LOGGER$_{2100}$

**Data Acquisition Software for
Microsoft Windows
(98, NT, ME, 2000, XP)**

Software User's Manual

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INTRODUCTION

There are two basic software packages produced to acquire data from the 2100 series of irradiance and radiance sensors. This manual covers the software package **LOGGER$_{2100}$,** written to operate under Microsoft Windows (Win98, WinNT, WinME, Win2000).

LOGGER$_{2100}$PPC software package was specifically written for use with the PocketPC. The term "PocketPC" designates a palm-sized computer that runs Microsoft's PocketPC operating system (also known as Windows CE 3.0). Instructions for the installation and use of this software are found elsewhere. **Palm$_{light}$** is the package for use with Palm OS devices.

Installation

The files needed to begin the software installation are found on the provided CD-ROM. The installation process begins with running *Setup.exe*. Once the setup has begun, the user will be given the opportunity to change the default installation directory (Figure A). Setup then proceeds without further dialog.
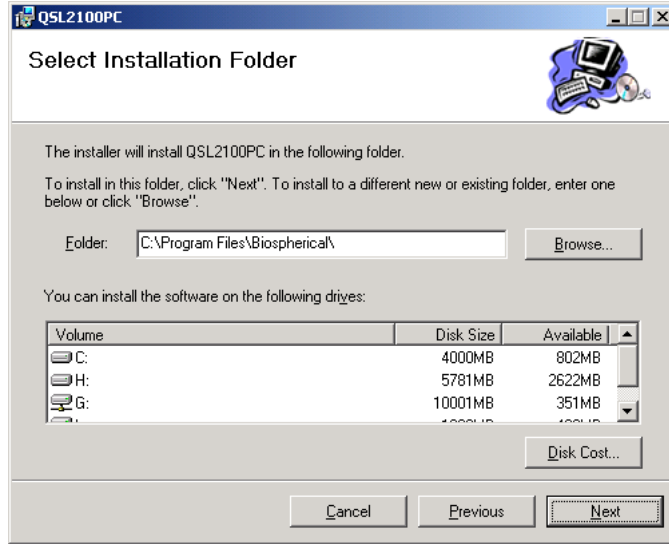
Figure A. *The choice of directory will not affect the operation of the software. A shortcut to run the program will be placed in the Windows "Start" menu during installation, and on the desktop.*

> **Be certain to connect the instrument to the computer using a serial cable!**

Starting Up The Software

After installation, double-clicking the Logger$_{2100}$ shortcut will launch the software and it will begin to search serial ports for a connected instrument. A COM port does not have to be specified. The software will search all available ports for the instrument (Figure B).

Figure B. *The software will automatically search all available ports for the instrument.*

When the instrument is located, the software will display identification and configuration information (Figure C).
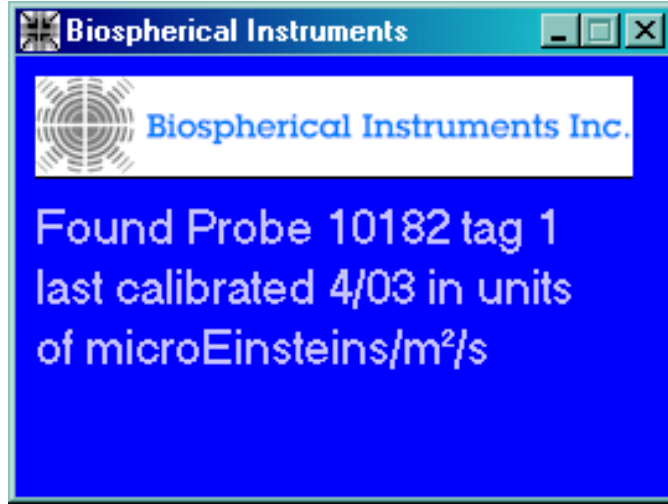
Figure C. *When an instrument is detected, the software will query the instrument for ID and calibration information that is stored in non-volatile memory onboard the instrument at time of manufacture.*

Lastly, a data display screen (Figure D) will appear showing instantaneous readings and three command button options. These three buttons control the behavior of the software. Clicking the button labeled "End" will close down the software and disconnect the instrument from the COM port. Selecting "Configure" will open a new "Probe Details" dialog window (Figure E).

Figure D. *Initial data display begins after the software queries the probe for ID and calibration information.*
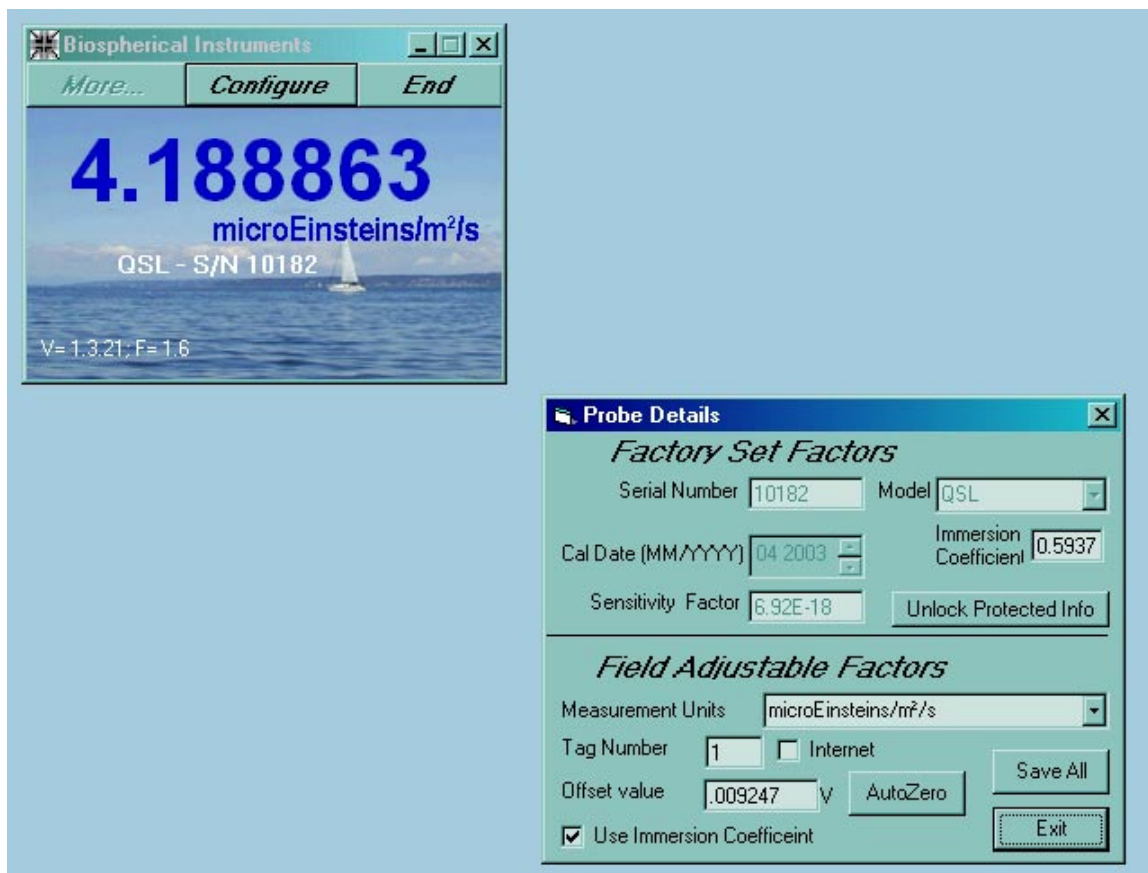
*Figure E. The "Configure" button will take the user to a new **Probe Details** window with many user-definable options.*

Probe Details Display

Factory Set Factors. The instrument is shipped calibrated and ready to use. The values displayed in this window are stored in non-volatile memory in the instrument and returned to the software during the initial ID and calibration query at the start. It is recommended that the user not adjust these values because modifications could affect the calibration of the instrument. To help avoid accidentally changing these factors, they are protected. They may be released for editing by pressing the "Unlock Protected Info" button.

Field Adjustable Factors. Field Adjustable Factors, such as measurement units, are options that are easily changed to suit the needs of the user. The ID or calibration of the instrument will not be affected, but the units used in the operation of the instrument will be adjusted as desired. Only appropriate measurement units will be listed in the drop down menu of the combo box.

The dark **Offset Value** may be edited from this window. The "dark offset" or "dark voltage" or "dark current" or "the dark" is the baseline reading from the instrument when there is no light. Variability in dark voltages is most always a function of instrument temperature. Dark voltages are almost always small. Over time or with changing temperature conditions, the dark offset value may deviate

from the factory value. If this occurs, you may correct the dark offset by darkening the collector (e.g. a very thick black cloth or layers of aluminum foil) and then clicking the "Auto Zero" button. A series of readings will be made, averaged, and saved as a new dark offset.

The **Immersion Coefficient** checkbox should be checked when measurements are to be made under water. When the immersion coefficient box is checked, an extra factor will be applied to the instrument's calibration factor to account for differences between air and water, such as index of refraction.

After any changes to the instrument configuration have been made, the "**Save All**" button should be clicked. This will write any changes made to the instrument's non-volatile memory.

Clicking the "**Exit**" button will return the user to the data display screen. If any changes have not been stored to memory, a confirmation message will be displayed.

Recording Data/Data Format

Pressing "**More**" from the main display will launch a new window that will plot the time series of the measurements and allow the data to be stored in a file (Figure F). Note that in addition to continuous sampling, the software provides an editable combo box to select working with averages, either 10 seconds or 1 minute intervals. To start recording data, simply press the "Start Recording" command button. A dialog box will open (Figure G) with a suggested file name based on the date and time. Data will be stored as ASCII text in a comma-separated format ("CSV"). After an initial row of ID information, data are stored in sequential readings, one row at a time. In the data rows, the first number is the time stamp indicating when the data point was recorded. The second value is the actual measurement from the instrument in calibrated units.

For recording of longer time series of data, the software provides the option of closing the current data file and reopening a new file at midnight. Selecting this checkbox provides an extra level of surety that a large data set will not be compromised in the event of an instrument, computer, or power failure.

Figure F*. The main data display. Pressing Start Recording opens a data file and allows recording of the time series of measurements.*

Figure G. *"Open file for recording" dialog box." The suggested file name is based on the date and time the "Start Recording" button was selected.*

Plotting Features

The plotting routines used in the Logger$_{2100}$ package support an extensive list of options that is revealed with a "right-mouse-click" on the plot (Figure H). These

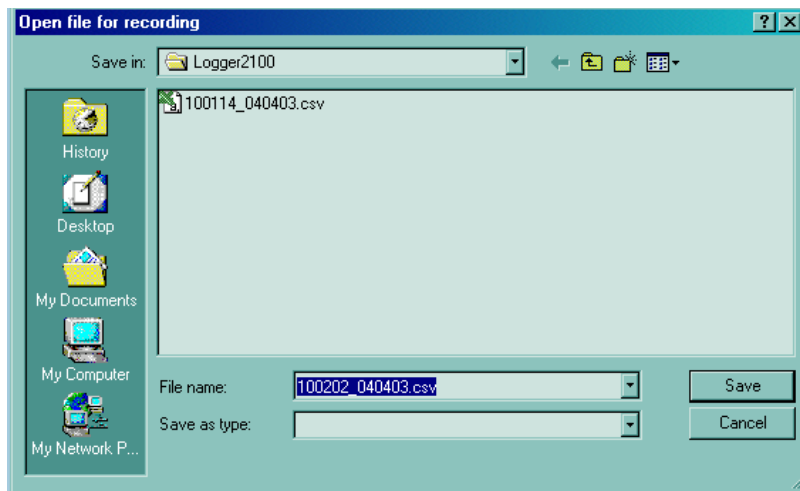may be adjusted individually, or *en mass* through the customization dialog
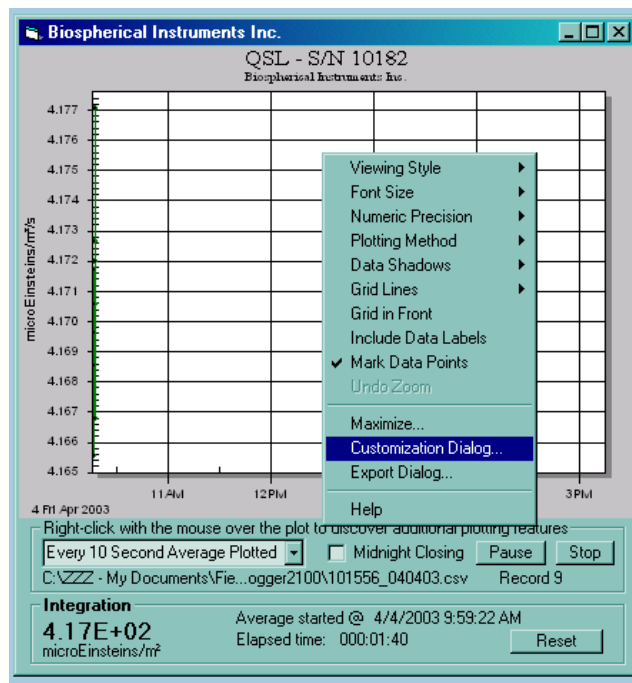(Figure I)

Figure H. *Clicking the plot screen with the right-mouse-button reveals a menu of options that may be adjusted as desired.*

Figure I. *Selecting the "Customization Dialog" option allows greater control over the format of the plot as well as plot titles.*

The plot image itself may be exported to a file or the clipboard by selecting "Export Dialog" and adjusting the output to the desired format and destination (Figure J). In addition to the plot image, a text file of the data used to create the image may be exported, as needed.

Figure J. *Selecting the "Export Dialog" option allows saving the plot to a file, printer, or clipboard. Exporting to the clipboard is a powerful feature – from there, the image may be incorporated into other documents (e.g. a data report) quickly and easily.*

Troubleshooting

```
                    ┌─────────────────┐
                    │ Start Logger2100│
                    └─────────────────┘
                             │
                    ┌─────────────────┐
                    │ Check the connections
                    │      (again)     │
                    └─────────────────┘
                             │
         No        ◇ Does it ◇    Yes        ┌────────┐
         ←─────────◇  work?  ◇──────────────→│  Done  │
                    ◇────────◇               └────────┘
                             │
                    ┌─────────────────┐
                    │ Use HyperTerminal to test
                    │  communications  │
                    └─────────────────┘
                             │
         No        ◇ Does it ◇    Yes
         ←─────────◇  work?  ◇──────────────┐
                    ◇────────◇              │
                             │     ┌─────────────────┐
                             │     │ Completely Uninstall
                             │     │ Logger2100, Reboot,
                             │     │  and Reinstall   │
                             │     └─────────────────┘
                             │              │
  ┌─────────────────┐        │      No  ◇ Does it ◇  Yes
  │ Install software on a    │      ←───◇  work?  ◇────→
  │   different PC  │        │          ◇────────◇
  └─────────────────┘        │
           │                 │
    No ◇ Does it ◇ Yes       │
    ←──◇  work?  ◇───┐       │
       ◇────────◇    │       │
           │         │       │
  ┌─────────────────┐│       │
  │ Use HyperTerminal│       │
  │   to test        │       │
  │ communications   │       │
  └─────────────────┘│       │
           │         │       │
    No ◇ Does it ◇ Yes       │
    ←──◇  work?  ◇───┐
       ◇────────◇    │
```
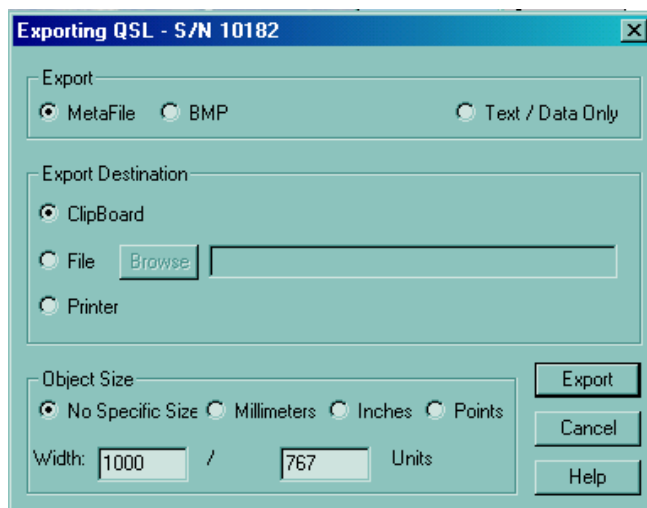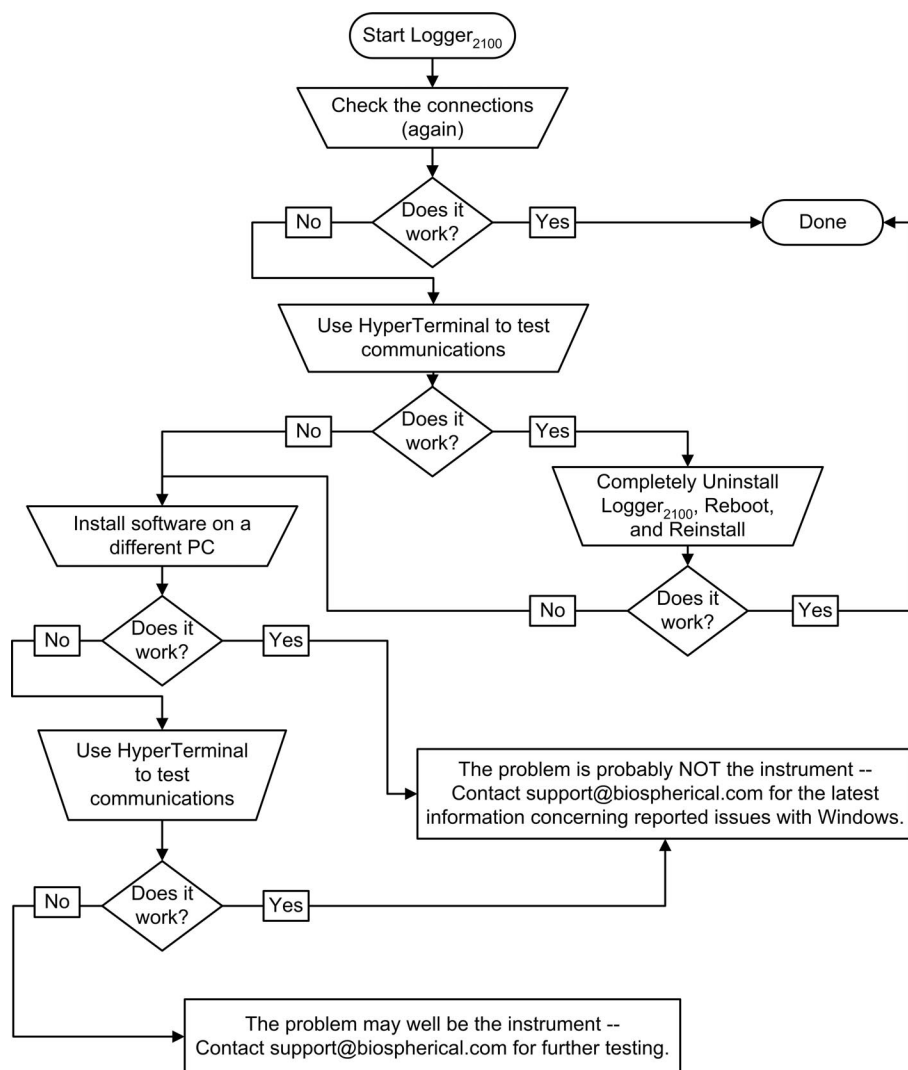
The problem is probably NOT the instrument --
Contact support@biospherical.com for the latest
information concerning reported issues with Windows.

The problem may well be the instrument --
Contact support@biospherical.com for further testing.

Over the years it has been our experience that most instrument issues result from problems with the connectors. With this in mind, if you experience a problem, the first thing you should do is make certain the probe is plugged in securely. Even when you know it is, check again because connectors are 80% of the problem. If the connection is not the problem, then try the probe in a different computer. This will help determine if the problem is in the PC or in the Probe. For instance, Windows 95 (and only Win95) users occasionally experience problems when Win95 fails to release a serial port even though an application may have terminated. When a BSI probe is subsequently plugged into that port, the Logger2100 software cannot detect the instrument during initialization. Fortunately, the serial ports can be refreshed manually within the Windows 95's Control Panel.

Test Using HyperTerminal. Following is a procedure to test your computer and Biospherical probe to see if they are connected properly. The procedure does

not require installing any Biospherical software, and uses the HyperTerminal program that is supplied with Win95, Win98, WinME, Win2000, and WinXP. HyperTerminal is a general purpose terminal emulator, and it can be used to poll the serial ports on a computer. Note that if HyperTerminal is not installed, you will need to install it, which may require the Windows installation disk.

If you are using an older version of Windows (e.g. Win95 or Win98), you should first determine if HyperTerminal has been installed. To do so, navigate to the Windows Control Panel, and select Add/Remove Programs. Next, select the Windows Setup tab and retrieve the details of the Communications components that have been installed. If the HyperTerminal checkbox is not checked, then use the mouse to select it for installation. You will be asked for the Windows installation disk. Just follow the instructions from there.

To test the connection with the BSI sensor, launch HyperTerminal -- it is often located in the "Start/Programs/Accessories/Communications/HyperTerminal" menu (Figure K). A message box will appear asking for a descriptive name for this test. If you are saving the configuration, use a helpful name such as "TestComPort." If not, just hit the Esc key to cancel the box and move on.
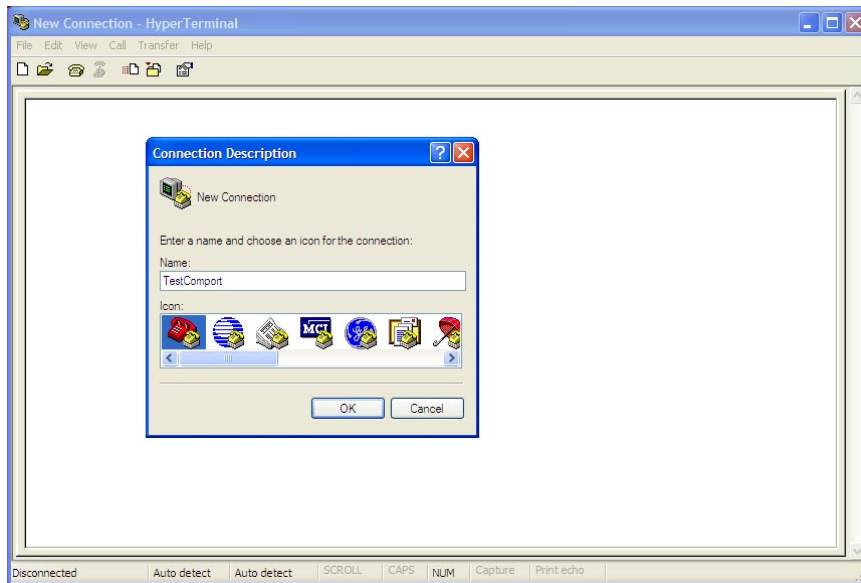

Figure K. *Open HyperTerminal, often found from the start menu under Accessories/Communications. Give this session a name like "TestComPort"*

Using File-Properties-Connect To, verify the communications port to be used (Figure L). Don't worry about items such as telephone number or other settings. Use the Configure button to adjust the settings for selections for 9600 bits per second, 8 data bits, no parity bit, 1 stop bit, and no flow control (Figure M).
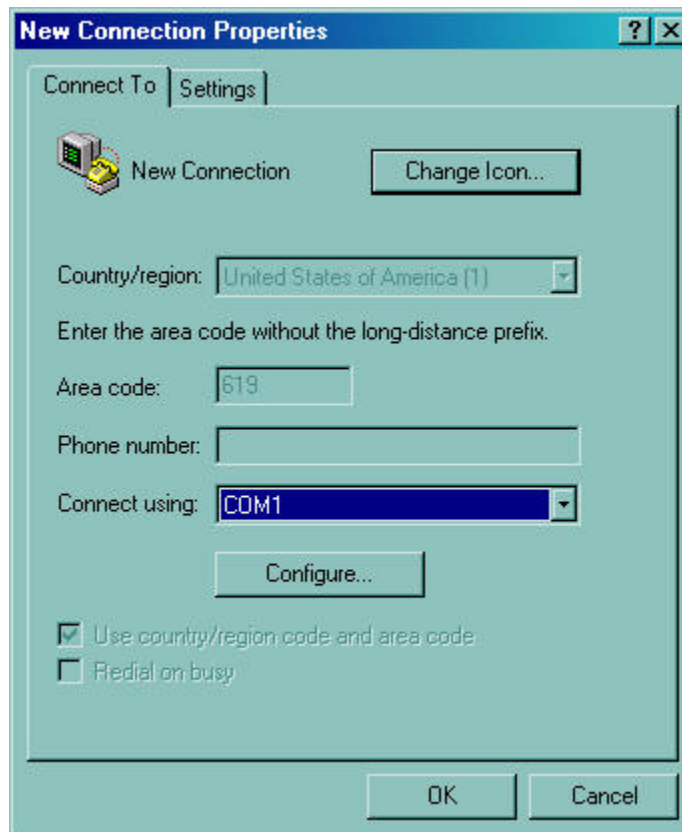
Figure L. Choose the communications port that is connected to the instrument. In this case, COM1. Do not choose any ports other than COM ports.
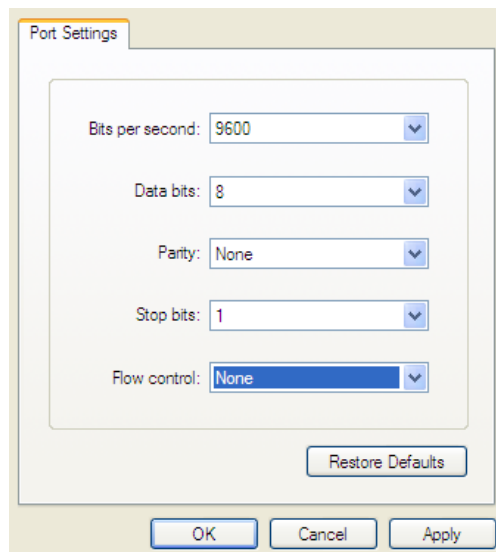

Figure M. Make the above selections for Bits per second (9600), Data bits (8), Parity (none), Stop Bits (1), and Flow Control (none).

Make certain that the probe is connected and press the OK button.
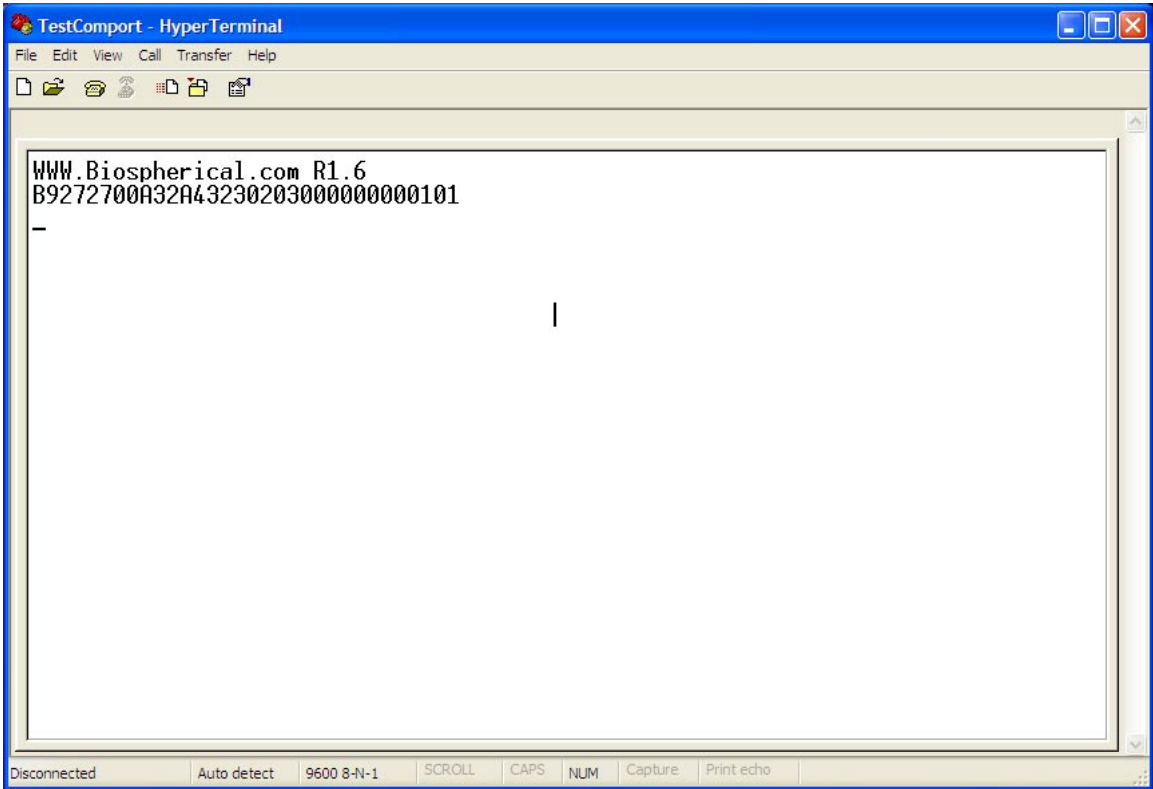

Figure N. *A typical response from an instrument after HyperTerminal opens the COM port and establishes a connection. If you see this, the comport is connected and working properly, at least in ONE DIRECTION.*

As soon as you press OK on the last screen, HyperTerminal will try to connect. If the probe is correctly connected and working properly, you will see a response something like Figure N. If you see this, you have established that the instrument is talking and that the computer communications port is working properly, at least in ONE DIRECTION.

To verify that the comport is working in BOTH directions, press the "*" (star or asterisk) key. This will send a command request to the probe asking it to repeat the first message (Figure O). If you see this duplicate information, the communications port is correctly connected and functioning in both directions, and the instrument is communicating properly.

Figure O. *To verify that the comport is working in BOTH directions, press the "*" key. If you see this duplicate information, the communications port is correctly connected and functioning in both directions, and the instrument is communicating properly.*
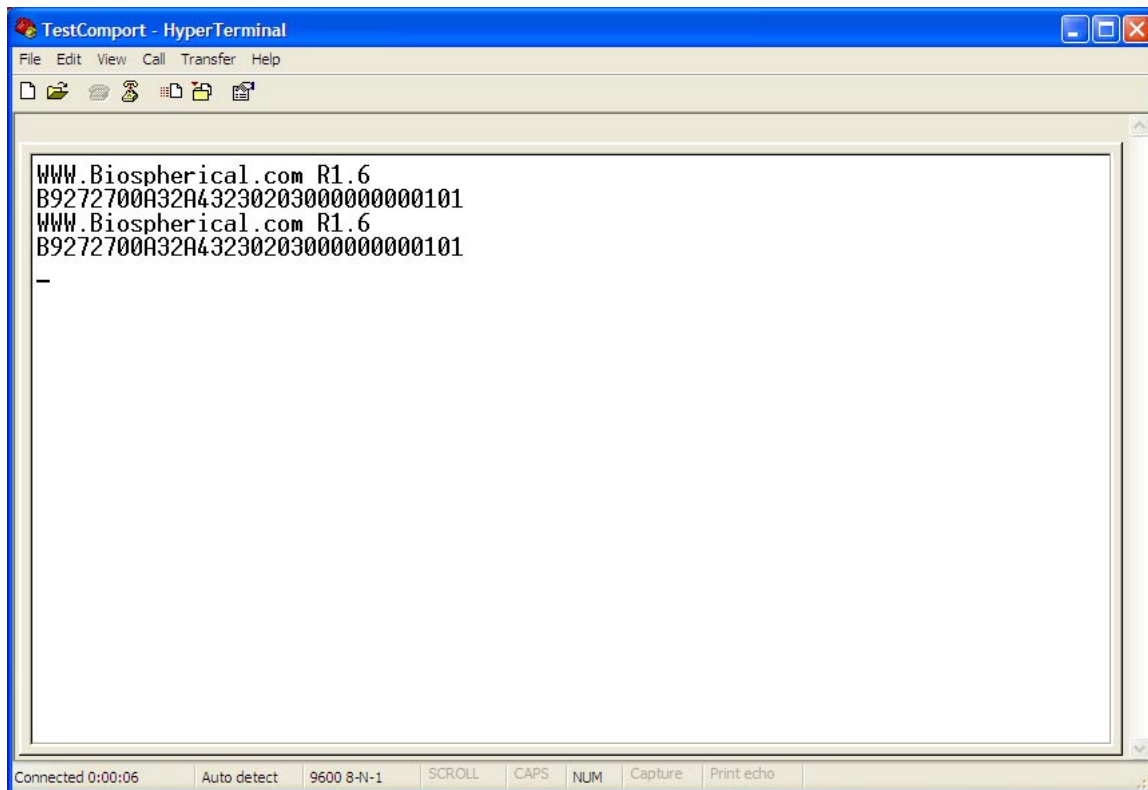
Lastly, if the problem is in the probe, and it is not the connector or computer, the probe will need to be returned to Biospherical for service. Please send a message to support@biospherical.com requesting an RMA (returned material authorization) number and detailed shipping instructions.

FAQ (Frequently Asked Questions)

Where is the calibration information stored?

It is stored inside the probe, in non-volatile memory. This information includes the probe's serial number, type, scale, offset, and units.

How do I recalibrate the sensor?

Calibration requires an extensive optical calibration laboratory. We recommend return of the probe to Biospherical for recalibration. Contact us at www.biospherical.com.

How do I change the batteries in the sensor?

Power requirements of the probe are minimal -- a very low 1mA. This is taken from the control lines in the RS-232 connector, so no batteries or power switch is needed in the probe.

I think your software stinks and I want to write my own. Can I?

Sure, no problem. Send a message to Support@Biospherical.com, tell us what you don't like about the software (so we can make it better), and we will send you source code that gives an example of how we communicate with the instrument.

When I submerge the probe in my culture vessel, I get an irradiance value that is much brighter than I measure at the same location without the vessel. I have paid attention to the "probe in water" immersion settings. What's up?

Our best guess is something we've seen before -- a curved culture vessel full of water acted as a lens and concentrated the light at its center (where you are measuring).

Why am I getting measurements much larger than I get with my Licor sensor?

The answer could be many things. It is important to compare "like" with "like." Is one sensor measuring scalar and the other cosine irradiance? The latter measures light proportionally to the cosine of the angle of incidence. A scalar sensor measures light from almost all directions around the sphere, thus often returns higher readings.

What is PAR?

Photosynthetically Active (sometimes Available) Radiation (PAR) is most often measured over the spectral region from 400 to 700 nm using a sensor with an equal (flat) quantum response (responds equally to all wavelengths).