

Gentec-EO USA Inc.



PDQ-4-DPM Pulse Track Operating Instructions

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Introduction

The DPQ-4-DPM is an advanced Beam Position Measurement system. It is used with the Pulse Track Applications Software, which creates a full featured data acquisition system for measuring and displaying laser energy and beam Position.

The DPQ-4-DPM is used with compatible Gentec-EO USA probes, the DPQ-J9, DPQ-J20, DPQ-R9, and DPQ-R20. The J series probes are used for pulsed laser applications, and the R series are used for Radiometric application. The DPQ-4-DPM can measure pulsed lasers up to 1000pps on each channel when using the J series probes. When using the R series probes the beam modulation rate can be set from 5Hz to 50Hz

Figure 1 shows the DPQ-4-DPM front panel. Figure 2 shows the DPQ-4-DPM back panel.



Figure 1, DPQ-4-DPM Front Panel



Figure 2, DPQ-4-DPM Back Panel

Installing the Software

Do not plug the DPQ-4-DPM into your PC yet.

Step 1, Installing the Applications Software.

1. Insert the installation CD. The installation will start automatically. If it does not, browse to the setup.exe file on the CD and run it.
2. The Welcome to the DPQ-4-DPM Installation Wizard will open. Select Next.
3. The Select Destination Folder dialog box will open. It is recommended that you leave the destination folder at the default setting. Select Next.
4. The Ready to Install the Application dialog box will open. Select Next. The application software and support files will be installed.
5. Upon completion of the installation, the Success dialog box will open. Select Finish.
6. Leave the CD in your PC as the USB drivers are located on the disk and are needed for step 2.

Step 2, Installing the USB Drivers

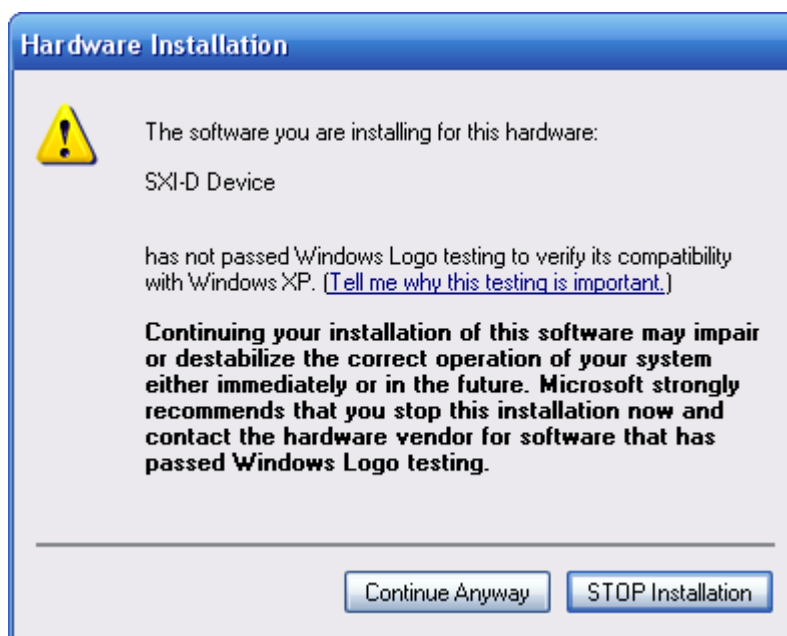
1. Connect the DPQ-4-DPM to your PC with the supplied USB cable.
2. Connect the power supply and turn on the DPQ-4-DPM.
3. The Found New Hardware Wizard will run. If the Windows Update prompt appears, select No, not this time and press Next.



4. When the Install from CD appears, select Install Software Automatically and press Next.



5. When the Windows Logo Warning appears, select Continue Anyway



6. When the Completing prompt appears, select finish.

The driver install process will now be repeated for the serial port drivers.

If during the driver installation Windows asks for the location of a file, browse to the CD drive and select OK. All the required files are on the install CD.

The software installation is now complete. You may now run the application software. The Gentec-EO USA DPQ-4-DPM instrument is a PC based design. As such it comes with a Software Application written in Lab View 8.6 designed to handle the control and display tasks. The DPQ-4-DPM communicates with the host PC via a USB port. The device supports full speed USB 2.0. The implementation of the port in the host PC is accomplished via a Virtual Com Port, or VCP. This in effect mimics a standard serial port so that the user can take advantage of the ease of developing custom applications with existing terminal emulators. Any programming environment that can use an RS232 serial port can communicate with the instrument.

Instrument Hardware

Power Source

The DPQ-4-DPM system is supplied with a 10V, 1.5A universal power module. It will accept voltages from +9V to +15V provided they supply at least 1A and the plug is 5.5mm outer diameter, 2.1 mm inner diameter, and 11mm in length, with the center being positive. Plug the supply into the DC power jack located on the front panel.

Probe Connection

The DPQ-4-DPM probes use a DB25 connector. See figure 1. To remove the probe, power down the unit first and remove the connector.

Indicator LED's

There are 2 LED's on the DPQ-4-DPM back panel as shown in figure 2.

The Power LED is illuminated when ever an external supply is plugged into the DC power jack.

The Trigger LED illuminated when the DPQ-4-DPM is triggered. This LED functions at all times, whether the DPQ-4-DPM is sending data to the application software or not.

USB

The DPQ-4-DPM communicates with the host PC via a USB port. The device supports full speed USB 2.0. The host P.C must have the DPQ-4-DPM USB drivers installed. These drivers are on the disc supplied with the DPQ-4-DPM instrument. The Application Software is written in LabView and uses the NI-VISA software from National Instruments to affect a communication link with the DPQ-4-DPM. The USB cable cannot be unplugged from the DPQ-4-DPM during operation.

Analog Out

The Analog Output provides an amplified, buffered signal from the probe. A Full Scale Reading will correspond to a 1.5V Signal at the analog out when set to a channel.

The 5th choice is a Bar Graph representing each of the 4 channels. A value of 2.000V is a full scale representation. Each bar in the graph is approximately 50us wide.

External Trigger

DPQ-4-DPM supports internal and external triggering. Connect a TTL trigger signal to this input to use external triggering.

Turning the Unit On

Before turning the DPQ-4-DPM on, be sure that the probe in use is plugged in. When the DPQ-4-DPM powers up, it reads the probe memory to obtain required information for correct operation. DPQ-4-DPM cannot detect a probe removal, so hot swapping the probe is not permitted. Doing so will not cause damage, but the probe information will not be updated. Once the probe and power supply are connected, turn the unit on by setting the

Power Switch to ON. The Power LED will illuminate. The DPQ-4-DPM is now ready to use.

Power on Tests

When powered on, the DPQ-4-DPM tests its internal memory and its control circuitry to ensure it can accurately measure data. If the internal memory fails its test, the DPQ-4-DPM will not turn on the Power LED. Should this condition occur, contact Gentec-EO USA at 503-697-1870 for service of the unit.

The Applications Software

Welcome to the DPQ-4-DPM Pulse Track Software Application Software. This software, when coupled with a Gentec-EO USA DPQ-4-DPM Instrument, provides the user with a versatile measurement system.

The Applications Software communicates with the host PC via a USB port. The system uses the DPQ-4-DPM Command Set to do this.

The DPQ-4-DPM sends the measured data to the Applications Software when requested to do so. The software will then display the data from each of the 4 channels.

Communications with Host PC

The DPQ-4-DPM Instrument communicates with the host PC via a USB port. The device supports full speed USB 2.0. The host P.C must have the DPQ-4-DPM Instrument USB drivers installed. These drivers are installed by the disc supplied with the DPQ-4-DPM Instrument. The Application Software is written in LabView and uses the NI-VISA software from National Instruments to affect a communication link with the DPQ-4-DPM Instrument. The implementation of the port in the host PC is accomplished via a Virtual Com Port, or VCP. This in effect mimics a standard com port so that the user can take advantage of the ease of developing custom applications with existing terminal emulators.

The Ports Settings are:

Baud Rate : 115200
Data Bits : 8
Stop Bits : 1
Parity : None
Flow Control : None

The host PC must have the DPQ-4-DPM USB drivers installed. These drivers are installed by the disc supplied with the DPQ-4-DPM instrument. The DPQ-4-DPM instrument will use the highest available PC baud rate. PC's running a language that uses an alphabet such as English generally will have a maximum baud rate of 921600. PC's

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using a symbol based language such as Japanese run slower baud rates, usually with a maximum of 115200. This restriction drives the maximum rate used in the DPQ-4-DPM.

Data Format

Measurement Data is sent from the DPQ-4-DPM Instrument as a Hexadecimal string. The supplied LabView VIs parse this data into numeric values.

Pulse amplitude for each channel, Measurement Range, and time stamp information are sent.

The format is: AAAAAAAAAAARPPPPPPPCRLF

Where AAA is the pulse amplitude in ADC counts, for each of the 4 channels. R is the range index of the range used to measure the data. P is the pulse time stamp. The values are followed by a carriage return and a line feed.

The final byte of the pulse amplitude consists of 4 bits of data in the high nibble, followed by 0x04, the end of transmission character, in the low nibble. This is done because the data is sent over the com port, and is also sent to the secondary processor. The secondary processor uses the data to set the analog out DAC, and must know where each pulse terminates.

The range byte is 0 to 18, with 0 indicating 2 fJ and 18 indicating 2kJ. Ranges are in decades.

The period is based on a 135MHz clock, so dividing 135MHz by the period counts will yield the frequency.

A full scale reading in any range is 3072 counts. To find the value of the pulse, divide it by 3072 and multiply the result by the range.

To decode the pulse amplitudes, mask off bytes 0 to 11. Channel 1 is bytes 0, 1, and 2, on to Channel 4 at bytes 9, 10, and 11. Suppose byte 0 is 0x41, byte 1 is 0x39, and byte 2 is 0xC4. 0x41 is an 'A', and 0x39 is a '9'. The third byte has the 0x04 lower nibble to signal the end of the channel data. The character of interest is the 'C'. There for the pulse amplitude is 0xA9C, or 2716 counts. The energy measured will be 2716/ 3072 times the range.

Data Acquisition

When the DPQ-4-DPM Instrument is powered on, it enters the data acquisition state and waits for a trigger. When a trigger event occurs, the Triggered LED will illuminate and the Instrument will measure the pulse energy and the period timer. If the instrument has been commanded by the user to send data, the results will be sent to the com port and the analog out controller.

Command Set

All host commands and queries must consist of 3 alphabetic characters followed by an optional argument list. If there is more than one argument, they must be comma separated. All commands are terminated by a carriage return followed by a line feed. The format is:

abc<arg1,arg2,...,argN>CR LF

The 3 characters are case independent. If the command has arguments and the argument is valid, "OK\r\n" is returned unless noted below. If an error occurs, "ERR\r\n" is returned. If the command has no arguments, it is interpreted as a query if applicable and the value of the current state of the parameter the command is returned. All returned parameters are terminated with a carriage return followed by a line feed. All commands/queries have a LabView VI to implement them. Since the communications is done via a com port, any software that supports RS232 communications can be used to develop a custom application using the command set.

Command and Query List

VER, Version Query, causes the instrument to return the internal firmware version.

IDN, Instrument ID Query, causes the instrument to return the instrument identification.

SND, the data send command. This command uses one argument. If the command is sent with a 1, then the data stream is turned on. Sending it with a 0 turns the data stream off and the instrument responds with OK.

RNG, the range command. Sets the instrument measurement range if sent with the range index. The ranges correspond to the sent index as follows:

Range	Range Index
2fJ or 2 fW	0
20fJ or 20fW	1
200fJ or 200fW	2
2pJ or 2pW	3
20pJ or 20pW	4
200pJ or 2000pW	5

2nJ or 2nW	6
20nJ or 20nW	7
200nJ or 200nW	8
2μJ or 2μW	9
20μJ or 20μW	10
200μJ or 200μW	11
2mJ or 2mW	12
20mJ or 20mW	13
200mJ or 200mW	14
2J or 2W	15

If the command is sent with no argument the current range index is returned.

MAX, the maximum range query, returns the maximum range index that can be requested. If the range command is sent with a index greater than this value, and ERR is returned.

MIN, the minimum range query, returns the minimum range index that can be requested. If the range command is sent with a index less than this value, and ERR is returned.

MRD, the maximum reading query, returns the maximum value that the instrument can measure.

TRG, the trigger level command, sets the internal trigger level in % of full scale. The allowed range is 2% to 20%. Values outside of this range will be ignored and ERR will be returned. If sent without an argument, the current level is returned.

TSC, the trigger source command, sets the trigger source to internal or external. An argument of 0 sets the trigger to internal, and argument of 1 sets it to external. The source cannot be queried.

POL, the external trigger polarity, set the external trigger edge sensitivity. An argument of 0 sets the trigger to rising edge, and argument of 1 sets it to falling edge. The polarity cannot be queried.

SRC, the analog out source command, selects which signal to send to the analog out BNC. The source cannot be queried.

Argument Sent	Analog Out Source
0	4 Channel Bar Graph
1	Channel A Pulse
2	Channel B Pulse
3	Channel C Pulse
4	Channel D Pulse

WAV, the user wavelength command, sets the wavelength in use. The argument is the wavelength in nm. No argument returns the current wavelength. This command is used in conjunction with the WCM command.

WCM, the wavelength compensation command, turns wavelength compensation on or off. An argument of 0 turns it off, and argument of 1 turns it on. No argument returns the current state. This command is used in conjunction with the WAV command.

WVQ, the wavelength response query, returns the sensor wavelength and percent response at the desired index. The instrument stores 40 response points in the sensor EEPROM. Sending the query with arguments from 0 to 39 will return each of the points respectively.

The following commands access the EEPROM used in the sensor. They should be used as queries only as they will overwrite the factory values if used as commands.

PRV, the probe responsivity query, returns the responsivity for the requested channel. The argument is the channel index.

Argument Sent	Channel Responsivity Returned
0	Channel A
1	Channel B
2	Channel C
3	Channel D

PWV, the calibration wavelength query, returns the calibration wavelength in nm.

PSZ, the element diameter query, returns the element diameter in meters.

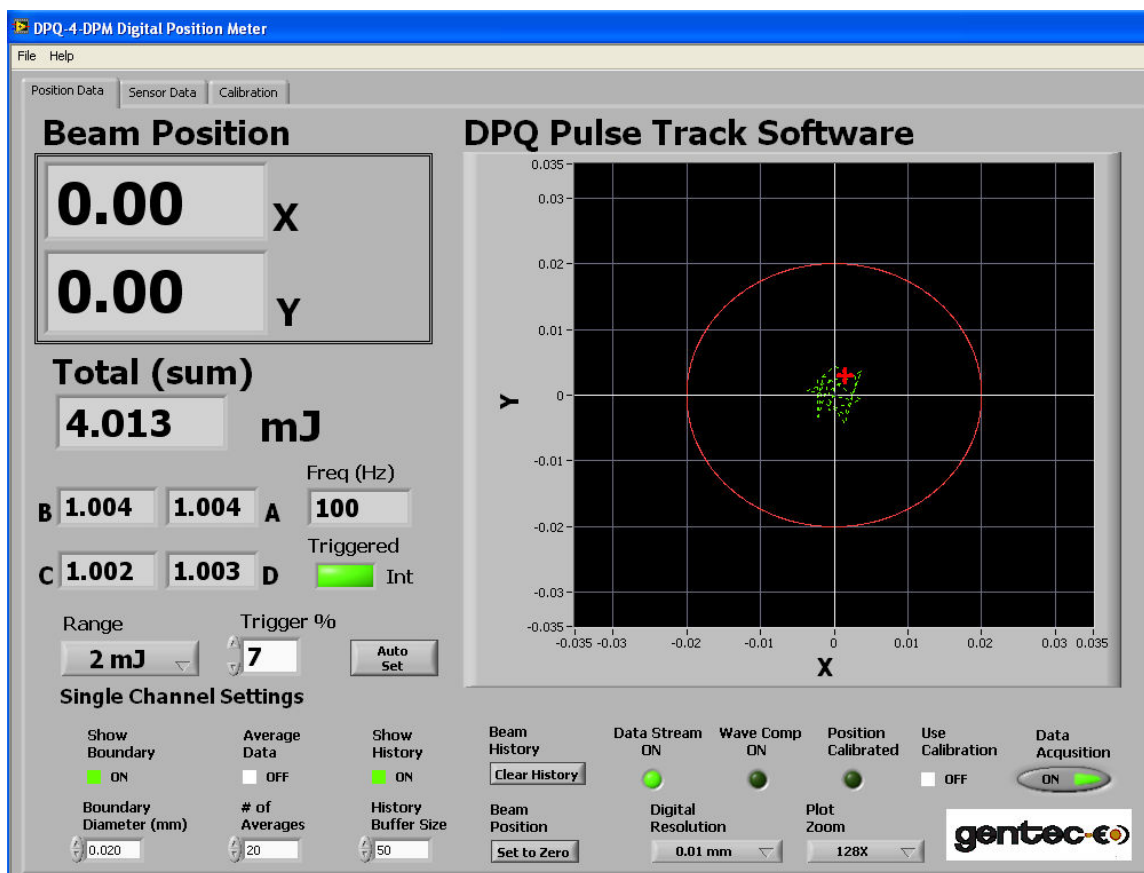
PTY, the sensor type query, returns the sensor type index. 0 is a Joulemeter, 1 is a Radiometer.

The Main Display

The Main Display Panel has two display regions. They are:

1. The Position Data Display, which is on a user selectable tab.
2. The Sensor Data Display, which is on a user selectable tab.
3. The Calibration Display, which is on a user selectable tab.

The Position Data Display



The Measurement Display has Controls and Indicators related to instrument usage. It is the main display used while taking data with the DPQ-4-DPM Instrument.

Controls

The controls on the Position Data Display are:

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Range
Trigger %
Show Boundary
Boundary Diameter
Average Data
of Averages
Show History
History Buffer Size
Clear History
Beam Position (Zero Beam)
Digital Resolution
Plot Zoom
Use Calibration

Auto Set
Run

Range

Sets the instrument to the desired range.

Trigger %

The trigger level in percent of full scale. If the level is set to 10% and the range is set to 200uJ, then the instrument will trigger at signals greater than 20uJ.

The DPQ-4-DPM examines all 4 channels for a trigger event in sequences, so if any of the 4 channels are above the set trigger level, all 4 channels will be measured.

Show Boundary

When this control is ON a circle with the set diameter is plotted on the X Y graph. When coupled with the plot history, this can be used for limit testing.

Boundary Diameter

The diameter of the Boundary Circle plotted on the X Y graph. When coupled with the plot history, this can be used for limit testing.

Average Data

When turned on the data is averaged using a moving average, also known as a Box Car filter.

This means that the average will not be complete until all the samples are taken, but the displays will reflect the current averaged value until this happens. Suppose that a batch size of 5 is selected, and then Average Data is selected. The samples will be averaged as follows:

Sample Number	Number Averaged
1	1 sample summed, divided by 1
2	2 samples summed, divided by 2
3	3 samples summed, divided by 3
4	4 samples summed, divided by 4
5	5 samples summed, divided by 5

The averaging filter is now full. As each new sample is taken, it will replace the oldest sample and a new average will be computed based on the new data set, that is sample 6 will replace sample 1, the and the new set will be averaged.

of Averages

The number of averages to use in the moving average.

Show History

When this control is ON the red beam position indicator will draw a dashed green line on the graphic display to show where the beam has been. The number of history points to keep is set by the History Buffer Size control. When the beam position history reaches the History Buffer Size, the history will be cleared and will start over. The plot update rate is 330 ms, so a History Buffer size of 1000 points will trace out 330 seconds of beam history, or 5 ½ minutes.

History Buffer Size

The number of points to keep in the Beam History plot.

Clear History

Clears the Beam Position History plot. If Show History is active, a new history plot will start.

Beam Position (Zero Beam)

Forces the Beam Position to 0, 0. This can be used to measure displacement of the beam.

Digital Resolution

Sets the resolution of the X and Y indicators. This control has no effect on the energy

indicators.

Plot Zoom

Zooms in the graphic display by the selected factor. Zoom factors are set in powers of 2 from 1X to 128X.

Use Calibration

When this control is ON the beam position indicator will be corrected for the non linear response of the detector. If the beam position has not been calibrated, then the control will be turned off and an error message will be displayed.

If the control is OFF, then no correction will be done.

Auto Set

Calls the Autoset VI. This VI attempts to find the best range and trigger level for the signal being measured. The flow is:

1. Set trigger level to 7%
2. Set Range to top Range.
3. Test for triggering.

If no triggers are present, the VI reduces the range to the next lowest and tests for triggering. It repeats this process until the lowest range is reached. If no triggers are present, it then reduces the trigger level 1% at a time until either triggering occurs or the minimum trigger level is reached.

When a trigger is found, the VI returns the discovered setup to the Position Data Display.

Run

Data Collection Control. When active the data is collected for display if the device is triggered. Data Collection is suspended if another control is activated, and then resumed when the other control is released.

Indicators

The indicators on the Position Data Display are:

X (mm)
Y (mm)
Total
Quad Energy A

Quad Energy B
Quad Energy C
Quad Energy D
Frequency (Hz)
Triggered
Data Stream On
Wave Comp On
Position Calibrated
Pulse Track Plot

X (mm)

The X position of the beam on the detector surface in millimeters. The units are only visible when the Beam Position has been calibrated.

Y (mm)

The Y position of the beam on the detector surface in millimeters. The units are only visible when the Beam Position has been calibrated.

Pulse Energy

The total energy in the beam. This is the sum of each of the energies measured by the quadrants.

If any of the 4 channels is over ranged, this indicator's background will turn red.

Quad Energy A

The energy in the portion of the beam incident on quadrant A, the upper right quadrant.

If the channel is over ranged, this indicator's background will turn red.

Quad Energy B

The energy in the portion of the beam incident on quadrant B, the upper left quadrant.

If the channel is over ranged, this indicator's background will turn red.

Quad Energy C

The energy in the portion of the beam incident on quadrant C, the lower left quadrant.

If the channel is over ranged, this indicator's background will turn red.

Quad Energy D

The energy in the portion of the beam incident on quadrant C, the lower right quadrant.

If the channel is over ranged, this indicator's background will turn red.

Frequency (Hz)

The frequency (pulse repetition rate) of the pulses being measured.

Triggered

Illuminates when the instrument is triggered and sending data to the VI. If triggers stop, the trigger timer must expire before the LED will go out.

Data Stream On

Illuminates when the Data stream is on. Note that if the instrument is not triggered, no data will be sent.

Wave Comp On

Illuminates when Wavelength Compensation is on.

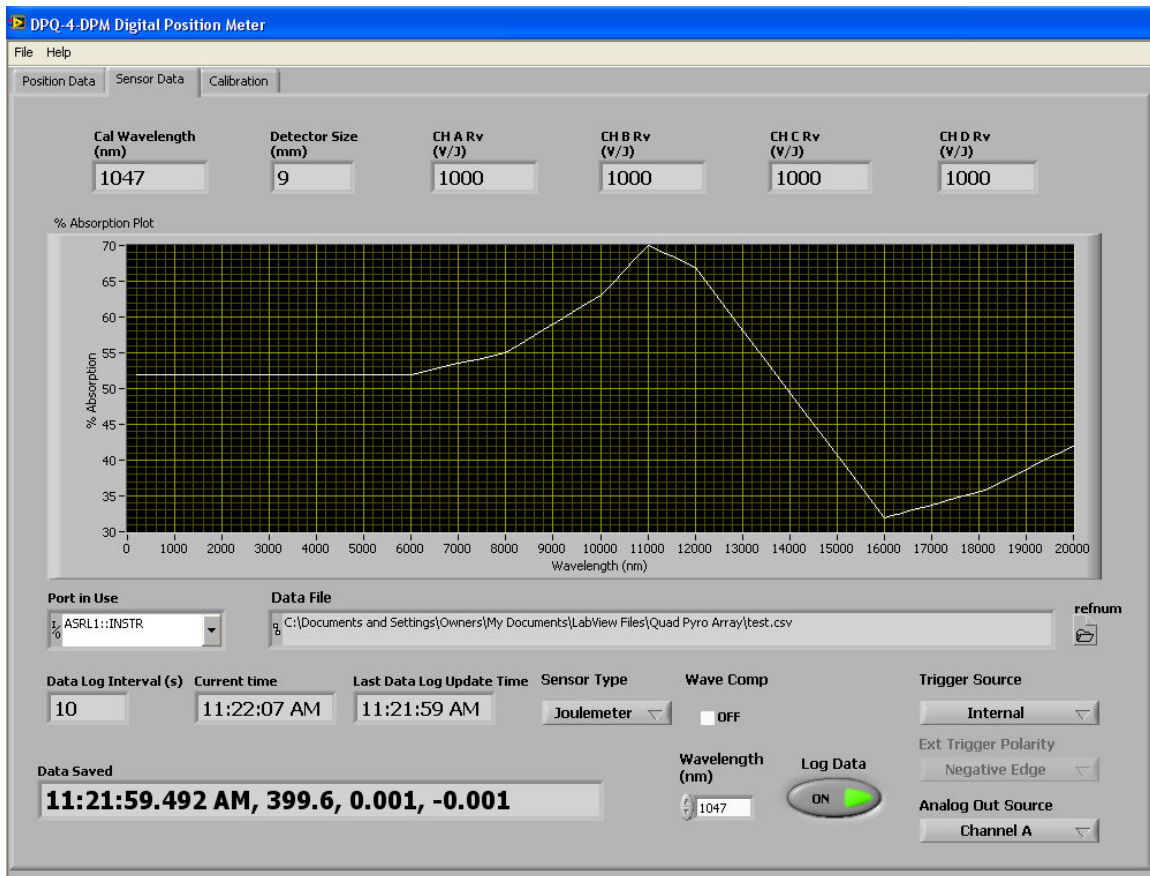
Position Calibrated

Illuminates when the Beam Position has been calibrated.

Pulse Track Plot

Graphic plot of the beam position and position history if active.

Sensor Data Display



The Sensor Data Display has Controls and Indicators related to the sensor. The sensor information is read from the sensor memory on program startup.

Controls

The Controls are:

Trigger Source

Trigger Polarity

Log Data

Wavelength (nm)

Analog Out Source

Trigger Source

Selects the Trigger Source, External or Internal. If External is selected, a trigger source must be connected to the External Trigger BNC.

Trigger Polarity

Selects the External Trigger Polarity, Positive (rising) or Negative (falling) edge.

Log Data

Log data to selected file. if no file is currently open, a prompt will request the file to log data to. Data files can be opened and closed via the File menu.

Wavelength (nm)

Sets the wavelength of the laser in use.

Since the sensor responsivity varies with wavelength, turning Wavelength Compensation on with the wavelength set to any value other than the calibration wavelength may cause a rescale of the available ranges. If this occurs, the instrument will set itself to the same currently set range if it is still available. If it is not, the instrument will set itself to the next available range.

Analog Out Source

Selects what is sent to the Analog Out BNC of the DPQ-4-DPM. The Analog Output provides an amplified, buffered signal from the probe. A Full Scale Reading will correspond to a 1.5V Signal at the analog out when set to a channel.

The 5th choice is a Bar Graph representing each of the 4 channels. A value of 2.000V is a full scale representation. Each bar in the graph is approximately 50us wide.

Indicators

The Indicators are:

- Cal Wavelength
- Wave Comp
- Detector Size
- Responsivity
- % Absorption Plot
- Port in Use
- Data File
- Data Log Interval
- Current Time
- Last Data Log Update Time
- Data Saved

Cal Wavelength

The wavelength of the laser used to calibrate the sensor.

Wave Comp

Turns Wavelength Compensation On. The sensor responsivity is wavelength dependent. Turning Wavelength Compensation On causes the instrument to restructure its internal gains to compensate for the variation in responsivity.

Detector Size

The size of the detector used in the sensor. This is not the size of an individual quadrant, but rather the total detector.

Sensor Responsivity

The responsivity, in V/J, of each of the 4 sensors in the quad. This data is stored in the array memory and read by the instrument to be used for responsivity normalization.

% Absorption

The wavelength response, in % Absorption, of sensors in the array. This data is stored in the array memory and read by the instrument to be used for responsivity normalization when the sensor is used at a wavelength other than the calibration wavelength.

Port in Use

The Virtual Com Port in Use.

Data File

The path of the currently open data file. If the indicator is empty, no file is currently open to log data.

Data Log Interval

Sets the time interval to use when saving data to a file. Do not set this interval to less than 1 second or invalid data may be saved.

Current Time

The current time. This is used to determine when the data log interval has been reached.

Last Data Log Update Time

Displays the last data log time stamp. This value is written to the data file.

Data Saved

Displays the saved. This value is written to the data file.

Calibration Display

DPQ-4 DPM Digital Position Meter.vi

File Help

Position Data Sensor Data **Calibration**

Calibrate Beam Position

Calibrated = A x Measured⁷ + B x Measured⁶ + C x Measured⁵ + D x Measured⁴ + E x Measured³ + F x Measured² + G x Measured + G

Set Postions	Measured Postions	Corrected Postions	Coefficients
0 -2.00E+0	0 -3.86E+0	0 -2.00E+0	0 2.61E-2
-1.50E+0	-3.33E+0	-1.50E+0	5.04E-1
-1.00E+0	-1.96E+0	-9.92E-1	-5.63E-2
-5.00E-1	-1.01E+0	-5.18E-1	-1.19E-2
0.00E+0	-1.20E-2	2.00E-2	8.31E-3
5.00E-1	1.04E+0	4.87E-1	-1.23E-5
1.00E+0	2.44E+0	1.01E+0	-3.14E-4
1.50E+0	3.33E+0	1.50E+0	5.89E-5
2.00E+0	3.86E+0	2.00E+0	

Save Coefficients
Recall Coefficients

The Calibration Display has Controls and Indicators related to calibrating the beam position.

To use the Beam Position Calibration, first make sure that the instrument is triggered and measuring. Press the Calibrate Beam Position button. The software will request you to place the beam at a series of five positions on the X axis. A measurement will be taken at each position and the resulting data will be used to fit a 7th order polynomial. The results of the curve fit will then be used to correct the Beam Position display if the Use Calibration control is active.

Controls

The controls are Calibrate Beam Position, Save Coefficients, and Recall Coefficients.

Calibrate Beam Position

Pressing this button calls the Beam Position Calibration routine. The user will be asked to set the beam position to a set of X axis values determined by the sensor radius. At each

position the measured displacement and the set displacement will be recorded. When all measurements are taken, a 7th order polynomial curve fit will be done to determine the correction coefficients. The results of the correction will be displayed to show the accuracy of the corrections.

Note that each measurement taken is the average of 16 pulses. This means that the time to finish the calibration is pulse rep rate dependent.

The measured data from the instrument is nonlinear in response and is also dependent on the beam shape. The quadrants are symmetric about the center and have excellent spatial uniformity and matching responsivity, so calibration can be performed in one axis only. The system calibrates the sensor in the X axis by measuring the data at 9 positions. These positions are found using the sensor radius. A 9mm sensor has a radius of 4.5mm. The software will use the closed even value, which is 4mm, then divide it into 8 intervals, or 9 steps or -2.00, -1.50, -1.0, -0.5, 0, +0.5, +1.0, +1.5, and +2.0. It then uses the known positions and the measured data to calculate the correction coefficients.

The beam must be at the 0,0 position before performing the calibration, and the Beam Position must not be Set to Zero by using the Zero Beam control.

Save Coefficients

Saves the Displayed Calibration Coefficients to a user specified file.

Recall Coefficients

Recalls the Calibration Coefficients from a user specified file. These values will then be used for beam position correction.

Indicators

The indicators are:

Set Position
Measured Position
Coefficient
Calibrated Position

Set Positions

The requested Set Position for each measurement during the calibration.

The Set Positions are determined by computing the closest even integer radius of the Sensor and then dividing that value by 8. The positive X axis 4 steps plus zero are used to fit a 7th order polynomial.

As an example, suppose the Sensor has a diameter of 9mm. The radius will then be 4.5mm, so the algorithm will set this to 4mm. Division by 8 gives 0.5mm. The 9 Set Positions will then be:

(-2.0,0) , (-1.5,0) , (-1.0,0) , (-0.5,0) , (0,0) , (0.5,0) , (1.0,0) , (1.5,0) , (2.0,0)

Measured Positions

The Measured Position by the DPQ-4 for each Set Position used during the calibration.

Coefficients

The 8 coefficients used in the correction equation.

$$y(x) = Ax^7 + Bx^6 + Cx^5 + Dx^4 + Ex^3 + Fx^2 + Gx + H$$

where x is the measured position and y is the calibrated measurement.

Calibrated Positions

The Corrected Position for each measurement.

Operating DPQ-4-DPM with the Applications Software

Plug the power supply and probe into the DPQ-4-DPM instrument. Start the application software. The software will set itself to the Position Measurement Tab and initialize contact with the instrument. It will then set itself to the Probe Data tab and read the required information from the probe. The software will then configure itself for the ranges appropriate to the probe and set itself to the Position Measurement tab. The system is now ready for use.

Getting Ready to Measure Data

The DPQ-4-DPM instrument and applications software provide a versatile high speed measurement system. It must be properly set up to work well. The following sections discuss the controls that set up the instrument for measuring data.

Range Setting

The available ranges are dictated by the probe in use. Use the range control to set the range to a value appropriate for the expected energy. Note that energy values above the range value can be measured, but accuracy may be reduced. In general, the smallest range that will contain the expected energy should be used, i.e., if the maximum energy to be measure is 189μJ, the use the 200μJ range. Note that this energy can be measured in the 2mJ range with a trigger level below 9%, or an external trigger, but more accurate results will be obtained in the 200μJ range.

Trigger Level Setting

If internal trigger is used, then the trigger level is set to a value that is less than the lowest expected energy. For example, energies from 1.8mJ to 15mJ are expected. Select the 20mJ range, and set the trigger level to less than $1.8 / 20 \times 100 = 9 \%$. You may have to experiment with the trigger level until the trigger LED illuminates.

Trigger Source Setting

The trigger source can be set to internal or external. Internal trigger generates a trigger event whenever the pulse exceeds the trigger level. External triggering generates a trigger event whenever a TTL pulse is received on the external trigger input. A measurement is taken when a trigger event is generated, so with external triggering missing or runt pulses can be discovered.

Trigger Polarity (Slope) Setting

In external trigger mode, the rising or falling edge of the TTL pulse may be selected as the trigger event. If the trigger is set to external, with edge polarity, then the temporal relationship between the edge of the trigger and the rising edge of the pulse must be in a window not to exceed $\pm 10\mu\text{s}$.

Autoset

This button calls the Autoset VI. This VI attempts to find the best range and trigger level for the signal being measured. The flow is:

1. Set the trigger source to internal.
2. Set trigger level to 7%
4. Set the Range to Top Range.
5. Test for triggering.

If no triggers are present, the VI reduces the range to the next lowest and tests for triggering. It repeats this process until the lowest range is reached. If no triggers are present, it then reduces the trigger level 1% at a time until either triggering occurs or the minimum trigger level is reached.

When a trigger is found, the VI returns the discovered setup to the Instrument Controls Display.

Measuring Data

Once range and trigger setting have been made, and the trigger LED is illuminated, then data can be acquired by pressing the Acquire Data button

Data Correction

The DPQ-4-DPM system is capable of correcting data for wavelength variation from the calibration values. This correction can be disabled if so desired.

Wavelength Correction

Wavelength correction is done in the DPQ-4-DPM instrument. When a wavelength different from the calibration value is selected, the internal gains of the instrument are changed to normalize the response of the probe to the calibration wavelength. Since the sensor responsivity can vary significantly with wavelength, turning Wavelength Compensation on may cause a rescale of the available ranges. If this occurs, the instrument will set itself to the currently set range if it is still available. If it is not, the instrument will set itself to the next available range.

The response of the probe is stored in the probe memory and is read when the DPQ-4-DPM is powered on. It is plotted on the Probe Data display

File Management

As data is being acquired, it may be saved to an external file for later analysis, either by the Applications Software or some other software package of the users' choice. The Applications Software can open, close, and copy an open file to the Applications Software displays.

Obtaining Help

There is context sensitive help available by selecting the Show Context Help item in the help menu. A help window will appear when the mouse cursor is placed over a control or indicator.

There is a compiled help file that can be called by selecting the Help item in the help menu.