



HYPACK
a xylem brand

HYPACK® LIDAR PAYLOAD Unmanned Surveys

QUICKSTART MANUAL

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Introduction

The HYPACK® LIDAR PAYLOAD is a complete, portable topographic LiDAR surveying solution with HYPACK® for data collection and processing. Our end-to-end, HYPACK®/HYSWEEP® solution fulfills your LiDAR surveying needs from survey planning to data post-processing.

HYPACK LIDAR PAYLOAD



PHYSICAL INSTALLATIONS

The HYPACK® LIDAR PAYLOAD is designed to mount on air, land, and sea vehicles. The package comes with two brackets: one for mounting the payload on the under side of drones and one to attach the payload to the roof or deck of land or sea vehicles.

- **Drones:** The mounting frame is sized to work on any drone that is of industry standard size. The LIDAR PAYLOAD requires carrying capacity of at least 10 lbs. (4.5 Kg).
- **Unmanned Surface Vessels (USVs):** The HYPACK® LIDAR PAYLOAD devices are packaged in an enclosure designed to withstand the conditions of **any** survey environment. Send the LIDAR PAYLOAD out on a USV mission to survey locations inaccessible to larger vessels.

- **Manned Boats and Land Vehicles:** The HYPACK® LIDAR PAYLOAD is equally adaptable to manned vehicles. An optional VNC connection from your laptop to the payload provides all of the real-time surveying features of a HYSWEEP® SURVEY as you collect your LIDAR data.

ACCESSING THE PAYLOAD COMPUTER

The survey computer is sealed inside the LIDAR PAYLOAD unit. You must interface with it to perform your survey work and update your license information. USB and Ethernet ports on the rear panel provide such access.

LiDAR Payload Access Panel



There are two common interfacing methods:

- **Connect a laptop via the ethernet connection.** This option is likely the most practical for unmanned surveys. It requires a VNC program to do so. (There are free programs available on the Internet.) Use the following IP Addresses to configure the connection:
 - > **Payload Computer:** 192.168.137.8
 - > **External Computer:** 192.168.137.1

NOTE: The ethernet connection is only for interfacing with HYPACK® in the payload enclosure.



- **USB peripherals.** Use the USB-to-HDMI hub to expand the number of ports and connect a monitor, keyboard, and mouse. This is an opportunity for a full-size keyboard and expanded screen space to view post-processing windows. In manned



surveys, a larger monitor may be useful to view the real-time survey displays.

HYPACK LICENSING



The LIDAR PAYLOAD includes a HYPACK® SURVEY/ HYSWEEP® license.

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:** If this option is checked, the dongle will not be recognized and *HYPACK® will not run on leased keys after the expiration date.*

[Rescan] repeats the test.

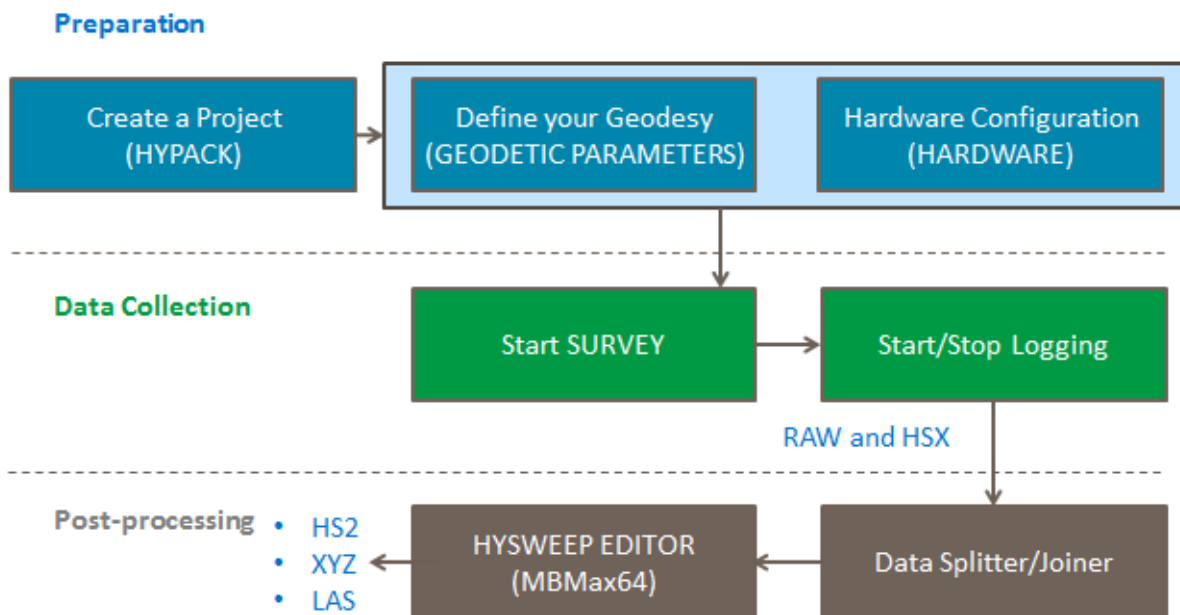
WORK FLOW

The following flowchart shows the general work flow in a LIDAR PAYLOAD project. The blue items are part of the preparation phase; you can do them all ahead of time in the office. The green items are in the HYPACK® SURVEY program. The gray items are post-processing modules.

Tip:

Click on any step in the flowchart to jump to the corresponding information in this manual.

LIDAR PAYLOAD Unmanned 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 by using the FILE-NEW command or copy an existing project using the FILE-COPY menu command.
 - > **When you create a new project**, it inherits the last settings for geodesy and hardware.
 - > **When you copy a project**, it copies everything from the previous project, with the exception of the data files.
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.** The LIDAR PAYLOAD system comes with preconfigured and calibrated hardware. A template project includes the standard hardware configuration that you can copy to your new project. Confirm that all systems are communicating correctly.
4. **Create planned lines as needed.** (Optional)
 - > In manned surveys, they can be useful for automatic logging features. They are not required.
 - > In unmanned surveys, navigation is typically controlled in the UAV or USV. HYPACK® logs the survey data.

HYPACK INTERFACE

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

[*HYPACK® User Interface*](#)

Title Bar
Menu Bar
Toolbar

Panels:

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



Status Bar

Color Bar

Area Map

Map View Tools

NOTE: 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).

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.

Tip:

Use the Options menu to quickly disable the data files, the project files, or all files in the Project Items list.

- > **Red X:** File is not available at the designated location.

NOTE: The red X is visible only when OPTIONS-FOLDER ICONS is selected. Otherwise, the file appears in the Project Items list without a checkbox.

To remove these files from your project list, select OPTIONS-REMOVE MISSING FILES from the Project Items menu.

- > **Remove files:** Select one or more files or folders in the File Items list then right-click and select REMOVE FILE or REMOVE FOLDER FILES respectively. The process unloads them from your project, but does not remove them from your hard drive.
- > **Delete files:** Select one or more files in the File Items list then right-click and select DELETE FILE. The unloads them from your project and moves them to the Windows® Recycle Bin.

NOTE: If you delete a catalog (*.LOG) file, HYPACK® unloads the LOG from the project, but it sends only the LOG file, *not the member files*, to the Recycle Bin.

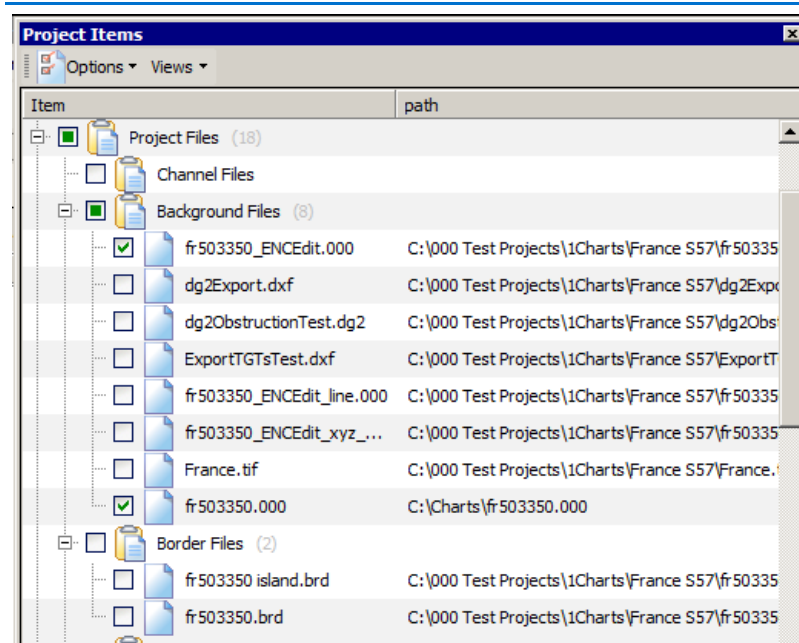
- **Rename files** via a right-click menu. HYPACK® does not allow you to rename S57, S63, ARCS or VPF charts.

- **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®.

- **Open any ASCII file in NotePad:** Right-click and select 'Open in Notepad'.
- **Open Windows® Explorer to the folder in which any file in your project is stored:** Right-click and select 'Open in Explorer'. Alternatively, open the project folder by selecting FILE-WINDOWS EXPLORER.

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

Project Items

HYPACKTOOL 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

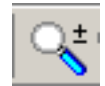


To turn the toolbar display on/off, right-click in the toolbar area and select/deselect 'HYPACK® toolbar'.

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

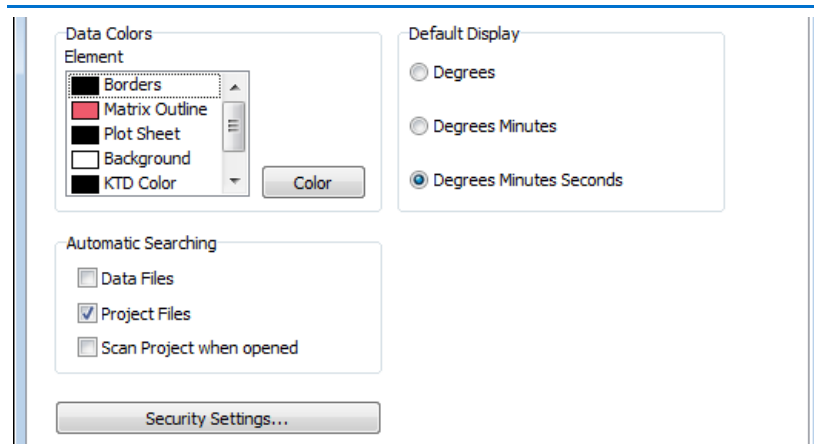
Select SETTINGS-SETTINGS (F9) to control the presentation in the area map.

[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.

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.

GENERAL DISPLAY SETTINGS

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.

**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

Settings

General Soundings Seabed ID Tracklines Charts Targets Grid Planned Lines

Orientation: Fixed Angle Angle: 0

Style: Pixel Size: 3

Color: Color by Depth Color Table

Resolution: 1 Decimal

Rounding: Truncate to Tenth Nearest Tenth < 40 Nearest Half < 100 Test Rounding...

Plot: Depth 1

Options

☐ Negative Soundings get +

☐ Hide Soundings Above 15.00

☐ Hide Soundings Below 15.00

Depth 1 Text: Depth 1

Depth 2 Text: Depth 2

☐ Hide above CHN Design Depth plus this value 3.00

Draw Mode

☒ Fonts Font... ☐ Prevent Sounding Overwrite:

☐ Vector

Vector Size: 2.00 mm

Vector Scale 1: 250 ft/in

☒ Set as Default OK Apply Cancel Help

The following options are relevant to LIDARdata:

Style: Select Pixel and define the size of each sounding.

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

When you select the Color by Depth option, click **[Color Table]** to assign and configure the color palette in the COLOR EDITOR from within the Control Panel. This also affects the palette displayed in the Color Bar.

- **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.

More Information:

- [Sounding Color Settings in LIDAR PAYLOAD](#) on page 1-13

SOUNDING COLOR SETTINGS IN LIDAR PAYLOAD

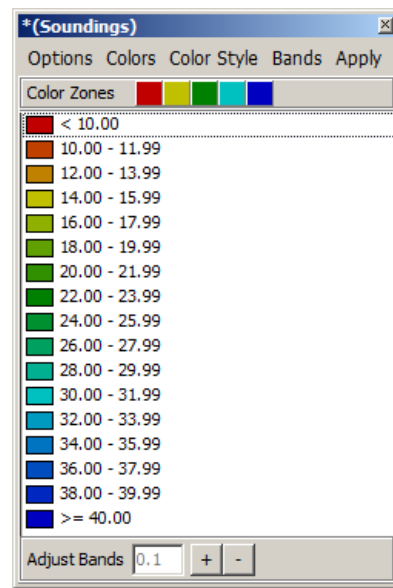
The **Color Editor** enables you to specify your project colors the HYPACK® programs use to code your data. Most often, you color-code your displays by sounding depths, but the project colors may also represent other values. Your project color settings are reflected in the color bar, which can be displayed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

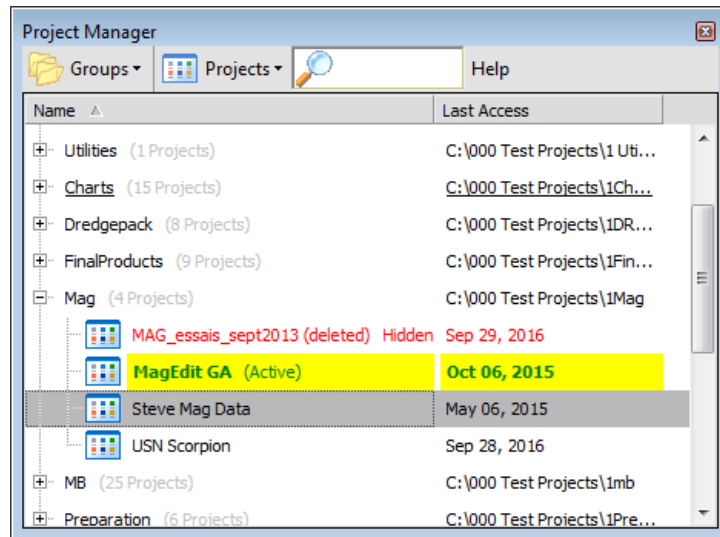
PROJECTS IN HYPACK®

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.

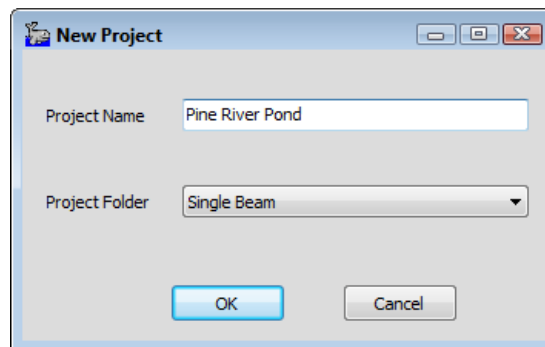
The **project file group** is a folder that stores one or more HYPACK® projects. HYPACK® stores projects, by default, to the HYPACK 2019\Projects folder. Projects stored there are known as **local projects**.

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 2019).

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.

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.

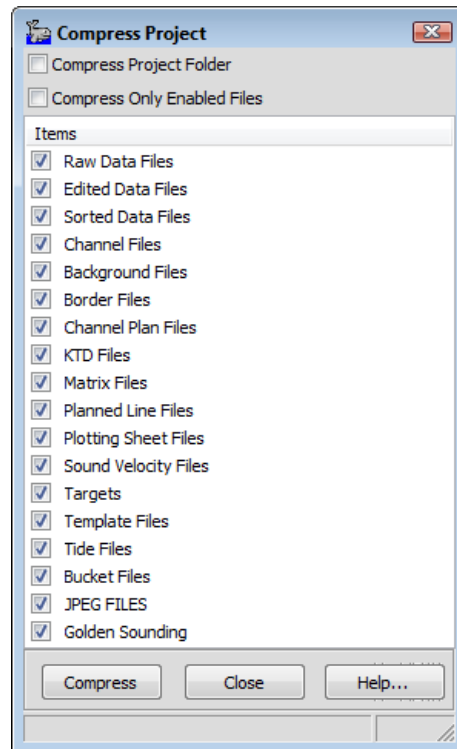
EXPORTING YOUR PROJECT FROM THE PAYLOAD COMPUTER

At some point after your survey, before or after the post-processing phase, you need to transfer your project from the LIDAR PAYLOAD for backup purposes. Use COMPRESS PROJECT to prepare your files for transfer, then copy or move the resulting ZIP file to an external USB storage device.

The HYPACK® COMPRESS PROJECT program compresses selected files to a ZIP file. The program stores the output file, by default to the project folder.

1. **Start the COMPRESS PROJECT program** by selecting FILE-COMPRESS PROJECT. The COMPRESS PROJECT window appears.

The COMPRESS PROJECT Window



2. **Select your files you want to include.**
 - > **Check the boxes** corresponding to the listed item types.
 - > **Compress Only Enabled Files:** Omits files that are disabled in the project from the archive. It includes project items that are stored outside of the project folder.
 - > **Compress Project Folder:** Ignores the selections in the Items list and includes everything in the project folder. It excludes files stored outside of the project folder.
3. **Click [Compress] and name the compressed file.** The data is compressed and saved to a ZIP file.

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.
- The projection parameters: Automatic when you choose one of the pre-defined grids.

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.
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. **Set your RTK (Real-Time Kinematic) 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.)

Tip:

In LIDAR PAYLOAD projects, the survey range is small enough that you can usually assume a constant separation between the Chart Datum and the Reference Ellipsoid, eliminating the need for a KTD file.

Configuring your Geodesy for RTK Tide Corrections

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

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

LIDAR PAYLOAD HARDWARE SETUP IN HYPACK®

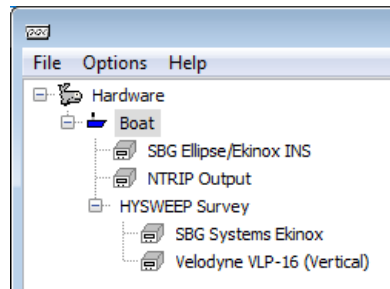


'Hardware' is the term we use for the sensor devices from which HYPACK® receives data. The hardware configuration describes what devices you have, how they are connected to the survey computer, and your logging instructions.



The HARDWARE configuration (PREPARATION-HARDWARE SETUP) delivered **with your** includes a VLP 16 Puck Lite LiDAR sensor and an SBG Ellipse 2D INS/GNSS system.

LIDAR PAYLOAD HARDWARE Configuration (as delivered)



Each node in the tree has some settings associated with it. When you select each node, one or more tabs appear on the right where you enter your configuration information.



SBG



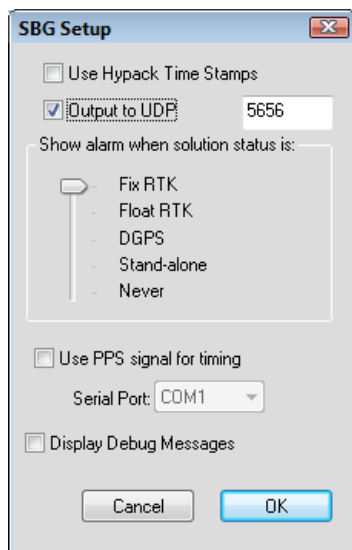
The SBG unit is the source for position and motion information to HYPACK. The SBG unit does not provide any information to the craft for navigation or flight stability. The SBG is configured on the Boat node and on the HYSWEEP® SURVEY node.

HYPACK SBG.DLL

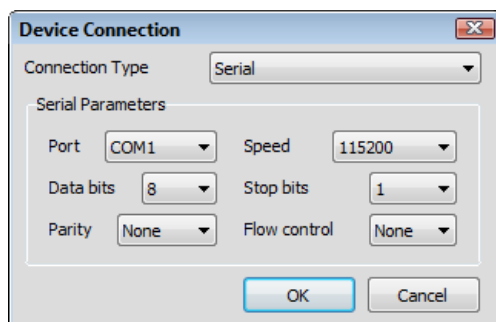
Functions

Functions	Options
☐ Record raw message	☒ Record raw data
☒ Position	☒ Record quality data
☐ Depth	☐ Use for matrix update
☒ Heading	
☐ Speed	
☐ Tide	
☐ Heave	
☒ Record device specific messages	

Driver Setup



Connections

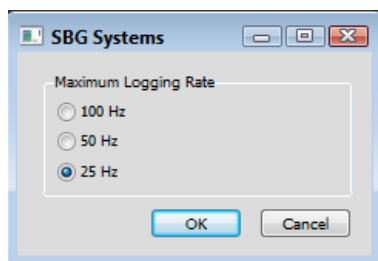


SBG Offsets



HYSWEEP® SBG

Driver Setup



Connections

The screenshot shows the 'Connections' dialog box with the 'Offsets' tab selected. The 'Manufacturer / Model' tab is also visible. The 'Connect' tab is active, showing the following settings:

- ☒ Enabled
- ☒ Ignore Checksum
- Timeout Interval: 15.0 Sec
- ☒ Record raw message
- Network Connection:
 - Port: 5656
 - Internet Address: 127.0.0.1

Offsets match the HYPACK SBG.dll.

NTRIP.DLL

NTRIP (Network Transport of RTCM via Internet Protocol) enables you to receive your RTK corrections on your survey computer over an Internet connection. The stream server (or caster) receives the corrections from GPS stations and sends them to your survey computer HYPACK®.

IMPORTANT:

You must configure your SBG Port E to accept the corrections through the port defined under 'Connections' for the NTRIP.dll. To assure proper communication, be sure the baud rate of the NTRIP driver matches with the baud rate set in the SBG driver.

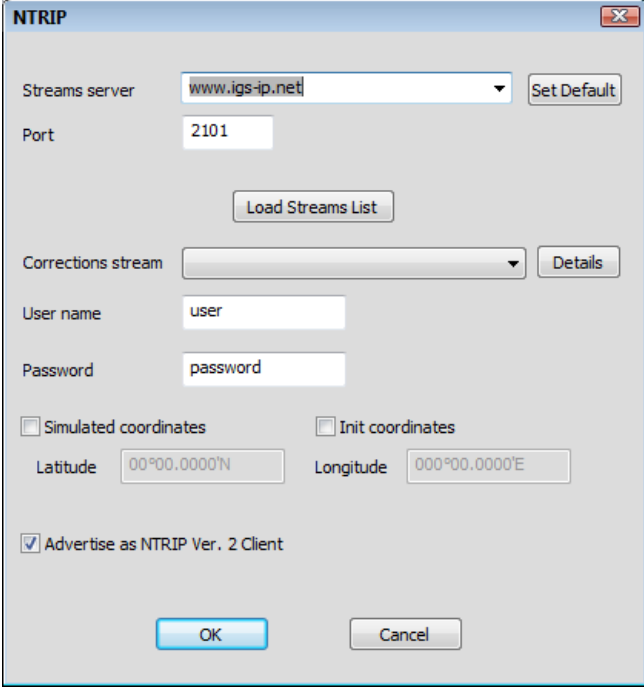
NOTE: If Internet access is unavailable, you can do vertical positioning corrections in post-processing using SBG Qinertia data. This service is licensed separately through SBG systems. In this case, you can omit the NTRIP driver from your configuration.

Functions

The screenshot shows the 'Functions' dialog box with the 'Functions' tab selected. The 'Options' tab is also visible. The 'Functions' tab shows the following settings:

- ☒ Generate output messages

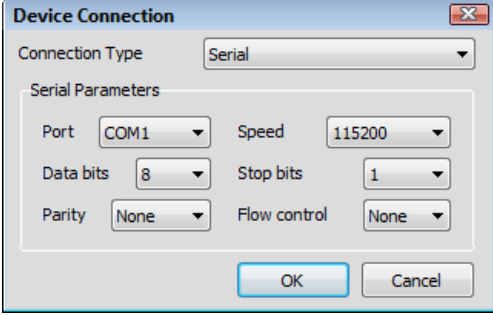
Driver Setup



The NTRIP configuration dialog box contains the following fields and controls:

- Streams server:** A dropdown menu with "www.igs-ip.net" selected. A "Set Default" button is to its right.
- Port:** A text field containing "2101".
- Load Streams List:** A button located below the Port field.
- Corrections stream:** A dropdown menu. A "Details" button is to its right.
- User name:** A text field containing "user".
- Password:** A text field containing "password".
- Simulated coordinates:** An unchecked checkbox.
- Init coordinates:** An unchecked checkbox.
- Latitude:** A text field containing "00°00.0000'N".
- Longitude:** A text field containing "000°00.0000'E".
- Advertise as NTRIP Ver. 2 Client:** A checked checkbox.
- Buttons:** "OK" and "Cancel" buttons at the bottom.

Connections



The Device Connection configuration dialog box contains the following fields and controls:

- Connection Type:** A dropdown menu with "Serial" selected.
- Serial Parameters:** A group box containing:
 - Port:** A dropdown menu with "COM1" selected.
 - Speed:** A dropdown menu with "115200" selected.
 - Data bits:** A dropdown menu with "8" selected.
 - Stop bits:** A dropdown menu with "1" selected.
 - Parity:** A dropdown menu with "None" selected.
 - Flow control:** A dropdown menu with "None" selected.
- Buttons:** "OK" and "Cancel" buttons at the bottom.

Offsets are all 0.

VELODYNE VLP 16

The Velodyne VLP-16 LiDAR unit is a high-density laser device. The driver is a passive UDP network driver that reads XYZ lidar points from the data stream. It is configured on the HYSWEEP SURVEY node in the HARDWARE configuration.

There is no driver setup and offsets are all 0.

Connections

The screenshot shows the 'Connections' dialog box in HYPACK, specifically the 'Offsets' tab. The dialog has three tabs: 'Manufacturer / Model', 'Connect', and 'Offsets'. The 'Offsets' tab is active. It contains the following settings:

- ☒ Enabled
- ☐ Ignore Checksum
- Timeout Interval: 15.0 Sec
- ☐ Record raw message
- Network Connection section:
 - Port: 2368
 - Internet Address: 127.0.0.1

In addition to the sensors, your hardware configuration includes a tracking point—the position used by SURVEY to position the mobile in the world. On the LIDAR PAYLOAD, the tracking point is at the vessel origin—the center of the LIDARhead. All of the tracking point functions (target position, cross track error, DBL, DTG, etc.) should be relative to the LIDARhead.

Survey

The survey programs log the survey data. The Smart Launch Survey icon launches the data collection programs based on your hardware configuration.



In the LIDAR PAYLOAD system, the HYPACK® and HYSWEEP® SURVEY programs run simultaneously; HYPACK® provides inertial positioning and HYSWEEP® provides the LIDAR collection.

In unmanned surveys, mission planning and navigation are controlled by the survey vessel. The LIDAR PAYLOAD logs the data to its survey computer. Once you have completed the preparation phase, just start up your systems, launch the survey programs, confirm data streaming, and start logging. *You cannot monitor the HYPACK® displays during data collection.*

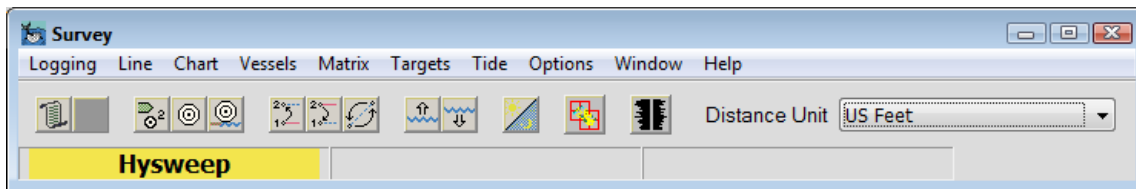
In manned surveys, the displays provide information to monitor survey data collection. Customize the real-time displays to suit your needs and preferences, then use the easy keyboard commands or toolbar icons to control data collection.

SURVEY PROGRAM INTERFACES

HYPACK® SURVEY

Each Survey program includes a primary “shell” window, and a collection of display windows.

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 other project files that are currently enabled.

HYPACK® SURVEY Shell

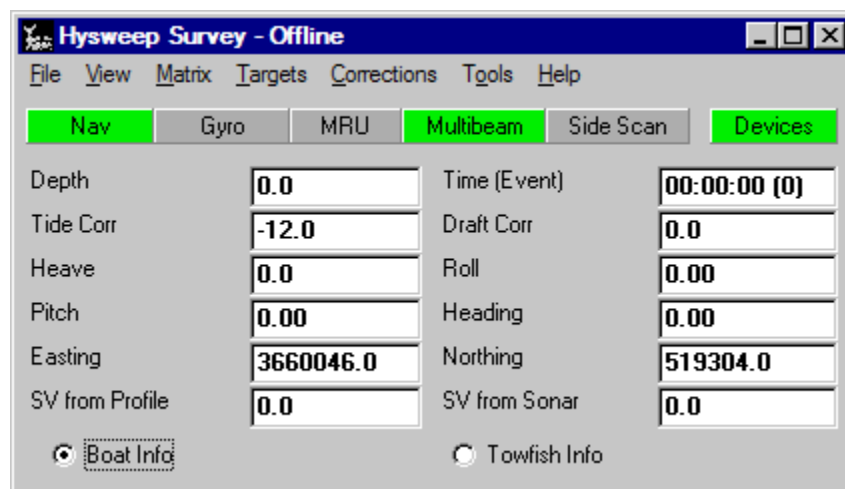
HYPACK® SURVEY functions can be executed through the menus in the shell, the (optional) toolbar, or through keyboard shortcuts.

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.

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

WINDOWS IN SURVEY AND HYSWEEP SURVEY

The HYPACK® and HYSWEEP® SURVEY displays are comprised of the main window (the "shell") with a menu bar, toolbars and alarm indicators, as well as your choice of several independently-displayed and configured windows: The following sections discuss

those most useful for LIDAR PAYLOAD projects. Please refer to the full HYPACK® User Manual or Help for information on additional displays.

ALARMS

HYPACK® SURVEY

Alarm indicators are located along the bottom of the SURVEY shell. They are used to alert 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 also changes the alarm boxes to yellow until the reason for the alarm has been corrected.

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.

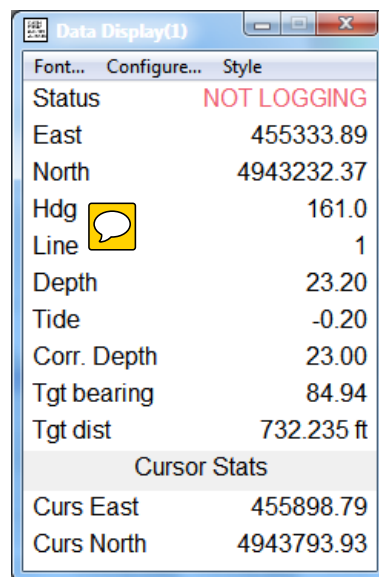
IMPORTANT:

Before you attempt to log data, check the alarms to be sure successful data reception in SURVEY.

DATA DISPLAY IN HYPACK® SURVEY

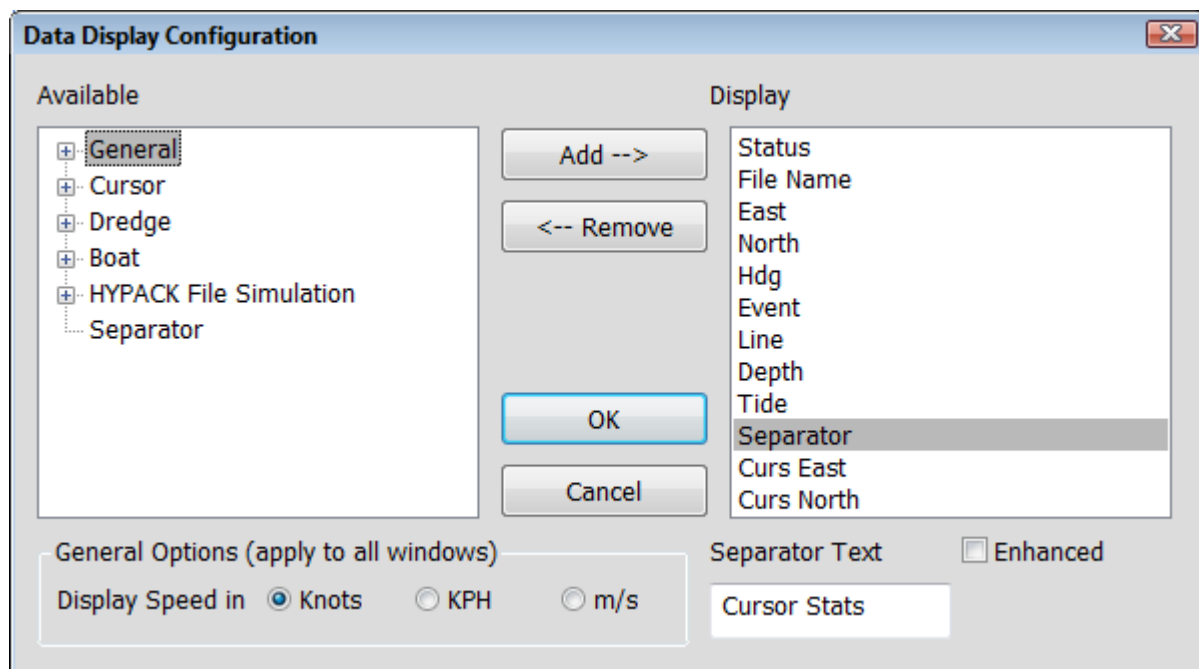
In unmanned LIDAR PAYLOAD surveys, you can check the data values and verify logging has begun before you send your survey vehicle out on collection.

The Data Display window shows textual information about the survey.

The Data Display Window

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.

1. **Select CONFIGURE on the menu bar** and the Data Display Configuration window appears.

Configuring the Display

2. **Select the items to be displayed.**

There are two lists: 'Available' and 'Display'. The items in the 'Display' list appear in the Data Display.

To move any item from one list to the other, do either of the following:

- > Double-click on the item
- > Select the item in the list, then click [Add=>] or [=<Remove].

Items appear in the Data Display in the order they have been added to the Display list. To re-configure the entire order, just drag the items up or down the Display list.

RAW DATA FILES

The LIDAR PAYLOAD logs two types of raw data: RAW for positioning and HSX format files for motion corrections and the LIDAR data.

RAW FORMAT

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 2019\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.

HSX FORMAT

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.

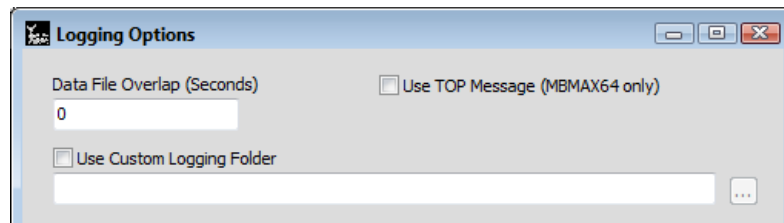
HYPACK® programs use the data from the RAW files to position the data in the corresponding multibeam HSX files.

TOP FORMAT

TOP records are high-resolution topographic LiDAR records. They provide a 10,000 beam/ping limit; the laser data is not downsized. TOP records have millimeter resolution. Additionally, TOP records include the Velodyne quality data, which enables you to filter or color the display based on quality, and generate BAG (Bathymetric Attribute Grid) files.

In the LIDAR PAYLOAD HYSWEEP® SURVEY configuration, the **Use TOP Message** option in the Logging Options dialog (FILE-LOGGING OPTIONS) is selected.

FIGURE 1. Logging Options Dialog



In addition, for Velodyne systems, HYPACK® SURVEY provides filters (TOOLS-VELODYNE VLP-16 CONTROL) to limit the range of logged data:

FIGURE 2. Velodyne VLP16 Controls



The screenshot shows the 'Velodyne Control' window. It has three main sections: 'Filters', 'Enabled Beams', and control buttons. In the 'Filters' section, the 'Range' box has 'Min' at 0.0 and 'Max' checked at 377.3. The 'Angle' box has 'Min' at 30 and 'Max' at 330. The 'Enabled Beams' section has a list of 16 beams, each with a checkbox and an angle range. Beams 0 through 7 are on the left, and beams 8 through 15 are on the right. All checkboxes are currently unchecked. At the bottom are 'Apply' and 'Close' buttons. Above the beam list are 'Check All' and 'Check None' buttons.

Enabled Beams	
☐ 0, -15°	☐ 8, -7°
☐ 1, 1°	☐ 9, 9°
☐ 2, -13°	☐ 10, -5°
☐ 3, 3°	☐ 11, 11°
☐ 4, -11°	☐ 12, -3°
☐ 5, 5°	☐ 13, 13°
☐ 6, -9°	☐ 14, -1°
☐ 7, 7°	☐ 15, 15°

Range (survey units) omits data outside the defined distances from the device.

Angle omits data outside of the defined range. If you define only Minimum angle, the program assumes the maximum to be 360. If you define only a Maximum angle, the program assumes the minimum to be zero.

Enabled Beams limits the beams from which you log data. (Beams 17 - 32 apply only to 32-beam devices.)

LOGGING DATA IN UNMANNED SURVEYS

- IMPORTANT:** When you turn on the LIDAR PAYLOAD system, check the SURVEY alarms to confirm data is streaming before you start logging.
- **When you are ready to collect data**, select LOGGING-START LOGGING (Ctrl+S). When you begin logging data, the SURVEY program opens a data file and begins to record data. The status in the Data Display window changes to Logging. This is your indication that the SURVEY program is logging data.
 - **When logging is complete**, stop logging. Select LOGGING-STOP LOGGING (Ctrl + E). The Data Display window changes

to 'Not Logging'. The SURVEY program closes and saves the data files in the project \Raw folder.

LiDAR Payload Processing

The following sections briefly describe the processes used in post-processing data from the LIDAR PAYLOAD system. Please refer to the corresponding sections of the HYPACK® User Manual or Help files for detailed explanations and procedures.

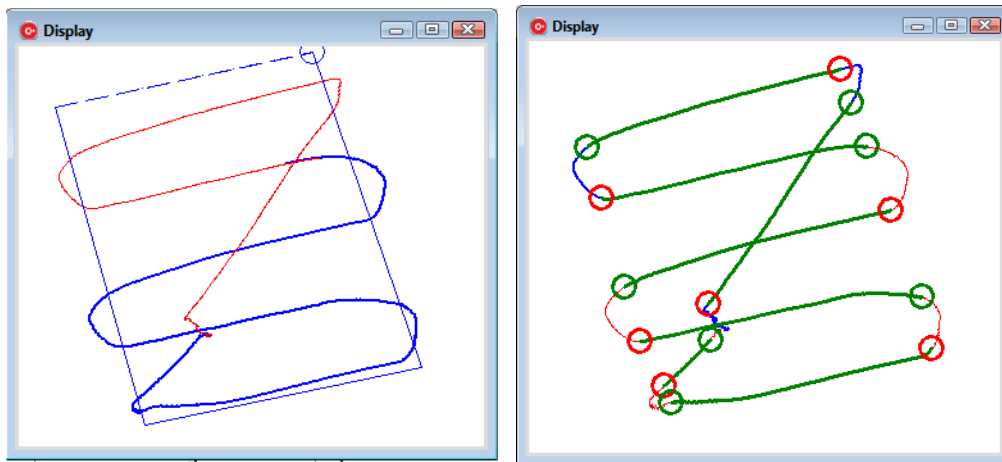
DATA SPLITTER/JOINER

Though an unmanned mobile may travel in parallel lines, it may log data in one continuous file, or a series of files generated based on time rather than survey line position.

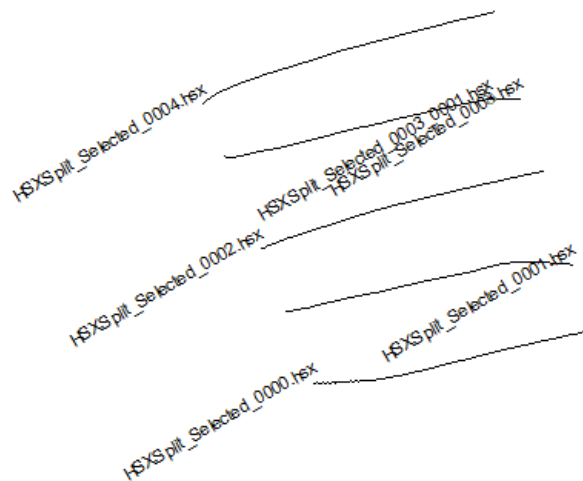
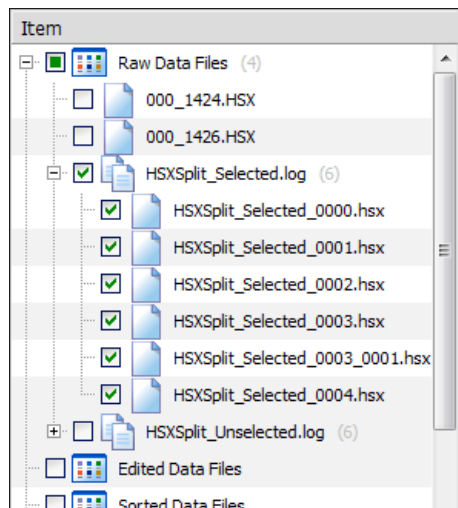
The DATA SPLITTER-JOINER is designed for you to define the segments of your RAW or HSX data that are useful for your survey and generate a new line set from the chosen segments. (You can, optionally, generate a separate line set with the *unselected* data.)

Where two input lines meet, the program automatically merges data where overlapping or small gaps occur.

In the following example, we used the DATA SPLITTER-JOINER to trim the turn segments beyond the survey lines and remove the diagonal segments.

Initial Clipping—Drawing the Polygon (left), Result Preview (right)

Resulting HSX Files—Line “0003” has two segments because each of the original files occupied part of the defined output line.



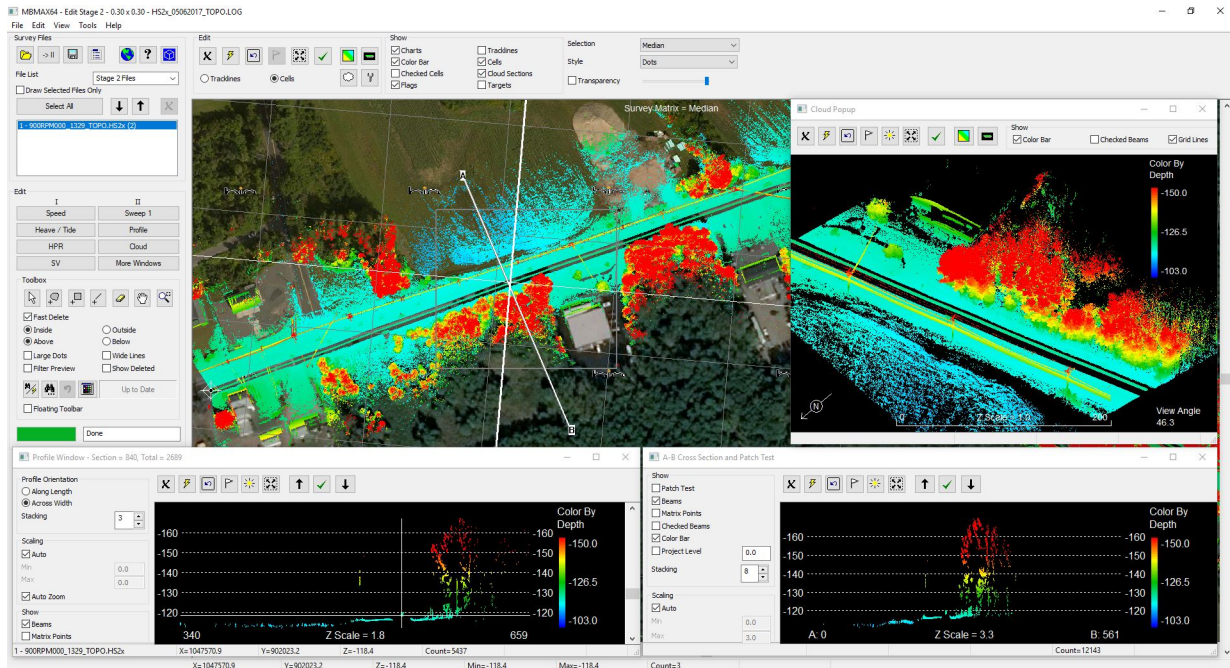
64-BIT HYSWEEP EDITOR

The 64-bit HYSWEEP® EDITOR reads the topographic laser data, and applies corrections to find corrected . The 64-bit HYSWEEP® EDITOR displays all measurements graphically and provides a number of editing methods.

In the topographic surveys of the LIDAR PAYLOAD, you must use the 64-bit HYSWEEP® EDITOR to apply corrections to the sounding data, but the CLOUD program is a simpler editing tool for point cloud data.

NOTE: If you have not logged RTK corrections during data collection, you can import SBG Qinertia correction files in the 64-bit HYSWEEP® EDITOR.

LIDAR Data in the 64-bit HYSWEEP® EDITOR



CLOUD

CLOUD creates 3-dimensional displays of your survey data, representing each sounding with a pixel, color-coded according to your project's sounding colors and positioned in the model according to its XYZ coordinates.

In CLOUD, you can select and remove individual points or blocks of data and save the results in XYZ, matrix or a selection of third-party formats. If you load an HS2 file or HS2x, you may also save your edited results to HS2 or HS2x format respectively.

NOTE: HS2x format is supported only by the 64-bit program.



LIDAR Data in CLOUD

