PFPDView

Optional Software for the
Model 5380 PFPD

Operator's Manual

Version 1.0

O·I·Analytical

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Chapter 1
Introduction

PFPDView is a software option package for OI Analytical's Model 5380 PFPD (Pulsed Flame Photometric Detector). This program can be used to reprocess (post-run) either portions of or an entire chromatographic run under different PFPD operational parameters without the need for rerunning the chromatographic analysis. This allows the parameters to be adjusted for optimal selectivity without the extra time and expense of rerunning the analysis to find the ideal parameters. Post-run analysis facilitates method development, dual gate optimization, and technical support. It can also provide structural information on unknown compounds.

Features

- Post-run display of emission scans, gate parameters, and chromatograms.
- Allows the operator to review individual time emission profiles to obtain some heteroatom structual information of unknown compounds.
- Permits post-run gate optimization for improved sensitivity and selectivity.
- Permits off-line optimization of the dual gate modes to enhance interhetroatom selectivity.
- Allows the operator to reanalyze off-line chromatographic runs under different PFPD parameters.

The PFPDView software package includes:

- One floppy disk (3.5")
- One operator's manual (Part #311019)

Specifications

Hardware Requirements

- Pentium/100 MHz IBM-compatible platform (minimum)
- 2 MB hard disk space
- 16 MB RAM minumum
- VGA monitor (or higher)
- One serial port (RS-232-C) (16550 buffered UART 38.4 K baud required)

Host Software Requirements

- Windows 3.1x, Windows 95, Windows 98, or Windows NT
- OI Analtyical's WinPulse™ software

Chapter 2
Installation

This chapter explains installation of the PFPDView software. Before installing PFPDView, verify that WinPulse Version 2.0 is installed in the PC.

Note: The firmware in the Detector Controller must be Version 2.01 or higher (see the label on the firmware chips). If an earlier version is installed in the Detector Controller, replace the chips with the ones provided with the PFPDView software. Follow the chip installation instructions included in the Start-up Kit.

Note: PFPDView is designed to run under Microsoft® Windows version 3.1 or later. For information on how to use Microsoft Windows, refer to the appropriate Windows documentation.

Note: PFPDView is designed to operate with a PC mouse. For information on how to use a mouse, refer to the appropriate Windows documentation.

Installation

Before installing the PFPDView software, confirm that the minimum hardware and software specifications required to run PFPDView exist in the PC on which PFPDView is to be installed (see “Specifications” in Chapter 1). Begin installation in the Windows environment.

Note: It is recommended that you exit all Windows programs before installation.

1. Insert the 3.5" PFPDView floppy disk into the appropriate floppy disk drive.

2. Under the **Start** menu (or **File** menu in Windows 3.1x), select **Run**.

3. Type *a:\setup* or *b:\setup* depending on which drive the PFPDView floppy disk is in, and press [Enter].

4. A welcome screen will appear asking whether or not to install PFPDView. Click on **Next** to install PFPDView.

5. Follow the directions given. (In the NAME and COMPANY input window, move from the NAME box to the COMPANY box by pressing [Tab]. Do not click on **Next** until after all information has been entered.)

Chapter 3
Overview of PFPDView

PFPDView is an optional software program that permits post-run processing of the data files collected using the WinPulse software for the Model 5380 PFPD. PFPDView is accessed either from the WinPulse Main Screen or by clicking on the PFPDView icon.

This chapter describes the PFPDView Screen and the menu features available.

PFPDView Screen and Menu Features

The PFPDView screen and menus have been organized for efficiency. All of PFPDView's functions can be accessed by navigating these menus. Table 3.1 shows the complete menu/submenu structure for PFPDView. These menus are accessed from the PFPDView Screen.

Overview of the PFPDView Screen

The PFPDView Screen consists of a toolbar and separate graphics displays for the time emission profile and the chromatogram. The top window is the selected time emission profile for the pulse indicated by the cursor line in the chromatogram (displayed on the PFPDView Screen). The lower window is the resulting chromatogram for the entire analytical run, calculated from the specified gate parameters from all of the collected time emission profiles. See Figure 3.1.

The analysis time for the particular displayed time emission profile (pulse) is displayed on the first line of the legend. The vertical axis (Y) on the chromatogram represents the (peak) intensity, and the horizontal axis (X) is the retention time of the peak in seconds. Exact retention time information is generally not available unless the Model 5380

Table 3.1. PFPDView Menus/Submenus

Menu	Submenu
File	Open Close Save cfg File Open cfg File Print Printer Setup XXXX.DAT Exit
Edit	Send to Clipboard
View	Scan Chromatogram Zoom In Zoom Out Previous View Restore Snap to Trace Toolbar Status Bar
Tools	Recalculate Chromatogram
Option	Gate Mode Log Timed Events Board/Channel
Window	Cascade Tile [Files Currently Open]
Help	Index Using Help About PFPDView

Detector Controller is synchronized (via remote start) with the GC's run start.The Y-axis of the time emission profile displays the intensity level, and the X-axis is the pulse time in milliseconds.

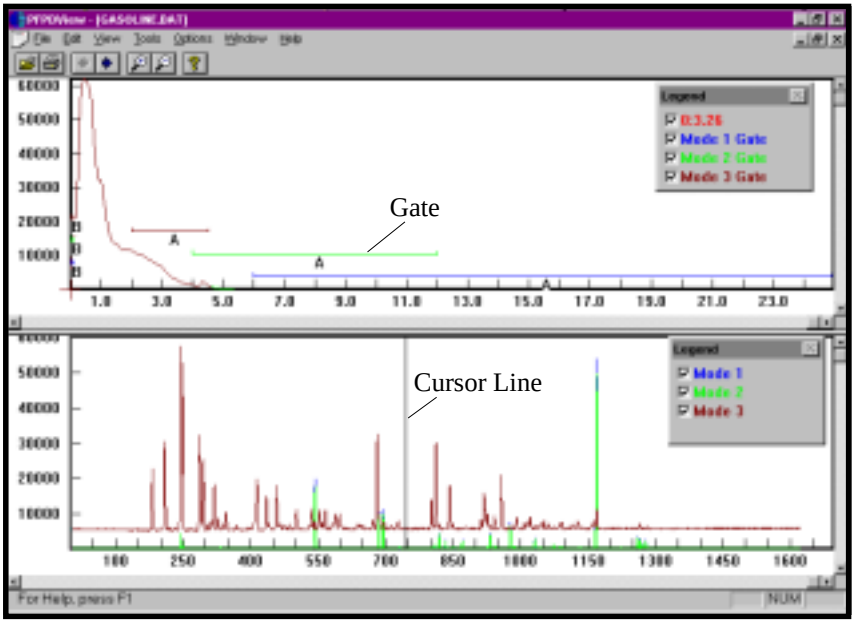


Figure 3.1. PFPDView Screen

The time emission profile (pulse) for a specific point on the chromatogram can be viewed three ways: (1) clicking on the selected area/time of the chromatogram, (2) clicking on the appropriate arrow button (or) on the toolbar, or (3) pressing the arrow keys on the computer keyboard until the vertical cursor line is on the specific point.

The cursor line is a very helpful tool. It allows each individual pulse emission in the chromatogram to be viewed individually. Holding the arrow key down on the keyboard will rapidly scroll the cursor line across the chromatogram. By viewing each pulse, certain elements and their ratios can be identified. For more information, see “Analyzing and Viewing Data” in Chapter 4.

The horizontal colored lines in the time emission display indicate the gate settings for the corresponding mode. To add or remove these indicators, simply click in the appropriate check box in the legend.

Note: Chromatograms for up to five gate settings can be displayed simultaneously. Each chromatogram can be displayed or hidden by clicking on the mode of interest in the chromatogram legend.

The toolbar at the top of the screen allows the operator to perform the following operations.


Imports a previously saved chart.


Prints the displayed plot(s).


Displays the previous time emission profile.


Displays the next time emission profile.


Zooms in on the selected chromatogram.


Zooms out on the selected chromatogram.


Accesses the Help files.

File Menu

Open opens an existing data file (*.dat).

Close closes the opened data file.

Save cfg File saves the file that is currently opened as a configuration file (*.cfg) that can be used in WinPulse.

Open cfg File opens a saved configuration file (*.cfg).

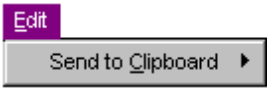
Print prints the current data to a file or printer.

Printer Setup allows the operator to set up the printer or file where the data will be sent.

XXXX.DAT lists the last three data files that have been opened in PFPDView.

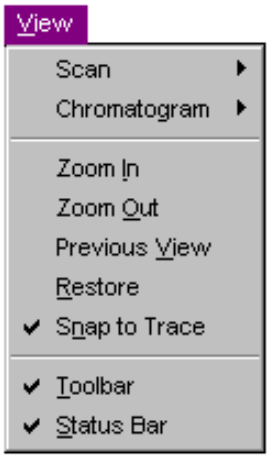
Exit exits PFPDView.

Edit Menu



Send to Clipboard sends the current time emission profile view, chromatogram view, or both views to the clipboard.

View Menu



Scan allows the operator to chose options for viewing the time emission profile.

Grid - Adds grid lines to the time emission profile.

Legend - Shows or hides the legend. The legend can be moved by dragging it.

Line Styles - Switches between dashed and solid lines.

Next and Previous - Move through the time emission profiles.

Chromatogram allows the operator to chose options for viewing the chromatogram.

Grid - Adds grid lines to the chromatogram.

Legend - Shows or hides the legend. The legend can be moved by dragging it.

Line Styles - Switches between dashed and solid lines.

Axis Labels - Hides or shows the time axis on the chromatogram.

Zoom In zooms in on the entire selected plot (time emission profile or chromatogram) viewing area.

Zoom Out zooms out on the entire selected plot (time emission profile or chromatogram) viewing area out.

Previous View displays the previous viewing area.

Restore restores the chromatogram to its original view.

Snap to Trace - Holding the right mouse button on either the emission profile or the chromatogram displays a crosshair cursor. With Snap to Trace selected, the origin of the crosshair cursor follows the points on the emission profile or chromatogram as the cursor moves. Both the time and amplitude values of the points will be displayed at the bottom of the screen.

Toolbar hides or shows the toolbar.

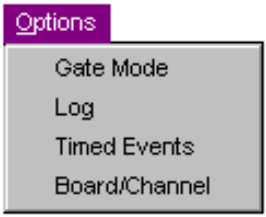
Status Bar hides or shows the status bar.

Tools Menu

Recalculate Chromatogram recalculates the chromatogram for the data file that is open.

The ghosted (grayed) options are not currently available.

Option Menu



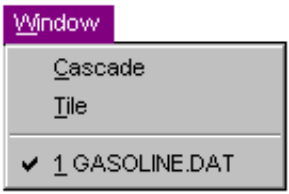
Gate Mode accesses the Gate Parameters screen, which is used to set gate values and identify gate mode labels. For more information, see “Gate Parameters Screen” in Chapter 3 of the *Model 5380 PFPD Operator’s Manual*.

Log opens the run log. All changes that are made while using PFPDView will be recorded in this log file.

Timed Events accesses the Timed Events screen. For more information, see “Timed Events Screen” in Chapter 3 of the *Model 5380 PFPD Operator’s Manual*.

Board/Channel accesses the Board/Channel Parameters screen, which is used to set board/channel parameters. For more information, see “Board/Channel Parameters Screen” in Chapter 3 of the *Model 5380 PFPD Operator’s Manual*.

Window Menu



Cascade overlaps the plots.

Tile places the plots side by side.

XXXX.DAT lists the data file(s) that are currently open in PFPDView.

Notes

Chapter 4
Operation

This chapter provides information on operating PFPDView. To access additional on-line information, click on the **Help** menu in the PFPDView screen or the **Help** button in dialog boxes.

Note: PFPDView is designed to run under Microsoft Windows version 3.1 or later. For information on how to use Microsoft Windows, refer to the appropriate Windows documentation.

Note: PFPDView is designed to operate with a PC mouse. For information on how to use a mouse, refer to the appropriate Windows documentation.

Starting PFPDView

PFPDView can be started two ways:

- Double-click on the PFPDView icon in Program Manager (Windows 3.x or NT 3.51) or select **PFPDView** from the Start Menu (Windows 95 or NT 4.0); OR

- From the WinPulse Main Screen, go to the **Utilities** menu and select **Use PFPDView**.

Loading a Data File

Data files used in PFPDView are created in the WinPulse program supplied with the Model 5380 PFPD. These files can be created in WinPulse either manually from the main screen (by pushing the Record button) or automatically by using the record timed event function. Once collected in WinPulse, the *.dat files can be opened and worked with using PFPDView.

1. Go to the **File** menu and select **Open**.

2. Select the data file that you want to open, then click **OK**. This will load the selected data file to PFPDView.

Note: PFPDView calculates a chromatogram from the stored pulses (time emissions) in the data file for every gate mode in the current gate table (i.e., for each mode that was in the Gate Parameter List in WinPulse when the file was created) (see "Gate Parameters Screen" in Chapter 3 of the *Model 5380 PFPD Operator's Manual*). The progress of this generation is indicated in the lower left corner of the main screen.

3. After a data file is loaded, a new configuration file can be loaded if needed. Go to the **File** menu, and select **Open cfg File**. Click on **OK**.

Note: The chromatograms will be recalculated whenever a new configuration file is opened.

Note: If the data was collected using the WinPulse Record button and not the GC remote start, the time scale used for the chromatogram in PFPDView will not match the one generated by the GC data handling system. A dialog box will appear to notify you of the fact. See Chapter 5, "Troubleshooting" for more information.

By using the cursor line in the chromatogram display, each pulse emission in the chromatogram can be viewed individually (see Figure 3.1).

By observing individual pulses, the operator can obtain several types of useful information. The time emission profile provides useful information regarding the flame characteristics in the PFPD, and it can be easily observed from the emission whether the detector flows are properly optimized and tuned. Cleanliness of the detector can also be observed by noting the time emission profile in the early (1.5–3.0 msec) time frame.

Additionally, by observing the pulses, the operator can obtain basic elemental information for peaks of interest. For example, one can determine from the pulse (post-run) whether a peak has either S or P in it, or a combination of both. Relative concentrations of each element in a specific peak can also be determined by noting the time emission profile, as shown in Figure 4.1. This is especially helpful when trying to determine unknown composition.

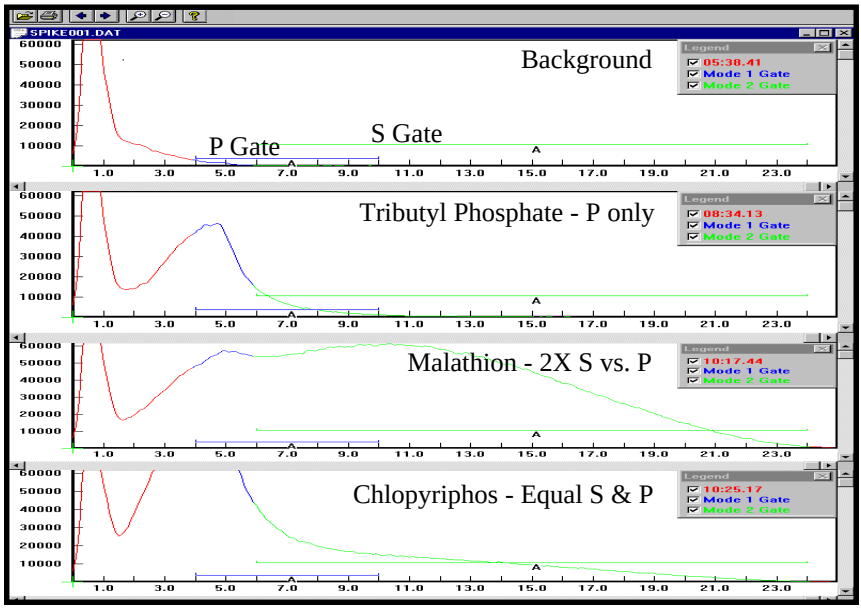


Figure 4.1 Using PFPDView to Obtain Heteroatom Composition Information

1. Place the cursor line on the peak to view by clicking on the specific peak on the chromatogram or by using the arrow keys on the keyboard to move the cursor line to the specific peak.

Note: To zoom in on a specific area on either the emission profile or the chromatogram, hold down the left mouse button and drag the cursor over the area to be zoomed in on. Release the mouse button. To return to the original view, go to the **View** menu and select **Restore**.

2. If necessary, isolate the specific gate by checking/unchecking the mode (gate) in the legend.

Adjusting the Parameters and Creating New Configuration Files

To observe what a chromatogram would look like if collected using different gate parameters, PFPDView can be used to change the gate parameters, and the resulting chromatogram will be displayed. Once optimized, a new configuration file to use in WinPulse can be generated with PFPDView. The results of the new parameters can be viewed and adjusted without the need to rerun the analysis. This allows the chromatograph to be reanalyzed off-line using only a single chromatographic run.

1. Go to the **Options** menu, and select the appropriate screen to be accessed (Gate Mode, Timed Events, or Board/Channel).

2. Make any necessary changes. Note that all the fields cannot be modified. For information on the Gate Parameters Screen, Timed Events Screen, and Board Channel Parameters Screen, see the *Model 5380 PFPD Operator's Manual. (Figure* 4.2)

   For example, to change a gate parameter, go to the **Option** menu, and select **Gate Mode** to access the Gate Parameters screen. Click on the mode to be modified, and make the changes in the specific parameter(s) to be changed.

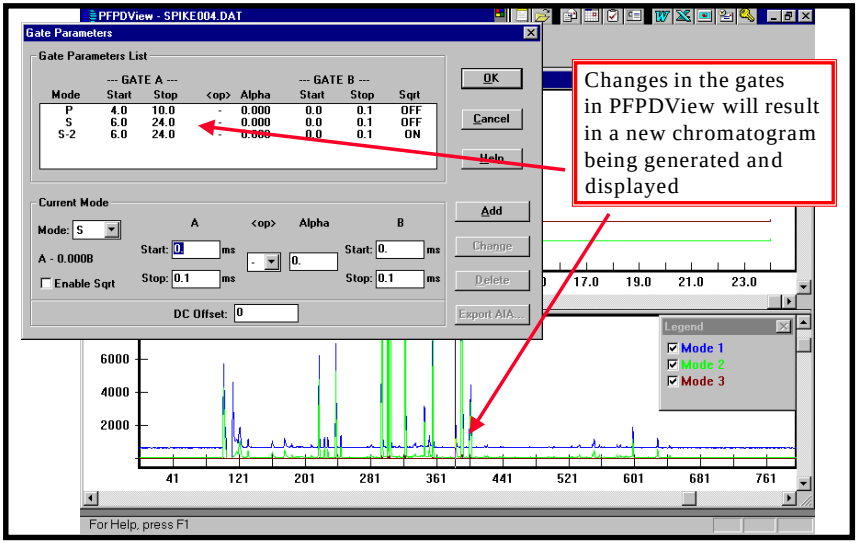


Figure 4.2. Post-Run Reprocessing of Gate and Timed Events Parameters

4. Click on **Change** for the changes to take affect.

5. Click on **OK**. PFPDView will recalculate the chromatogram using the new parameters.

6. To save the new parameters in a new WinPulse configuration file, go to the **File** menu and select **Save cfg File**. Enter the name of the configuration file to be saved, then click on **Save**. This configuration file can then be opened and used in WinPulse. Alternatively, the new PFPD parameters can be simply manually entered directly into the WinPulse program.

Optimizing the Dual Gates

Another beneficial use of PFPDView is to easily optimize the very powerful tool of the PFPD referred to as the Dual Gate Mode of operation to eliminate interferences between two species. This technique allows the selectivity of the PFPD to be significantly enhanced using the dual gate subtraction mode. For more information, see "Appendix C" in the *Model 5380 PFPD Operator's Manual*.

1. Load a data file (see "Loading a Data File" in this chapter).

2. Go to the **Options** menu and select **Gate Mode**. In the **Gate Parameters List**, select the mode to optimize. Change the Alpha value and the Gate B parameters as needed. Click on **Change**.

3. Click on **OK**. The chromatogram will be recalculated and displayed using the new gate parameters. (See Figure 4.3.)

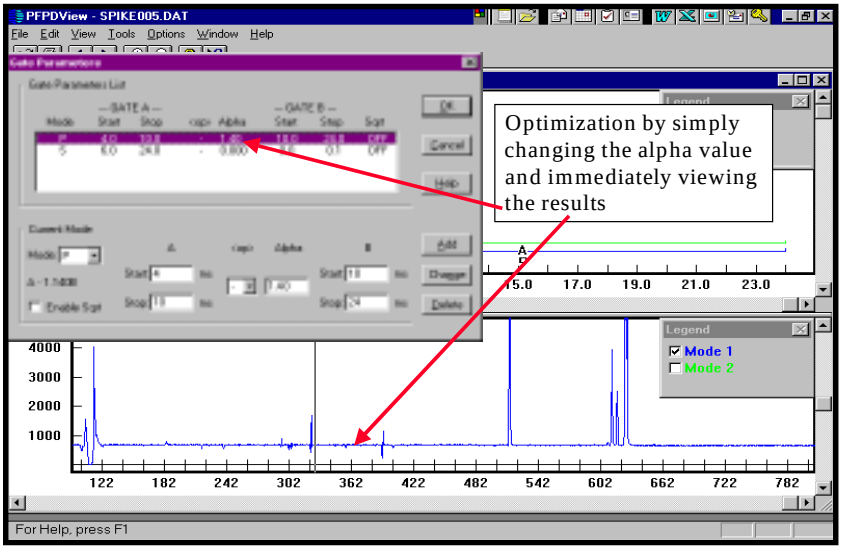


Figure 4.3. Post-Run Optimization of Gate Alpha Values

4. Evaluate the chromatogram. Repeat steps 2–3 until the proper Alpha value is obtained. (See Figure 4.4.)

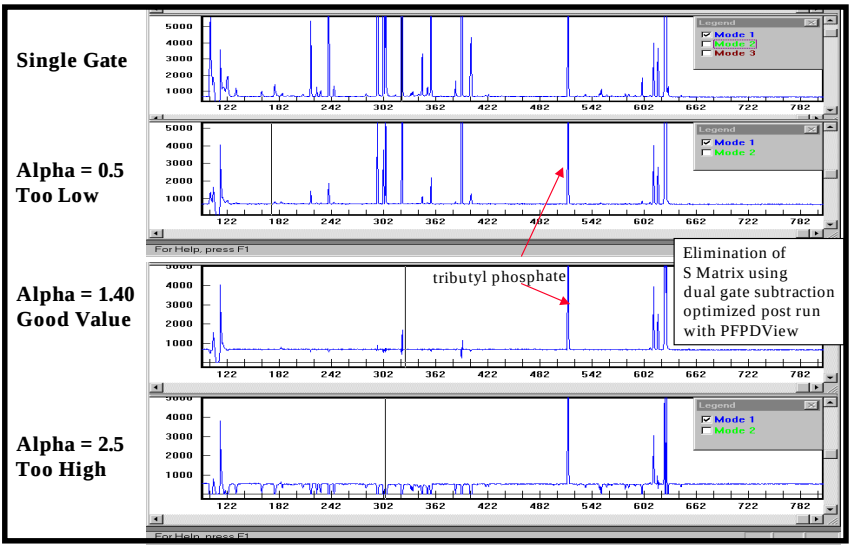


Figure 4.4. Post-Run Optimization of Dual Gate to Eliminate S Interferences in a P-Optimized Analysis

5. Go to the **File** menu and select **Save cfg File** to save the new value(s). Enter the name of the configuration file to be saved, then click on **Save**. The new configuration file can now be called up in WinPulse and used for future runs. Alternatively, manually enter the final optimized parameters into the WinPulse Gate Parameter Screen.

Exporting the Chromatogram

Each chromatogram displayed in the PFPDView screen can be exported as a new GC data file in an AIA format. These files can be imported into most chromatographic data systems (like Agilent ChemStation) that accept the AIA file format. This permits the operator to view, reprocess, print, or reintegrate the GC run under the new PFPD parameters without rerunning the sample.

Note: Caution must be taken when reanalyzing post-processed runs as calibration procedures must take into account any PFPD parameters that have been changed.

1. Go to the **Options** menu, and select **Gate Mode**. This will access the Gate Parameter screen.

2. In the Gate Parameters List, select the desired gate mode to be exported as an AIA file (see Figure 4.5). One of the modes in the Gate Parameters List must be selected to activate the **Export AIA** button.

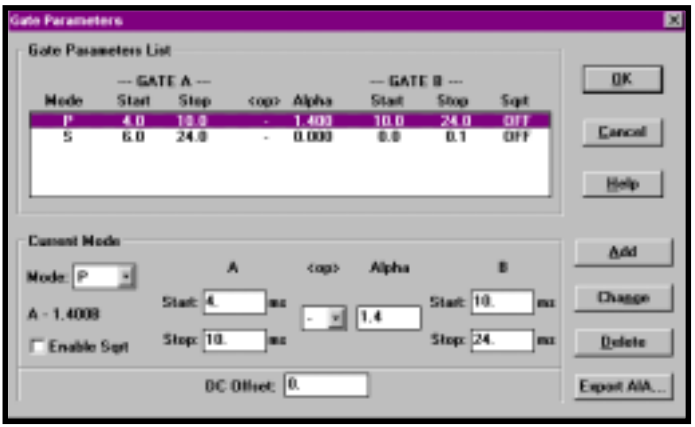


Figure 4.5. Gate Parameters Screen

3. Under **DC Offset**, enter the desired offset if needed (must be less than the lowest point in the chromatogram).

4. Click on **Export AIA**. This will access the Export AIA Data screen (Figure 4.6).

5. Enter in all the necessary information. Fields that may be modified are displayed with a white background. After all the necessary information has been entered, click **Save As**.

6. Enter the name of the export file to be saved, then click on **OK**.

7. To import the file into a data system, refer to the data system's operator's manual.

8. Reprocess the chromatogram as desired using the GC data system.

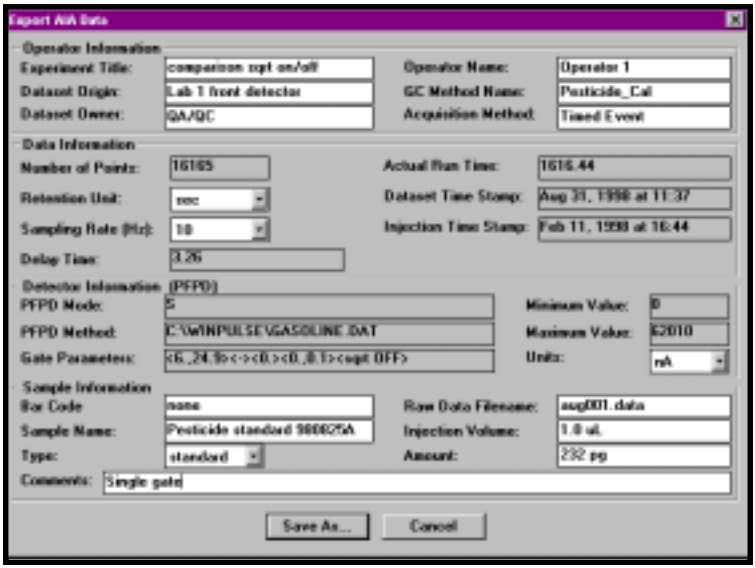


Figure 4.6. Export AIA Data Screen

Additional PFPDView Uses

PFPDView stores all the pulsed flame emissions during the analytical run. This enables the operator to improve several important PFPD analytical capabilities by manipulating the two gates.

For more information on the dual gate approach for enhanced PFPD operation, read the following paper:

> Amirav, Aviv; Jing, Hongwu. Pulsed Flame Photometer Detector for Gas Chromatography. *Anal. Chem.* **1995**, *67*, 3305–3318.

The dual gate approach and post-run data analysis with PFPDView can be used to enhance the PFPD performance.

Optimal gate delay for best sensitivity or selectivity

PFPDView can be used for post-acquisition optimization of the gate start and stop set points. These gate settings can have a significant effect on the results. Either the sensitivity or the selectivity, or both, can be optimized using PFPDView.

Simultaneous Sulfur and Carbon Analysis

Simultaneous sulfur and carbon analysis can be important for gasoline and other related petrochemical analyses. A normal gate (from 6 msec to 24.9 msec) is used for detecting the sulfur, and a second, narrower gate is used for detecting the carbon (from 1.5 msec to 3 msec). If the carbon and sulfur emissions overlap, a delayed start time can be set for the sulfur (7 or 8 msec, for example), greatly improving the sulfur selectivity without sacrificing sulfur detectivity. However, it will be necessary to use the dual gate subtraction technique to remove the contribution of the sulfur from the carbon emission. The sulfur emission usually exists to a small degree within the carbon gate, and a small alpha coefficient is sufficient to remove the sulfur contribution. PFPDView can be used to determine the best start time for the sulfur gate and the best alpha coefficient for subtraction of the sulfur contribution from the carbon gate.

Simultaneous Multi-element Analysis

Compounds containing both sulfur and phosphorus, such as some pesticides, can be analyzed by using a UV-34 optical filter. The dual gate subtraction approach is used to generate simultaneous, single element chromatograms for both heteroatoms. (See Appendix C in the *Model 5380 PFPD Operator's Manual* for information on dual gate subtraction.) Additional optical filter/PMT configurations are available for simultaneous analysis of other heteroatom pairs, such as sulfur and nitrogen or phosphorus and nitrogen.

Reducing Sulfur Interference in Phosphorus Pesticide Analysis

The emission times of specific heteroatoms often overlap (e.g., the tail end of the phosphorus (P) emission overlaps with the initial phase of the delayed sulfur (S) emission). The selectivity for the delayed, extended S emission relative to the earlier P emission can be enhanced by simply moving the start S gate to a point beyond the interfering P emission (e.g., 16–20msec). This improvement in the selectivity between phosphorus and sulfur will result in a small decrease in the sulfur sensitivity. Eliminating the S emission from the P emission with simple adjustment of gate settings is less easy, because the S emission overlaps with a significant portion of the phosphorus emission.

However, using the dual gate enhanced mode of operation allows the operator to significantly increase phosphorus selectivity relative to sulfur (and vice versa).

This optimization of gates is easily done using the PFPDView software after running just a single analysis. Once optimal dual gate parameters are obtained, they are simply entered into the gate table of the WinPulse program and used for all subsequent analyses. A detailed description of how this enhanced selectivity is accomplished for phosphorous versus sulfur can be found in OI Analytical Application Note #1127.

Elemental Identification with the Gated Response Ratio (GRR)

The Gated Response Ratio (GRR) technique is a qualitative technique that can be used to identify whether there are multiple heteroatoms present within a specific chromatographic peak without going through the full dual gate subtraction procedure. The GRR technique is particularly useful where complex sample matrices make individual peak identification difficult (e.g., identification of organophosphorus pesticide residues in food matrices containing sulfur). To determine the GRR, a single run is made with compounds containing known concentrations of the heteroatoms of interest. The ratio of the peak heights is a unique number that can then be used to identify whether one or both of the heteroatoms are present. To use the GRR technique for an unknown, one gate is defined for the compound of interest (e.g., 4 msec to 10 msec for P), and a second gate is defined as the P/S ratio (see Figure 4.7). Comparing the P chromatogram to the P/S chromatogram will then provide information about whether there is sulfur interference present in the target phosphorus peak.

Generally, sulfur and phosphorus can be identified by their emission even without any GRR; however, at low levels or if both elements are in a given compound, the GRR may be the best way to confirm this information. The process is qualitative only; it will only indicate whether one or two specific heteroatoms are present in a given compound peak (e.g., S, P, or S and P). The GRR technique will not give quantitative information about the relative amounts of the individual heteroatoms; for quantitative results the dual gate subtraction technique is necessary.

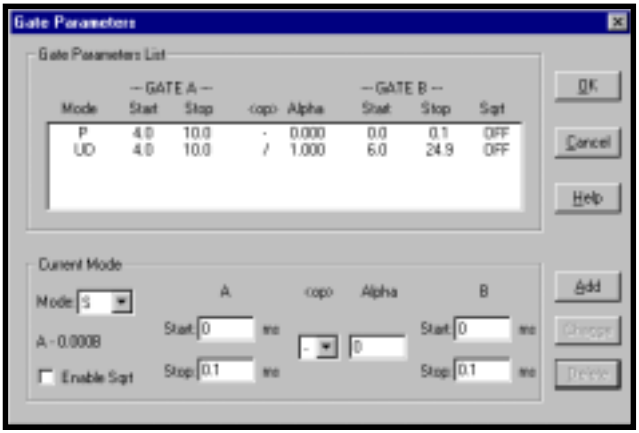


Figure 4.7. Gate Parameters for GRR Technique for Unknown

Extended Sulfur Measurement Dynamic Range Using the Gated Response Ratio

Due to its quadratic response, the dynamic range for sulfur is limited to about 2.7 orders of magnitude. The dynamic range for sulfur, and other elements, can be extended by approximately one order of magnitude using the Gated Response Ratio (GRR). When the sulfur emission becomes saturated, it can be observed that only a portion of the full sulfur gate has reached a maximum; the early portion of the sulfur emission will not reach maximum or electronic saturation conditions. To use the GRR technique, one gate is defined in the usual manner (e.g., 6 msec to 24.9 msec for sulfur), and a second gate is defined with minimal or no delay and a 2–3 msec gate width (e.g., 4 msec to 6 msec) (see Figure 4.8). Using a sulfur standard that does not reach saturation conditions, simultaneous chromatograms for both gates are acquired, and the GRR is calculated by dividing the response from the first (normal) gate by the response from the second (early) gate. Then, when a normal sulfur signal (6 msec to 24.9 msec) is acquired under saturation conditions, the response from the early gate (4–6 msec) can be multiplied by the GRR to determine the estimated delayed emission response, thus extending the overall dynamic range. Note that the PFPDView software by itself allows the operator to extend the measurement resolution up to 24 bits versus 16 bits (Digital to Analog Converter (DAC)) existing within the PFPD's signal

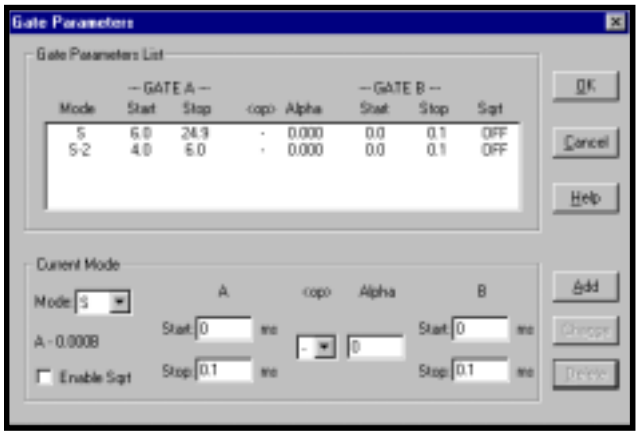


Figure 4.8. Gate Parameters for Extended Sulfur Measurement

processing circuitry. This additional information can be used to extend the dynamic range of the detector if reprocessing the chromatogram using PFPDView.

Quenching Identification and Elimination

Quenching occurs when a high concentration of hydrocarbon co-elutes with the targeted sulfur compound and causes a reduction in or loss of the sulfur emission. Adjusting the chromatographic conditions so that the hydrocarbon and the sulfur peak of interest are separated spatially can eliminate quenching. It can also be reduced or eliminated by using a 3-mm I.D. combustor and an increased Air 1 flow rate. Using the larger combustor increases the combustion volume and reduces the potential for sulfur emissions being “intercepted” and absorbed by the competing hydrocarbon moiety.

PFPDView can be used directly to observe the emission profile for any area of the chromatogram where quenching is suspected. If the characteristic sulfur emission collapses or folds in on itself (i.e., does not extend beyond 20 msec) and is immediately and simultaneously replaced by a saturating hydrocarbon emission, quenching has taken place.

The Gated Response Ratio technique can also be used to determine qualitatively whether quenching has occurred, which is not always

apparent from the appearance of a chromatogram. Two gates are defined, one for the normal sulfur emission (6 msec to 24.9 msec) and one for the early segment of the emission (6 msec to 9 msec). The GRR for the two responses is calculated for a nonquenching (and nonsaturating) peak. Comparing the peak heights from the two chromatograms acquired for an unknown can easily identify quenching. The gate response ratio will be changed by quenching, and this change will be the indication that quenching has occurred.

The term “quenching” is also sometimes used to describe the self-quenching effect seen when there are very high concentrations of sulfur present. In this case, the concentration of sulfur dimers in the combustor is high enough that the sulfur “self-absorbs” or “quenches” the emissions before they can reach the light tube and be transmitted to the PMT. When this type of quenching has occurred, the top of the chromatographic peak will be shaped like the letter “M”, having the appearance of a split peak. This type of quenching is easily identified using PFPDView by observing the change in the characteristic sulfur emission for a suspected peak. The sulfur emission will reach saturation and then collapse, but it will not be replaced with a simultaneous hydrocarbon emission as described earlier. Using a 3-mm I.D. combustor can reduce the chances of self-quenching.

Chapter 5
Troubleshooting

PFPDView may display messages under normal operating conditions. For assistance with error messages, contact OI Analytical Customer Service at (800) 336-1911 or (409) 690-1711.

Time Scales

If data was collected using the WinPulse Record button and not the GC remote start, the time scale used for the chromatogram in PFPDView will not exactly match the one generated by the GC data handling system. Three different types of datafiles can result.

- **WinPulse is in Run and the Clock is Updating**
  The time base may not correspond to the chromatographic time being recorded. Relative time differences between PFPD pulses will be accurate; however, the absolute time will appear to be incorrect.

- **WinPulse Record is Pressed Prior to GC Start (with start cable connected)** If recording is started prior to run start, an injection will be made into the GC and the Detector Controller will detect a run start signal. WinPulse will close the file that is currently open, increment the counter, and open and start recording to a new file. The first time emission profile will occur immediately after the run start signal is detected by the Detector Controller.

- **WinPulse is in Ready and Does Not Advance to Run**
  The elapsed time from run start remains at zero (0) for every time emission data set. When PFPDView opens this file, the secondary time base (time elapsed from the previous pulse) will be “summed” to generate the time base.

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