500 Series Auxiliary Software Features

Application Note
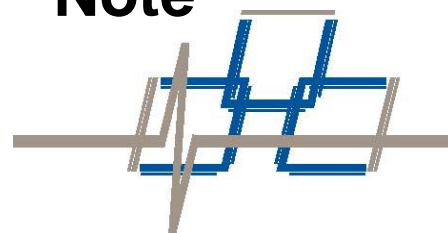
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1. Introduction

This application note describes some of the additional software features available in the software suite for the 500-series alarm processing units (APUs). These features apply to **SL508**[TM], **SL508-SM**[TM]**, FD508**[TM]**, FD525**[TM]**, FD525R**[TM] and **FD525-HALO**[TM] APUs. The software is available for download from the Fiber SenSys website at **http://www.fibersensys.com.**

Most of the features described in this document are available through the **500 Series View** software application. To start the software suite, double click on the **500 Series Suite** icon on the desktop or in the **Fiber SenSys** folder in the Start menu. The suite launcher will appear, allowing you to select the appropriate software.

Figure 1-1: 500 Series Suite icon and launch window

Alternatively, click the Start button and navigate to "All Programs | **Fiber SenSys** | **500 Series View**".

Figure 1-2 shows a representative screen shot of the software from which these features are
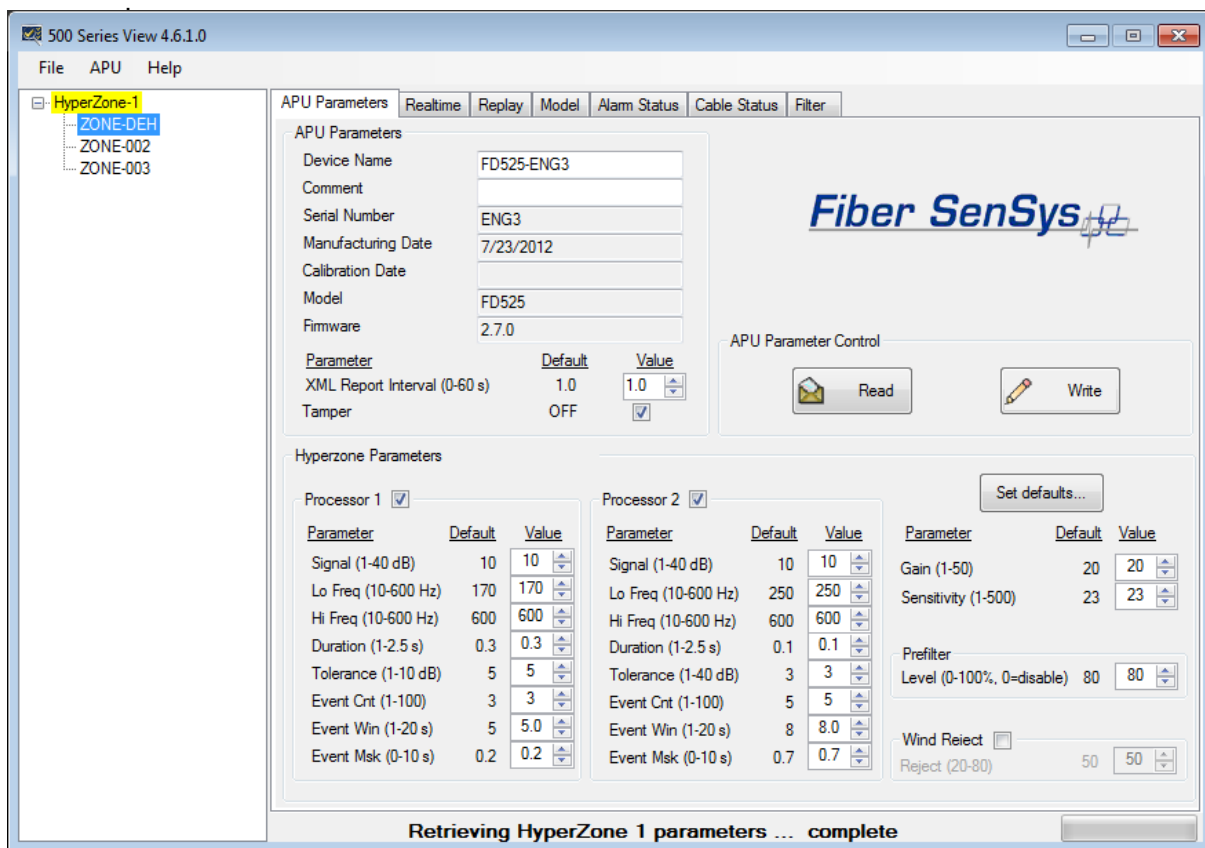
Figure 1-2 SW application from which the auxiliary SW features are accessed.

The auxiliary software features include:

1. Saving and replaying Realtime data

2. Viewing and analyzing saved data

3. Modeling tuning parameters

4. Viewing and logging system activity

5. Performing system diagnostics

6. Using the digital filter

7. Displaying the alarm history

Most of these features are designed to help with tuning the system, particularly in difficult circumstances. For example, if you have an environmental source that is causing nuisance

alarms, you may want to capture and save the spectral data, and then replay and analyze the data, to determine what tuning parameters are best suited for rejecting the nuisance alarms.

Each of the following sections describes these features in greater detail.

2. Saving and replaying real time spectral data

You can save the real time spectral data to a file for later analysis. The save function can be triggered manually. It can also be triggered automatically, whenever an alarm and/or an event is detected.

When the APU receives either a manual or an automatic trigger, the software records ten seconds of data; five seconds of buffered data, from before the trigger, and five seconds of data following the trigger.

All hyperzone information and tuning parameters associated with the selected zone are saved with the file. The controls that allow you to record thedata are in the upper right area of the **Realtime** screen.

Data is saved in files using the following file name format: **prefix.xx.yyy.fsi**

The prefix is user specified, and entered in the **Prefix** field on the **Realtime** screen. This allows you to create a series of files identified by a common prefix, for example, by location, such as "NE Corner A1."

The **xx** is the currently selected zone number, supplied automatically when the file is saved.

The **yyy** is an automatically incrementing sequence number that starts at 0 and increments each time a file is saved with the same prefix. You can change the sequence number manually by clicking on the up and down arrows in the **Sequence** box.

By default, data files are saved to the My Documents folder. You can specify a different location for saving files by clicking on the **Path** field and selecting from the **Browse for Folder** dialog box that appears.

Recording data manually

Use this feature when you want to record sensor data (for the currently selected zone) manually.   As before, specify a file name in the **Record File Prefix** field. And, if necessary, enter a new destination directory for the file by clicking on the **…** button next to the **Path** field. When you click the **Record** button, the message **Manual Record…** appears in the message bar at the bottom of the screen while data is recorded. After five seconds, the save is complete, and **500 Series View** displays the path and filename of the saved file in the message bar.

Recording data automatically

You can save sensor cable data automatically by specifying the automatic trigger. There are four automatic trigger options: when an event is detected by Processor 1, when an event is

detected by Processor 2, when an alarm condition occurs in Processor 1, and when an alarm condition occurs in Processor 2. Each of these triggers is enabled by clicking in the appropriate checkbox in the **Event Record** controls of the **Realtime** screen.

To record sensor cable data automatically, follow these steps:

Under **Record File**, specify a filename prefix and destination directory for the data file(s).

Check one or more of the trigger checkboxes under **Event Record** to enable the selected trigger(s).

When any of the selected triggers occurs, **500 Series View** begins recording five seconds of sensor cable data. The message **Event save in progress…** appears on the message bar at the bottom of the screen while the recording is in progress.

After five seconds, the save is complete. **500 Series View** displays the path and filename of the saved file in the message bar.

3. Viewing and analyzing saved data

This section describes how to import spectral data and analyze the frequency content on the **500 Series View Replay** screen. The **Replay** screen displays signal data that was recorded on the **Realtime** screen.
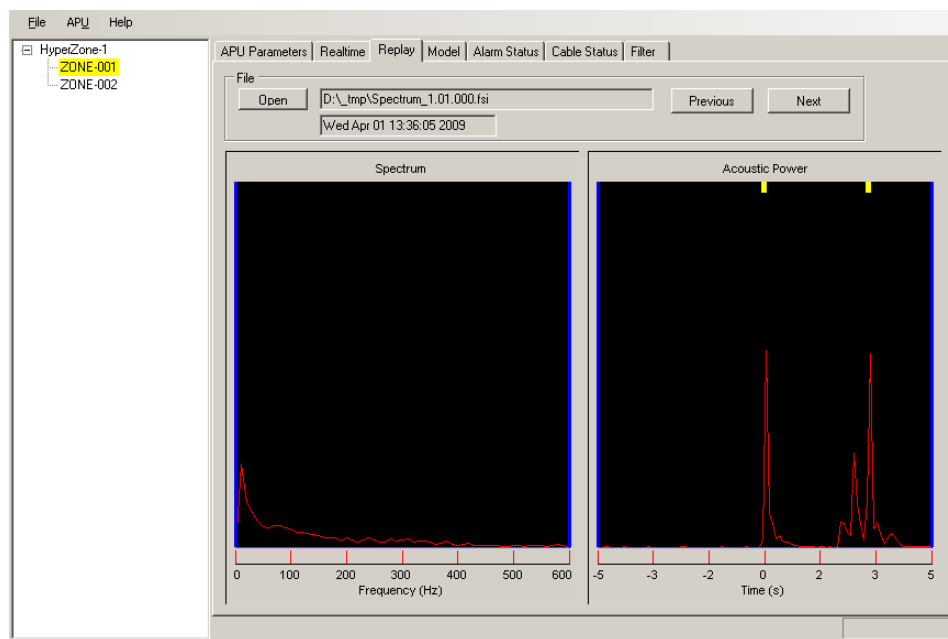
Figure 3-1 The Replay screen

To open and replay **Realtime** spectral data, first click on the **Open** button; an **Open** dialog box displays, allowing you to browse the files on the PC.

Select a data file (**.fsi** extension). **500 Series View** imports the file and displays its data in both the Spectrum and Acoustic Power windows. All hyperzone and tuning parameters associated with the zone are also imported. The file name and data/time stamp of the file are displayed in the field next to the **Open** button.

You can click on the **APU Parameters** tab to view the tuning parameters associated with the file. This data is displayed, but not written to the APU unless you click on the **Write** button on the **APU Parameters** screen.

The buttons labeled **Previous** and **Next** allow you to scroll through all the files in a series (that is, files with the same filename prefix but with incrementing sequence numbers).

The **Replay** screen provides two ways of viewing the spectral data:

Spectrum window – Displays the signal amplitude as a function of signal frequency (Hz).

Acoustic Power window – Displays the raw signal's acoustic power as a function of time. Colored markers above the waveform indicate event and alarm points. The 0.0 position on the X axis indicates the trigger point of the recording, while the negative numbers indicate the time in seconds leading up to the trigger.

The two windows are interactive; that is the data appearing between the blue cursors in one window is a conversion of the data between the blue cursors in the other window.

Initially the blue cursors are positioned at the left and right edges of each window. You can drag and reposition any of these cursors within its window. As you drag a cursor, narrowing the focus of data in that window, the other window is automatically updated.

For example, the cursors in the **Acoustic Power** window are initially displayed at -5 and +5 seconds. Moving these cursors to the +1 and +2 second positions updates the **Spectrum** window to display the frequency content of the signal that occurs only between those points in time. Similarly, placing the markers between the 100 and 200 Hz positions in the **Spectrum** window updates the **Acoustic Power** window to display only the signal amplitude content present in that frequency range.
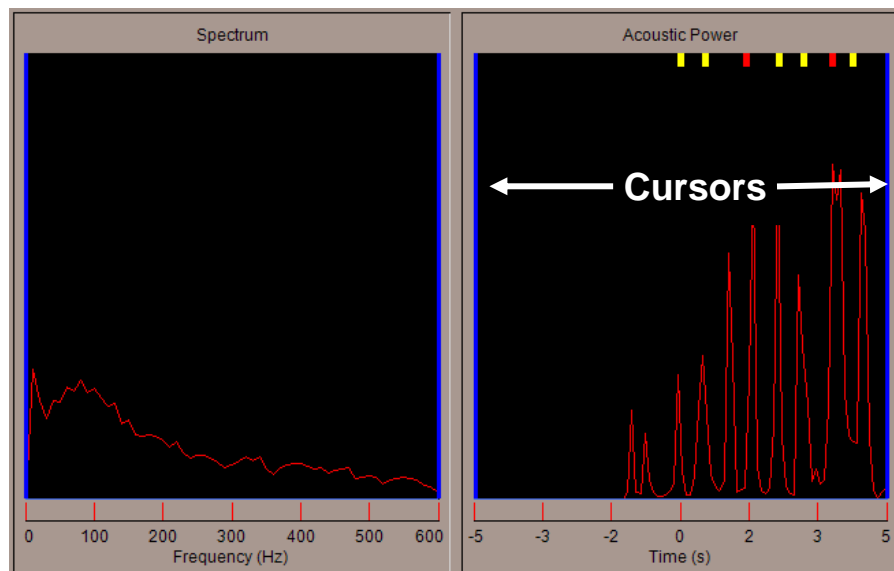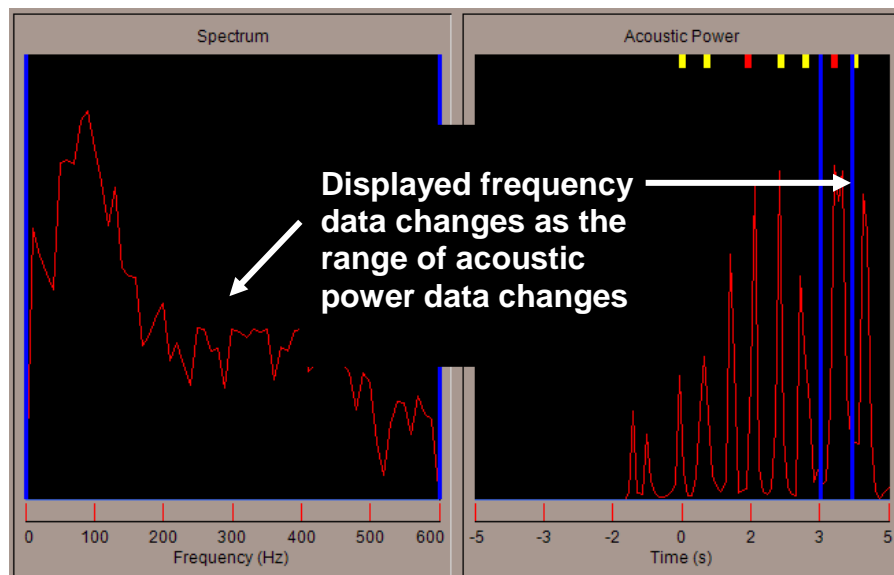
Figure 3-2 Changing the range of displayed data on the Replay screen

You can move both cursors as a pair by right clicking over either one and dragging. Double clicking on a window's X axis at any time returns the cursors to their default positions.

The **Replay** screen helps you identify signals from unknown sources and compensate for them. If a recurring alarm from an unknown cause is received, for example, you can save waveforms using the **Realtime** screen, then view the results on the **Replay** screen. The presence of specific frequencies or frequency harmonics may help you identify vibration from nearby heavy equipment or vehicle traffic. By contrast, sporadic, low-magnitude signals that spread across the frequency spectrum may indicate a stealthy, fence-climbing intrusion attempt.

4. Model tuning parameters

The **Model** screen allows you to adjust theoretical tuning parameter values and preview the potential effects on APU performance, using previously saved sensor data. This way, you can see the effect that different tuning parameters would have had, had the APU been tuned differently. Spectral data modeling is an important tool in deriving the optimum settings for each zone in your system.
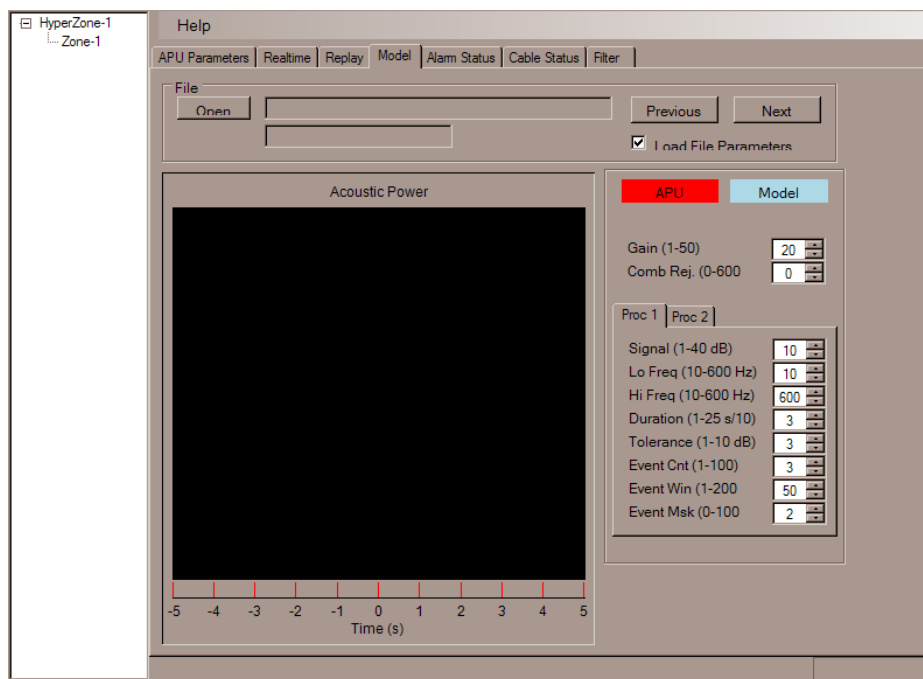
Figure 4-1 The Model screen

When you open the sensor data for viewing on the **Model** screen, you can choose whether or not to also load the tuning parameters that were in the APU when the sensor data was first acquired. To load the tuning parameters with the sensor data, click the **Load File Parameters** box; or, leave the box unchecked to load just the sensor data, without the tuning parameters.

Open the sensor data for viewing by clicking on the **Open** button; an **Open** dialog box displays, allowing you to browse the files on the PC and select the one you want to open. **500 Series View** imports the file and displays the data in the **Acoustic Power** window. The file name and data/time stamp of the file are displayed in the field next to the **Open** button.

If you had the **Load Calibration Parameters** box checked, you can click on the **APU Parameters** tab to view the tuning parameter settings associated with the file. This data is displayed, but not written to the APU unless you click on the **Write** button on the **APU Parameters** screen.

The buttons labeled **Previous** and **Next** allow you to scroll through all the files in a series (that is, files with the same filename prefix but with incrementing sequence numbers).

The **Model** screen shows two waveforms. The red waveform represents the acquired sensor data, uploaded from the file. The blue waveform is a caricature, indicating what the acquired sensor data would look like, had the modeler tuning parameters been used (rather than the tuning parameters in the APU, when the sensor data was originally acquired). If the modeler tuning parameters are exactly the same as those used by the APU, the red and blue curves will overlap. The curves will diverge as the modeler tuning parameters are adjusted differently than the original tuning parameters in the APU.
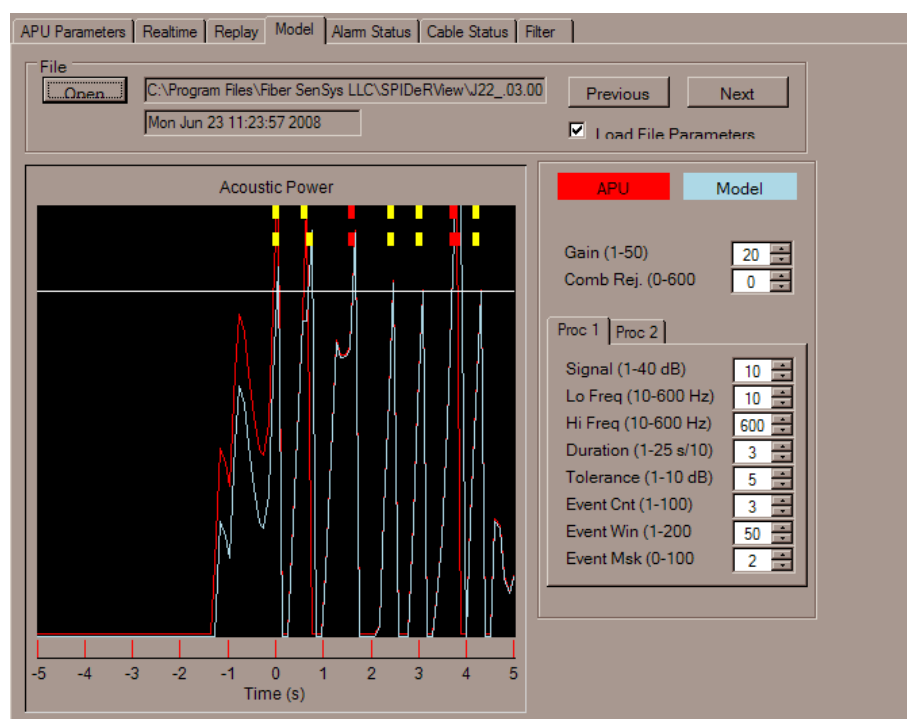

Figure 4-2 Spectral data display on the Model screen

The horizontal white line shows the event threshold. The top row of markers corresponds with the events and alarms from the acquired signal, and the bottom row of markers corresponds with the events and alarms from the modeled signal at the current calibration parameter

settings. The marker colors match the colors used in the **Realtime** screen.These markers indicate when the sensor signal exceeds the threshold, causing events and alarms.

If nuisance activity is present, you can determine, from the **Model** screen, the parameter settings at which the activity causes events and alarms. You can then adjust the settings until these peaks drop below the event threshold..

Writing modeled parameters to the APU

Any parameter setting changes made in the modeling process are also displayed on the **APU Parameters** screen. You can use the modeling process to derive optimal tuning parameter settings, then click on the **APU Parameters** tab to display the **APU Parameters** screen and view the new settings.

To write the settings to the APU, click on the **Write** button. The new settings are saved to the APU, and applied to all zones in the selected hyperzone. You can then click on the **Save** button to save all parameter settings for all hyperzones in the system, including the updated hyperzone in a **.prm** file on the PC for future use.

NOTE: If you decide not to save the modeled parameters, simply click on the Read button to discard the modeled parameter settings without writing them to the APU. Clicking on the Read button uploads parameter settings for the currently selected hyperzone and displays them on the APU Parameters screen.

Spectral modeling example

As an example of spectral data modeling, consider a site where a **500 Series** system is installed in metal conduit. An elevator goes by several times a day, setting off alarms on a zone that runs parallel to the elevator shaft. The system must be calibrated so the elevator does not cause alarms, but the system can still detect an intruder cutting into the conduit.

The zones running parallel to the elevator shaft should be placed into its own HyperZone. A series of sensor data recordings are then made during when the elevator is passing. For comparison purposes, separate recordings of simulated attempts at cutting the conduit should also be made.

The **Model** function is used to improve tuning parameters, as follows:

Open one of the files with sensor data acquired during passing of the elevator. Next, adjust the parameter settings until the model trace drops below the event threshold. Adjust the gain setting first, setting it just low enough to eliminate events, but no lower.

On paper, record the adjusted parameter settings.

Open a data file that includes a simulated intrusion attempt in the same hyperzone, and verify that the system still detects intruders. If it does not display events/alarms for the simulated intrusion, you may need to adjust the parameters.

Once the tuning parameters are adjusted to detect the simulated intrusion, reload the file taken when the elevator was passing by. Make sure that this file does not cause events/alarms. You may need to iterate this process several times until you arrive at a set of tuning parameters that does not generate events/alarms when the elevator passes buy, but still detects the simulated intrusion.

Once you are satisfied with the new tuning parameters, click on the **APU Parameters** tab to display the **APU Parameters** screen. Click on the **Write** button to write the optimized parameter settings to the APU for Hyperzone 3.

NOTE: Zone sensitivity and wind compensation parameters cannot be modeled on the Model screen.

5. View and log system activity

A diagnostic alarm status display is available by clicking on the **500 Series Alarm Status** tab. On this screen, system alarm, event, and fault indicators are updated in real time. Each zone in the system has its own indicator. With no activity, the zone is not highlighted.

Figure 5-1 The Alarm Status screen for a 5-zone system

The **Alarm Status** screen is useful as a diagnostic tool for determining the performance of the system. For example, this screen gives immediate alarm and event feedback during system performance checks. You can also localize a fault in the cable assembly by tracing the fault indicators on the **Alarm Status** screen, isolating it to the backbone cable or an individual sensor cable – a fault in the backbone cable cases fault indicators to illuminate from multiple successive zones.

NOTE: the Alarm Status screen is not designed for long-term system monitoring. Instead, use Fiber Commander™ software or a similar product that is designed for monitoring purposes.

Logging system activity

You can enable the log feature on the **Alarm Status** screen to keep a running log of all events, alarms, and faults that occur in the system. Click on the **Log File** checkbox to turn on the logging function. A **Save As** dialog box appears, allowing you to choose a location and enter a file name for the log file. All subsequent occurrences of events, alarms, and faults are stored into the file. The file can be viewed using the 500 Series Log software.

Log information stops recording when you uncheck the **Log File** box, or when you select another **500 Series View** tab. If you return to the **Alarm Status** screen when the **Log File** box is checked, the recording of events, alarms, and faults resumes.

6. Perform system diagnostics

Use the **Cable Status** tab to monitor the optical loss of the zones in your security system.
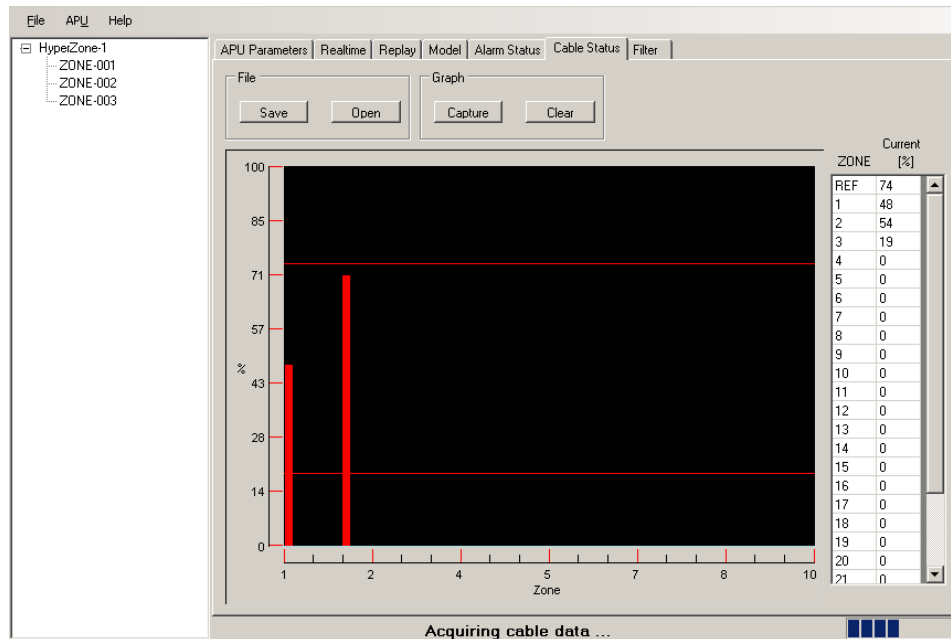

Figure 6-1 The Cable Status screen

The **Cable Status** screen shows the signal strength of the different zones in graphical form, with each bar showing the signal strength of a particular zone. A horizontal line near the top of the display represents the signal strength of a reference source that's inside the APU, and a horizontal line near the bottom represents the system's noise floor. A table to the right of the bar graph shows the numerical values of the signal levels, as a percentage relative to the internal reference signal.

One of the main purposes of the **Cable Status** screen is to help you compare the current signal strength with saved (historic) values. A certain amount of variation is normal, simply because the sensor responds to environmental stimuli. This normal variation is on the order of about 20-50%. If you see more variation than this, however, it might be an indication of damage to the optical fiber or degradation in the APU. If one zone is low, compared to its historic values, it may indicate a damaged fiber or connector. On the other hand, if all the zones are low, it can be an indication of a damaged laser, or damage to some other internal component of the APU.

Saving zone signal strength

You can save the signal strengths of the zones on a PC for later comparison by clicking on the **Save** button. An **Enter Cable Status File Name** dialog box appears allowing you to choose a location and enter a file name. The magnitude values are saved to the file but are not written to the APU.

To save the current values (for the zone signal strengths) to the APU, click on the **Update** button. This writes the values shown in the **Current** column of the **Cable Status** table to the APU. The **Saved** column is updated to reflect the new values saved to the APU.

Loading sensor magnitude values

You can load saved sensor magnitude values into the **Cable Status** screen and compare the historical data against current **Realtime** cable data. Do this as a system status check at routine intervals. To compare data, follow these steps:

Click on the **Open** button. An **Open** dialog box appears, allowing you to browse and select the **.cbl** or **.cbs** file to load.

500 Series View loads the selected file and displays the historical magnitude values as blue bars on the graph.

NOTE: The sensor reflection magnitudes displayed in the Saved column in the table to the right are the values last written to the APU, not the values retrieved from the disk file.

Compare the historical values against the current value of each zone, as well as the reference level. Inspect and recalibrate any zones showing a variation of greater than 5 dB. If the reference reflection shows more than 5 dB in variance, the APU may be damaged.

Click on the **Clear** button at any time to clear the historical data from the **Cable Status** screen.

Capturing Cable Status screen data

Zone signal strength may fluctuate rapidly when the fiber is being disturbed. Under such conditions, you can assess the signal variation in a particular zone or zones using the screen-capture function on the **Cable Status** screen. To capture sensor data, follow these steps:

On the **Cable Status** screen, use the cursor to zoom in on one or more sensor signal bars. Zoom in by using the cursor to outline the area to view. The outlined area is magnified to fill the graph portion of the display.

To return to normal view, click the mouse on either axis of the graph to display two zoom options: **Zoom Normal** and **Zoom Out**. **Zoom Normal** returns the graph to full view, and **Zoom Out** zooms out in steps.

Click on the **Capture** button to capture the data. The captured data is displayed in blue, while the live data continues to be displayed in red. The bars are shown side by side for easy visual comparison of the data.
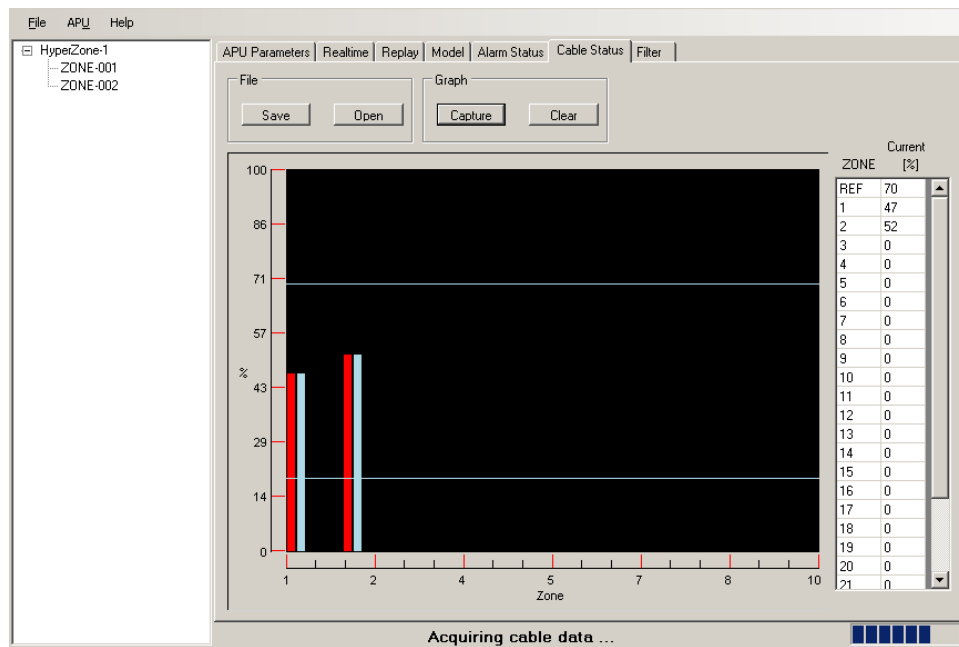

Figure 6-2 Captured data on the Cable Status screen

7. Using the digital filter

500 Series View includes a digital filter that you can use to reduce low-frequency signals. Controls for adjusting the filter are available on the **Filter** screen.
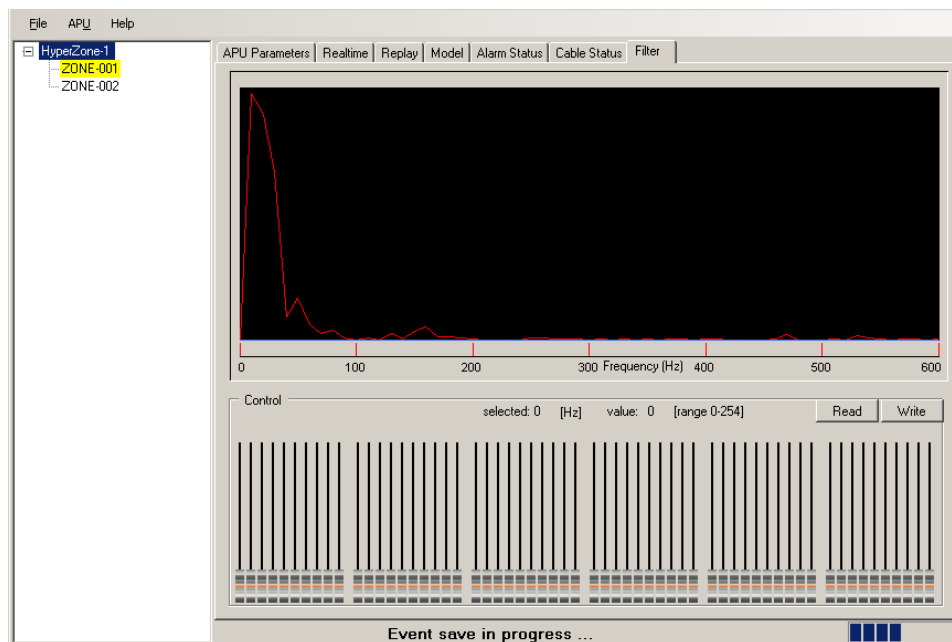

Figure 7-1 The Filter screen

Each of the 60 sliders represents a frequency band of 10 Hz and a range of 0 to 254. The middle frequency of each slider is displayed on the screen when the cursor hovers over that slider. Starting with the leftmost slider, the middle frequencies are 5 Hz, 15 Hz, 25 Hz, etc., up to 585 Hz for the rightmost slider.

The filter acts like a subtraction filter, subtracting the slider value, 0 – 254, to suppress unwanted signals.

There are 60 slider controls for fine-tuning the filter. Control these sliders in any of the following three ways:

- Drag the slider in the normal way using the mouse and the left mouse button.

- Select the slider first by clicking on it, then use the **Page Up** and **Page Down** keys for larger movement and the up and down arrow keys for finer movement.

- Hold down the **Ctrl** key and move the mouse over the sliders *without* pressing the mouse keys.

To read filter settings from the currently selected hyperzone, click on the **Read** button. The sliders are adjusted to the settings saved at the APU.

You can use the sliders to adjust the filter settings. When you change a slider position, the **Write** button turns red, indicating that unsaved changes have been made.

Once the sliders are adjusted to the desired frequency subtraction, you can click on the **Write** button to apply the settings to the currently selected hyperzone.

Click on the **Read** button to read the current filter settings from the APU. If you have changed the filter settings but have not written them to the APU yet, clicking on the **Read** button uploads the APU filter settings to the screen and discards any changes.

Right click anywhere over the slider controls to reveal a pop-up menu that displays more options.
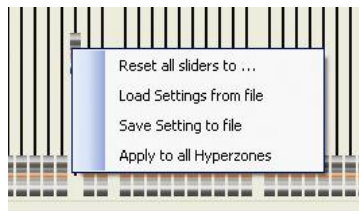

Figure 7-2 The Filter screen pop-up menu

The options on this menu allow you to perform the following functions:

Reset all sliders to… – set the value of all the sliders to the new, user-defined value. Use this option, for example, to reset sliders to 0.

Load Settings from file – load the slider settings from a saved **.spec** file. When you select this option, an Open dialog box appears, allowing you to browse for the **.spec** file to load. When you load the file, the sliders are adjusted automatically to the settings from the file.

Save Settings to file – save the slider values to a **.spec** file. When you select this option, a **Save As** dialog box appears, allowing you to specify the location and file name of the file into which filter settings will be saved.

NOTE: Filter settings are also saved and restored with tuning parameters when you use the Save and Restore functions on the APU Parameters screen.

Apply to all Hyperzones – apply the current slider settings to all hyperzones. When this option is selected, the settings are first written to a file. Then a prompt displays to confirm that the settings should be applied to all hyperzones in the system. To apply the filter settings to all hyperzones in the system, click the **OK** button on the prompt.

8. Displaying the alarm history

500 Series Log is a program that allows you to graphically display the alarm history recorded on the **Alarm Status** screen. Using **500 Series Log**, you can quickly verify that the system is functioning properly following configuration and tuning.

Click on the **500 Series Log** desktop icon to launch the software or select the Start button and navigate to "All Programs | **Fiber SenSys** | **500 Series Log**" :

The **500 Series Log** software starts by displaying the **View** screen.
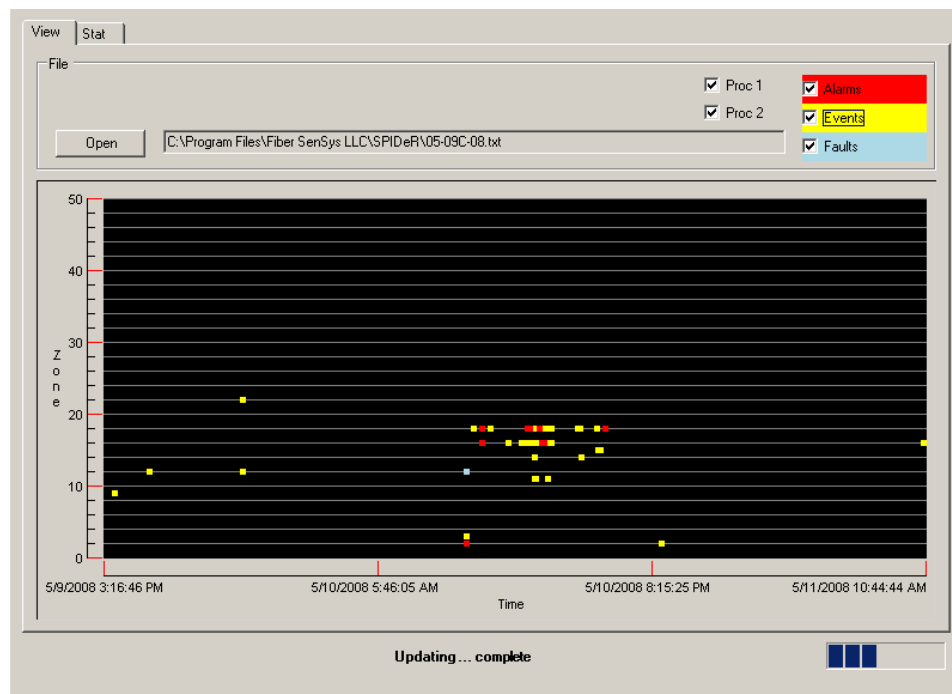

Figure 8-1 500 Series Log View screen

The **500 Series Log Alarm Status** screen allows you to log alarm, event, and fault data into a file on the PC. Using the **500 Series Log View** screen, you can then open that file and view the activity in graphical form.

![Fiber SenSys logo]

On the **View** screen, click on the **Open** button. An **Open** dialog box displays, allowing you to select a log file (**.txt** extension) to display. When you select the file, the **View** screen displays all alarms, events, and faults generated by the APU, using color-coded indicators, as follows:

Red – alarm

Yellow – event

Blue – fault

The X axis shows the time, and the Y axis shows all the zones in the system.

View filters

The **View** screen has filters that allow you to choose the type of data that is displayed on the screen. These filters are shown as five checkboxes in the top right corner of the screen.
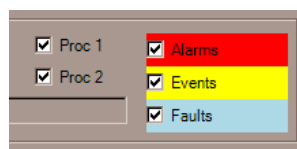

Figure 8-2 500 Series Log View screen filters

Each event or alarm originates from either Processor 1 or Processor 2. You can select to display activity from only one of the processors by checking the **Proc 1** or **Proc 2** checkbox in the upper right of the screen. If both boxes are checked, all activity is displayed; if one processor is checked, only activity originating with that processor is displayed.

You can also choose to display the type of activity to display, using the **Alarm**, **Events**, and **Faults** checkboxes in the upper right of the screen.

Zoom

As on other graph views, you can zoom in on a particular area of the screen. Using the mouse, draw a box to select the area. That area is magnified to fill the graph. To return to normal view, click the mouse on any axis of the graph to display two zoom options: **Zoom Normal** and **Zoom Out**. **Zoom Normal** returns the graph to full view, and **Zoom Out** reduces the magnification in steps.

The Stat tab: view alarm counts by zone

The **Stat** screen displays the same alarm log data as the **View** screen, but in histogram format, showing counts for alarms, events, and faults by zone. The filter checkboxes selected on the **View** screen remain active on the **Stat** screen. In the example below, only alarm data is displayed. Above the graph area, the start and end times for the alarm log are shown, as well as the total alarm count, and the count for the selected zone. The pull-down box next to the **Zone Count** field allows you to choose the zone for which to show the alarm count.
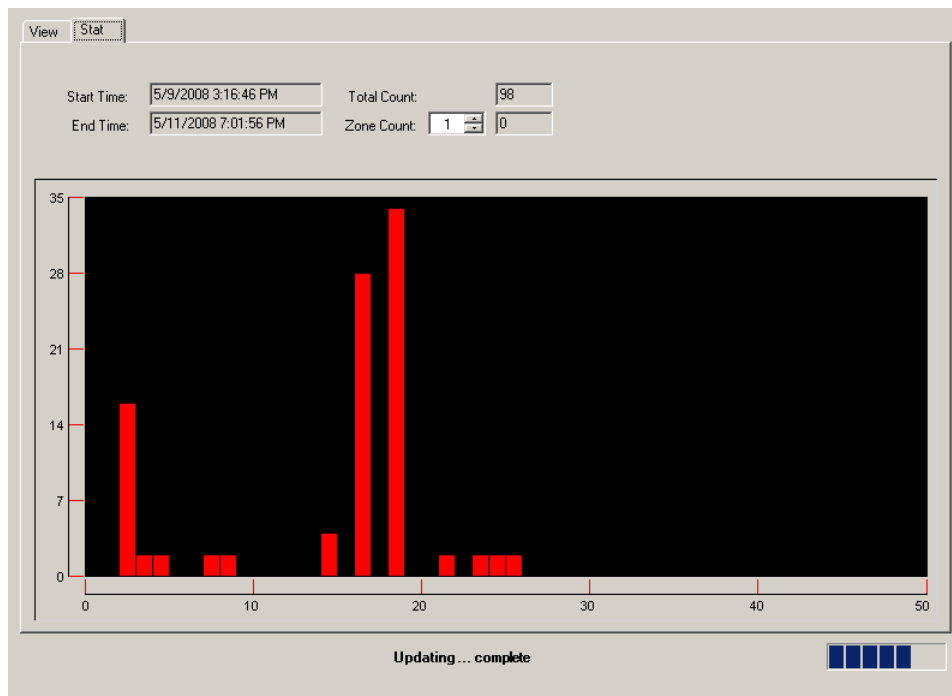

Figure 8-3 The 500 Series Log Stat screen

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Fiber SenSys

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