Additional file appears left of the sounding position.

Resolution enables you to specify soundings to either one 1 Decimal (Tenths) resolution or 2 Decimal (Hundredths) resolution.

Rounding enables you to determine how the soundings are presented.

- **None** displays the soundings decimal places according to the resolution setting.
- **Truncate to Tenth** just leaves off the hundredth digit. For example, 6.97 is written as 6.9.
- **HYPACK:**
  - > **Depth below Nearest Tenth value:** Round to nearest tenth using a x.05 rounding point (e.g 12.46 -> 12.5)
  - > **Depth below Nearest Half value:** Round using 3 rounding points:

    <x.3 =x.0 (e.g 42.28 -> 42.0)

    <=x.8 = x.5 (e.g. 42.6 -> 42.5)

    > x.8 = (x + 1).0 (e.g. 42.83 -> 43.0)
  - > **Depth above Nearest Half value:** Round to a whole number using x.8 rounding point (e.g. 123.7 -> 123.0, but 123.8 -> 124.0).
- **ROK Rules (Republic of Korea):**
  - > **Depth < the specified Nearest Tenth** threshold, it is displayed at the specified decimal resolution.
  - > **Depth >= 31**, it is truncated to a whole value, otherwise it is truncated to the first decimal.

NOTE: The rule stated 31 meters as the whole value threshold but, *if you are using depths in feet, the threshold will be interpreted as 31 feet by the sounding engine*.

- **UKHO Rules (United Kingdom Hydrographic Office)**:

> **Depth < 0:** Drying Heights are rounded nearest tenth using a x.03 threshold.
> **Depth below Nearest Tenth value:** Round to nearest tenth using a x.08 threshold.
> **Depth below Nearest Half value:** Output x.0 or x.5 using a x.5 threshold.
> **Depth above Nearest Half value:** Round to a whole number using a x.75 threshold.

- **NOAA (National Oceanographic and Atmospheric Administration)**:
  > **Depth < 0:** Drying Heights are rounded to nearest whole number using a x.5 threshold.
  > **Depth below Nearest Tenth value:** Round to nearest tenth using a x.075 threshold.
  > **Above Nearest Tenth** (Nearest Half not used) Round to a whole number using a x.75 threshold.
- **AHOI (Australian Hydrographic Office)**:
  > **Depth < 31:** (designed for meters) Display in Tenths, round at a x.065 threshold.
  > **Depth >= 31:** Display as a whole number, round at a x.65 threshold.

[Test Rounding] provides a quick test platform to aid in understanding how your current settings affect your sounding display, and to ensure that the rounding rules have been implemented correctly. Just enter any sounding value in the dialog provided and see the display value based on the current option set.

The **Options** settings contain the following items:

- **Negative Soundings get "+"** does just that. If you have processed your sounding data in elevation mode (z values are negative), this setting will display them on the screen in depth mode (z values are positive).
- **Hide Soundings Above** a user-defined level plots only soundings deeper than the specified depth.
- **Hide Soundings Below** a user-defined level plots only soundings shoaler than he specified depth.
- **Depth 1 Text** and **Depth 2 Text** (HYPACK® Control Panel only) are the terms by which you, personally, call the depths in a dual frequency data string. If you prefer a term other than ’Depth 1’ and ‘Depth 2’, enter them in the fields provided. Your terms will then replace ‘Depth 1’ and ‘Depth 2’ in this and other HYPACK® dialogs.

NOTE: These labels have not been fully implemented . They occur initially in the HYPACK® and HYPLOT Control Panels, and in the SB SELECTION program.

- **Hide Above CHN Design Depth Plus this Value**: Omits soundings that are more than the user-defined distance from the channel template.

Color: Defines predefined sounding color settings (Black or ECDIS) or the value HYPACK® is color-coded according to a user-defined palette.

- **Black**: HYPACK® ignores the project colors and draws all soundings in black.
- **Color By File** enables you to set specific colors for each catalog or individual file through the right-click menus in the Project Items list. Files loaded as part of a catalog all inherit the color of the catalog. When you assign a color to a file, the file name appears in the same color in the Project Items list.

NOTE: **To color individual files**, you must first load them to the project separately.

- **ECDIS Colors:** HYPACK® ignores the project colors and draws all soundings according to ECDIS convention.
- **Color by Depth** colors your data based on the Z-values. Configure your palette according to your expected Z range.

. (See Also Sounding Color Settings in HYPACK® on page 1-17)

Draw Mode: Select a method and set the corresponding parameters.

Fonts: [Font] displays the Windows® Font dialog where you can set font, and font size. (Ignore the remaining options; HYPACK® does.)

- **Prevent Sounding Overwrites** When you are drawing soundings with Windows® fonts, this option plots soundings gridded with sufficient spacing to make them readable. To accomplish this, the number of soundings displayed in a given area changes with the zoom range. *This is for display purposes only*. It does not thin your data.

Vector options: Set the Vector Scale at which you expect to plot your survey, then enter a Vector Size that appears as you wish.

Planned Line Display Settings

The Planned Lines tab includes checkboxes where you can choose whether to display the lines and the labels.

Click **[Line Color]** to access a color dialog where you can choose the color that the planned lines will display.

The **Label Orientation** and **[Font]** options are the same a track line options.

Draw Template Points: If you have a planned line with template information, HYPACK® draws small circles at each template inflection point in the area map display.

The Planned Lines Tab

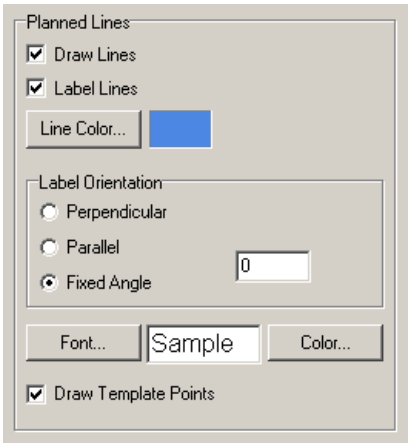
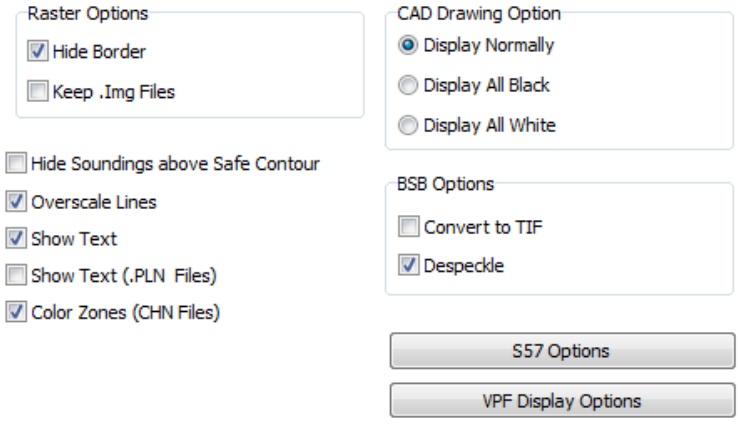


Chart Display Settings

The Charts Tab provides display options for background charts.

The Charts Tab



Raster Options

When you enable raster charts in your project, HYPACK® generates an IMG file for display. This process can take significant time and hard drive space; however, you can save the IMG file and display the chart instantaneously after that.

NOTE: Mr. Sid and ARCS charts are excluded from these options.

Hide Border displays only the map part of the chart file, omitting the text, scales and other 'extraneous' information around the outside.

Keep IMG Files saves the IMG file in your project folder and display time going forward is fast. Deselected, disabling a chart also removes its IMG file, and it must be regenerated each time you enable the chart.

Tip:

IMG files tend to be *very large* compared to the raster charts they represent. Consider selecting this option while you are actively using your project to save time as you enable and disable charts. When you want to archive or transfer your project, deselecting this option reduces the size of your project.

BSB Options

Convert to TIF: When you load BSB charts to your project, HYPACK® compares the chart geodesy against your project geodesy. If they do not match, it first re-projects the chart to the project geodesy before it generates the IMG file for display. Select this option to generate a compressed Geo-TIF, which displays when you enable the source BSB chart. The Geo-TIF generates its own IMG file (*.KAP.TIF.IMG), but a bit faster than the BSB because no re-projection is required. The TIF is also much smaller than an IMG file for project storage and transfer purposes.

Creating Geo-TIFs offers a compromise between the best display speed and the smallest project size offered by the Keep IMG Files option.

BSB Chart Scenarios—After the First File Load

Keep IMG Files	Convert to TIF	After the Chart First Enabled...	
		Display Speed	**Inactive Project Size**[a]
No	**No**	• **Slowest**. • Requires re-projection and IMG generation.	• No added files to store

Keep IMG Files	Convert to TIF	After the Chart First Enabled...	
No	**Yes**	• **Faster** than source BSB by re-projection time. • Only generates IMG	• Each Geo-TIF is moderately larger than its source BSB.
Yes	**No**	• **Instantaneous**	• Each IMG very much larger than its source BSB

a. Inactive Project Size refers to space required to store or transfer. When the project is inactive, HYPACK® deletes the IMG files unless the Keep IMG Files option is selected. In an active project, all enabled raster files also require the IMG files, which require added memory.

NOTE: *You would not select both options.* Keeping the IMG file of the BSB would make the Geo-TIF unnecessarily redundant.

Despeckle quickly fills scattered pixels that were unfilled by the re-projection process.

CAD Drawing Option

Display Normally (default) draws your chart using the colors specified in the file.

Display All Black and **Display All White** override the chart colors in the HYPACK® display.

To override the setting in the Control Panel, right-click on the file name in the Project Files list, and select DISPLAY OVERRIDE and your desired setting.

To return to the setting in the Control Panel select DISPLAY OVERRIDE-PROJECT SETTING in the right-click menu.

Additional Chart Options

Hide Soundings above Safe Contour displays soundings, other than those in the Project Items list, greater than the Safety Contour value in the S57 Options.

Overscale Lines tell you that you are viewing the chart at a smaller scale than that in which it was created. An over scale chart will appear with diagonal, white-dotted lines. These appear on ARCS chart displays.

Show Text includes item labels in the display. If you have several labeled items in a small area or if you are viewing a large area at a small zoom scale, the labels may become confusing. If this is the case, clear this option to display only the symbols.

Color Zones shows the channel zone colors assigned in ADVANCED CHANNEL DESIGN. Otherwise, it only outlines the channel faces.

SOUNDING COLOR SETTINGS IN HYPACK®

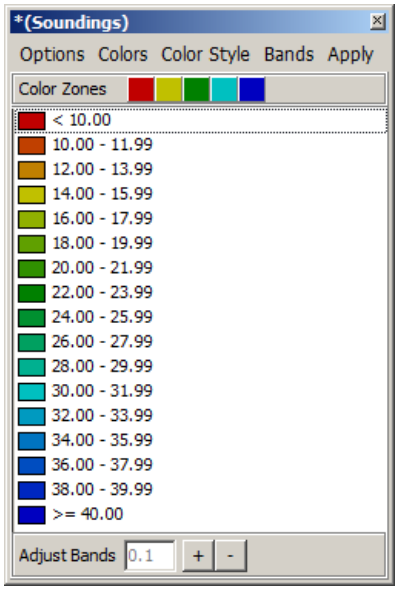
The **Color Editor** enables you to specify your project colors the HYPACK® programs use to code your data. Most often, you color-code your displays by sounding depths, but the project colors may also represent other values. Your project color settings are reflected in the color bar, which can be displayed in the HYPACK® interface by selecting WIDGETS-COLOR BAR in the map window menu.

If your current color palette does not reflect the values you want, you can customize the zones, colors and bands for your purposes.

To configure your color palette, do the following:

1. **Open the COLOR EDITOR.** Select VIEW-COLOR EDITOR (or SETTINGS-SOUNDING COLORS).

COLOR EDITOR



2. **Select a color palette from the Colors menu.**
3. **Select your color style.**
4. **Customize your zones. (Optional)** This option is unavailable for some color styles.
5. **Generate an initial color palette.** You define the range and increment for the values represented in the palette. The COLOR EDITOR evenly distributes the color zones over the

user-defined color range, then “smooths” (interpolates) the colors for the bands (value increments) between each zone color.

6. **Customize your color bands by setting the value range and increment.** Once the initial color palette is established, you can further customize your settings by adding and deleting bands.
7. **Click [Apply].** This updates your displays with the new color palette and stores your current palette in the corresponding HCF file.
8. **Save your color palette for future use.** (Optional) Select OPTIONS-SAVE COLOR FILE and name your file something *other than the default file names*: color.hcf, and clr01.hcf,clr02.hcf, clr03.hcf and clr04.hcf. This allows you to load the same color palette at a later time by simply loading the HCF file to the selected palette (OPTIONS- OPEN COLOR FILE).

(See Also Soundings Display Settings on page 1-10)

PROJECTS IN HYPACK®

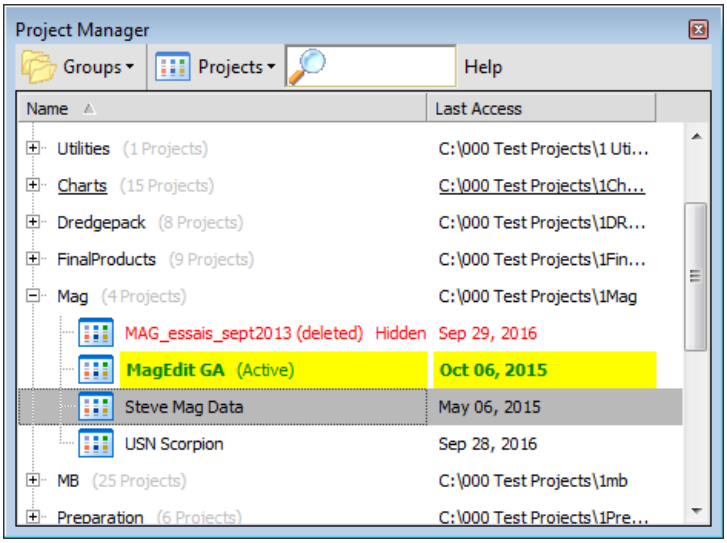
A **project** is a folder, with a user-defined project name, and all of the information about your survey it contains. Each time you open HYPACK®, it opens the most recently used project and displays the project name in the title bar.

NOTE: The first time you open HYPACK®, or if you have removed the project folder from the hard drive, the title bar says “No Project Loaded” and most menus and icons are disabled.

Every time you begin a new survey in HYPACK®, you create a new “project”. Under the project folder, HYPACK® creates a series of subfolders: **Raw, Edit, Sort** data files will be saved, by default, to the subfolder appropriate to their type.

The **project file group** is a folder that stores one or more HYPACK® projects. HYPACK® stores projects, by default, to the HYPACK 2020\Projects folder. Projects stored there are known as **local projects**.

Project Manager

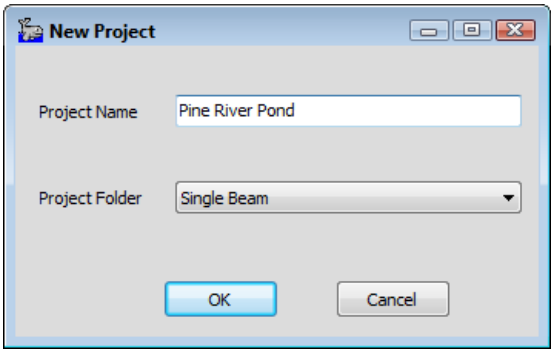


CREATING A NEW PROJECT

Each time you begin a new survey, you should create a new project. HYPACK® enables you to name your project and then stores all of the information about that survey in the project folder.

1. **Select FILE-NEW PROJECT** and the New Project dialog appears.

Setting the New Project Name and Location



2. **Name the project and select a folder where the project will be stored.**
   > **Project Name**: Enter a name that will remind you of the location and the date of the survey. Project names may not contain periods, back or forward slashes, question marks, less than or greater than signs, or bars.

Invalid Characters

.	/	\	?	<	>	|

> **Project Folder:** Enter the project group folder where your project should reside. We recommend you use the default project folder (HYPACK 2020).

The software creates a folder in the specified location using the project name.

3. **Click [OK].**

FILE-SAVE PROJECT saves all of the settings and files used in the current project. When you re-open a project, it will restore all features as they were when you last saved the project.

Tip: Click on any step in the "Survey Work Flow," figure to jump to the corresponding information in this manual.

MANAGING FILES IN YOUR PROJECT

Several types of files may comprise your project data. These files are listed in the Project Items lists. The Project Manager provides a number of tools with which you control the files used in your project at any one time.

Loading: You must load files that you want to use in your project, but do not yet appear in your project items. The process tells HYPACK® the name of the file and where it is stored on your system.

Enabling and Disabling: Generally, enabled files are drawn to your map window. By enabling and disabling select files, you control the combination of files displayed in the map window at any one time.

Renaming files in the Project Items list and on your hard drive simultaneously from the HYPACK® interface.

Removing files unloads them from your project, but *does not* remove them from your hard drive. If you change your mind, you can reload them to you project.

Deleting files unloads them from your project and moves them to the Windows® Recycle Bin.

Loading Files to your Project

Files that you create while working in a project are saved, by default, to the project folder, enabled (drawn) on the screen, and added to the Project Items list. HYPACK® attempts to draw your data in an order which will optimize the display of all enabled files. Occasionally, modifications to the draw order or transparency are required.

1. **Right-click the folder in the Project Items list that corresponds to the file type you want to load** in the Project Items list.
2. **Select Add File or Add File & Copy and choose the file.** The loaded program becomes enabled in the Project Items list.
   > **Add File** reads the file from its current location but *does not copy it to the project folder*. This can be useful if you are using very large files (eg. charts) that take excessive space on your hard drive in multiple projects.
   > **Add File & Copy** allows you to select a file from outside the project folder. It then imports the file from its current location to the project folder and enables it in the project.

BEWARE! Saving the project folder does not save a file that has not been copied into the project folder. When you only add a file to the project, it must remain where it is on your system so HYPACK® can find it when you open the project.

This manual assumes that you store all project files in the project folder.

Raw Data Files

Raw files are the data files that result from the SURVEY or DREDGEPACK® program. Every time you log data, a new Raw data file is created. They are ASCII format files that contain the header information and time-series information for each survey device.

By default, they have the RAW extension and, in a standard HYPACK® project, are stored in the HYPACK 2020\Projects*ProjectName*\Raw folder.

A list of individual data files is provided in a catalog (*.LOG) file. You can quickly draw or process a group of files by specifying the *.LOG name, instead of entering the name of each data file.

HYPACK® programs use the data from the RAW files to position the data in the corresponding multibeam or side scan HSX files.

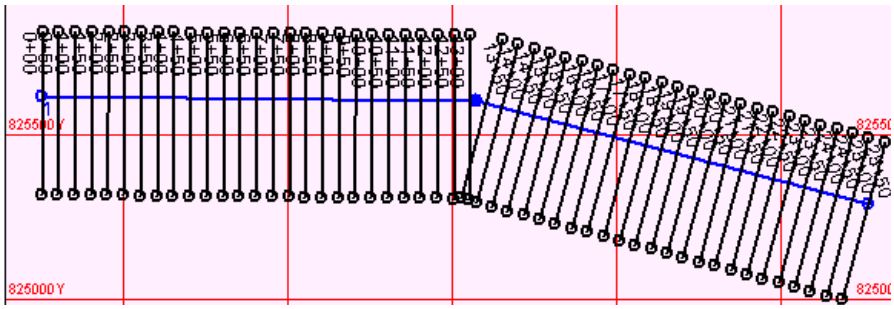
HSX format files store data logged by HYSWEEP® SURVEY. Each time you log data, HYSWEEP® SURVEY generates a file with the same root name as the RAW file from HYPACK® SURVEY and the HSX extension. HSX files are listed together in catalogs separate from the RAW files: HSX_Raw catalog root name.LOG. HYPACK® programs use the data from the RAW files to position the data in the corresponding multibeam HSX files.

HYPACK® Project Files

The Project Files list includes files, other than data files, used in the project. In single beam projects, these typically include planned survey lines and background charts.

Planned survey lines (*.LNW) define where you want your vessel to go. The line file contains the grid coordinates and names for each planned line in your project area and can also contain cross section template information. Line files are typically created in the LINE EDITOR program.

Sample Planned Survey Lines



Background charts provide context and navigational reference for your work. HYPACK® displays several types of electronic charts in the area map and in the data collection and editing programs.

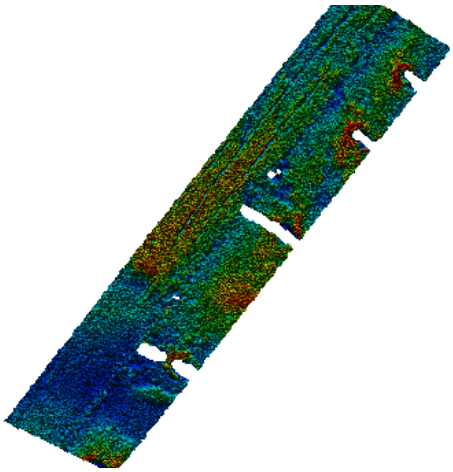
NOTE: Charts drawn in XY (DGN, DXF, DIG, TIF and SHP) *must be in the same geodesy as your project* to be positioned correctly. Charts drawn in WGS-84 (S57, VPF), the SURVEY or DREDGEPACK® program will transform the data files to the local datum, using the datum transformation parameters in the GEODETIC PARAMETERS program, before converting them to your

projection. This allows you to use these file formats on any projection.

Matrix files (*MTX) are gridded rectangular areas. You can fill the cells with depth information from your echosounder in real time during data collection, or in post-processing.

Empty matrix files are typically created in the MATRIX EDITOR and saved to the project folder.

Matrix File Color-coded in Post-processing with Intensity

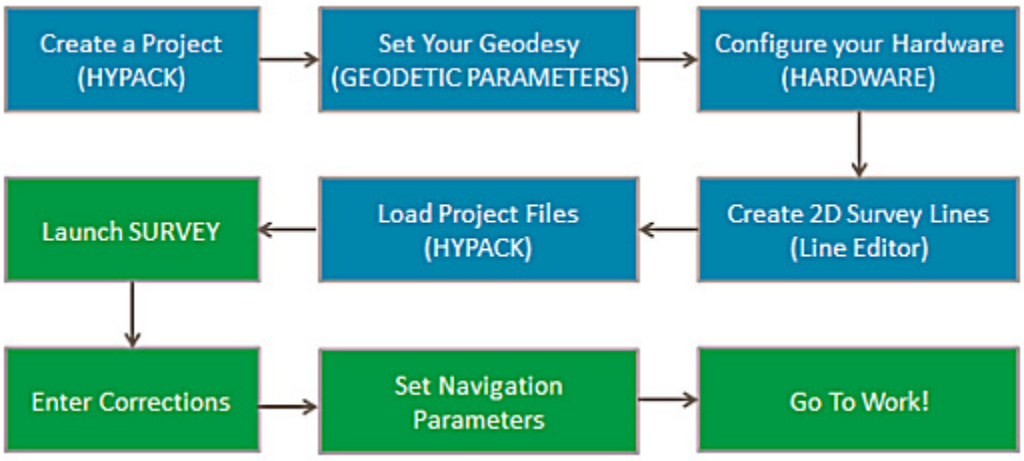


CHAPTER 2

Preparation

WORK FLOW

Survey Work Flow



Before you begin your work in your project area, there are several tasks to consider:

1. **Create a new project.** You can create a new project and all of the files in it by using the FILE-NEW command.

   When you create a new project, it inherits the last settings for geodesy and hardware.
2. **Check your Geodesy.** If you have not previously specified your geodesy, enter the GEODETIC PARAMETERS program and configure your geodesy.
3. **Configure and calibrate your hardware.** If you have not previously specified your sensors, configure your equipment in the HARDWARE program.
4. **Create your planned survey lines.** (Optional)

If you are working on a new survey project, you typically create planned survey lines to assure even coverage. Create planned lines in the LINE EDITOR.

5. **Prepare and load other support files as needed**. These may include:
   > Background charts
   > Corrections files

Tip: Click on any step in the Work Flowchart to jump to the corresponding information in this manual.

ENTERING YOUR GEODETIC PARAMETERS

Geodesy is the science of positioning objects on the earth's surface. Even though you don't need to be a master of geodesy to run HYPACK®, some basic geodetic knowledge can make the difference between obtaining a correct position and having your boat plot elsewhere.

Most GPS equipment outputs your position in WGS-84. HYPACK® receives the Latitude, Longitude and Height information based on the WGS-84 ellipsoid, and transforms it into a Latitude, Longitude and Height on the Local Datum. It then performs a grid conversion to calculate an X (Easting) and Y (Northing) on the specified projection.

The **GEODETIC PARAMETERS** define your local grid. This enables HYPACK® to correctly calculate your XY position on your local grid from your GPS data (typically WGS84).

You must define the following geodetic parameters for your local grid.

- The reference ellipsoid.
- Any necessary datum transformation parameters: If your local grid is not based on the WGS-84 ellipsoid, datum transform parameters are required. (Consult your project specifications. Refer to the full HYPACK® User Manual or Help for detailed directions.)
- The projection parameters: Automatic when you choose one of the pre-defined grids.

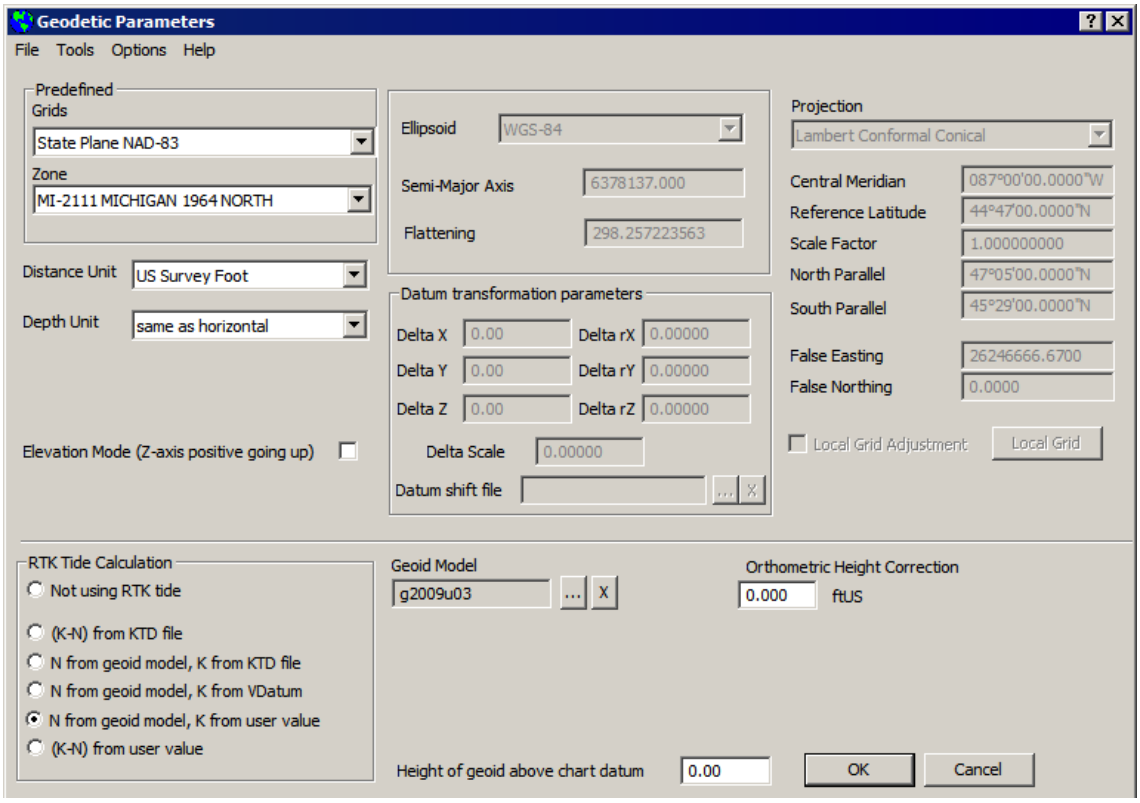
Tip: If you don’t know the correct geodesy settings, choose the correct pre-defined UTM grid and zone. The UTM grid is based on the

WGS-84 ellipsoid so no datum transform parameters are required and the data can be converted to the proper geodesy later.

The grid, zone, ellipsoid and survey units are displayed in the HYPACK® status bar above the area map.

1. **Start the GEODETIC PARAMETERS program** by selecting PREPARATION-GEODETIC PARAMETERS.

Geodetic Parameters Dialog



2. **Select your Ellipsoids and Projection Parameters**. Many grids have been built into HYPACK®. Just select the correct grid and zone, and your projection parameters are automatically loaded.

NOTE: If your ellipsoid is other than WGS-84, you must also enter datum transformation parameters. Consult your project specifications. The HYPACK® User Manual and Help files include directions for calculating datum transformation parameters.

3. **Select your Distance Units.** Notice that you can set your vertical and horizontal distances to be measured in different units if you wish.

4. **Set your Datum Transformation values**.
5. **Choose your degrees format.** Select OPTIONS-DEGREES FORMAT and the format you want to use.
6. **If you are logging RTK (Real-Time Kinematic) tides, set your vertical correction settings according to the following table**. When you make your RTK Tide Calculation selection, the dialog updates to display the other relevant options. (Please refer to the full version of the HYPACK® User Manual or your Help files for the full details on RTK tide corrections.)

Configuring your Geodesy for RTK Tide Corrections

Area Description	RTK Selection	Enter Geoid?	KTD File?	Enter Chart Datum[a]?
• US Coastal Waters	N from Geoid[b], K from VDatum[c]	Yes	No	Chart Datum
• **Geoid** Present • **Constant Separation** of Geoid - Chart Datum	N from Geoid, K from user value	Yes	No	Height of Geoid above Chart Datum
• **Geoid** Present • **Changing Separation** of Geoid - Chart Datum	N from Geoid, K from KTD	Yes	Yes Geoid above Chart Datum values	No
• **No Geoid** Present • **Constant Separation** of Reference Ellipsoid-Chart Datum	(K-N) from user value	No	No	Height of Ellipsoid above Chart Datum
• **No Geoid** Present • **Changing Separation** of Reference Ellipsoid-Chart Datum	(K-N) from KTD	No	Yes Ellipsoid above Chart Datum values	No

a. The related fields are enabled and disabled according to the RTK selection.

b. If you use the 2012 Geoid, you must also use the 2012 VDatum files. Otherwise, use the previous version of VDatum with Geoid 2009.

c. When using the VDatum database, you *must* use one of the pre-defined chart datums. If you enter a user-defined chart datum level, the VDatum database is ignored.The Vertical Datum field is written to the header of your file, but HYPACK® doesn't use it for anything else.

7. **If you are working in Elevation mode, do the following**:
   > **Select the Elevation Mode option**.
   > **Enter a user-defined Chart Datum Level above Geoid.**
8. **Click [OK].** Your geodesy settings will automatically be saved to your project.

HARDWARE SETUP IN HYPACK®

'Hardware' is the term we use for the sensor devices from which HYPACK® receives data. The hardware configuration describes what devices you have, how they are connected to the survey computer, and your logging instructions.

All devices are configured from a common HARDWARE interface; however, HARDWARE includes three separate sets of configuration tabs according to the type of project and device—HYPACK, HYSWEEP® and SIDE SCAN HARDWARE.

When you indicate that your configuration includes multibeam system, a HYSWEEP® SURVEY subheading appears below the vessel. When you select the subheading, the program displays the corresponding tabs for multibeam devices and options (HYSWEEP® HARDWARE).

Hardware Divisions

System Setting	Devices
HYPACK® HARDWARE	• Positioning devices • Devices used exclusively in single beam projects (single beam sounders) • Devices used in *both* single beam and multibeam surveys (ex. GPS, tide gauges) • Dredging tools (inclinometers, digging tool drivers) • Other non-bathymetric sensors
HYSWEEP®	• Devices used only in multibeam or multiple transducer surveys (ex. multibeam sonar, motion sensors) • Side scan devices when they are used together with multibeam devices

If your equipment does not change, and you are satisfied with the communication between your equipment and the survey programs, you don't have to run HARDWARE again.

If you change survey equipment, you will have to reconfigure your hardware.

1. **Select PREPARATION-HARDWARE SETUP** or click on the Hardware icon. The HARDWARE window will appear with any

configured devices listed on the left. When there are no devices configured, it lists a “boat” with no devices.

2. **Select FILE-NEW.** The configuration begins with a single vessel and no devices. The program asks whether to save the current configuration. If you want to save it, click [Yes] and save your configuration file before proceeding with this step. If you don't need it or have already saved the current configuration, click [No] and build a new hardware configuration from the beginning.
3. **Set your mobile settings.** Your hardware configuration includes a mobile for each device position you will track.

   Each vessel (mobile) in your configuration has an associated Mobile dialog which appears when you select the vessel name in your device list. This is where you can rename the mobile and set the tracking point.

   In the Vessel Shape tab, you may also assign a boat shape which can be used in place of the simple symbol options to more closely represent your vessel in SURVEY.
4. **Configure your System settings.** If you are configuring a system with **multibeam or side scan devices**, add either group to the appropriate mobile.
5. **Configure each device in your system.** This includes selecting a device driver for each device and configuring the driver setup options, connection information and the position of the device relative to a fixed reference point on the mobile (measured offsets).
6. **Test the communication** between the devices and your survey computer.
7. **Save your configuration.** when you select FILE-SAVE, your current hardware configurations are stored in the project INI files.

Saving Your Hardware Configurations

Device Type	FILE-EXPORT Menu Selection	Default INI File
GPS, Single Beam and Dredge equipment	Hardware Settings	survey32.ini
Multibeam and any Side Scan devices logged simultaneously	Multibeam Settings	hysweep.ini

Each time you save a your settings in HARDWARE, they are recorded to these files where they are read by other programs to enable your data collection, and by HARDWARE itself to display your settings when you re-open the program.

System Settings

To access the System settings select “Hardware” in the tree view.

HYSWEEP® SURVEY Options:

- The **Include** option makes multibeam devices available in the HARDWARE interface.
- **Installed on Towfish** assigns the multibeam device to the second mobile in the tree view. Otherwise it is assigned to the first mobile. Use the Towfish driver to calculate the towfish position relative to the boat.

IMPORTANT: All multibeam devices must reside on the same mobile.

Synchronize the Computer Clock: *All devices must use the same time basis*—the computer Veritime or UTC time. If any device sends UTC time-stamped data, you must synchronize your computer clock with UTC time using the 1PPS box or the NMEA ZDA message.

If you synchronize the clock, HYPACK® adjusts the Veritime clock speed to match the UTC time based on the time in the ZDA message from the GPS.

NOTE: You should run SURVEY for two minutes before collecting data to allow the Veritime clock to synchronize with UTC time.

BEWARE! Update settings *on your GPS* of faster than 1000 msec (or 1 Hz) when you are using the Sync. Clock feature may result in significant drift between the computer clock and GPS time.

Mobiles and Mobile Settings

A **Vessel** (also called a **mobile**) in HYPACK® is any independently mobile object. If HYPACK® needs to have a position for it, it’s a vessel. For each mobile, SURVEY displays a symbol or boat shape at its current position.

HARDWARE always has at least one mobile. Each mobile has an origin (reference point) and a tracking point. You may also assign a

boat shape which can be used in place of the simple symbol options to more closely represent your vessel in SURVEY.

The **vessel origin** is the reference by which you position your devices and tracking point on your vessel. The tracking point and each sensor is referenced to the origin based on the distance in survey units it is starboard (X-direction), forward (Y-direction) and vertically (Z-direction). Vertical offsets are measured from the static water line, and are always *positive downward*.

A **tracking point** is the position used by SURVEY to position the mobile in the world. It is used to provide left/right guidance, make automatic “start line” and “end line” decisions, and calculate horizontal distances between the vessel and features in your survey area. It is also the location at which Quickmark targets are marked.

To properly position your data, our hardware configuration defines the devices, the mobiles, which devices are on each mobile and each device position relative to the origin of its mobile.

SPECIFYING DEVICES IN HARDWARE

When you have created a mobile for each position you want to track in SURVEY, you are ready to begin configuring your devices.

HARDWARE divides devices into three categories: HYPACK®, HYSWEEP® and Side Scan.

- **HYPACK® devices (positioning, heading, etc.):** You must configure at least one positioning device. The GPS.dll supports most GPS devices. For other positioning devices, check the *Common Driver Notes* in your HYPACK 2020\Help folder.
- **Multibeam equipment**: This includes not only multibeam and multiple transducer sounders, but motion sensors and gyros that are required for accurate sounding positioning. In addition, the multibeam list includes side scan devices that you may log simultaneously with multibeam data. The drivers are listed in alphabetical order by manufacturer. Multibeam devices automatically get their positioning from HYPACK® SURVEY.

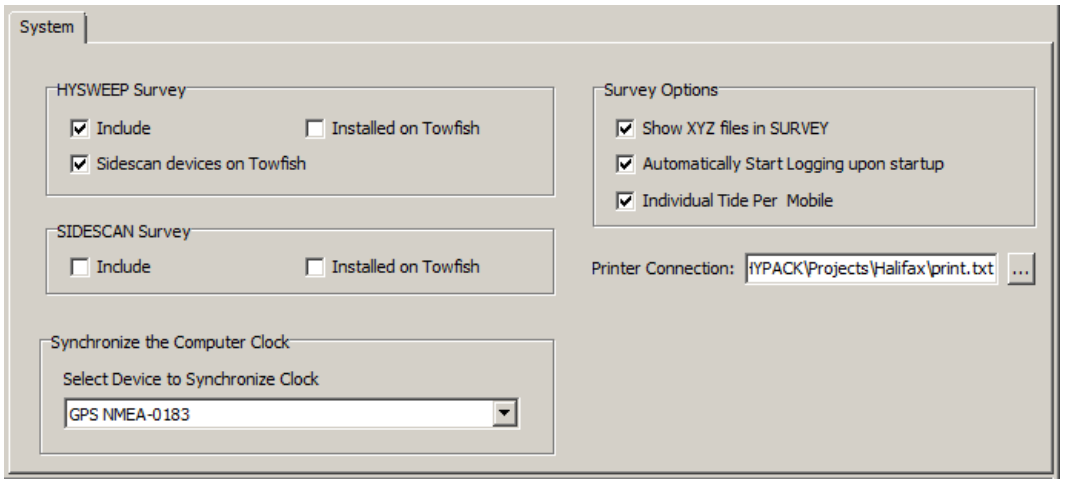
NOTE: To assist in configuring your drivers, you can refer to the Interfacing notes found in the HYPACK 2020\Help folder.

When your configuration includes multibeam devices, HARDWARE displays a subheading below the mobile to which they are assigned.

NOTE: Multibeam devices must be assigned to the first or second mobile. All multibeam devices must be assigned to the same mobile.

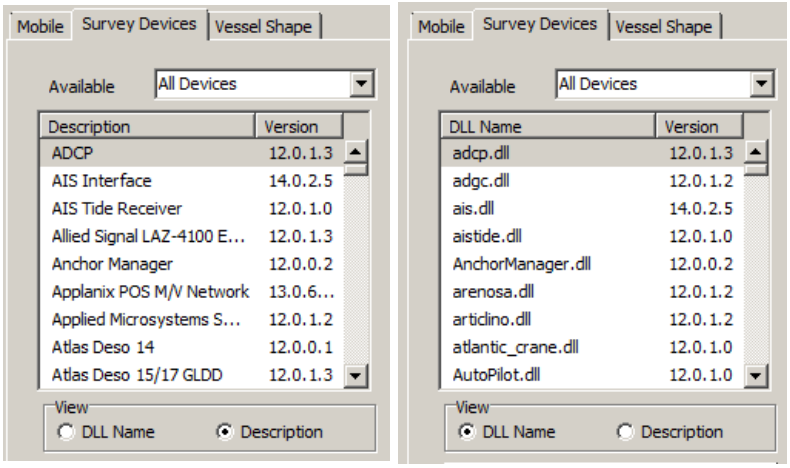
1. **Open the HARDWARE program.** Select PREPARATION-HARDWARE SETUP.
2. **Add a mobile for each vessel**.
3. **In multibeam projects, add the multibeam subheading to the appropriate mobile using your system settings**.
   a. **Access the System settings.** Select “Hardware Configuration” in the tree view.

Hardware System Settings



   b. **In the HYSWEEP® SURVEY area, check the Include option** to make multibeam devices available in the HARDWARE interface.
4. **For each HYPACK® device:**
   a. **Select the correct mobile in the tree view for your device.**
   b. **Select the Survey Devices tab.**
   c. **Use the View option to sort the device list** by driver name (eg. gps.dll) or description (eg. GPS NMEA-0183). (Optional)

HARDWARE Drivers—Sorted by Description (left) and by Dll Name (right)



d. **Use the Available option to list only drivers that record the desired data type.** (Optional)

e. **Move the devices in your configuration to the Installed list.** For each device, select the driver in the Available list on the left and click [Add->]. You must, at least, include a positioning driver for each mobile. (For example, use the GPS driver for your boat and the towfish driver to position towed devices).

5. **For HYSWEEP® devices, select the heading or subheading on the correct mobile in the tree view for your device type.** Choose the mobile for HYPACK® devices, or HYSWEEP® SURVEY for multibeam device.

NOTE: If you are logging both multibeam and side scan, configure all of them using the options in the HYSWEEP® SURVEY area.

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6. **Move the HYSWEEP® devices in your configuration to the Installed list.** Select the device in the Available list on the left and click [Add->] or Double-click the device in the available list.
7. **Configure the driver options:**

> **Name your device.** (Optional) The name (under the Installed list) defaults to the driver description, but you can change it to something simpler or to distinguish between two devices using the same device driver.

> **Click [Setup] and select the appropriate options** according to the Interfacing Notes, your device manual and your project requirements.

> **If you are using GEOCODER™ with side scan data, check the device specified under 'Specific Sonar**

Identification' to be sure it matches the model you are using. This is automatically filled when you add your device, but some drivers support more than one model. GEOCODER™ needs detailed information that may differ between models.

> **Assign any multibeam device to the correct mobile.** The **Installed on Towfish** option assigns the multibeam device to the second mobile in the tree view. Otherwise, it is assigned to the first mobile.

8. **Configure the Connection, Offsets and Driver Setup options.**
9. **Save your configuration (FILE-SAVE).**

CONNECTION INFORMATION IN HARDWARE

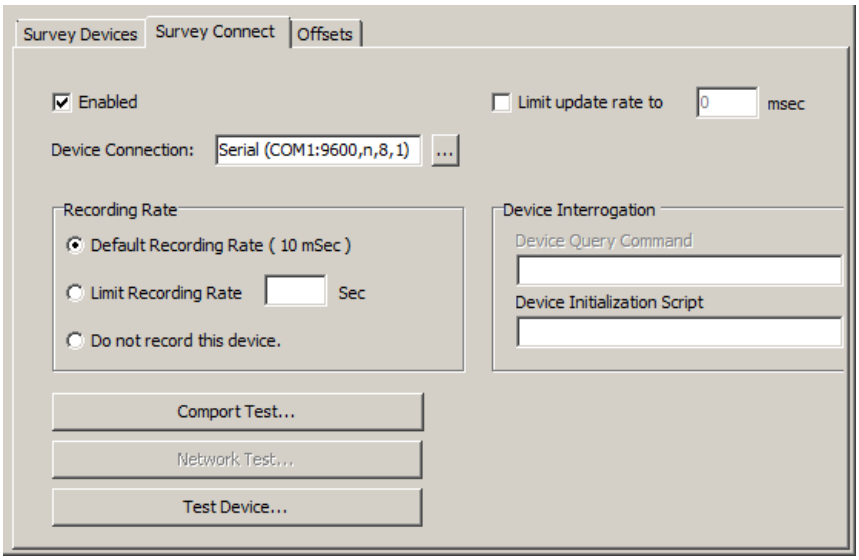
The Connect information provides the device location and communication parameters to the SURVEY program.

CONFIGURING CONNECTIONS FOR HYPACK® DEVICES

The Connect information tells the SURVEY program the device location and communication parameters.

1. **Select the device in the tree view and open the Survey Connect tab.**

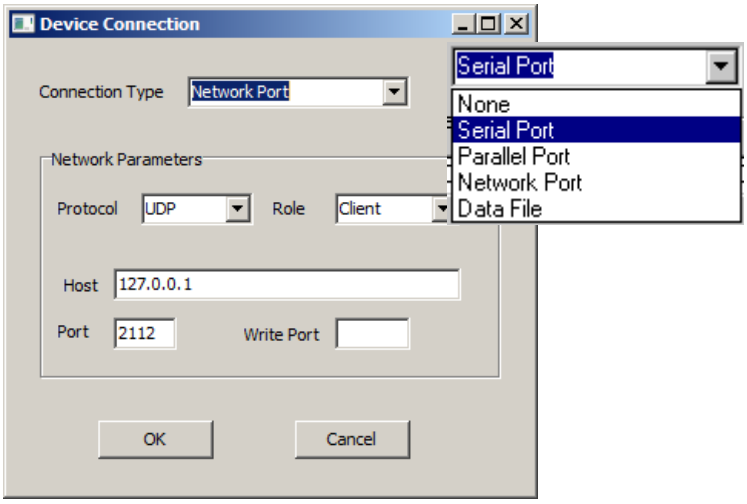
Survey Connect Tab



2. **Check the Enabled option**.

3. **Specify the device connection type for this device**.
   a. **Click [...].** The Device Connection dialog appears.

Device Connection Dialog

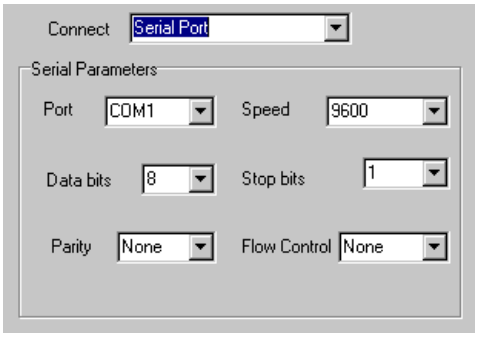


   b. **Select the connection type**. The default settings corresponding to the selected type are displayed below the selection.
   c. **Enter the port settings or data file you are simulating.** If the default settings are not accurate, they may be edited.

   HYPACK® uses the same serial (COM1: through COM50:) and parallel (LPT1: through LPT4:) drivers utilized by the Windows® operating systems.

   - The **Serial connections** (Parity, Flow Control, Baud, Data Bits, Stop Bits and Flow Control) must be set to match your equipment or SURVEY will not read the device data.

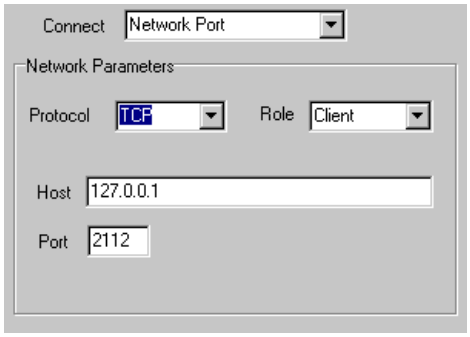
Serial Connect Options



   - **Network Connections**: Network devices are becoming more common. Echosounders with network

connections are advantageous in that full scan information can be recorded instead of only the depths.

Network Connect Options



Protocol: Choose between TCPIP, which passes data between two specific computers or UDP, which broadcasts to all computers on the local network.

Role: *Only valid for TCPIP protocol*, it depends the configuration in the echosounder. You can check your sounder's user manual for that information but, the majority of the time, the sounder will be the Server so you should configure HYPACK® to be the Client.

Host: This is the IP address of your sounder. Your sounder should be set to read the IP address of your survey computer.

Port: The port number is set for each device. It is the port from which HYPACK® is to read data. (Odom devices use 1601. Reson devices use 1998.)

Write Port is only required for the UDP protocol. It is the port at which HYPACK® should respond to this device.

- **Parallel Connections:** The port number is the only setting required for parallel connections.
- **No Connection (None):** Analog devices are frequently found on dredges to measure rotation. They interface with your survey computer through an Analog to Digital (A/D) card specific for the kind of input: 4-20mA, 0-5VDC, 0-10VDC, or -5 to +5VDC

d. **Click [OK].**

4. **Set any of the remaining options where they are applicable:**

> The **Limit Update Rate To** option is the time interval (in milliseconds) that the SURVEY program requests information from the device. The default value is 10, but you can modify the amount of information passed between

the device driver to the SURVEY program through this setting.

A millisecond is 1/1000th of a second. If your echosounder is updating 20 times per second and you specify an update frequency of 100 milliseconds, the device driver will only pass the last depth received to the SURVEY program 10 times per second, based on the update frequency setting.

All devices in HYPACK® operate on a “Last Only” basis. This means if a new piece of information arrives at the device driver before it has delivered the last update, it deletes the earlier information and holds only the last measurements. If you want to get every bit of information received from a particular device, make sure the update frequency is quicker than the update rate of the equipment.

> **Recording Rate** is the rate (in seconds) at which SURVEY records values for the device when logging. The default rate is 10 msec.

NOTE: If you attempt configure any recording rate other than the default for a positioning device, the program immediately displays a warning questioning your intentions.

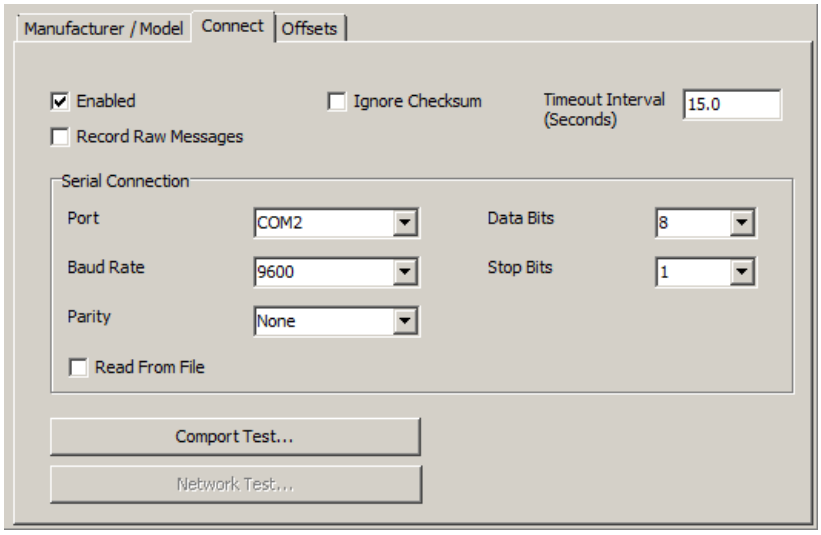
Tip: In most cases, we highly recommend you do not limit the recording rate. This will give you plenty of data from which to select your final soundings in post-processing. Remember, it is better to come home with too much data than with too little.

> **Device Initialization Script** sends user-supplied configuration information to certain echosounders. The information is sent at the start of HYPACK® SURVEY to restore the device to exact settings.

CONFIGURING CONNECTIONS FOR HYSWEEP® DEVICES

Select the device in the tree view then click the Connect tab to access device communication settings. Connection settings are required for each serial or network device. Serial or Network connection options are included in this dialog according to your device.

Serial Connections



- **Enabled**: Clear this selection to temporarily remove a device from the configuration without losing the device settings.
- **Ignore Checksum** is not recommended, but there are situations (normally testing) where the checksum is wrong, but the data is good.
- The **Timeout Interval**: The Devices alarm turns from green to red.when the last data received from any, individual device exceeds the defined time. It defaults to 15 seconds.

  This option can be useful where a normal return interval is greater than the 30 second time out that is hard-coded for the other individual device alarms (Nav, Side scan, etc).
- **Record Raw Messages** saves the original data string as it is read from the device into the raw data file. (Binary data is output in hexadecimal format.)

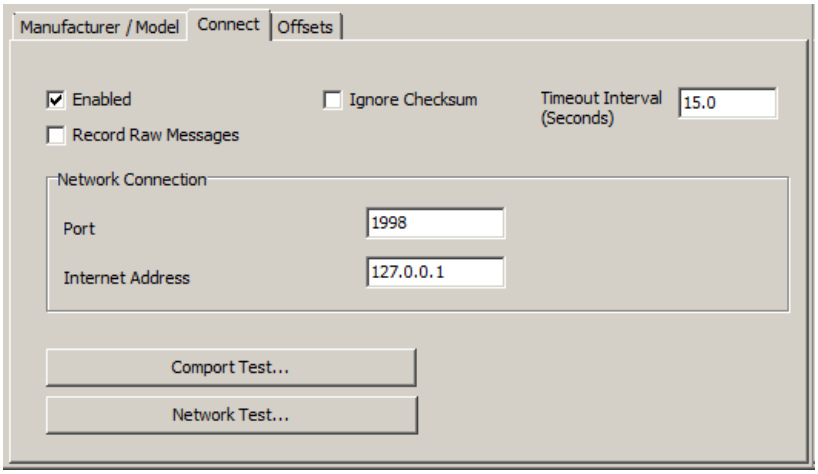
Serial Connection Settings

- **Port, Baud Rate, Parity, Data Bits, Stop Bits**: Enter your device settings. These should be in the information received from the device manufacturer.
- The **Read from File** checkbox enables you to simulate data input from this device by reading a file. Many times, when you are having a problem with a device in the field, we will ask you to log some of the output from the device to a file and upload it to us. We can then replay the information using the File setting to see what is happening.

Network Device Connections

Drivers specify the network connection automatically. Define the network settings in the Connect Tab.

Network Connections



If you have a DNS server, you can define your destination computer by name or by IP Address. If you do not have a DNS server, you must include the IP Address. If these values are unknown, contact HYPACK or the device manufacturer for help.

IMPORTANT: Be sure each network device has a unique IP Address to avoid network conflicts.

No Connection

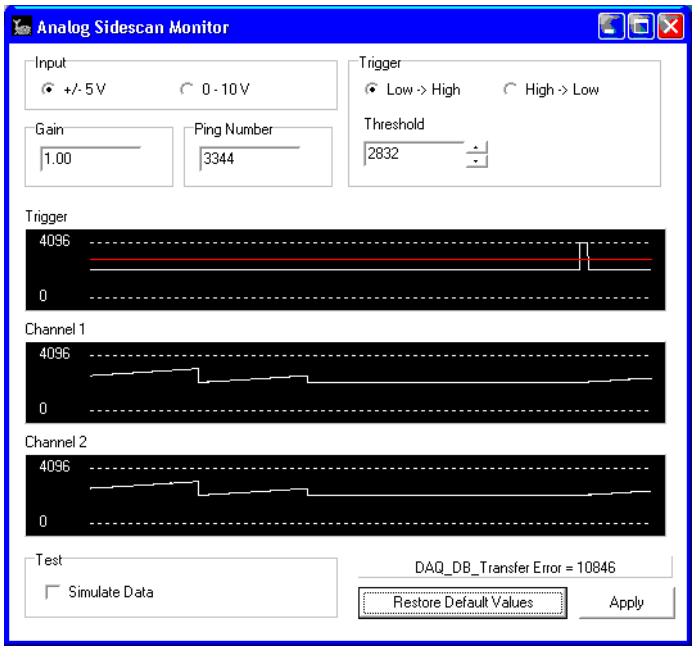
Some devices, such as the HYPACK® Side Scan, receive data from other places and no connection settings are necessary.

HYPACK® Side Scan converts analog side scan data from single beam devices with side scan capability, which are configured in HARDWARE, and passes it to SIDE SCAN SURVEY or HYSWEEP® SURVEY where it is stored to RSS records in the raw HSX file. When this driver is loaded, the Analog Side Scan program is automatically launched with HYPACK® SURVEY and the Analog Side Scan Monitor appears. This dialog enables you to monitor and control the device activity.

Most analog devices are supported by the Analog Side Scan option and an A/D card connection in your data collection computer.

NOTE: Certain A/D adapters are not compatible with Windows® Vista.

Analog Side Scan Monitor



Input: Select a -5 to +5 volt or 0 to 10 volt range according to the device specifications.

Gain: Multiplies signal by this amount. A value of 1.0 is usually the best choice.

Ping Number displays the sequential ping numbers.

Trigger: Enter the change in the strength of the return when it hits the bottom (the threshold) in A/D count. The value must be within the 0-4096 range.

The **graphs** allow you to monitor device activity.

Test: Check the **Simulate Data** box for simulated side scan data.

Testing Serial Communication with WCOM32

When your drivers are configured, you can use WCOM32 to capture serial data strings to a text file.

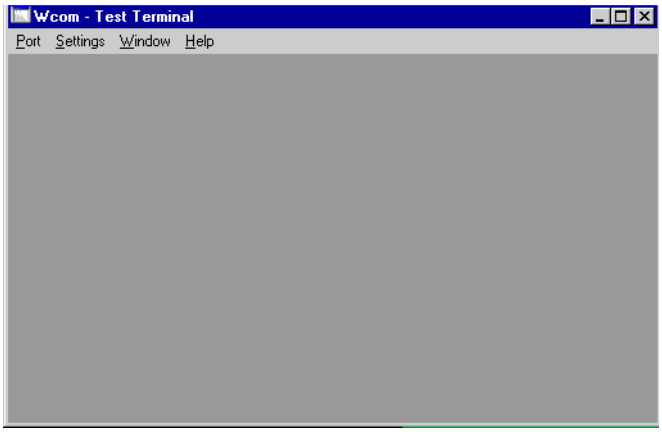
1. **Make sure the equipment is turned on** and actually sending information. This can be confirmed by attaching a serial LED line tester to the end of your cable. The Receive Data light should be flashing (changing state from red to green) at each measurement transmission. If there are no lights flashing, your equipment is not transmitting or your cable is grossly wrong. A

serial LED line tester is a great piece of equipment that can be picked up inexpensively at an electronics store.

2. If you have verified the equipment is transmitting, **try to display or record the data in the WCOM32 program.** HYPACK has included a shareware program (courtesy of Comtrol Corp., the manufacturer of Rocketport serial cards) in your HYPACK® install to make this recording process really easy. Here's how it works.

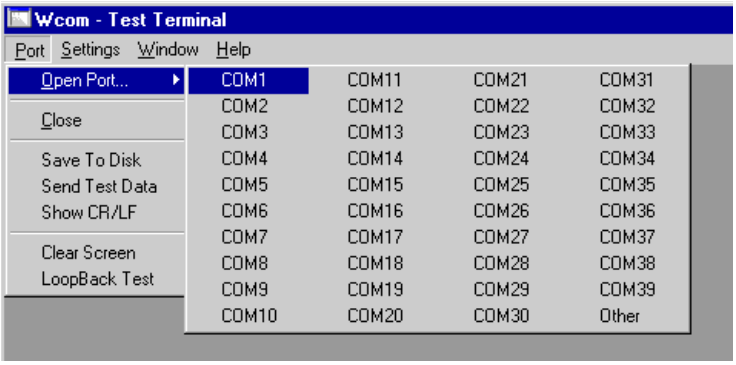
   a. **Launch the Wcom32 program** by selecting OPTIONS-WCOM32 in the HARDWARE window. The WCom32 dialog will appear.

Connect-Data Window



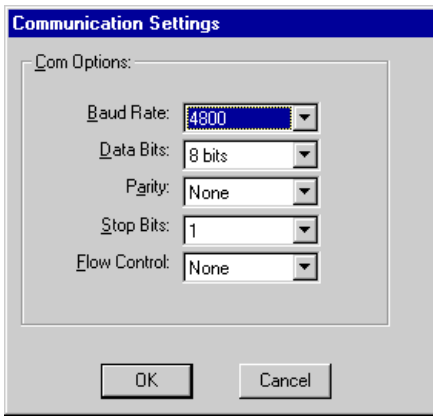
   b. **Select PORT-OPEN PORT** and select the port from which you want to capture data.

Selecting the Port



   c. **Select SETTINGS-PORT SETTINGS** and select settings that match those of your device.

Port Settings



d. **Repeat the steps 3 and 4 for each device** from which you would like to record data.

e. **Select PORT-SAVE TO DISK** and wait about a minute. The data is now recording to files on your hard drive.

f. **Select PORT-SAVE TO DISK** again (deselecting this option) to end the recording process.

g. **Rename your saved data files by device name.** Use Windows® Explorer to go to the HYPACK 2020\Support\Com directory. The files that you have just recorded are named KOMx.txt where x is the port number from which the data was recorded. You can see that a data file named for the port rather than the device would soon be mixed up with all of the others that are named in the same way. Name the file for the device to avoid that problem.

NOTE: This is also the procedure to use if you have questions or problems regarding your data and or Technical Support asks you to send us some sample data.

---

3. If you are successful in reading the messages in the WCOM32 program, **test each device in the HARDWARE program**. This checks that you are using the correct device driver and whether the communication settings have been properly set.

   a. **Start the HARDWARE program**.

   b. **Test your first device.**

      i. **Select the device in the configuration list**

      ii. **In the Survey Connect tab, click [Test Device].** The HARDWARE program launches the TEST program with a sample device window for that device.

To suspend the display updates so you can view it more easily, select TEST-PAUSE ALL. Repeat the same selection to resume scrolling.

To terminate the test, select TEST-STOP ALL.

If you are unsuccessful at this point, you probably have the wrong device driver specified in the library entry. Contact HYPACK, and ask for Technical Support.

c. **Repeat the test process for each device.** When all test correctly individually, go on to the next step.

NOTE: Once the Test program is open, you can test remaining devices from within the Test program by selecting TEST- *DeviceName*.

---

d. **Test all of the survey devices at once.** This determines if there are hardware conflicts between serial ports. In the TEST program, select TEST-TEST ALL. A device window will appear for each device.

If every device is being properly interfaced, you are ready to enter the HYPACK® SURVEY program.

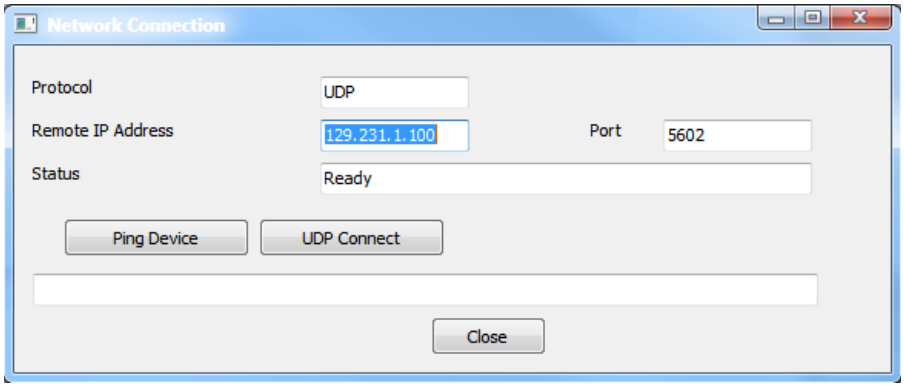
If all of your devices work when testing them individually, but *do not* work when testing them together, you have a problem with your serial communication hardware. Contact Technical Support at HYPACK, Inc. for assistance.

TESTING NETWORK COMMUNICATION FOR ALL NETWORK DEVICES

If you are using a network connection, you can test your settings to which you are connecting:

Click [Network Test] on the Connect tab. The Network Connections dialog automatically displays the connect information you have entered in the Connect tab.

Network Test Dialog



- **For TCP/IP connections**, click **[Ping Device]**. If the designated address is found, the status reads 'Ping OK'. If not, it says 'Time out waiting for a reply'.
- **For UDP connections,** click **[UDP Connect]** to attempt to read incoming data from the UDP port. If the connection is successful, the status field continuously updates the number of messages and their size. Each message display in the field at the bottom, though it will not be text you can read.

MEASURING HARDWARE OFFSETS

The position of everything on a mobile is determined by applying their offsets to the mobile heading and origin position. For the most accurate data collection, it is important to measure as accurately as possible.

Location Measurements

Position measurements are the distances, measured in survey units, starboard, forward and vertically from your boat origin to your device.

- The **Starboard** and **Forward** offsets: Use positive numbers for positions forward and starboard of the origin and negative numbers for devices aft and port of the origin.
- The **Vertical** offset is the distance below the static waterline of the vessel. Enter the antenna height above the water line as a *negative* value. The distance from the waterline to the transducer head will be positive.

Rotation Measurements:

The rotation angles (yaw, pitch and roll) are critical to the success of multibeam surveys. These measurements are difficult to make with high accuracy. Do the best you can then do a patch test to find the real rotation or use 0 for all angles and let the patch test do the work.

- The **Yaw** offset is an orientation offset that is added to ship's orientation. It is intended for use with multiple transducer systems that are not oriented perpendicular to the ship's longitudinal axis. Yaw corrections are normally determined in the Patch Test program and are entered as decimal degrees in this dialog. Yaw offset can also be entered when gyros provide magnetic orientation to correct for magnetic variation.

  Transducer and MRU Yaw: The transducer and MRU should be aligned with the keel. If they are, use 0 for yaw (or 180 for reverse mounting of the transducer). If either is slightly misaligned, use a positive angle when it is rotated clockwise.

  Gyro Yaw: The Gyro should be aligned with the keel. If it is, use 0 for gyro yaw. If the gyro is slightly misaligned, use a positive angle when the gyro is pointing to the port side, negative when pointing starboard. Gyro yaw is also used to correct for variation of magnetic north from true north. To correct, add the variation to the mounting offset. For example, if the gyro has a mounting offset of –1.5 degrees and magnetic north is + 4 degrees from true north.
  Gyro yaw offset = mounting offset + magnetic variation
  =-1.5 + 4
  =2.5 degrees
- The **Pitch** offset is normally only entered for multibeam sensors which are not oriented directly below the vessel. It allows you to enter mounting angles for forward- or rear-looking sonars. These angles are also determined in the Patch Test are entered in decimal degrees. The transducer and MRU should be aligned vertically. If they are, use 0 for pitch. If either is slightly misaligned, use a positive angle when it is pointing forward.

  NOTE: The MRU is usually calibrated during installation and adjustments made in the device itself. The Patch Test calculates a combined adjustment value which will be applied to the transducer.

- The **Roll** offset is normally only entered for multibeam sensors which are not oriented directly below the vessel. It allows you to enter mounting angles for forward- or rear-looking sonars. These angles are also determined in the Patch Test are entered in decimal degrees. The reference roll angle is 0 for vertical mounting of the transducer and MRU. Use a positive angle when the transducer is rotated to the port side, negative when rotated to starboard.

Multiple Transducer Offsets

There are some multiple transducer systems that are still available in HYPACK® SURVEY. If this is the case, enter an offset for each transducer, in order from port to starboard, in the driver setup.

Latency:

The **latency time** is the time delay in seconds from when a piece of survey equipment makes a measurement to when it outputs it to the survey computer. This allows the HYPACK® SURVEY program to correctly time-tag information from each piece of equipment. Values for multibeam systems can be determined in PATCH TEST routine.

IMPORTANT: All devices must use the same time basis. If any device sends UTC time-stamped data, you must synchronize your computer clock with UTC time using the 1PPS box or the NMEA ZDA message. (See Time-Tagging Your Data on page 2-26)

OFFSETS AND LATENCY

The best position for the boat origin varies depending on what sensors are included in your configuration. The following table provides our general recommendations for the position of the origin.

Recommended Vessel Origin Placements

Vessel Type	Recommended Origin Location
With MRU:Single or Multibeam	At the MRU location
Towed Devices	Attachment point of the cable to the towfish

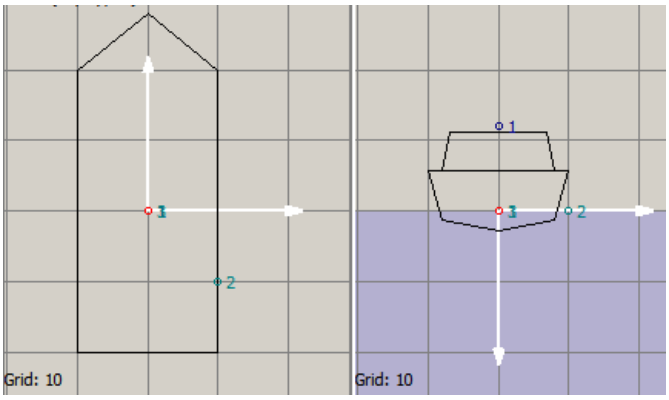
When you have carefully measured your position offsets, enter your measurements for each in the Offsets tab of HARDWARE.

NOTE: You can leave latency set to zero then correct it with the results from your patch test. The same is true for the rotational offsets—pitch, roll and yaw.

1. **Open HARDWARE.**
2. **For each device, do the following**:
   a. **Add the device to the appropriate mobile in your configuration.**
   b. **Select the device in the tree view**.
   c. **Click the Offsets tab**.
   d. **Enter your position offsets and close HARDWARE**.

3. **Run your calibration tests.** For multibeam and laser surveys, the PATCH TEST measures latency and the rotational offsets.
4. **Reopen HARDWARE and enter the offset corrections derived from your calibration test.**
5. **Save your configuration** (FILE-SAVE).

Hull-mounted Multibeam

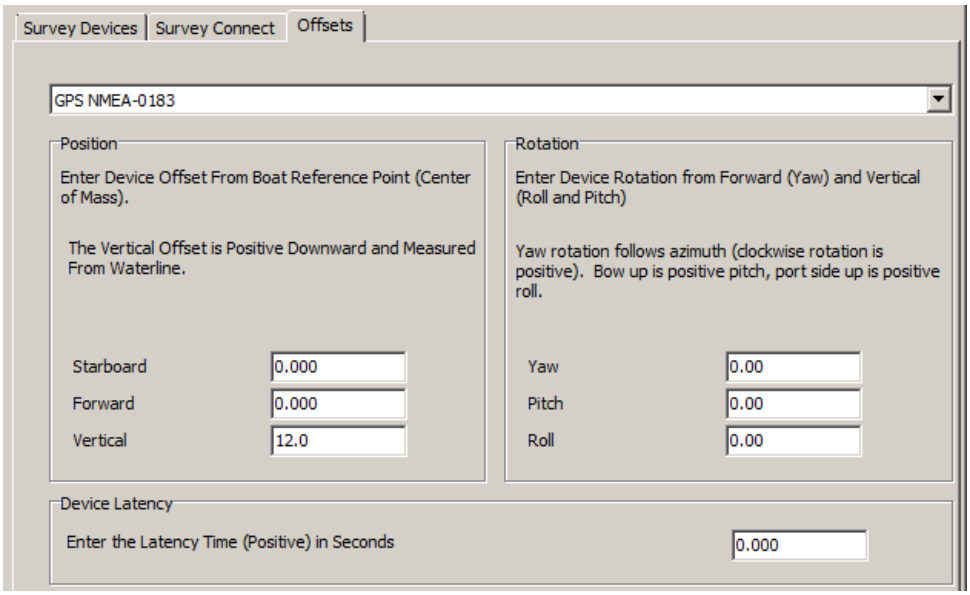


- The **Origin** in a multibeam is at the center of mass (vessel center of gravity (X,Y) and at the static waterline (Z)).
- **MRU:** Multibeam boats require some type of Motion Reference Unit (MRU) to compensate for vessel heave, pitch and roll during survey.

Tip: For best results, the MRU should be mounted at the pivot point for roll and pitch rotations and the multibeam transducer should be mounted as close as possible to the MRU. This way, the heave measured by the MRU is the same as the heave experienced by the transducer. Measure the horizontal distances from the navigation origin using the sign convention used with transducer measurements.

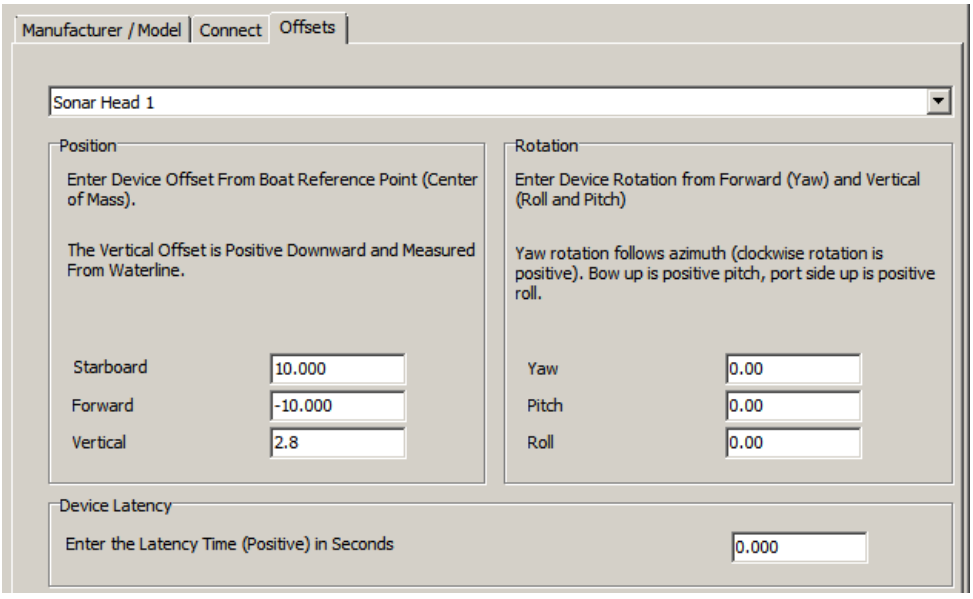
- The **GPS antenna** is directly above the boat origin so the port and forward offsets are zero. The vertical offset is the distance above the waterline. This value is negative because, in HYPACK®, the Z axis is positive downward from the waterline.

Sample GPS Offsets



The **transducer** is starboard and aft of the origin so the starboard offset is positive and the forward offset is negative.

Multibeam Offsets



Assigning the Tracking Point in HARDWARE

A **tracking point** is the position used by SURVEY to position the mobile in the world. It is used to provide left/right guidance, make automatic “start line” and “end line” decisions, and calculate horizontal distances between the vessel and features in your survey area. It is also the location at which Quickmark targets are marked.

In addition to the sensors, your hardware configuration must include a tracking point.

To define the tracking point position, enter its offset distances from the vessel origin in the Mobile tab.

On a multibeam survey, you typically place the tracking point over the transducer because all of the tracking point functions should be relative to the transducer.

Time-Tagging Your Data

To correctly correlate positions with other data, it is essential to determine the precise time of the GPS measurement.

SURVEY and DREDGEPACK® use a proprietary clock model called Veritime. Veritime is initially set to the Windows® clock time, but the two clocks slowly drift apart. In a simple hardware configuration (eg. a GPS and single beam echosounder), all time tags are assigned based on the same standard: the Veritime clock.

IMPORTANT: *All devices must use the same time basis*—the computer Veritime or UTC time. If any device sends UTC time-stamped data, you must synchronize your computer clock with UTC time using the 1PPS box or the NMEA ZDA message.

If you synchronize the clock, HYPACK® adjusts the Veritime clock speed to match the UTC time based on the time in the ZDA message from the GPS.

NOTE: You should run SURVEY for two minutes before collecting data to allow the Veritime clock to synchronize with UTC time.

BEWARE! Update settings *on your GPS* of faster than 1000 msec (or 1 Hz) when you are using the Sync. Clock feature may result in significant drift between the computer clock and GPS time.

The following table presents the three techniques used in HYPACK® to determine the time of measurement. Each has its advantages and drawbacks.

Time Tagging Options

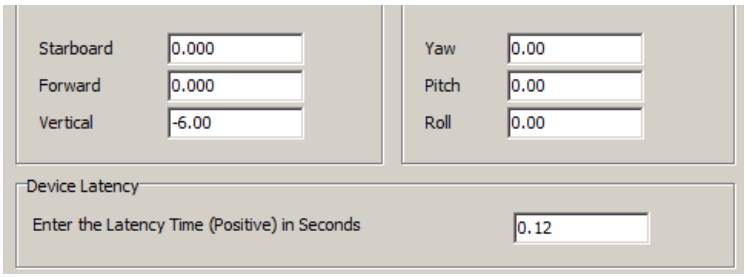
Method	Advantages	Disadvantages
Apply a Fixed Latency Time.	• Simple. It does not require any special cable and allows you to operate on local time.	• GPS latency can vary, depending on the type of receiver, the number of satellites and the geometry of the satellites.
Use the NMEA ZDA message to synchronize the computer clock.	• Simple. It does not require any special box or cable. • Eliminates drift between the GPS and computer time. • Accuracy to within 1 msec. 98% of the time.	• The $ of the $GPZDA message must be transmitted at the referenced UTC time. • Some GPS units do not have ZDA capability.
Monitor the 1PPS Output of the GPS	• Provides a time tag of 1PPS times accurate in HYPACK® to within 100 microsec. with standard deviation of 2 microsec.	• Requires a special hardware box and cable. • GPS manufacturers differ over the timing of the 1PPS pulse.

APPLYING A FIXED LATENCY

Enter a latency value in the Offsets for the GPS device. When a measurement is received from the GPS, the computer takes the current computer clock time and subtracts the latency value to determine the time of the measurement.

For example, if the latency is 0.5 seconds. When the computer receives a GPS message, it gets a time tag when it receives the first character. It would then subtract the 0.5 seconds from the time tag to obtain the final time of measurement.

Specifying the Latency for a GPS device



To obtain a latency value, perform a single beam latency test or, if you also have a multibeam system, a patch test. This determines the combined latency between the GPS and your echosounder.

BEWARE! There is some variation in GPS latency. For most newer equipment, we have performed tests that show the standard deviation of latency to be within 0.050 seconds for most GPS receivers. The main problem occurs with RTK units. There are some RTK units that take up to two seconds to output a position. These sets have major variation in latency and this method should be used at survey scales of 1:25,000 or higher.

SYNCHRONIZING THE COMPUTER CLOCK TO UTC TIME USING THE ZDA MESSAGE

Using the arrival time of the ZDA message, HYPACK® eliminates clock drift between the GPS and the computer clock and generates time tags to within 1 millisecond accuracy 98% of the time.

This is only important when using devices that output time-tagged information. In these cases, the device must also be synchronized to the UTC time in the ZDA message and we maintain the time the device assigned to the data because it is more closely correlated to the data than if we were to assign a time tag when the survey computer receives the data.

NOTE: This works for all GPS devices, whether they are RTK-capable or Differential.

Many GPS units can output a ZDA message, which contains only the UTC time, at the UTC time tic. As soon as the message is received, the SURVEY program uses the local time offset from the Windows® registry and resets the computer clock to the local time. All of the time tagging for other devices (echosounder, gyro, etc.) will now be based on the computer clock. You should let SURVEY

run for at least two minutes to begin the process. From then on, the SURVEY program uses the UTC time contained in the GGA message as the time tag for the GPS position.

BEWARE! Update rates for ZDA messages, *set in the GPS*, should be no faster than 1000 msec (or 1 Hz) when you are using the Sync. Clock feature. Faster update rates may result in significant drift between the computer clock and GPS time.

- In the HARDWARE System tab, select the GPS driver under the **Synchronize Computer Clock** option.
- In the General tab of the GPS driver setup, *clear* the **Use PPS Box for Timing** option.
- **Graphing the Synchronization Values** is optional, but the displays will alert you if the synchronization has gone awry.

SYNCHRONIZING THE COMPUTER CLOCK TO UTC TIME USING A 1PPS BOX

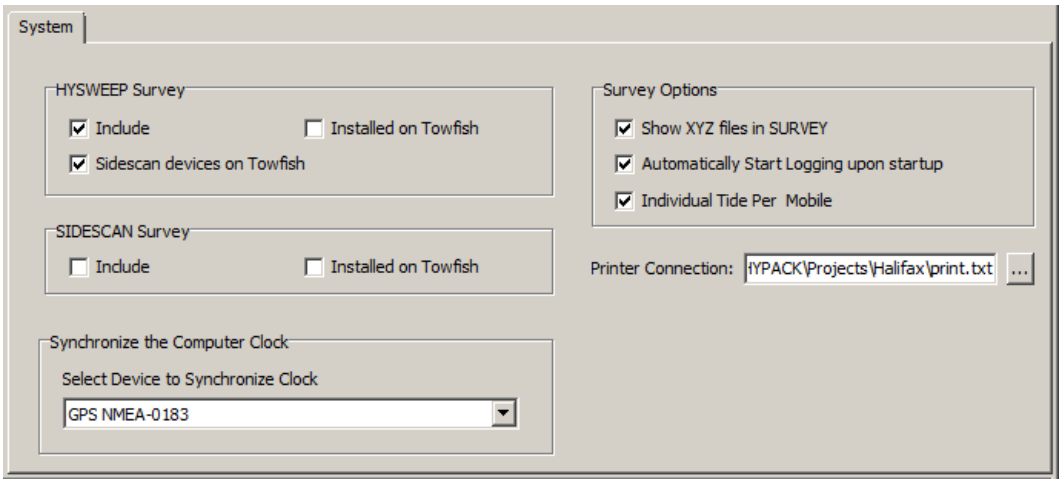
If you include data from another computer with time synchronized data (such as the POS MV or Geoswath), your survey computer must also be synchronized in order to accurately match the data. In HYPACK®, we synchronize to UTC time.

Many GPS units can output a 1PPS (pulse per second) signal that is synchronized with the measurement phase. By using a 1PPS box to synchronize the computer clock to UTC time indicated in the ZDA message, HYPACK® can achieve time tag precision to within 100 microseconds of the 1PPS pulse (the most accurate indicator of the UTC time) with a standard deviation of 2 microseconds.

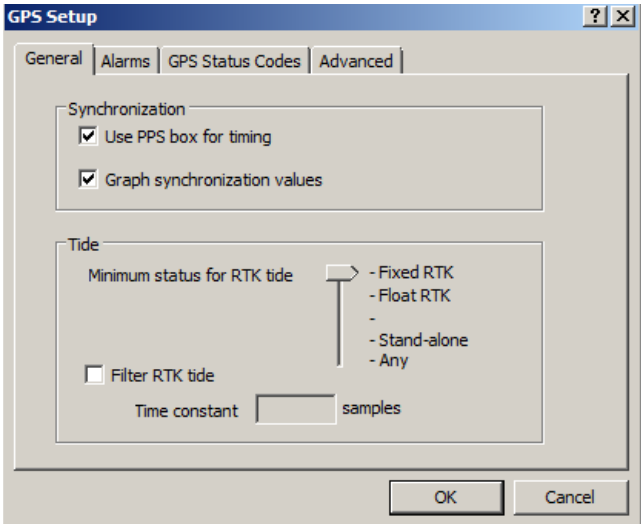
The HYPACK® SURVEY program uses the 1PPS box to monitor the CTS line of the GPS serial port. Every time it changes state (from 0 VDC or from 5 VDC to 0 VDC), it takes a time tag from the Veritime computer clock (corrected with the Windows® time zone offset). If a latency value has been entered, it also offsets the time tag by the value in the latency offset. The next message arriving from the GPS then receives that time tag.

- **In the HARDWARE System tab**, select the GPS driver under the Synchronize Computer Clock option.
- **In the General tab** of the GPS driver setup, select the **Use PPS Box for Timing** option.
- **Graphing the Synchronization Values** is optional, but the displays will alert you if the synchronization has gone awry.

Synchronizing the Clock to the GPS



Instructing the SURVEY Program to use the 1PPS Output for Time Tagging in the GPS.dll Setup.



You can use the ZDA TEST to verify the synchronization and view statistics regarding various factors affecting the level of synchronization.

CONFIRMING SYNCHRONIZATION WITH THE ZDA TEST

The ZDA TEST monitors your GPS input and provides detailed feedback allowing you to adjust your system settings to optimize proper function.

The program checks for the following conditions:

- **ZDA messages are arriving from the GPS once per second.** Anything between 0.8 sec and 1.2 sec is considered good.
- **Number of characters is consistent with baud rate.** If the number of characters received in one second is more than 80% of the maximum number that could be received, shows the following message:

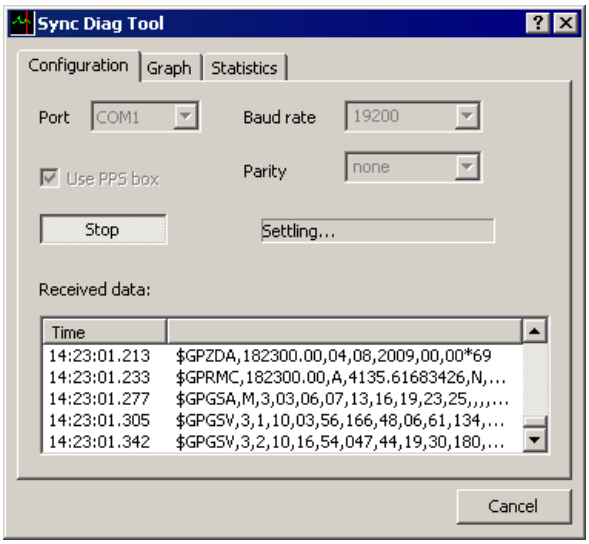
  ```
  Too many characters received in one second.
  Increase the baud rate or reduce the number of NMEA
  messages.
  ```

- **Checks if the PPS pulse are correctly received** if configured for PPS pulses.

To run the test, do the following:

1. **Launch the ZDA TEST** by selecting UTILITIES-CALIBRATION-ZDA TEST. A tabbed dialog will appear.
2. **In the Configuration tab, enter your connection settings and click [Start]**.
   > The Configuration tab displays the data received from the GPS.

Configuring your Connection Settings in the ZDA TEST



> The **Graph tab** displays a scrolling graph of the synchronization error.

CONFIGURING YOUR DEVICES

Once you have specified your devices in HARDWARE, you must enter the device-specific settings for each one.

CONFIGURING THE GPS

FUNCTIONS

When you are configuring HYPACK® devices (not multibeam or side scan), the Functions list in the Survey Devices tab shows types of data the selected driver can collect. Select the driver in the tree view and check the data types that you want to record with the selected driver. The following are the typical functions selected. Please refer to the Common Driver Notes document found in your HYPACK 2020\Help folder for full details.

Position stores position data from this device.

Depth is typically unused by GPS devices. However, it is used in conjunction with the 'Record Tide as Depth' option to, for example, record waterfront depths using land vehicles.

Use for matrix update: Color-codes a matrix based on the data received from this device when recording tide as depths.

Heading tells the SURVEY program to use the Course Made Good from the VTG, RMC or HDT message for the orientation of the vessel.

BEWARE! If you are using a gyro for heading, you should not select heading for your GPS. If both were selected for heading, the SURVEY program would switch between gyro and GPS orientation as each device updates and you would see the vessel in your SURVEY Map window twitch at each update. This is because it is unlikely that the two heading values will be exactly the same.

The **Speed** box tells the SURVEY program to use the speed information from the VTG message for the vessel speed.

Tip: The GPS speed is much smoother and more accurate than the speed the SURVEY program will calculate. We recommend that you use the speed from your GPS antenna.

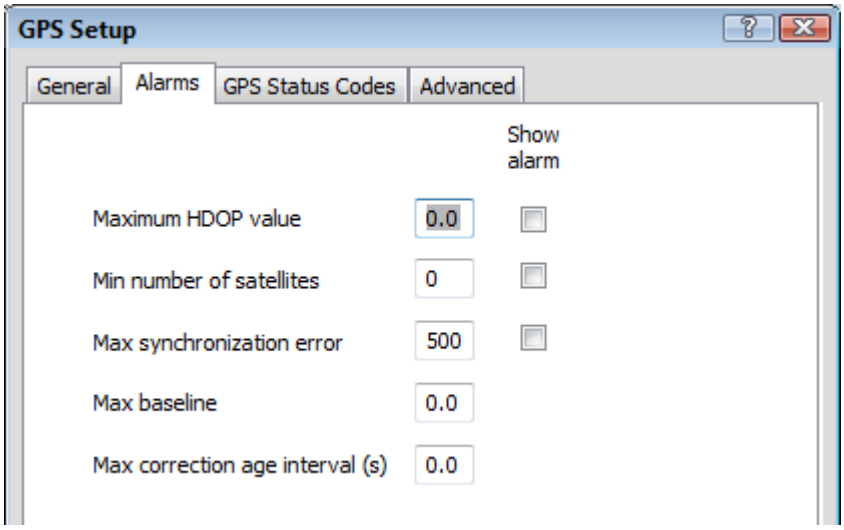
DRIVER SETUP

The **Alarms** and **GPS Status Codes** tabs provide settings to show alarms based on the quality information in the GGA string.

NOTE: You can also filter multibeam data based on these codes in the editor programs during post-processing.

Alarms Tab

GPS Driver Setup - Alarms Tab



In the Alarms Tab:

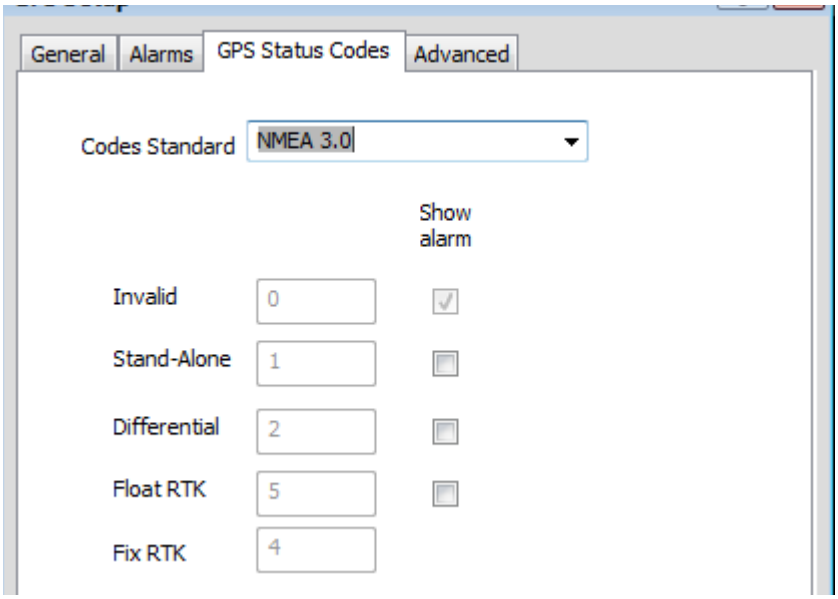
1. **Enter alarm conditions**.
2. **Check the corresponding Show Alarm box for each condition to which you want to be alerted**.

Alarm Conditions

Alarm Condition	Alarm Shown When
Maximum HDOP	HDOP greater than the value entered. (Recommended Value = 4)
Number of Satellites	Number of satellites less than the value entered. (Recommended Value = 5)
Maximum Synchronization Error	Difference between the computer time and GPS time at any sync. attempt is greater than the value entered. (Recommended Value = 100ms)
Maximum Baseline Error	Distance between GPSs configured for OTFGyro is greater than the distance entered. (Recommended Value = 2m for DGPS or 0.5 m for RTK.)

GPS Status Codes

GPS Driver - GPS Status Codes Tab

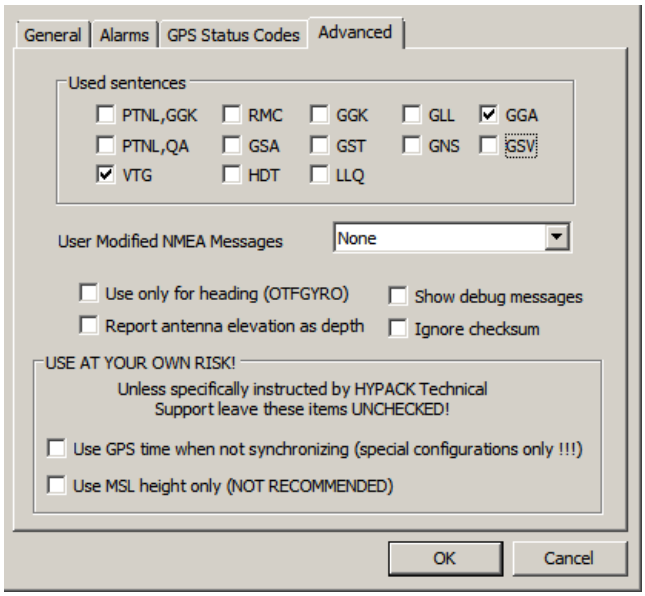


In the GPS Status Codes Tab:

1. **Select a GPS Status Code** according to your GPS output.
   > If you select either the NMEA 2.1 or NMEA 3.0 option, the status fields will automatically reflect the correct values.
   > If your GPS does not conform to either of these standards, select the Custom option and define your own status codes.
2. **Check the corresponding Show Alarm box for each condition to which you want to be alerted**. Alarms will show when the status codes equal the selected status.

Advanced

GPS Advanced Options



Used sentences: Instructs which strings the driver should read from your GPS output. Select *one position string* and at least one string for each of the other functions selected in the Device Setup (heading, speed, etc).

NOTE: In general we recommend that you configure the GPS receiver to output only the messages that you need and leave all the other check boxes unchecked.

Tip: For all DGPS applications, we prefer to receive the GGA and the VTG messages.

Ignore Checksum: Some devices use a different checksum calculation than we do. In this case, you may get a lot of bad checksum errors when the data is good. Check this option to skip the checksum routine and assume the data is good.

Use GPS time when not synchronizing: If you use two GPS receivers and you are synchronizing your computer clock with UTC time, only the first GPS is synchronizing the computer clock with the GPS clock. However, the driver for the second GPS can safely use the UTC time tag included in the GPS message because any two GPS receivers are synchronized to UTC time. When the checkbox is checked the driver assumes that computer clock is synchronized with the GPS clock and records position messages using the UTC time provided by the GPS receiver.

Use MSL height from GGA sentence assumes the MSL height provided by the GPS receiver is correct. If you have loaded a geoid in your geodetic parameters, it will be ignored.

GPS Connection

Most GPS devices today are network devices. Please refer to your device manual and Configuring Connections for HYPACK® Devices.

GPS Offsets

Install your GPS directly above your origin (at the vessel center of gravity) to eliminate horizontal offsets. The vertical offset is negative because the GPS is above the waterline.

Configuring your Echosounder

Echosounder Driver Setup

Each multibeam sonar has model-specific settings. Please refer to the *HYSWEEP® Interfacing Notes* document found in your HYPACK 2020\Help folder for full details.

Echosounder Connection

Multibeam echosounders interface through network connections. Please refer your echosounder manual and to Configuring Connections for HYPACK® Devices.

Echosounder Offsets

For multibeam systems:

- The **patch test** measures your GPS latency as well as the rotational alignment of the system with the keel. While it is difficult to accurately measure the angular mounting components (roll, pitch, and yaw) of multibeam systems, errors in these measurements can lead to inaccurate surveys. The patch test is a data collection and processing procedure to calibrate these angles, along with positioning system latency.
- The **bar check** measures the static draft for your echosounder. The Bar Check routine in HYSWEEP® SURVEY enables you to confirm the accuracy of the vertical offset for your multibeam echosounder, adjust it if necessary, and save documentation of the process. Once this process is accomplished, your echosounder outputs soundings relative to the transducer head.

Configuring your MRU

Install the MRU as close as possible to the vessel's center of gravity and at the water line.

The MRU is typically configured as a HYSWEEP® device.

DRIVER SETUP

Each device has model-specific settings. Please refer to the *HYSWEEP® Interfacing Notes* document found in your HYPACK 2020\Help folder for full details.

CONNECTIONS

Motion sensors are serial or network devices. Please refer to your device manual and Configuring Connections for HYPACK® Devices .

OFFSETS

Enter horizontal and vertical offset (if any). All other offsets are zero. Please refer to your device manual and Measuring Hardware Offsets .

CONFIGURING YOUR GYRO

DRIVER SETUP

Each device has model-specific settings. Please refer to the *HYSWEEP® Interfacing Notes* or *Common HYPACK® Drivers* document found in your \HYPACK 2015\Help folder for full details.

CONNECTIONS

Gyros can be serial or network devices. Please refer to your device manual and Configuring Connections for HYPACK® Devices .

OFFSETS

All offsets and latency are typically 0. Check the device manual from the manufacturer.

CALIBRATING YOUR HARDWARE

Before surveying, you should first confirm that the required offsets are as accurate as possible. Calibration tests provide accurate measurements which you must enter in your hardware configuration to complete the calibration of your system.

When you collect data, the offsets from the hardware configuration are recorded in the header of each raw file where they are read by the editor in post-processing.

- **If you collect data before your system is calibrated,** you must correct the data by loading the correct offsets in the Read Parameters dialog of the editing program.
- **If you collect data with a calibrated system**, you are set. The correct offsets are recorded to your raw data where they are read by the editor program.

For multibeam systems:

- The **patch test** measures your GPS latency as well as the rotational alignment of the system with the keel. While it is difficult to accurately measure the angular mounting components (roll, pitch, and yaw) of multibeam systems, errors in these measurements can lead to inaccurate surveys. The patch test is a data collection and processing procedure to calibrate these angles, along with positioning system latency.
- The **bar check** measures the static draft for your echosounder. The Bar Check routine in HYSWEEP® SURVEY enables you to confirm the accuracy of the vertical offset for your multibeam echosounder, adjust it if necessary, and save documentation of the process. Once this process is accomplished, your echosounder outputs soundings relative to the transducer head.

BAR CHECKS

For multibeam systems, the most common practice is to set your echosounder for a fixed velocity (for example 1500m/s or 4800 ft/s) and use a sound velocity profile to adjust the depths in real time or post processing.

Enter the static draft as a vertical offset of the echosounder in HARDWARE then use the Bar Check tool in HYSWEEP® SURVEY to check the accuracy of your data throughout your project depth range. The Bar Check tool provides statistical data for each beam and enables you to adjust your vertical offset accordingly if you choose.

MULTIBEAM BAR CHECK TOOL

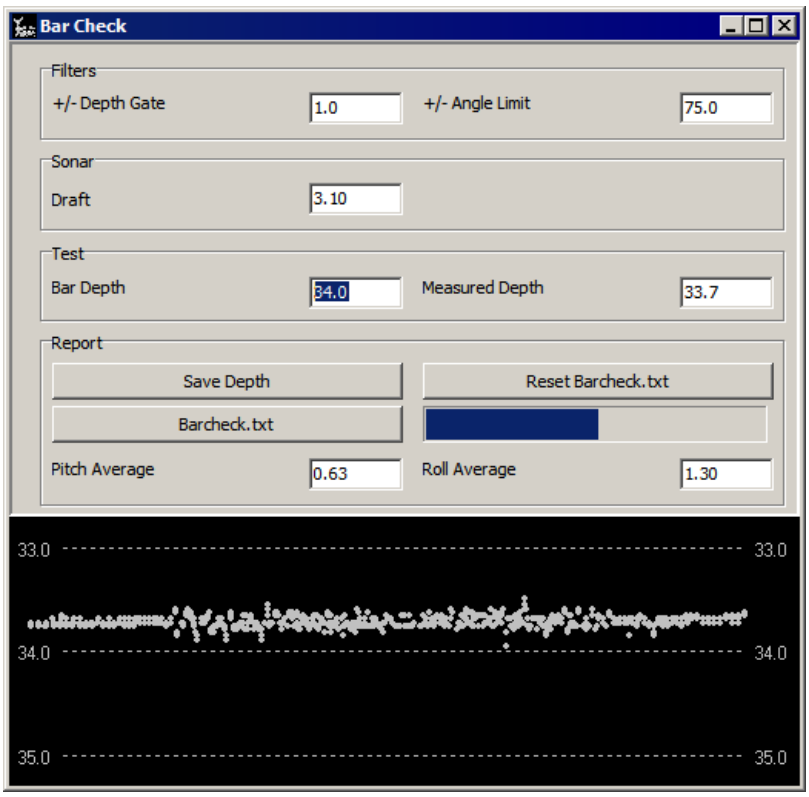
The Bar Check routine, in the HYSWEEP® SURVEY, enables you to calibrate your echosounder and save documentation of the process. The Bar Check tool provides statistical data for each beam and enables you to adjust your vertical offset accordingly. Once this process is accomplished, your echosounder output soundings relative to the transducer head and writes the vertical offset to the header of the raw data file (*.HSX). The survey programs add the vertical offset to the received depth and report the result as the raw Depth.

IMPORTANT: Use draft/squat corrections in SURVEY *only for dynamic draft*. When you incorporate the static draft into the hardware configuration *and* as a draft/squat correction in SURVEY, HYPACK® corrects for the static draft twice.

The Bar Check window also displays the average pitch and roll over the time span of the test. These values can be significant, particularly if you added weight, changed weight distribution in your vessel after the MRU was installed, resulting in the MRU no longer being level.

1. **Open the Bar Check program** by selecting TOOLS-BAR CHECK. The Bar Check window will appear.

Bar Check Window

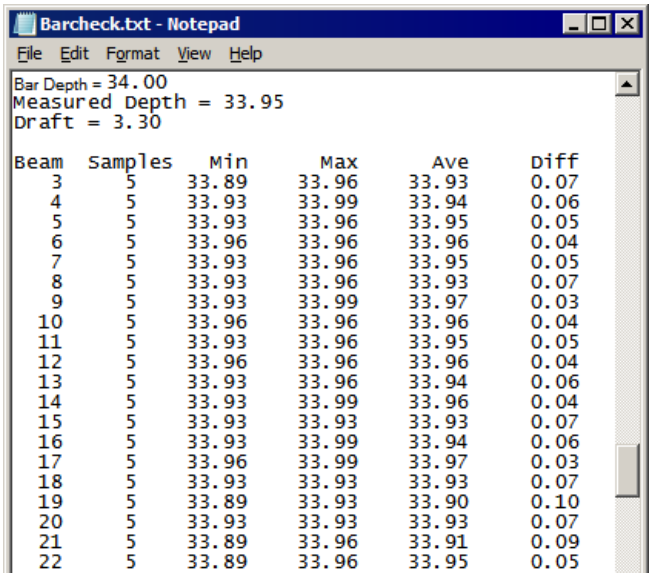


2. **Click [Reset Barcheck.txt]** to begin a new Bar Check Report.
3. **Set your filters**.
   - > **Depth Gate** determines the scope of the display in the lower part of the window.
   - > **Angle Limit** defaults to 75 degrees. If you see indications on the sides that the outer beams are inaccurate you may need to narrow your focus. We have seen instances where, at 75 degrees, the outer beams were hitting the chains suspending the bar thus affecting the accuracy of the test.
   - > **Sonar Draft:** The Bar Check Tool initially displays the Vertical offset from your hardware configuration, but you can adjust this value as necessary until the Bar Depth equals the Measured Depth and use the new value to update your hardware configuration.

> **Bar Depth** is the depth at which the bar is currently set.
> **Measured Depth** is a calculated average of all sounding data over the three-second interval.

4. **Set your Bar Depth** just a short distance below the transducer (eg. 5 feet), enter the same depth in the Bar Check dialog under Test Bar Depth and watch the data on the screen.
5. **When the Measured Depth stabilizes, if the Measured Depth does not approximate the Test Bar depth**, adjust the Sonar Draft value until it does.
6. **When the Measured depth approximately equals the Bar Depth, click [Save Depth].** This saves statistical documentation about the data gathered by each beam over the past three seconds.
7. **Repeat steps 4 and 6 at each Bar Depth** for which statistics are required.
8. **When the test is complete, click [Barcheck.txt]** to view and print the stored data in Windows® Notepad.

Sample Barcheck.txt File



9. **Note the Pitch and Roll Average values** to update the MRU offsets in HARDWARE.
10. **Update the Vertical Offset for your transducer.** (Optional) If you have adjusted the Draft value in the Bar Check Tool, when you exit the tool it asks if you want to save your change. Click [Yes] to update your hardware configuration (hysweep.ini) with the sonar draft value from the Bar Check Tool. (This assumes your original measurement of the vertical offset for the sonar was inaccurate and adjusts your settings according to the Bar

Check.) Otherwise, click [No] and investigate further to resolve the vertical difference.

11. In HARDWARE, update the pitch and roll offsets for your MRU using the Average Pitch and Roll values.

IMPORTANT: *Changing these values affects your patch test results*. If you change these offsets after your patch test, you should do new patch tests for pitch and roll.

MULTIBEAM PATCH TEST

While it is difficult to accurately measure the angular mounting components (roll, pitch, and yaw) of multibeam systems, errors in these measurements can lead to inaccurate surveys. The PATCH TEST is a data collection and processing procedure to calibrate these angles, along with positioning system latency.

In the latency test, we successively modify GPS latency by the time step for the number of steps selected using the original GPS latency time as the center time. At each step, the depth profiles are recalculated and drawn in cross section, so that the number of cross-sections equals the number of time steps.

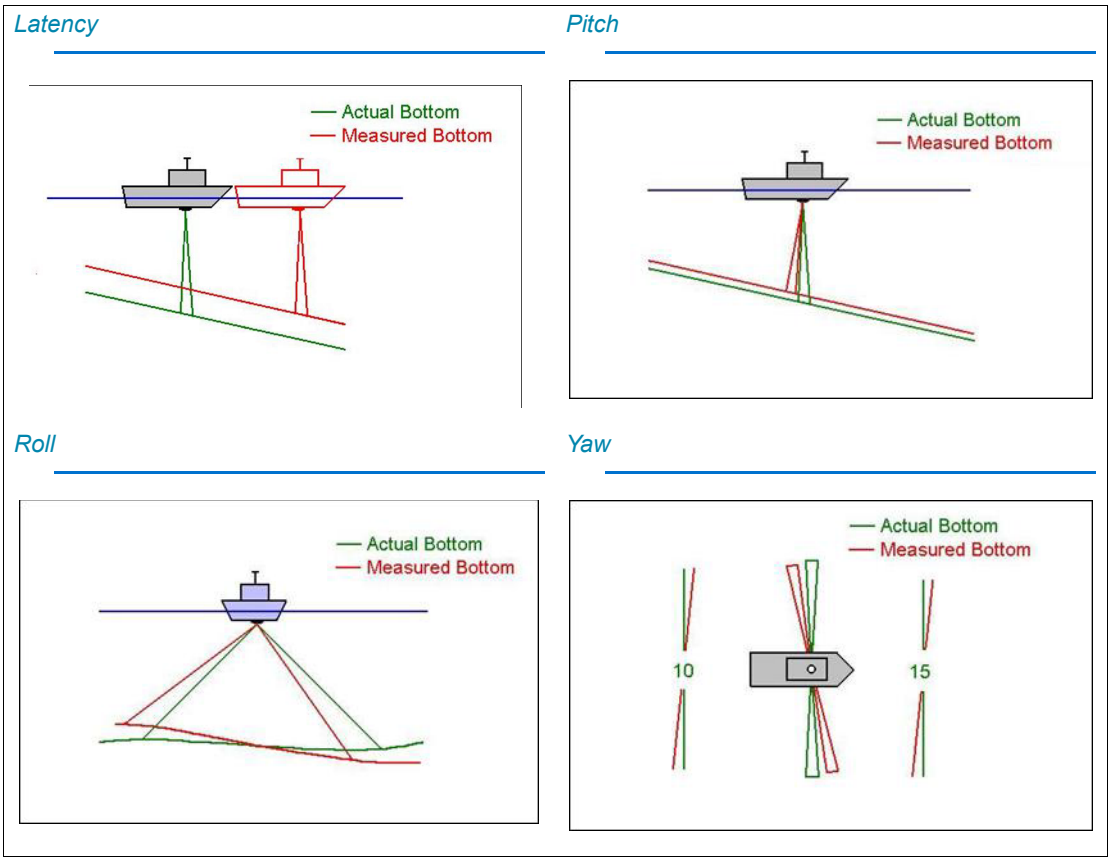
In yaw, roll and pitch tests, we successively modify the respective mounting angles by angle step for the number of steps selected. Again, at each step the depth profiles are recalculated.

Since the calibration of one offset will affect the results of subsequent tests, you should process each pair of lines separately and in the following order:

1. **Latency**: Delay between the position fix and the data arrival time introduces positioning error, independent of any transducer misalignment.
2. **Roll**: Vertical misalignment, port and starboard, between sonar and MRU can cause depth errors, especially at the outer beams.
3. **Pitch**: Vertical misalignment, forward and aft, between sonar and MRU can cause depth and position errors across the swath.
4. **Yaw**: Misalignment of the sonar and gyro relative to the boat frame can cause position errors.

NOTE: If you save the results of one test then load the next pair of lines, you can apply the offsets calculated thus far. Since

one offset affects the accuracy of later calculations, this is usually a good thing to do.



Multibeam offset adjustments are calculated with the PATCH TEST in the 64-bit HYSWEEP® EDITOR program.

PATCH TEST PROCEDURE

1. **Collect survey data in the prescribed pattern**.
2. **Process the data through all phases of editing.** At this point, the Patch Test option will be enabled.

   In the 64-bit HYSWEEP® EDITOR, you can load two lines of test data at a time or load all of the test lines at once, but move back and forth between stage 1 and 2 editing, each time selecting the correct pair for the next test in stage 1 editing then clicking the stage 2 icon to take only the selected lines to stage 2.

   Use the editor to apply your sound velocity and tide corrections, and remove all spikes and outliers. After you have completed all editing, run the PATCH TEST from the Tools menu.
3. **Run the PATCH TEST** which will calculate offset adjustment values for latency, pitch, roll and yaw.

The values calculated from each test can be applied to each subsequent test for better results.

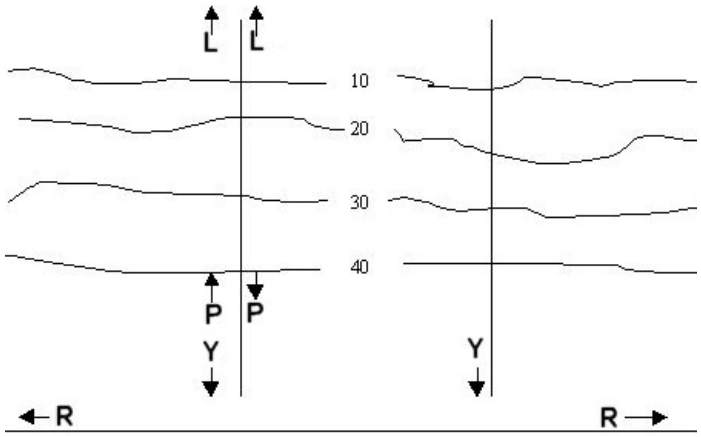
Once you have run each test once and applied the results, you may run each test again using fine step settings. This second pass may improve the accuracy of the calculations as the first tests did not have the benefit of the values produced in the later tests.

4. **Enter the adjustment values** in the Offsets Dialogs in the HARDWARE and HYSWEEP HARDWARE programs.
5. **Correct the offsets in data collected with incorrect offsets in post-processing.** Enter the correct offsets in the Offsets Tab of the Read Parameters dialog of the editor program. This process corrects only the edited data. The Raw data will remain unchanged.

PATCH TEST DATA COLLECTION

Run lines, 200-300 feet (100 m) long. For each offset test, the lines must be run over specific bottom terrain in a specific way as follows:

Map View of Patch Test Survey Lines (single head transducer) with Bottom Contours—Roll (R), Latency (L), Pitch (P), and Yaw (Y) Test Lines.



Single Head Transducer Data Collection Specifications

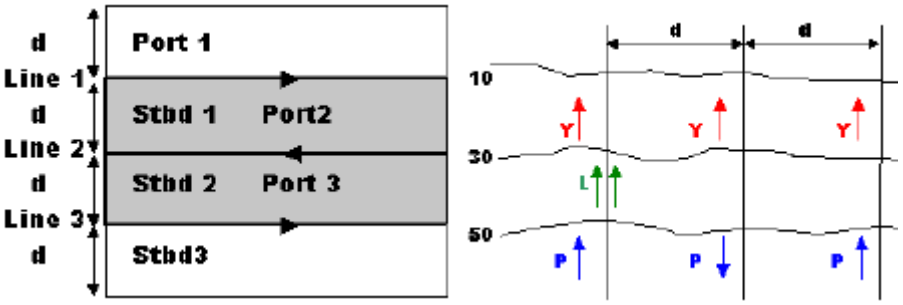
Offset	Collection Specifications
Latency	• Perpendicular to a slope • Run same line twice in the same direction • One line at maximum survey speed and one as slowly as possible
Roll	• Over Flat bottom • Run same line twice in opposite directions • Normal survey speed

Offset	Collection Specifications
Pitch	• Perpendicular to a slope • Run same line twice in opposite directions • Normal survey speed
Yaw	• Perpendicular to a slope • Two parallel lines spaced at a distance equal to the channel depth. • Run each line in the same direction • Normal survey speed

The data collection pattern for a dual head multibeam system is a little different than for the single head system in order to overlap the soundings and PATCH TEST for head 1 and head 2 separately.

Tip: In the Multibeam view options of HYSWEEP® SURVEY, you can choose whether the data from Head 1 or Head 2 will paint the matrix to ensure proper overlap.

Roll Data (left), and **Y***aw,* **L***atency,* **P***itch (right)*



Dual Head Transducer Data Collection Specifications

Offset	Test Specifications
Latency	• Perpendicular to a slope • Run same line twice in the same direction • One run at maximum survey speed and one as slowly as possible
Roll	• Over Flat bottom • Three parallel lines spaced at a distance equal to the channel depth • Run in alternating directions • Normal survey speed

Offset	Test Specifications
Pitch	• Perpendicular to a slope • Three parallel lines spaced at a distance equal to the channel depth • Run in alternating directions • Normal survey speed
Yaw	• Perpendicular to a slope • Three parallel lines spaced at a distance equal to the channel depth • Run all in the same direction • Normal survey speed

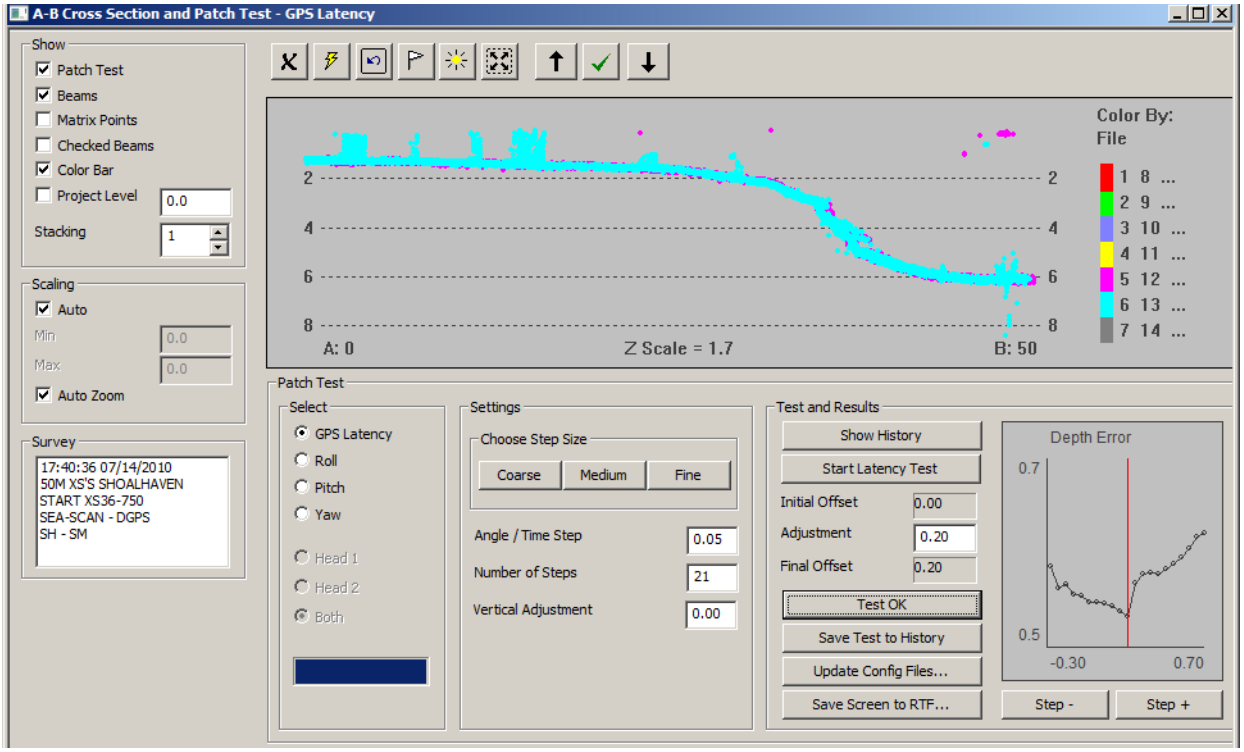
For optimal test results, consider the following:

- **Verify the multibeam power and gain settings** before data collection to minimize spikes.
- **Verify good positioning.** Small position errors can cause erroneous patch test results. If your HDOP is high, consider calibrating at another time.
- **Take care to minimize your cross track error.** PATCH TEST only works on overlapping data.
- **Parallel lines require 50% (1/2 swath) overlap** where the data from each swath will be compared.
- **Test in the deepest section of your survey area**. Errors are most apparent and more accurately calculated in deeper waters.
- **Always collect three sets of data** to confirm the results.
- **Average the results** from multiple patch tests for final results.

PATCH TEST INTERFACE IN THE 64-BIT HYSWEEP® EDITOR

The PATCH TEST interface shows the alignment of the data in your two overlapping data sets. The PATCH TEST tools are merged in an A-B Cross Section and Patch Test window where you can do your stage 2 editing, removing any spikes that will negatively effect your patch test, then run the adjustment calculation routines.

PATCH TEST Interface



Tip: Use [Update Config Files] in the PATCH TEST interface to quickly and accurately update your HYSWEEP® HARDWARE configuration.

CALCULATING OFFSET ADJUSTMENTS WITH PATCH TEST

In the 64-bit HYSWEEP® EDITOR, you can load *all* of your patch test lines at once then advance only selected lines to stage 2 for each patch test. Remember to run the tests in order: latency, roll, pitch then yaw. In stage 2, edit your data in the editor or in the PATCH TEST interface before you run the calibration test.

NOTE: If you are calibrating a dual head system, you can load all lines for the same test (roll, pitch, yaw), then choose to view data from Head 1, Head 2 or both during the tests.

Tip: When you load all of your patch test files to the 64-bit HYSWEEP® EDITOR, you can update the offsets with calculated Final Offset value of each test, directly from the PATCH TEST interface, and use it in successive tests. In this way, the accuracy of the later tests is improved because they use correct offsets from the earlier tests.

Tip: If you load survey data with the patch test, you can go right into editing because offsets would've been updated during the patch test. Alternatively, you can update your boat configuration file, then load the survey data separately and load the PATCH TEST results from the boat configuration file.

Grid Convergence

The **grid convergence correction** is commonly incorporated into the yaw offset for your heading device. This method works in both the 32-bit and 64-bit processing. However, if you work in multiple sites with significant distance between, the convergence value changes thus requiring a new patch test at each project location.

The 64-bit HYSWEEP® EDITOR, provides an easier alternative in the Sonar Processing options of the Read Parameters dialog: **Apply Grid Convergence** automatically calculates and applies the grid convergence based on the positions in your data. When you apply grid convergence, the convergence value appears in the Sounding Information window.

IMPORTANT: *You must use the same method to correct for grid convergence when you process both your patch test and survey data*; otherwise, the editor can not apply the same corrections.

Tip: If you always use the **Apply Grid Convergence** option, it doesn't matter where your site location is, and your edited data will be always be accurately corrected.

1. **Load all patch test files to the 64-bit HYSWEEP® EDITOR.**
2. **Do any editing required in stage 1.**
3. **Take the lines for your test into stage 2 editing.**
   a. **Select the test lines.**
   b. **Advance to stage 2 editing.** The program asks if you want all lines or selected lines.
   c. **Click [Selected Files].** Your selected lines advance to stage 2 and the File List updates accordingly.
4. **Load the data to the PATCH TEST.** The cross section on which the calculations are based may be selected manually or automatically:
   > **Manually choose the cross section** on which to base the statistics.

Tip: This method is recommended as it enables you to cut the profile at optimal positions in your data for each test.

i. **Click the A-B Cross Section and Patch Test icon then drag the cursor across the data** in the Survey window. The A-B cross

section window appears displaying the data at the selected cross section location.

ii. If the PATCH TEST controls are not visible, **check the Show PATCH TEST option**.

iii. **In the Select options, select the correct test** for the data.

> **Allow the editor to choose the cross section on which to base the statistics**, select the correct test for your data in the TOOLS-PATCH TEST menu. The PATCH TEST will appear displaying the selected data. In this case, the cross sections will be positioned as follows:

- **Latency and Pitch:** Directly under the track line.
- **Roll**: Transverse to the survey lines at their mid-point.
- **Yaw**: Mid-way between the track lines.

5. **Perform stage 2 editing as necessary**.
6. **Perform the PATCH TEST calculations**.

a. **Select the offset correction you are calculating.**

b. **If you are calibrating a dual head system, you can choose to view data from Head 1, Head 2 or both during roll, pitch and yaw tests.**

[Coarse Steps], [Medium Steps] and [Fine Steps] provide suggested Angle/Time Step settings for each step level, but you may enter other values if you wish.

c. **Click [Course Steps] then [Start.... Test].** (The text on the button matches the offset to be calculated.)

d. **Click [Medium Steps] then [Start... Test].**

e. **Click [Fine Steps] then [Start... Test].**

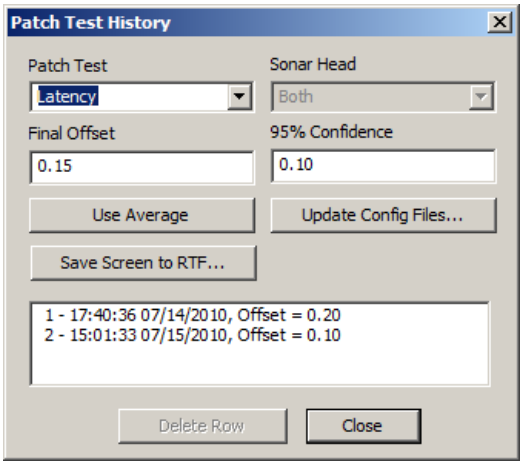
When each calculation is complete, the profile display is updated according to the calculated offset correction and the graph of the difference between the cross sections (Y-axis) for each angle or time adjustment (X-axis) appears.

Tip: If your graph is a bit jagged, try adding data by increasing the number of stacks and rerunning the calculations. The selected number of stacks is centered on the original profile location.

7. **If the results are unacceptable, close the PATCH TEST window and start again.** The program will ask if you meant to save the results. Since your results are unacceptable, click [No] to return to the editor interface and begin again. This provides the opportunity to load alternate test files or to correct errors you may have made in the previous test.
8. **When your completed results are satisfactory, click [Test OK].** The [Save Test to History], [Update Config Files] and [Save to RTF] buttons are then enabled.

> **[Save Test to History]:** Stores your test results in a record of all PATCH TEST calculations for the project and displays the records in the PATCH TEST History window.

Sample PATCH TEST History



> **[Use Average]** calculates each Final Offset value as an average of all results saved in the project history and applies that offset to all currently loaded files.

Tip: If you have loaded all of your patch test files, this adjusts them with the current correction which will, in turn, make the next patch test calculation more accurate.

Tip: You may also load your survey data with the patch test data and update the offsets in those as well. This means that, after the patch test is complete and you have updated your files with each offset value, you would go back to stage one, select all of your data files, then move to stage 2 with only the selected files.

> **[Update Config Files]** copies the calculated Final Offset to the selected initialization files.
  - **HYSWEEP® HARDWARE:** Quickly and accurately updates the Hysweep.ini which populates the settings in HYSWEEP® HARDWARE with your test results.
  - **Boat configuration file:** The boat configuration file stores all of the offsets in a central location. If you will be running multiple sets of data using the same device settings, you can save your current offset settings for easy reload. Boat configuration files are generated and loaded in the 64-bit HYSWEEP® EDITOR Read Parameters dialog.The editor uses these offsets to present your data for editing and stores the correct offsets in the edited output files.

In this case, the program updates the boat configuration file with the current offset calculation.

NOTE: This option is only enabled if you have used one of the boat file options in the Read Parameters dialog when you loaded your data.

> **[Save Screen to RTF]** saves a screenshot of the display, labeled with the tested offset and sounder head, to an RTF[1] file. The program asks you to name each file.

Tip: Alternatively, if you name the first file, then choose the same file for each successive test, *the results are appended to the existing file*. It is not overwritten.

9. **Close the Patch Test window**. This completes the patch test for the lines you brought to Stage 2.
10. **If you have not yet run each of the four patch tests, bring the lines for the next test to Stage 2**.
    a. **Change the File List display in the drop-down selection above the File List to All Files.** All files loaded to the 64-bit HYSWEEP® EDITOR are displayed.
    b. **Select the files for the next test and repeat the process** taking them to Stage 2 and PATCH TEST.

When the calculations are complete, the profiles are drawn using the offset adjustment value and a graph displays the difference between the cross sections (Y-axis) for each angle or time adjustment (X-axis). In the graph, you are looking for a distinct 'V'-shaped graph where the best offset adjustment value is at the apex of the 'V'.

Initial Offset + Adjustment = Final Offset

You should then enter the Final Offset value as your sounder offset in HYSWEEP® HARDWARE.

1. **RTF (Rich Text Format)** files are text documents that support graphics. If your current word processor does not support graphics, you can download the Word Viewer from Microsoft free of charge.

Finalizing Hardware Offsets Using Calibration Test Results

Calibration tests calculate adjustments that must be made in your hardware offset settings to collect accurate depth and position data. The values calculated should be used as follows for maximal accuracy of your hardware offsets.

In the HARDWARE program:

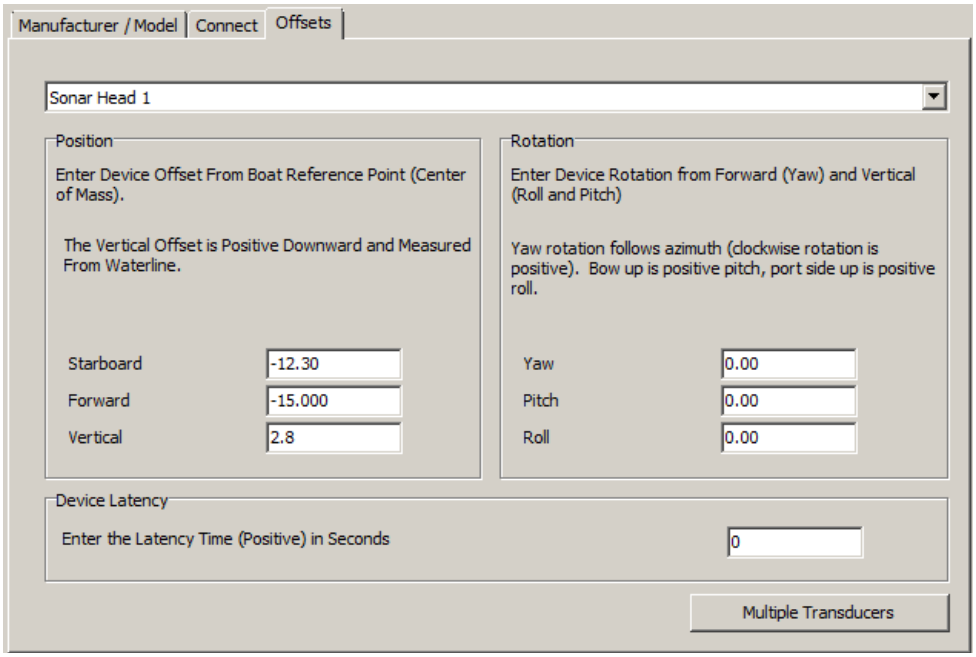
1. **Click on the DEVICE menu and select your position device.**
2. **In the Offsets tab, enter your latency** in seconds.

   In multibeam configurations, the latency value calculated by the PATCH TEST should be entered into the hardware setup for your GPS to correct timing errors in the system.

   Enter the *Final Offsets* value from the PATCH TEST dialogs to the device offsets in the HARDWARE program. Select the positioning driver to apply the latency and the echosounder to apply the roll, pitch and yaw values.

Tip: In the 64-bit HYSWEEP® EDITOR, you can update the Latency, Yaw, Pitch and Roll settings in HARDWARE from the PATCH TEST interface: click [Update Config Files] and select the HYSWEEP® HARDWARE option.

Adjusting Hardware Offsets in HYSWEEP® HARDWARE



PLANNED SURVEY LINES

Planned survey lines (*.LNW) define where you want your vessel to go. The line file contains the grid coordinates and names for each planned line in your project area and can also contain cross section template information. Line files are typically created in the LINE EDITOR program.

Planned lines are saved with an LNW extension and are saved in the project folder. You should give each set of planned lines a unique name which will allow you to determine for what area the survey lines were created.

Although it is possible to collect survey data without planned lines, it will make the editing process more logical and assure your required coverage if you have referenced some kind of survey lines in your area.

LINE EDITOR creates planned line files. Create each line individually, or create one line then additional lines offset in a choice of patterns. There is no limit to the number of waypoints per line or lines per file.

Additionally, planned lines may be exported to a selection of third-party plan files.

SPACING PLANNED LINES

Line spacing for single transducer surveys is somewhat arbitrary, because full bottom-coverage is almost never practical. For sweep surveys, where full bottom-coverage is practical, line spacing is usually chosen to insure full coverage.

If your boat is equipped with a multibeam system, where the coverage of a single sweep varies depending on water depth, line spacing will often change from one survey to the next. Some simple trigonometry gives the coverage relationship with water depth.

- **Port Coverage** = Water Depth x Tan(Port Theta)
- **Starboard Coverage** = Water Depth x Tan(Starboard Theta)
- **Sweep Coverage** = Port Coverage + Starboard Coverage

It is tempting to orient the sweep transducer with somewhat side-looking geometry, as this increases the coverage per sweep. Be

careful about this because the trade-off is decreased data quality in the outer beams.

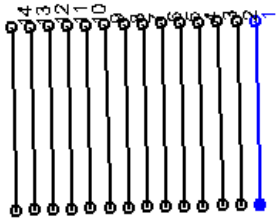
OFFSET PATTERNS FOR PLANNED LINES

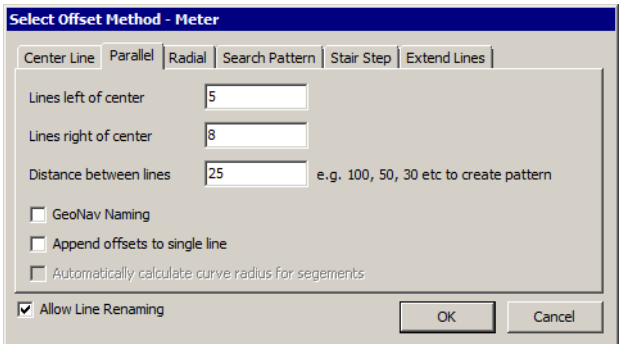
Planned lines can be created in any one of several patterns using the Offsets function. All of the following patterns are available when you generate lines in the LINE EDITOR.

Planned Survey Line Offset Patterns

Parallel Offsets

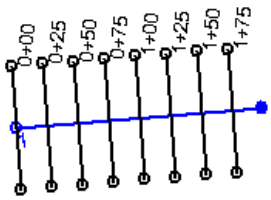
Parallel lines on either side of the initial line.

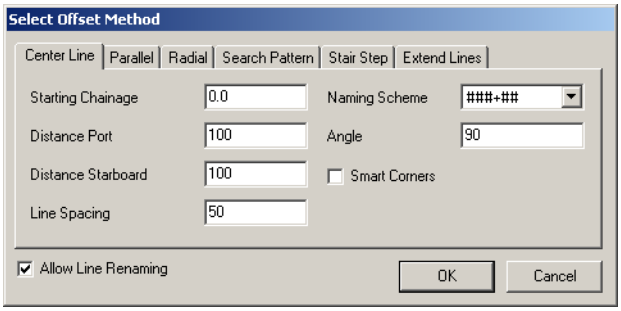




Center Line Offsets

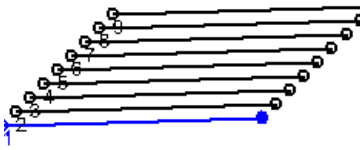
Perpendicular lines at user-defined spacing along the initial line.

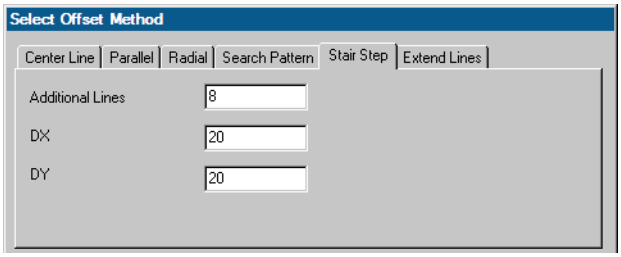




Stair Step Offsets

Add user-entered X, Y values to each waypoint creating a stair step effect.

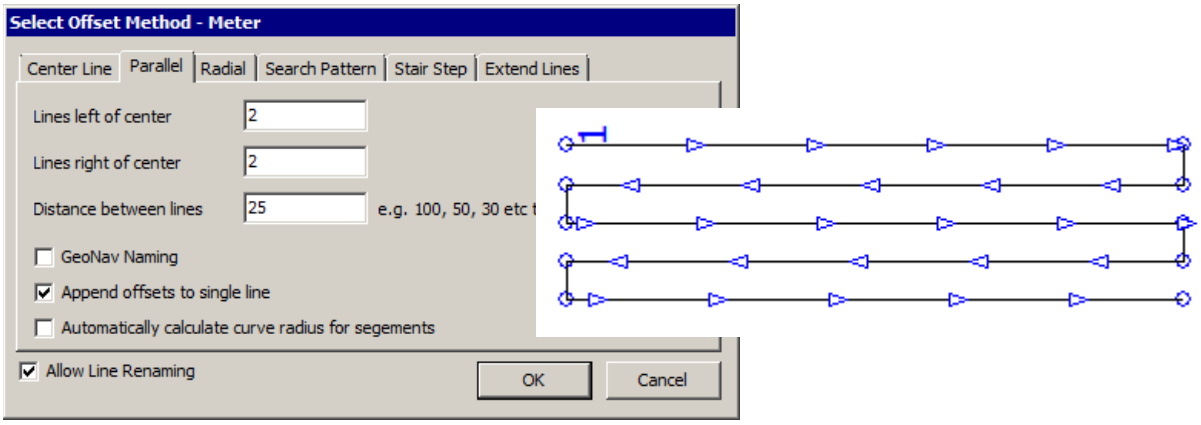




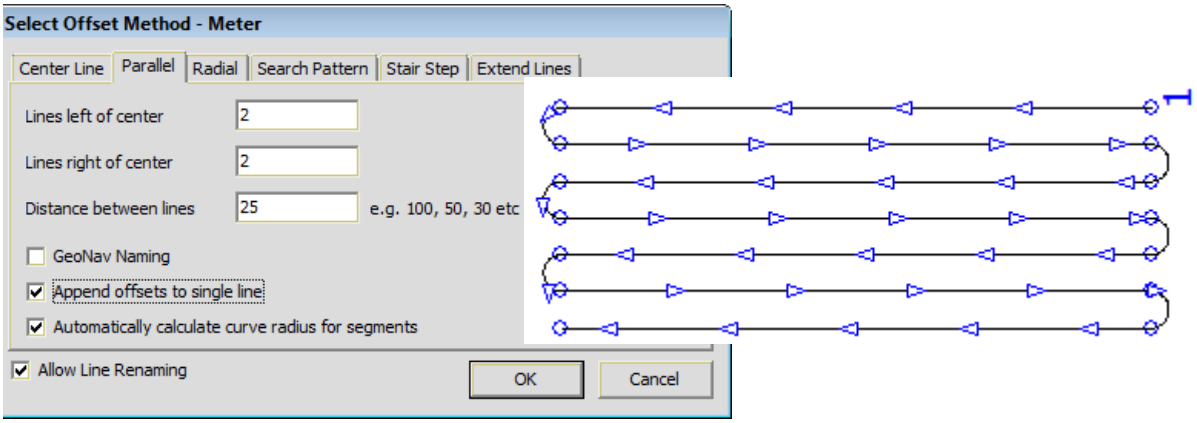
Mission Plans

You may choose to join the lines together into one line, with straight or curved segments joining the end of one straight segment to the beginning of the next. You can use such lines in HYPACK® or export them to a mission format supported by your survey vehicle: MavLink, GPX, MOOS-Ivp BHV or Teledyne ZRP.

Appending Offsets to One Line Settings (left), and Results (right)



Appending Offsets to One Line With Calculated Radius Settings (left), and Results (right)



CREATING 2-D PLANNED LINES USING THE CURSOR AND OFFSET TECHNIQUE

In the LINE EDITOR Import dialog you can extract data from ASCII text files and use it to populate the fields of the LINE EDITOR to generate single-segmented planned lines. Alternatively, you can interactively create planned survey lines in the LINE EDITOR:

1. **Open a Background File** of your survey area.

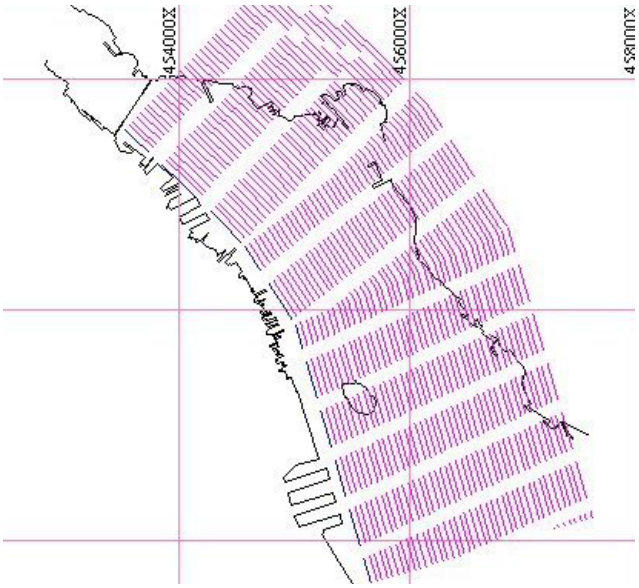
Sample Background File

2. **Open the LINE EDITOR.** Select PREPARATION-EDITORS-LINE EDITOR.
3. **Create your initial planned line.** Click the Cursor icon and the LINE EDITOR will minimize.

4. **Click in the area map to mark each waypoint in the initial line**.
5. **Restore the LINE EDITOR** by clicking [Line Editor] in the toolbar. You can review the points of your first line, and then continue.
6. **Create your Offset Lines**.
   a. **Click the Offsets icon.** The offsets dialog will appear.

   b. **Select the pattern of lines** you wish to use by selecting the corresponding tab.
   c. **Enter the number of offsets to be created as well as the distance or angle between them**. For Parallel and Center line Offsets, imagine you are standing at the start of the initial line looking toward the end to determine which way is left or right (port or starboard).
   d. **Choose whether to allow line renaming**.
   e. **Click [OK].** HYPACK® will create the additional offset lines and display your filled spreadsheet.
7. **Preview your lines** by clicking the Extents icon. The LINE EDITOR spreadsheet minimizes and the area map zooms in to the line file.

Planned Lines Preview on HAL.DIG



8. **Return to the LINE EDITOR.** Click [Line Editor] in the toolbar.
9. **Save your Line File.** Select FILE-SAVE or FILE-SAVE AS and name your file. Your data will be saved, by default, with an LNW extension to your project folder and enabled in the project files listing.

More Information

- Loading Files to your Project on page 1-21

CHAPTER 3

Survey

HYPACK® SURVEY

The survey programs provide you with information to monitor survey data collection and to assure full coverage of the survey area. Customize the real-time displays and set the navigation parameters to suit your normal needs and preferences then use the easy keyboard commands to manually guide your data collection.

In multibeam, HYPACK® SURVEY runs simultaneously with HYSWEEP® SURVEY to provide the navigational data while HYSWEEP® SURVEY collects the multibeam data.

Once you have set up your project, you are ready to set up your SURVEY options. The consider the following tasks before you begin to collect data:

SURVEY INTERFACE

To launch HYPACK® SURVEY, select SURVEY-HYPACK® SURVEY or click the icon.

Tip: **Smart Launch Survey icon** in the HYPACK® toolbar launches one or more survey programs according to your current hardware configuration.

- **Multibeam** configurations, *including those with side scan sonar,* launch HYPACK® SURVEY and HYSWEEP® SURVEY.

The HYPACK® SURVEY program loads the information from the current project. The program reads geodetic information and hardware information from the project initialization files. It loads the most recently used planned survey line file (*.LNW) from the

current project, as well as any background files and matrix files that are currently ‘Enabled’.

HYPACK® SURVEY functions can be executed through the menus in the shell, the (optional) toolbar, or through keyboard shortcuts.

Toolbar

The toolbar is a row of icons that duplicate the function of several of the menu selections. To determine each icon's function, hold the cursor over the icon and a tool tip will appear.

WINDOWS IN SURVEY

The SURVEY display is comprised of the ‘shell’, with a menu bar, toolbars and alarm indicators, as well as your choice of several independently-displayed and configured windows:

- **Area Map:**This is a plan view of your project area. It displays any enabled project files along with the position of the vessels and their track lines.
- **Left-Right Indicator:** Shows the position of the boat relative to the current planned line segment.
- **Data Display:** Shows real-time, textual information regarding your logged content.

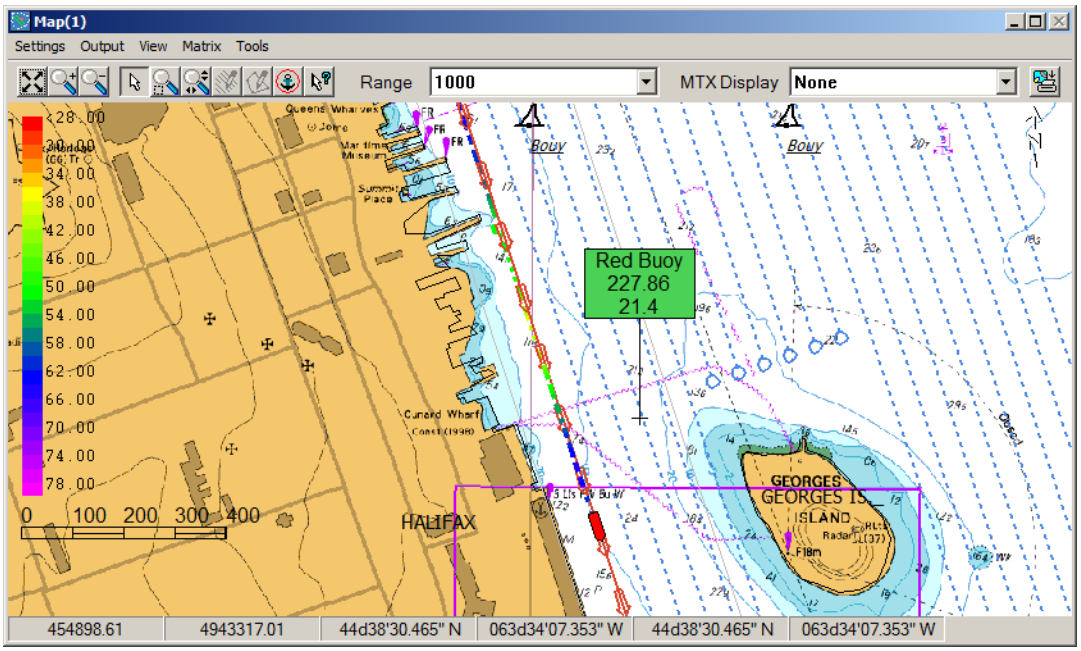
You may reposition and size all windows, in one or more monitors, using the cursor to drag the title bars and window edges.

Once you have configured, sized and placed the windows on the screen, the SURVEY program remembers and restores them to the same status and location each time you start the SURVEY program.

AREA MAP IN SURVEY

The Area Map window contains a plan view of your survey area that includes all files active in HYPACK® when you start SURVEY and a symbol representing each mobile in your hardware configuration.

A Sample Area Map



Sounding colors are determined by the project's color settings. The position of the survey boat is updated on the Area Map at an interval defined by the GPS Update Frequency in the HARDWARE program.

Each area map includes the standard zoom and pan controls.

NOTE: The Range setting in the Area Map toolbar enables you to set the zoom at any of a series of preset zoom scales.

A tracking setting other than "No Tracking" overrides the effect of the pan tool.

When you exit the SURVEY program, it records the status of the items in the Area Map and restores the same configuration when you re-start the program.

AREA MAP LAYER MANAGER

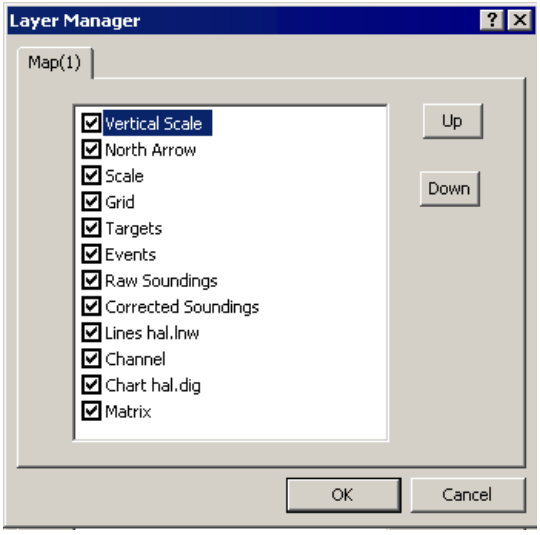
In addition to your project files, you may also include chart features, such as a legend, scale, north arrow, and projection and lat./lon. grids, in your area map display.

To set the files displayed and their draw order:

1. **Access the Layer Manager** by selecting SETTINGS-LAYER MANAGER.
2. **Check the files and features you want to display**.

3. **Set the draw order.** You can click and drag the files in the list or select one and reposition it with the Up and Down buttons. Items at the end of the list are drawn first and will be overlaid by any in the list above them that are selected.
4. **Click [OK]**.

A Sample Area Map

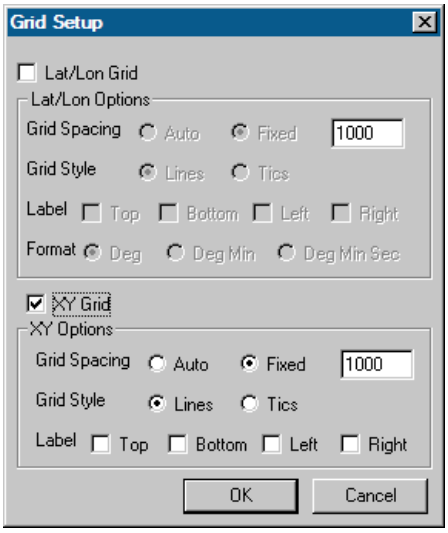


AREA MAP GRID PROPERTIES

Grid Properties set how the projection and lat/long grids are presented. Select SETTING-GRID PROPERTIES to access the Grid Setup dialog. As in the HYPACK® Control Panel, you can choose automatic or fixed spacing and the style of the labels. Labeling is available on all four sides of the map.

NOTE: The Lat/Lon grid is displayed in Lat/Lon of the local datum.

Grid Setup Dialog

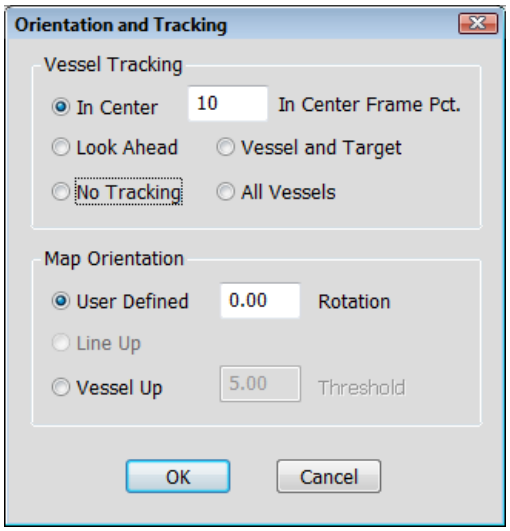


Area Map Tracking and Orientation Options

Tracking and Orientation options automatically re-adjust the screen when the boat leaves the display area and to rotate your map to your preferred orientation.

Vessel track points are limited to one per second.

Tracking and Orientation Dialog



Select SETTINGS-TRACKING/ORIENTATION from the menu and the Orientation and Tracking dialog appears.

Vessel Tracking

- **In Center** returns the boat to the center of the screen as it nears the edge. The **Edge Dist to Win Size Pct** option determines when the centering will occur based on the distance between the vessel and the edge of the area map

(expressed in percentage of the Area Map window size with an allowable range of 5-25%).

NOTE: If you enter a value outside the 5-25 range, the program resets the value to 5, if you have entered a value less than 5, or 25 if you have entered a value greater than 25.

- **Look Ahead** moves the boat further back from the center to maximize the amount of space displayed ahead of the vessel.
- **Vessel and Target** keeps the boat and the current active target in view. The map automatically zooms to fit as you approach.
- **All Vessels:** The map automatically zooms to fit to keep all mobiles in view.
- **No Tracking** allows you to move the screen anywhere you want without having it zoom back to keep the boat in view. (Press the Home key to center the vessel on your screen.)

The toolbar displays the current tracking method. If you set your preferred method of tracking, you can quickly toggle between this setting and “No Tracking” by clicking the toggle tracking icon (Ctrl+T) or selecting SETTINGS-TOGGLE TRACKING.

Map Orientation

- **Vessel Up** aligns the Area Map with the current vessel heading. Define a threshold (in degrees) to determine how much the vessel heading must change to cause the map orientation to adjust. This prevents constant (annoying) updates of the map orientation with only small changes in vessel heading.
- **Line Up** draws the screen so the current line segment is directly “up” the screen. If you are in the “Line Up” orientation, the boat should be progressing up the screen. If your boat is going “down” the screen, you need to “whip” the line ends (change the start-line and end-line points) by using the Ctrl-W key command or the LINE–SWAP menu item.
- **User-Defined Rotation** draws the Area Map according to the specified degrees. Zero degrees will orient the map with North up.

LEFT-RIGHT INDICATOR IN SURVEY

The Left-Right Indicator window only appears when you have planned lines loaded into the SURVEY program. It shows the position of the main vessel relative to the planned survey line, as well as certain information of particular interest to the helmsman:

Left-Right Indicator Statistics

Logging Status	Display
Logging	Distance and Time[a] to the end of the current survey line.
Not Logging	Distance and Time* to the start of the next survey line.
Always	Logging status, uncorrected depth and tide

a. Times are calculated based on distance and current speed.

To load additional displays, select WINDOW-NEW- LR INDICATOR.

Configuring the Scale

You can display the cross track error using either of two scales, and expand and contract the either scale to suit your purposes.

To choose the type of scale, select or deselect the Logarithmic Scale option in the Options menu.

To contract the scale:

- Click ‘Contract’ on the menu bar.
- Use Ctrl-C (Contract) from the keyboard.

To expand the scale:

- Click ‘Expand’ on the menu bar.
- Use Ctrl-V (Expand) from the keyboard.

NOTE: These keyboard commands only work with the focus on the Left-Right Indicator window.

Configuring the XTE Label

The cross track error label is a real-time display of the distance off line. The font and float properties can be configured to meet the needs of different operators.

To modify the font, select OPTIONS-FONT in the indicator menu. The Windows® Font Dialog appears for you to make your adjustments. *Only the font, style and size apply*. These settings override the current scheme until you exit SURVEY.

The label can float above the pointer in the indicator or remain centered over the graphical display.

To toggle the float setting, select and deselect the OPTIONS-FLOATING TEXT menu option.

Setting the XTE Alarm Distance

SURVEY alerts you that your vessel is too far off the currently selected survey line. You can decide the distance at which you will be alerted.

To set a "Cross Track Error Alarm" distance:

- **Drag the tab indexes in the left–right indicator window.** The tab indexes are small gray bars, equidistant from center on the indicator scale.
- **Set the XTE limit in the Navigation Parameters dialog** (in the Options menu).

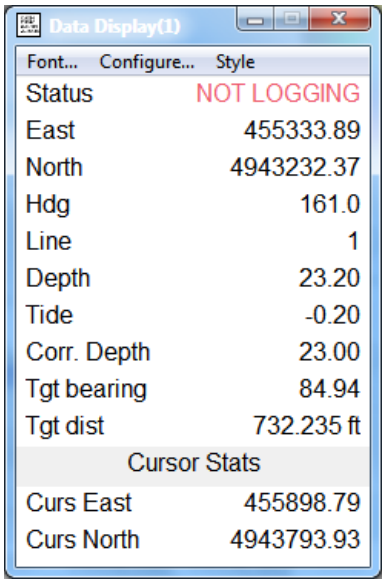
When this setting is changed, all other Cross Track Error displays update accordingly.

When the boat travels outside this range, the frame around the cross track label turns either red (planned line is to starboard) or green (planned line is to port), and the 'XTE' alarm appears in the shell. *This has no effect on the data logging*; it is only a visual alarm to the helm to steer toward the survey line.

DATA DISPLAY IN SURVEY

The Data Display window in HYPACK® SURVEY shows textual information about the survey.

The Data Display Window



When you first start the SURVEY program, the display does not contain any items. Use the menu in the Data Display window to configure the Data Display. You can select the items to display, the font of the displayed items, or change the style of the display.

ALARMS IN SURVEY

Alarm windows are located along the bottom of the SURVEY screen. They are used to denote error conditions to the operator. When the criteria are met, the alarm window turns red and the Windows® exclamation alarm sounds. You can turn off the audio alarm by pressing the Escape key. This will also change the alarm boxes to yellow until the reason for the alarm has been corrected.

The SURVEY program can generate the following alarms:

Survey Alarm

Alarm	Text Displayed	Reason	Documented
Time Out	Time Out	Generated when a device has not reported an update within the last 5 seconds.	Survey Log
Track Error	XTE	Generated when the tracking point is outside the limit set in the Navigation Parameters[a] dialog or the Left-Right Indicator.	Trace File[b]
Minimum Depth	Min Depth	Generated when the measured depth drops below the value defined in the Navigation Parameters[a] dialog	Survey Log
Maximum Depth	Max Depth	Generated when the measured depth is greater than the value defined in the Navigation Parameters[a] dialog	Survey Log
Heave Drift	Drift = Current Drift Value	If the heave value differs from the average of the last 100 heave readings by more than the “Alarm Threshold” set in the Vessel Setup.	Survey Log

a. Select OPTIONS-NAVIGATION PARAMETERS.

b. The Trace file is named RAW date.txt (eg RAW0927.txt) and saved in your project folder. It contains basic information about which files you are using as you survey, as well as data about events, targets, logging, etc. You can read it with any text editor.

CORRECTIONS IN SURVEY

Tide, draft and sound velocity corrections affect the accuracy of the depth and positioning data. During acquisition, SURVEY logs these corrections in the header of each raw data file when you start logging, and in a correction-specific record any time a correction changes during your data collection.

TIDE CORRECTIONS IN SURVEY

In HYPACK®:

Final Depth	=	Measured Depth	+	Tide Correction	+	Draft Correction	+	Sound Velocity Correction

Since the tide correction is normally added to the measured depth, it will normally be a negative value in HYPACK® (unless the tide drops below the chart datum).

For example, if the water level is 1.3m above the chart datum, the tide correction in HYPACK® would be “-1.3”.

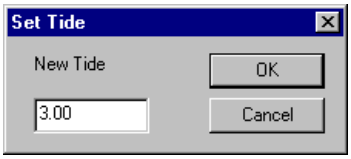
You can display one or more of the following data affected by tide in the Data Display:

- Current tide correction
- Measured depth from the echosounder
- Corrected depth

Since the tide correction is applied to all vessels, it is displayed in Black in the Data Display window.

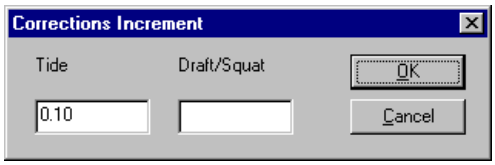
You can set the initial value of the tide correction by clicking the TIDE–SET menu item. This value will be assigned to all soundings logged until you set a new value. Update this value often, especially if the tide level is changing quickly.

Setting the Tide Value



The Tide Increase (Alt-Y) and Tide Decrease (Alt-Z) can be used to increase or decrease the current tide value by the current increment. The increment is set from the OPTIONS–CORRECTIONS INCREMENT menu item.

Setting the Corrections Increments



NOTE: If you use the same time and tide correction information to create a tide correction file, then use it to apply your corrections during post-processing, your results will be more realistic. The editor will interpolate the tide correction values over time, thus avoiding the sudden changes in tide correction values.

The tide correction value at the time each raw file is opened will be recorded in the header of the file. Each time you modify the correction value, it will be recorded as a TID record and used to correct soundings taken after that time.

Alternatively, you can record tide corrections from a telemetry tide gauge:

The SURVEYprogram treats telemetry tide gauges like another piece of survey equipment. A device driver in the hardware configuration receives data from the device and automatically sets the tide correction to the appropriate value.

DRAFT CORRECTIONS

In HYPACK®, Final Depth = Raw Depth + Static Draft + Dynamic Draft (+ Tide, SV and Heave corrections)

To log accurate depths, you must correct for both static and dynamic draft. You have already accounted for static draft in your hardware configuration, but you correct for dynamic draft during data collection.

Dynamic draft corrections are logged with the rest of your data using your choice of the following options:

- **Manual Corrections:** Use the Draft option in the Vessel Setup dialog to adjust the correction currently logged in the data file. The draft correction is logged in the header of each data file and to a DFT record each time it is changed. This value is also displayed for each vessel in the Data Display using the Vessel Perimeter Color associated with each vessel.

- **Use the DraftTable Driver:** The DRAFTTABLE.DLL allows you to construct a table of Dynamic Draft Correction versus Speed. The driver then uses the Speed Over Ground from the GPS (or the internal speed computed by SURVEY or DREDGEPACK®) and interpolates a draft correction based on the Speed Over Ground.

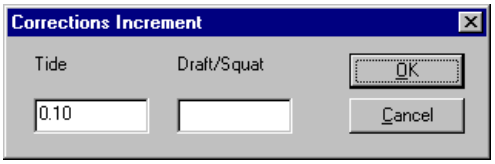
NOTE: On a river, your speed through the water column may not equal your speed over ground. This could cause some significant errors in the Dynamic Draft correction being assigned by the driver.

MANUAL DRAFT CORRECTIONS

Define Draft corrections for each vessel in the Vessel Setup dialog in SURVEY or DREDGEPACK® under "Dynamic Draft".

To set the amount that the arrow keys in the Vessels dialog increment/decrement the Dynamic Draft, select OPTIONS–CORRECTION INCREMENT and enter it under "Draft/Squat".

Setting the Corrections Increments



AUTOMATIC DRAFT CORRECTIONS

Automatically apply draft/squat corrections by installing the Draft Table Driver in HARDWARE. The Draft Table is a listing of draft correction values with their corresponding vessel speeds. This option enables SURVEY or DREDGEPACK® to automatically apply dynamic draft/squat corrections based on the speed of the vessel.

The driver allows for Shallow Water and Deep Water curves. Shallow depths can affect how the wake forms around the vessel and it has been shown it can significantly affect the draft. If this is the case, enter different drafts for shallow and deep water.

If you enter both shallow water and deep water draft values:

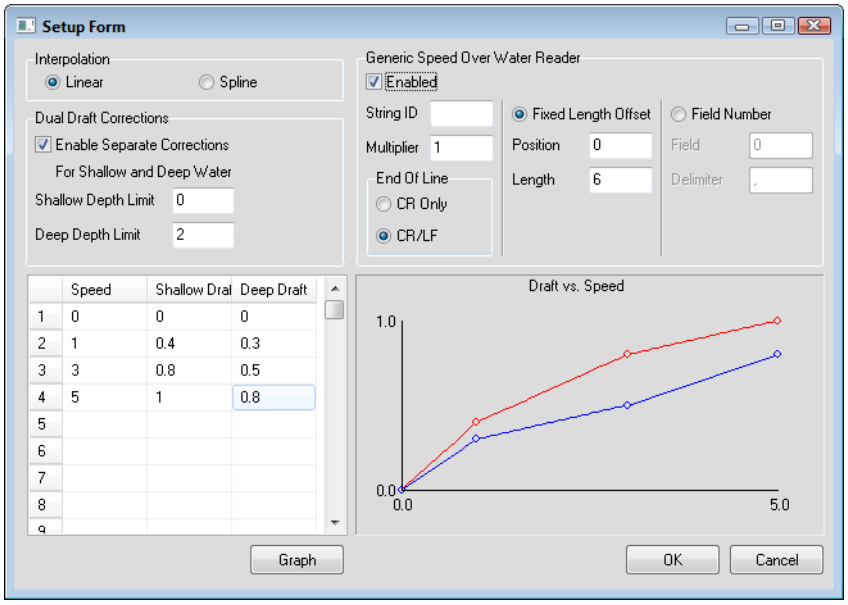
- **When the depth is less than the Shallow Depth Limit**, use just the shallow water table.
- **When the depth is greater than the Deep Depth Limit**, use just the deep water table.
- **When the depth is between the Shallow and Deep Depth Limits**, interpolate between the two table values.

NOTE: If there are soundings taken at speeds greater than those defined in the Draft Table, the driver will assign draft correction value that corresponds to the fastest speed in the draft table.

1. **In HARDWARE, select DEVICES-ADD DEVICE** and select the DraftTable driver.
2. **Click [Setup] and configure your driver for your project**. The Driver Setup is a table defining draft values and their corresponding vessel speeds. SURVEY interpolates draft values according to the selected interpolation method and within the defined speed range and stores a draft correction value appropriate to the vessel speed with each sounding.

   [Graph] plots your corrections over speed on the right.

DraftTable Driver Setupl



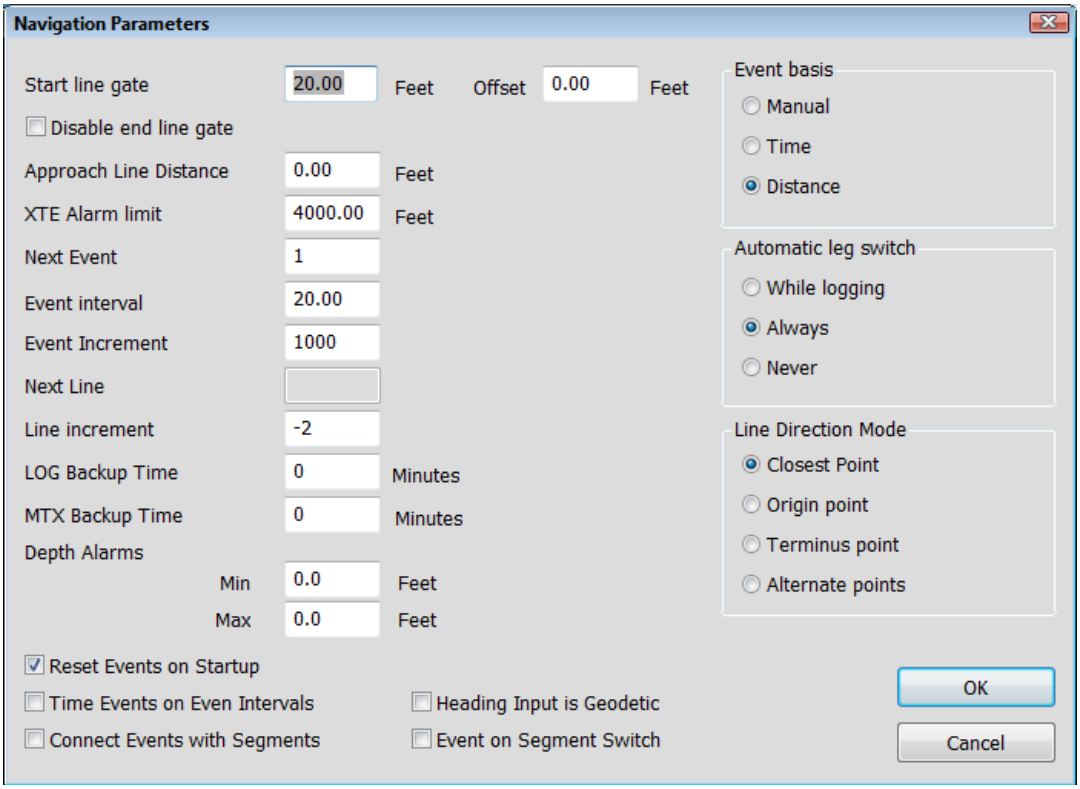
3. **Click [OK].**

NAVIGATION PARAMETERS

The Navigation Parameters in SURVEY to help automate the planned line navigation and data logging. This allows the helmsman to focus on driving while the program handles the data.

To access the Navigation Parameters, select OPTIONS-NAVIGATION PARAMETERS.

Navigation Parameters Dialog



NAVIGATING PLANNED LINES IN SURVEY

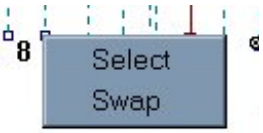
The active planned line file in your project will be loaded to the SURVEY program. You can load a different line file by selecting LINE-SELECT FILE and choosing the new line file from the file selection dialog. The program will unload any active line file and load the selected file. Only one planned line file may be enabled at a time. (You can unload any active line file and work with no lines loaded by selecting LINE-UNLOAD.)

When you first enter the SURVEY program, it will select the first line in the queue as the current active line. When you exit the program, it writes the current active line to a default file. Next time, it reads this default file and re-establishes the last active line as the current active line.

To select the line you wish to survey, use one of the following methods:

- **Right-click on a line handle and then click the "Select" item**. The "handles" are located at each line origin (the first point entered when creating the line) and are drawn as little boxes at the origin of a planned line.

Selecting a Line Using "Handles"



- **Use the LINE–INCREMENT LINE menu item** or Ctrl-I to move ahead by the number of lines defined under Line Increment in the Navigation Parameters.
- **Use the LINE–DECREMENT LINE menu item** or Ctrl-D to move back by the number of lines defined under Line Increment in the Navigation Parameters.
- **Enter the desired line number under Next Line in the Navigation Parameters**. You may enter either the number or name (“34+00”) associated with a line.

LOGGING DATA IN SURVEY

Typically, when you set up a survey project, you create a set of planned survey lines to guide your navigation as you collect data. They help insure that you achieve the proper coverage of your survey area. Most surveyors begin on the first line of the line file and navigate up one line and down the next, logging data for each line, until they reach the end.

When you begin logging data at the beginning of each planned line (start line), the SURVEY program opens a data file and begins to record data. The status in the Data Display window will change to ‘Logging’. This is your indication that you have started line and the SURVEY program is logging data.

Logging Data

You can start line manually or automatically.

- **Manually** by selecting LOGGING-START LOGGING (Ctrl+S)
- **Automatically** using the automatic Start Line Gate feature.

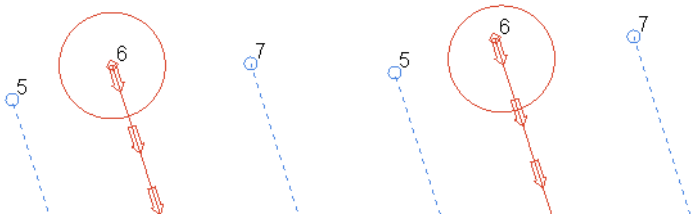
The automated Start Line Gate feature begins logging automatically if the vessel tracking point passes within the specified distance of the start line point.

The **Start Line Gate** is specified in the Navigation Parameters window. Select OPTIONS–NAVIGATION PARAMETERS.

- **Start Line Gate = “0.0”,** the feature is disabled and the SURVEY program only starts and ends logging if you manually intervene.
- **If the Start Line Gate > 0**, the program starts logging automatically when the distance from the tracking point to the

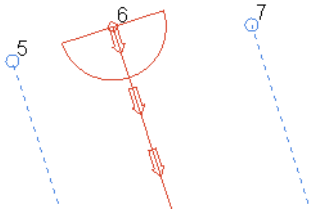
starting point of the planned line is less than the absolute value of the Start Line Gate. This "trigger area" is shown as a circle at the beginning of the planned line. A positive **Offset** shifts the circle down line by the specified amount, while a negative offset shifts it backward along the line.

Start Line Gate = 25 (left), with Offset=10 (right)

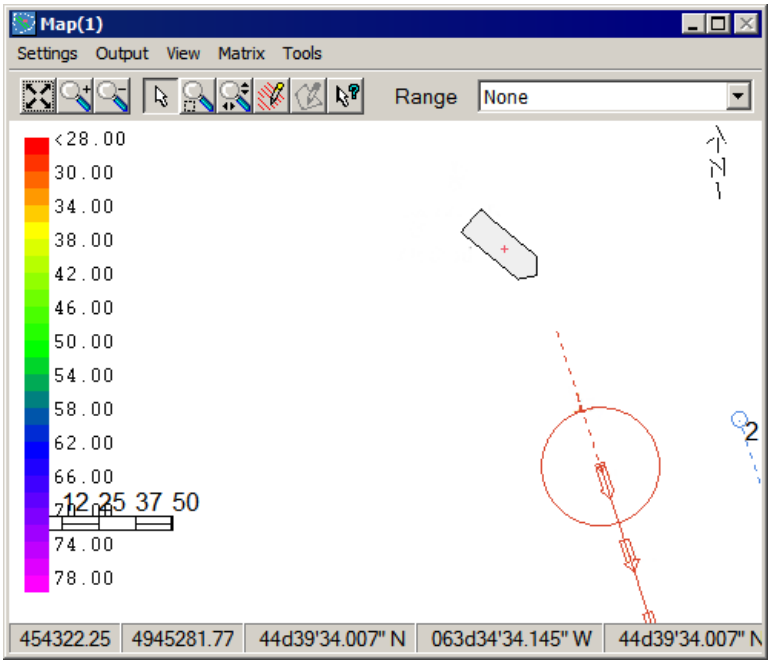


- **Start Line Gate < 0**, the SURVEY program only starts logging when the tracking point breaks the perpendicular projection of the start line point and the distance from the tracking point to the starting point of the planned line is less than the absolute value of the Start Line Gate.

Negative Start Line Gate



Approach Line Extends 50 Meters from the Start Line



Suspending Logging

At any time while logging, select LOGGING-SUSPEND LOGGING (Ctrl+U). The status in the Data Display window will display the word “Suspended”. A target with the name “Paused” will be placed on the screen at the tracking point position. You will still receive screen updates and position information, but the program will not write information to disk. This is useful if the survey boat needs to pause for traffic.

Resuming Logging

Select LOGGING-RESUME LOGGING (Ctrl+R).

To Abort Logging

At any time while “On-Line”, select LOGGING-ABORT LOGGING (Ctrl+A). SURVEY stops logging data and saves the data logged to that point with an *.XXA extension. (If this would cause a duplicate file name, the extension becomes *.XXB, *.XXC...). The aborted file is *not included in the current catalog file*.

To End Logging

Once logging has been started, it can be ended (end line) as follows:

- **Manually** by selecting the LOGGING-END LOGGING (Ctrl+E).
- **Automatically** if you are using the Start Line Gate. The line will be ended automatically when the tracking point breaks the a line projected perpendicular from the end segment point of the planned line.

  To disable the automatic end line, select the Disable End Line Gate option in the Navigation Parameters dialog. In this

case, you must stop logging manually, though a start line gate automatically starts logging.

When the SURVEY program executes an “End Line” event, it closes and saves the data file and then selects the next line in the line queue. It determines the start line point based on the Line Mode in the Navigation Parameters dialog. A small red circle is drawn about the start line point and arrows indicate the direction of travel.

SURVEY KEYBOARD SHORTCUTS

SURVEY Keyboard Commands

	Functions	Commands
Line Functions	Decrement line by Line Increment set in the Navigation Parameters. (Only when not logging.)	Ctrl+D
	Increment line by Line Increment set in the Navigation Parameters. (Only when not logging.)	Ctrl+I
	Swap planned start end	Ctrl+W
	Decrement line segment by 1	Ctrl+B
	Increment line segment by 1	Ctrl+F
Logging Functions	Start Logging	Ctrl+S
	Pause Logging	Ctrl + U
	Resume Logging	Ctrl + R
	Manual Event Mark	Ctrl+N
	Abort Logging	Ctrl + A
	End Logging	Ctrl+E
Target Commands	Mark target at tracking point	F5
	Target Properties dialog	F6
	Marks a Waters Edge Target	F7
Tide Corrections	Increment by current increment	Alt+Y
	Decrement by current increment	Alt+Z
Map Zoom Commands	Zoom In	+
	Zoom Out	-
	Move left, right, up and down	Arrow Keys
	Rotate Starboard	Ctrl++
	Rotate Port	Ctrl + -

	Functions	Commands
	Center Map	Home
	North Up	Ctrl+Home
L/R Indicator Commands	Contract scale	Ctrl+C
	Expand scale	Ctrl+V
Profile Window Commands	Contract horizontal scale	Ctrl+C
	Expand horizontal scale	Ctrl+V
	Decrease vertical scale	Alt+C
	Increase vertical scale	Alt+V

HYSWEEP® SURVEY

HYSWEEP® SURVEY is a multibeam, topographic LiDAR and side scan data collection and logging program. Real-time displays and quality control testing give on-the-spot information on bottom conditions and data quality.

The HYPACK® and HYSWEEP® SURVEY programs run simultaneously; HYPACK® provides navigation and single beam data collection and HYSWEEP® provides the multibeam features.

Data is logged to HSX format, then processed through the 32-bit HYSWEEP® EDITOR or 64-bit HYSWEEP® EDITOR.

HYSWEEP® SURVEY Display Windows

There are several windows which may be displayed through HYSWEEP® for real-time monitoring of your data collection.

The View menu provides access to existing windows, and options to generate (VIEW-NEW-*WindowName*) and remove (VIEW-REMOVE-*WindowName)* windows in your display. In this way, HYSWEEP® SURVEY can show multiple windows of the same type, but you can configure them to display data from different devices (selected in the toolbar for each window) or the same data with different display options.

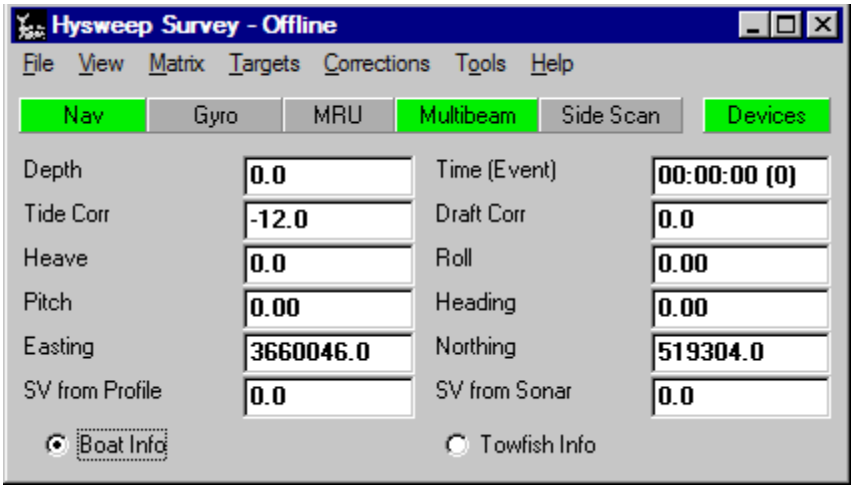
MAIN WINDOW IN HYSWEEP® SURVEY

The main window consists of a menu, some alarm indicators and current data values. It can be resized to show only items of interest and will retain the size on subsequent program runs.

The title bar shows logging and playback status. During logging or playback, it names the current data file; otherwise, it says "Offline".

You can choose to display data relative to the boat or to the towfish by selecting the option at the bottom of the dialog.

HYSWEEP® SURVEY



ALARMS IN HYSWEEP® SURVEY

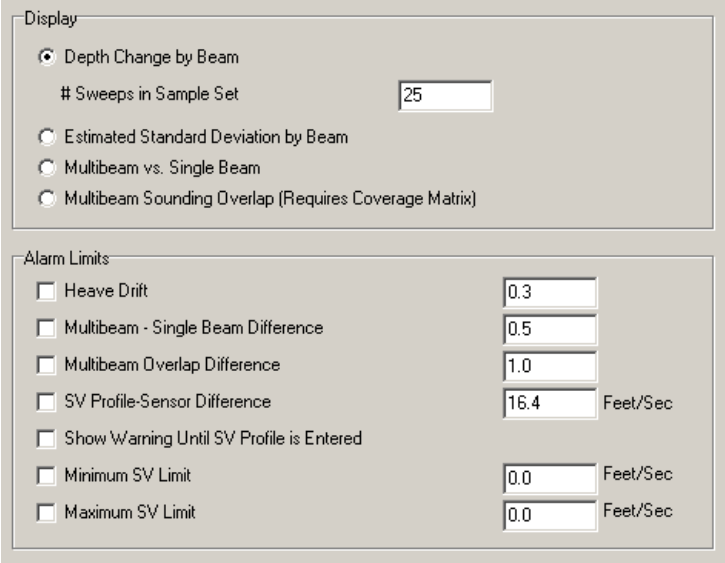
HYSWEEP® SURVEY can be configured to continuously check for and notify you of data errors or loss of data input. They show green (OK), yellow (careful) or red (look out) depending on status. Click the indicator to show status history.

The alarms at the top of the main window of HYSWEEP® turn red when no data has been received from the corresponding device for some time. Set the Time Out Interval in the Connect tab in HARDWARE.

There are also quality control alarms for heave drift, excessive multibeam–single beam difference and excessive multibeam overlap difference and several other problematic conditions.

To set up the alarms and limits, select VIEW-OPTIONS-QC Test and choose your alarms and limits.

View Options—QC Test Tab



HYSWEEP® SURVEY MEASUREMENTS

The measurements displayed in the HYSWEEP® SURVEY shell are updated about once a second. They include the following:

Depth: Nadir beam depth in survey units.

Time (Event): Latest sounding time and event number. Time will not update if no soundings are being received.

Tide Corrections: Latest tide correction from HYPACK® SURVEY.

Draft Corrections: Latest dynamic-draft correction from HYPACK® SURVEY or from the HYSWEEP® squat & settlement table.

Heave: Latest heave in survey units, positive upward.

Roll: Latest roll in degrees, positive port side up.

Pitch: Latest pitch in degrees, positive bow up.

Heading: Latest ship heading.

Easting / Northing: Latest grid position from HYPACK® SURVEY.

SV from Profile is the current sound velocity correction from the sound velocity profile entered under CORRECTIONS-SOUND VELOCITY.

SV from Controller is the current sound velocity correction from the sensor. If there is no sound velocity sensor, it will display the sound velocity value entered in the sonar controller.

More Information

- Sound Velocity Corrections in HYSWEEP® SURVEY on page 3-28

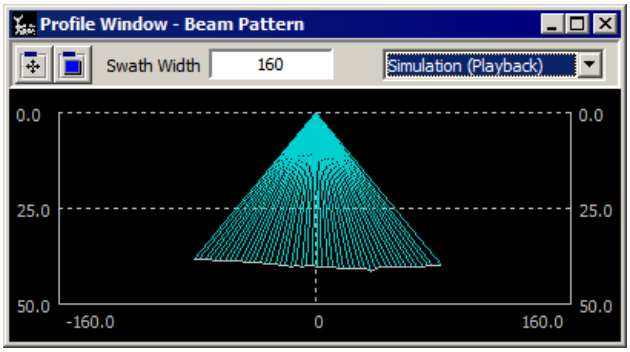
PROFILE WINDOW IN HYSWEEP® SURVEY

The Profile window shows sweep profiles in various ways:

- a profile line
- the beam pattern (shown)
- a bizarre wave-front display.

Only the profile line is available with multiple transducer and LiDAR systems. The view is looking forward from behind the sonar.

Profile Window



This display is limited to 75 beams and the swath width is displayed in the status bar. Note the color of the beams. The coding is such that blue indicates good data, yellow marginal and red bad. The relationship between color and beam quality code is established under VIEW-OPTIONS-OTHER.

To show the Profile Window, select VIEW-PROFILE WINDOW from the HYSWEEP® SURVEY menu. Display settings for the Profile Window are set by selecting VIEW-OPTIONS then RANGE SETTINGS and MULTIBEAM DISPLAY.

If you are collecting data from multiple sensors configured in HYSWEEP® HARDWARE (for example, multibeam and LiDAR data) the display defaults to the first device in the hardware

configuration. You can manually select the device for which the data should be displayed in the Device Selections dialog.

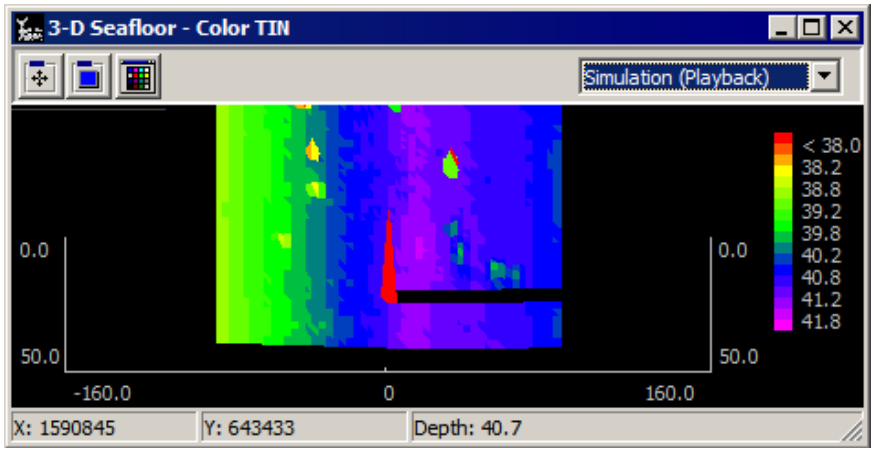
3D SEAFLOOR IN HYSWEEP® SURVEY

The 3D Seafloor window shows a three-dimensional representation of the aft seafloor. The view is through the rear-view mirror, which is somewhat odd but is the only way to draw these 3Dimensional images effectively. Display methods are:

- 3D Wiggle
- Color Wire Frame
- Solid TIN
- Color TIN (shown)

F11 toggles scrolling on / off and is useful to freeze the frame in case something interesting shows up. Moving the cursor across the window displays grid position and depth. Contacts may be targeted by double clicking the object of interest and object size is measured by dragging the cursor from point to point.

3D Seafloor



To show the 3D Seafloor, select VIEW-3D SEAFLOOR from the main HYSWEEP® SURVEY menu. Display settings may be set by selecting VIEW-OPTIONS then Range Settings and Multibeam Display.

If you are collecting data from multiple sensors configured in HYSWEEP® HARDWARE (for example, multibeam and LiDAR data) the display defaults to the first device in the hardware configuration. You can manually select the device for which the data should be displayed in the Device Selections dialog.

MULTIBEAM WATERFALL IN HYSWEEP® SURVEY

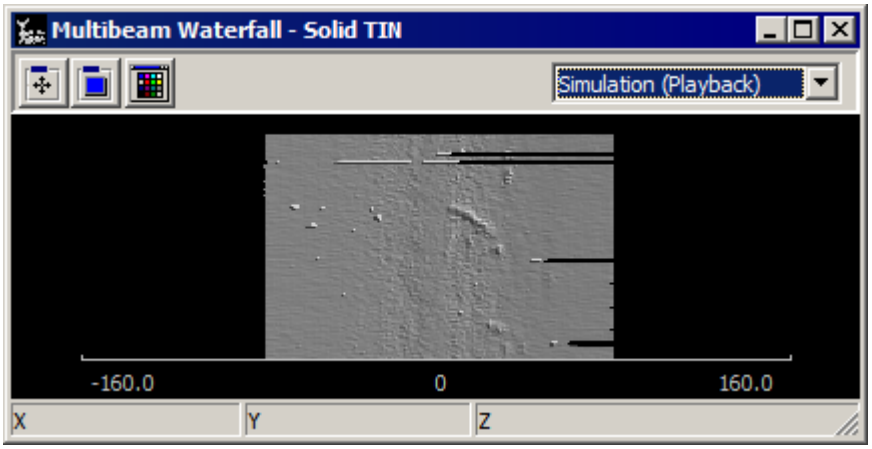
Waterfall windows are scrolling displays of your data. HYSWEEP® SURVEY includes waterfall windows of multibeam data colored based on depth or intensity, and a sideways waterfall—the shore view window—for topographic laser systems.

Multibeam and Intensity Waterfalls

The Multibeam and Intensity Waterfall windows are forward-looking representations of the seafloor shown as a gray or color TIN. The original multibeam waterfall can be colored based on intensity instead of depth, however the Intensity Waterfall provides a better display.

The waterfall is a more traditional display method than the 3D view.

Multibeam Waterfall



F11 toggles scrolling on / off and is useful to freeze the frame in case something interesting shows up. Moving the cursor across the window displays grid position and depth. Contacts may be targeted by double-clicking the object of interest and object size is measured by dragging the cursor from point to point.

To access this window, select VIEW-MULTIBEAM WATERFALL from the main HYSWEEP® SURVEY menu. Display settings may be set by selecting VIEW-OPTIONS then Range Settings and Multibeam Display.

If you are collecting data from multiple sensors configured in HYSWEEP® HARDWARE (for example, multibeam and LiDAR data) the display defaults to the first device in the hardware configuration. You can manually select the device for which the data should be displayed in the Device Selections dialog.

COVERAGE MAP AND CROSS SECTION WINDOWS IN HYSWEEP® SURVEY

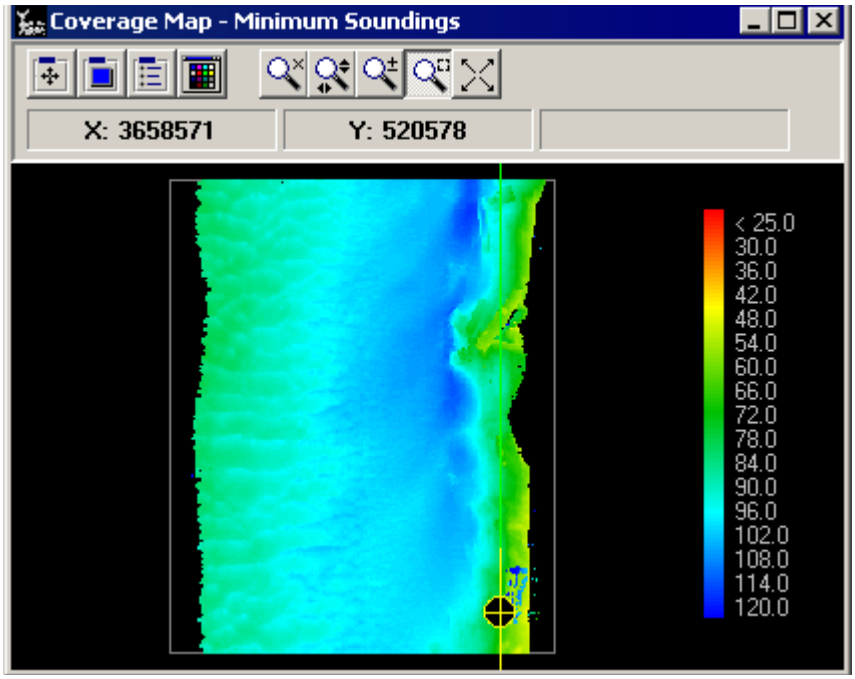
The Coverage Map views the survey area from above. It has a number of features and options.

- **Multibeam, side scan and laser topographic coverage** as scan lines.
- **Color-coded matrix display** showing depths according to the options set in the matrix view options.

NOTE: This requires a HYSWEEP® type matrix.

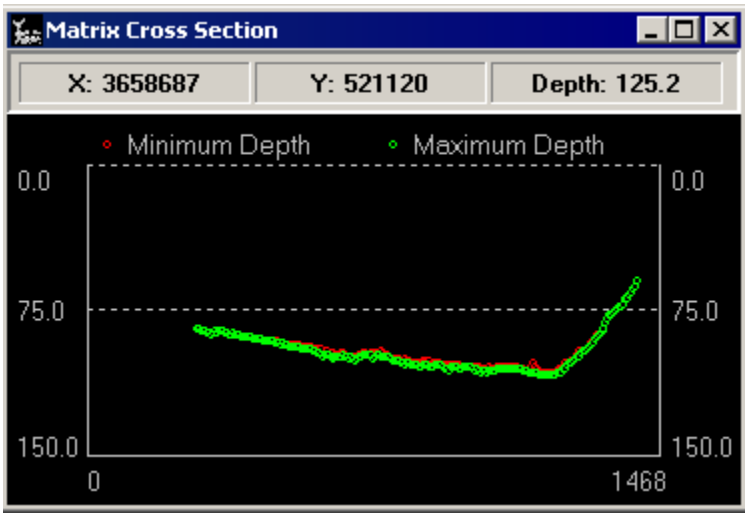
- **Planned survey line display**.
- **A toolbar** for cutting cross sections, panning and zooming.
- **Distance and color scale bars**.
- **Boat tracking**
- **Current sweeps** colored differently to distinguish them from previous sweeps and assist navigation.
- **To target contacts** double-click the object of interest.
- **To measure object size** drag the cursor from point to point.
- **Toggle scrolling on/off with F11**. This is useful to freeze the frame in case something interesting shows up.
- **Cursor position display:** Moving the cursor across the window displays grid position and depth.

Coverage Map



To cut a cross-section through the sounding matrix, click the cross-section tool and drag the section line across the matrix. The cross section is displayed in a separate window.

Matrix Cross Section



To access the Coverage Map, select VIEW-COVERAGE MAP from the main menu. Display settings are in the Coverage Map tab of the View Options dialog, and through the Matrix Options dialog (Show Coverage).

DISPLAY SETTINGS IN HYSWEEP® SURVEY

The view options determine what data appears in the display windows and how the windows should be configured to optimize the display. They *do not affect data logging*.

- In the **Device Selections dialog,** choose the source for each type of data displayed.

  To access the Device Selections dialog, select VIEW-DEVICE SELECTIONS.

- The settings in the **View Options** dialog determine how the data should be displayed. Each of the windows is configurable to a certain extent. Range settings are adapted to expected bottom depths, display styles are selected to the operators personal preference and need.

  To access View Options:

  > Select VIEW-OPTIONS from the shell menu.

  > Press the F9 key.

NOTE: The side scan windows have separate display options accessed from an icon in their windows.

CORRECTIONS IN HYSWEEP® SURVEY

TIDE CORRECTIONS IN HYSWEEP® SURVEY

HYSWEEP® SURVEY gets real-time tide corrections from HYPACK® SURVEY. This is done automatically through the shared memory mechanism.

(See Tide Corrections in SURVEY on page 3-10)

DYNAMIC DRAFT CORRECTIONS IN HYSWEEP® SURVEY

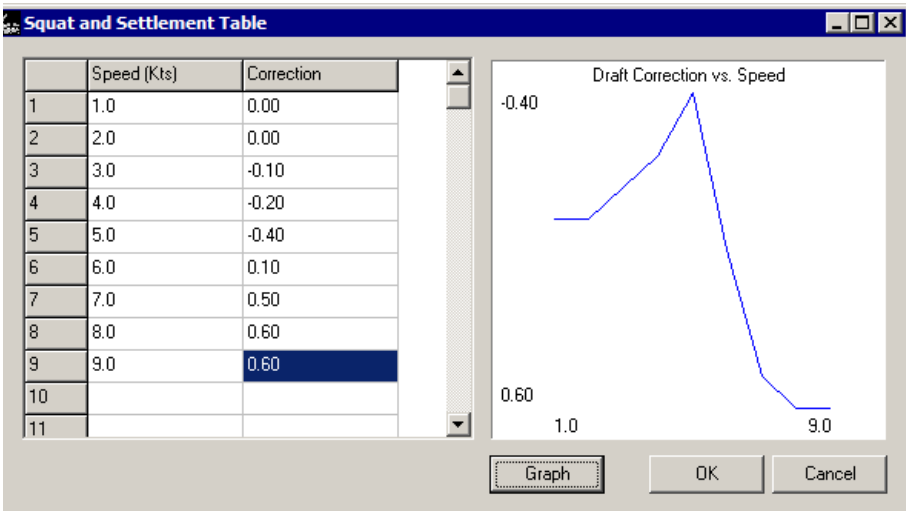
HYSWEEP® SURVEY has two methods for application of dynamic draft correction. HYSWEEP® SURVEY can do either of the following:

- **Take dynamic draft corrections from SURVEY** (whether you enter them manually or use the draft table). This is the default setting.

- **Use the Squat and Settlement Table** available in HYSWEEP® SURVEY.

To enter a squat & settlement table, select CORRECTIONS-SQUAT AND SETTLEMENT and enter the draft correction values (in survey units) versus speed (in knots). When a table is entered, HYSWEEP® SURVEY calculates the dynamic draft correction from boat speed (from GPS via HYSWEEP® SURVEY) and the table.

Squat and Settlement Corrections Table



NOTE: If you are using RTK tides with HYPACK®, you do not need to enter any draft corrections. The GPS.dll subtracts the dynamic draft correction to compute the "true" tide correction. Without a draft correction, the driver will still calculate a correct chart sounding, but the RTK Tide value will be different from the conventional tide value.

SOUND VELOCITY CORRECTIONS IN HYSWEEP® SURVEY

The survey programs use the correction data to provide real-time correction depths, and record the corrections into headers of the raw files for use in post-processing. In HYSWEEP® SURVEY, you can also mark a target to mark the cast location.

NOTE: If there is a pre-existing Sound Velocity Profile when you enter HYSWEEP® SURVEY, the multibeam alarm shows yellow. It's a good idea to verify it is accurate before you

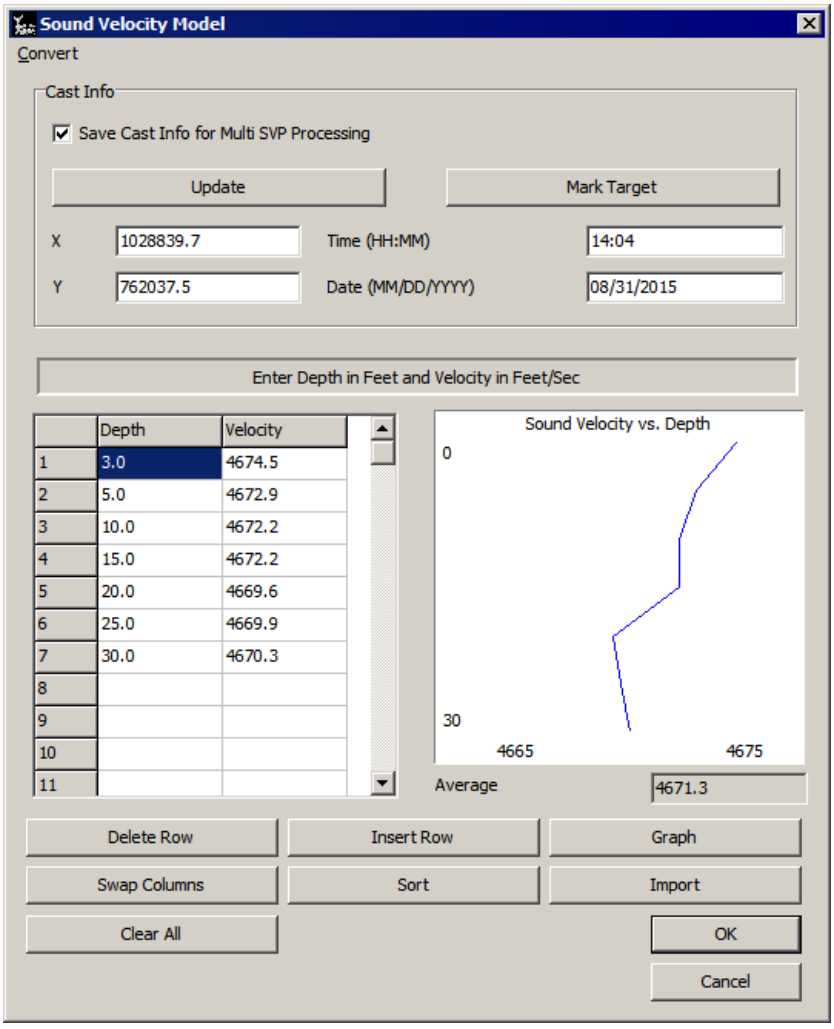
begin to collect data. The alarm will turn off when you click [OK] in the sound velocity model.

HYSWEEP® SURVEY uses the average sound velocity calculated from the model for display calculations instead of the more time-consuming ray path calculations used in post-processing.

Enter the depth and sound velocity values (in survey units & survey units/sec) into the spreadsheet in increasing depth order. Manually type the data or import the file generated by your sound velocity probe. You can use [Graph] to check for errors when you're done.

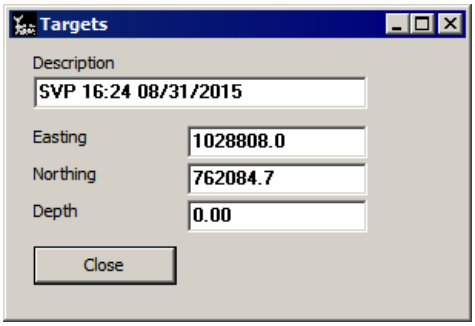
NOTE: If the units of your sound velocity cast differ from your survey units, use the Convert menu options to automatically convert the values in one or both columns.

Sound Velocity Model



1. **Select CORRECTIONS-SOUND VELOCITY**. The Sound Velocity Model window appears.
2. **If you plan to interpolate between multiple sound velocity casts in post-processing, enter your cast information**:
   a. **Check the Save Cast Information option**.
   b. **Enter the position, date and time of the sound velocity cast.** Manually enter the data or use [Update] to automatically enter the current position, date and time.
   c. **Mark a target at your cast location.** (Optional.)
      i. **Click [Mark Target].** The Target dialog appears with the target name, X, Y and Z. The target name defaults to SVP *Time Date.*

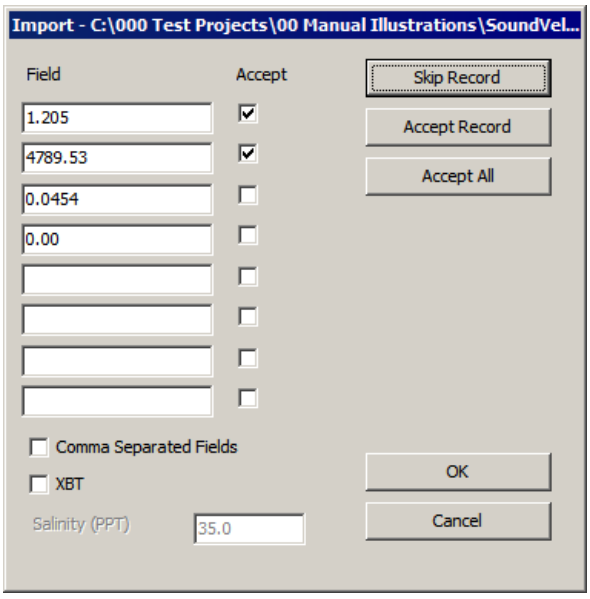
Targets Dialog



ii. **Modify the information as required and click [Close]**.

3. **Enter the cast data.** Manually enter the depth/velocity pairs or import the file from your sound velocity profiler as follows:
   a. **Click [Import].** A File Selection dialog will appear for you to select your text file. The Import dialog then displays the values from the first line in your text.
   b. **If the values in your profiler data are separated by commas, check Comma Separated Data.**
   c. **If your profiler data is an XBT file, check XBT.**
   d. **If the first record does not contain correction values, click [Skip Record]** to advance the program one line in your imported file. Continue to skip records until you find a depth/correction pair.

Sample Import Dialog



e. **Check the Accept box next to the two fields that represent the depth and sound velocity correction values.** This tells the program which two values to read from the displayed record.

f. **Accept the data for your Sound Velocity Corrections.**

- **If your depth and correction values are always in the same position, as suggested, click [Accept All]** and the program will extract the selected fields from each line in the file.
- **If the value position varies or if each line is not a record, click [Accept Record].** The program will copy only the displayed values to your Sound Velocity Corrections file, then display the values from the next line of the text file. This allows you to step through your text file, one line at a time, changing the position designations (select new checkboxes) before accepting each record or skipping lines all together ([Skip Record]). Continue through your file until you have all of the values in your corrections file that you need.

4. **Click [OK].**

> **If you have selected the Save Cast Information option**, a Save As dialog appears for you to store the sound velocity correction file: name your file and click [Save].

> **If you have *not* selected the Save Cast Information option**, the dialog closes.

HYSWEEP® SURVEY writes the data to the raw data files and displays corrected depths in the HYSWEEP® SURVEY displays.

NOTE: Corrected soundings are *for display only*. HYSWEEP® SURVEY logs all raw data directly to the HSX files without calculations or corrections.

PAINTING YOUR SURVEY AREA WITH AUTO-MATRIX

For multibeam surveys only, Auto-matrix is a method by which hydrographic or topographic matrix data is logged to a binary data file. When you close the SURVEY program, HYPACK® generates matrix files according to user-defined options, and the right dimensions to fit your survey data. This eliminates the need to size one or more matrix files over your survey area in the MATRIX EDITOR.

You may use Auto-matrix to log both hydrographic and topographic data simultaneously from HYSWEEP® SURVEY, but you must configure them separately and SURVEY generates separate matrix files for each data type.

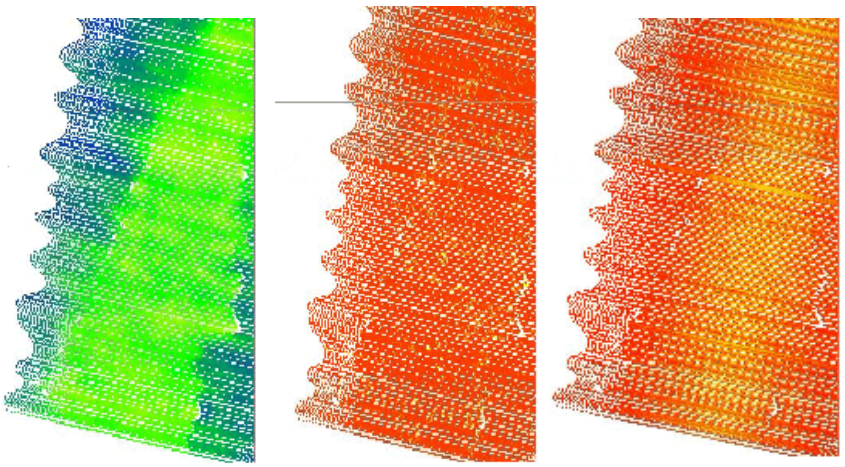
NOTE: The auto-matrix feature draws only in HYPACK® SURVEY.

AUTO-MATRIX IN HYPACK® SURVEY

When HYPACK® SURVEY starts to paint sounding data, a series of matrix blocks appears in the Map window. HYPACK® SURVEY starts with one or more matrix blocks according to your auto-matrix settings. As you move toward the edge of the current matrix block, the HYPACK® SURVEY program adds one or more blocks ahead of the vessel for continuous coverage display.

In the HYPACK® SURVEY Map windows, a matrix display drop-down—MB_MTX for hydrographic data, and Topo_MTX for topographic data—enables you to choose the data displayed: Minimum, Maximum or Average Depths, Standard Deviation or Sounding Count per Cell. All options are available for display *regardless of what you have chosen to log in the auto-matrix settings*.

Minimum, Maximum or Average Depth—Average Depth (left), Standard Deviation (center), Sounding Count (right)



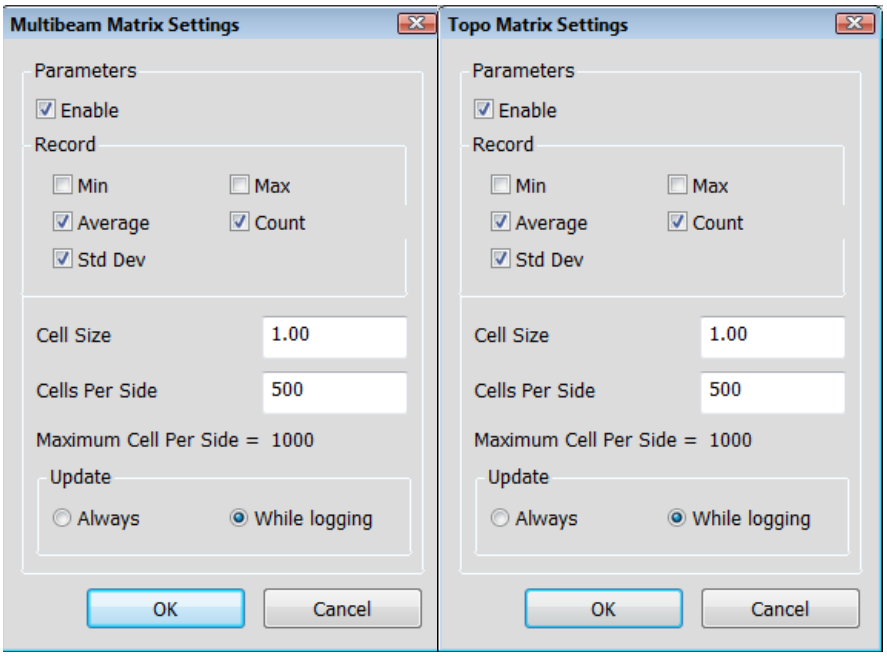
CONFIGURING THE AUTO-MATRIX

You may use Auto-matrix to log both hydrographic and topographic data simultaneously from HYSWEEP® SURVEY, but you must

configure them separately and SURVEY generates separate matrix files for each data type.

1. **Open the auto-matrix settings dialog for the type of data you want to log**.
   > **For hydrographic data**, select CHART-MULTIBEAM MATRIX.
   > **For topographic data**, select CHART-TOPO MATRIX.

Auto-matrix Configuration Dialogs— Hydrographic Data (left) and Topographic Data (right)



2. **Select the Enable option for that data type and configure the related options:**
   > **Choose one or more values you want to store for each cell** in the output HYPACK®-type matrix files.
   - **Minimum Depth**
   - **Maximum Depth**
   - **Average Depth**
   - **Standard Deviation**
   - **Sounding Count**

   > The **Cell Size** is the size (in survey units) for each matrix cell in the matrix block and when HYPACK® generates the matrix from the binary data.
   > **Cells Per Side** determines the size of each matrix block when multiplied by the Cell Size.

BEWARE! If you edit the Cell Size or Cell Per Side in a filled matrix file, you will lose its data. **To retain your matrix coverage**, exit HYPACK®

SURVEY to generate filled matrix files with your current data, *then* restart the survey programs, change your matrix options and resume logging.

> **Choose when to paint the matrix**—all of the time, or only when you are recording data.

3. **Click [OK].**

When you close HYPACK® SURVEY after logging data, for each matrix block the program generates a matrix file for each selected value. (For example: If you have 3 auto-matrix blocks, and you have selected Average and Standard Deviation Multibeam Auto-matrix options, the program generates 6 MTX files—3 with average values and 3 with standard deviation. If you have also configured the Topographic Auto-matrix options in the same way, the program generates 6 more MTX files using the topographic data.)

In addition, the matrix files with the same value type are grouped into a Matrix Catalog File (*.MLOG) to keep them organized and facilitate viewing.

BEWARE! If you delete an MLOG in the Project Items list, HYPACK® also deletes *all member matrix files*.

Matrix Log (.MLOG) in HYPACK®*