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# **Particle Analysis and Display System (PADS): Summary Module Manual**

**DOC-0299 Rev A**

**PADS 3.5.0**

**Summary Module 3.5.0**



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For similar reasons, DMT recommends that you do not install or run other software on the dedicated instrument computer. Although the installation of some software may be unavoidable, it is particularly important not to run other software while the computer is acquiring data.

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## 1.0 Introduction

The Particle Analysis and Display System (PADS) is a software package that interfaces with instruments produced by Droplet Measurement Technologies (DMT) and other leading instruments used in the atmospheric sciences. This manual describes the PADS Summary display version 3.5.0, which allows you to view and analyze data from several instruments simultaneously.

For an explanation of the basic PADS setup and instructions on how to acquire data using PADS, consult the *PADS Overview Manual*, DOC-0300. This manual also gives definitions for all the channels that the Summary can display.

Because the Summary tab displays data from several different instruments, you cannot use the Summary screen to configure instruments. Therefore, the **Configure Instrument** option on the **Configure** menu has been grayed out. If you want to configure an instrument that has data displayed in the Summary tab, click on that instrument's tab in PADS and select **Configure Instrument**. From the Summary tab, you can also click on **Configure > Configure All Instruments** to bring up each instrument's configuration editor sequentially.

*The Summary tab has additional features that are not documented in this manual. These features are optional and are sold separately. They include Serial Output and ARINC 429. Each of these features supports the writing of a data file of the channels selected for the output data stream. This data file output support allows users to create a single data file that contains data channels from multiple instruments. For more information on these features, see the PADS manuals for these modules.*

## 2.0 Configuring the Display

To configure the Summary display, click on the “Summary” tab if you're not already on it. From the **Configure** menu, select **Configure Display**. You will see the following window.

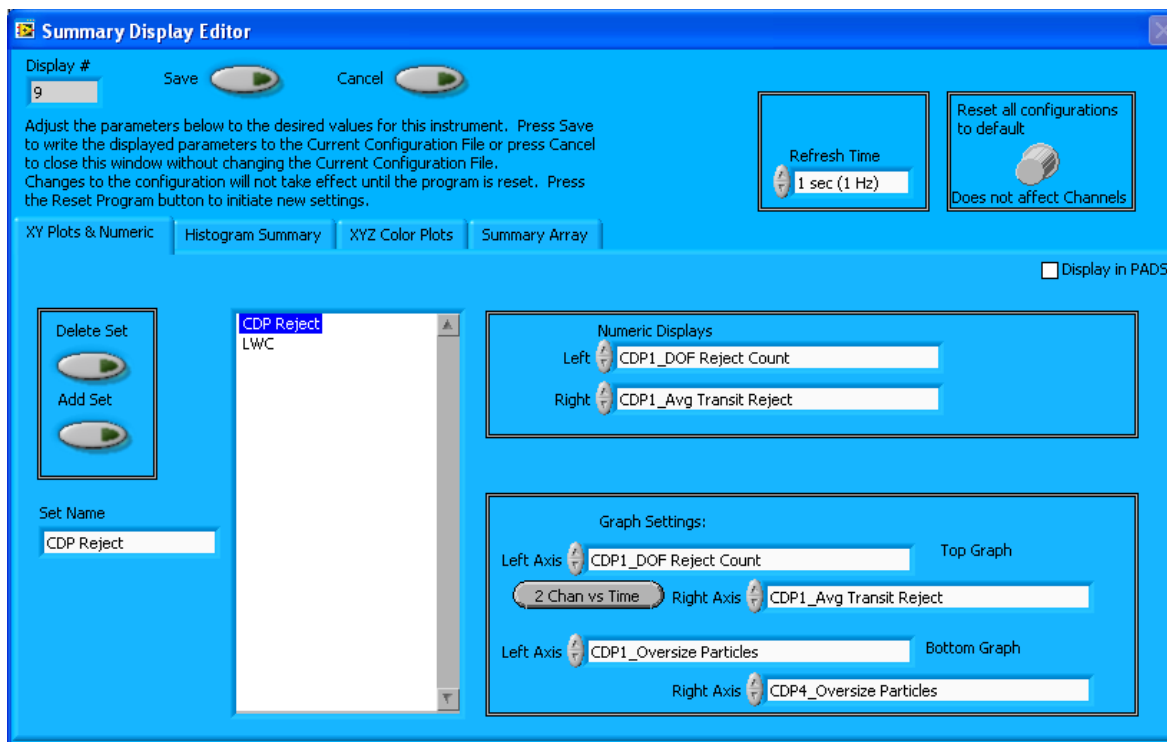


Figure 1: Summary Display Editor Window with XY Plots & Numeric Sub-tab Active

You do not need to modify the **Display #**.

Changing the **Refresh Time** allows you to set the time intervals for data display during acquisition mode; you can choose any time that is equal to or greater than the instruments' sample times. (Choosing a time less than the sample time is not useful, since the same data will be displayed multiple times.) If the instruments displayed on the Summary tab have different sampling times, setting the refresh time to that of the fastest sample time will update the data whenever any new data become available.

Pressing **Reset all Configurations to Default** resets various display defaults. Clicking this button will deselect instruments selected on the **Histogram Plot** and **Summary Array** sub-tabs. It also affects the settings on the Serial Output and ARINC 429, if they exist on your system.

The Summary Display Editor has sub-tabs that correspond to the sub-tabs on the main Summary tab. Modifying the XY Plots & Numeric Sub-tab settings on the Display Editor, for instance, will change the default start-up display of this same tab on the main Summary tab.

The default Summary Display Editor sub-tabs are described below. *Note that your system may have additional sub-tabs such as Serial Output and ARINC 429. As noted above, these are described in separate manuals.*

## 2.1 XY Plots & Numeric Sub-tab

The Display Editor (Figure 1) allows you to define sets of data that the Summary displays. A set is basically a single configuration of the Summary display. It specifies which channels the **Summary** tab will display, in both the numeric displays and the graphs. Note that any set can include channels from any instrument in the system. For instance, you might define a set called “LWC” that displays and graphs LWC readings from various instruments. For information on channels and their definitions, see *Appendix A* of the *PADS Overview Manual*.

The **2 Channel vs Time/Chan vs Channel** button allows you to specify how a given set should graph the channels in the top graph—with respect to each other, or with respect to time.

The white box in the center left of the sub-tab lists all the available data sets. You can add and delete sets using the buttons to the left of the box. When you add a set, you specify the set name and all the displayed channels using the controls on the right side of the sub-tab. Pressing **Delete Set** deletes whichever set is highlighted in the list in the large white **Sets** box.

When **Display in PADS** is checked, the XY Plots & Numeric sub-tab will be displayed on the Summary tab.

## 2.2 Histogram Plot Sub-tab

The Histogram Plot sub-tab (Figure 2) allows you select which instruments’ data will appear in the Histogram tab on the main Summary screen. These are the defaults the system will use upon start-up. Holding the <CTRL> key allows you to select multiple instruments; holding the <Shift> key allows you to select a range of instruments.

When **Display in PADS** is checked, the Histogram Plots sub-tab will be displayed on the Summary tab.

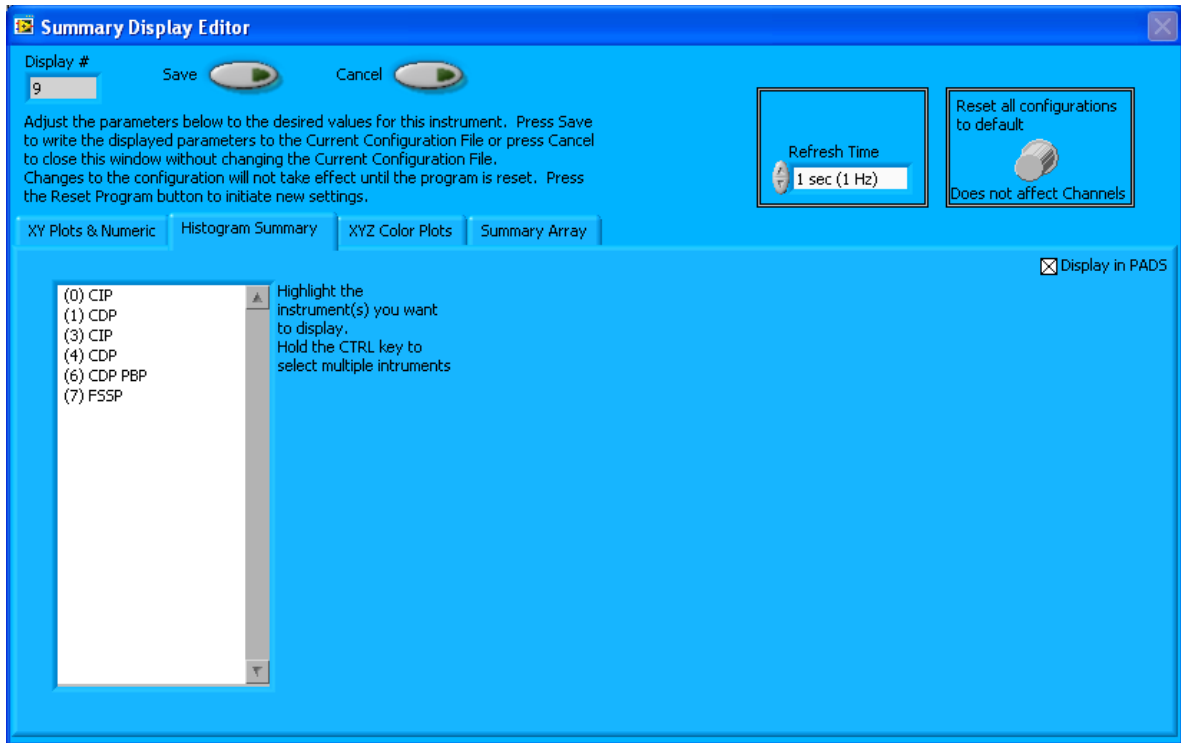


Figure 2: Histogram Plot Sub-tab on Summary Display Editor

## 2.3 XYZ Color Plots Sub-Tab

If the XYZ Color Plots feature is enabled, this sub-tab will appear in the Display Editor. It allows you to create sets that work much like those described in the XY Plots & Numeric sub-tab section (section 2.1). These sets can then be accessed from the XYZ Color Plots tab on the main Summary screen.

Pressing the **Add XYZ Set** button (Figure 3) allows you define a new set by specifying a name, the x-axis channel (End Seconds in Figure 3), the y-axis channel (Laser Temp), and the “z-axis” channel (Laser Current), which is denoted by color. Pressing **Delete XYZ Set** deletes the selected set. To select a set, click on it in the **XYZ Sets** control so it is highlighted.

When **Display in PADS** is checked, the XYZ Color Plots sub-tab will be displayed on the Summary tab.

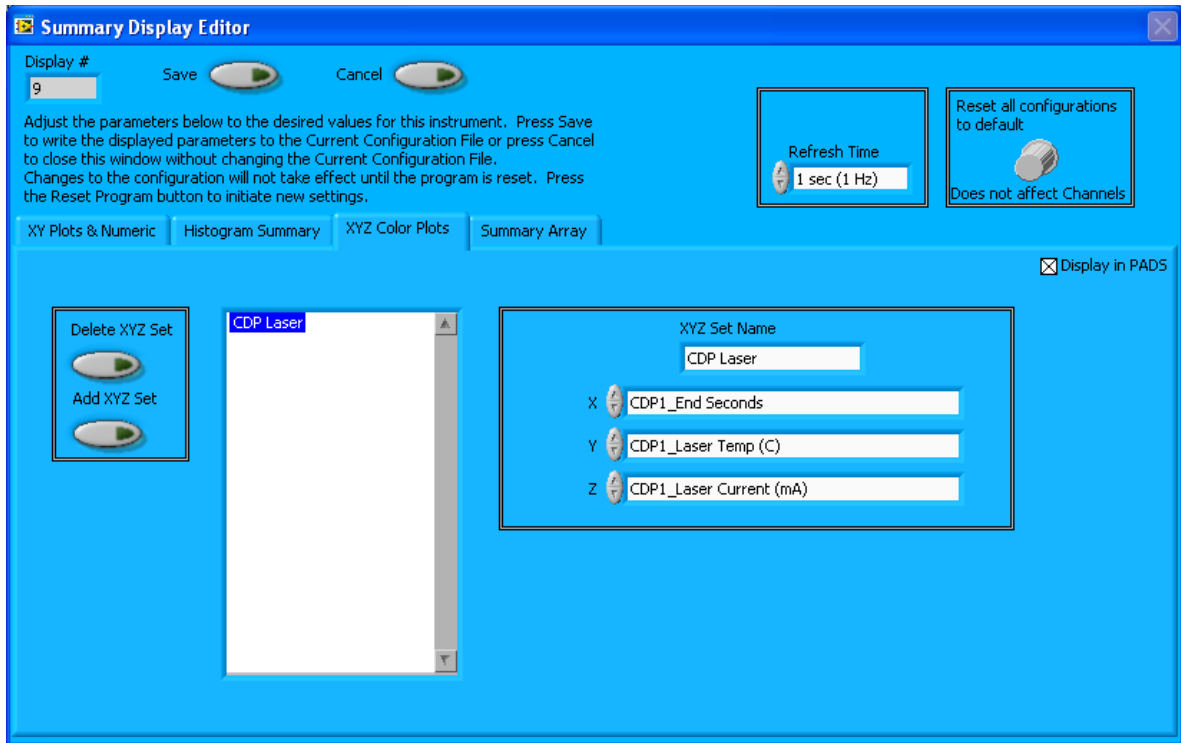


Figure 3: XYZ Color Plots Sub-tab on Summary Display Editor

## 2.4 Summary Array Sub-tab

The Summary Array sub-tab (Figure 4) allows you to select which instruments' data channels will appear on the main Summary Array tab on the main Summary screen. These are the defaults the system will use upon start-up. Holding the <CTRL> key allows you to select multiple instruments; holding the <Shift> key allows you to select a range of instruments.

When **Display in PADS** is checked, the Summary Array sub-tab will be displayed on the Summary tab.

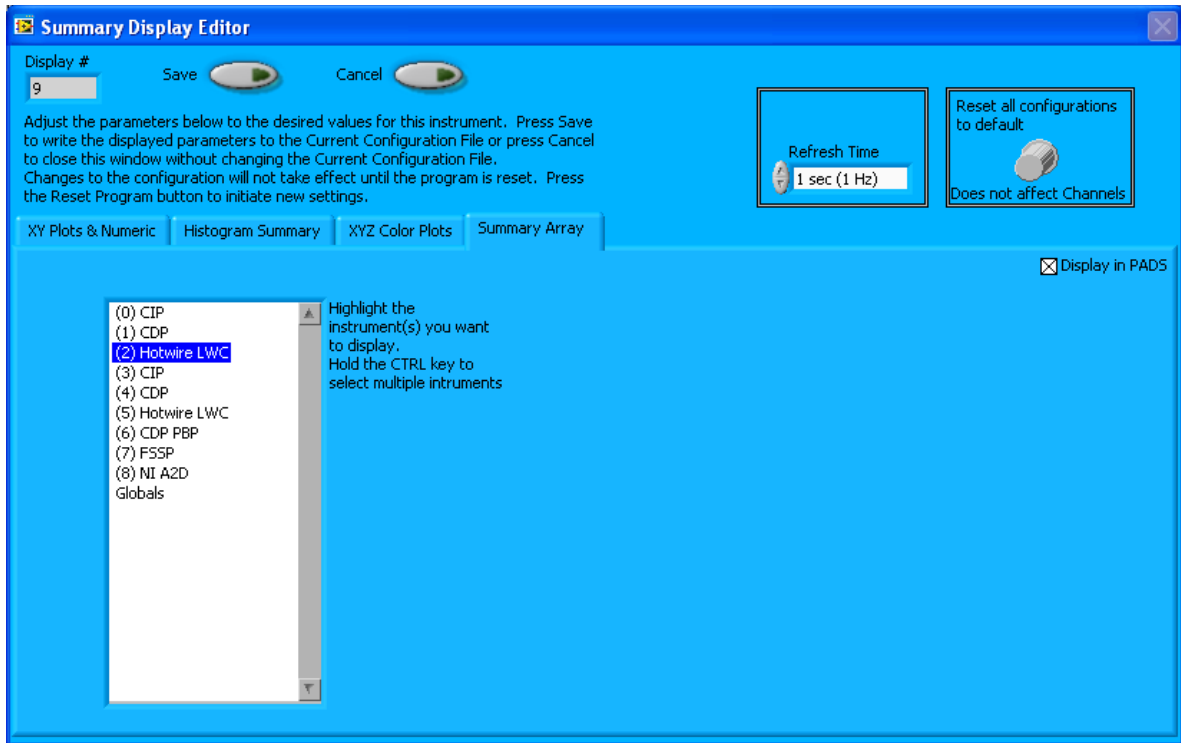


Figure 4: Summary Array Sub-tab on Summary Display Editor

## 2.5 Saving Display Parameters, Changing Display While the Program is Running

When you are done changing parameters on the Display Editor window, click on **Save** to update the configurations or **Cancel** to revert to the previous configurations. After you reset PADS, you will be able to see any changes by viewing the Summary display. Note that clicking **Reset Program** will clear out any data currently being displayed.

Note that all of these parameters are also changeable from the Summary display itself, as discussed in section 3.0. Changing the parameters directly on the Summary display changes them for the current session only, while changing them on the Display Editor window creates parameter sets that are also available in future sessions.

## **3.0 The Summary Window**

The default Summary Display Editor sub-tabs are described below. *Note that your system may have additional sub-tabs such as Serial Output and ARINC 429. These are described in separate documents.*

As described below, the channels being displayed on each sub-tab can be changed on that sub-tab—i.e., on the main Summary tab rather than the Display Editor. However, this only changes their values for the current PADS session. To change their values permanently upon program start-up, do so from the Display Editor as described in sections 2.1 - 2.4.

### **3.1 XY Plots & Numeric Displays Sub-tab**

The Summary window displays channel data in both numeric and graphical form. At the top of the window, two user-selected time-specific numeric data channels are displayed. Upon startup, these channels will correspond to the “Left” and “Right” settings on the Display Editor’s Numeric Displays (see Figure 1 and Figure 5). The two numeric channels are highlighted in Figure 5. They can be changed from the screen shown in Figure 5 using the controls. These are in the white boxes shown below, on the left-hand side.

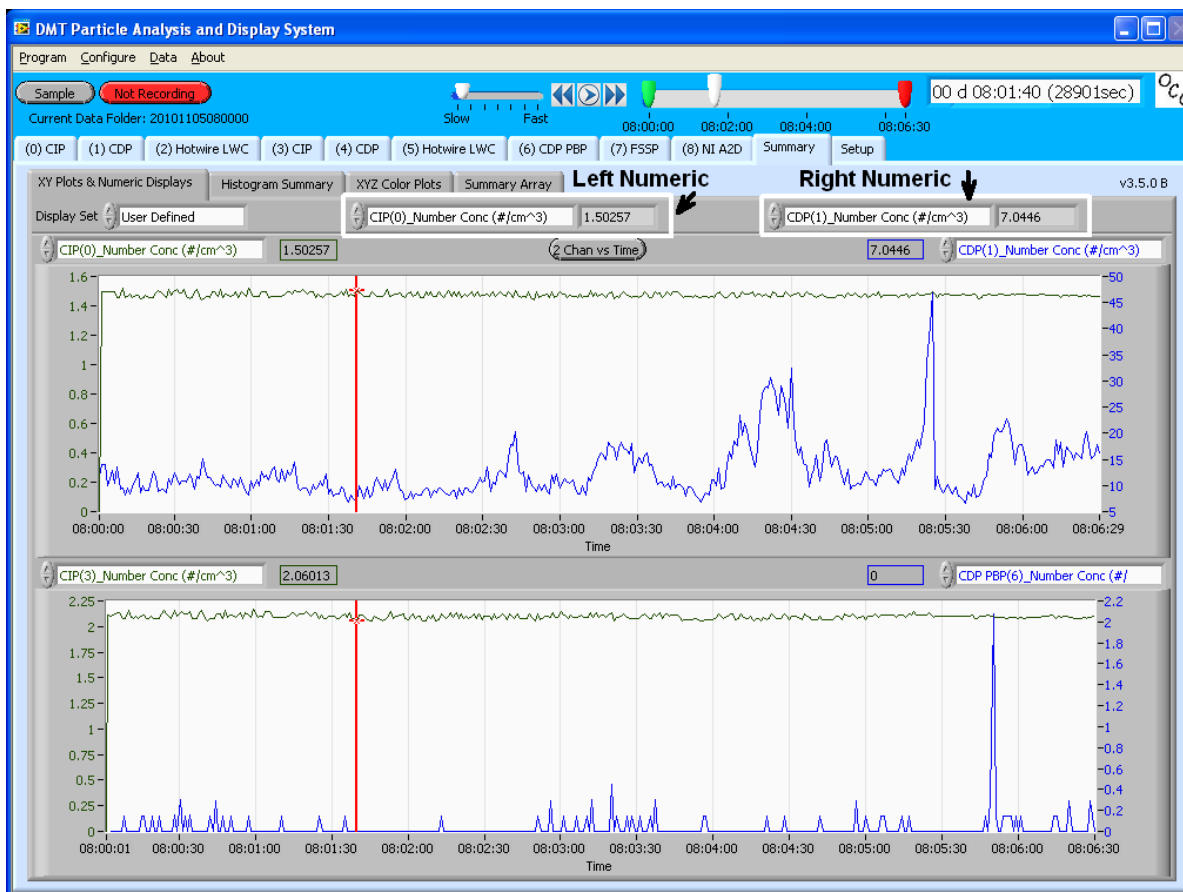


Figure 5: Summary Tab with Numeric Channel Items Labeled

The Display Editor settings also determine which channels are shown in the top and bottom graphs. For both graphs, the left-axis channel is displayed in green and has its legend on the left side of the graph. The right-axis channel is displayed in blue and has a legend on the graph’s right side.

Pressing the **2 Chan vs. Time** button changes the button so it reads **Chan vs. Chan**, and the top graph displays the two channels with respect to each other. The two channels on the bottom chart are always graphed with respect to time.

If you have created sets on the Display Editor screen (see section 2.0), you can display these pre-specified channels by selecting the desired set in the **Display Set** control in the upper left of the screen. If you select a set and then modify the channels being displayed, the **Display Set** value changes to “User Defined.” You can revert to a pre-defined set by selecting that set in **Display Set**.

For information on specific channels, their definitions, and their acceptable ranges, consult *PADS Overview Manual’s Appendix A: Definitions*.

When you access time-series charts in playback mode, the currently selected moment in time is indicated by a red cursor. The y-axis value for this time is indicated by cross (+) on this cursor, as shown in Figure 6. This y-axis value is always for the channel listed on the left side of the graph, i.e. the one that PADS displays in green.

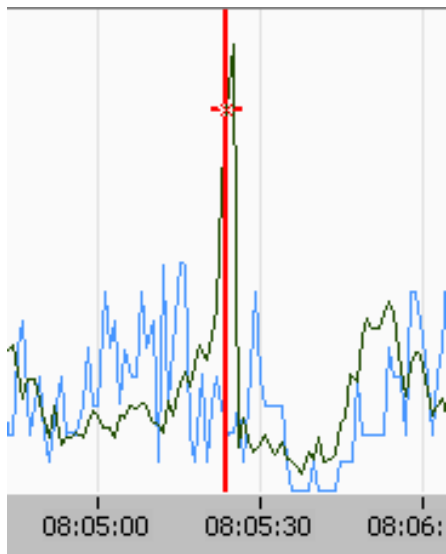


Figure 6: Summary Display Time Cursor

Note that when you display a large range of time-series data, the chart display does not have sufficient resolution to display each individual time point. To increase resolution, zoom in on the data by changing the time interval to a smaller range.

On both the top and bottom charts, you can change the scale by typing a different number into the starting and ending values on each axis. You will need to turn off autoscaling before manually scaling plots this way.

The charts also show you options for scaling and copying the data when you right-click on them, which brings up a drop-down menu. These options are as follows:

**Autoscale** This autoscales the relevant axis. In autoscaling mode, the minimum and maximum values of the axis are set automatically so that all data points can be seen in the display. Note that on charts that have autoscale buttons, like the large histogram chart on some instrument tabs, the buttons override the Autoscale options in the drop-down menu. To see autoscaling options in the drop-down menu, position the cursor over the relevant axis before right-clicking. Note that you may not always be able to autoscale the x-axis.

**Copy Data** This copies the chart to the clipboard using a screen capture. This chart can then be pasted into other documents like Word or PowerPoint presentations.

**Export Simplified Image** This copies a simplified image of the data to the clipboard or an output file. You can choose the format you desire—bitmap (.bmp), encapsulated postscript (.eps), or enhanced metafile (.emf). Note that when you select the .eps option, you must copy the data to a file. Unless you specify otherwise, output files will be saved in the time-and-date-specific output file directory for the current session.

**Clear Graph** This erases the currently displayed data points from the graph.

## 3.2 Histogram Summary

The Histogram Summary sub-tab (Figure 7) shows a combined particle-size histogram. You can select which instruments' data to include in the histogram by highlighting these instruments in the box at the upper left. Holding the <CTRL> key allows you to select multiple instruments, while holding the <Shift> key allows you to select a range of instruments.

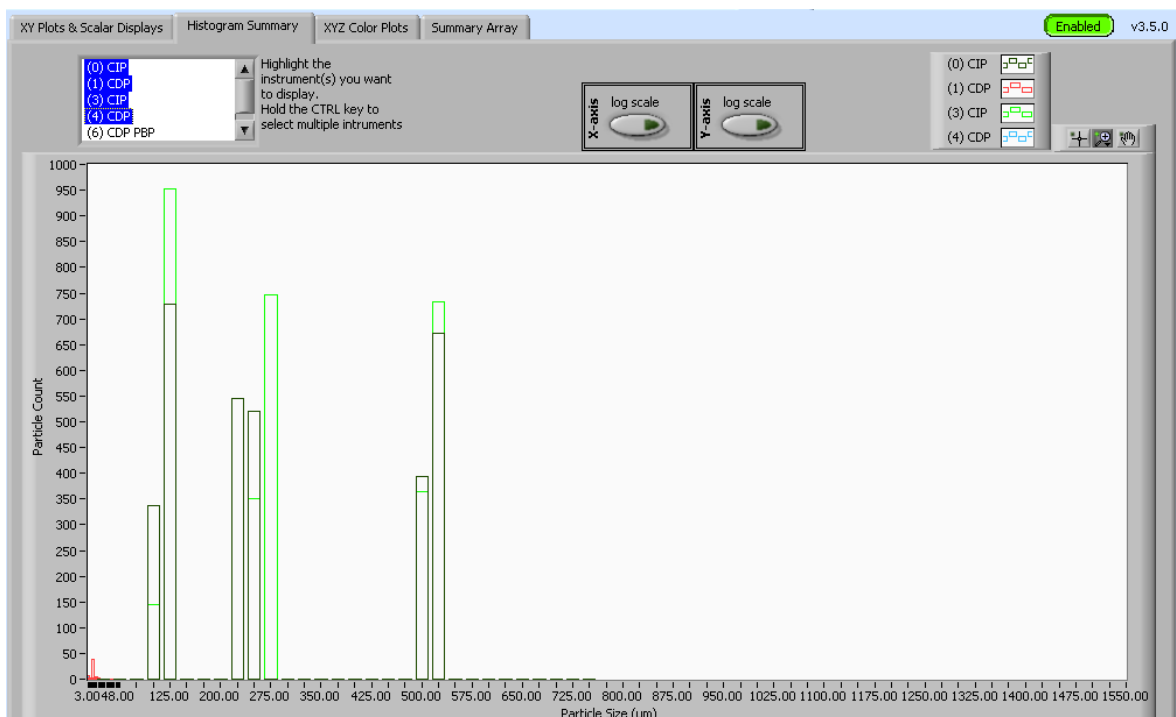


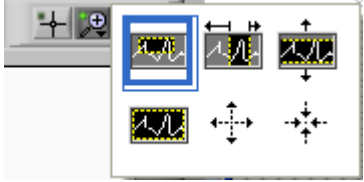
Figure 7: Histogram Summary Sub-tab

Pressing the **log scale** buttons allows you to log scale the X and/or Y axis.

The color legend in the upper right indicates which colors are associated with each instrument. Clicking on the color display brings up a drop-down menu that allows you to change these colors.

Note that histograms are overlaid upon each other. In Figure 7, for example, CIP (0) detected about 725 particles of size 125  $\mu\text{m}$ , while CIP (3) detected 950 particles in this size bin.

If you are combining instruments with different size ranges, you may see a cluster of black lines along the x-axis near the origin. These are clustered tick marks indicating bin boundaries, which are very close together on the overall particle-size scale. To zoom in on the data, click on the magnifying glass in the upper right corner of the histogram display. Then select your desired zooming method. Choosing the first option (Figure 8) allows you to zoom both horizontally and vertically.



*Figure 8: Selecting Zooming Method*

You should now see the magnifying glass icon when you hover the cursor over the histogram display. Move the cursor to the lower x and y boundaries of your desired size range, then click and hold down the mouse button, moving the mouse to the upper boundaries of your desired size range. Release the mouse button, and the data will rescale accordingly.

### **3.3 XYZ Color Plots**

The XYZ Color Plots sub-tab approximates a three-dimensional graph by using an x-axis, a y-axis, and color-coded data values (i.e., different colors for different z-axis values). For example, the graph in Figure 9 shows CIP Recovery Temperature plotted with respect to time, with CIP probe air speed indicated by the colors of the data points.

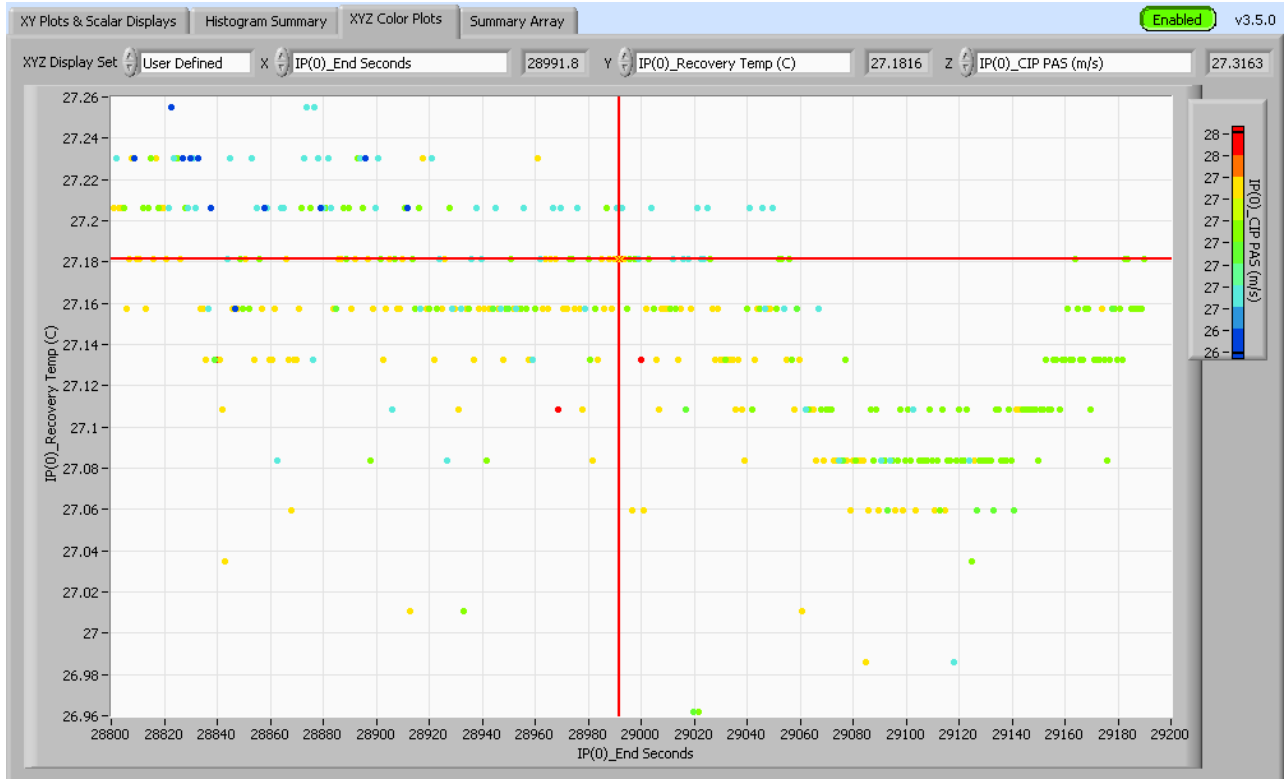


Figure 9: XYZ Color Plots Sub-tab

### 3.4 Summary Array Sub-tab

The Summary Array sub-tab (Figure 10) displays all the output channel data from user-specified instruments. You can select which instruments’ data to include by highlighting these instruments in the box at the upper left. Holding the <CTRL> key allows you to select multiple instruments, while holding the <Shift> key allows you to select a range of instruments.

Data values are for the current moment in time. The box at the upper right corner of the tabular display indicates the row number of the data being displayed. Rows start at 0. You can view additional data using the scrollbar to the right of the window.

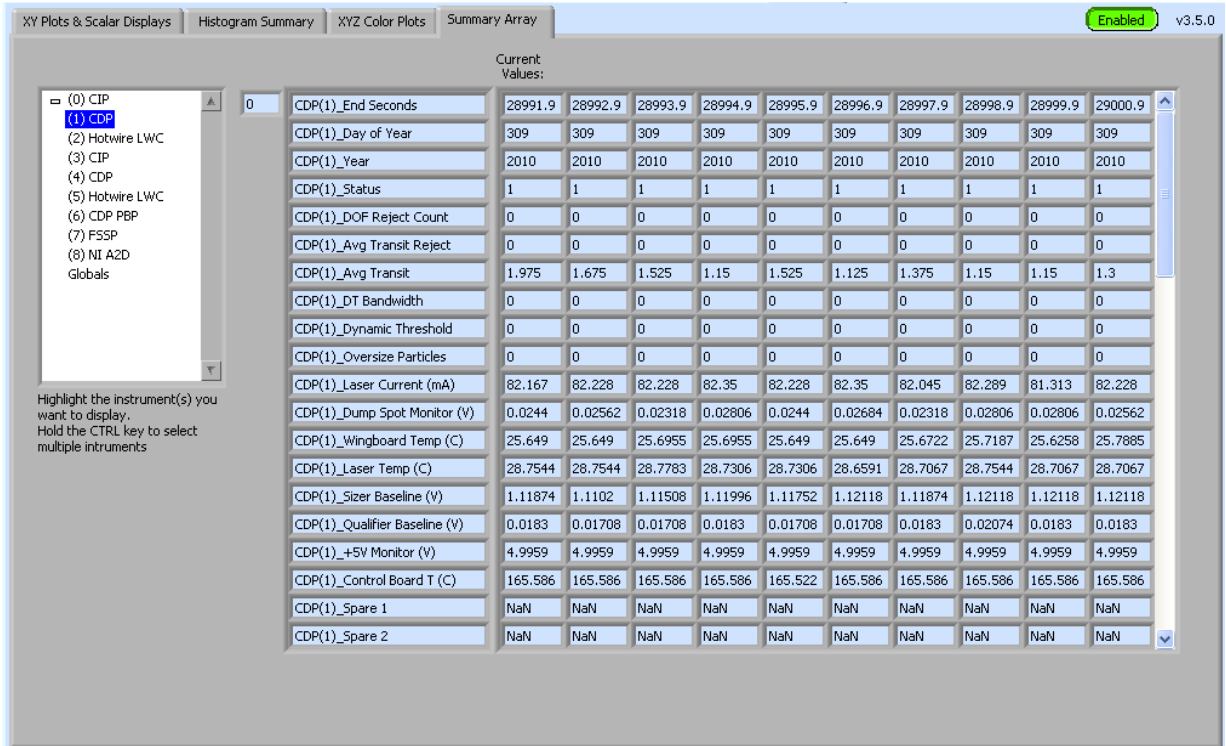


Figure 10: Summary Array Sub-Tab