



***Interrogator Software
for the
860 DSP
Automatic Headend Analyzer***

**OPERATION
MANUAL**

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Trilithic Company Profile

Trilithic is a privately held manufacturer founded in 1986 as an engineering and assembly company that built and designed customer-directed products for telecommunications, military and industrial customers. From its modest beginnings as a two-man engineering team, Trilithic grew over the years and broadened its offerings of RF and microwave components by adding broadband solutions to its product line. This was accomplished with the acquisition of components manufacturer Cir-Q-Tel and instruments manufacturer Texscan.

Today, Trilithic is an industry leader providing telecommunications solutions for major broadband, RF and microwave markets around the world. As an ISO 9000:2001 certified company with over 40 years of collective expertise in engineering and custom assembly, Trilithic is dedicated to providing quality products, services and communications solutions that exceed customer expectations.

Trilithic is comprised of three major divisions:

- **Broadband Instruments & Systems**
Offers test, analysis and quality management solutions for the major cable television systems worldwide.
- **RF Microwave Components**
Provides components and custom subsystems for companies specializing in cellular, military and other wireless applications.
- **Emergency Alert Systems**
Leading supplier of government-mandated emergency alert systems used by HFC service providers.

Helpful Website

The following websites may be of interest to you:

<http://www.trilithic.com>

Trilithic's website contains product specifications and information, tips, release information, marketing information, Frequently Asked Questions (FAQs), bulletins and other technical information. You can also check this website for product updates.

Where to Get Technical Support

Trilithic technical support is available Monday through Friday from 8:00AM to 5:00PM EST.

Callers in North America can dial 1-317-895-3600 or 1-800-344-2412 (toll free). International callers should dial 1-317-895-3600 or fax questions to 1-317-895-3613. You can also e-mail technical support at techsupport@trilithic.com.

For quicker support response when calling or sending e-mail, please provide the following information:

- Your name and your company name
- The technical point of contact (name, phone number, e-mail)
- The version number for the Interrogator software
- The version of Windows you are using (including any Service Packs and patches)
- A detailed description of the problem you are having, including any error or information messages



This chapter:

- Describes Interrogator's purpose
- Provides an overview of Interrogator's features
- Gives a guided tour of Interrogator's main menu and information icons

What is Interrogator?

The Interrogator software works with Trilithic's 860 DSPh Automatic Headend Analyzer to monitor cable channel activity. You can customize and organize your network using the features of the Interrogator. The features are displayed in different view formats:

- Element view
- Element properties
- Channel events with detailed view
- Live channel view

Overview of Interrogator's Features

Element View

The Element View allows channels to be organized into hierarchical tree-style representations. This structure provides a quick view into the status of your entire cable network, or of selected parts. Element trees can be created to represent any desired configuration. For example, geographical location, hub, service technician or power supply.

Element Properties

The Element Properties window displays channel information in two formats -- group and channels. The group view displays the name, type and description of the group. The channel view displays all available channel properties when a specific channel is selected.

Channel Event View

Interrogator displays a chronological list of all channel events generated by the 860 DSPh hardware. When channel measurements reach any of the user-defined thresholds, the 860 DSPh software logs an entry into the channel event list indicating location and severity of the violation.

Live Channel View

The Live Channel feature lets you view current channel activity from the 860 DSPh Automatic Headend Analyzer via its built-in web server. The activity involves measurements and tests for each channel.

The measurements and tests vary depending on whether an analog or digital channel is selected. Analog channels include the following measurements and or tests: Level, Audio, Depth of Mod (Modulation), FM (Frequency Modulation) Deviation, Hum, C/N (Carrier-to-noise), Spectrum, and Scan. Digital channels include the following: Level, QAM/MER (Quadrature Amplitude Modulation/Modulation Error Rate), Spectrum, Scan, and QAM/ BER (Quadrature Amplitude Modulation/Bit Error Rate).

Overview of Interrogator's Main Screen and Information Icons

Main Screen

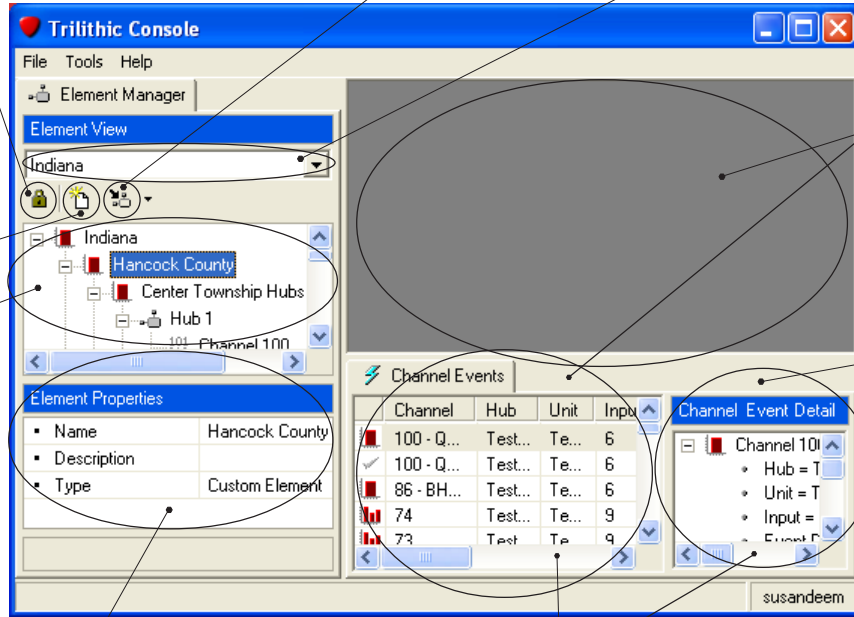
Click the **Element View Editor** button to lock and unlock access to the **New Element View** and **Group** buttons. These buttons are grayed out when the default is set to lock.

Click on the **Group** button to create groups and select the inputs for the channel you want to monitor.

Select the name of the element view you want to work with from the dropdown menu.

Click on the **New Element View** button to create new element views.

Element View
Where you create and view the hierarchy trees that represent how your elements are organized. Double clicking on a channel brings up the live-view mode.



When you double-click on a channel event, live-view measurements and test modes are displayed here.

Channel Event Detail
Displays a more in-depth view of the measurement parameters for the channel event selected. Use the + and - buttons to expand and contract the category.

Element Properties
Displays the properties of the Group and Channel when they are selected.

Channel Events
Displays channel alarms received from 860 DSPh devices.
Click once on a channel event to see the Channel Event details.
Double-click on a channel event to bring up a live view mode to monitor current channel measurements.

Information Icons

These information icons are presented in the different window views of your Interrogator software. These icons are to assist you in identifying the various event and mode measurements.

- | | | | |
|--|-----------------------------------|--|---|
| | Analog Channel Clear | | Digital Level Delta Event |
| | Analog Level Delta Event | | Digital Level Event |
| | Analog Level Event | | Depth of Modulation Event |
| | Bit Error Rate (BER) Event | | Frequency Modulation Deviation Event |
| | Carrier-to-Noise Event | | Hum Event |
| | Digital Channel Clear | | Modulation Error Rate (MER) Event |

This chapter explains how to:

- Install Interrogator onto your PC
- Login to Interrogator
- Setup and use Interrogator

Before Installing Interrogator onto Your PC...

To use Interrogator, your PC must meet the following system requirements:

- 1 GHz Pentium-III or higher (2 GHz Pentium IV or higher recommended)
- 256 MB RAM
- 2 GB free disk space (or 50 MB free disk space for client-only installations)
- Windows 2000, Windows XP, or Windows Server 2003
- Color monitor running at 256 colors or higher, 1024x768 minimum screen resolution
- High-speed Internet connection
- Windows compatible keyboard and mouse

Note: If the Windows firewall is running, or if any firewall or packet filtering exists between the client, server or 860 DSP hardware, the following requirements must be met.

- Interrogator Server: Incoming UDP port 162 must be opened
Incoming TCP port 24111 must be opened
Outgoing TCP port 24121 must be opened
- Interrogator Client computer: Incoming TCP port 24121 must be opened
Outgoing TCP port 24007 must be opened

Step 1: Install Interrogator




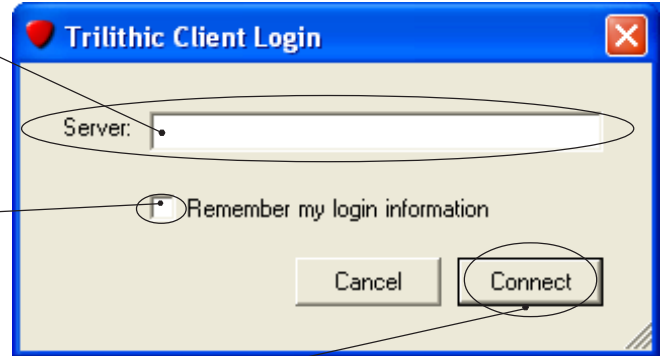
Be sure to check the CD for release notes that may affect the installation and configuration process!

To install Interrogator:

1. Log onto your computer as the local Administrator, or as a user that is a member of the local Administrator's group.
2. Insert the Interrogator software installation CD into your CD-ROM drive.
3. **If you have Autorun enabled for the CD-ROM drive**, the Interrogator software set-up program will start automatically.
If you DO NOT have Autorun enabled for the CD-ROM drive,
 - 3a) Click **Start** (which is found on the lower left-hand side of your screen).
 - 3b) Select **Run** from the pop-up window.
 - 3c) Type `D:\setup.exe` (substitute the appropriate drive path if D is not your CD-ROM drive).
 - 3d) Click **OK**.
4. To complete the installation, follow the on-screen prompts.

Step 2: Log into Interrogator

- 1  Double-click on the Interrogator icon that is automatically placed on your desktop at installation.
- 2 Type in the name or IP address of the Interrogator server.
Note: If the client and the server are on the same machine, you can leave this blank.
- 3 Place a check in this box to remember the name of the server and bypass this prompt in the future.
Note: Once you place a checkmark in the **Remember my login information** box upon initial startup, you won't see the dialogue box again. To change connection information, go to *Step 7: Set Options in Interrogator*.
- 4 Click on **Connect**.

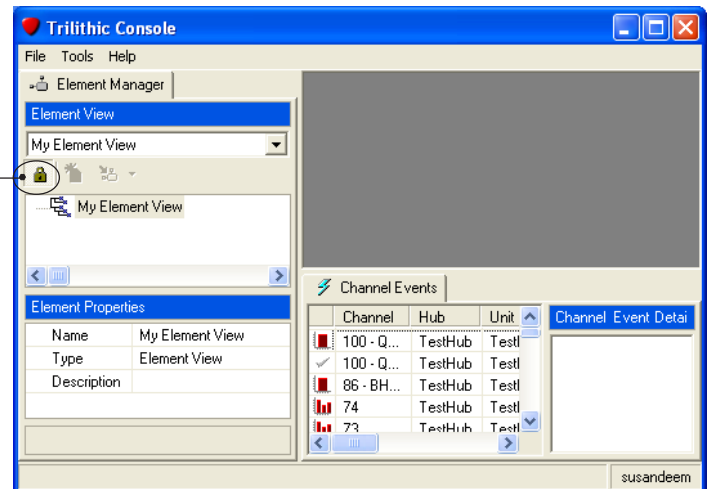


Step 3: Create Element Views

Once you have logged into Interrogator, messages are automatically received from the 860 DSPh(s) and you will see up to 200 events in the Channel Events log. Element views (root folders) will need to be created as a way to identify and group the events. The default element view is My Element View.

To customize and create a new Element View:

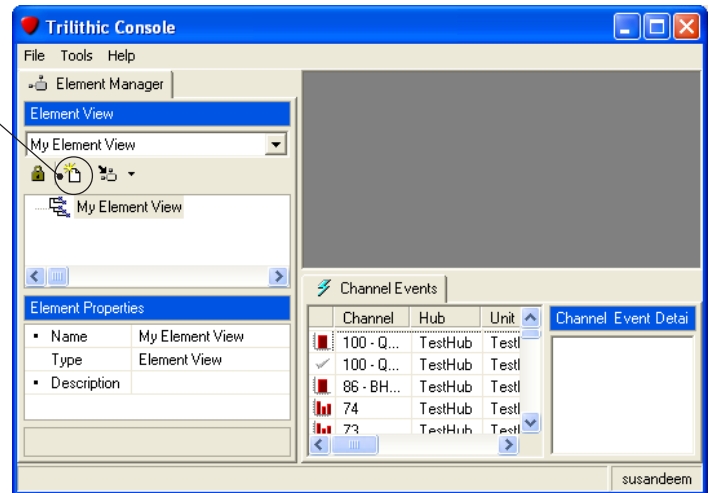
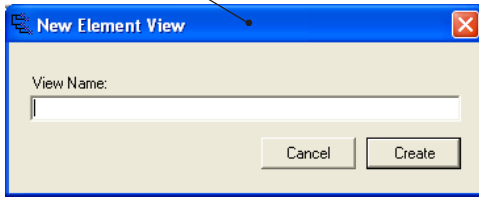
- 1 Click on the **Element View Editor** button to unlock it (the default position of the button is locked).



If the **Element View** buttons are grayed out, press the **Element View Editor** button to unlock and activate the buttons.

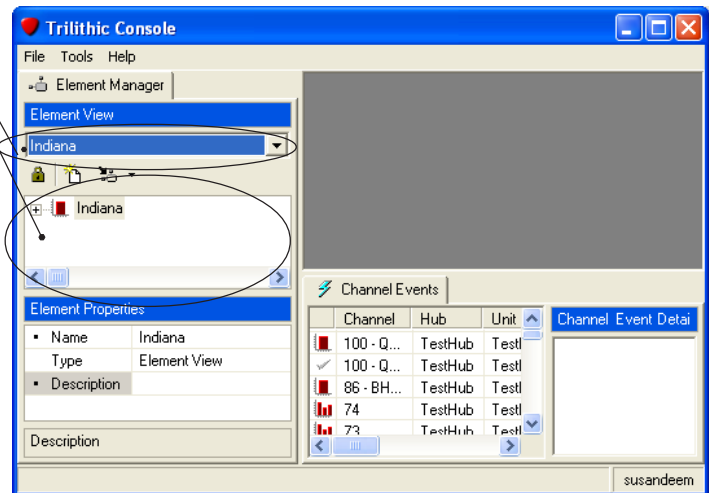
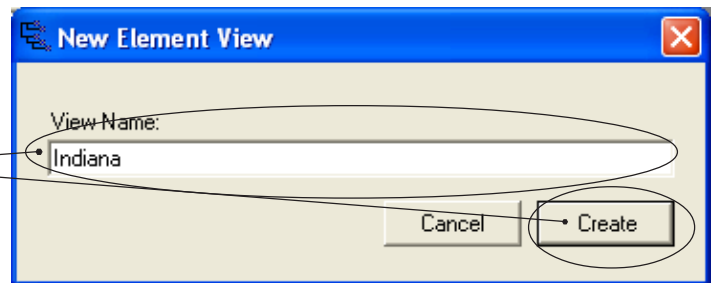
- 2 Click the **New Element View** button.

The **New Element View** dialog box appears.



- 3 Enter a name in the **View Name** field, then click **Create**.

Note: The **New Element View** name appears in the Element View Window. As you add additional views, you will note they are arranged alphabetically in the element view dropdown menu.



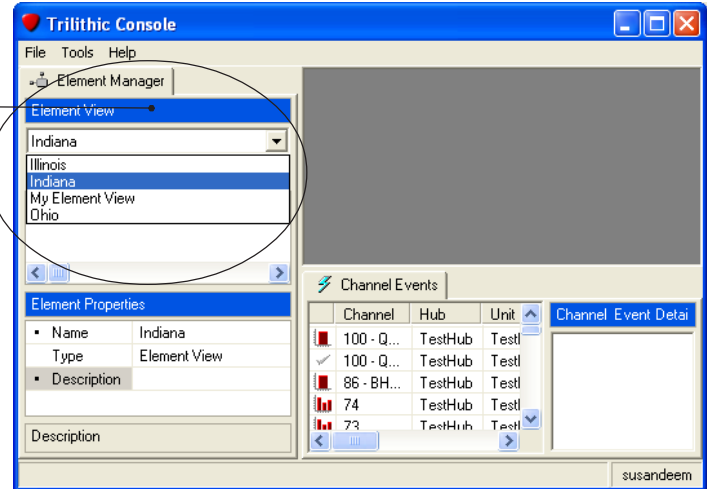
- 4 To add more element views, repeat the process.

Step 4: Build Groups Within an Element View

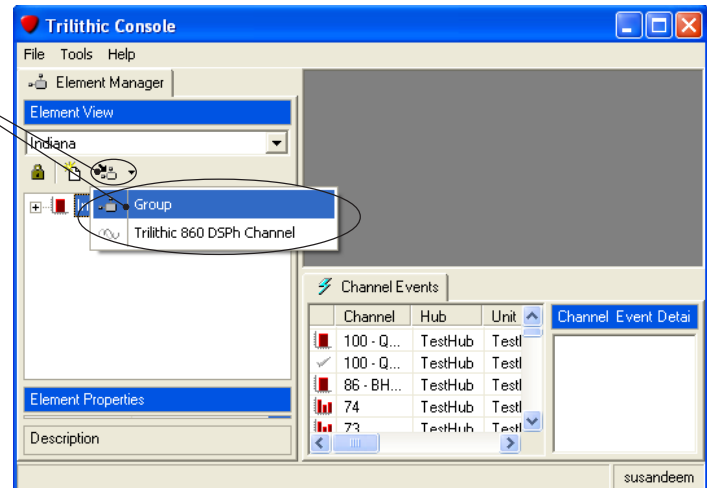
You can create as many individual views (root folders) as you want with groups nested within other groups to maximize the usefulness of the tree. A tree view of groups provides a convenient visual for locating the information quickly and viewing the Group and Channel Properties. For example, you could create views to organize elements by locations, service types, hubs, inputs, or individual technicians.

To add a group within the element view:

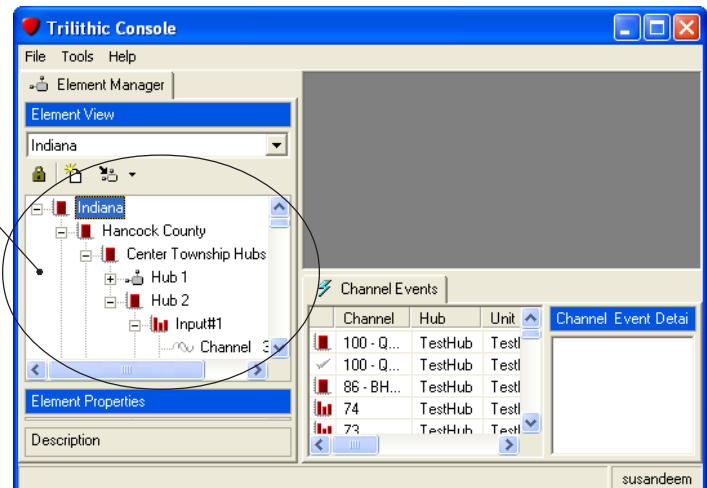
- 1 Go to the **Element View** window and click to view the dropdown list. Select one of the new element views where you want to place a group.



- 2 Click the **New Element** button to select and add a **Group** from the floating menu.



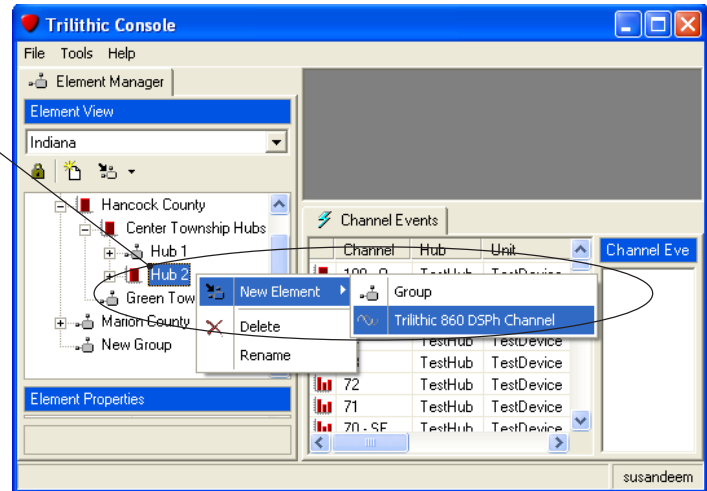
Note: Creating **New Element Views** and **Custom Elements** gives you flexibility in grouping, storing, and arranging the elements to best fit your requirements in a tree-style hierarchy.



Step 5: Adding Channels to a Group

- 1 Select a group name. Right-click and select **New Element**, then select **Trilithic 860 DSPh**.

A dialogue box with a list of the 860 DSPh analyzers and channels is displayed.

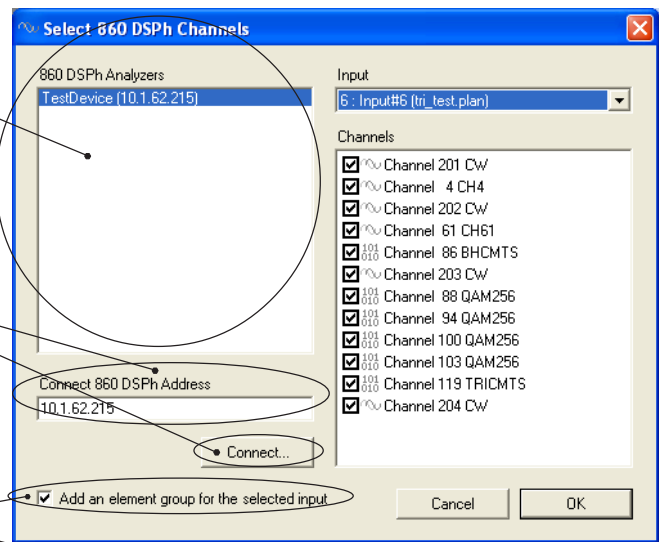


- 2 Select an **860 DSPh Analyzer**.

The list contains the 860 DSPh analyzers that were previously installed on your network system. If an 860 DSPh Analyzer does not appear in the list, enter the name and IP address in the **Connect 860 DSPh Address** field below and click on **Connect**.

- 3 Select an **Input**.

The inputs for the selected 860 DSPh Analyzer appear in a dropdown menu. If the **Add an element group for the selected input** is checked, the channels for that input will be automatically added to the group when **OK** is selected.

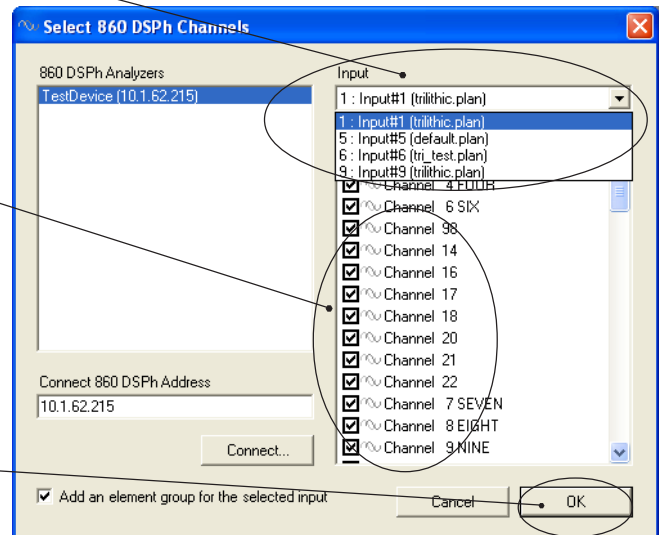


- 4 If they aren't already, select the appropriate channels.

Clicking on the box changes the status of the channel. If a checkmark appears in the box, the channel will be added. If no checkmark appears in the box, the channel will not be added.

- 5 Press **OK**.

All channels with a checkmark will appear in the **Group** that you selected along with the **Input**.

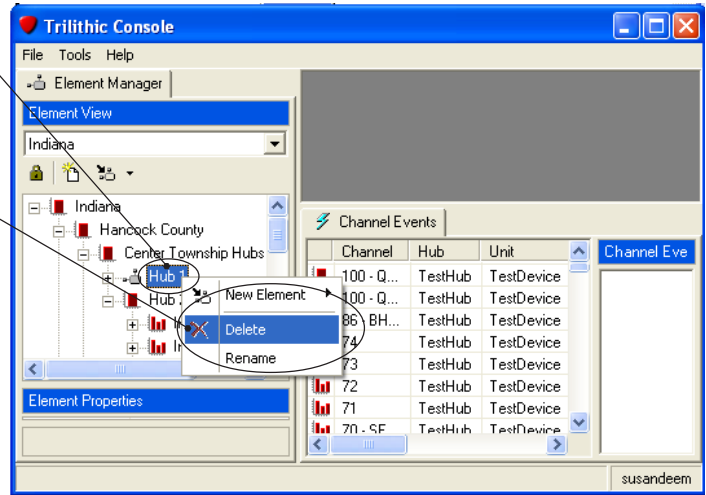
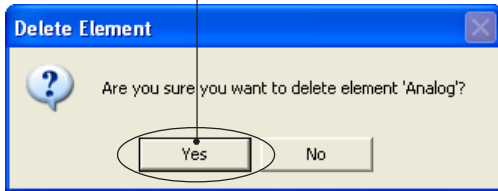


Step 6: Delete or Rename an Element View or Group

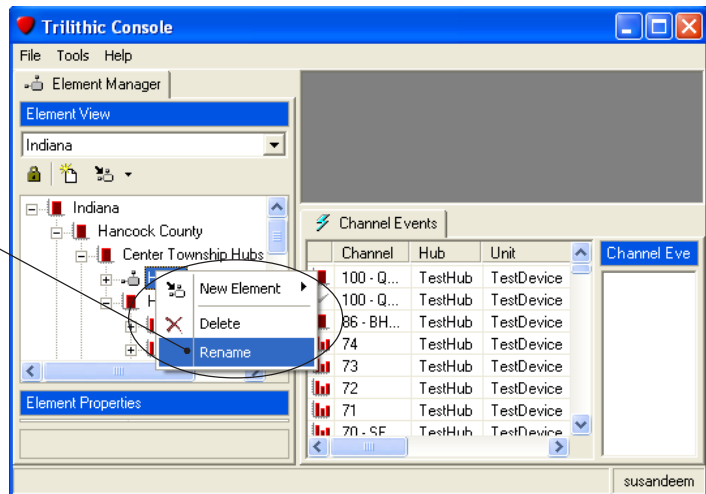
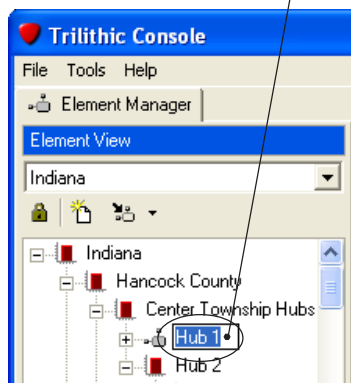
- 1 Select an **Element View** and right-click. A dialogue box appears.

- 2 Select **Delete** or **Rename** from the dropdown menu.

- 2a Selecting **Delete** brings up a dialogue box, select **Yes** to delete.



- 2b Selecting **Rename** moves the cursor to the element name with a box around the name indicating it can now be changed. Enter the new name and hit your keyboard's **Enter** key.



The windows can be resized for a larger viewing area by running your cursor over the edges of the window. When an east-west or north-south icon appears, you can move the window in that direction to enlarge.

Step 7: Set Options in Interrogator

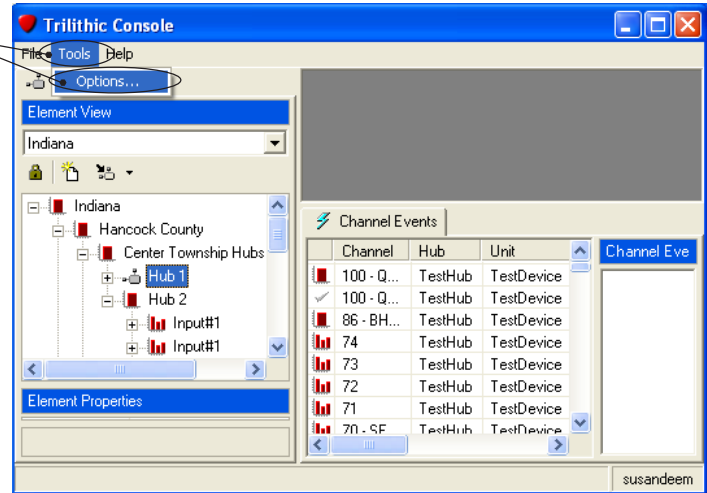
In the **Options...** menu, you will find General and Guardian II settings.

- The General feature lets you make changes to your connection information.
- The Guardian II feature lets you select a sound to alert you when an event is received from the 890 DSPh.

- 1 To select an option, choose **Tools** and then **Options**.
The Application Options screen appears.

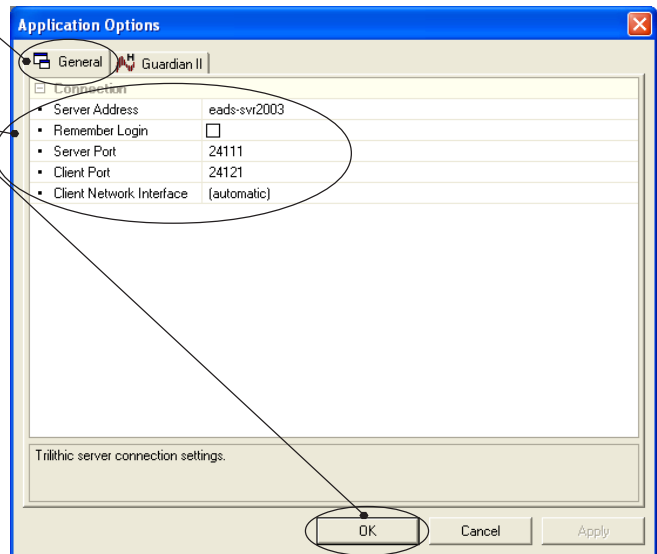
To make changes in the **General** tab, go to step 2.

To make changes in the **Guardian II** tab, go to step 4.



- 2 Choose the **General** tab if you want to make changes to your network connection.

- 3 Enter applicable information in the fields as explained below and select **OK**.
 - **Server Address:** Enter the Interrogator server address or IP address.
 - **Remember Login:** Check this box if you want the system to remember the username and password.
 - **Server Port:** Enter the network port number on which the Trilithic server is configured to accept connections. Enter 24111 for the default connection.
 - **Client Port:** Enter the network port number on which the Trilithic server is configured to accept connections. Enter 24121 for the default connection.
 - **Client Network Interface:** Enter zero-based index of the network interface (adapter, dial-up, or VPN connection) on which the Trilithic server is configured to accept event connections. To automatically detect the appropriate interface, enter -1 in this field.

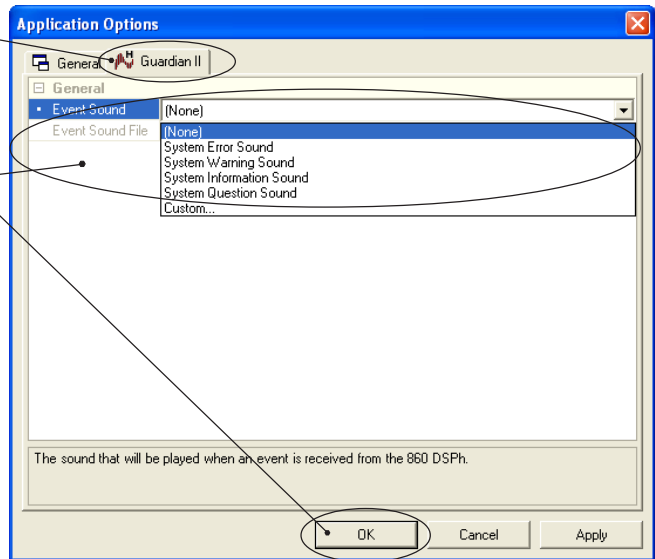


Note: The server port, client port and client network interface will seldom need to change.

- 4 Select the **Guardian II** tab if you would like to hear an alert sound when the 860 DSPh receives an event.

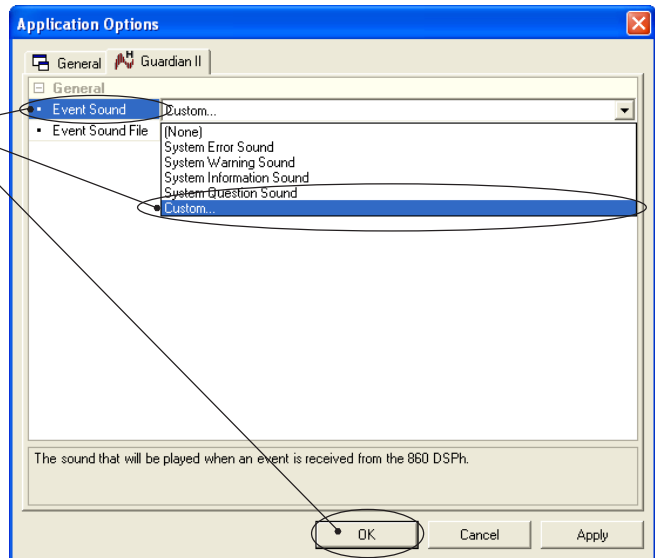
To choose one of Viewer II's built-in alert sounds, choose **System Error Sound**, **System Warning Sound**, **System Information Sound**, or **System Question Sound** from the **Event Sound** dropdown menu and then click on **OK**.

You can also select a custom sound file from your hard drive or network.

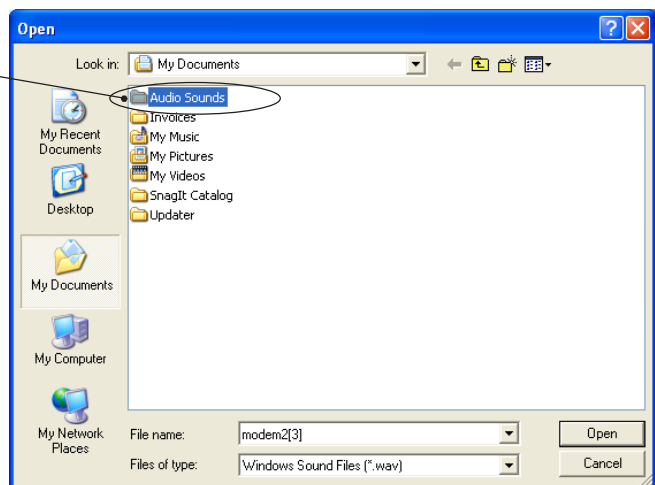


- 5 To select a custom sound, highlight **Custom** from the **Event Sound** dropdown menu and press **OK**.

A dialogue box on your computer system is displayed.



- 6 Open the file folder on your computer where the audio sounds are stored.

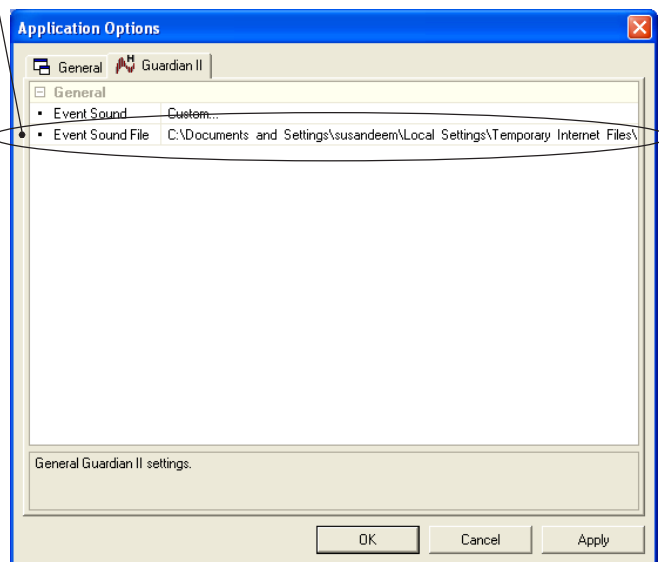
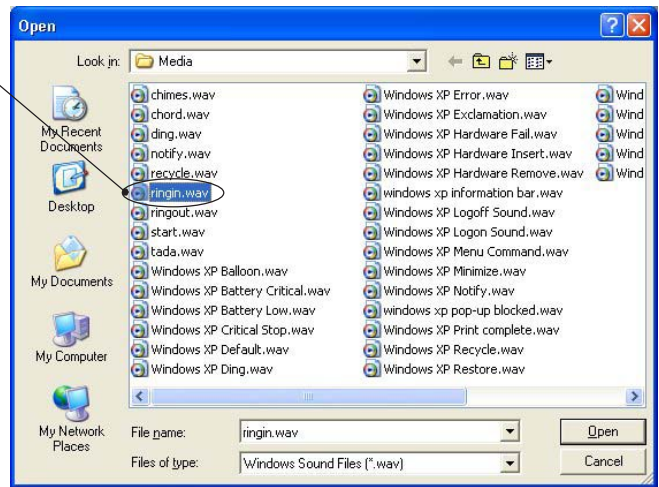


- 7 Highlight the sound that you would like for your custom sound and double-click.

The pathway will be included in the **Event Sound File** as shown.

Notes: Only one custom sound can be stored at a time.

If you want to change the custom sound, select **None** in the **Event Sound** option and then re-select **Custom** and follow steps 5-7.



Step 8: View the Information Provided by Interrogator

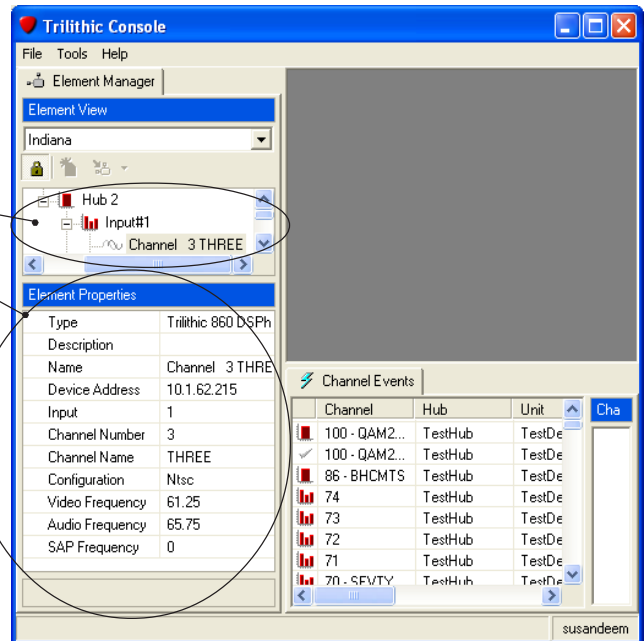
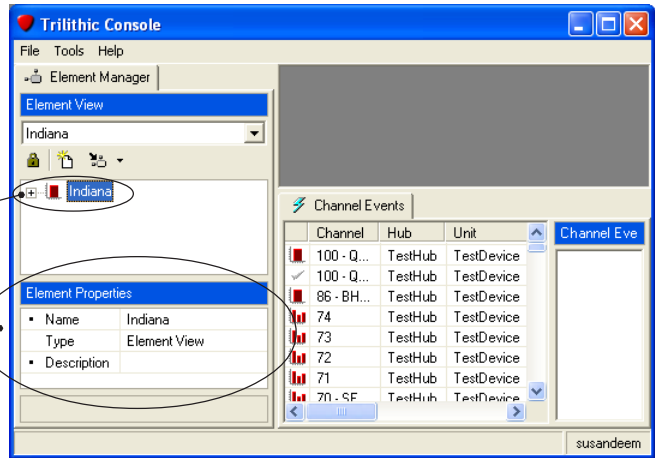
Your Interrogator software package displays information in the areas listed:

- **Element Properties** view (group and channel)
- **Channel Events** view (list of events received from 860DSPh devices)
- **Channel Events with Detailed** view (analog and digital measurement parameters)
- **Live Channel View** mode (measurement modes)

Element Properties

The **Element Properties** window displays the Group and Channel properties.

- **Group Properties:** Shows Name, Type, and Description of the element view or group name that is selected.
- **Channel Properties:** Shows all properties when a channel number is selected in the element view. You will note that some of the same information can be viewed more in-depth in the **Channel Event Details** window.

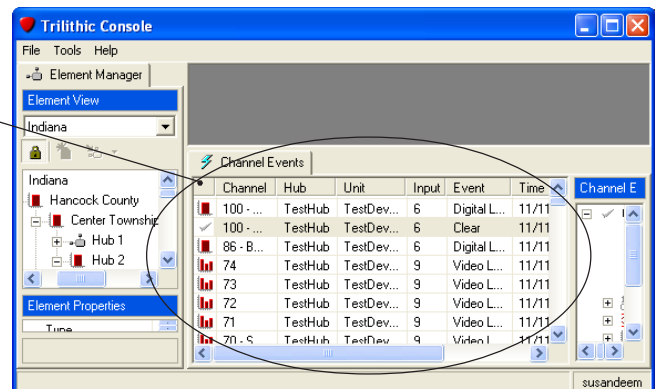


If a bullet (•) appears to the left of a field in the Element Properties view, the field can be changed. Those fields that do not contain a bullet are fixed.

Channel Events

The **Channel Events** window gives an overview of the channel activity within the 860 DSPh Analyzer system.

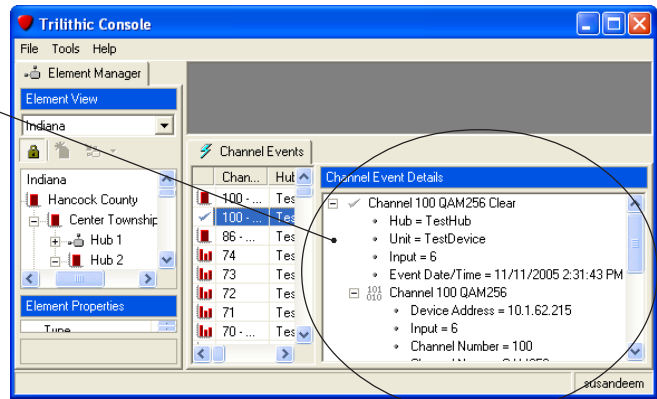
- Click anywhere in the channel event line to display the **Channel Event Details** view.
- Double clicking anywhere in the channel event line brings up the **Live View** information for that channel.



Channel Event Details

The **Channel Event Details** window presents a more in-depth view of categories that contain measurement parameters for the channel selected. The categories vary according to whether the channel is digital or analog. Some of the channel information is the same as that which appears in the **Element Properties** and **Channel Events** windows.

- Click anywhere on a channel in the **Channel Event** window to display the measurements in the **Channel Event Details** window for the channel.

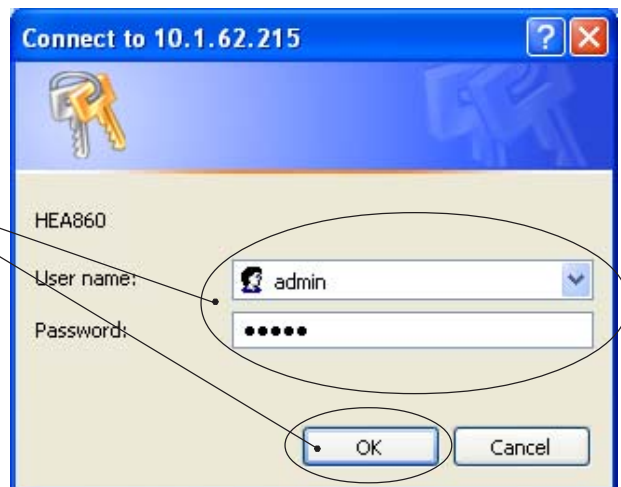
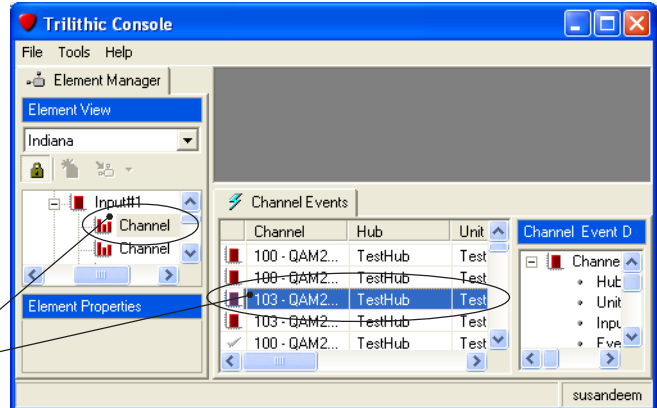


You can expand or contract the tree items by clicking the plus (+) or minus (-) symbol to the left of the element name.

Live Channel View

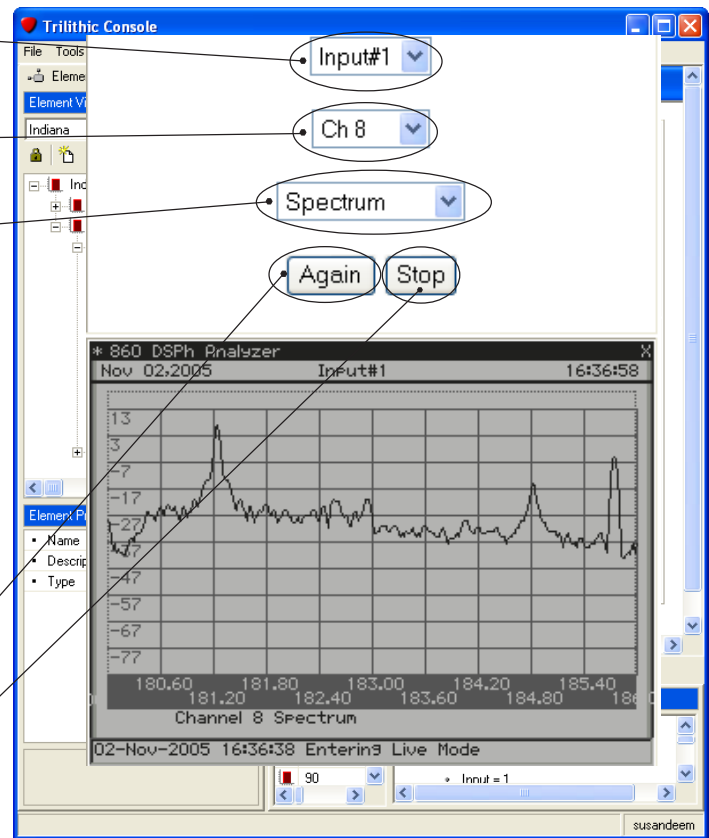
The **Live Channel View** mode allows you to view real-time activity of different measurement modes for any channel that you select. You can get to live channel view through the **Channel Events** or **Element** window.

- Double-click on a channel number in the **Element View** window or a channel event in the **Channel Events** window. The log-in window may appear.
- Enter the **User name** and **Password** and click on **OK** to access the live channel view screen. The default user name and password is **admin**.
The live channel view screen is displayed.



Remember when connecting to live channel view that you are actually connecting to the 860 DSPh Automatic Headend Analyzer.

- 3 Select an input from the dropdown list.
- 4 Select a channel from the dropdown list.
- 5 Select a measurement/test from the dropdown list.
After you select the measurement/test, live channel view runs for one minute before returning to automatic scanning. You can rerun or stop live channel view before the minute ends.
Note: For detailed information on the modes in this dropdown list, see the **Live Channel View Measurement Modes** section below.
- 6 Click here to rerun live channel view.
- 7 Click here to stop live channel view before the one minute ends.



Live Channel View Measurement Modes

The Live View measurement data for analog and digital channels provide a real-time visual of the signal quality through the 860 DSPh analyzer. Rapid changes in the measurement results for a channel are detected through the modes that are available and will assist in analyzing the signal problems with the channel. For detailed information, refer to your 860 DSPh operation manual.

Depending on whether you chose an analog or digital channel in step 4 above in the Live Channel View section, you will see one of the following dropdown lists when you get to step 5.

Analog Modes



Digital Modes



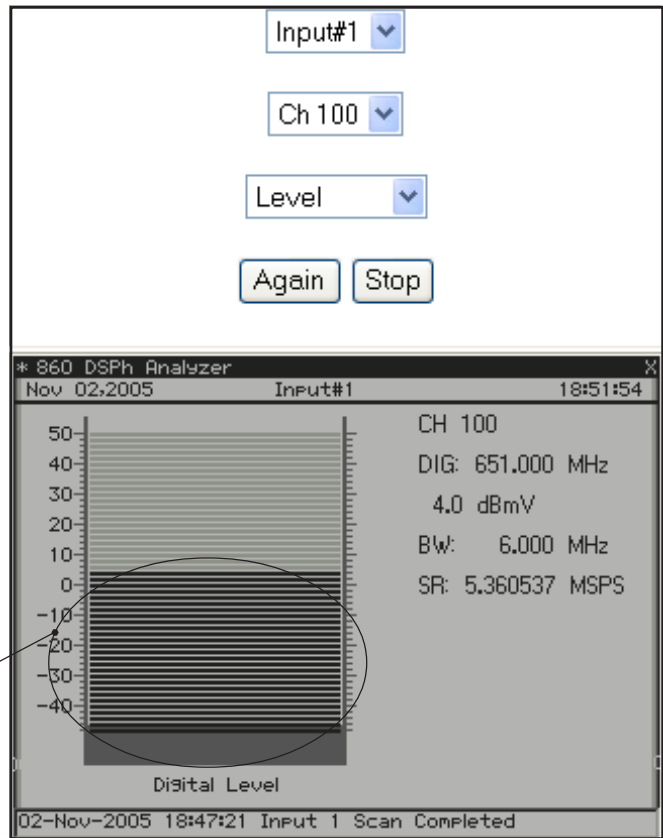
Level Mode (Analog or Digital)

In the **LEVEL** mode, the 860 DSPh displays the amplitude (signal voltage or current size) of the carriers included in a single channel, or the amplitude of a signal at a selected frequency. Measurements are displayed both numerically and as a bar graph.

The vertical bar represents the signal strength and the amplitude is represented numerically at the left of the bar graph. The amplitude and frequency of each bar are also displayed numerically to the right of the bar graph along with the channel number.

The default setting is set to average 16 Times and can be set from 1 Time to 1024 Times. Refer to the **Workbench** manual to change the setting.

Note: The graphic for the **Level** mode is an example of the digital level.

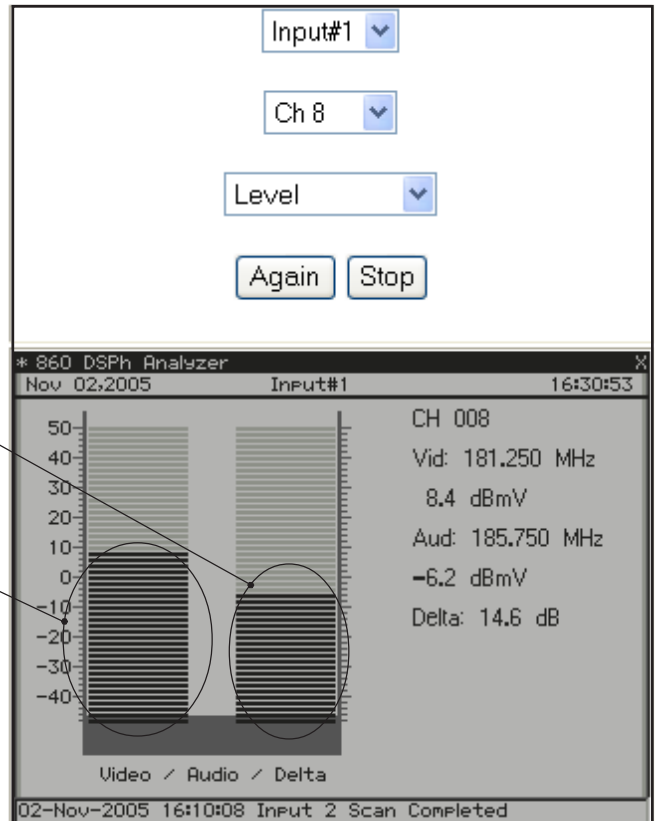


Digital Level

Audio Mode (Analog only)

In the **Audio** mode, the 860 DSPh displays the same information as the **Level** mode for amplitude of the carriers included in a single channel. Measurements are displayed both numerically and as a bar graph.

Note: Only the **Level** mode graphics are displayed in this manual as a representative of both the **Audio** and **Level** measurement modes.



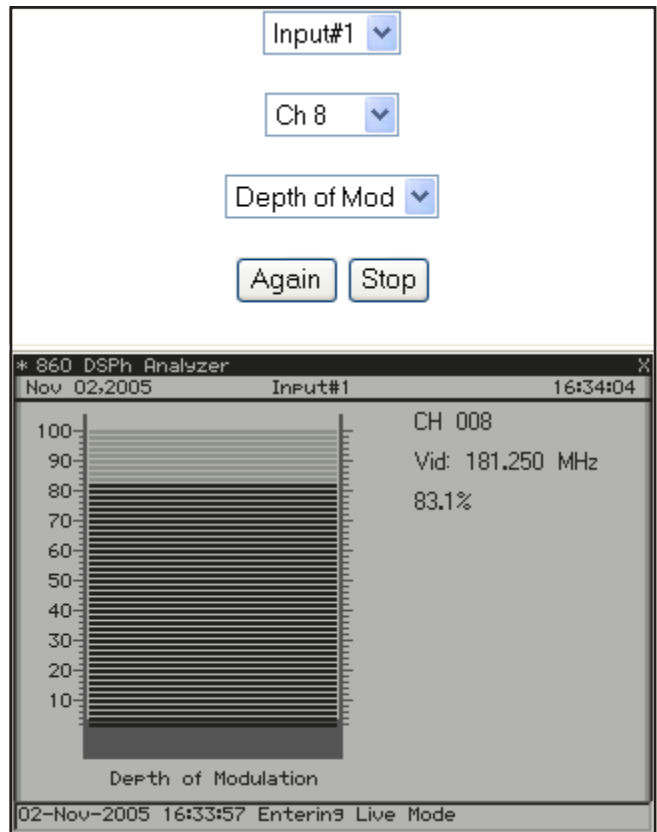
Audio Level

Video Level

Depth of Modulation (Analog only)

Depth of Mod mode in the 860 DSPh displays the percentage, both numerically and as a bar graph, of video modulation for the visual carrier of a single, user-selected channel. Overmodulation shows up as nonlinear distortions such as differential phase and gain. Undermodulation often results in degraded signal-to-noise performance.

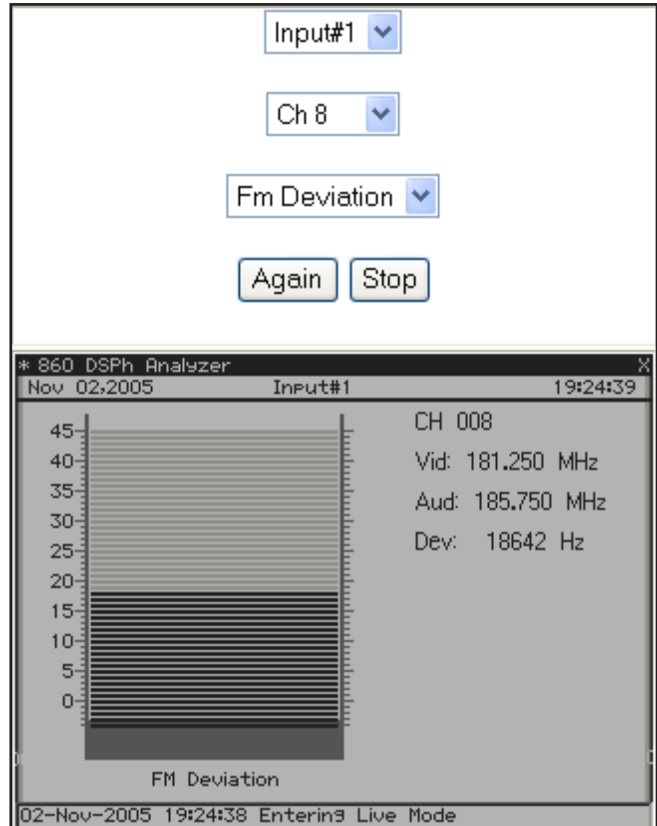
Note: The 860 DSPh measures modulation on analog non-scrambled channels only.



Frequency Modulation Deviation Mode (Analog only)

In **FM Deviation** mode the 860 DSPh displays the current and maximum FM deviation on the audio carrier of a single, user-selected channel. The selected channel number and detected **FM Deviation** (current and the maximum) are displayed both numerically and as a bar graph.

Note: The FM audio is also sent to the front panel speaker provided the volume is set above zero (0). Refer to the **Workbench** manual to change the setting.



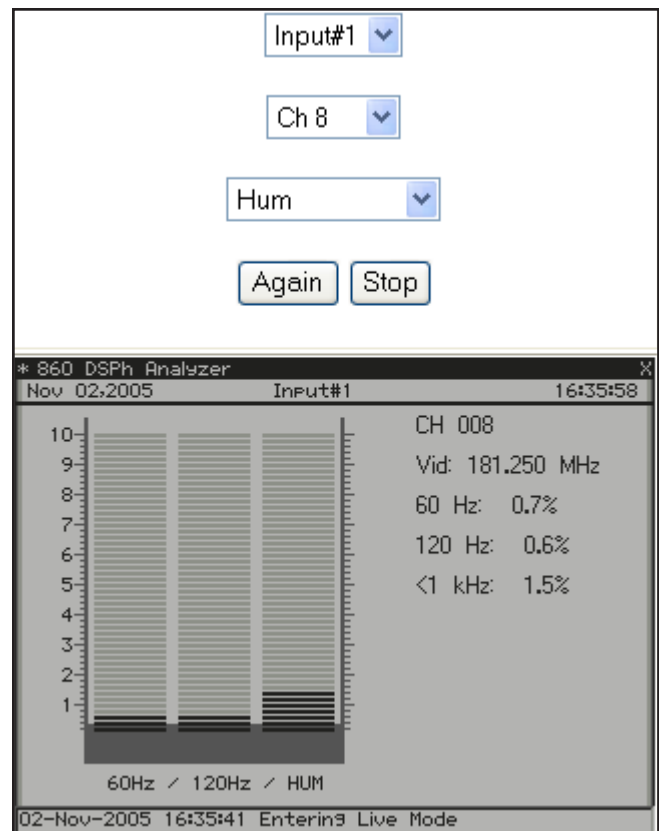
Hum Mode (Analog only)

With the **HUM** mode selected, the 860 DSPh displays the amplitude of the 50/60 Hz, 100/120 Hz and <1kHz low frequency interference present on the video carrier of a single selected channel. Measurements are displayed both numerically and as a bar graph.

The selected channel number and the amplitudes of the hum and low frequency interference are displayed as percentages. **Hum** mode requires a minimum signal level of -20dBmv.

The default for the **Hum** measurement is 60 Hz (U.S.).

Note: The 860 DSPh measures **Hum** on non-scrambled analog channels only.

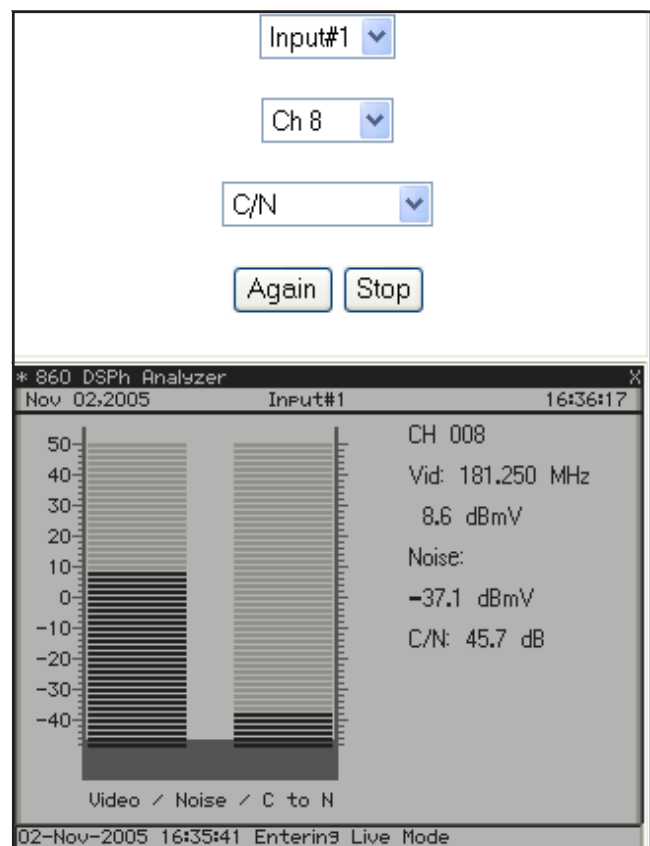


Carrier-to-Noise Mode (Analog only)

The **C/N** mode measurement is the decibels between the amplitude of a video carrier and the rms (root-mean-square) amplitude of system noise in a specified bandwidth (or ratio value between carrier level and noise level measured in units of decibels) within a single, selected channel. High carrier-to-noise ratios provide better quality of reception and higher communications. The 860 DSPh requires a minimum signal level greater than 10dBmV.

Values are displayed both numerically and as a bar graph. The **Carrier-to-noise** mode displays the selected channel number, frequency, amplitudes of the video carrier, corrected bandwidth noise, and ratio of the two measurements.

Note: The 860 DSPh measures **C/N** on non-scrambled analog channels only.



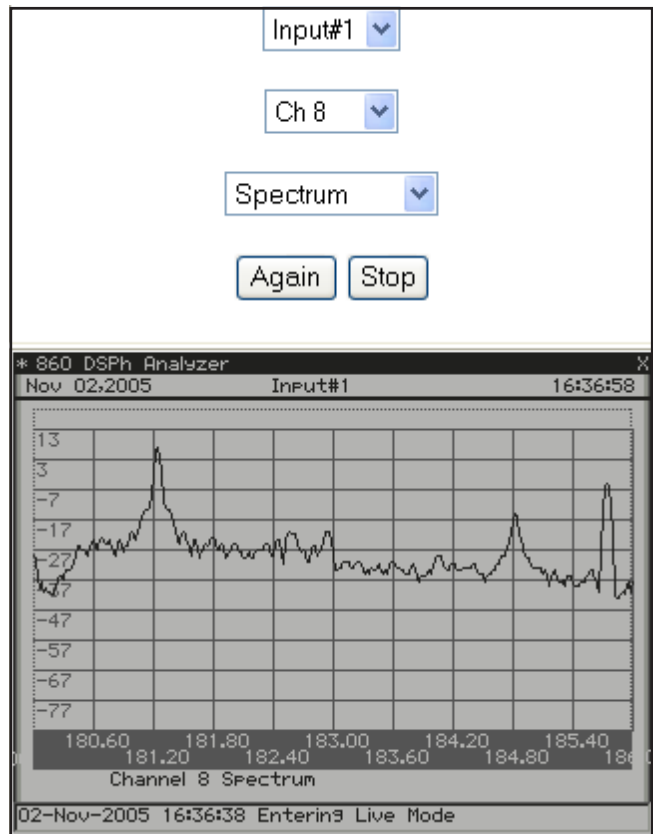
Spectrum Mode (Analog or Digital)

The **Spectrum** mode displays the amplitude of all carriers, beats, and other RF sources present in a selected span of frequencies. When a time-varying signal is subjected to frequency analysis, it is transformed from the time domain to the frequency domain. The frequency-domain representation of the signal is called the *spectrum*, and the time domain representation is called the *waveform*.

Frequency resolution bandwidth is set at 30 kHz in the 860 DSPh. The resolution bandwidth (RBW) setting determines how close together in frequency two signals can be and still be represented individually on the spectrum display.

The RF amplitude is displayed as a power-vs-frequency line graph. On the Spectrum graph, vertical displacement represents signal strength. The horizontal axis represents a range of frequencies.

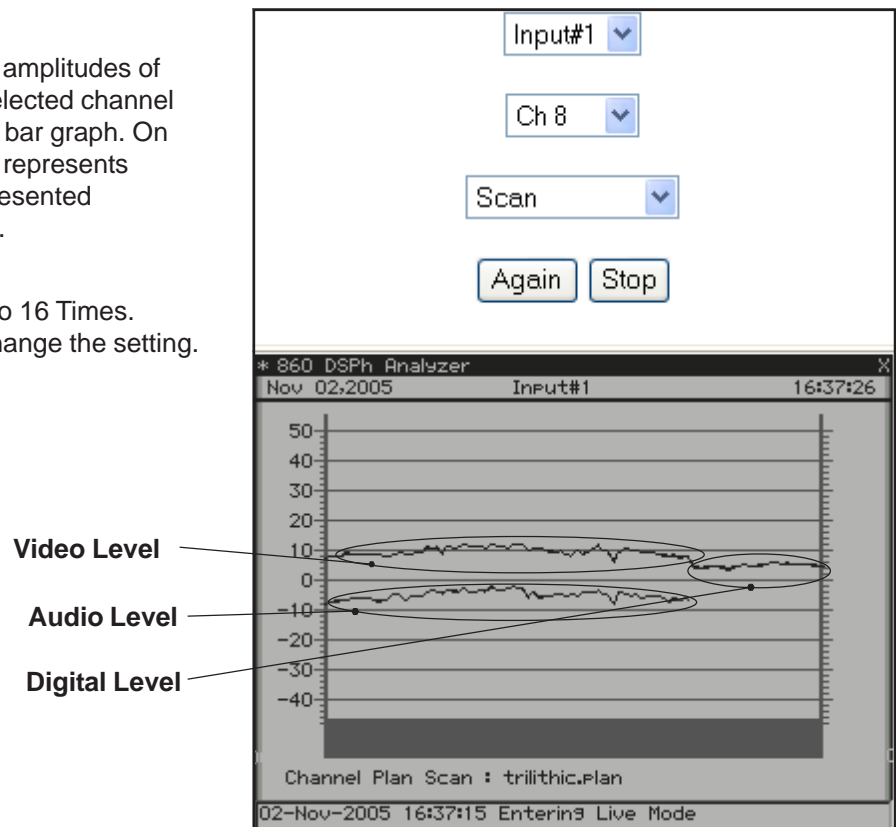
Note: No setup in the 860 DSPh is required to begin



Scan (Analog and Digital)

In **Scan** mode the 860 DSPh displays amplitudes of ALL Visual and Aural carriers of the selected channel as two simultaneous line graphs or as bar graph. On the Scan graph, vertical displacement represents signal strength. The amplitude is represented numerically at the left of the bar graph.

The default for scan averaging is set to 16 Times. Refer to the **Workbench** manual to change the setting.



QAM/MER or QAM/BER Mode (Digital only)

In **QAM** (Quadrature Amplitude Modulation) mode the 860 DSPh analyzes and displays the signal qualities of digitally modulated signals. You can select either **QAM/MER** or **QAM/BER** mode; both display similar information.

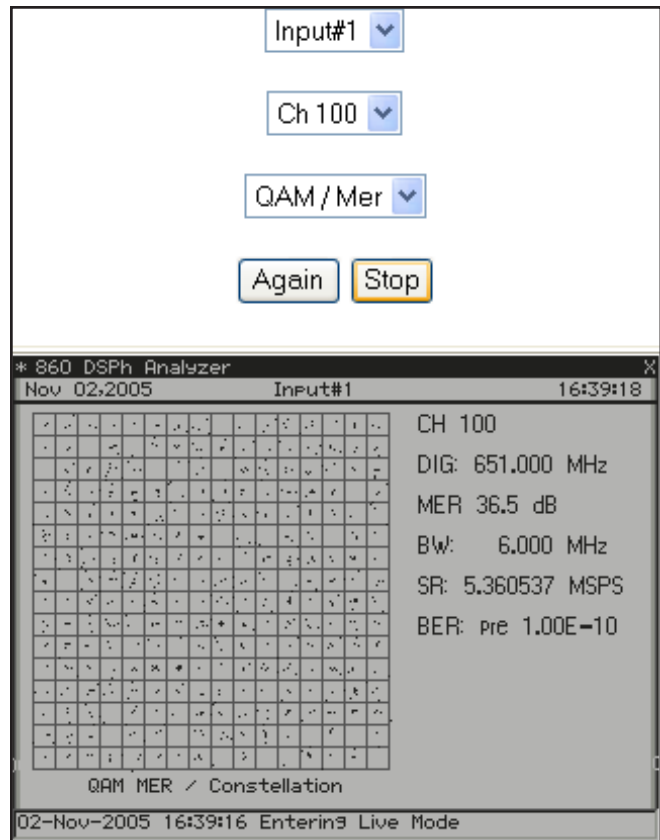
The MER (Modulation Error Rate) measurements are able to measure small changes in transmitter and system performance. MER is the ratio of the power of the signal to the power of the error vectors expressed in dB. It is an early indicator of the ability of the receiver to correctly decode the transmitted signal. MER compares the actual location of a received symbol to its ideal location. As the signal degrades the received symbols are located further from their ideal location.

BER (Bit Error Rate) is useful for standards cross-equipment checks and as an aid to identify short-term signal degradation.

The QAM measurements are displayed as a Constellation Diagram. The constellation display graphs symbol values on an I and Q grid. The display is useful for observing impairments in the digital signal.

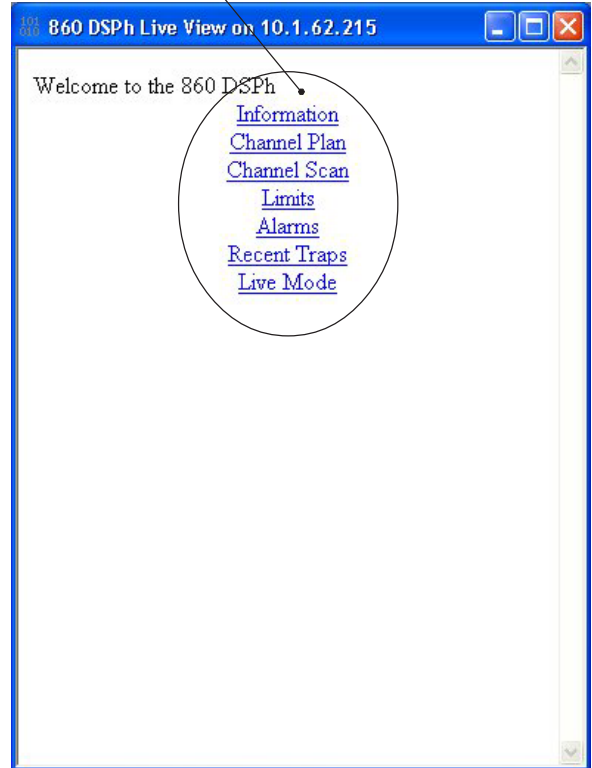
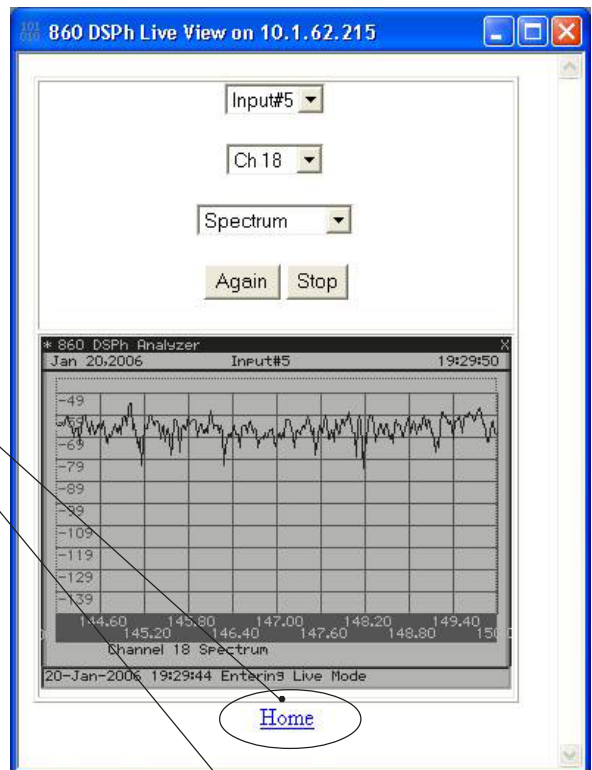
An optimum constellation has symbol clusters that are compact dots in the center of each symbol box. By observing the shape of the symbol clusters and their location relative to their optimum location in the constellation, it is possible to draw some conclusions about the nature of an impairment.

For example, broadband noise causes symbol clusters to enlarge. Symbol clusters with a hole in the center indicate coherent interference, spurs or ingress. Phase noise in headend converters causes the symbol clusters to appear as arcs particularly those near the edges of the constellation. A constellation with the corner symbol clusters drawn inward indicates gain compression.



Live Channel View Shortcut

Not only can you use the live channel view mode to view measurements and or tests, but you can access the 860 DSPh Automatic Headend Analyzer's homepage. Just select **Home** at the bottom of the Live View screen and you are now viewing a list of attributes generated by the 860 DSPh Automatic Headend Analyzer.





9710 Park Davis Drive
Indianapolis, IN 46235
(317) 895-3600

www.trilithic.com