BoxCar Pro 4.3
User's Guide

Onset Computer Corporation

BoxCar® Pro

For All 32 Bit Windows Platforms

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Thank you for purchasing Onset products. Our loggers and software are designed to be easy to use.

For a quick start, please refer to the *Launching a Logger* section in Chapter 1 on page 4. Consult the other sections of this manual or the online help for a more detailed description of software capabilities.

Contact Information

For support, please contact the company that you bought the products from: Onset Computer Corporation or an Onset Authorized Dealer.

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Chapter 1
BoxCar Pro Fundamentals

This chapter explains the primary functions of BoxCar® Pro including:

- Installing and running BoxCar Pro

- The BoxCar Pro main window

- Starting your logger

- Reading Data from your logger

Installing and Running BoxCar Pro

System Requirements

BoxCar Pro 4.3 requires Windows® XP Professional or Home Edition, Windows® 2000 Professional Edition, Windows® Me, or Windows® 98 and a computer with resources appropriate for your listed version of the Windows® operating system. The computer must have at least one free COM port for serial communications. Refer to the *Connecting to your PC* section on page 2 for more details about the COM port and possible usage of USB-to-serial converters.

Installation

To install BoxCar Pro:

1. Load the BoxCar Pro CD into the CD drive of your computer. The installation program should start automatically. If it does not, navigate to the CD drive from My Computer or Explorer and double-click the BoxCar Pro 4.3 setup.exe. If you are installing BoxCar Pro from a website, click the appropriate BoxCar Pro 4.3 link and follow the download instructions on the screen.

2. Once the BoxCar Pro installation program begins, follow the instructions on the screen. The setup program prompts you for an installation directory (C:\Program Files\Onset Computer Corporation\BoxCar Pro 4.3 is the default), and installs BoxCar Pro and other components into that directory. The setup program installs a shortcut for BoxCar Pro 4.3 on your desktop and in the Start menu (under Onset Applications if you accepted the default installation).

See the BCReadme file for additional notes on installation and the software.

Connecting to your PC

A PC-3.5 interface cable is required to connect all loggers to the PC except for the HOBO Water Temp Pro, which requires an IR Basestation instead (see below). The interface cable is designed to connect directly between the PC's 9-pin COM port (serial) and the data logger. The interface cable must be connected to a working serial port. Test it using the communications port tester (explained below) to be sure the serial cable and port work correctly. If you don't have an open COM port, an alternative may be to use a USB-to-serial converter, which allows you to expand the number of open ports available. For the latest recommendations on COM port expansion solutions, refer to the main Onset website at www.onsetcomp.com, or see www.hobohelp.com if you purchased the software through an Onset Authorized Dealer.

The HOBO Water Temp Pro requires an IR Basestation for optical communication instead of the interface cable. The IR Basestation requires a direct connection to a standard 9-pin serial port. A 25-pin serial port can be used, but requires a 25-pin to 9-pin adapter. The IR Basestation may not work if connected to currently available USB-to-serial converters. Also note that accessory IR ports on laptops and PCs are not compatible. We are continuing to test new devices; these exclusions may be removed in the future. Call your HOBO supplier for details.

To set the COM port for all loggers except the HOBO LCD Temp/RH and Water Temp Pro, select **Preferences** from the **Edit** menu in BoxCar Pro and change the Logger Serial Port setting. For the HOBO LCD Temp/RH and Water Temp Pro loggers, click the **Launch** menu, select the logger name, and select **Port** from that logger's submenu.

Note: If you are frequently switching the PC interface cable with an IR Basestation or a Palm interface cable (for use with HandCar software), consider purchasing a serial port extension cable or switch box, which moves the serial port closer to you. This way you don't need to reach behind the computer every time you need to switch the cable.

Start BoxCar Pro

Before starting BoxCar Pro, set your computer's clock to the correct time in the correct time zone because the logger uses your computer's clock to set its own internal clock. **Note:** The HOBO LCD Temp/RH and HOBO Water Temp Pro loggers also have an option to launch without using the computer's clock. Details about logger time for these two loggers and the HOBO Weather Station Loggers are explained in Chapter 3 on page 27.

To start BoxCar Pro, double-click the BoxCar Pro shortcut icon on the desktop, or click **Start**, **Programs**, **Onset Applications**, **BoxCar Pro** (if you changed the program group icon location during the installation, your path will be different). **Note:** It is not recommended that you start BoxCar Pro by double-

clicking the program executable. BoxCar Pro contains a built-in Windows installer feature that automatically searches and replaces any missing files. This feature is only enabled when you start BoxCar via the desktop icon or Start menu.

Testing the Communications Port

You need a paper clip to perform this test. To test the communications port and/or serial port:

1. From the **Help** menu, select **Test Port**.

2. Select the port you want to test and a baud rate, and follow the instructions on the dialog.

3. Watch the Status line for the progress of the test. Once you are finished, click **Cancel** or the close button (the x in the upper right corner).

BoxCar Pro Main Window

BoxCar Pro's main window consists of a menu bar, toolbar, and an application area containing a plot window and readout log. The following example shows the main window with two data series in the plot window and the readout log below the plot. Some BoxCar Pro window features are summarized below.
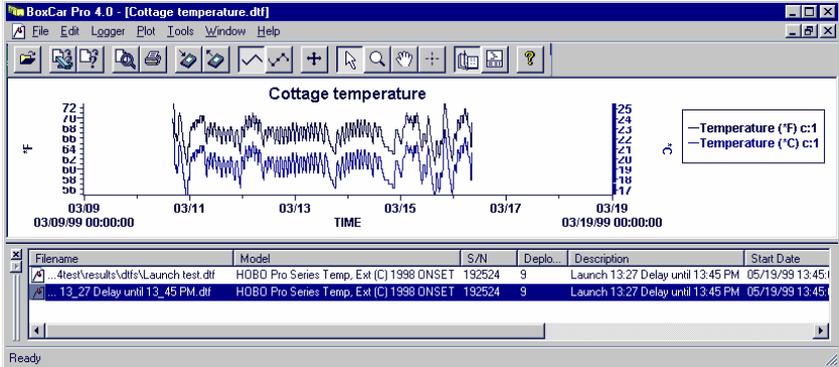
Menu Bar

The menu bar contains the following submenus: File, Edit, Logger, Plot, Tools, Window, and Help. The Plot and Tools menu are only available when a plot is open.

Toolbar

The toolbar (below the menu) contains shortcut icons for features such as opening a datafile, exporting and printing, launching and reading out, adjusting the view, and help. Place the mouse pointer over an icon to view its function.

Plot Window

Select **Open** from the **File** menu or read out data from a data logger to display one or more data series in the plot window. You can open more than one plot window, compare data, and drag and drop a data series from one window to another. See *Chapter 2: Plotting, Exporting, and Printing* on page 9 for an introduction to plotting.

Readout Log

At the bottom of the main window, the readout log displays the datafile names when you read out loggers. The readout log window can also be resized or hidden. See *Keeping Track of your Datafiles* on page 22 for more information.

Launching a Logger

For a quick demonstration of launching and collecting data with a logger, follow these instructions.

1. Connect the interface cable to an open COM port on the back of the computer. If you are using the HOBO Water Temp Pro, connect the IR Basestation to the COM port instead of the interface cable.

2. Connect the other end of the interface cable to the logger. Make sure the plug is firmly seated in the jack (twist the plug if it does not connect properly on the first try). If you are using the HOBO Water Temp Pro, point the communications window of the logger at the IR Basestation, making sure they are no more than 4 or 5 inches apart.

3. Start BoxCar Pro. From the **Logger** menu, select either **Launch** or the name of your logger and then Launch from that logger's submenu (the HOBO LCD and HOBO Water Temp Pro loggers are listed separately in the Launch menu). This displays the launch dialog (an example is shown with step 4). If it does not, check the COM port.
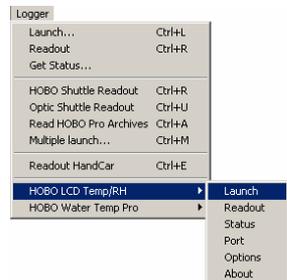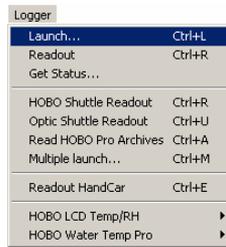
4. Change selections as you like. Select a short interval (for example, 1 or 2 seconds) so you will have data to look at. Once finished entering selections, click **Start** or **Launch**. Some loggers may also display other messages. (**Note:** Clicking **Start** will stop the logger if it is logging and will overwrite any recorded data. Click **Cancel** to cancel the launch; the logger will not be started). For details about setting the features of a particular logger, see *Chapter 3: Details of Individual Loggers and Shuttles* on page 27.
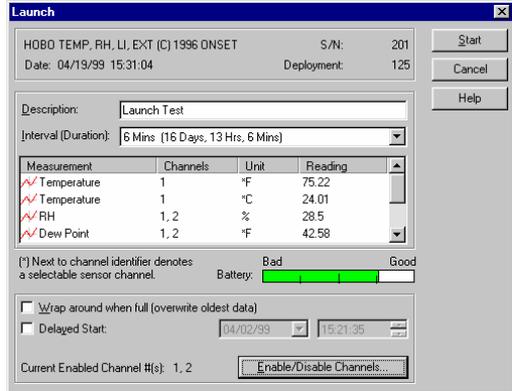
5. Watch the launch progress bar until it has completed (only displayed on some loggers). The logger is now launched and recording data.

6. Disconnect the logger after the launch progress bar has finished. Some loggers display a Disconnect Logger dialog like the one shown to the right; click **OK** after you've disconnected the logger. (For more information on this message, refer to page 70.) If the logger records temperature, hold the logger in your hand during the test to get a change in temperature and varied data.
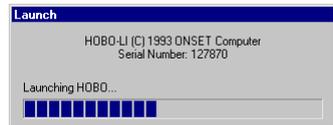
Reading Out Data from a Logger

When you read out (off-load) data from most loggers, BoxCar Pro *stops the logger* from logging. To restart logging, you will need to launch again from the Logger menu. Some loggers, however, can continue logging while reading out data, such as the HOBO LCD Temp/RH, HOBO Water Temp Pro, and HOBO Weather Station. If your logger has this feature and the logger is not full when you read it out, you will see a message prompting you to either stop the logger or continue logging.

To read out data from the logger, follow these steps.

1. Connect the logger to the interface cable. If reading out the HOBO Water Temp Pro, make sure the IR Basestation is connected to the computer instead of the interface cable. Point the HOBO Water Temp Pro communications window at the IR Basestation.

2. Start BoxCar Pro. Click the **Logger** menu and select either **Readout** or the name of your logger and then **Readout** from that logger's submenu (the HOBO LCD and HOBO Water Temp Pro loggers are listed separately in the Launch menu). Some loggers can continue logging during readout. If the logger supports this feature and is still logging, a message prompts you to either stop the logger and off-load, or continue logging while off-loading. Choose one. All loggers will display a progress bar until the readout is complete.
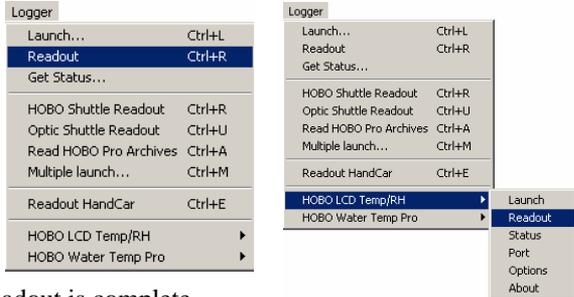
3. Name the datafile and click **Save**. (A *datafile* refers to the data returned from a deployment of a specific logger.) The default datafile name is the description entered when you launched the logger. Use unique datafile names so you don't overwrite data (a warning message is displayed if you are about to overwrite a file). Unless you specify a different directory, the datafile is saved in the directory where BoxCar was installed. If you do select a different directory to save the datafile, your specified directory will be used by default for all subsequent readouts until you choose another one.

4. Select the series you want to view. (A *series* is the data that can be shown as a single line on a plot. A series is often one channel, but may be a composite channel such as the dew point channel in a logger that measures both temperature and relative humidity. You can select multiple series or all series. However, displaying too many series may result in a plot that is difficult to read.) **Note:** The HOBO LCD Temp/RH, HOBO Water Temp Pro, and HOBO Weather Station loggers also have an option to modify the display time used in the graph. See the sections for each individual logger in Chapter 3 for more details.
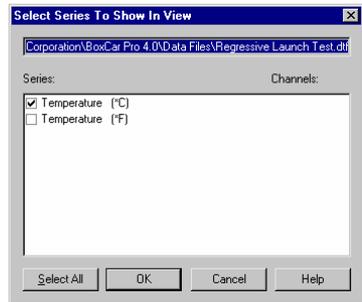
5. The data displays in a plot window. Use the zoom, crosshair, and other plot tools to navigate. See *Adjusting the View* on page 11 for more details.
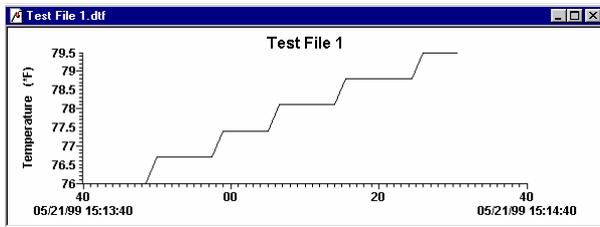
Chapter 2
Plotting, Exporting, and Printing

Many Ways to View Your Data

BoxCar Pro provides methods for showing multiple datafiles on a single plot, and for zooming and manipulating plots in many ways. You can also print data on a printer or export it to a text file or Excel spreadsheet. These features are explained in the sections listed below.

Displaying a Plot

BoxCar Pro provides three ways to get data from a datafile into a plot window.

- **Open a File from the File Menu.** From the **File** menu, select **Open**. Choose the datafile containing the data you are interested in viewing.

- **Open a File from the Readout Log.** Double-click a datafile in the readout log.

- **Off-load a Logger.** When you off-load data from a logger, you can display a plot of the data you just off-loaded.

Select Series to Show in View

When you open a datafile, the **Select Series to Show in View** dialog opens first, letting you pick one or more series to display in a new plot window. Selecting several series may result in a plot that is difficult to read. When you select the series you want to see, click **OK** to display the plot.
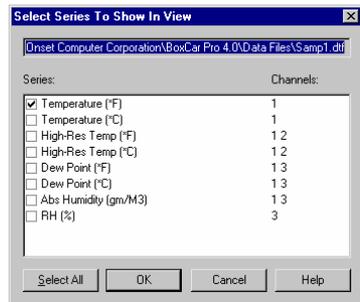
Note: The HOBO LCD Temp/RH, HOBO Water Temp Pro, and HOBO Weather Station loggers also have an option to modify the display time used in the graph. For more details, see the sections for the individual logger in Chapter 3, page 27.

Inserting a Series on a Plot

You can add series from multiple datafiles to one plot. This is helpful if you want to show data taken from multiple deployments of a logger in a single location, or compare data taken at the same time by different loggers. You can insert a series using the File menu or by drag and drop. **Note:** *You cannot save the plot view once you have inserted a series, zoomed, or used the other plotting tools.* You can, however, export multiple series to a text file. See the section *Exporting Plot Data* on page 18 for information on exporting.

To insert a series with the File menu:

1. Click the **File** menu, select **Insert Series from Datafile**.

2. Select the datafile, and click **Open**. The new series is added to the current plot window. The plot axes expand to include the new data.

To insert a series using drag and drop:

1. Open two plot windows containing the series you wish to merge.

2. Click the arrow tool on the toolbar.

3. Click the series you wish to drag, hold down the mouse button, and drag the series to the other plot window. A different cursor displays while dragging. You can only insert one series at a time with this method.

Overlaying data from different time periods

A key benefit to inserting a series is the ability to overlay data from different time periods. This allows you to compare data before and after an event or change (for example, compare the temperature in a room before and after a change to the HVAC control system). To do this, you must create separate time axes for each series.

1. Right-click the series you wish to overlay and select **Properties**.

2. Click the time axis drop-down arrow and select **New Time Axis**.

3. Type a name for the axis and click **OK**.

4. Two time axes should appear on the graph. You can then further adjust the time axis properties to set each axis to a different period of time. For example, set one axis to show the data from May through August of 2000 and the other to show May through August of 2002. For more details on adjusting the time axis, see *Time Axis Properties* on page 15.

Adjusting the View

There are several ways to adjust the view, including zoom, arcade zoom, drag, and smart scale. You can also custom set the data range of an axis, which is described in *Customizing the View*. **Note:** *There is no way to save the view as a BoxCar Pro file once you have adjusted the view using the zooming or dragging tools.* You can, however, print a hard copy of a zoomed or altered view (see the *Printing* section on page 26).

Original Plot

No matter what adjustments you make to the view, or how far afield your zooming gets, you can always get back to the original view by selecting **Original Plot** from the **Plot** menu. You can also click the original plot icon on the toolbar or press F9.

Zoom

To focus on one area of the display, pick the zoom selection tool (magnifying glass) from the toolbar (or from the **Tools** menu, select **Zoom**). Place the tool in one corner of the area you choose to expand, then click and hold down the left mouse button. Drag to the opposite corner of the area and release the mouse button. The selected area is outlined by a rectangle. If you click inside the rectangle, the area within the rectangle expands

to fill the whole plot. Click outside the rectangle to cancel the selection. **Note:** Zooming will not work on an axis that is locked. To unlock an axis, right-click the axis, select the axis properties from the menu, and remove the checkmark from Lock Axis Bounds.
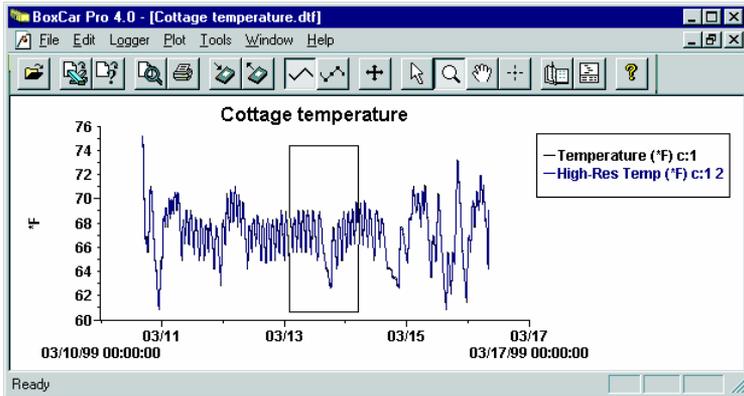
Arcade Zoom and Single-Axis Arcade Zoom

Arcade zoom is continuous zoom. Using the magnifying glass tool, click and hold down the left mouse button on the section of the plot you want to expand. After about a second, a plus sign appears in the middle of the tool and the plot expands around the location you have selected. As you move the zoom tool, the center of the expanded area moves with it.

To zoom out, hold down the Ctrl key, or the right mouse button, while you hold down the left mouse button. When a minus sign appears in the tool, the plot zooms out. Hold down the X key while zooming to restrict motion horizontally. Hold down the Z key while zooming to restrict motion vertically. You can also arcade zoom on a single axis by clicking and holding the zoom tool on an axis.

Single-Click Zoom and Single-Click Axis Zoom

A single click and release with the zoom tool causes the plot to zoom in about a factor of two. The plot is centered on the location where the click was made. Hold the Ctrl key down while single-clicking to zoom *out* about a factor of two. Click an axis with the zoom tool to expand the curves corresponding only to that axis. Hold the Ctrl key down while you click the axis to zoom out.

### Hand Tool

Click the hand tool on the toolbar (or from the **Tools** menu, select **Hand**) to pan the curves within the plot. Move the hand cursor on the plot and click and hold down the left mouse button to drag a different section of the plot into view. The plot follows the movement of the mouse, and the axes are continuously updated in response to the movement. To stop dragging, release

the mouse. **Note:** Dragging will not work on an axis that is locked. To unlock an axis, right-click the axis, select the axis properties from the menu, and remove the checkmark from Lock Axis Bounds. Hold down the X key while dragging to restrict motion horizontally. Hold down the Z key while dragging to restrict motion vertically. To drag one series at a time, click and hold the axis associated with the series. Only the curve connected with the associated axis moves.

Smart Scale

When adjusting the view with the zoom and dragging tools, the numerical bounds of the axes may no longer be on 'round' numbers. Select **Smart Scale** from the **Plot** menu (F5) to adjust the axes to end on major tick marks. The following two views show a plot that has been left on minor ticks after zooming, and the same view cleaned up with Smart Scale.
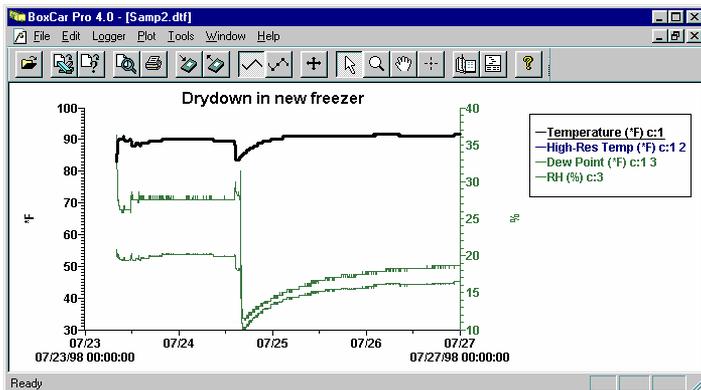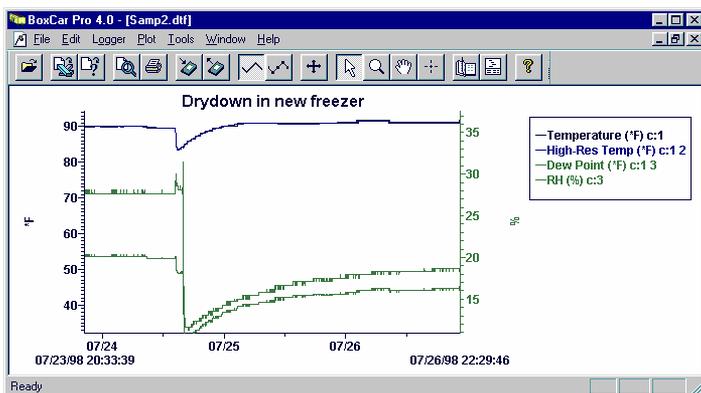
Crosshair Tool

Use the crosshair tool to zero in on a specific value in the plot. Select the crosshair tool from the toolbar or from the **Tools** menu, select **Crosshair**. On the plot, click and drag to draw a crosshair, which shows the points nearest to the mouse click. If the legend is displayed next to the plot, the point values for each series are updated to reflect the crosshair location. The data selected with the crosshair is also highlighted in the view details window if open. Remove the crosshair tool by clicking the crosshair toolbar icon again, or click the **Tools** menu and select **Remove Crosshair Indicator**.

Line Tools

This section describes tools for modifying how data is shown on the plot. The Line Tools are accessible from the **Plot** menu.
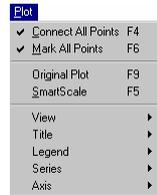
Connect All Points

When **Connect All Points** (F4) is selected (the default), the plot is drawn with lines connecting each measured data point, giving a continuous line for each series in the plot window. **Note:** Series can be hidden by deselecting both Connect All Points and Mark All Points.

Mark All Points

When **Mark All Points** (F6) is selected, each data point is displayed with a small geometric shape drawn around the point. (Use the series properties to change the shape of the marked point. See *Customizing the View* on page 14 for more information.) For sparse data sets, this option adds visibility to the individual data points.

Original Plot and Smart Scale

The Original Plot and Smart Scale options are discussed in *Adjusting the View* on page 11.

Customizing the View

Further customize the plot window with the properties options for View, Axis, Series, Title, and Legends, which lets you change the plot title, axis and title locations, and the extent and color of the axis. Choose the arrow tool (not the zoom or hand tools) to access the property dialogs with the mouse. These tools are also accessible from the Plot menu.

View Properties

Using the arrow tool, double-click anywhere inside the plot window to open the View Properties dialog. (**Note:** If you double-click too close to a particular series, the series dialog opens.) Show or hide the legend and title. Select **Show Border** to draw a border around the view area. Select **Show Filled** to display the background in a solid color.
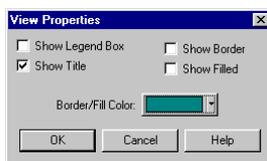
Time Axis Properties

To modify the display of the time axis, double-click below the time axis with the arrow tool. The Axis Properties dialog lets you modify the start and end times of the axis (click Min or Max). Select **Show Gridlines** to toggle vertical gridlines on or off, or click **Custom Tick Marks** to customize the axis labeling. You can also change the axis color and location. Select **Lock Axis Bounds** to lock the axis, which then cannot be affected by zooming or dragging (it is usually recommended that you lock the data axis rather than the time axis, particularly for data from state loggers).
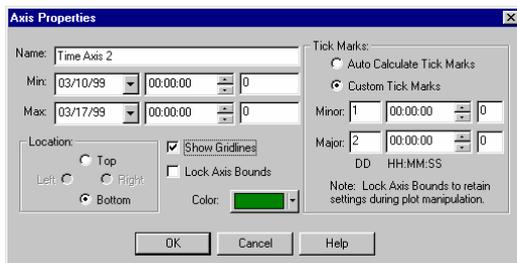
Data Axis Properties

To adjust the properties of the data axis, double-click near the data axis. The Axis Properties dialog shown lets you modify the minimum and maximum values represented by the data axis. You can also toggle horizontal gridlines on or off, choose custom tick marks, and change the color and location of the data axis. Select **Lock Axis Bounds** to lock the axis, which then cannot be affected by zooming or dragging. **Note:** When viewing a plot from an H6 State logger, the data axis is locked by the default.
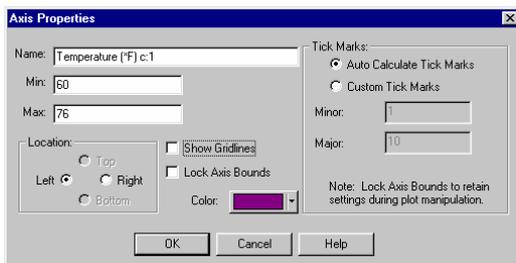
Series Properties

Double-click a series with the arrow tool to display the Series Properties dialog, which lets you change the name and color of the selected series. The new name displays in the legend box. You can also specify whether you want to connect points and set ranges for alarm lines. **Note:** Changes to the series name will not be displayed in View Details.
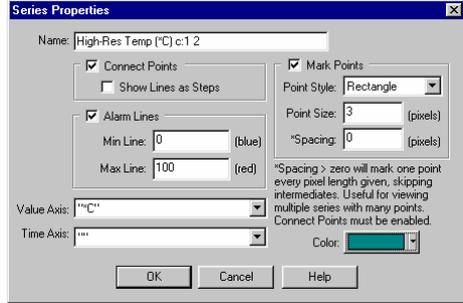
Title Properties

Double-click the title with the arrow tool to display the Title Properties dialog, which lets you change the title text, color, font, and location. The original title comes from the description you provided when you launched the logger.

Legend Properties

Double-click the legend box to display the Legend Properties dialog, which lets you change the location, name, and color of the legend. Select **Show Border** to draw a border around the Legend box. If you select **Use Series Color(s)**, the name of each series in the legend box is displayed in the same color as its associated series on the plot.

Window Management

Cascade Windows

Select Cascade Windows to align each open window so that titles are displayed. This arrangement allows you to read the file names and still be able to see large plots of the data. Switch between plots by clicking the title bar of the window you want to view.

Tile Horizontal and Tile Vertical

Select Tile Horizontal or Tile Vertical to display each open plot window in equal size. You can read all tiled windows at the same time, however the more windows you display this way, the smaller they are. For four windows or more, the Horizontal and Vertical commands have identical results. If the open

windows are very small, only the series will be displayed until you resize the window.

Arrange Icons

Select Arrange Icons to order minimized windows in the workspace.

Close All

Select Close All to quickly close all open plot windows.

Status Bar, Tool Bar, View Details

These options show and hide the corresponding features.

Readout Log

The readout log provides a simple way to track the location of datafiles on your disk. For more information about the readout log, see the section *Keeping Track of your Datafiles* on page 22.

The Open Window List

This feature displays the file names of all open plots in a list below a menu separator in the Window menu. Bring any plot window to the front by selecting it from the list or by typing Alt+W and the corresponding window number. The list holds approximately nine windows.

View Details

To get point-by-point information about the currently displayed datafile, use View Details, which shows information for the entire datafile. The information does not change with a zoom.

To open View Details, click the **Window** menu and select **View Details,** or click the icon on the toolbar. View Details is divided into two parts: the upper section describes the source of the data and the lower shows the actual data points.

Upper Section

The upper section of View Details lists all available information about the logger used to create the particular series data. For each series in the plot window, there are four categories: Logger Info, Series Info, Stats, and Launch Parameters. Click the node (plus sign) at the left of a line to expand that block and display specific details of the category.
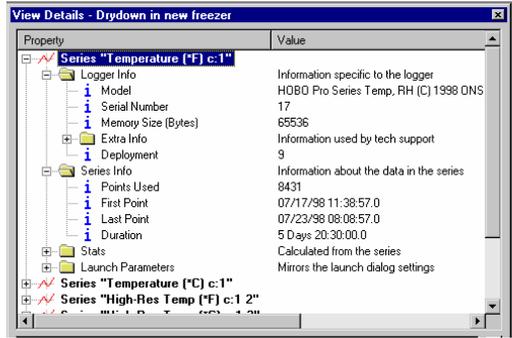
Lower Section

The lower section of View Details shows each data point along with the date and time of each measurement.

Exporting View Details

You can also export the information in the View Details window. For further details, see the next section *Exporting Plot Data* on page 18.

Exporting Plot Data

The Export feature allows you to save data from BoxCar Pro as a Microsoft® Excel spreadsheet or as a text file to import into other applications. With Export, you can save data from one or more series in the currently selected plot. All data is saved using the time displayed in the plot. To use the Export feature, click the **File** menu, select **Export**, and then select **Microsoft Excel Text**, **Microsoft Excel Spreadsheet**, **Lotus 1-2-3**, or **Custom**. Each option is explained below. **Note:** Exported files cannot be read back into BoxCar Pro.

Microsoft Excel Spreadsheet Export

If you are using Excel, the easiest way to export your data is to choose Microsoft Excel Spreadsheet. This option saves the data in a format that can be opened directly as an Excel spreadsheet. Select the series you wish to export (to choose more than one series, press the Ctrl key while selecting each series, or click the All Series checkbox to export all the series). Click **Export**, and then open the file in Excel. In addition to data recorded by the logger, the spreadsheet includes series information, which is the information about the launch displayed in the upper half of the View Details window. You also have the option of including the serial number for the logger or sensor above the series information. Select the Include Serial Number in Data Export checkbox to add the serial number to the top of the series information list in the spreadsheet. **Note:** Regardless of whether you select the Include Serial Number option, the spreadsheet will always include the series information along with the data. To remove this information from the spreadsheet, delete the appropriate columns in Excel.
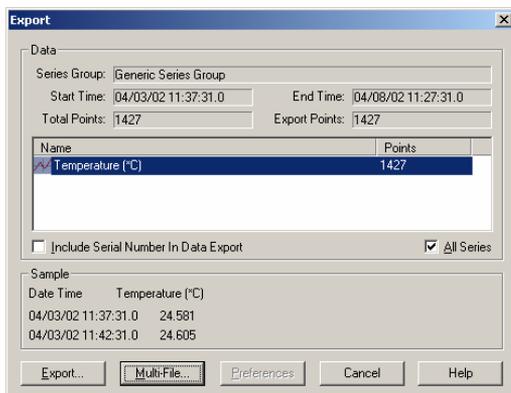
## Microsoft Excel Text and Lotus 1-2-3 Export

Select Microsoft Excel Text or Lotus 1-2-3 to save the data in a pre-defined text format (if you need to change the text format, use Custom Export instead). Select the series you wish to export (to choose more than one series, press the Ctrl key while selecting each series, or click the All Series checkbox if you want to export all the series). Select the Include Serial Number in Data Export checkbox to add the serial number at the top of the .txt file. **Note:** The Microsoft Excel Text and Lotus 1-2-3 options do not export series information; they only export data. If you wish to export the series information contained in the upper half of the View Details window, use Custom Export instead.

After you've selected the series you wish to export, click the **Export** button to create a single file with all data, or click **Multi-File** to split up the data into multiple text files. Enter the number of data points you wish to include in each file and then click **OK**. The data will be exported into several files numbered sequentially (the number will be appended to the end of the filename, for example, junedata0000.txt, junedata0001.txt, junedata0002.txt, etc). Once saved, you can import the .txt file into Excel or Lotus 1-2-3.

Custom Export

Like the Microsoft Excel Text and Lotus 1-2-3 export options, the Custom option saves data in a text format. However, this option gives you more control over how the data is formatted in the .txt file (for example, the date and time format and use of data separators).

Select the series you wish to export (to choose more than one series, press the Ctrl key while clicking each series or click the All Series checkbox to export all the series) and then click the **Preferences** button to set up the custom format for the text file.
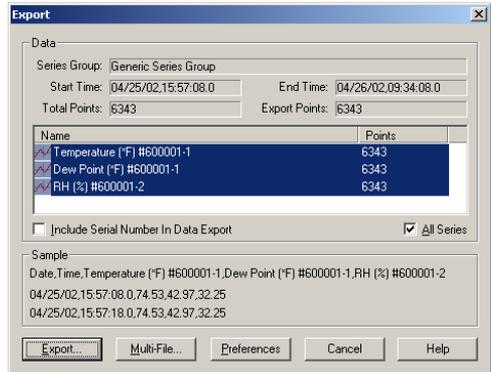
Preferences

The following options can be set with the Export Preferences box during a custom export.
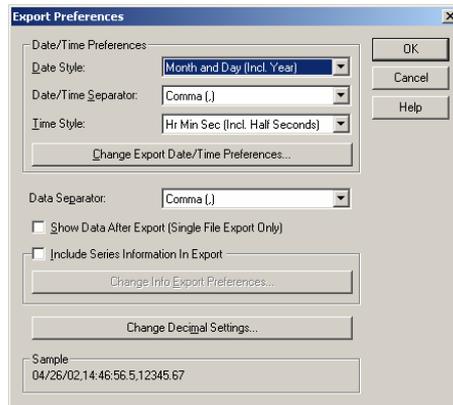
- **Date Style.** Choose the format to display the date. For most spreadsheet programs, the default option of Month Day Year suffices. However, for compatibility's sake, there are two other options: Day Number (day of year, 0 to 365) and Old Lotus/Excel (for versions of Lotus 1-2-3 prior to version 5 or Microsoft Excel prior to 4.0). You can also choose to have no date included in the export.

- **Date/Time Separator.** Select the character to separate the date and time in the spreadsheet. If you wish to have both date and time in a single column, set this option to 'Space.' To separate the columns, you

may choose any of the other options available in this box (comma, semicolon, or tab).

- **Time Style.** Choose the format in which the time is displayed in the exported data. For most spreadsheets, the default value of Hour:Minute:Second (with half seconds) is acceptable. For compatibility's sake, there are several other options, including the old Lotus and Excel formats.

- **Export Date/Time Preferences.** Click the Change Export Date/Time Preferences button to change how the date and time are displayed. Select the order the month, day, and year are listed in, and choose the character used to separate them. Select either 24-hour (military time) or 12-hour time formats and the character used to separate the hours, minutes, and seconds.
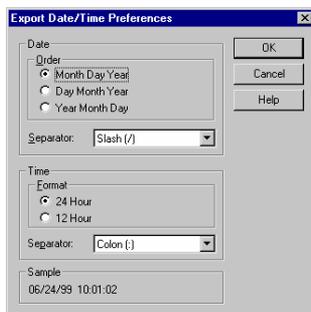
- **Data Separator.** Choose how to separate the columns of data points. Select comma, semicolon, tab, or space.

- **Show Data After Export.** Click this checkbox if you want the text files to open automatically after the export is finished.

- **Include Series Information in Export.** Select this option to create a separate file showing all available information about the logger(s) used to create the series. This is the same information displayed in the upper half of the View Details window. This second file uses the file name you select for the data, with "_info" appended to the name. If you select this option, you can also click **Change Info Export Preferences** to choose the formatting of the exported Series Information file to either easy-to-read tabbed format or in a form accessible to spreadsheet programs.

- **Change Decimal Settings.** Click this button to change the decimal point from a period to a comma. Normally you will use the default setting in the control panel.
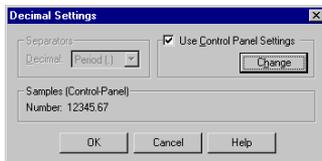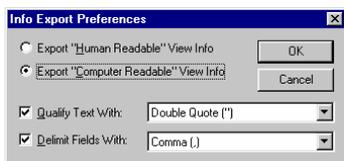
- **Sample.** This line displays a sample of what the exported data will look like. Inspect this line before exporting to make sure it looks correct.

Export and Multiple File Export

Once you've set the Custom Export Preferences, click the Export button to create a single file with all data, or click Multi-File to split up the data into multiple text files. If you choose Multi-File, enter the number of data points you wish to include in each file and then click OK in the Multiple File Export dialog box. The data will be exported into several files numbered sequentially (the number will be appended to the end of the filename, for example, junedata0000.txt, junedata0001.txt, junedata0002.txt, etc).

Note: If you choose Export instead of Multi-File and the data file contains more than 16,000 points, you will be automatically prompted to export to multiple files (some spreadsheets are unable to import files with more than 16,000 points).

Keeping Track of Your Datafiles

A single data logger can produce many datafiles quickly if it's used often. Without some organization, these datafiles can become scattered on your disk, and you may soon forget their names and locations.

Use the readout log to help you keep track of datafiles. The readout log is a window attached to the main window. It lists datafiles by name and location, showing information such as serial number, description, start/end dates, and number of points.

Filename	Model	S/N	Deployment	Description	Start Date
...ate 06_23_99 16_22_03.dtf	...T Computer	127870	N/A		06/23/99 16:20:3
...s\Regressive Launch Test.dtf	...ER CORP.	84626	N/A	Regressive Launch Test	06/09/99 10:56:1
...Pro 4.0\Data Files\Samp1.dtf	...1998 ONSET	17	10	Drydown in new freezer	07/23/98 08:11:2
...Pro 4.0\Data Files\Samp2.dtf	...1998 ONSET	17	9	Drydown in new freezer	07/17/98 11:38:5
... Files\Top of Mt Greylock.dtf	...36C TO 75C	282	N/A	Top of Mt Greylock	06/29/99 22:57:5
...\Top of Mt Greylock_0000.dtf	...36C TO 75C	282	N/A	Top of Mt Greylock	08/03/99 20:59:3
...\Top of Mt Greylock_0001.dtf	...36C TO 75C	282	N/A	Top of Mt Greylock	06/24/99 14:51:5

Using the Readout Log

As you off-load data from loggers, datafiles are added to the readout log window automatically. To see the readout log in action:

1. From the **Logger** menu, select **Readout** and off-load a data logger (or if off-loading a HOBO LCD Temp/RH or HOBO Water Temp Pro logger, select the logger name from the bottom of the **Logger** menu and then **Readout**).

2. Save the datafile using the Save As dialog.

3. Select a series in "Select Series to Show in View."

4. The file name you've chosen appears in the readout log along with other information about the file. To open a datafile, double-click on any datafile name in the log. To display the readout log menu, right-click anywhere inside the readout log window.

```
Open Readout Log
Export Readout Log

Open Selected Entries
Insert Log Entries
Delete Selected Entries

Clear All Entries
```
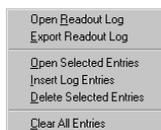
The readout log menu lets you open, insert and delete files, show or hide the readout log, and export the log to text. To open more than one file at a time from the readout log, hold down the Ctrl key and click to select the files, then choose **Open Selected Items** from the pop-up menu. You can also access the readout log menu from the Window menu.

You can also switch between logs or create a new log. To create an entirely new log, choose **Open Readout Log** and enter a new log name in the Open dialog box. (Log files are saved to disk with the .log extension.)

Note: If you move datafiles around on your disk, the readout log will not be able to find them. To fix this, use the readout log menu to delete the outdated entry and add a new one. The shuttle serial number (if applicable) cannot be carried over to the new entry. To permanently change the default location of the readout log, select **Preferences** from the **Edit** menu and enter a new location.

Sorting Datafiles
Click one of the buttons at the top of the readout log to sort the log by a specific category. Each button is resizable so you can display the fields that are most important. The sort categories in the readout log are:

- **Filename.** Name given to the file, includes all directory information.
- **Model.** Logger model number.
- **S/N.** Logger serial number.
- **Deployment.** Logger deployment number (if available).
- **Description.** Logger description string (typed in at deployment).
- **Start Date.** Start time and date.
- **End Date.** Time and date of last data point.
- **Points.** Number of data points.
- **Shuttle S/N.** S/N of shuttle used to off-load (not available if added).
- **Save Date.** Save date (date off-loaded or date added to Log).

The Shuttle S/N is not applicable (and is not displayed) unless a Shuttle was used to off-load the data.

Export Readout Log to a Text File

To export the readout log to a text file, right click the readout log and click Export Readout Log. Each exported entry takes two lines: the first line is the file name and path. The second line displays the rest of the log information. (The Save Date is not displayed in the exported log.)

Data Analysis with Filters

There are several filter options that let you modify the contents of a data series and create a new data series. Only one series can be filtered at a time, and the new filtered series is displayed in the plot window. To access filters, use one of the methods below:

- Right-click a series, then select **Filter Series**.

- From the **Plot** menu, select **Series**, **<Series Name>**, then **Filter**.

- Right click in the plot window, and select **Series**, **<Series Name>**, then **Filter** from the shortcut menu that appears.

There are different filters for different types of loggers. Each filter, however, lets you use period options in Day(s), Hour(s), Minute(s), or Second(s). The different sets of filters are explained in the following sections.

Note: You cannot save filtered series within BoxCar Pro. You can, however, export these series to a text file. See the section *Exporting Plot Data* on page 18 for information on exporting.

Event Logger Filter

When viewing data from an Event logger, the available filters are **Event Sum** and **# of Events**. Event sum is defined as the number of events in the interval multiplied by the event value. (You specify the event value when launching.) For a logger used with a rain gauge, the event sum can be used to show rainfall per interval. **Note:** The HOBO Weather Station rain gauge sensor is not supported by the event logger filter.

State Logger Filter

These filters work with data from State loggers (Closed/Open or ON/OFF). The filters are described in terms of Closed (1) or Open (0). OFF is equivalent to Open and ON is equivalent to Closed (for ON/OFF loggers).
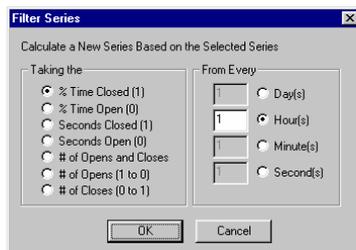

Maximum, Minimum, or Average Filter

This filter is available for loggers that sample values; it is not available for loggers that sample states or events. Select maximum, minimum, and average on the left of the dialog. For example, selecting **Average Data Point** and **Minute(s)** creates a new series containing the average of all values for each minute of the original series.
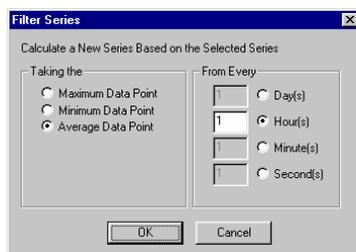
The plot window displays a new series with the filtered data. For example, the plot window below is a result of running a "# of Events per minute" filter on a series taken from an Event logger.
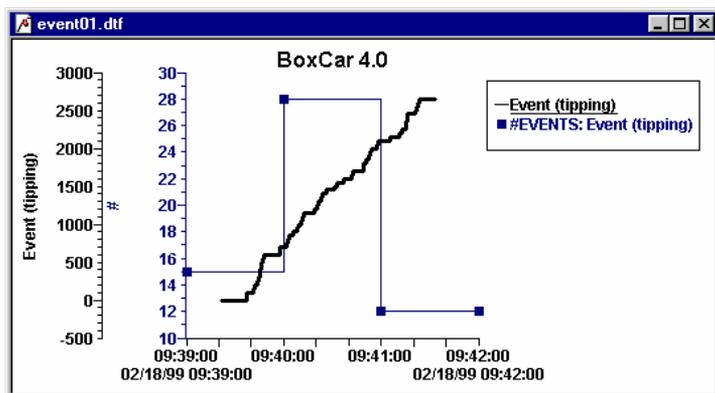
How Data Filters Calculate Time

Data filters calculate time by using the closest time that is divisible by the sampling interval. If the actual sampled time is not evenly divisible by the sampling interval, the first filtered point rounds down to the closest time and the last filtered point rounds up to the closest time. For example, if you selected a sampling interval of 5 minutes and the first sampled point is at 5:17 PM and the last is at 5:27 PM, the filter will round down to 5:15 PM for the first point and round up to 5:30 for the last point.

Filters place their values at the start of each sampling interval. Because of this, if the last point doesn't fall on the sampling interval, the filter will repeat the next-to-last point in the filtered series so all intervals on the plot will match the selected filter interval. For example, if the filter interval is 5 minutes, the value displayed at 5:15 PM represents a filter of every value in the original series sampled between 5:15 and up to but not including 5:20. If the last point in the series was at 5:18, a filtered point at 5:20 is drawn so the step line will pass through 5:18 but not end on 5:18 (since 5:18 is not divisible by the sampling interval).

Printing

BoxCar Pro has several printing options in the **File** menu.

Print Graph

Click the **File** menu and select **Print Graph** to print a graph. The graph is always blown up to fit a full page, regardless of its size on the screen. The page orientation, portrait or landscape, can be modified (see *Print Setup*).

Print Info

Click the **File** menu and select **Print Info** to print just the information about the data. This information is the same as that displayed in the View Details dialog. **Note:** This option sends the information directly to the printer without an additional prompt.

Print Data

Click the **File** menu and select **Print Data** to print the values from the series in the current plot window. BoxCar Pro displays the number of pages it will print in a dialog, then sends data from the open series to the printer. **Note:** The Print Data option can send a large number of pages to the printer; click Cancel on the dialog to end printing.

Print Preview

To see what the graph will look like when printed, click the **File** menu and select **Print Preview**. You can magnify the view by clicking Zoom In and Zoom Out.

Print Setup

To display the Print Setup dialog, click the **File** menu and select **Print Setup**. From here you can choose paper size, paper orientation, your preferred printer, and the printer's properties. Additional options, such as resolution, scaling, and print quality, may be available depending on the attached printer.

Chapter 3

Details of Individual Loggers and Shuttles

This chapter describes the loggers available in the HOBO and StowAway lines and how they are handled by BoxCar Pro.

BoxCar Pro will launch and read out data from all of these loggers/shuttles. For general launch and readout procedures, see Chapter 1. This chapter describes the variations in launch and readout for individual loggers.

HOBO 2K Loggers

The HOBO 2K is the first logger in the HOBO/StowAway series, and has only 2K of memory. The most popular version of this logger, the H01-001-01, is shown here. Note that this product is not the same as the H08-001-02, which has an almost identical case and markings.

The HOBO 2K Launch Dialog

To display the launch dialog (shown below), connect a logger to your computer, click the **Logger** menu, and select **Launch**.
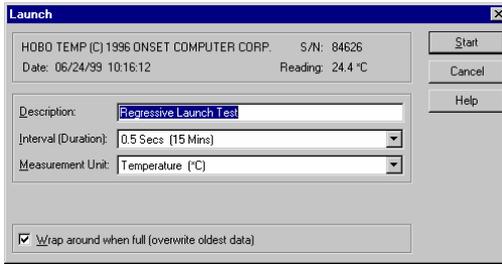
- **Launch Dialog Information**. The first line of information identifies the type of logger and its serial number (S/N). The date field displays your computer's current date and time. If it is incorrect, consult your Windows manual on how to change your computer's date or time.

- **Reading**. This field displays what the logger is currently reading in the selected Measurement Unit.

- **Description**. The text in the Description box is displayed above the time axis on the readout graph. Up to forty characters can be typed in this area.

- **Interval (Duration)**. Use this field to select the Interval (time between measurements) and the Duration (amount of time the logger will collect data).

  To create your own custom interval, select "Add Custom Interval" at the bottom of the Interval scroll box. You can designate as many custom intervals as you require (between 0.5 seconds and 9 hours).
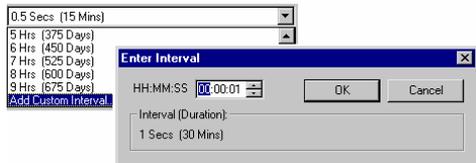
Custom Intervals are saved for the current session, but disappear when you exit BoxCar Pro.

- **Measurement Unit.** The Measurement Unit box allows you to choose the units displayed in the Reading. This also sets the default units at readout. For example, you can view a temperature graph in either degrees Fahrenheit or degrees Celsius. BoxCar Pro allows you to change the units after reading out data.

- **Wrap around when full.** This allows the logger to record continuously, overwriting the oldest points when it becomes full. The logger will continue logging until interrupted by a readout or launch. On readout, the most recent points will be read out. If this box is not checked, the logger will stop once its memory is full.

- **Start.** Click the Start button when you are satisfied with the settings. Do not unplug the logger from the interface cable until BoxCar Pro has indicated the launch has been completed. *Launching your logger will overwrite the previously recorded data.* Confirm a successful launch by watching for the logger's LED to blink.

HOBO H6 State loggers

The HOBO H6 State loggers record the time and date when devices change between on and off, or open and closed. One popular version is the light on/off model, shown in the picture here.

The HOBO H6 Launch Dialog

To display the launch dialog (shown below), connect a logger to your computer, click the **Logger** menu, and select **Launch**.
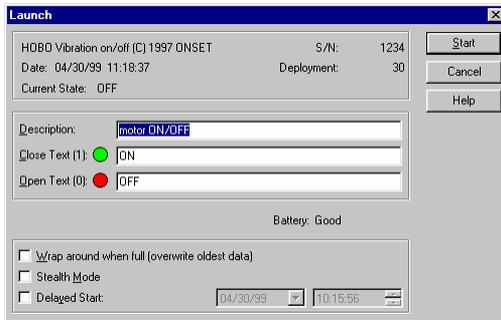
- **Launch Dialog Information.** The first line of information identifies the type of logger and its serial number (S/N). The date field gives your computer's current date and time. If this is incorrect, consult your Windows manual on how to change your computer's date or time. Use the Open Text(0) and Close Text(1) fields to describe your state information with text.

- **Deployment.** This field shows how many times the logger has been launched, including current deployment, and is unalterable. Every time the logger is launched the number increases by one.

- **Current State.** This feature displays the logger's current state while it is connected. The text matches either Close Text or Open Text.

- **Description.** The text in the description box is displayed above the time axis on the readout graph. Up to forty characters can be typed in this area.

- **Close Text.** The text entered in the Close Text box (up to twenty characters) will be stored with the timestamp for each closing and displayed on the axis label of the graph. A closed state is plotted as one

(1) on the plot. When using an ON/OFF logger, closed is equivalent to ON.

- **Open Text.** The text entered in the Open Text box (up to twenty characters) will be stored with the timestamp for each opening, and displayed on the axis label of the graph. An open state is plotted as zero (0) on the plot. When using an ON/OFF logger, open is equivalent to OFF.

- **Battery.** This field shows the state of the battery. It displays 'Good' if the battery has more than 20 percent of its capacity remaining, otherwise it displays 'Bad.'

- **Wrap around when full.** This option allows the logger to record continuously, overwriting the oldest points when it becomes full. The logger continues logging until interrupted by a readout or launch. On readout, the most recent points will be read out. If this box is not checked, the logger stops once its memory is full.

- **Stealth Mode.** The logger will not blink its LED while logging when this option is enabled.

- **Delayed Start.** By entering a specific start date and time, Delayed Start allows you to postpone logging for up to three months after launching your logger. The format for entering dates may change depending on the date and time formats that you set within BoxCar Pro. Enter this time in the format currently specified in the Date/Time Preferences. After launch, the logger flashes dimly every four seconds until the start time has been reached, then starts logging.

- **Start**. Click **Start** when you are satisfied with the settings. Do not unplug the logger from the interface cable until BoxCar Pro has indicated that the launch has been completed. Launching your logger will overwrite the previously recorded data. Confirm a successful launch by watching for the logger's LED to blink (unless the logger was launched in stealth mode). Consult the logger's User's Manual for more information on the LED status signals.

HOBO Event Logger

The HOBO Event logger records when momentary contact-closure events happen, storing the date and time of each event. Event loggers are most commonly used with tipping-bucket rain gauges where each tip of the bucket represents 1/100" of rain.

The HOBO Event Launch Dialog

To display the launch dialog (shown below), connect a logger to your computer, click the **Logger** menu, and select **Launch**.
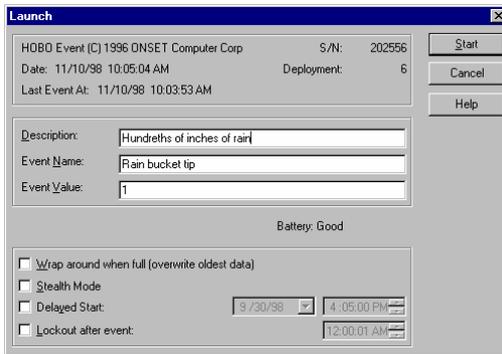
- **Launch Dialog Information.** The first line of information identifies the type of logger and its serial number (S/N). The date field gives your computer's current date and time. If this is incorrect, consult your Windows manual.

- **Deployment.** This field shows how many times the logger has been launched, including current deployment, and is unalterable. Every time the logger is launched the number increases by one.

- **Last Event At.** While the Launch dialog box is open, this field displays the time of the last event. If an event occurs while the launch screen is shown, it will display the time.

- **Description.** The text in the description box is displayed above the time axis on the readout graph. Up to forty characters can be typed in this area.

- **Event Name.** Use the Event Name text box to describe the type of event being monitored. This name will be displayed on the Y-axis at readout.

- **Event Value.** Use Event Value to specify the quantity associated with one event.

- **Battery State.** This field shows the state of the battery. It displays 'Good' if battery has more than 20 percent of its capacity remaining, otherwise it displays 'Bad.'

- **Wrap around when full.** This feature causes the logger to record continuously, overwriting the oldest points when it is full. The logger continues logging until interrupted by a readout or launch. On readout, the most recent points are read out. If this box is not checked, the logger stops once its memory is full.

- **Stealth Mode.** When this option is enabled, the logger does not blink its LED while logging.

- **Delayed Start.** By entering a specific start date and time, Delayed Start allows you to postpone logging for up to three months after launching your logger. The format for entering dates may change depending on the date and time formats that you set within BoxCar Pro. Enter the time in the format currently specified in the Date/Time Preferences. When launched, the logger flashes dimly every four seconds until the start time is reached, and then starts logging.

- **Lockout after event.** When selected, this option tells the logger to ignore events for a programmable period after an event is recorded. This can be set for as short as one second to as long as nine hours. With tipping-bucket rain gauges, we recommend setting the lockout to one second to eliminate switch bounce.

- **Start.** Click **Start** when you are satisfied with the settings. Do not unplug the logger from the interface cable until BoxCar Pro has indicated that the launch is complete. Launching your logger will overwrite the previously recorded data. Confirm a successful launch by watching for the logger's LED to blink (unless the logger was launched in stealth mode). Consult the logger's User's Manual for more information on the LED status signals.

HOBO H8 Loggers

The HOBO H8 family of loggers features multi-channel logging. The logger pictured here has four channels: temperature, relative humidity, light intensity and an external channel that can be connected to a variety of external sensors.

The HOBO H8 Launch Dialog

To display the launch dialog (shown below), connect a logger to your computer, click the **Logger** menu, and select **Launch**.
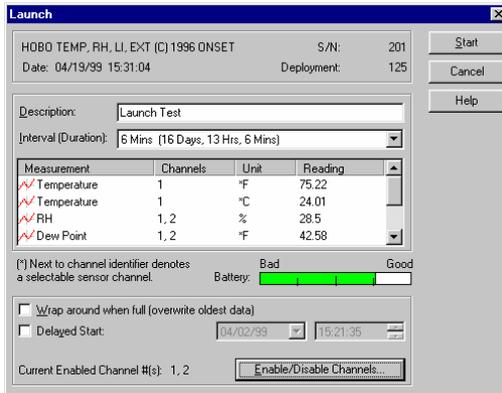
- • **Launch Dialog Information.** The first line of information identifies the type of logger and its serial number (S/N). The date field gives your computer's current date and time. If it is incorrect, consult your Windows manual on how to change your computer's date or time.

- • **Deployment.** This shows how many times the logger has been launched, including current deployment, and is unalterable. Every time the logger is launched the number increases by one.

- • **Description.** The text in the Description box is displayed above the time axis on the readout graph. Up to forty characters can be typed in this area.

- • **Interval (Duration).** The Interval (time between measurements) and the Duration (amount of time the logger will collect data) are selected here.

- • **Add Custom Interval.** To create your own custom interval, select "Add Custom Interval" at the bottom of the interval scroll box. You can

designate as many custom intervals as you require (between 0.5 seconds and 9 hours). Custom Intervals are saved for the current session, but disappear when you exit BoxCar Pro.

- **Measurement, Channels, and Reading.** The Measurement column shows the units available based on the sensors chosen

Measurement	Channels	Unit	Reading
Temperature	1	°F	81.53
Temperature	1	°C	27.52
RH	1, 2	%	71
Dew Point	1, 2	°F	71.2

from the Enable/Disable Channels button. In the example below, the HOBO RH/Temp/Light/External with all Channels enabled will measure Temperature (C and F), RH (%), Dew Point (C and F), Abs Humidity (gm/M3), Uncomp RH (%), Intensity (Lumens), and Voltage.

  The Channels column shows which sensors are used to calculate the measurement. For example, Dew Point uses the temperature channel plus the humidity channel to calculate Dew Point, as there is not really a dew point sensor connected.

  The Reading column gives the current reading of the connected logger. This value is updated every second.

- **Battery Level.** The Battery Level gauge shows a percentage of the battery's capacity left. When the gauge reaches one quarter remaining, it is suggested that the battery be changed for longer deployments.
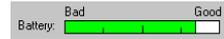
- **Wrap around when full.** This feature allows the logger to record continuously, overwriting the oldest points when it becomes full. The logger will continue logging until interrupted by a readout or launch. On readout, the most recent points will be read out. If this box is not checked, the logger will stop once its memory is full. **Note:** The HOBO H8 Pro Series loggers do not support "Wrap Around When Full." See the section *HOBO H8 Pro Series Loggers* on page 37 for more information.

- **Delayed Start.** By entering a specific start date and time, Delayed Start will allow you to postpone logging for up to three months after launching your logger. The format for entering dates may change depending on the date and time formats that you have set within BoxCar Pro. Enter this time in the format currently specified in the Date/Time Preferences. Once launched, the logger will flash dimly every four seconds until the start time has been reached and then start logging.

- **Enable/Disable Channels.** To enable or disable channels, click Enable/Disable Channels. The dialog box shown below appears. Check the box next to a sensor to enable/disable that channel. If your logger

has more than one channel, you will be able to enable or disable each channel every time you launch the logger. Max points per deployment relates directly to the data memory size divided by the number of channels. To select resolution for HOBO Pro Series loggers, see the section *HOBO H8 Pro Series Loggers* on page 37.
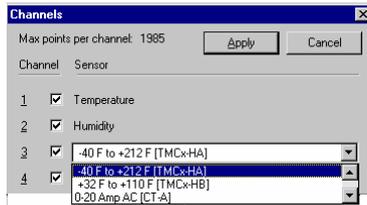
Note: If your logger has one or more external sensor jacks, you must specify what type of sensor is connected to each jack or data will not be displayed correctly.

- **Start.** Click **Start** when you are satisfied with the settings. Do not unplug the logger from the interface cable until BoxCar Pro indicates the launch is complete. Launching your logger will overwrite the previously recorded data. Confirm a successful launch by watching for the logger's LED to blink. Consult the logger's User's Manual for more information on the LED status signals.

The HOBO H8 Pro Series Loggers

The HOBO H8 Pro Series introduces 12-bit resolution for temperature measurements, 64K datafiles and data archiving. These features along with its weatherproof case make it ideal for outdoor and industrial use. The HOBO Pro logger shown here measures both temperature and relative humidity.

The HOBO Pro Launch Dialog

To display the launch dialog, connect a logger to your computer, click the **Logger** menu, and select **Launch**.
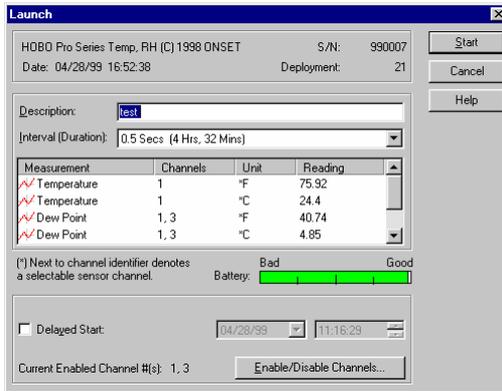

Launch Dialog Information

The first line of information identifies the type of logger and its serial number. The date field gives your computer's current date and time. At the bottom of the dialog, you will see the delayed start option. The HOBO Pro logger is similar to the HOBO H8, so only the features unique to the HOBO Pro are explained here.

No Wrap Around

The wrap around when full feature is not available on the HOBO Pro Series. The launch dialog does not support this feature.

Selecting Channels and Resolutions

HOBO Pro Series loggers offer the choice of standard-resolution (8-bit) or high-resolution (12-bit) operation for their temperature channel(s). High-resolution mode doubles the amount of memory required by each measurement, reducing
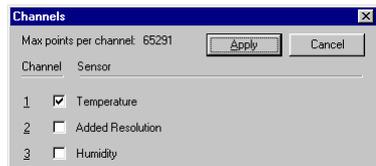
the deployment time for each interval setting, but dramatically improving the temperature resolution and accuracy. The high-resolution mode is not available for the RH channel. For high-resolution mode, select the sensor and "Added Resolution" on the channel that follows it. For standard-resolution, select only the temperature channel. "Added Resolution" should not be enabled unless the corresponding temperature channel is enabled, otherwise the data will be invalid. If you are using the Temp/Ext Temp version, the internal temperature sensor is Channel 1 and the external temperature probe is Channel 3.

Retrieving Archived Data

HOBO Pro Series loggers preserve the data from up to seven deployments preceding the current deployment. To retrieve archived data from the HOBO Pro, click the Logger menu and select Read HOBO Pro Archives. BoxCar Pro reads the last eight deployments, displays information such as the deployment number, start time, end time, number of points and the description, and then allows you to select which file(s) you would like to save.

When you select a file, BoxCar Pro displays View Details for that file, and opens a dialog box for you to save the file.
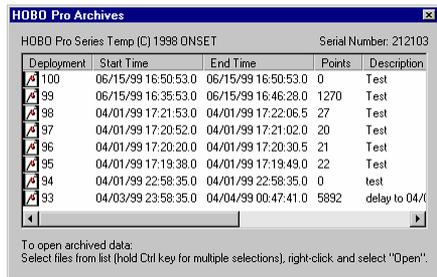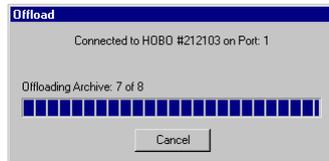
Battery Indication

The battery level is displayed on the host computer during Launch. For the HOBO Pro, this will show one of two states: 98% or 20%. If the level is 20%, the battery should be replaced.

HOBO LCD Temp/RH Logger

The HOBO LCD logger records and displays temperature and humidity conditions in manufacturing, processing, and storage environments where reliable monitoring and documentation of specific temp/RH conditions are critical. This logger includes an alarm display and built-in relay for use with Remote Alarm/Autodialer accessories.

The HOBO LCD Temp/RH logger is accessed by its own submenu in the Logger menu. The general Launch, Readout, and Get Status commands available from the Logger menu do not work for this logger. Instead, select the **Logger** menu, then select **HOBO LCD Temp/RH**, and then the appropriate command from the submenu. Each of these commands is described in this section.
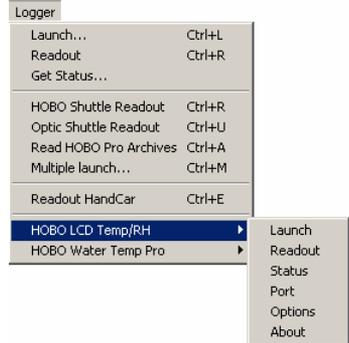
The HOBO LCD Temp/RH Launch Dialog

To display the launch dialog, connect a logger to your computer, click the **Logger** menu, select **HOBO LCD Temp/RH**, and then select **Launch**.

Note: If the logger is already launched, the system displays the following window instead. Click **Continue With Launch** to set launch parameters and launch the logger. If you do proceed to launch, you will lose any data already recorded. Click **View Status Only** to identify the logger and verify its operation.

The launch dialog contains four sections:

- Logger Information
- Launch Parameters
- Sensor Information
- Alert Limits

Each section is described below.

Logger Information

The Logger Information section of the Launch dialog displays the type of logger, the logger part number, serial number, and memory capacity. It also displays:

- **Deployment.** This shows how many times the logger has been launched, including current deployment, and is unalterable. Every time the logger is launched the number increases by one.

- **Description.** This field displays the launch description used in the last launch. Type up to 40 characters of text to describe the deployment. The description will be used as the default prefix for the data file name upon readout and is displayed above the plot on the readout graph.

- **Battery status.** The Battery gauge shows the percentage of the battery's capacity left. When the gauge indicates 20% or less, it is recommended that you change the battery for longer deployments.

Launch Parameters

The Launch Parameters section of the Launch Dialog displays the following fields:

- **Logging interval.** Type the frequency between logger readings in the following format: H:MM:SS. The minimum logging interval is 1 second and the maximum is 9 hours. The specified logging interval applies to both the temperature and RH sensors.

- **With this interval, the duration is/logger wraps at.** This field displays how long the logger will collect data before the logger memory is full (if wrap around when full is *not* selected) or old data is overwritten with new data (if wrap around when full is selected). The

duration is listed in number of days, hours, minutes, and seconds, and is based on the selected logging interval and the number of sensors in use.

- **Start logging immediately.** If this button is selected, logging will start once you click the **Launch Immediately** button.

- **Delayed start.** Delayed Start allows you to start a logger at a future date or time (for example, at the top of the hour or tomorrow at noon). This is useful if you do not have a laptop or handheld device to bring to the deployment site or if you want to synchronize start times for multiple loggers. You can also set up delayed start when you need to allow time for current alert conditions to settle before launch. To configure the logger with a delayed start, select the date and time you want to start the launch. Once you click the Launch with Delayed Start button, the logger will display "DLY" until the launch begins at the date and time you selected.

- **Hold for later launch.** Use this option to save the launch settings you've specified for a future launch. It does not launch the logger.

- **Time format.** Switch between local time and GMT (UTC). GMT is Greenwich Mean Time, which is also known as Coordinated Universal Time (UTC). UTC is the time based on atomic clocks that is broadcast by government radio stations. Both local time and GMT (UTC) are determined from your computer's date, time, and time zone settings. **Note:** The www.time.gov web site is one resource for accurate time settings based on UTC.

- **Logger date/time and host date/time.** These fields display the date and time according to the logger and computer respectively. **Note:** These times may differ if you disabled "set logger clock with host time on launch."

- **Set logger clock with host time on launch.** This option determines whether the logger's internal clock will be reset to match the host computer clock upon launch. When this setting is enabled (which is the default), it is important to make sure the computer' clock is set to the correct date, time, and time zone before launching the logger. Also check that daylight savings time preferences are correct in the Date/Time Control Panel (if applicable). When this setting is disabled, the logger clock will not be updated.

- **Wrap around when full.** If this box is checked, new data will overwrite the oldest data sequentially one sample at a time when the memory is full. The logger will continue logging indefinitely until the logger is either off-loaded and stopped, or the battery fails. If this box is *not* checked, the logger will stop logging when the memory is full and

no data will be overwritten. **Note:** If using the HOBO LCD Temp/RH logger with an alarm, it is recommended that you set the logger to wrap around when full (make sure the box is checked) because alarm functionality is only activated while logging is taking place.

Sensor Information

Use the Sensor Information section to:

- **Select units of measurement.** Select either English or Metric to change the current unit display in the software and on the LCD. Off-loaded data can be viewed in either Metric or English units, regardless of what was selected before launch.

- **Enable one or both sensors.** Select the sensors you want to display and record during deployment. You can check either temperature, humidity, or both sensors. Current readings for both are also displayed. The logger memory will be divided between the number of sensors selected.

Alert Limits

Use the Alert Limits section of the Launch dialog to set the limits at which the alert display and alarm output will be activated. If the measurement for an enabled sensor goes outside the limits you set, an alert will flash on the LCD. Drag the vertical bars or click the up and down arrows to set upper and lower limits for the alert indicator. Alert limits are shown in the plot as alarm lines (red lines for upper limits and blue lines for lower limits). Click the Advanced Options button for the following additional alert settings:
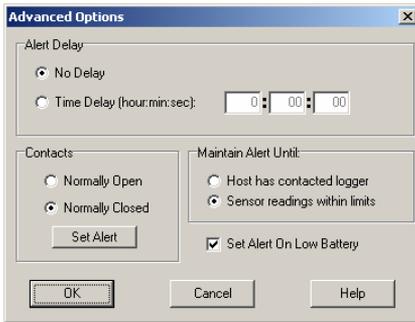
- **No delay.** Click this button if you want immediate notification when the temperature and humidity measurements are out of range.

- **Time delay (hour:min:sec).** Click this button and specify a time delay in this field to avoid nuisance tripping. This delay works in conjunction with the Alert Limits set in the Launch screen. For example, let's say you are logging a refrigerator's temperature and the High Temperature

Alert Limit set at 48˚F. When the refrigerator door is opened, the temperature goes above 48˚F, which causes the Alert Delay to flash indicating that the High Temperature Alert Limit has been exceeded. This Alert Limit will remain flashing until the temperature drops back below the set point of 48˚F. If the temperature does not drop back below the set point within the specified time delay, the alarm will trip.

- **Contacts: Normally open.** Click this button to set alert output contacts as normally open (closed in alarm condition).

- **Contacts: Normally closed.** Click this button to set alert output contacts as normally closed (open in alarm condition).

- **Set Alert.** Click the Set Alert button to set the alert output contacts to the alarm condition as a way to test for proper operation. The alert output contacts will revert to their normal state when the logger is launched.

- **Maintain alert until: Host has contacted logger.** Select this button to maintain the alert until the logger is contacted by a host computer.

- **Maintain alert until: Sensor readings within limits.** Select this button to turn off the alert as soon as conditions return to normal.

- **Set alert on low battery.** Check this button to activate the alert output contacts when the battery is very low and the unit is about to stop logging. Low battery level is indicated on the LCD display before reaching this point.

## Launching multiple HOBO LCD Temp/RH loggers

After you launch a HOBO LCD Temp/RH logger, a launch confirmation message appears. Click the Launch Another button if you wish to launch more than one HOBO LCD Temp/RH logger. The launch settings you specified in the previous launch will be repeated in the next Launch screen. This makes it easy to configure multiple launches with the same parameters. **Note:** The Multiple Launch option on the Logger menu does not work for this logger. Use the Launch Another button instead.

Reading out the HOBO LCD Temp/RH Logger

To read out the HOBO LCD Temp/RH logger, connect the logger to your computer, click the **Logger** menu, select **HOBO LCD Temp/RH**, and then select **Readout**. If the logger is still collecting data, the following screen appears:
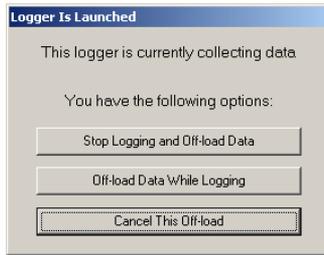
Logger Is Launched

This logger is currently collecting data

You have the following options:

Stop Logging and Off-load Data

Off-load Data While Logging

Cancel This Off-load

To off-load data, click either **Stop Logging and Off-Load Data,** which means the logger will stop recording data before off-loading, or **Off-load Data While Logging**, which means the logger will continue to record data in the current deployment while off-loading takes place.

After saving the file, you will be prompted to select the data series you wish to view in a plot. Series selection is the same for all loggers. However, the HOBO LCD Temp/RH logger also gives you the option of changing the time displayed in the plot. This does not change the actual time saved in the datafile; it only changes the time used in the presentation of the plot and when exporting data.

Select Series To Show In View

C:\New datafiles\Production Bay 5-101319.dtf

Series: Chans/Sensor S/N:

☑ Temperature (°C)
☐ Temperature (°F)
☐ Dew Point (°C)
☐ Dew Point (°F)
☐ RH (%)

Select time offset from UTC (GMT) (+/- 13 Hrs):   -5

1st point using selected time offset: 04/03/02 10:12:32
1st point with time zone setting used at launch: 04/03/02 10:12:32
1st point in UTC (GMT):   04/03/02 15:12:32

Select All   OK   Cancel   Help

Time is shown in hours offset from Universal Coordinated Time (UTC), also known as Greenwich Mean Time (GMT). The time offset listed by default matches the time zone setting used to launch the logger. In this example, the logger was launched in Eastern Standard Time. Therefore, -5 is filled in by default because Eastern Standard Time is five hours behind UTC (GMT) (when daylight savings time is not in effect).

To change the default time offset, enter the number of hours the new time differs from UTC (GMT). For example, to change the time offset in the example above to Pacific Standard Time, enter -8 because Pacific Standard is 8 hours behind UTC (GMT) (when daylight savings time is not in effect). To help make sure you are entering the correct time offset, this screen displays the date and time for the logger's first measurement, or data point, in three ways:

- The time based on the value entered in the "Select time offset from UTC (GMT)" field. This is the time that will be used in the plot.

- The time zone setting used to launch the logger.

- UTC (GMT).

Checking HOBO LCD Temp/RH Status

To check the status of the HOBO LCD Temp/RH logger, connect the logger to your computer, click the **Logger** menu, select **HOBO LCD Temp/RH**, and then select **Status**. (The general Get Status command available from the Logger menu does not work with this logger.) The Logger Status screen shows the current launch status (logging, not launched, waiting for delayed start) and current readings. It also lists other launch parameters including:

- Current battery level

- Available memory and whether Wrap Around When Full is enabled

- The current date and time according to both the logger and the computer currently connected to the logger

- The time logging began

- Alert settings

You can also change the display of the temperature units and the time format. This will only affect the status display; it does not affect the launch.

Note: The difference in time between the logger and the host computer may fluctuate by a few seconds if the status window remains open for more than a minute. This difference may be even greater if you elected to not set the logger clock with the host time upon launch.

Other HOBO LCD Temp/RH menu options

In addition to the Launch, Readout, and Status commands, the following commands are available from the HOBO LCD Temp/RH submenu:

- **Options.** Select Options to specify what is included with the default datafile name upon readout. The name can include the logger serial number, deployment number, and time of readout in addition to the description you entered in the launch parameters screen. You can also disable the "Launching will erase data" warning that displays each time you launch the logger.

- **Port**. Use this command to change the port number or test the COM port with the LCD. Do not change the port number with Logger Serial Port setting in the Application Preferences window.

- **About**. This command displays the copyright and version information for the HOBO LCD Temp/RH component of BoxCar Pro software.

HOBO Water Temp Pro Logger

The HOBO Water Temp Pro provides accurate temperature measurement in underwater and condensing environments. This logger features a durable streamlined case suitable for extended deployment in water up to 50°C and is equipped with an infrared interface for data off-load.

The HOBO Water Temp Pro logger is accessed by its own submenu in the Logger menu. The general Launch, Readout, and Get Status commands available from the Logger menu do not work for this logger. Instead, select the **Logger** menu, then select **HOBO Water Temp Pro** and then the appropriate command from the submenu. Each of these commands is described in this section.
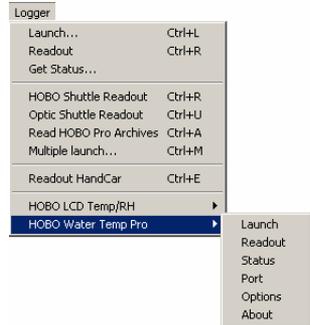
The HOBO Water Temp Pro Dialog

To display the launch dialog, point the logger's communication window at the IR Basestation window, making sure they are no further than 4 or 5 inches away. From BoxCar Pro, click the **Logger** menu, select **HOBO Water Temp Pro**, and then select **Launch**.

The software searches for the all loggers within the IR Basestation's view and lists them as detected. If you only are working with one logger, you can stop the search and continue to the launch screen. For more information on using the search feature, see *Multiple Logger Detection*.

Note: If the logger is already launched, the system displays the following window instead. Click **Continue With Launch** to set launch parameters and launch the logger. If you do proceed to launch, you will lose any data already recorded. Click **View Status Only** to identify the logger and verify its operation without launching.

The launch dialog contains three sections:

- Logger Information
- Launch Parameters
- Sensor Information

Each section is described below.

Logger Information

The Logger Information section of the Launch dialog displays the type of logger, the logger part number, serial number, and memory capacity. It also displays:

- **Deployment.** This shows how many times the logger has been launched, including current deployment, and is unalterable. Every time the logger is launched the number increases by one.

- **Description.** This field displays the launch description used in the last launch. Type up to 40 characters of text to describe the deployment. The description will be used as the default prefix for the data file name upon readout, and is displayed above the plot on the readout graph

- **Battery status.** The Battery gauge shows the percentage of the battery's capacity left.

Launch Parameters

The Launch Parameters section of the Launch Dialog displays the following fields:

- **Logging interval.** Type the frequency between logger readings in the following format: H:MM:SS. The minimum logging interval is 1 second and the maximum is 9 hours.

- **With this interval, the duration is/logger wraps at.** This field displays how long the logger will collect data before the logger memory is full (if wrap around when full is *not* selected) or old data is overwritten with new data (if wrap around when full is selected). The

duration is listed in number of days, hours, minutes, and seconds, and is based on the selected logging interval.

- **Start logging immediately.** If this button is selected, logging will start once you click the **Launch Immediately** button.

- **Delayed start.** Delayed Start allows you to start a logger at some time in the future (for example, at the top of the hour or tomorrow at noon). This is useful if you do not have a laptop or handheld device to bring to the deployment site. The Delayed Start mode is also helpful for synchronizing start times for multiple loggers. Select the date and time you want to start the launch.

- **Hold for later launch.** Use this option to save the launch settings you've specified for a future launch. It does not launch the logger.

- **Time format.** Switch between local time and GMT (UTC). GMT is Greenwich Mean Time, which is also known as Coordinated Universal Time (UTC). UTC is the time based on atomic clocks that is broadcast by government radio stations. Both local time and GMT (UTC) are determined from your computer's date, time, and time zone settings. **Note:** The www.time.gov web site is one resource for accurate time settings based on UTC.

- **Logger date/time and host date/time.** These fields display the date and time according to the logger and computer respectively. **Note:** These times may differ if you disabled "set logger clock with host time on launch."

- **Set logger clock with host time on launch.** This option determines whether the logger's internal clock will be reset to match the host computer clock upon launch. When this setting is enabled (which is the default), it is important to make sure the computer' clock is set to the correct date, time, and time zone before launching the logger. Also check that daylight savings time preferences are correct in the Date/Time Control Panel (if applicable). When this setting is disabled, the logger clock will not be updated.

- **Wrap around when full.** If this box is checked, new data will overwrite the oldest data sequentially one sample at a time when the memory is full. The logger will continue logging indefinitely until the logger is either off-loaded and stopped or the battery fails. If this box is *not* checked, the logger will stop logging when the memory is full and no data will be overwritten.

- **Stealth mode.** This feature disables the LED blink while collecting data. This feature is useful if you do not want a logger deployed in the

field to attract attention. For more information about the LED, consult your logger's manual.

Sensor Information

In the Sensor Information section of the Launch screen, select either Celsius or Fahrenheit to change the current units displayed. Off-loaded data can be viewed in either Celsius or Fahrenheit, regardless of what was selected before launch. The system displays the current logger reading, which is updated approximately once per second.

Launching Multiple HOBO Water Temp Pro Loggers

After you launch a HOBO Water Temp Pro logger, a launch confirmation

message appears. Click the Launch Another button if you wish to launch more than one HOBO Water Temp Pro logger. The launch settings you specified in the previous launch will be repeated in the next Launch screen. This makes it easy to configure multiple launches

with the same parameters. **Note:** The Multiple Launch option on the Logger menu does not work for the HOBO Water Temp Pro logger. Use the Launch Another button instead.

Reading out the HOBO Water Temp Pro Logger

To read out the HOBO Water Temp Pro logger, point the logger's communication window at the IR Basestation window. Click the **Logger** menu, select **HOBO Water Temp Pro**, and then select **Readout**. The software searches for the all loggers within the IR Basestation's view and lists them as detected. If you only are working with one logger, you can stop the search and continue to the readout screens. For more information on using the search feature, see *Multiple Logger Detection*.

If the logger is still collecting data, the following screen appears:
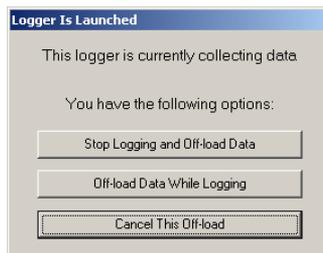
To off-load data, click either **Stop Logging and Off-Load Data,** which means the logger will stop recording data before off-loading, or **Off-load Data While**

Logging, which means the logger will continue to record data in the current deployment while off-loading takes place.

After saving the file, you will be prompted to select the data series you wish to view in a plot. Series selection is the same for all loggers. However, the HOBO Water Temp Pro logger also gives you the option of changing the time displayed in the plot. This does not change the actual time saved in the datafile; it only changes the time used in the presentation of the plot and when exporting data.

Time is shown in hours offset from Universal Coordinated Time (UTC), also known as Greenwich Mean Time (GMT). The time offset listed by default matches the time zone setting used to launch the logger. In this example, the logger was launched in Eastern Standard Time. Therefore, -5 is filled in by default because Eastern Standard Time is five hours behind UTC (GMT) (when daylight savings time is not in effect).

To change the default time offset, enter the number of hours the new time differs from UTC (GMT). For example, to change the time offset in the example above to Pacific Standard Time, enter -8 because Pacific Standard is 8 hours behind UTC (GMT) (when daylight savings time is not in effect). To help make sure you are entering the correct time offset, this screen displays the date and time for the logger's first measurement, or data point, in three ways:

- The time based on the value entered in the "Select time offset from UTC (GMT)" field. This is the time that will be used in the plot.

- The time zone setting used to launch the logger.

- UTC (GMT).

Checking the HOBO Water Temp Pro Logger Status

To check the status of the HOBO Water Temp Pro logger, point the logger's communication window at the IR Basestation window, click the **Logger** menu, select **HOBO Water Temp Pro**, and then select **Status**. (The general Get Status command available from the Logger menu does not work with this logger.) The Logger Status screen shows the current launch status (logging, not launched, waiting for delayed start) and current readings. It also lists other launch parameters including:

- Current battery level

- Available memory and whether Wrap Around When Full is enabled

- Whether stealth mode is enabled

- The current date and time according to the both the logger and the computer currently connected to the logger

- The time logging began

- The NIST information (see the *HOBO Water Temp Pro User's Manual* for details)

You can also change the display of the temperature units and the time format. This will only affect the status display; it will not affect the launch.

Note: The difference in time between the logger and the host computer may fluctuate by a few seconds if the status window remains open for more than a minute. This difference may be even greater if you elected to not set the logger clock with the host time upon launch.

Multiple Logger Detection

Every time you launch, read out, or check status, the software will search for all HOBO Water Temp Pros pointed at the IR Basestation and compile them in a list. You can then select the appropriate logger and continue on with the launch, readout, or status check. Once compiled, the list will be remembered throughout the current BoxCar session. Click Refresh to update the list if you have added or removed loggers. If you are only working with one logger and do not need BoxCar to complete a full search for loggers, you can stop the search and click OK to continue with your task. Whether you stop the search or wait for it to complete, the Stop Search button changes to a button listing the task you selected. In the following example, the Stop Search changed to a Launch button once the search was complete. Click the Launch, Readout, or Status button as appropriate to continue with the task.
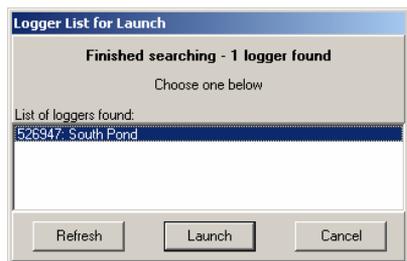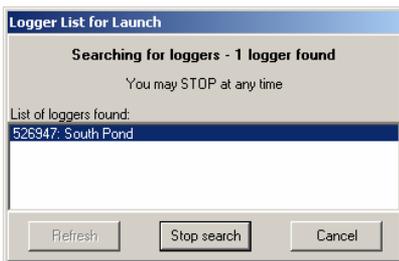
Other HOBO Water Temp Pro menu options

In addition to the Launch, Readout, and Status commands, the following commands are available from the HOBO Water Temp Pro submenu:

- **Options.** Select Options to specify what is included with the default datafile name upon readout. The name can include the logger serial number, deployment number, and time of readout in addition to the description you entered in the launch parameters screen. You can also disable the "Launching will erase data" warning that displays each time you launch the logger.

- **Port**. Use this command to change the port number for the IR Basestation. Do not change the port number with Logger Serial Port setting in the Application Preferences window.

- **About**. This command displays the copyright and version information for HOBO Water Temp Pro component of BoxCar Pro software.

HOBO Weather Station Logger

The HOBO Weather Station logger records numerous properties, including temperature, relative humidity, rainfall, wind speed and direction, and barometric pressure. Smart sensors plug into the data logger and are automatically recognized without complicated wiring, programming, or calibration requirements.

The HOBO Weather Station Logger Launch Dialog

To display the launch dialog, connect a logger to your computer, click the **Logger** menu, and select **Launch**.

This screen contains four sections:

- Logger Information
- Sensor Information
- Launch Parameters
- Deployment Notes

Each section is described below.
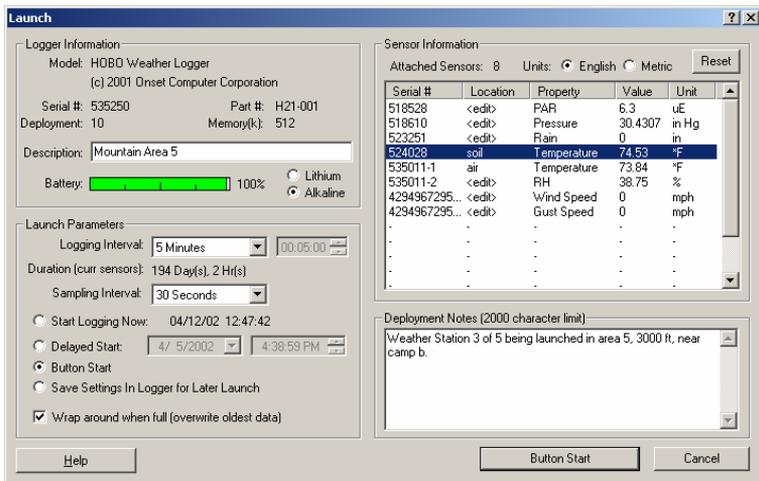
Logger Information

The Logger Information section of the Launch screen displays the type of logger, the logger serial number, part number, and memory capacity. It also displays:

- **Deployment.** This shows how many times the logger has been launched, including current deployment, and is unalterable. Every time the logger is launched the number increases by one.

- **Description.** This field displays the launch description used in the last launch. Type up to 40 characters of text to describe the deployment. The description will be the default prefix for the data file name upon readout, and is displayed above the plot on the readout graph.

- **Battery.** The Battery gauge shows the remaining battery capacity. For lithium batteries, the gauge displays a status of either good or empty. Lithium batteries have a relatively flat discharge curve, which means the voltage does not vary much with use until they fail. Lithium battery voltage is either "good," which represents anywhere from 25 to 100% of capacity remaining, or "empty," which represents 0 to 25% of capacity remaining. Because of the uncertainty in capacity, it is recommended that you begin new deployments with new lithium batteries that you know are at 100% rather than relying on old ones. For alkaline batteries, the gauge displays the percentage of capacity remaining.

  The logger also has a Battery Low status light, which will blink when the battery has 25% or less capacity remaining. Replace the batteries in the logger with new ones when the Battery Low status light blinks.

  Be sure to select the appropriate battery type (lithium or alkaline) when launching the logger. Otherwise, the current battery status will not be accurately reflected in the software and the battery low light may not flash at the appropriate time. For more information, see the *HOBO Weather Station User's Guide*.

Launch Parameters

The Launch Parameters section of the Launch Dialog displays the following fields:

- **Logging interval.** This indicates how often the logger will record data (for example, every five seconds, 30 minutes, hour, etc.) for all attached sensors. The minimum logging interval is 1 second and the maximum is 17 hours, 59 minutes, 59 seconds. Use either the pre-defined logging intervals or select "Custom" and define your own interval in the following format: HH:MM:SS.

- **Duration.** This field displays approximately how long the logger will collect data based on the memory size, the logging interval, and the number of sensors currently connected. The duration is listed in number of days, hours, minutes, and seconds. Note: Battery life may limit the duration before memory is full. Check the *HOBO Weather Station User's Guide* for more information.

- **Sampling interval.** The sampling interval is valid only for sensors that support measurement averaging. See the Sensor Manual to determine if your sensor supports measurement averaging. At the time of printing, the following sensors support data averaging: solar radiation, photosynthetic light (PAR) and barometric pressure. The sampling interval sets how often the sensors will take measurements. When the logging interval is reached and a sampling interval has been selected, all the sampled measurements for the sensor are averaged together and the average is then recorded as one data point. Note that the individual data points that comprise the average are not saved; only the final, averaged data point is saved. If you have at least one sensor that supports measurement averaging, set the sampling interval to one of the pre-defined settings. Valid sampling intervals are between 1 second and 4 minutes, 15 seconds. The sampling interval must be less than or equal to the logging interval. Sampling rates shorter than 1 minute will reduce the logger's battery life. **Important:** If you do not have any sensors that support data averaging, set the sampling interval to "Off" as there will be no benefit and it will reduce the battery consumption.

- **Start Logging Now**. Select this option when you are finished configuring the logger and want to start recording measurements right away. With this option selected, the system will begin logging data from all sensors on the network once you click the Start button on the Launch screen. This start mode is ideal if you launch the logger in the field with a laptop, or if you want to test the logger and its sensors on the bench.

- **Date/time.** The software displays the date and time according to the computer. Upon launch, the logger's clock is set in Coordinated Universal Time (UTC), which is determined from your computer's time, the time zone, and daylight savings time settings. UTC, colloquially known as Greenwich Mean Time (GMT), is the time based on atomic clocks that is broadcast by government radio stations. The www.time.gov web site is one resource for accurate time settings based on UTC. Before launching the logger, make sure your computer's clock is set to the correct date and time, and the time zone and daylight savings time preferences are correct in the Date/Time Control Panel.

- **Delayed Start**. Select this option if you wish to postpone the launch until a specific date and time. Type the desired date and start time in the specified fields. This start mode is useful for synchronizing multiple loggers, or when it is important to start the launch at an exact time. It is also useful if you plan on setting up the logger in the field and do not have a laptop to bring with you. You can add sensors to the logger any time before the specified start time.

- **Button Start**. This option is ideal for launching the logger in the field without a laptop. Configure the logger in the lab or office, transport it to the field and set it up, and then simply press the Start Logging button on the logger itself for 1 second. With this mode selected, you can add a sensor any time before the start button is pressed. This start mode is also useful if you want to trigger the start of a launch on an event.

- **Save Settings in Logger for Later Launch**. Select this option when you simply want to save the current launch settings for a future launch, but not start the launch now. Any customizations, such as descriptions and deployment notes, will also be saved.

- **Wrap around when full.** If this box is checked, new data will overwrite the oldest data sequentially one sample at a time when the memory is full. The logger will continue logging indefinitely until the logger is either off-loaded and stopped or the battery fails. If this box is *not* checked, the logger will stop logging when the memory is full and preserve the acquired data.

Sensor Information

Use the Sensor Information section to verify the correct sensors are connected and measuring properly. Select either English or Metric to change the current unit display in the software. Off-loaded data can be viewed in either Metric or English units, regardless of what is selected before launch.

The Sensor Information section lists the sensors currently connected to the logger. The list is automatically updated whenever a sensor is added or removed. **Note:** If a sensor is removed and then immediately re-inserted, it may not be auto-detected. Click the Reset button to refresh the list of sensors. This works during configuration only; if the logger is recording data, new sensors will not be identified. Also note that for sensors with two measurement parameters

(such as the temperature/RH sensor), both parameters will be displayed. It is not possible to deselect one of the two parameters.

The following details are displayed for each sensor:

- **Serial #**. This column displays the serial number for each sensor, which is a useful way of identifying sensors, particularly if you are using multiple sensors measuring the same property (for example, two sensors both measuring temperature). The serial number is located under the plastic tubing on the sensor cable or on the PVC housing found on some cables. Note that dual sensors (sensors that take more than one type of measurement, such as temperature/RH) have the same serial number, but have a suffix to distinguish between the two properties.

- **Location**. This is a descriptive field you can use to help differentiate between sensors and record where a sensor was placed. For example, type "soil" and "air" to distinguish between two temperature sensors. Edit the field by clicking on it. This opens the Sensor Location dialog box, which lists specific information about the sensor and a field you can use to describe the location. To change the location, type over <edit> with a description of the sensor location (maximum 30 characters), such as air, soil, or 2m height, and then click OK. The description you entered will then appear in the Sensor Information list.

- **Property**. This column lists the type of measurement the sensor is monitoring.

- **Value**. This column shows the current reading. Current values are updated every second.

- **Unit**. This column shows the type of unit for the weather property being measured. Note: Auxiliary units/properties such as dew point are not shown.
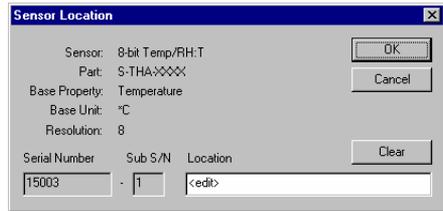
Deployment Notes

Use the Deployment Notes section of the Launch screen to enter information about the system setup at the time of launch, or any other specific notes you want to record. There is a 2000 character maximum (about one page of text). Deployment notes are stored in the logger and can be viewed with the data file when you readout (off-load) data from the logger. Open the View Details screen

and check the Deployment Notes folder for the notes you entered. If you did not enter any notes, the Deployment Notes folder will not display.

Reading out the HOBO Weather Station Logger

To read out the HOBO Weather Station logger, connect a logger to your computer, click the **Logger** menu, and select **Readout**. If the logger is still collecting data, the following screen appears:
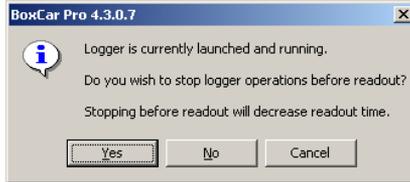
If you want the logger to stop recording data before reading out (off-loading), click Yes. If you want the logger to continue recording data in the current deployment while reading out (off-loading), click No.

After saving the file, you will be prompted to select the data series you wish to view in a plot. Series selection is the same for all loggers. However, the HOBO Weather Station logger also gives you the option of changing the time displayed in the plot. This does not change the actual time saved in the datafile; it only changes the time used in the presentation of the plot and when exporting data.

Time is shown in hours offset from Universal Coordinated Time (UTC), also known as Greenwich Mean Time (GMT). The time offset listed by default matches the time zone setting used to launch the logger. In this example, the logger was launched in Eastern Standard Time.

Therefore, -5 is filled in by default because Eastern Standard Time is five hours behind UTC (GMT) (when daylight savings time is not in effect).

To change the default time offset, enter the number of hours the new time differs from UTC (GMT). For example, to change the time offset in the example above to Pacific Standard Time, enter -8 because Pacific Standard is 8 hours behind UTC (GMT) (when daylight savings time is not in effect). To help make sure you are entering the correct time offset, this screen displays the date and time for the logger's first measurement, or data point, in three ways:

- The time based on the value entered in the "Select time offset from UTC (GMT)" field. This is the time that will be used in the plot.

- The time zone setting used to launch the logger.

- UTC (GMT).

Note: The first time the datafile opens after readout may take a couple of minutes depending on the number of sensors used and the size of the file.

Checking the Weather Station Logger Status

You can check the status of the logger during launch. From the **Logger** menu, select **Get Status**. The Status window shows what state the logger is in: launched, waiting for button start, waiting for a delayed start, or not launched. It also lists:

- Current battery capacity and type

- Description

- Deployment number

- Memory available and whether Wrap Around When Full was selected

- The time for the launch, first sample, and current logger time in both GMT and the time zone used at launch

- Each sensor and its serial number, location description (if any), and current reading

Square-box StowAway Loggers

StowAway loggers have memory sizes up to 32K, alarms, and multiple measurements per sample period. The most popular version of this logger, the StowAway XTI, is shown here.

The Square-box StowAway Launch Dialog

To display the launch dialog, connect a logger to your computer, click the **Logger** menu, and select **Launch**.
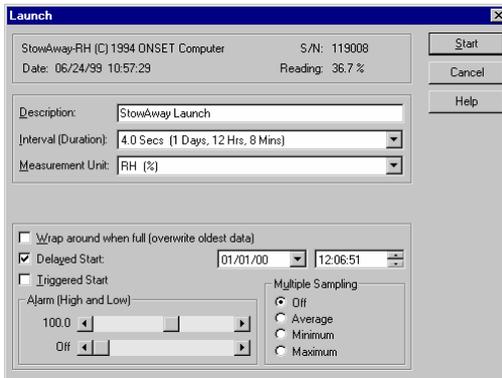
- **Launch Dialog Information.** On the launch dialog, the first line of information identifies the type of logger and its serial number. The date field displays your computer's current date and time. If this is incorrect, consult your Windows manual on how to change your computer's date or time.

- **Reading.** This field displays what the logger is currently reading in the selected Measurement Unit.

- **Description.** The text in the Description box is displayed above the plot on the readout graph. Up to forty characters can be typed in this area.

- **Interval (Duration).** The Interval (time between measurements) and the Duration (amount of time the logger will collect data) are selected here.

- **Add Custom Interval.** To create your own custom interval, select "Add Custom Interval" at the bottom of the interval scroll box. You can designate as many custom intervals as you require (between 0.5 seconds and 9 hours). Custom Intervals are saved for the current session, but disappear when you exit BoxCar Pro.

- **Measurement Unit.** The Measurement Unit box allows you to choose the units displayed in the Reading. This also sets the default units at readout. For example, you can view a temperature graph in either degrees Fahrenheit or degrees Celsius. BoxCar allows you to change the units after reading out data.

- **Wrap around when full.** This allows the logger to record continuously, overwriting the oldest points when it becomes full. The logger will continue logging until interrupted by a readout or launch. On readout, the most recent points will be read out. If this box is not checked, the logger will stop once its memory is full.

- **Delayed Start.** By entering a specific start date and time, Delayed Start will allow you to postpone logging for up to three months after launching your logger. The format for entering dates may change depending on the date and time formats that you have set within BoxCar Pro. Enter this time in the format currently specified in the Date/Time Preferences. Once launched, the logger will flash dimly every four seconds until the start time has been reached and then start logging.

- **Triggered Start.** Selecting Triggered Start will allow you to postpone the launch time of your StowAway until triggered. After the logger has been launched, the StowAway will flash its LED dimly every six seconds until triggered. Once triggered, the LED will flash brightly four times and then continue to flash brightly every time a measurement is taken.

- **Delayed Start after Triggered Start.** Selecting both Triggered Start and Delayed Start causes the StowAway to delay for a specified amount of time after the trigger has been activated but before it starts logging. The time format is displayed in the format currently specified in the Date/Time Preferences.

- **Alarm.** Alarm, when selected, allows you to see if the StowAway has recorded a reading outside of a pre-selected range. The Alarm reads in the units shown in the Measurement Unit box. To set the Alarm, slide the tabs to the desired High and Low values. The Alarms are off when the High tab is slid all the way to the right and the Low tab is slid all the way to the left (the word 'off' will replace the numeric value).

  You can turn the Alarms off independently of each other. For example, if you only want a High alarm, turn off the Low and keep the High on. The various StowAway loggers have different ways of representing

Alarm conditions. Read the individual logger's manual for details. The Alarm data can be seen on the graph after readout. The section *Customizing the View* shows how you can display alarm lines for all loggers.

- **Multiple Sampling.** Multiple Sampling causes the logger to make multiple measurements during an interval and store only the minimum, maximum, or average of the readings. In Multiple Sampling

mode, the logger takes about 100 measurements, evenly spaced in each interval unless the interval is less than one minute. For shorter intervals, the logger will measure once every half second during the interval. Multiple Sampling increases the average current drain of the logger. To minimize current drain, this feature should not be used unless needed.

- **Start.** Click **Start** when you are satisfied with the settings. Do not unplug the logger from the interface cable until BoxCar Pro indicates the launch is complete. Launching your logger will overwrite the previously recorded data. Confirm a successful launch by watching for the logger's LED to blink. Consult the logger's User's Manual for more information on the LED status signals.
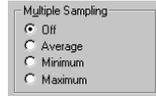
Optic StowAway Logger

The Optic StowAway uses optical communication and requires an Optic Base Station for direct readout with BoxCar Pro.

The Optic StowAway logger uses the same launch dialog as the Square-box StowAway.

Connecting an Optic StowAway for Readout

To read out or launch an Optic StowAway, you must first insert the logger into the Optic Coupler and connect it to the interface cable.

Important Note about Coupler Orientation

The orientation of the coupler is important. The bulge on the side of the coupler is a magnet that enables communication with the Optic StowAway. The bulge must be on the end the logger is connected to!

Also, do not leave the logger in the coupler for extended periods of time because the logger's current drain is higher while it is in the coupler.

Same Launch Dialog as Square-box StowAway

To launch the Optic StowAway, connect the logger to your computer, click the Logger menu and select Launch. BoxCar Pro displays the same launch dialog as the Square-box StowAway.

StowAway TidbiT and TidbiT XT Loggers

TidbiTs are another variation of the StowAway design. Two versions are available. One has an internal sensor, and the other has a sensor in its external probe. Both loggers are compatible with the Optic Shuttle.

The StowAway Tidbit uses the same Base Station as the Optic StowAway but with a special TidbiT coupler.

Note about Coupler Orientation

The orientation of the coupler is important. The coupler contains a magnet (the bulge on the side), that enables communication with the logger. Be sure to orient the

logger so that the loop on the side of the StowAway TidbiT fits through the pin on the coupler. When using the StowAway TidbiT XT, align the arrow on the side of the logger with the pin.

Do not leave the logger in the coupler for extended periods of time because the logger's current drain is higher while it is in the coupler.

Bright Sunlight Can Affect Communication

If communications with the TidbiT are attempted in bright sunlight, the communications with the TidbiT may be compromised. This problem is eliminated by shading the TidbiT and coupler.

Same Launch Dialog as Square-box StowAway

Connect the logger to your computer and select Launch from the Logger menu. The Square-box StowAway launch dialog is displayed. See the *Square Box StowAway Loggers* section on page 60 for more information on this launch dialog.

HandCar

HandCar is software for Palm™ handheld computers that allows you to launch and readout HOBO and StowAway loggers in the field, and then upload the datafiles from the Palm handheld to BoxCar.

Off-loading Data from HandCar

To upload data files to BoxCar Pro:

1. Place the Palm handheld into the communications cradle or connect it to the Palm-to-PC cable, then connect the cradle or cable to your computer (see the HandCar user's manual for the computer interface requirements for your version of HandCar).

2. Disable the HotSync Manager. If the HotSync Manager icon is on your system tray (on the taskbar), right-click the icon and select Exit. BoxCar Pro and HotSync Manager cannot use the same COM port at the same time.

3. Turn the Palm handheld computer on and start HandCar.

4. Start BoxCar Pro.

5. From the HandCar Data menu, select Upload Datafiles.

6. Watch HandCar Status until it displays "Waiting for host…" and then click the Logger menu in BoxCar Pro and select Readout HandCar.

7. The file transfer begins. During the transfer, both HandCar and BoxCar Pro display status information. When the transfer is done, HandCar displays "Upload Complete" in the Status field and BoxCar Pro opens the AutoSave dialog. Click Yes to save all data files with a numeral appended to the file name to either the directory where BoxCar was installed or the last directory where a datafile was saved. Click No to save each data file individually, which allows you to choose the file name.

After upload, BoxCar Pro does not reset the internal clock of the Palm handheld to the PC clock (BoxCar Pro does reset the clocks of the HOBO Shuttle and Optic Shuttle).

For more details on launching and reading out with HandCar, refer to the HandCar manual.

HOBO Shuttle

The HOBO Shuttle allows retrieval of data without the necessity of either bringing the loggers back from the field or taking a computer into the field. The HOBO Shuttle's small size and water-resistant case make it convenient to use.

Off-loading Data from the Shuttle

To off-load data from the HOBO Shuttle, select HOBO Shuttle Readout from the Logger menu. BoxCar Pro will connect to the HOBO Shuttle and begin to off-load the data files. By default, BoxCar Pro displays the File Info box for each file in sequence and prompts you to save datafiles individually. Turn on AutoSave by clicking yes when Boxcar Pro displays the AutoSave dialog. BoxCar Pro will then save the files for you and append a numeral to the end of each file name.
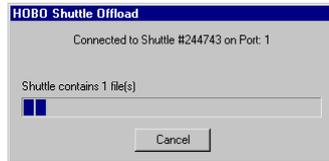
After the files have been saved, BoxCar Pro will relaunch the Shuttle. It compares the HOBO Shuttle's current time to the host computer's clock and tells you what the difference was. You may want to note this time difference to help interpret your data later. It then synchronizes the HOBO Shuttle's clock to your computer's clock. BoxCar Pro also checks the HOBO Shuttle's battery and gives you the battery level percentage. When the battery voltage is low, a warning is displayed indicating that you should change the battery. Make sure you change the battery as advised to avoid data loss or corruption. For the latest recommendations for battery replacement, refer to the main Onset website at www.onsetcomp.com, or see www.hobohelp.com if you purchased the software through an Onset Authorized Dealer.
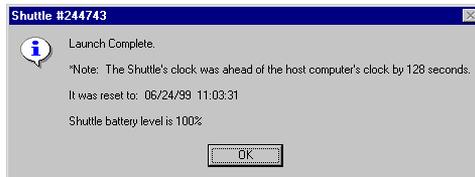
Synchronize the Shuttle's Clock Before Reading Loggers

You can synchronize the shuttle's clock by selecting Launch from the Logger menu. BoxCar Pro connects to the HOBO Shuttle, synchronizes the HOBO Shuttle's clock to the PC's clock, and displays the battery's percentage level. Be sure your PC clock is set to the correct time before launching your shuttle.

The Optic Shuttle

The Optic Shuttle can be used to off-load Optic StowAways, StowAway TidbiTs, and TidbiT XTs in the field. The Optic Shuttle is then brought back and read out by BoxCar Pro. The picture shows an Optic Coupler attached to the shuttle. (Use the TidbiT Coupler to connect to a TidbiT.)

Off-loading Data from the Shuttle

Connect the Optic Shuttle to the Optic Base Station using the Optic Coupler (the coupler's orientation doesn't matter), and select Optic Shuttle Readout from the Logger menu. The program prompts you to connect the Optic Shuttle to the displayed port number and then to press the button on the Optic Shuttle to off-load. **Note:** If you select Optic Shuttle Readout when the optic shuttle is not connected to the computer, BoxCar may close. Reopen BoxCar and make sure the Optic Shuttle is connected properly before selecting Optic Shuttle Readout.

The Optic Shuttle's orange light will blink indicating that it is attempting to communicate. After it makes contact with BoxCar Pro, it starts off-loading datafiles.
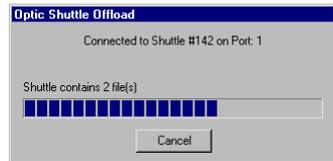
Once the data has been off-loaded, BoxCar Pro will prompt you to save each datafile. (Choose AutoSave to save all files at once.) After the files have been saved, BoxCar Pro sets the Optic Shuttle's current time to the host computer's current time. It reports the difference between the Optic Shuttle's current time and the computer's clock, and synchronizes the Optic Shuttle's clock to your computer's clock. Note this time difference to help interpret your data later.

BoxCar Pro will prompt you to individually save each of the data files from the Optic Shuttle.

It's a good idea to re-synchronize the Optic Shuttle's clock before reading out loggers. To do this, read out the shuttle again. After any data has been read out, BoxCar Pro synchronizes the clock to the PC's clock. Be sure your PC clock is set to the correct time before doing this readout. If the data from the Optic Shuttle has already been saved, you do not need to save it again (select Cancel in the Save As dialog).

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Chapter 4
Other Functions

This section explains additional features available in BoxCar Pro.

Copy and Application Preferences

Copying pictures

To copy your graph as a bitmap to the Windows Clipboard, click the **Edit** Menu and select **Copy**.
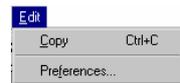
Changing the Application Preferences

Click the **Edit** menu and choose **Preferences** to customize aspects of the BoxCar Pro program.
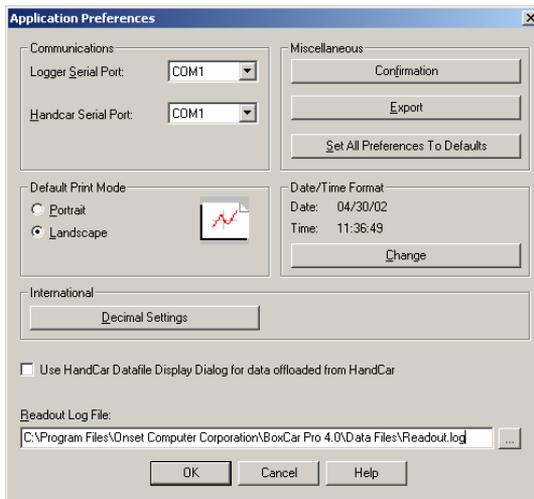
- **Communications.** Use the Logger Serial Port box to choose the default communications port that BoxCar Pro will use when reading out and launching most loggers. For the HOBO LCD Temp/RH and Water Temp Pro loggers, do not use this preferences window for port configuration. Instead, click the **Logger** menu, select the Logger name, and then click **Port**. Use the HandCar Serial Port to choose the default port that HandCar will use.

- **Confirmation.** Click the Confirmation button to enable and disable confirmation dialogs.
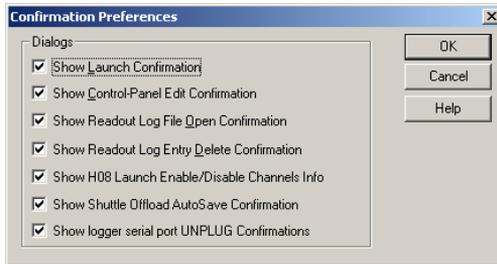
The Launch Confirmation warns you that you will erase all data when launching.

The Control-Panel Edit Confirmation warns that you are making a global Windows Control Panel change (such as changing the Date/Time Format), which may affect other programs.

The Readout Log warnings alert you when you might be loading potentially invalid data and when you are removing a log entry.

The Enable/Disable Channels message informs you that you can change the types of measurements being recorded.

The Shuttle Off-load AutoSave Confirmation prompts you for the autosave option during shuttle readout.

The logger serial unplug confirmation informs you when to unplug the serial cable from some loggers. This is important because some laptops employ power conservation features that shut off the communications port within seconds after launch, causing the logger to stop logging. This message keeps the port open while you unplug the logger ensuring that the logger will continue logging.

- **Export.** Click the Export button to change File Export preferences. These are the same settings available when selecting Preferences from the Export window. See the *Exporting Plot Data* section on page 18 for details on Export Preferences.

- **Set All Preferences to Defaults.** Click this button to return all customizable preferences to their original settings.

- **Default Print Mode.** Choose either Landscape or Portrait default printing.

- **Date/Time Format.** This area shows the currently selected date and time format. To modify date and time settings, click Change.

- **Decimal Settings.** Click this button to change the default decimal settings used by the Windows Control Panel, which is a global change that may affect other programs.

- **Use HandCar Datafile Display Dialog.** Click this box to toggle the Datafile Display message when uploading from HandCar to BoxCar.

- **Readout Log File.** The readout log file text box displays the name of the text file holding the current readout log. To change the file used for the readout log, click the button at the right of the text box to browse to a new file. For more information about the readout log, see the section *Keeping Track of Your Datafiles* on page 22.

Multiple Launch

To launch multiple loggers, click the Logger menu and choose Multiple Launch (Ctrl+M). Multiple Launch is useful when a study requires a number of loggers to start logging at the same time. **Note:** The HOBO LCD Temp/RH and Water Temp Pro loggers do not support the general Multiple Launch command. To launch multiple HOBO LCD Temp/RH or Water Temp Pro loggers with the same setting, launch one as normal. Then upon successful launch, click Launch Another instead of Done. The HOBO Weather Station logger is not supported by multiple launch.

Multiple Launch Dialog

The Multiple Launch dialog displays two options: Use Existing Logger Description or Enter a Description. If you want the description in each logger to hold unique identifying information such as logger location, click the "Use Existing Logger Descriptions" option. This defaults to the description already entered for each logger, which can be edited. The other option (Enter a Description) allows you to enter a common description field for all loggers launched.
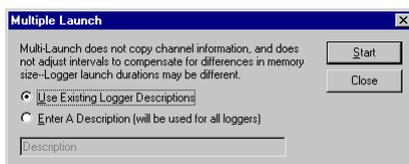
Connect a Logger and Click Start

Click Start to display a dialog indicating a new logger type has been found (as the first logger in this multiple launch it is considered new). Multiple Launch then downloads parameters from the current logger and displays a launch dialog.

When the launch dialog displays, fill in parameters and click Start. The Multiple Launch Dialog displays again. Attach another logger and click Start again. The

launch interval (and delayed start time interval) and other settings will be preloaded into the dialog for the new logger. If BoxCar Pro discovers a change of logger type during multiple launch, it displays the New Logger Type alert, warning you to check the launch parameters. To expedite the process during multiple launching, you should group loggers by type.

When you have finished launching all the loggers, click Close on the Multiple Launch dialog.

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