HR2000 High-Resolution Spectrometer

The HR2000 High-Resolution Spectrometer was designed for hassle-free instrument-to-PC interfacing. An analog-to-digital (A/D) converter is necessary to interface all Ocean Optics spectrometers to PCs. Using the HR2000 eliminates the need for installing A/D converters into a PC's motherboard and for searching for available IRQs and I/O ranges.

The HR2000 is easy to set up, allowing the user to start collecting data within minutes. This document provides instructions on installing and configuring the software and interfacing the HR2000 to your PC. For detailed instructions on using OOIBase32, refer to the OOIBase32 Spectrometer Operating Software Manual, which can be found on the Software and Resources Library CD and our web site. If you need step-by-step directions for using spectroscopic accessories, again, refer to the technical documents found on the Software and Resources Library CD and our web site.

Inside the shipment box is a bubble-wrapped package. It contains the Wavelength Calibration Data Sheet wrapped around the Spectrometer Configuration diskette, the USB cable that connects the spectrometer to a PC and a static-shielded bag. Inside the silver static-shielded bag is the HR2000 spectrometer. You will need all of these to get started.

Interfacing Options

You can interface the HR2000 to a PC in a variety of ways. Because the HR2000 has both a USB and a serial port, you have the option of connecting the HR2000 to a desktop or notebook PC via a USB port or connecting it to a desktop, notebook or handheld PC via a serial port. The requirements for each interface are listed in the chart below.

Computer	Operating System Requirements	Cable Needed
Desktop PC via USB Port	Windows 98, Windows ME and Windows 2000 Operating Systems	USB-CBL-1
Desktop PC via Serial Port	Windows 95, Windows 98, Windows 2000, Windows NT and Windows ME Operating Systems	USB-CBL-PC
Notebook PC via USB Port	Windows 98, Windows ME and Windows 2000 Operating Systems	USB-CBL-1
Notebook PC via Serial Port	Windows 95, Windows 98, Windows 2000, Windows NT and Windows ME Operating Systems	USB-CBL-PC
Handheld PC via Serial Port	Windows CE 3.0 Operating System	USB-CBL-H

Install Software

When you get your HR2000, you might be tempted to connect the HR2000 to your PC before doing anything else. However, you must install the latest version of OOIBase32 Spectrometer Operating Software first.* Before installing OOIBase32, make sure that no other applications are running. From the Software and Resources Library CD, navigate to Install OOIBase32.

1. Execute Setup.exe. At the "Welcome" dialog box, click **Next>**.
2. At the "Destination Location" dialog box, accept the default or choose **Browse** to pick a directory. Click the **Next>** button.
3. At the "Backup Replaced Files" dialog box, select either Yes or No. We recommend selecting **Yes**. If you select Yes, you can choose Browse to pick a destination directory. Click **Next>**.
4. Select a Program Manager Group. Click **Next>**. At the "Start Installation" dialog box, click **Next>**.
5. Follow all prompts regarding the Spectrometer Configuration diskette that came with your system.
6. At the "Installation Complete" dialog box, choose **Finish>**.
7. When prompted to do so, restart your computer when the installation is complete.
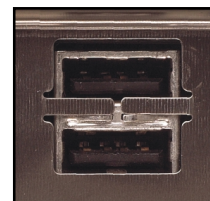8. Do not run OOIBase32 at this time.

*   If you connected the HR2000 to your PC before you installed OOIBase32, you will NOT be able to use your spectrometer. See page 4 for details on how to rectify an incorrect installation.

Using the USB Option: Desktop and Notebook PCs

Connect the HR2000 to your PC

Now connect the HR2000 to your PC. To use the USB port on the HR2000, the PC to which it is interfacing must have the Windows 98, Windows ME or Windows 2000 Operating System.

1. The USB port on your PC can supply sufficient power to the HR2000 and up to four HR2000 channels.
2. Find the USB cable (item code USB-CBL-1) that came with your shipment. Insert the square end of the cable into the side of the HR2000 spectrometer. Insert the other end into a USB port on your PC (picture at right is a USB slot on a PC).
3. If you installed OOIBase32 correctly, an Add New Hardware Wizard message appears telling you that the HR2000 was successfully loaded.

Configure Software

Wait a minute or two between connecting the HR2000 to your PC and starting any software. After a couple of minutes, navigate to the OOIBase32 icon and select it. You need to configure OOIBase32 before using the HR2000. (For details on using OOIBase32, refer to the OOIBase32 Spectrometer Operating Software Manual, which can be found on the Software and Resources Library CD and our web site.)

Operator and Serial Number Dialog Box

First, a prompt to enter a user name and software serial number appears. Some data files will include this information in the header.
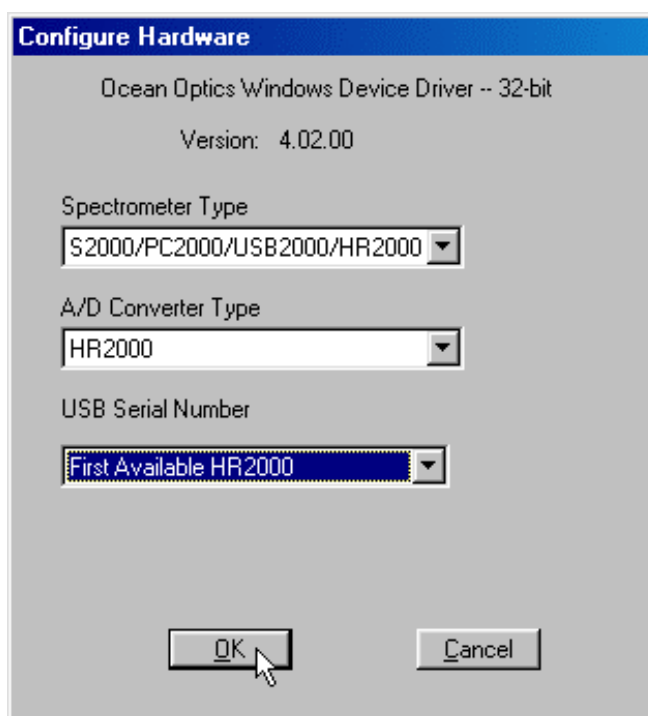
Default Spectrometer Configuration File

Next, a message appears asking you to select a default spectrometer configuration file. Navigate to the OOIBase32 directory and choose the file with **.spec** as the extension. The **.spec** extension is preceded by the serial number of your spectrometer (HRA001.spec is an example of a spectrometer configuration filename).

Configure Hardware Dialog Box

1. Next, the Configure Hardware dialog box opens. The parameters in this dialog box are usually set only once -- when OOIBase32 is first installed and the software first opens.
2. Next to Spectrometer Type, choose **S2000/PC2000/USB2000/HR2000**.
3. Next to A/D Converter Type, choose **HR2000**.
4. Next to USB Serial Number, choose your HR2000. These are the only parameters for your system.
5. Your spectrometer should now be acquiring data and responding to light.

Spectrometer Configuration Dialog Box

Select **Spectrometer | Configure** from the menu and set system parameters. In the Wavelength Calibration page, the coefficients for your system were loaded as part of the .spec file. Under Spectrometer Channel, make sure that both Master and the Enabled box are selected. In the A/D Interface page, enter the same values as you did in the Configure Hardware dialog box. When you exit OOIBase32, this data is stored in the the .spec file.

OOIBase32 Settings Dialog Box

Choose **Edit | Settings** from the menu to set OOIBase32 parameters in the OOIBase32 Settings dialog box. Go through this dialog box to select options for saving, opening, and printing data; to choose wav sound files for various program events; to configure default setting files; and to select other important options such as storing data, copying data and choosing warning messages.

Configure Data Acquisition Dialog Box

Finally, select **Spectrum | Configure Data Acquisition** from the menu to open the Configure Data Acquisition dialog box and to set your data acquisition parameters such as the integration time, averaging and boxcar smoothing, and several other parameters.

Your HR2000 can connect to any PC that 1) uses Windows 98/ME/2000 Operating System and 2) has OOIBase32 installed and configured for use with your HR2000 spectrometer. If multiple PCs meet these two qualifications, you can switch your HR2000 among them. When you connect the HR2000 to any computer that has previously been set up properly and you open OOIBase32 software, you can receive data immediately.

Connect Spectroscopic Accessories

To find detailed information on connecting and operating sampling optics such as light sources, sampling chambers, probes, fibers, or any other Ocean Optics spectroscopic accessory, check the *Software and Resources Library* CD or our web site at www.OceanOptics.com/Technical/OperatingInstructions.asp for instructions on using your spectroscopic accessory.

Start Software and Receive Data

Run OOIBase32 in Scope Mode and take a dark reference spectrum. Choose the absorbance, transmission, or relative irradiance mode to take your measurements. For detailed information on OOIBase32 functions and features and for an Experiment Tutorial, refer to the OOIBase32 Spectrometer Operating Software Manual.

Rectifying an Incorrect Installation

If you connected the HR2000 to your PC before you installed OOIBase32, you will not be able to use your spectrometer. You will receive an **Add New Hardware Wizard** message box as your computer tries to find the device driver necessary for it to interface to the HR2000. Ultimately, you will get a message that tells you that Windows has not installed a driver for the device. Also, if you have an older version of OOIBase32, you will have to uninstall it and install the latest version. To rectify an incorrect installation, follow these steps:

If you connected HR2000 before installing OOIBase32
1. Navigate to your computer's Device Manager. For Windows 98 systems, right click on My Computer, select Properties and click on the Device Manager tab. For Windows 2000 systems, right click on My Computer, select Properties, select the Hardware tab and click on the Device Manager button.
2. Scroll down until you see Other devices. Select the "+" sign to the left of Other devices.
3. Under Other devices, you will see Ocean Optics HR2000 next to a large question mark. Select Ocean Optics HR2000. Now select the Remove button at the bottom of the dialog box. Click OK.
4. A warning box asks if it is okay to remove the Ocean Optics HR2000 device from your system. Click OK.
5. Unplug your HR2000 from your PC. Follow directions starting with **Connect the HR2000 to your PC** on page 2.

If you have an older version of OOIBase32
If the PC you want to use to interface to your HR2000 already has an older version of OOIBase32, you must uninstall the older version of OOIBase32 and install the latest version of OOIBase32. No spectral data files will be lost during an un-installation process.
1. Select the Start button on your Windows task bar. Choose **Settings | Control Panel | Add/Remove Programs**.
2. Select **OOIBase32** from the list.
3. For Select Uninstall Method, choose **Automatic** and click **Next>**.
4. For Perform Rollback, select **No** and click **Next>**. Click **Finish**. If prompted, restart your PC.
5. Follow the directions starting with **Install Software** section on page 2.
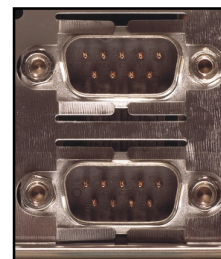
Using the Serial Interface Option: Desktop and Notebook PCs

The HR2000 also has a serial port for interfacing the spectrometer to PCs, PLCs and other devices that support the RS-232 communication protocol. When using the serial port on the HR2000 to connect to a serial port on a PC, a separate serial cable with adapter block (item code USB-CBL-PC) and external power supply (item code USB-CBL-PS) must be used.

Connect the HR2000 to your PC

Connect the HR2000 to your PC. To use the serial port on the HR2000, the PC to which it is interfacing must have the Windows 95/98/ME or Windows 2000/NT Operating System.
1. Connect the adapter block and 10-pin end of the serial cable to the HR2000 and the DB9 end to your PC (picture is a serial port on a PC).
2. Note the serial port number (also called COM Port) on the PC to which you are interfacing. (Some PCs may not have numbered ports.)
3. Plug the power supply into an outlet and connect it to the HR2000.

Install Software

Before installing OOIBase32, make sure that no other applications are running. From the Software and Resources Library CD, navigate to Install OOIBase32.
1. Execute Setup.exe. At the "Welcome" dialog box, click **Next>**.
2. At the "Destination Location" dialog box, accept the default or choose **Browse** to pick a directory. Click the **Next>** button.
3. At the "Backup Replaced Files" dialog box, select either Yes or No. We recommend selecting **Yes**. If you select Yes, you can choose Browse to pick a destination directory. Click **Next>**.
4. Select a Program Manager Group. Click **Next>**. At the "Start Installation" dialog box, click **Next>**.
5. Follow all prompts regarding the Spectrometer Configuration diskette that came with your system.
6. At the "Installation Complete" dialog box, choose **Finish>**.
7. When prompted to do so, restart your computer when the installation is complete.

Configure Software

Navigate to the OOIBase32 icon and select it. You need to configure OOIBase32 before using the HR2000. (For details on using OOIBase32, refer to the OOIBase32 Spectrometer Operating Software Manual, which can be found on the Software and Resources Library CD and our web site.)

Operator and Serial Number Dialog Box
First, a prompt to enter a user name and software serial number appears. Some data files will include this information in the header.

Default Spectrometer Configuration File
Next, a message appears asking you to select a default spectrometer configuration file. Navigate to the OOIBase32 directory and choose the file with **.spec** as the extension. The **.spec** extension is preceded by the serial number of your spectrometer (HRA001.spec is an example of a spectrometer configuration filename).
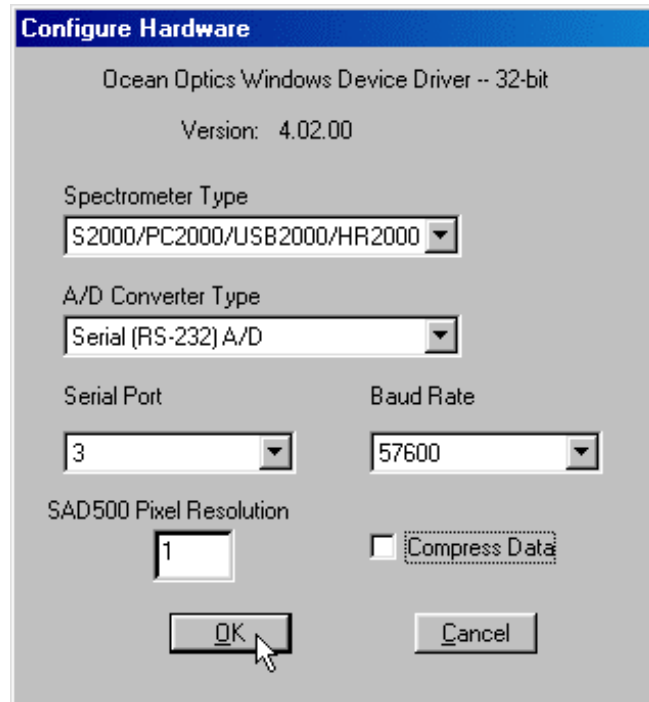
Configure Hardware Dialog Box

After restarting your computer, navigate to and select the software's icon. The first time you run the software after installation, select settings in the Configure Hardware dialog box. Select **Configure | Hardware** from the menu. The parameters in this dialog box are usually set only once -- when the software is first installed and runs.

1. Under Spectrometer Type, select **S2000/PC2000/USB2000/HR2000**.
2. Under A/D Converter Type, choose the **Serial (RS-232) A/D** option even though HR2000 is listed.
3. Under **Serial Port**, choose the COM port number your computer is using to interface to your HR2000. See the Troubleshooting section below to determine the COM Port.
4. Under **Baud Rate**, select the speed at which the HR2000 will operate. (We recommend 115,200 baud.)
5. Under **Pixel Resolution**, enter resolution values from 1 to 500. This value specifies that every nth pixel of the spectrometer is transmitted from the HR2000 to the PC. By sacrificing resolution, you gain speed. The transfer of one complete spectra requires ~0.3 seconds when communicating at 115,200 baud rate. If you need your information in <0.3 seconds, increase the resolution or enable data compression.
6. Enable the **Compress Data** function to minimize the amount of data transferred over the RS-232 connection. Transmission of spectral data over the serial port is a relatively slow process. Enabling this function ensures that every scan transmitted by the HR2000 will be compressed, greatly increasing the data transfer speed of the HR2000.
7. For your setup, only these parameters apply to your system. Click **OK**.

Spectrometer Configuration Dialog Box

Select **Spectrometer | Configure** from the menu and set system parameters. In the Wavelength Calibration page, the coefficients for your system were loaded as part of the .spec file. Under Spectrometer Channel, make sure that both Master and the Enabled box are selected. In the A/D Interface page, enter the same values as you did in the Configure Hardware dialog box. When you exit OOIBase32, this data is stored in the the .spec file.

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<u>**Configure Data Acquisition Dialog Box**</u>
Finally, select **Spectrum | Configure Data Acquisition** from the menu to open the Configure Data Acquisition dialog box and to set your data acquisition parameters such as the integration time, averaging and boxcar smoothing, and several other parameters.

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Troubleshooting

Occasionally, there will be problems associated with your PC configuration and the software. Here are a few tips to assist you.

♦ To ensure that the software and hardware are in-synch, exit the software, cycle power on the HR2000, and restart the software.

♦ In Windows 95/98, you can find out your Serial Port (or COM Port) number by selecting Start | Settings | Control Panel. Then double-click on the System icon and select the Device Manager tab. Double-click on Ports (COM & LPT) to display the COM port numbers. Ensure that there is no yellow or red warning sign next to the COM Port you are attempting to use.

♦ If the ports on your PC are not labeled and you don't know which COM port you are using for your HR2000, you may have to resort to trial and error. If you choose the wrong serial port number, you will not see a dynamic trace responding to light near the bottom of the displayed graph. Instead, you will see a straight line at 0 counts.

♦ On some computers, users may have to disable any virus protection software to ensure timely and complete transfer of the data.