



**PC-SOLO**

**SINGLE CHANNEL LASER POWER/ENERGY METER**

**INSTRUCTION MANUAL**

**200641**

Revision 4.0  
Mai 2006

## WARRANTY

The Gentec-EO carries on each item manufactured to the original buyers a one-year warranty (from date of shipment) against material and/or workmanship defects, when used under normal operating conditions. The warranty does not cover damages related to battery leakage or misuse.

Gentec-EO Inc. will repair or replace, optionally, any materials that proves to be defective during the warranty period, except in the case of product misuse.

Any attempt by an unauthorized person to alter or repair the product voids the warranty.

The manufacturer is not liable for consequential damages of any kind.

Customers must fill in and mail the warranty card in order to activate the warranty.

In case of malfunction, contact your local Gentec-EO distributor or nearest Gentec-EO Inc. office to obtain a return authorization number. The material should be returned to:

Gentec Electro-Optics, Inc.  
445, St-Jean-Baptiste, Suite 160  
Québec, QC  
Canada G2E 5N7

Tel: (418) 651-8003  
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e-mail: [info@gentec-eo.com](mailto:info@gentec-eo.com)

Website: [www.gentec-eo.com](http://www.gentec-eo.com)

## CLAIMS

To obtain warranty service, contact your nearest Gentec-EO agent or send the product, with a description of the problem, transportation and insurance prepaid, to the nearest Gentec-EO agent. Gentec-EO Inc. assumes no risk for the damage in transit. Gentec-EO Inc. will, at its option, repair or replace the defective product free of charge or refund your purchase price. However, if Gentec-EO Inc. determines that the failure is caused by misuse, alterations, accident or abnormal condition of operation or handling, you will be billed for the repair and the repaired product will be returned to you, transportation prepaid.

## SAFETY INFORMATION

Do not use the PC-SOLO with the SOLO if the device or the detector looks damaged, or if you suspect that the SOLO is not operating properly.

Appropriate installation must be done for water-cooled and fan-cooled detectors. Refer to the specific instructions for more information. The user must wait for a while before handling these detectors after power is applied. Surfaces of the detectors get very hot and there is a risk of injury if they are not allowed to cool down.

**Note:** This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, it is suggested to try to correct the interference by taking one or more of the following steps:

- Reorient or relocate the receiving antenna.
- Increase the distance between the equipment and receiver.
- Connect the equipment to an outlet that is on a different circuit than the receiver.
- Consult the dealer or an experienced radio/TV technician for help.

**Caution:** Changes or modifications not expressly approved in writing by Gentec-EO Inc. may void the user's authority to operate this equipment.

## SYMBOLS

The following international symbols are used in this manual:



Refer to the manual for specific Warning or Caution information to avoid any damage to the product.



DC, Direct Current

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# 1 THE SOLO SINGLE CHANNEL LASER POWER/ENERGY METER



## 1.1 Introduction

To obtain the full performance from the SOLO and the PC-SOLO, we recommend that you read this manual carefully.

The PC-SOLO software transforms your PC screen into a large SOLO screen enabling you to control and see your information from a distance, while saving data. It can transfer data files to a PC for more sophisticated data analysis and respond to commands through the PC interface see Fig. 1.1 for an example of the PC-SOLO user's interface.

The SOLO PE is a microprocessor-based power and energy meter that uses the latest technology to provide a multitude of options in a user-friendly environment. It is a complete power and energy meter that can provide statistical analysis of your measurements. It allows you to store data on the 1-megabyte flash internal memory. Moreover, it can be updated over the internet by connecting the USB or the RS-232 port to a personal computer. It can also interface with a PC using the PC-SOLO. When connecting a QE-xx-x-MT or a XLE-4 the Solo enters the metallic mode to ensure proper measurements. The metallic mode is a new addition to the latest SOLO. To know if your Solo supports the metallic mode see in the "?"/about menu says "Metallic support". The new SOLO also has improved performance in joulemeter mode that allows 2 additional lower scales.

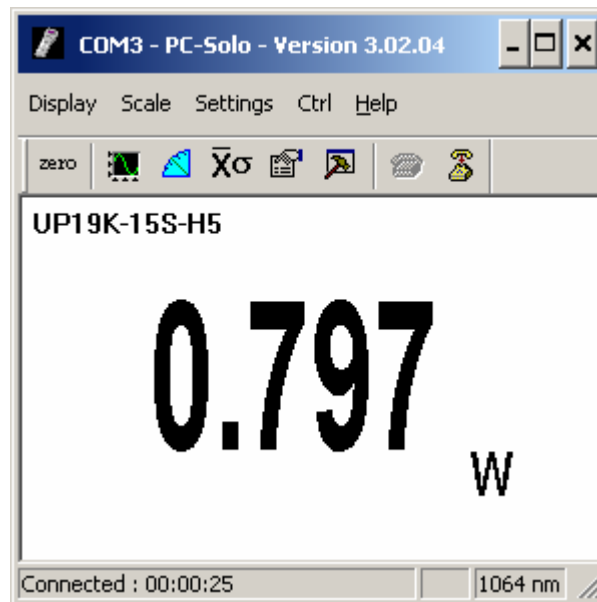


Fig 1.1 PC-SOLO user's interface

## Unpacking

Each Gentec-EO SOLO is thoroughly tested and calibrated prior to shipment.

Visually inspect every SOLO unit after removing it from the shipping containers. If you see any damage, retain all packaging materials and shipping receipts. Any damage claim should be made promptly to the transportation company. Notify the nearest Gentec-EO representative concerning the claim, so that any repair or replacement can be arranged as soon as possible.

Keep in touch with the latest improvements to our user-friendly software. You can download the latest software version anytime from our website [www.gentec-eo.com](http://www.gentec-eo.com) and install it on the SOLO with the serial interface.

You can download the PC-SOLO program and its user manual from our website. Access our website and go to the **Downloads** section. Click on the file name and download it to your PC. The specific actions necessary vary by browser and browser settings. After it is transferred, open the file on your PC and follow the instructions to uncompress and install it. You may consult the download instructions document that is also in the downloads section of our website.

## 1.2 Front Panel Description

### 1- I/O control key.

The I/O key has two functions:

SOLO on and off

Pressing the I/O key quickly when the SOLO is OFF turns the SOLO ON (do not hold the I/O key). To turn off the SOLO, press and hold the I/O key a few seconds. To prevent battery leakage and to increase battery life, we recommend switching off the SOLO when not in use.

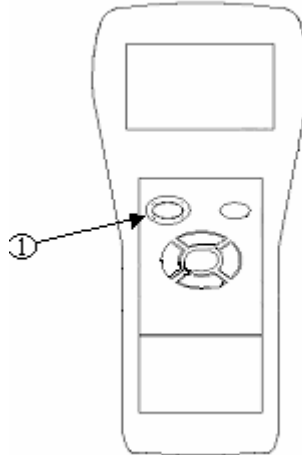


Fig. 1.2 SOLO Front Panel

## 1.3 Top Panel Description

See Figure 1-3 below.

### 1- EXTERNAL POWER SUPPLY INPUT JACK:

Input voltage required: 12 VDC/800 mA.

### 2- SERIAL INTERFACE CONNECTOR (RS 232):

This interface allows remote control and data transfers between the SOLO and a computer, a terminal, a printer or any device that has a serial communication port.

### 3- USB INTERFACE CONNECTOR:

This interface allows remote control and data transfers between the SOLO and a computer that has a USB communication port.

### 4- 0 to 1 VOLT ANALOG OUTPUT:

For monitoring laser average power or energy by using external equipment such as a chart recorder, a computer with an analog interface, a voltmeter, etc.

The output signal represents the amplified and anticipated power detector response in the case of a power measurement. In the case of an energy measurement, the output signal is a DC voltage representing the pulse energy value.



The 1 V value corresponds to the full scale reading of the selected range. That provides the best signal-to-noise ratio, The measured power or energy is then related to the output voltage and to the selected range according to the following equations:

$$Power = V_{output} \times \text{Max of Range selected}$$

$$Energy = V_{output} \times \text{Max of Range selected}$$

For example:

1.00 V corresponds to 10 Watt on the 10 W range  
 0.25 V corresponds to 2.5 Watt on the 10 W range  
 0.10 V corresponds to 30 milliwatts on the 300 mW range

Specifications:

Maximum output voltage:	1 V
Output impedance:	10 k $\Omega$
Connector type:	Female 1/8" jack

## 5- PROBE INPUT JACK:

The SOLO uses a DB-15 female connector to mate with the detector heads (probes).

The **SOLO** works with all Gentec-EO detectors. It automatically recognizes every power detector head, which ensures accurate auto-calibration. More importantly, it can take advantage of our *Personal wavelength correction*<sup>TM</sup>. It reads the memory in the *Smart Interface* connector (version 5 and higher) to provide a wavelength correction that is based on spectral data measured from that specific detector.

The SOLO may not recognize some of the earlier heads. These are identified as "wattmeter."

**Energy detector heads** prior to version 4 have a BNC connector. The user must use a universal BNC/DB-15 adaptor to connect an energy detector head to the SOLO. This adaptor is compatible with all the Gentec-EO pyroelectric joulemeters except the EPD.

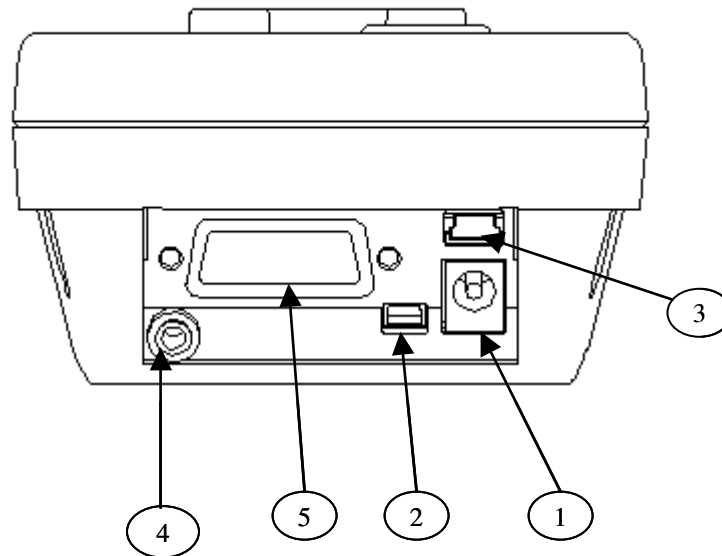
For these early energy detector heads, a pop-up menu asks the user to select the proper detector model. This does not affect the reading and the measured value is still valid.

**Power detectors of version V2 and higher** and **Energy detectors of version V4 and higher** are equipped with an "intelligent" DB-15 male connector that mates directly to the DB-15 female connector. They do not require an adaptor.

**WARNING: This DB-15 connector, though similar to that of the former TPM-310 and TPM-330 monitors, is incompatible with the power detector heads of PS-310 Series Version 1 and PS-330 Series Version 1. These heads used a different technology and do not have the same pin-out configuration.**

The GENTEC C-300 adaptor can be used in order to connect the power detector heads of PS-310 Series and PS-330 Series Version 1 and 2. Please contact your local Gentec-EO distributor or the nearest Gentec-EO office for further information.

Any attempt to modify connectors of the early version heads to mate with the SOLO can result in damage to the monitor.



**Fig. 1.3 SOLO Top Panel**

## 2 Getting Started



This section contains important information concerning the installation and operation of the SOLO.

The SOLO is delivered ready to use. Just insert a detector head in the Probe Input Jack (#5 in Figure 1-3) and press the I/O key.

### 2.1 Quick power and energy measurement procedure

This section applies to all SOLO versions. It will show you the fastest way of making a laser power and energy measurement with the SOLO and a Gentec-EO power or energy detector.

The monitor automatically recognizes all the Gentec-EO power heads and energy heads of version 4 or higher. All custom technical data required for optimum operation of the detector will be automatically downloaded from the EEPROM in the DB-15 connector. This data includes sensitivity, model, serial number, version, wavelength correction factors, and time response. For energy detectors before version 4, you must first select the correct pyroelectric joulemeter model from a pop-up menu. The latter also allows you to set the head sensitivity according to the calibration provided with your Gentec-EO joulemeter. The model number and sometimes the sensitivity appear with the serial number on the back of these early detectors. In case of a conflict, use the sensitivity on the most recent calibration certificate.

#### Version 7 energy heads

When the connector is attached, a message appears, asking you if the attenuator is in place. If the attenuator is in place, the wavelength menu disappears. If no attenuator is in place, the wavelength menu

appears. The attenuator switch is a toggle switch. Select Ctrl / Attenuator to turn it on or off. See Appendix A for more details.

Quick power and energy measurement procedure for PC-SOLO (The first 11 steps are for SOLO initialization, steps 12 to 14 refer to the PC-SOLO):

- 1- Install the power or energy detector head on its optical stand.
- 2- Turn the SOLO off and connect a version 5 (or higher) power or energy detector head to the SOLO using the **PROBE INPUT JACK** (see Fig. 1-3). It is recommended to turn the SOLO off before connecting a new head in order to prevent any lost of information from the detector head EEPROM.
- 3- Slide the latch to the left to lock the connector into place.
- 4- Switch the SOLO ON using the **I/O** key.
- 5- Power heads will default the SOLO P and SOLO PE to power measurement; energy heads will default the SOLO PE and SOLO E to energy measurement. The monitor will default to autoscale. If you have a photodiode, to obtain measurements in dBm, select Settings / Power Unit / dBm.
- 6- Remove the head's protective cover.

Put the detector head into the laser beam path. The entire laser beam must be within the sensor aperture. Do not exceed maximum specified densities, energies or powers. For the most accurate measurement, spread the beam across 60% to 80% of the sensor area.

**Attention: Power heads can be used with both CW and pulsed lasers.**

**- Energy heads can only be used with pulsed lasers.**

- 7- For power heads (using the SOLO PE or SOLO P), go to step 8. For energy heads (using the SOLO PE and SOLO E), go to step 11.

#### **Adjusting the zero (steps 8 to 10)**

- 8- Block off laser radiation to the detector.
- 9- The power read by the PC-SOLO when no laser beam is incident on the detector may not be exactly zero. This is because the detector is not thermally stabilized OR there was a heat source in the field of view of the detector when you turned on the SOLO.
- 10- To reset the zero, wait until the reading has stabilized and select click **Rezero**. You are now ready to make an accurate measurement. To turn the **Zero Offset** off, click **Rezero** for the menu, then click **Off**, To reselect the previous offset, click **Rezero** for the menu, click **Undo**.
  1. To set the diode to zero, select Ctrl / Set Diode Zero, and press the **↵ Enter** key. A message appears requesting you to put the black cover on your photodiode and press the **↵ Enter** key after you have done so. The SOLO passes through all the scales to determine the zero diode for each scale. The message "Diode Zero Done" appears when the SOLO has determined the zero diode.

#### **Notes:**

- Refer to specific power detector documentation for complete installation and operating instructions.
- The power detectors are thermal sensors sensitive to temperature variations.

For high-precision measurements, it is recommended to:

- Allow the power detector temperature to stabilize before zeroing the SOLO.

- Do not touch the detector head when handling the power detector. Touch only the stand.
- Avoid forced airflow or drafts around the detector.
  11. Apply the laser beam to the detector head. The laser beam average power or energy will be displayed on the SOLO screen.
  12. If the USB drivers and/or PC-SOLO have not been installed, install the USB drivers (see 3.2.1) then install PC-SOLO (self-directed). After the installation of PC-SOLO in Windows, there should be a shortcut to the software.
  13. Start the PC-SOLO software on the PC. Click Start / Programs / PC-SOLO.
  14. To connect the PC-SOLO to the device, Select the correct COM Port (see section...) and Click Reconnect. You should see values pertaining to the current settings, on the PC-SOLO

## 2.2 Description of the top level PC-SOLO menus

This section describes in detail the first group of menus essential to operating the PC-SOLO. The menus differ depending on the type of head that is plugged in. The display menu lets you view your measurement in various ways. The scale menu allows you to fix a specific measurement scale instead of autoscaling. Use the settings menu during setup to set the best parameters for the measurement task at hand. It provides the flexibility to accommodate a wide variety of measurement conditions. The more active controls you are likely to use during your measurements are in the CTRL menu. They are described in Section 2.3.

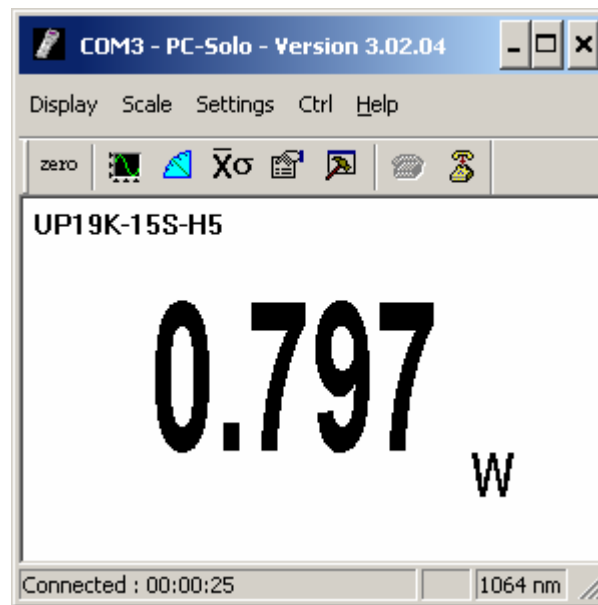


Fig. 2.1 View of the first group of PC-SOLO menus

## 2.2.1 The quick access buttons



Fig. 2.2 View of the quick access icons.

From left to right, they are shortcuts for :

- Zero->make a zero offset on the current scale
- Display->Histogram
- Display->Tuning needle
- Display->Statistics
- Display->Status
- Settings->Data Sampling
- Settings->Communication->Reconnect
- Settings->Communication->Close

## 2.2.2 Displays

The various displays offered by the PC-SOLO allow you to quickly view your measurement in several different ways. You will appreciate the easy-to-view high resolution graphic. The display menu is located at the top left of the screen. It includes five options, (see Figure 2.3) which allow you to select the best way to display the measurement according to your specific needs. You can switch from one option to another without interfering with the measurements. To change the way your data is displayed, activate the display menu by clicking on the display menu. Highlight the option of your choice, and click.

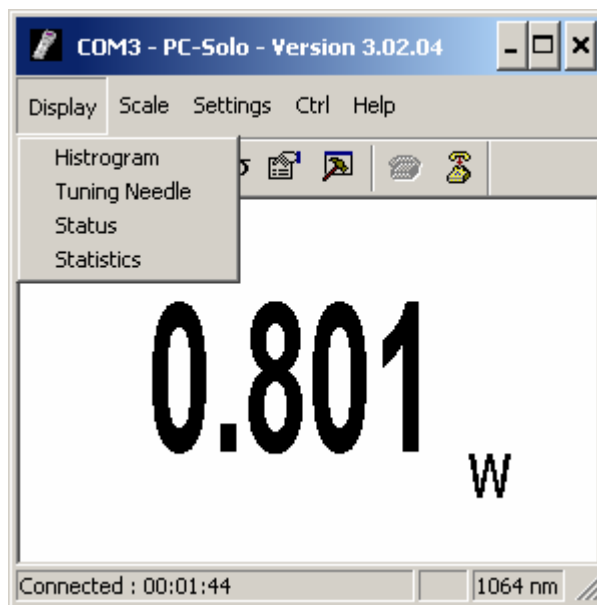


Fig. 2.3 display Menu

### 2.2.2.1 Histogram display

The histogram option gives a quick look at the laser beam's long-term stability and trends. The histogram adds new data points at a rate of 3 Hz and is dynamically scrolled to the left for each new point as soon as it reaches the right side of the screen.

### 2.2.2.2 Digital Tuning Needle display

When you select the **Tuning Needle**, a graphical interface shows a real-time digital needle. The deflection of the digital needle is proportional to the real-time measurement.

It is marked for use with any scale setting in the PC-SOLO.

### 2.2.2.3 Statistics display

This section gives a complete statistical analysis of the measured data. See section 2.3.3.3 for a detailed description of each item. To start or restart the statistical calculations, click the **Start** button (in Statistics/start). To stop the statistics before you reach the end of the period click **Stop**. The last statistical values calculated remain on screen so you can view them later. To calculate statistics on new data, reset the statistics by clicking **Reset**.

### 2.2.2.4 Show File

The Show File mode allows you to view data previously acquired in standard notation.

### 2.2.2.5 Status display

The status display mode shows all the major adjustable parameters currently active for the detector head in one convenient place.

## 2.2.3 **Scale Menu**

### The **Scale menu**

The scale can be set in the automatic scaling mode (auto mode) or you can choose a specific fixed scale according to the specific head, using the arrow keys on the keyboard. However, once the Gentec-EO head has been automatically identified from the detector head's EEPROM, the only scale menu available is the one corresponding to the detector head connected to the SOLO.

The scale menu is used to select the signal level read with a detector head. When a new head is plugged in, the autoscale is the default option. In this condition, the SOLO automatically selects the best scale for the value being measured. You may see the same information on the PC-SOLO.

The checkmark beside the scale number shows the currently selected scale. To change the scale, simply select a scale value from the appropriate range. The PC-SOLO only shows scale values that fall within the detector head's range.

When in a manually selected scale, you should always use the next higher scale to the measured value, for maximum precision.

Special care must be taken in the case of widely varying pulse energy to ensure that every pulse is detected. Contrary to the case of a power measurement where the autoscale adjusts continuously to the measured value, the autoscale in energy mode bases its scale selection on the energy of the previous pulse. A pulse with energy less than 2% of the energy of the previous pulse will not be detected. To avoid this problem, set the scale manually to a lower level. In this case, you measure this lower level when the higher energy pulses are saturated.

## 2.2.4 Settings

The settings menu is located on the menu bar. Options in the **Settings menu** define user-adjustable acquisition parameters, see Fig. 2.4 for setting menu display. All correction factors that will affect the reading can be easily programmed. That could be for a beam sampler, attenuator, or other optics that require you to multiply and/or add offsets to the detector reading. You can also adjust for a wavelength other than the calibration wavelength. A custom correction factor can also be keyed in. Pre-programmed wavelength correction factors dedicated to each detector head are also available and automatically loaded from the detector EEPROM, for the version 5 and higher detector heads. Data sampling and communication, as well as the commands for saving and loading your settings are also found in the Settings menu.

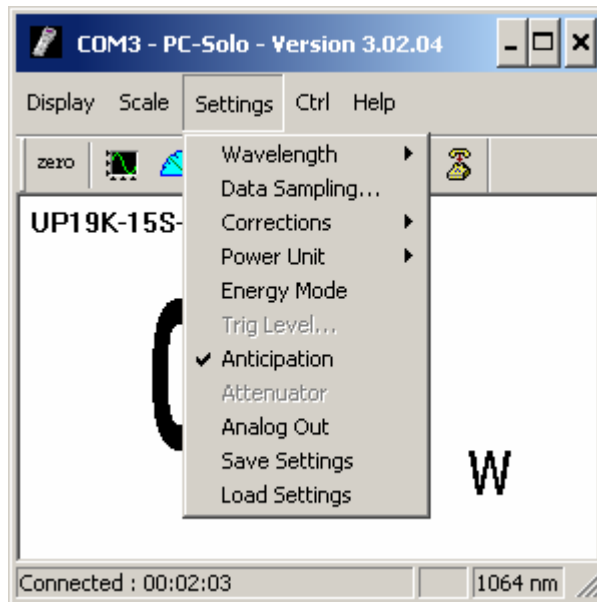


Fig. 2.4 Settings Menu

### 2.2.4.1 Wavelength Setting

The Wavelength menu is used to select the proper wavelength at which the detector is to be used. It applies a correction to adjust for the variation in responsivity at different wavelengths. When a new detector is plugged in, the calibration wavelength is the default selection.

The checkmark beside the wavelength shows clearly the current selection. To change the wavelength, select an appropriate wavelength from the Wavelength menu. The PC-SOLO only allows you to choose values that fall within the detector's range. If you select or enter a value that is not valid, a menu pops up to signal the error and the PC-SOLO automatically selects the default value. That is the wavelength used for calibration at Gentec-EO during manufacture or subsequent service. With the photodiode version 8 and up only the custom menu is available since the all wavelength are available in the photodiode range.

For the version 5 (V5) and higher detector heads, the SOLO automatically recognizes every energy and power detector, for accurate auto-calibration. More importantly, it takes advantage of our *Personal wavelength correction*<sup>™</sup>: it reads the memory in the *Smart Interface* connector to provide a wavelength correction based on spectral data measured from that specific detector. Your measurements across the band have never been this precise or easy.

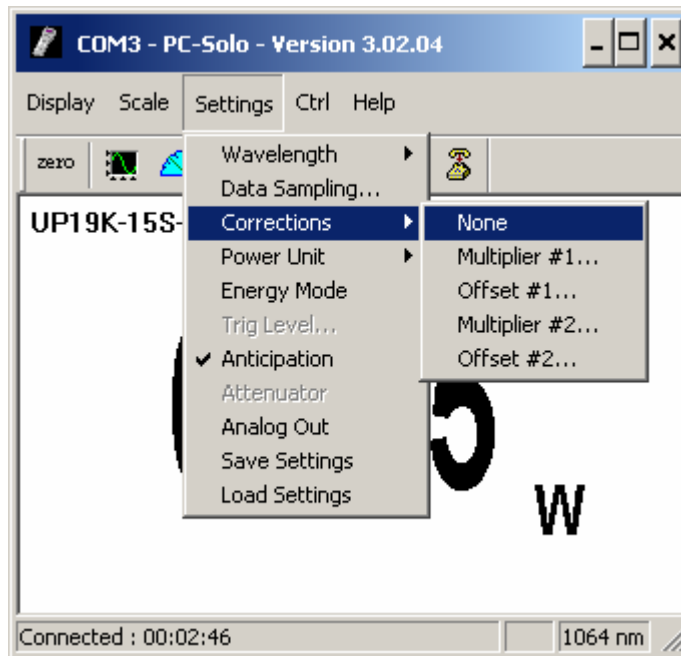
When working at a wavelength not available in the Wavelength menu, use the custom option in that menu and enter the wavelength you need. The wavelength you enter must be within the range of valid wavelengths. The SOLO interpolates a wavelength correction factor using the pre-programmed data in the detector's EEPROM.

*Personal wavelength correction*<sup>™</sup> is automatic only with version 5 and higher detectors. With version 4 (V4) detectors, you need to use the Corrections menu to manually enter a multiplier to correct for the wavelength. You will find these multipliers on the *Personal wavelength correction*<sup>™</sup> Certificate shipped with the detector. You can use both the Wavelength menu and the Corrections menu for all V5 and later detectors.



### 2.2.4.2 Corrections Setting

The user can apply up to 2 multipliers and 2 offsets to the detector reading. Correction factors are most useful when sampling a percentage of a powerful laser beam or correcting for absorption along an optical chain. The Status displays the values of correction factors that are being applied to the measurements. Also view them when you select **Status**.



**Fig. 2.5 Setting Correction menu**

To activate the correction factor, select **Corrections** in the **Settings Menu** and then select Multiplier or Offset. A dialog box opens where you enter the correction value in percentage or in absolute value. This number will then multiply, or add to the actual measured value to calculate the corrected value. The PC-SOLO will then display the corrected value.

For example, if you are measuring the laser beam passing through the 99.9% back reflector of a laser (giving 1/1000<sup>th</sup> of the real value), choose **Multiplier #1** and enter 1000 in the dialog box. The PC-SOLO will display the laser's power rather than the measured 0.1% sample on the main display.

The corrections are applied mathematically in the order shown in the menu. Therefore, to apply an offset before a multiplier you would enter a value for Offset #1 and a value for Multiplier #2 and leave Multiplier #1 at the default value. The default value for the multipliers is 1, and the default for the offsets is 0.

When a correction factor is active the "Head" value will be different from the displayed measurement. The corrected measurement appears in the center or upper right part of the screen depending on the display. The monitor will also turn itself in auto-scale mode to prevent any saturation problems.

It is also essential to make sure that the actual measured value complies with the power and energy limits of the detector head. It must always be based on the actual physical measured value and **not on the corrected values**. Of course, the displayed values are then calculated to take into account the correction factors.

Note that the **Statistics** are computed for the corrected values only.

To disable the correction factor, re-select the Correction Factor (multiplier, offset) in the **Corrections submenu** of the **Settings menu**. To disable all correction factors select **None** in that submenu.

#### 2.2.4.3 Data Sampling Settings

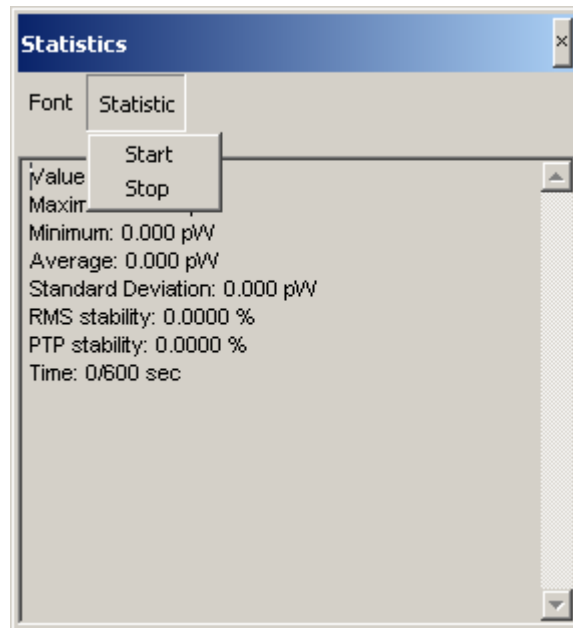
The PC-SOLO can display a complete statistical analysis of power or energy measurements. The Data Sampling menu is used to set up the data sampling parameters for calculating the Statistics. You have complete control over the data sampling. Use the defaults or select your own sample rate, sample period, and the time period or number of points to do the statistics. You can set the PC-SOLO either to calculate the statistics for a single sample and stop or to repeat continuously. Take data for a few seconds or a few weeks. You have the flexibility to handle any application, from analyzing a single short pulse with high resolution to sampling performance over a period of months.

In the **Data Sampling Settings** menu enter the sample rate, the sample period, and total duration. To change the units of time or to select the time stamp, use the drop down menus and click on the unit of time, or yes or no (time stamp). You can monitor the statistics being captured and calculated simply by looking at the **Statistics window**. You can switch back to any other display mode without affecting the measurement or the statistics. The statistical parameters that are calculated are listed in Table 2.1.

Table 2.1. Statistical Parameters

Statistical Parameters	Power	Energy	Definition
Current value	✓	✓	Value of the most recent measurement
Maximum value	✓	✓	Highest value in the sample period, $E_{max}$ or $P_{max}$
Minimum value	✓	✓	Lowest value in the sample period, $E_{min}$ or $P_{min}$
Average value	✓	✓	Rolling average of values in the sample, $E_{avg}$ or $P_{avg}$
Standard Deviation	✓	✓	A measure of the spread of the data around the average.  $STD = \sqrt{\frac{\sum_{i=1}^n (E_i - E_{avg})^2}{n-1}}, \quad STD = \sqrt{\frac{\sum_{i=1}^n (P_i - P_{avg})^2}{n-1}}$
RMS stability	✓	✓	Root mean square stability represents the standard deviation as a percent of the average.  $RMS = \frac{STD}{E_{avg}} \times 100, \quad RMS = \frac{STD}{P_{avg}} \times 100$
PTP Stability	✓	✓	Shows the spread between the highest and lowest point in the sample as a percent.  $PTP = \frac{E_{max} - E_{min}}{E_{avg}} \times 100, \quad PTP = \frac{P_{max} - P_{min}}{P_{avg}} \times 100$
Time	✓		Time elapsed since beginning the sample.
Pulse #		✓	Number of the last pulse added to the sample.
Repetition Rate		✓	Frequency of pulses coming from the laser, $PRR$
Average Power		✓	Power calculated from the pulse energies and repetition rate.  $P_{avg} = E_{avg} \times PRR$

To **Activate the Statistics**, on the statistics window click Statistic/ **Start**.



**Fig. 2.6** Statistic menu

The PC-SOLO starts compiling statistics on your measurements as soon as the Statistics mode is activated. When you stop the statistics, the last values remain in the statistics display window for you to view later. If you click start again, the PC-SOLO will reset the statistics and start again.

The PC-SOLO uses default sample parameters unless you set them yourself.

To **View the Statistics**, select **Statistics** from the **Display** menu.

To set the data sample parameters, enter the parameters of your choice in the Data Sampling Settings section found in the Settings menu. To update the device, click the button Send.

The key points to remember whether using a joulemeter or wattmeter are:

Sample Rate	Controls how fast you collect data.	Eg. 10 points/second or 50% of pulses
Sample Period	Controls how much data the statistics are computed for.	Eg. 5 minute or 1 day averages
Total Duration	Controls how long the PC-SOLO will acquire data and/or do statistics.	Eg. 1 period, 5 hours or 1000 pulses

Often the Total Duration and Sample Period will be the same but the PC-SOLO gives you the flexibility for any application. For example with the PC-SOLO you can see 5 minute averages of your laser performance as you check it during the day and have it stop and hold the last 5 minute statistics after 20 hours.

Table 2.2 Data Sampling Parameters

PARAMETER	Choices	Description	Default
Sample Rate	Integers 0 to 100 custom value 0 to 300	Sets the time between each sample. Specify it as a number of points per unit of time. <i>[for example, for 1 second between samples, set to 60 points per minute]</i>	10 (Power) 0 (Energy)
Sample rate units	pts/Second pts/Minute pts/Hour pts/Day	Sets the time period for the number of points entered above.  Maximum is 100 points/second, Minimum is 1 point/day.  Time between samples = 1/(sample rate)	pts/Second
% of Pulses Sampled <b>Energy only</b>	Integers 0 to 100	Sets the fraction of the incoming pulses sampled for the statistics calculations and data recording.	100 (Energy)
Sample Period	Integers 0 to 100 custom value 0 to 300 time units <b>or</b> 0 to 100,000 points	The time over which samples are to be averaged. Sets the number of samples used in the average and standard deviation <i>[for example, for each average to be based on 5 minutes of data, set to 5 minutes..]</i> . This is also the time period displayed by the Histogram and Line plot.	10 (Power) 500 (Energy)
Sample period units	Second Minute Hour Day Week Points	Sets the time period for the value entered above.  Maximum is 300 weeks or 100,000 points  Minimum is 1 second or 1 point	Minute (Power)  Points (Energy)
Total Duration	Integers 0 to 100 custom value 0 to 300 time units <b>or</b> 0 to 100,000 points	The time period for which samples are reported (to the display and output). Select a time period or a number of points <i>[for example, report statistics for 24 hours]</i> . Often the total duration and sample period will be the same.  The PC-SOLO automatically clears and recalculates the statistics at the end of each sample period unless you manually stop it.	1
Total Duration units	Continuous Periods Weeks Days	Sets the time period for the value entered above.  To make the statistics stop after one sample period, select "1" and "Period."  Maximum of 100 "periods" can be as high as 100	Period

	Hours Minutes Seconds	weeks. Minimum is 1 second.	
Time Stamp	Yes No	To have a <b>time stamp</b> appear with the data, select time stamp in the data sampling menu.	No

#### 2.2.4.4 Trig Level Setting

The trigger level only functions if an energy detector head is connected or if a power detector head is used in **Single Pulse Energy (Energy)** mode. This option allows the user to change the **Trigger Level** from the 2% of full-scale default value. This proves to be especially useful in noisy environments. Acceptable values range from 0.1% to 99.9%. Caution should be taken when choosing a lower trigger level than the 2% default value in a high noise environment.

To change the Trigger Level value, access the dialog box by clicking **Trig Level** from the **Settings** menu and enter the desired number in percentage or in decimals. The PC-SOLO will not detect pulses with a value under the Trig level. Be careful to select a scale that is close to the measured value if the Trig level is high.

The value of the Trigger level is shown on the side of the **Trig level** menu confirming that the Trigger level is activated to a specific user level.

Selecting a high value for the trigger level may cause problems with the detection of widely varying energy values in the Autoscale mode. The Autoscale function uses the energy level of the last pulse to set the scale level. Therefore it will not detect the next pulses if they are lower than the trigger level. As a result, the Autoscale may become caught on a high scale value. To solve this problem, select a lower value for the trig level, change the scale manually or reset the autoscale by reselecting autoscale in the **Scale** menu. With the metallic joulemeters (MT and XLE types), the trig level is set to 3% and cannot be change. If you inadvertently trigger on noise, change to a higher scale.

#### Erratic triggering?

For a few detector heads, in electrically noisy environments, it is possible that the SOLO will inadvertently trigger on the noise. In that case, increase the trigger level to 3% or higher if necessary.

It is always good practice to reduce electrical noise generation or shield the detector and monitor when measuring very low pulse energies.

#### 2.2.4.5 Save and Load User Settings

The PC-SOLO can remember and recall the settings of different users. You can share the PC-SOLO without the hassle of having to re-enter your settings. As an alternative, you can program it so that you can easily switch between three different measurement applications without having to re-enter your settings. This option is activated under the **Save Settings or Load settings** menu item.

## 2.3 Real-time Controls and About PC-SOLO

This section gives a complete description of the last group of menus and options available on the PC-SOLO in the Control and help menus. You can refer to Figure 2.7 at all times for a schematic view of the advanced menu structure.

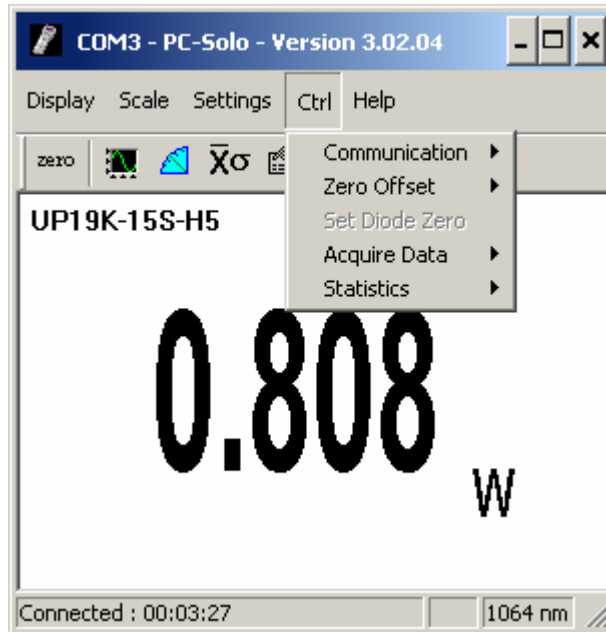


Fig. 2.7 View of the Ctrl Menu.

### 2.3.1 Control Functions in the Control menu

The following sections describe the Control menu

#### 2.3.1.1 Control – Zero Offset

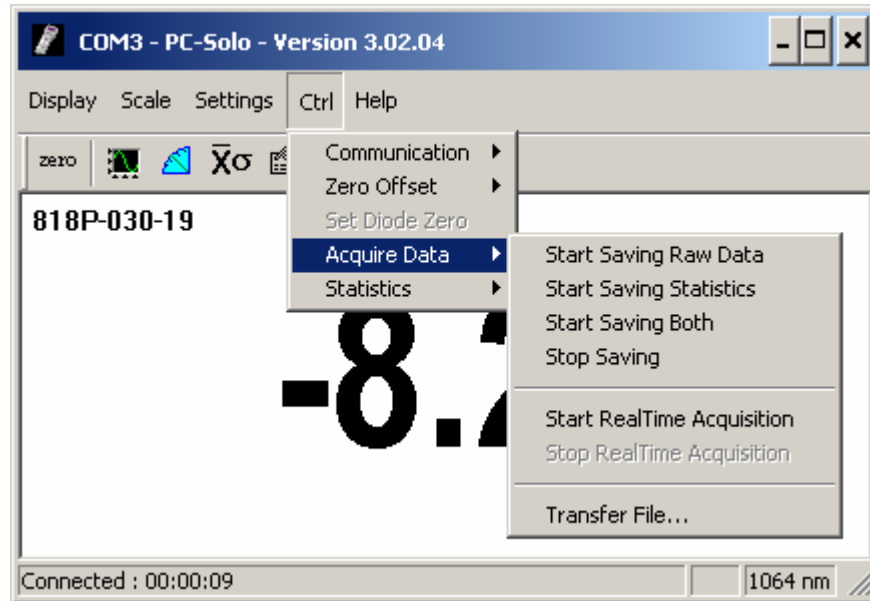
This function resets the zero reading level. It does this by subtracting the power reading on the display, the moment the command is selected by clicking **Zero Offset** below the data logging section. Subsequent measurements will be relative to this zero power level. The main purpose of this option is to remove reading offset caused by thermal noise in the environment of the detector. This can be caused by the fact that the detector has not been thermally stabilized OR there was a heat source in the field of view of the detector when the SOLO was turned on (for example, the hand or body of the user). Use this function once your power meter has achieved thermal equilibrium to ensure accurate measurements.

Alternative: To Rezero the offset, turn it off, or undo the previous setting, from the menu bar, click **Control / Zero Offset** and your choice.

**This control is only available for power heads.**

### 2.3.1.2 Acquire Data Ctrl

This option allows you the choice of saving raw data (only), statistics (only) or both. All the raw data will be at the top of the file, while all the statistical information will be at the bottom. Once the acquisition is finished (look at the monitor if the acquire sign is not there anymore) Click the file transfer option if you want to upload the file on your hard drive.



**Fig. 2.8 View of the Acquire Data Menu**

If you want to restore a file, you must restore it in the SOLO. This requires that the file be saved in Flash memory.

After you have restored the data from Flash memory on the SOLO, **CTRL/ acquire data/transfer file** in the Solo

Using the data has never been easier. If you drag the icon of your file onto the Excel icon or an open Excel spreadsheet, your data will automatically be put into the first one (or two) columns of a new spreadsheet. You can also open your file from within Excel. Just click **Finish** on the first screen of Excel's Text Import Wizard when it pops up. You can also copy and paste the data from your file into other files and applications.

### 2.3.1.3 Control – Energy Mode

This calorimeter feature allows you to measure the energy contained in a single pulse with a Gentec-EO **power detector head**. This mode of operation gives access to the same options as in the case of a pyroelectric joulemeter. The only restriction is that the time delay between pulses,



$Delay = \left( \frac{1}{Rep. Rate} \right)$ , must be more than three times the time constant of the detector. (Please refer to the instruction manual for the specific power detector you are using.)

You must select the scale manually because the Autoscale is deactivated when you select **Energy Mode**.

This command is a toggle so a checkmark indicates when it is on. Select it again to turn it off. The default is off.

Keep in mind that the power detectors are optimized to sustain high average power, not high peak energy. Always keep the energy density below the maximum energy density quoted in the manual for that specific detector.

The single pulse energy measured in **Energy Mode** is precise to  $\pm 5\%$  of the power measurement calibration. This is larger than the uncertainty in the power measurement (typically  $\pm 2.5\%$ ) because the energy calibration is computed from the power measurement calibration. A precision of  $\pm 3\%$  in the single pulse energy measurement can be achieved if the power detector head is specifically calibrated to measure in single pulse energy mode. Please contact your local Gentec-EO distributor or nearest Gentec-EO office for more information on obtaining a single pulse energy measurement calibration.

#### 2.3.1.4 Control – Power Unit

You may choose between Watt and dBm. Watt is the default. The dBm option is only available with photodiodes and power heads.

$$dBm = \text{Log}(\text{power in Watts}/0.001W)$$

#### 2.3.1.5 Control – Real Time Acquisition

This Acquisition option save data directly to your PC at a rate of around 0.5 Hz

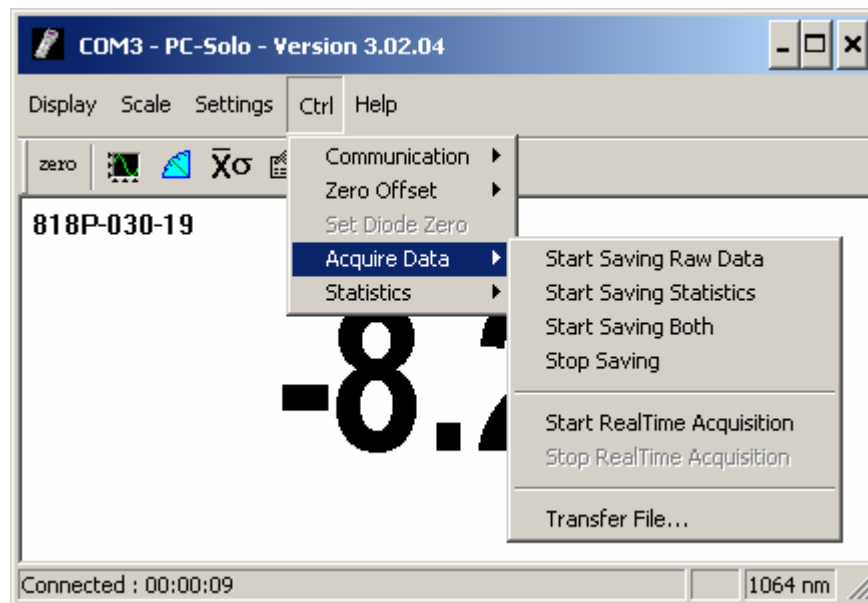


Fig. 2.10 Real Time Acquisition Menu

### 2.3.1.6 Control - Anticipation

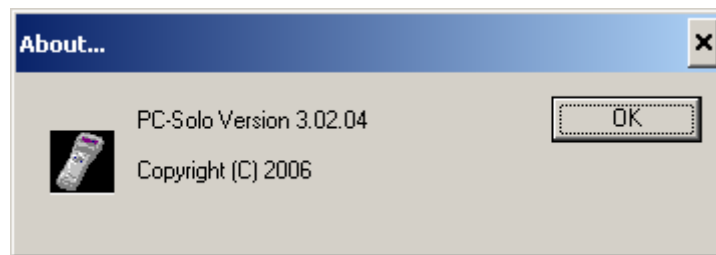
Use **Anticipation** to deactivate the power meter acceleration software that provides the “anticipation” response. By using advanced algorithms and known properties of the detector, this software allows the SOLO to provide a very accurate power measurement a few seconds faster than the natural response of a thermopile power detector. It accelerates the natural response by a factor of 5 to 10.

Turning off the anticipation will result in a slower response but it can provide a more stable measured value in a noisy environment.

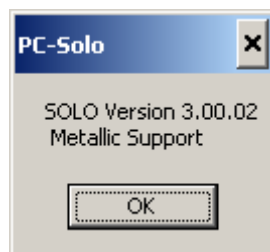
A checkmark shows when it is activated. It is a toggle switch so select it to change it between off and on. The default is on.

### 2.3.2 “?”

This menu contains “About PC-SOLO” to identify the software version, see Fig. 2.11. The about device is to identify the version currently loaded in the instrument if the monitor supports the metallic mode, see FIG 2.12.



**Fig. 2.11 About PC-Solo**



**Fig. 2.12 About PC-Solo**

## 3 Installation and communication

### 3.1 Installation

The SOLO is not required for the PC-SOLO software installation, however, you may already have connected it, and that is fine, too. Ensure that the SOLO is connected to the USB or RS 232 port when you are ready to run the PC-SOLO software.

Connect the SOLO USB or RS 232 port, located on the top panel of the instrument (see Figure 1.2), to the host device serial connector using the proper cable. The SOLO comes with a standard USB cable.

If you are using the USB connection, you must install the USB drivers.

The PC-Solo is compatible windows 2000 and XP.

#### 3.1.1 USB drivers Installation for Windows™:

##### Installation for Windows™:

Plug the Solo into a USB port on the PC. If the PC supports USB 1.1, Windows detects the new device and prompts you for the software drivers. A window will open that says **Found New Hardware – USB Device** and after several seconds to a minute, the Found New Hardware Wizard will appear.

Insert the Newport Software CD-ROM if not done already.

For Windows 2000: Cancel the wizard and execute the Auto installer “USB driver installer.exe” in the USB Driver folder from the CD-ROM.

For windows XP: Cancel the wizard and execute the Auto installer “USB driver installer.exe” in the USB Driver from the CD-ROM. If you have an installation problem do not cancel the Wizard. Click on Next until the Wizard asks you how to find the driver. Press the **Next** or **Continue** button as appropriate until the installation is complete. The final window should display “**Prolific USB-to-Serial Comm Port.**” Press **Finish** to exit.

At the end of this process, a new serial COM port will be added to the list of communication ports. It may be used as any other serial port. You will need to know the COM port number to set up the serial connection to the Solo.

**Note: Although the SOLO is equipped with both a mini-serial port and a USB port, they cannot be used at the same time. Only one port should be connected at a time.**

### 3.2 Setting up Communication to the SOLO

#### 3.2.1 Verify COM Port

To verify the USB installation and find the COM port number click:

**Start → Settings → Control Panel → System → Device Manager**

Scroll down to **Ports (COM & LPT)** and double click that line. One of the options should be

**Prolific USB-to-Serial Comm Port (COM#)**

Note the COM port number. You need it for the next step.

### **3.2.2 Connecting the PC-SOLO to the SOLO**

#### **3.2.2.1 Download the PC-SOLO file and execute it**

If you don't have the cd, download PC-SOLO from the internet, [www.gentec-eo.com](http://www.gentec-eo.com), in the Download section. Execute the downloaded file by double-clicking it or if the internet browser has the option of executing the file, you may execute it from the current location on the website.

#### **3.2.2.2 Installation**

Run the PCSolo-vx.x.exe, click the Next button until it installs itself. The installation is complete. You may be asked to reboot your computer. If so, reboot it.

### **3.2.3 Running PC-SOLO**

#### **3.2.3.1 Start the PC-SOLO**

Ensure that the solo is connected to the PC-SOLO either using the USB cable or the RS-232 port. Verify the COM port to ensure a proper connection. Start the PC-SOLO from the Start > Program >Gentec-eo

#### **3.2.3.2 Exit the PC-SOLO program**

Exit using the X in the right top corner.