MultiFrequency Phase Fluorometer

Installation and Operation Manual

Document Number MFPF-00000-000-02-0806

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Important Safety Notices

WARNINGS

1. **Intense UV radiation is emitted from the MFPF LED. Do not look directly at the LED output with the naked eye once the red cap is removed. To verify there is power to the instrument, place a white piece of paper in front of LED 1.**

2. **Do not open the instrument case. High voltage is present. There are no serviceable parts inside. Return the instrument to the factory for service.**

Table of Contents

About This Manual

Document Purpose and Intended Audience

This document provides the users of the MultiFrequency Phase Fluorometer with instructions for setting up, calibrating and performing experiments with their equipment.

What's New in This Document

This version of the *MultiFrequency Phase Fluorometer Installation and Operation Manual* updates the artwork in the document.

Document Summary

Chapter	Description
Chapter 1: *Introduction*	Contains descriptive information about the MFPF unit. It also provides a list of system requirements, interface options, and shipment components.
Chapter 2: *Installation*	Provides installation instructions.
Chapter 3: *Configuration*	Contains steps to configure MFPF and OOISensors software for use with the MFPF unit.

Product-Related Documentation

You can access documentation for Ocean Optics products by visiting our website at **http://www.oceanoptics.com**. Select *Technical → Operating Instructions*, then choose the appropriate document from the available drop-down lists. Or, use the **Search by Model Number** field at the bottom of the web page.

- Detailed instructions for the OOISensors Software are located at: **http://www.oceanoptics.com/technical/NEW OOISensors FOXY Manual.pdf**

Engineering-level documentation is located on our website at *Technical → Engineering Docs.*

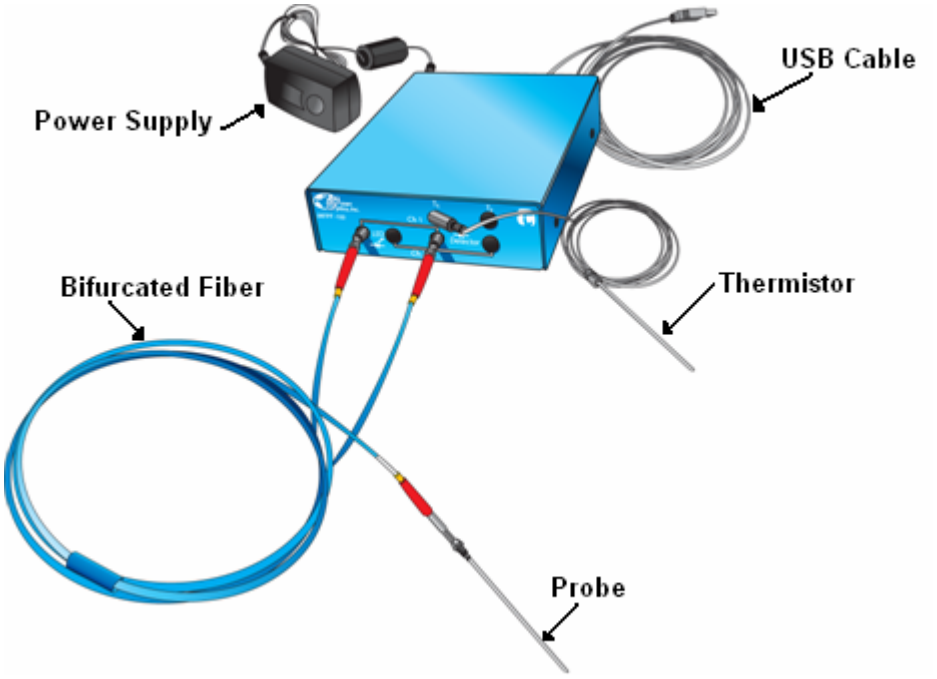
You can also access operating instructions for Ocean Optics products from the *Software and Technical Resources* CD that ships with the product.

Chapter 1

Introduction

MFPF System Overview

The MultiFrequency Phase Fluorometer (MFPF) is a flexible platform for measuring luminescence lifetime, phase and intensity. The MFPF is a compact, self-contained, frequency-domain luminescence monitor that uses LED excitation and photodiode detection with filter-based wavelength selection for easy experimental set-up and control. Because the unit is self-contained, it is invariant to fiber bending and stray light, and has a wide dynamic range of optical intensity as well as low optical and electronic crosstalk, and low drift and phase noise. Therefore, the MFPF is especially useful for oxygen sensing applications where sensitivity to drift is important and where sample set-ups must be left undisturbed for long periods of time.



The MFPF is used with Ocean Optics' Fiber Optic Oxygen (FOXY) Sensors and custom probes. FOXY Fiber Optic Oxygen Sensors are low-power, portable devices that offer high sensitivity, reversibility, and stability. Their small size is useful for remote monitoring. What's more, the thin film used in the probe tips consumes no oxygen, allowing for continuous contact with the sample. FOXY Sensors offer other key advantages: they're ideal for viscous samples and are immune to interference caused by pH change or from changes in ionic strength, salinity, and biofouling. The MFPF unit supports the following Ocean Optics sensors (and their respective frequencies):

- FOXY (40 kHz) – Ocean Optics' standard oxygen sensors designed for monitoring oxygen partial pressure in gas and aqueous solutions. FOXY is a fiber optic fluorescence probe with proprietary oxygen-sensing thin-film coating on the tip.
- HIOXY (40 kHz) – Designed for monitoring oxygen partial pressure in nonaqueous vapors and solutions. The sensor coating chemistry is compatible with oils, alcohols, and hydrocarbon-based vapors and liquids.
- FOSPOR (5 kHz) – A new generation of highly sensitive sensor coating for monitoring traces of oxygen in gas and liquids.

See **http://www.oceanoptics.com/products/probes.asp** for more information on probes available from Ocean Optics.

The MFPF connects to a PC via USB connection and saves your data in an easy-to-use Microsoft Excel format. The USB connection actually emulates the USB as a serial COM port. The MFPF can be configured with two-channel LED excitation and detection, and modulation frequencies to 100 kHz. It will give you lifetime measurements from 200 µsec down to 0.3 µsec. The on-board pressure transducer measures atmospheric pressure or external pressure with a ¼-inch hose fitting.

The MFPF software manages the device and OOISensors software monitors its output via a DDE software connection so that the MFPF software must be running in the background for the OOISensors to work properly. MFPF software is Windows 2000/XP control software that measures over a wide dynamic range of luminescence intensity, lifetime and phase, and allows you to select channels, the LED frequency duty cycle and advanced instrument functions.

Applications

Typical applications include the following:

- Luminescent materials characterization
- Phase/lifetime-based sensor development
- Calibration of phase/lifetime-based sensors
- Stability and photodegradation studies
- Characterization of phase shift over frequency
- Oxygen consumption measurement on cell islet cultures

Models

Two models of the MFPF are available:

- MFPF100-1: Single-Channel MultiFrequency Phase Fluorometer. The single channel unit comes complete with one thermistor.
- MFPF100-2: Two-Channel MultiFrequency Phase Fluorometer. The two-channel unit includes two thermistors.

The thermistor option is used for temperature logging, calibration and temperature correction.

Shipment Components

The following equipment and information ships with the MFPF:

- **Single-Channel MFPF (MFPF100-1)**
  Includes one thermistor.

  Or,
- **Two-Channel MFPF (MFPF100-2)**
  Includes two thermistors.
- **AC power supply**
  (Input AC100-240V, 50-60 HZ, 0.3A) (Output DC 6V 2A) (Model #EPAS-101W-06)
- **USB Cable**
- **Software and Technical Resources CD**
  Each order ships with the Ocean Optics *Software and Resources CD*. This disc contains software, operating instructions, and product information for all Ocean Optics software, spectrometers, and MFPF spectroscopic accessories. You need Adobe Acrobat Reader version 6.0 or higher to view these files. Ocean Optics includes the Adobe Acrobat Reader on the *Software and Technical Resources CD*.

  Ocean Optics software requires a password during the installation process. You can locate passwords for the other software applications on the back of the *Software and Technical Resources CD* package.
- **Packing List**
  The packing list is inside a plastic bag attached to the outside of the shipment box (the invoice arrives separately). It lists all items in the order, the shipping and billing addresses, and any items on back order.

Additional Recommended Equipment

- **FOXY, HIOXY or FOSPOR Oxygen Sensor Probe**
- **FOXY-CAL, HIOXY-CAL, FOSPOR-CAL**

  This is an optional factory calibration service for environments from 0 to 80ºC.

- **MFPF Software**

  The MFPF software runs in the background to gather data from the MFPF unit for the main interface, OOISensors software.

- **OOISensor Software**

  OOISensors is an advanced data acquisition and display program that provides a real-time interface to a variety of signal processing functions for users of Windows 95/98/ME/NT/2000/XP. OOISensors software supports USB2000 and USB4000 Spectrometers, and the MFPF unit.

- **Bifurcated Fibers**

Chapter 2

Installation

Overview

You must install the OOISensors software and the MFPF software applications prior to connecting the MFPF to the computer to install the drivers required for the MFPF. If you do not install the software first, the system will not properly recognize the MFPF.

Caution

Do not connect the MFPF unit included with the Fiber Optics Sensors System to the PC prior to installing the OOISensors software.

Software Installation

Two types of software are used together to manage your MFPF instrument:

- **OOISensors software** – This is a 32-bit, advanced acquisition and display program that provides a realtime interface to display and processing functions for use with Ocean Optics' oxygen and pH sensors. OOISensors acquires data for use by the MFPF software to convert data into concentration values, and save the data in spectral files and logs.

  Two additional software packages are also included as part of the OOISensors installer to set up the USB port as a serial COM port and to communicate with the MFPF unit.

- **MFPF software** –This is the application that controls and collects data from the MFPF unit.

The MFPF software is included as part of the OOISensors installation, so only one software installation process is necessary.

► *Procedure*

To install OOISensors and MFPF software,

1. Close all other applications running on the PC.

2. Start the software installation process.

Installing from CD:

a. Insert the CD containing the OOISensors and MFPF software.

b. Select the drive on your computer with the software CD.

c. Double-click on the Setup.exe. The installation wizard appears.

Installing from the Web:

a. Go to http://www.oceanoptics.com/technical/softwaredownloads.asp.

b. Right-click on **OOISensors Oxygen Measurement Software** and select **Save Target As…** to download the executable to your machine.

c. Double-click on the downloaded file. The installation wizard appears.

3. Click the **Next** button at the **Welcome** screen. The **Choose Destination Location** screen appears.

4. Select a location for your software files. Click **Next**. The **Backup Replaced Files** screen appears.

5. Select **Yes** or **No**, depending on whether you want to create backup replacement files. If you select **Yes**, choose a location for these files. Then click **Next**. The **Select Program Manager Group** screen appears.

6. Select the name of the Program Manager group to which you want to add the OOISensor icons. Then click **Next**. The **Start Installation** dialog box appears.

7. Click **Next**. The **Installation Password** dialog box appears. Enter the password for your OOISensors software. Passwords are located on the back of the software CD jacket. The software begins installing.

8. The MFPF dialog box appears asking you if you have MFPF hardware.

Notes

If a previous version of the MFPF software is detected on the computer, the installer will actually remove it and not install the new version. To install it, either run Setup.exe from the …\OOISensors\MFPF_installers\TauTheta_DDE_Server\ folder or just run the OOISensors installer again. In other words, each time the OOISensors installation is executed, the MFPF software toggles between being installed or uninstalled.

It is also possible to switch between a spectrometer and MFPF configuration in the software configuration panel (see *Configuring OOISensors Software* for more information).

9. Click **Yes**. The **Install Driver** screen appears. Click **Install** to install the USB to UART Bridge Controller Driver Set to the location shown on the screen, or browse to another location. A message appears informing you that your installation is complete.

10. Click **OK**, then click **Finish**. You have now installed both OOISensors and MFPF software. You must restart your computer to use the software.

Access MFPF software with the 

icon on your desktop. Access OOISensors software **Start | All Programs | Ocean Optics | OOISensors | OOISensors**. If you attempt to start OOISensors software without first starting the MFPF software, an error message appears.

Hardware Installation

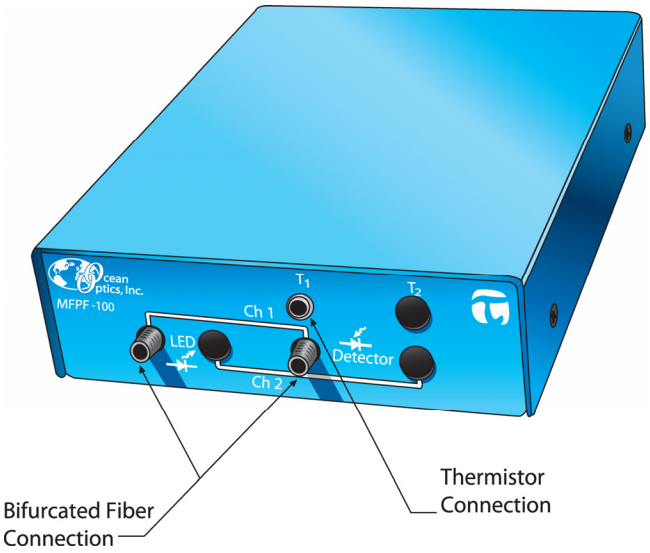
WARNING

Ensure that the red plastic caps are covering the four SMA connectors on the front of the MFPF unit. Intense UV radiation is emitted form the LEDS when the unit is powered-up. Do NOT look directly at the LED output with the naked eye.

► *Procedure*

1. Unpack the equipment and verify that you have all the necessary components (see *Shipment Components* and *Additional Recommended Equipment*).
2. Connect thermistor(s) to T1 and T2 (for Model MFPF100-2) connectors on front of unit.
3. Locate the 21-02 SMA Splice Bushing that came with the probe. This item is a 0.75" screw with two female ends. Screw one end of the splice bushing into the SMA 905 connector on the end of the probe.
4. Locate the bifurcated fiber that came with the system. This optical fiber assembly has a “Y” shaped design. Connect the common end of the bifurcated fiber to the splice bushing/probe.

5. Connect one arm (it doesn't matter which one) of the bifurcated probe fiber to Ch1 LED and the other arm to the Ch1 Detector on front of unit as shown below.



MFPF Unit Front Panel

6. Connect power cord from the power supply that came with your MFPF unit from back of unit to an AC outlet. To check that the unit is receiving power, look for light glowing through the LED #1 red cap, or place a piece of white paper in front of the LED if the red cap is not available. Do NOT look directly at the light being emitted with the naked eye.

Caution

Use only the power supply that came with your MFPF unit. Using a different power supply could damage your equipment.

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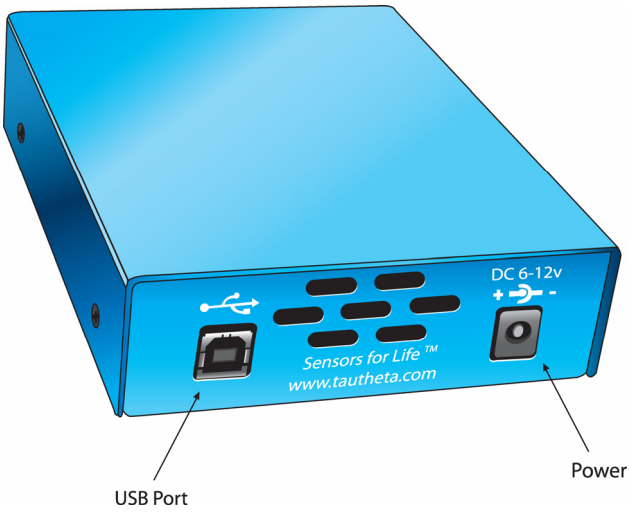
7. Connect the MFPF unit to your computer using the USB cable.

Note

The current version of the MFPF uses a USB connection with an emulated RS232 port. Before starting the MFPF software application, you must identify the COM port number of the emulated RS232/USB port.



MFPF Unit Rear Panel

Once you have installed both the hardware and the software, you must configure your system (see Chapter 3: *Configuration*).

Chapter 3

Configuration

Overview

Once the software has been installed, the system has been rebooted, and the hardware has been connected to the computer, you must configure the software.

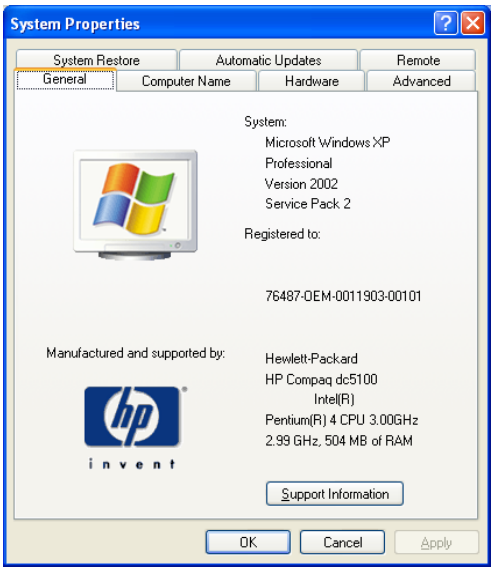
Configuring the COM Port with the MFPF Software

The MFPF unit uses a USB connection with an emulated RS232 port. Before you are permitted to start the software, you are asked to identify the COM port number of the emulated RS232/USB port.

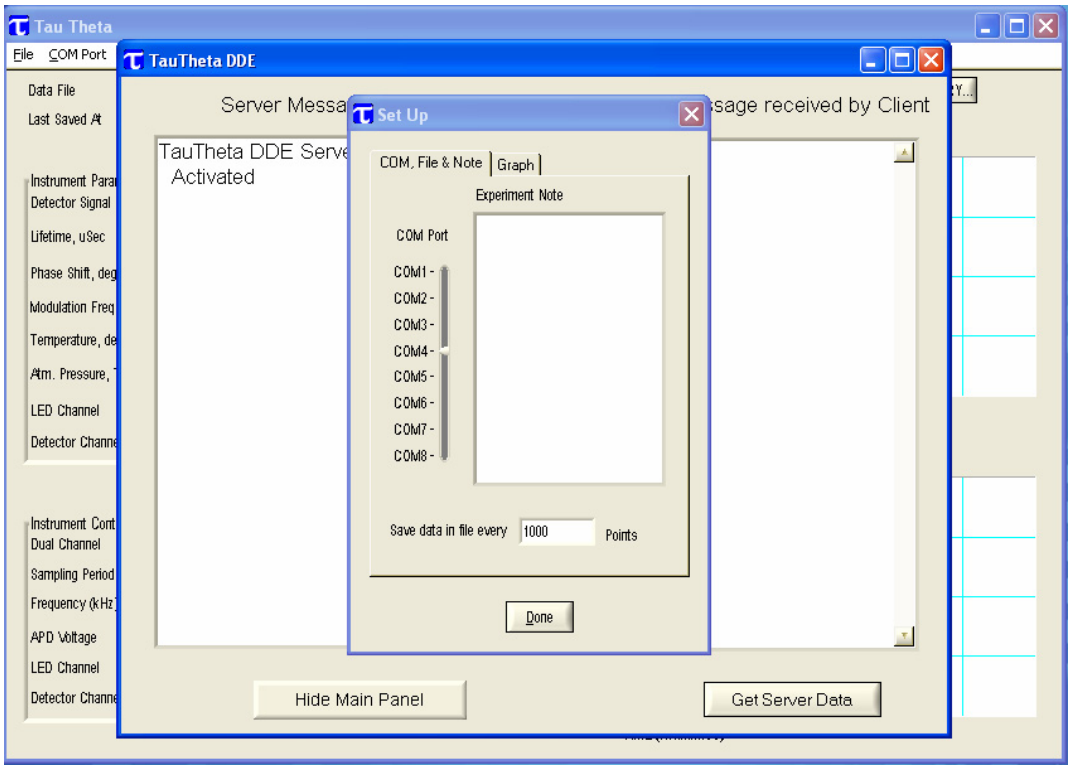
► *Procedure*

To select the COM port for the emulated RS232/USB port,

1. Click the Windows Start icon.
2. Select **Control Panel | System** to display the System Properties window.



3. Select the Hardware tab.
4. Click **Device Manager**.
5. Scroll down and expand the Ports (COM & LPT) list item.
6. Note the port number assigned to the CP210x USB to UART device.
7. Ensure that this is the COM port selected on the MFPF software Set Up screen.



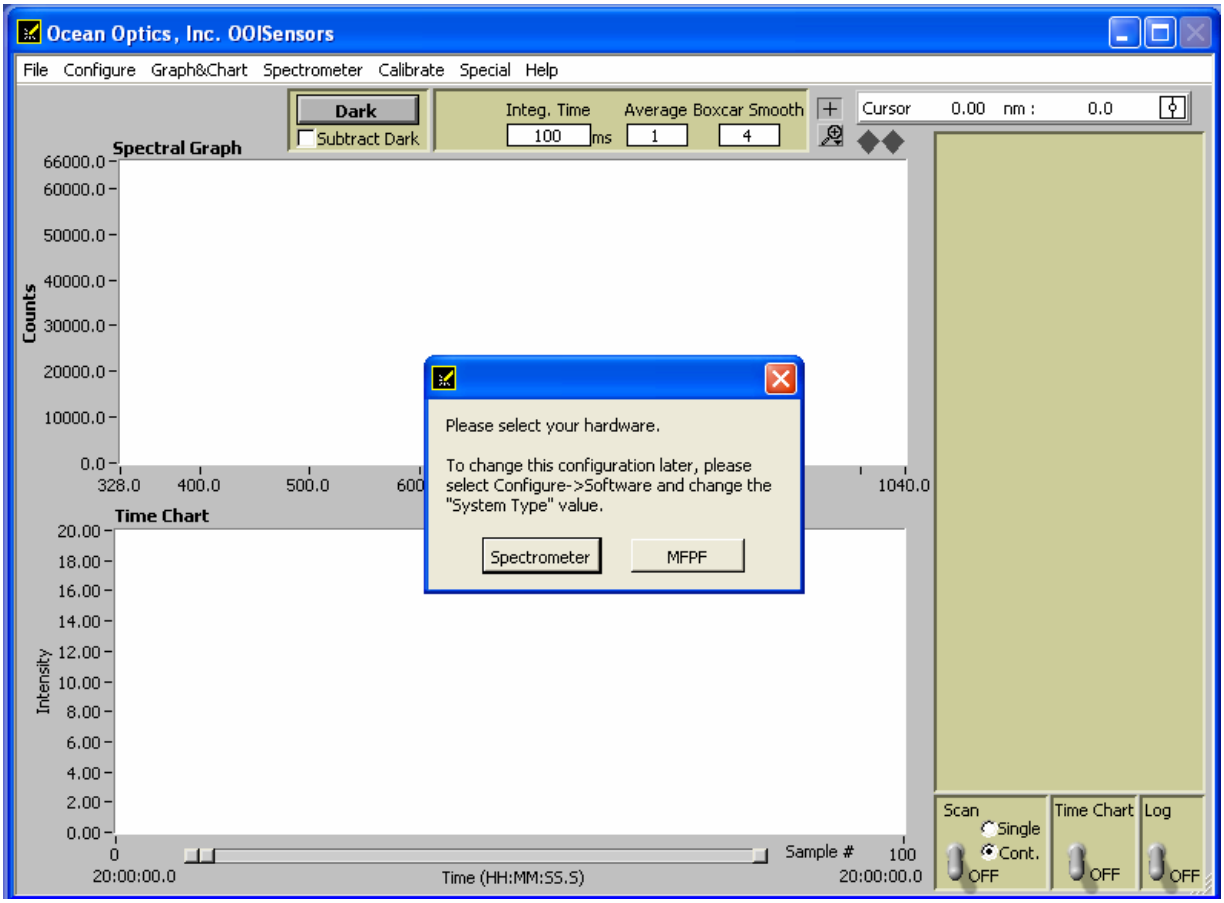
8. Click **Done**.

Configuring OOISensors Software

The first time that you run OOISensors, you will be prompted to configure the software for use with your hardware. Follow the steps below to configure OOISensors software.

► *Procedure*

1. Run OOISensors. If this is the first time you have opened the software, or if the software is not configured yet, the following screen appears:



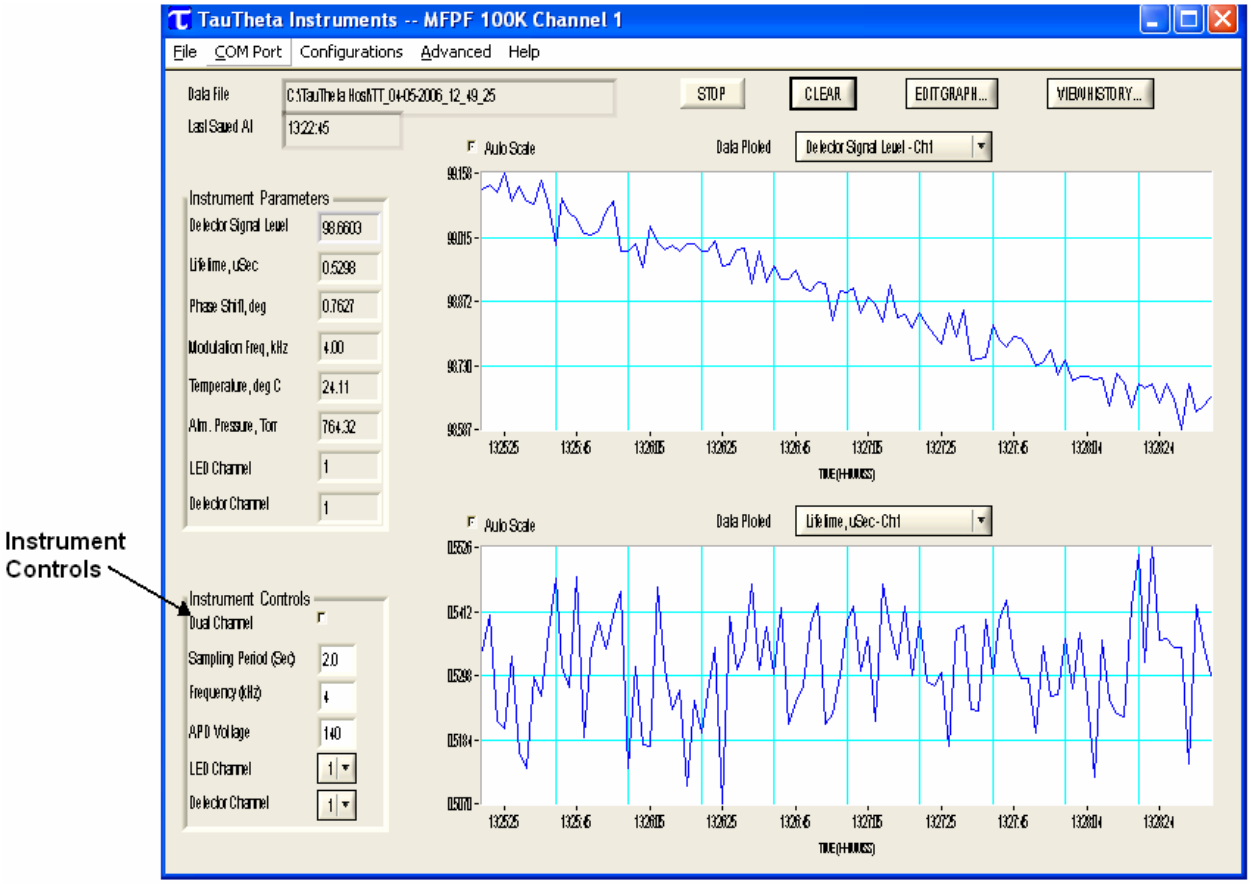
2. Click **MFPF**.

Note

OOISensors is configured to work with the MFPF unit. However, you can change the OOISensors configuration to work with spectrometers using the **Configure | Software** menu item.

3. Double-click on the 

icon on the desktop. The main MFPF screen appears:

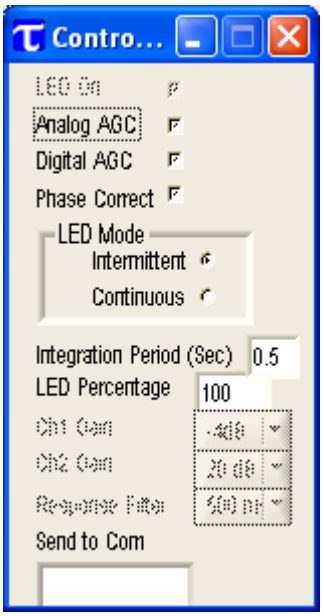


4. Set the MFPF parameters (located in the Instrument Controls box on the lower left of the main screen) according to the following recommendations:

Parameter	Setting
Dual Channel	Unchecked for set up, checked if 2 sensors are used
Sampling Period	2 seconds for set up

Parameter	Setting
Frequency kHz	5 kHz – FOSPOR 40 kHz – FOXY and HIOXY
APD voltage	110 to 155 V photon-to-electron ratio
LED Channel	Depends on your experiment
Detector Channel	Depends on your experiment

5. Select **Advanced | Show More Control Panel** from the menu bar. The following dialog box appears:



6. Set the parameters according to the following recommendations:

Parameter	Setting
Analog AGC	Checked
Digital AGC	Checked
LED Mode	Intermittent
LED Percentage	25 -- 100%

Appendix A

Specifications

Specification	Value
LED Modulation Range	2 kHz to 100 kHz (200 µsec to 0.3 µsec)
Control Software	Windows 2000/XP control software with data logging capability; controls include: modulation frequency, data rate, LED duty cycle, signal averaging, APD gain, analog gain, LED intensity
Measurement Modes	Intermittent LED (to minimize photodegradation); Continuous LED (for rapid measuring and accelerating photo-bleaching); Frequency sweep for luminescence characterization
Thermistor Probes	Closed-end stainless steel tube with thermistor sensor mounted in tip; liquid immersible rugged design; 1/8” NPT fitting; temperature range 0 to 75 °C, absolute maximum 100 °C+/- 0.2 °C; Interchangeable thermistors
Pressure Measurement	On-board pressure transducer monitors atmospheric pressure, optional configuration allows external connection for 0 to 15 psiA
Power, Input	6v - 12v, 1.5 Amps
Communications	USB or RS-232

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