



HiQnet  
**performance**  
manager™

# Measurement Integration User Guide



### **General Information**

Smaart Measurement Integration User Guide

Version: 1.0

Distribution Date: 07/25/2016

Copyright © 2016 by Harman International; all rights reserved.

### **JBL Professional**

8500 Balboa Blvd

Northridge, CA 91329

USA

## Thank you for using JBL Professional Performance Manager!

JBL® Performance Manager 2™ is the next-generation software application designed to configure networked audio systems for corporate and live concert events, as well as systems within performance venues such as theaters and houses of worship. Using Performance Manager dramatically reduces design time, simplifies networking and automates control interface configuration. The patented workflow paradigm of the Performance Manager interface guides the system designer through the complete system design, configuration and control process and, in many ways, the entire process feels and acts like a simple step-by-step wizard. Networking has been reduced to a simple drag-and-drop operation, and all test, tuning and calibration control interfaces are embedded – no need to spend time designing control panels. A dedicated show mode provides all the monitoring and control needed to have a complete picture of how the system is performing in real time.



### Recommended Computer Hardware

- Operating System: Windows® 7, Windows® 8.1 and Windows® 10 (64 bit only)
- CPU: 2 GHz Dual-Core Intel i5 Processor or faster
- RAM: 4 GB or greater
- Graphics: Intel HD 4000 or better, or 256 MB dedicated video RAM
- Display Resolution: Recommended 1920 x 1080 pixel | Minimum 1024 x 768 pixel

**Note:** This manual is specific to the new Measurement Integration feature in Performance Manager 2.1. For more information on other Performance Manager subjects, please refer to the Performance Manager Help file. For more information on Smart, please refer to the Smart User Guide or visit the [Rational Acoustics website](http://www.rationalacoustics.com).

# Table of Contents

- 1 Measurement Integration Overview ..... 6**
  - 1.1 Solving the Two Screen Issue ..... 6
  - 1.2 Local Implementation ..... 7
  - 1.3 Network Implementation..... 7
  - 1.3 Going Wireless ..... 8
- 2 SMAART API ..... 9**
  - 2.1 Enabling the SMAART API ..... 9
  - 2.2 Computer Operating System for Smaart ..... 9
- 3 Measurement Integration Mode ..... 10**
  - 3.1 Measurement Integration ON / OFF ..... 10
- 4 Connecting to Smaart ..... 11**
- 5 Measurement Mode Layout ..... 12**
  - 5.1 Top Ribbon ..... 13
  - 5.2 System Groups ..... 14
  - 5.3 Creating User Groups ..... 14
  - 5.4 Working with System Groups ..... 16
  - 5.5 Working with EQ Filters..... 17
- 6 Measurement Side Panel ..... 18**
  - 6.1 Live Channels Detailed View ..... 19
  - 6.2 Working with Live Channels..... 20
- 7 Editing Live Channels ..... 22**
- 8 Capturing and Editing Traces ..... 23**
  - 8.1 Capturing and Deleting Traces ..... 23
  - 8.2 Editing Stored Traces..... 24
- 9 Master Section ..... 25**
  - 9.1 Signal Generator Section..... 25
  - 9.2 Pause Button..... 25
- 10 Measurement Modes ..... 26**
- 11 RTA Mode ..... 26**
  - 11.1 RTA Live Channels ..... 26
  - 11.2 RTA Mode Parameters Panel..... 27
  - 11.3 RTA Mode Banding Examples..... 27
- 12 Magnitude Mode ..... 28**
  - 12.1 Find Delay and Delay Compensation ..... 29
  - 12.2 Applying Delay ..... 29

- 12.3 Magnitude Mode Parameters Panel ..... 30
- 12.4 Magnitude Smoothing Examples ..... 30
- 12.5 Coherence Trace ..... 31
- 12.6 Coherence Blanking Examples ..... 31
- 12.7 Inverting a Trace..... 32
- 12.8 Inverted Trace Examples ..... 32
- 12.9 Equalizing with an Inverted Trace ..... 33

**13 Delay Mode ..... 34**

# 1 Measurement Integration Overview

Today, system engineers rely on multiple computer programs (a minimum of 2) to set up and tune sound systems, which leads to some inconveniences. The first program is typically the control software. This is a software program provided by the sound system manufacturer and is used to control and set up the sound system. In our case, this software is JBL's Performance Manager, which can be used to configure and control Crown Audio I-Tech HD Series amplifiers - the required amplifiers for JBL VTX Series sound systems. Among other things, Performance Manager can be used to apply system equalization, adjust system levels and apply delay to different parts of the system. The second program is typically a measurement system like the Rational Acoustics Smaart. This software, in conjunction with the appropriate hardware, is used to analyze a sound system and help a system engineer optimize system settings for a given venue. This forces engineers to either use two computers and switch back and forth, or use the two programs on the same computer and constantly switch between the two. Something as simple as time aligning subwoofers to mains can take several steps, consume more time than necessary and be prone to errors. Measurement Integration aims to eliminate these issues and simplify the workflow of system engineers.

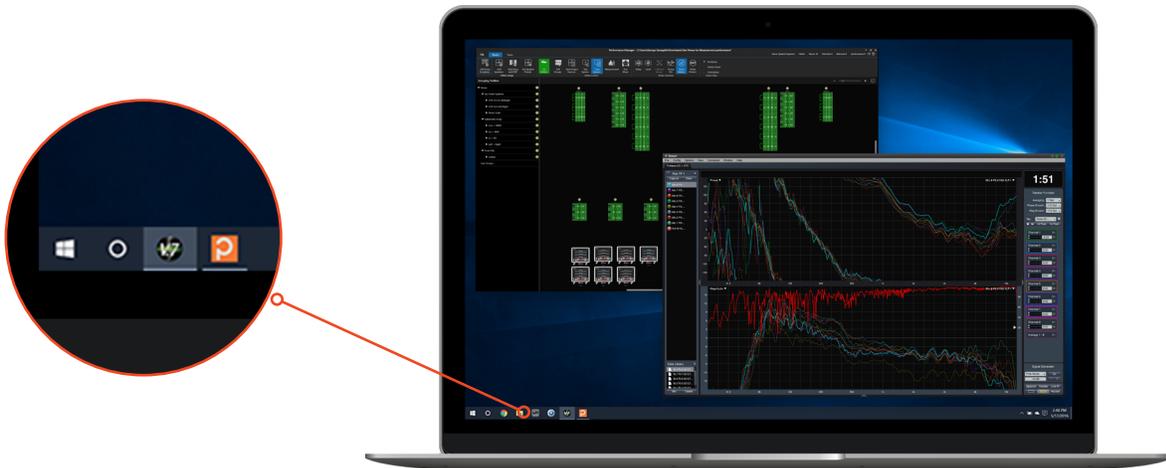
## 1.1 Solving the Two Screen Issue

The Measurement Integration feature in Performance Manager 2 integrates remote control and data sharing functionality from a measurement application (in this case, Smaart) right into Performance Manager. The implementation is a Server / Client-based system and allows Performance Manager (client) to connect and communicate with Smaart (server) and display all relevant information onto just one screen. Smaart runs in the background as a server and performs all necessary measurement functions. Instead of directly working with Smaart, engineers can access and control Smaart through Performance Manager.



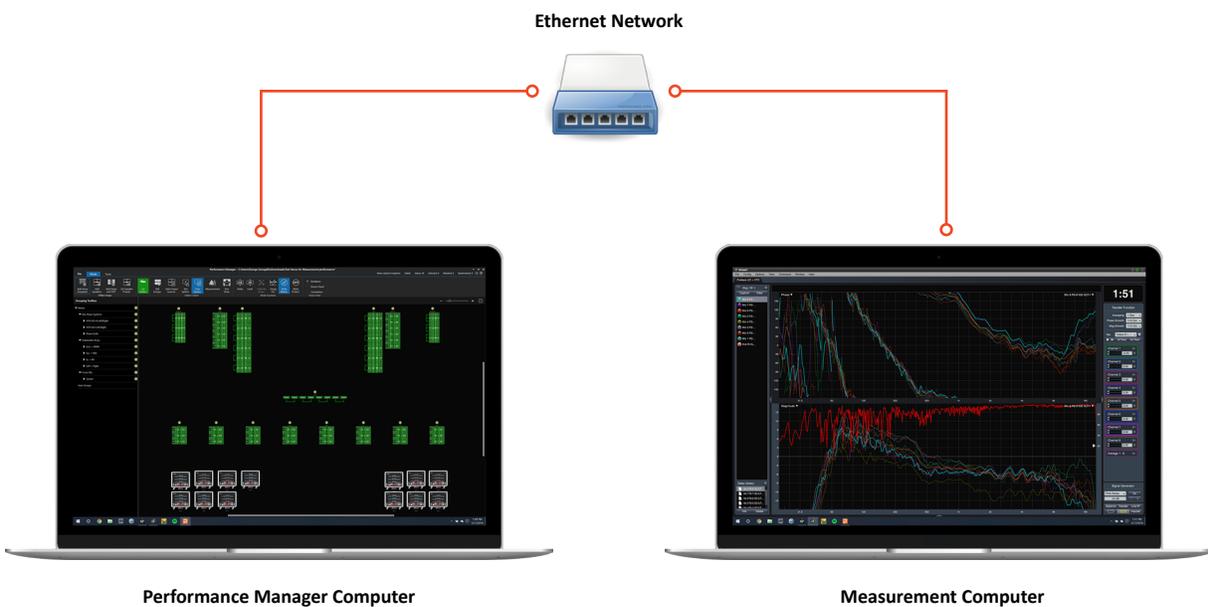
## 1.2 Local Implementation

Performance Manager and Smaart can run on the same computer or two independent computers. When used on the same computer, Performance Manager sends and receives information to Smaart, which is running in the background. This method is the most compact and requires the least amount of hardware. The downside is that the same computer is processing both applications, which can be demanding on the computer's CPU and requires the computer to be physically connected to an audio interface.



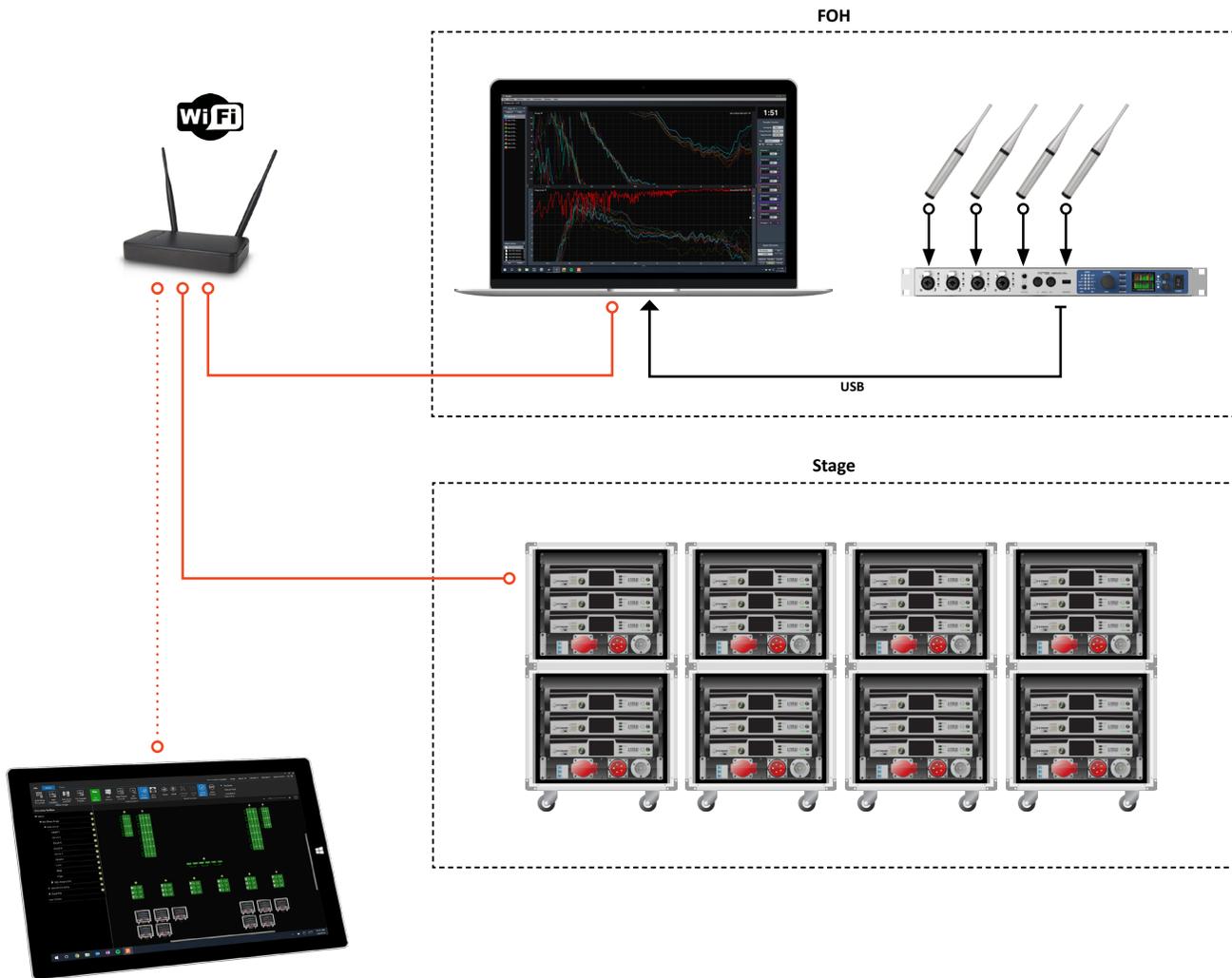
## 1.3 Network Implementation

The other option is to run the two applications on two different computers. In this scenario, the two computers are connected together via the Ethernet network, which allows Performance Manager to communicate with Smaart. This method requires two computers but allows each application to be individually processed which is easier on each computer's CPU.



### 1.3 Going Wireless

Using the network implementation method allows for some unique possibilities. Measurement computers are normally stationary since they require a hardwire connection to an external soundcard. The measurement computer is typically placed at FOH and always connected to the system. Since Measurement Integration works over the Ethernet network, control over Wi-Fi is also an option. A compact tablet computer can be used to run Performance Manager and connect to the measurement computer and amplifiers via the Wi-Fi network, allowing Performance Manager to have control over the sound system and the measurement computer simultaneously.



This option allows system engineers to walk around the venue, take measurements and control the sound system wirelessly from one remote computer. Since the remote computer is only running Performance Manager, the load is split between two computers. This configuration is less computationally intensive for each computer.

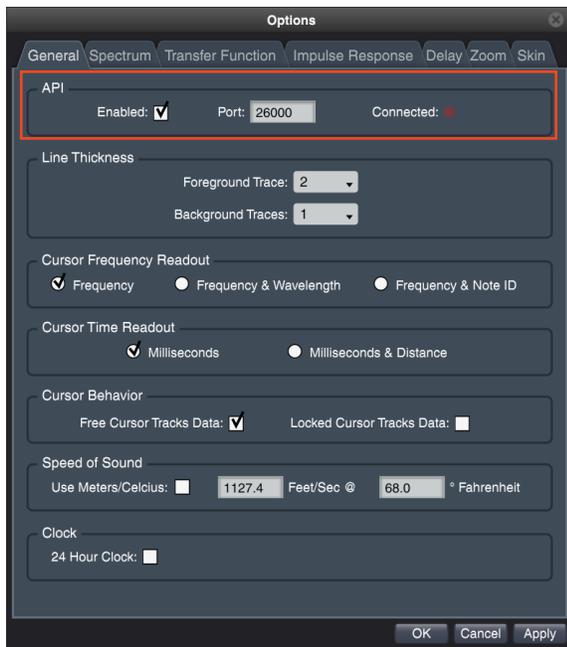
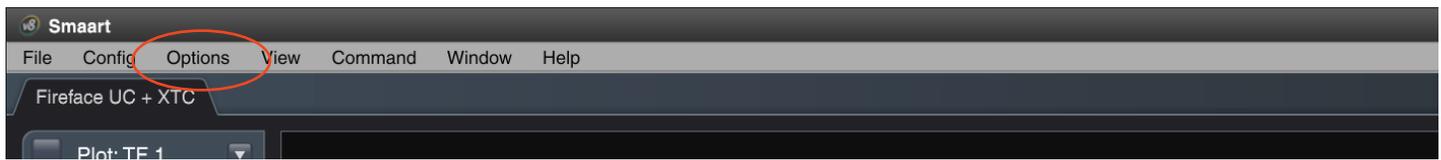
**Note:** A wired connection will always provide the best performance and reliability possible. When using wireless, at least one computer (likely the measurement computer) should be connected to the access point via wire. Only one API-based controller should be used at a time with a Smart server.

## 2 SMAART API

Performance Manager uses the standard Rational Acoustics Application Programming Interface (API) to communicate and control Smart. The Smart API allows real-time measurement data to be shared over a network, either with another copy of Smart (for version 8) or compatible clients like Performance Manager. The Smart API is set to OFF by default and has to be enabled before attempting to connect.

### 2.1 Enabling the SMAART API

The API settings are under the options menu. To open the options menu, go to **Options > General**.



Smart General options dialog pane

- Checking the **Enabled** checkbox turns data sharing functions on and begins broadcasting “here I am” messages on the local network so Performance Manager can detect the Smart application.
- The **Port** field sets the port number for the network socket address. You can usually leave this setting alone unless you have some specific reason to change it, such as a conflict with another application on your computer that uses the same port address for network communication, or a client application that requires a different setting.
- The **Connected** indicator turns from red to green when a Performance Manager is connected to Smart.

### 2.2 Computer Operating System for Smart

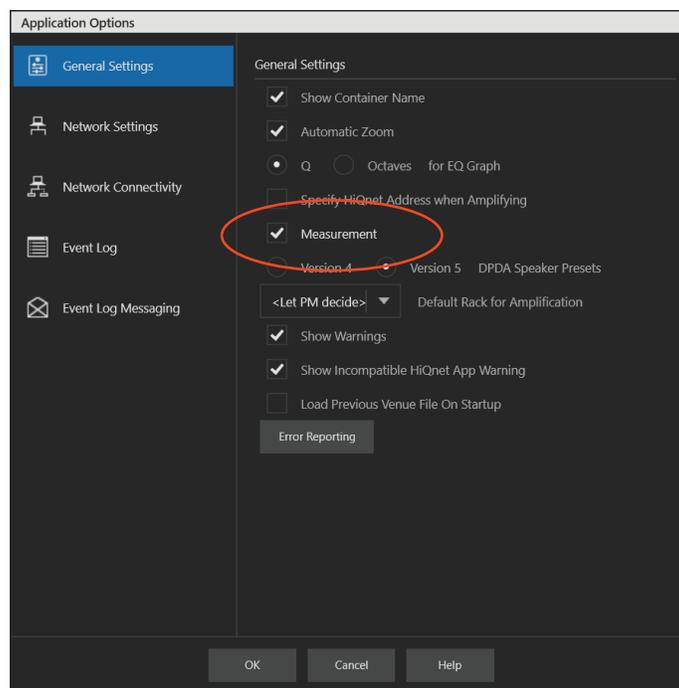
Even though Performance Manager runs exclusively on Windows, Smart is a cross-platform application and can run on Apple®’s macOS also. When both Smart and Performance Manager are used on the same computer, the operating system must be Windows. In situations where Smart is used on a separate computer and controlled via the network, it can run on Apple’s MacOS. The Smart API is the same and compatible with both variations of Smart. Running Performance Manager under Windows and Smart under OS 10 on the same computer using a virtualization solution is not recommended.

## 3 Measurement Integration Mode

Measurement Integration is an optional feature and new to Performance Manager version 2.1. The measurement integration can be turned ON or OFF from the Performance Manager **Application Options** menu. When enabled (default), a new icon appears on the top ribbon section called Measurement, and is used for navigating in and out of the new measurement section. When measurement integration is switched OFF, the associated UI elements are removed to make more space on the ribbon for smaller displays.

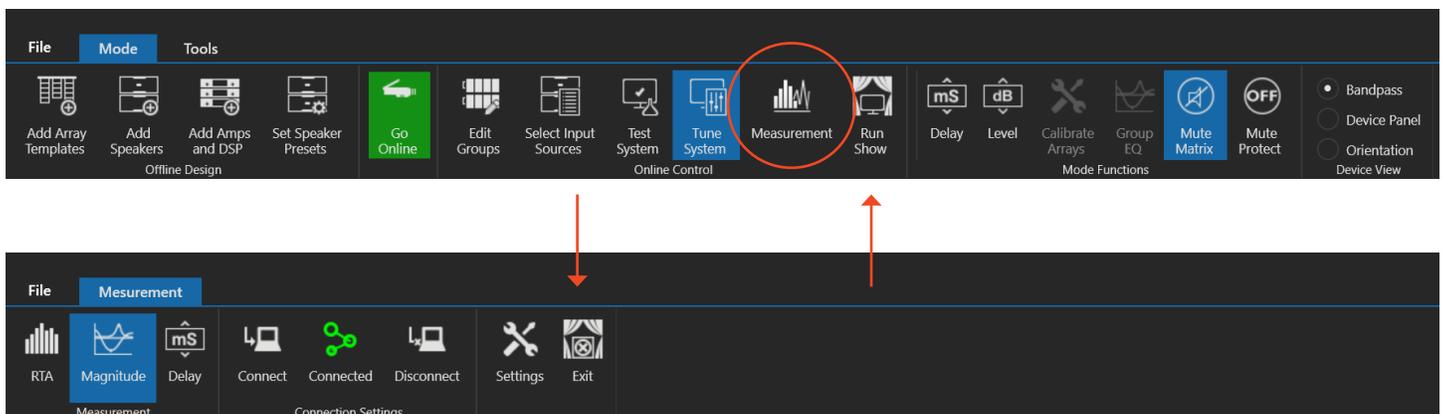
### 3.1 Measurement Integration ON / OFF

The Measurement Integration ON / OFF switch is under the Performance Manager options menu. To open the options menu, go to **File > Application Options**.



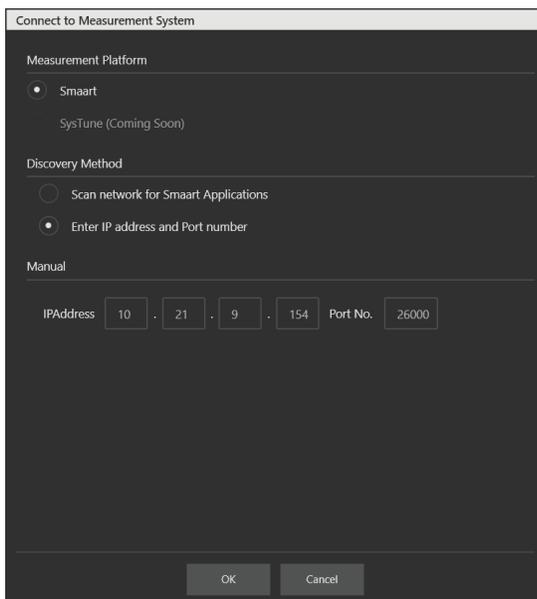
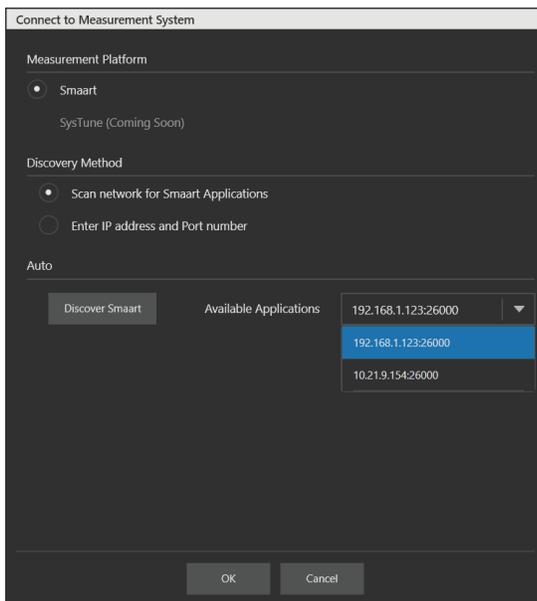
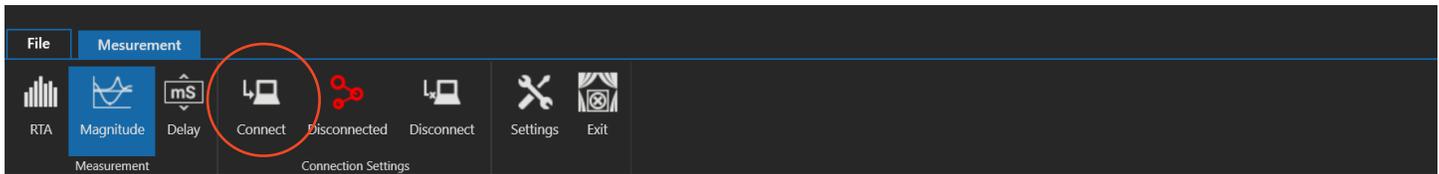
Performance Manager Applications Options

Unlike other Performance Manager modes (like Tune System mode), when entering Measurement mode, the entire ribbon layout will change to display a new set of controls dedicated to measurements.



## 4 Connecting to Smaart

Click the Connect button to open the Connect to Measurement System window:



- Measurement Platform** - Use the radio buttons to select the measurement platform. Options for Smaart or Systune (coming soon) are available. In this case, select **Smaart**.
- Discovery Method** - Use the radio buttons to select the Discovery Method. There are two options available, **Scan Network (automatic)** or **Enter IP (Manual)**.
- Scan Network** - With this method selected, the **Discover Smaart** button is used to start the discovery process. When engaged, Performance Manager searches the network and automatically discovers Smaart applications with the API enabled. Results are presented in the **Available Applications** drop-down menu. If multiple instances of the Smaart application are available on the network, all options are presented for selection. Select the appropriate available option and then click **OK**.
- Enter IP** - With this method selected, a specific **IP** and **Port** number must be entered. After entering the numbers, click **OK** to connect.
- Note** - The **Scan Network** option is a very robust method for connecting to Smaart and should be used as the first choice. If Performance Manager cannot discover Smaart, make sure the API is enabled and network settings are properly configured. In situations where **Scan Network** cannot find Smaart, try manually setting the IP and Port address.

# 5 Measurement Mode Layout



**1 Top Ribbon UI** - This part of the User Interface is used for switching between the different modes. For example, a user can select whether to measure frequency response or phase. Also found in this section are connection controls, which are used to establish communication with Smart.

**2 System Groups Section** - This section is dedicated to the system groups and is used to select the part of the system to measure / adjust. For example, the Main Left group can be selected to apply equalization to the house left array. This section is also used to Mute or Unmute systems.

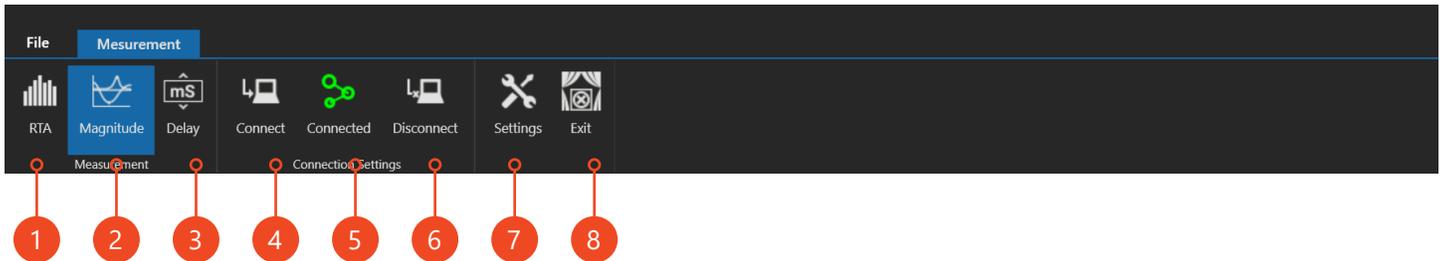
**3 Main Display Area** - This area is used to display the measurement data and equalization filters. What the display shows depends on the selected mode. For example, when the mode is set to Magnitude, the display area shows EQ filters and the received frequency response. When the mode is set to Delay, the display shows phase response.

**4 Control Area** - This area is dedicated to controls and changes with the mode selection. When RTA or Magnitude is selected, this area displays the EQ filter controls. When Delay mode is selected, this area includes delay controls for time alignment.

**5 Measurement Controls** - This area includes all measurement controls related to Smart.

## 5.1 Top Ribbon

Below is a detailed description of the Measurement mode ribbon layout. Some of the buttons represent Mode selections and some are related to settings.



**1 RTA Mode** - This mode overlays RTA bars on top of the Group EQ windows. The resolution and speed of the bars are set from the Parameters panel. This mode is the equivalent of the *Spectrum* mode in Smaart.

**2 Magnitude Mode** - This mode overlays a frequency response trace within the Group EQ windows. The resolution and averaging parameters are set from the Parameters panel. This mode is the equivalent of the *Transfer (magnitude)* mode in Smaart and is used for system equalization. In this mode, traces can be stored, recalled and edited from the *Traces* panel.

**3 Delay Mode** - This mode overlays a phase response trace within the Group window. Resolution and averaging are adjusted from the Parameters panel. This mode is the equivalent of *Transfer (phase)* mode in Smaart and is used for time aligning systems. In this mode, traces can be stored, recalled and edited from the *Traces* panels.

**4 Connect** - The *Connect* button opens a window that allows for connecting to Smaart applications.

**5 Connected LED** - The *Connected* LED provides visual feedback regarding the network connection status between Performance Manager and Smaart. Green means that Performance Manager is connected to Smaart and the connection is stable and without errors. RED means the connection between Performance Manager and Smaart has been lost.

**6 Disconnect** - The *Disconnect* button disconnects Performance Manager from Smaart and clears all settings including group and channel selections.

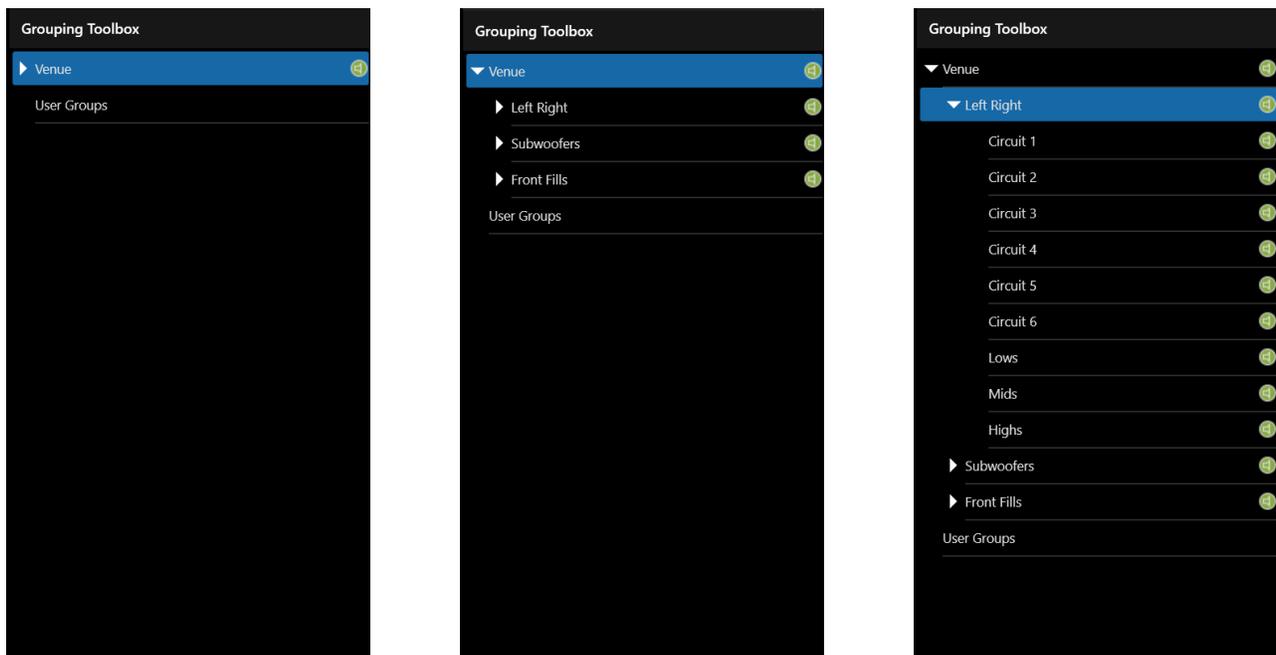
**7 Settings** - The Settings button opens a new window containing parameters related to Measurement mode. Within this panel, settings, including the *Coherence*, are set.

**8 Exit** - The Exit button returns Performance Manager back to Tune System mode. All settings are retained and recalled when returning to Measurement mode.

## 5.2 System Groups

System grouping is one of the most important features of Performance Manager. Modern sound systems are processed by multiple DSP units, which are typically found in the power amplifiers. For example, a JBL V25-II array consisting of 12 enclosures may be powered and processed by 6 Crown Audio 4x3500HD amplifiers. When making DSP changes (like applying EQ), all changes should be applied to all amplifiers driving that specific array. As the system size grows, so does the complexity of keeping track of all the device changes. System groups make this easy by grouping together all relevant devices and keeping everything in sync. Any changes applied to a group are correctly synced to all relevant devices in the background. Groups can be several layers deep to accommodate any configuration or system size.

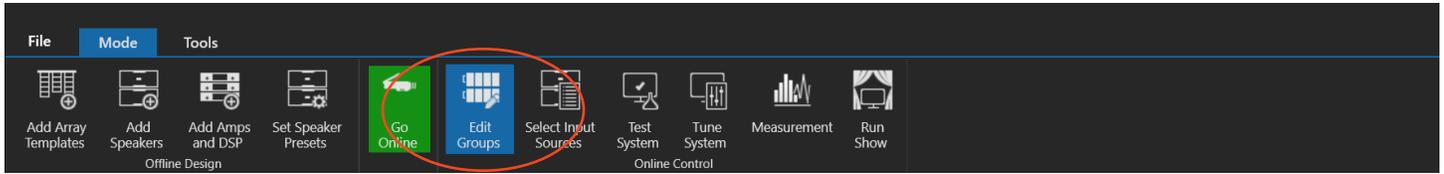
For the most part, Performance Manager creates all necessary groups automatically. The groups are generated based on the system template selected during the first steps of system design. Below are the groups Performance Manager created automatically for a small left / right system.



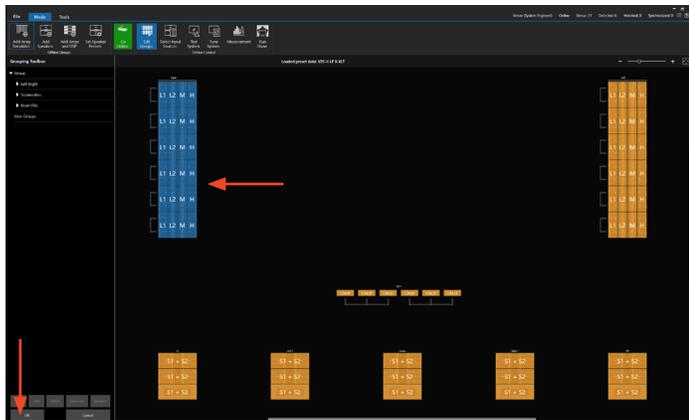
Groups can be expanded to reveal more and more granularity. The **Venue** group represents all devices, and any changes applied to the **Venue** group affects all devices. Each group or sub group includes a MUTE button that can be used to MUTE / UNMUTE a group of speakers.

## 5.3 Creating User Groups

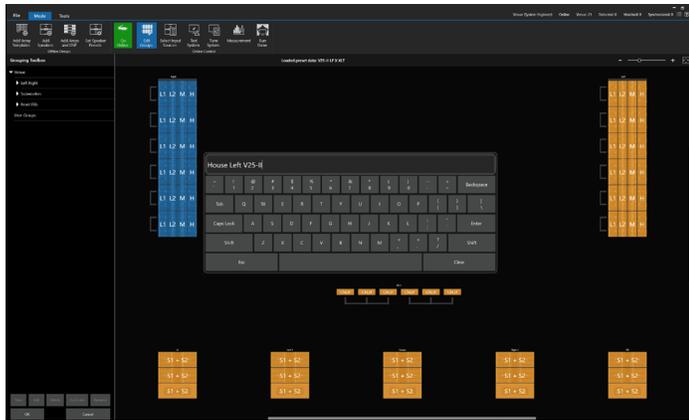
In some cases additional groups are required to gain the necessary MUTE granularity. Most of the pre-built Performance Manager groups are symmetric, meaning they control both sides of the system at the same time. When measuring sound systems, it's best to always measure one side at a time to avoid comb-filtering. In this case, User Groups can be created to control each section of the system independently. User Group creation is quick and easy and can be done in the **Edit Groups** mode.



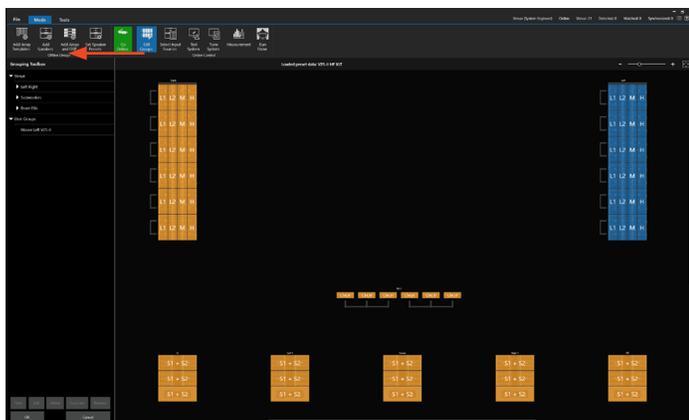
Below are the steps to create a new User Group for the House Left V25-II array:



- First click the **New** button to create a new User Group. Then use your mouse to select all bandpasses that are part of the new user group. Selected bandpasses turn blue to indicate selection. After all necessary parts are selected, click the **OK** button.



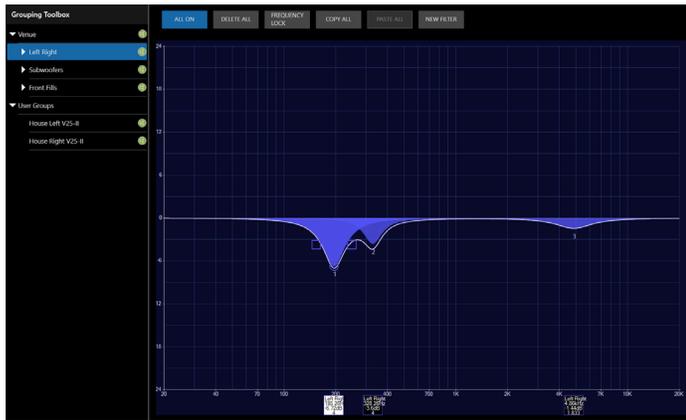
- Using the on-screen or physical keyboard, give the User Group a new name (i.e. VTX V25-II Left) and then click or press **Enter**.



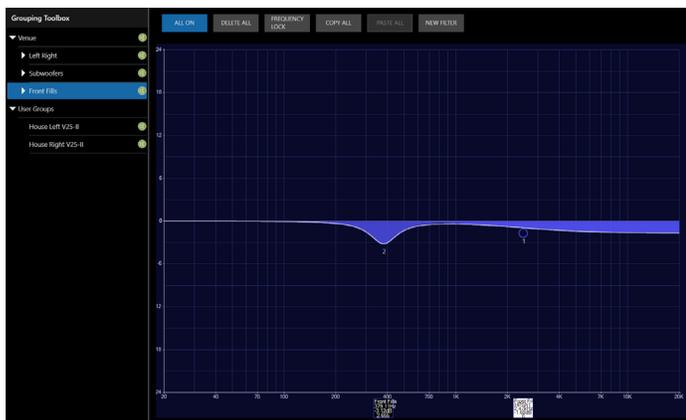
- Now a new group appears under the user groups. Any Groups (Factory or User) can be renamed by selecting the group and then selecting **Rename**.

## 5.4 Working with System Groups

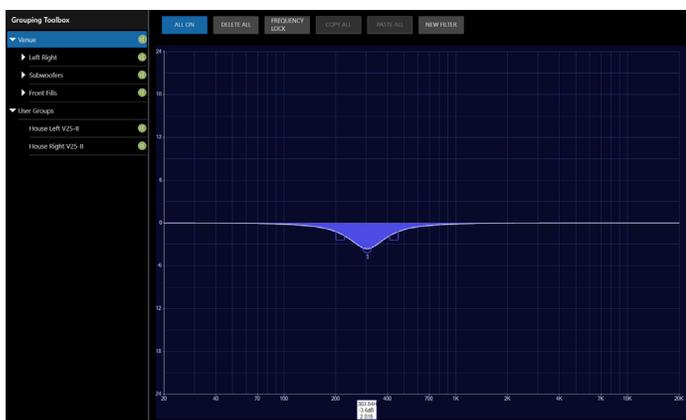
**System Groups** have two main functions. One is to provide a quick and easy way to MUTE / UNMUTE parts of the system without having to navigate to the **Mute Matrix** mode – all System Groups (Factory and User) include a MUTE button that can be used for this purpose. The other function is to provide selection for the Group EQ display and EQ parameter controls. At the center of the screen is a large EQ window, which, by default, is not associated with any part of the system. Selecting a group from the Groups panel associates the EQ screen and controls with that specific group. Only one group can be selected at a time. As each group is selected, the EQ screen updates to show the values for the selected group.



- Example 1:** The Left Right group is selected and Performance Manager displays the 3 PEQ filters used for this specific group. All Group EQ filters are applied to the input section of the Crown iTech HD amplifiers. The amplifiers contain 11 available filters that can be used in the Group EQ sections.



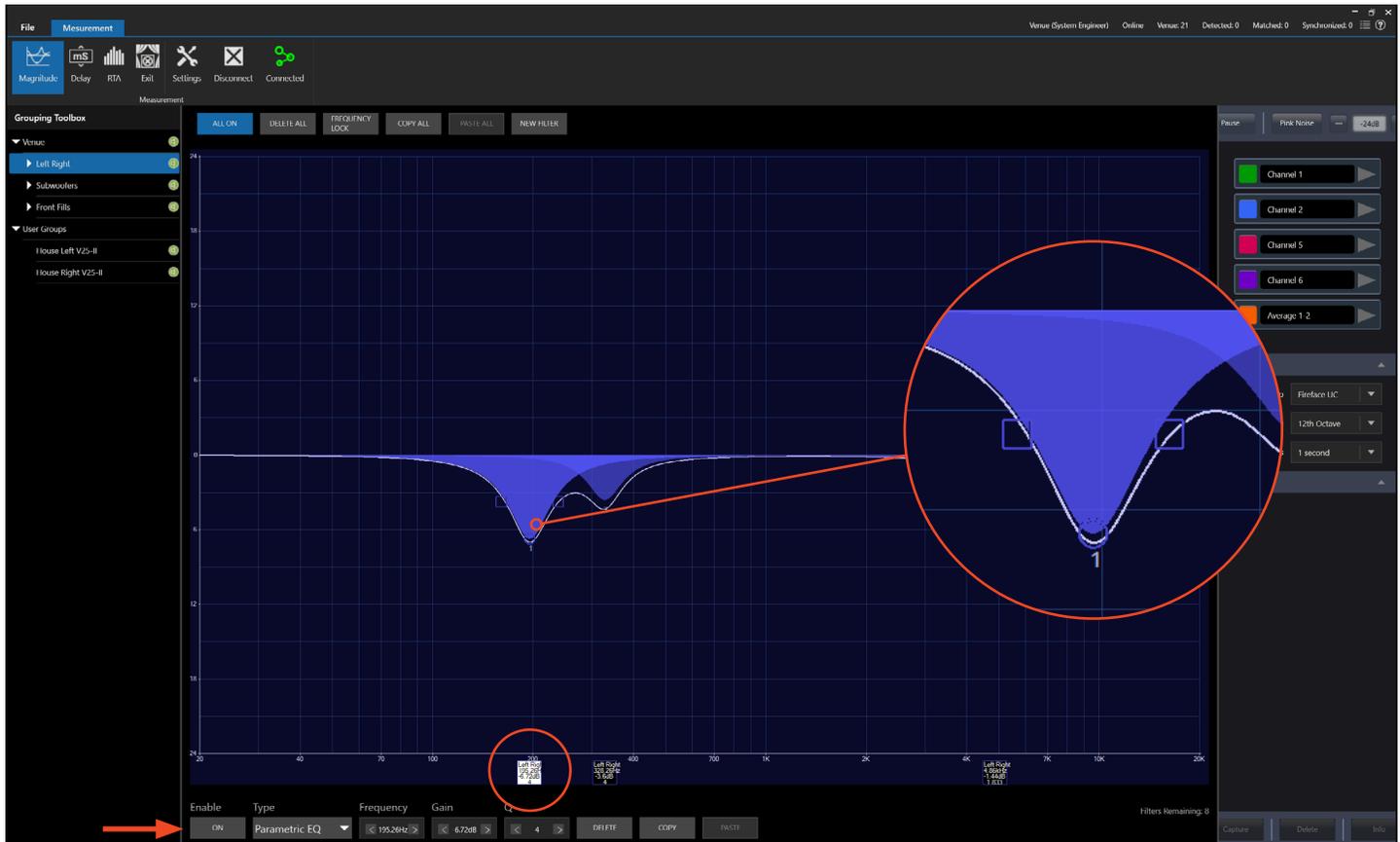
- Example 2:** The Front Fills group is selected and Performance Manager displays the 2 EQ filters used for this specific group. A filter counter is available at the bottom of the screen that shows how many EQ filters are still available for the selected group.



- Example 3:** The **Venue** group is selected and includes all groups within the venue, including the Left Right and Front Fills groups. A new filter is applied that affects all groups. The individual Group Filter counters reflect the correct available filters.

## 5.5 Working with EQ Filters

At the bottom of the Group EQ window is the Group EQ Control Bar, where EQ parameters are displayed for the selected EQ filter. Under each filter, a square box displays all information related to the filter – note that this box can also be used to select a filter for editing. After selecting a filter, the information box will turn white and the EQ Control Bar will display the information for the selected filter.



The Group EQ Control Bar offers precise control of filter editing, but in some cases, editing can be performed faster using the handles in the graph. When a filter is selected, control handles for Gain, Frequency and Q will become available in the graph. These control handles can be used to quickly adjust filter settings (this includes using a stylus on touch-screen computers). The control handles follow the filter selection, just like the Group EQ Control Bar.



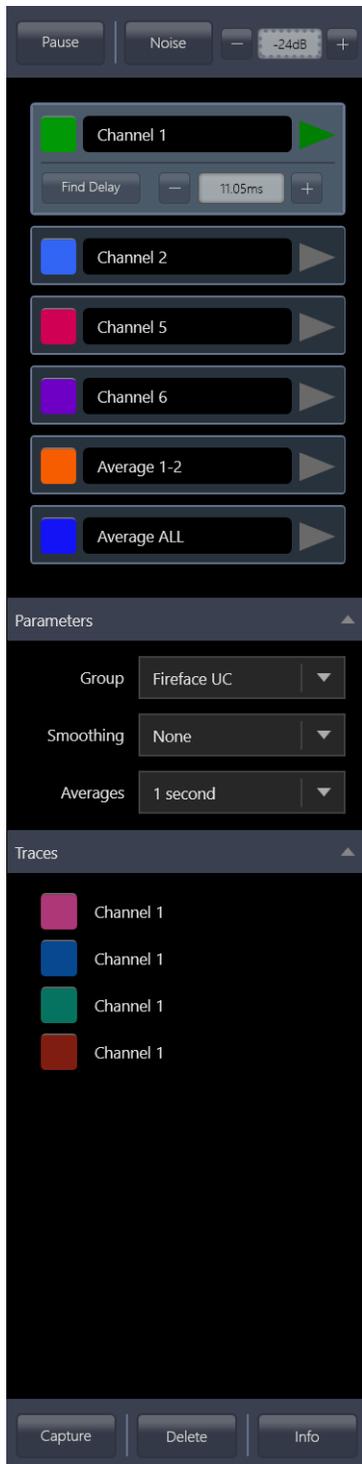
A new filter can be created by pressing the **New Filter** button located at the top section of the Group EQ window. Alternatively, a mouse or stylus can be used to click-and-drag anywhere on the white line of the EQ graph to create a new filter. After the filter is created, the type and parameters can be adjusted.



Individual filters can be transferred from one group to another by using the **copy / paste** controls. First, select a filter, and then select **Copy**. The entire EQ section can be transferred using the **Copy All / Paste All** controls at the top of the Group EQ window.

## 6 Measurement Side Panel

The measurement control panel, found on the right side of the Performance Manager interface, is a remote control for Smaart — adjustments made here are synced and mirrored in Smaart. For example, when the noise generator is switched ON, Performance Manager sends a signal to Smaart to turn the noise generator ON. The same goes for most other functions of this panel. There are some exceptions, which are detailed below and later in this document.



**Master Controls** - The top section of the measurement panel includes a master **Pause** switch and the **Noise Generator** controls. When paused, Performance Manager temporarily shuts down all network traffic to Smaart and freezes the measurement trace.

**Live Channels Section** - This section is received from Smaart and includes Live Channels, otherwise known as measurement inputs. These channels are sound card inputs coming into Smaart and are most often used for microphone inputs. This selection can also include Live Average channels, and the layout of this section is controlled by the selected group.

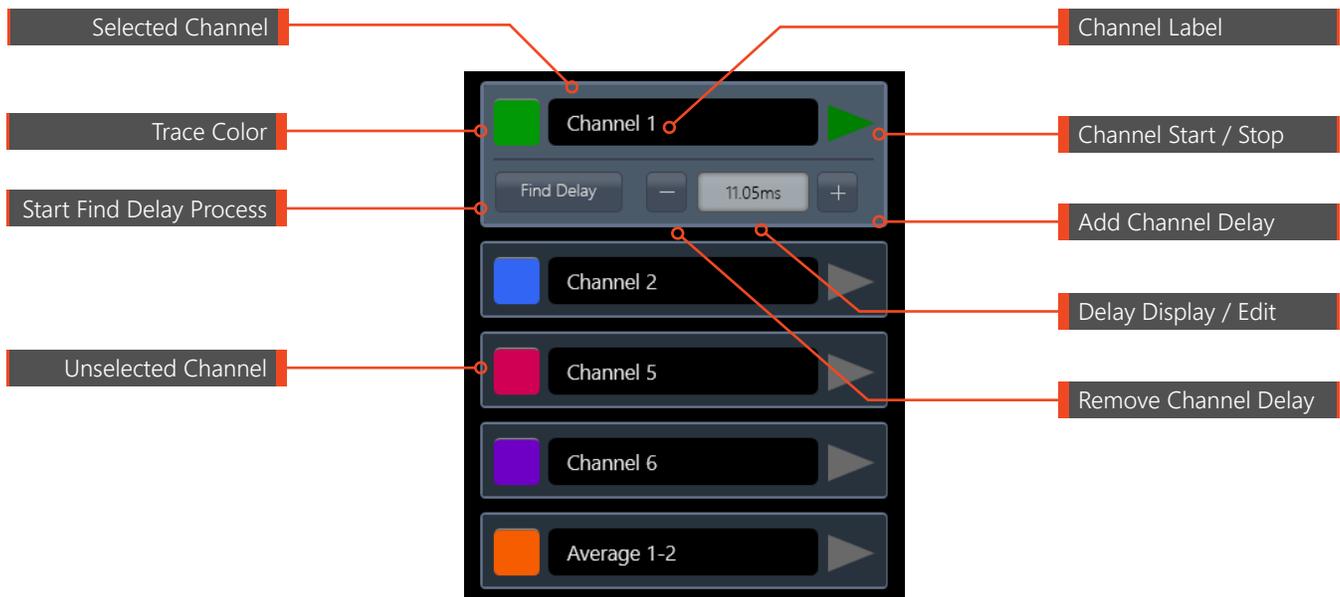
**Parameters Section** - This section includes measurement parameters like **Smoothing** and **Averaging**. Both are local to Performance Manager and are not synced to Smaart. **Groups** control the Live Channel layout and are created in Smaart and then synced to Performance Manager.

**Traces Section** - This section includes Stored traces. These traces are local to Performance Manager and are not synced to Smaart. The traces include data for Frequency Response, Phase and Coherence.

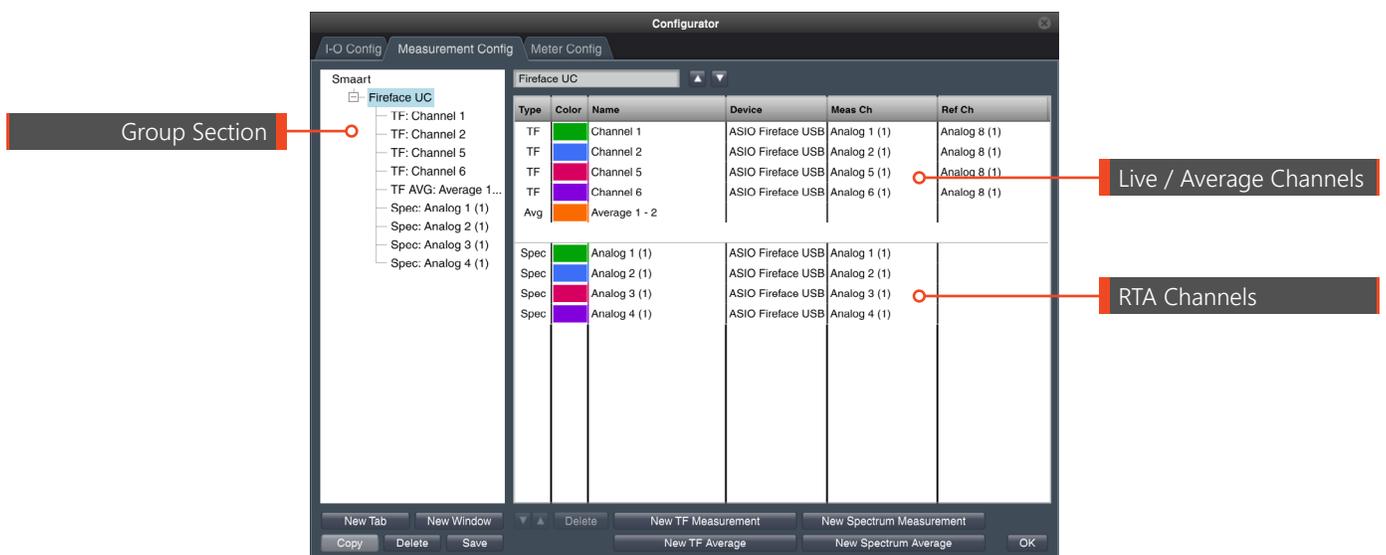
**Trace Management Section** - This section is used to capture, delete or manipulate Traces. The **Info** button opens a new window with additional settings for Live Channels.

## 6.1 Live Channels Detailed View

The Live Channel section is where all the measurement inputs reside. The content of this section is received from Smart and is part of the Smart measurement group. The Live Channel section can contain two types of inputs: individual Live Channels and Live Averages. Individual Live Channels are typically associated with a single input channel of a soundcard, and Live Averages are associated with a number of inputs and display an averaged response. The number of inputs, averages and names are all set in Smart using the Measurement Configuration panel. Below is a detailed view of the Live Channel section:



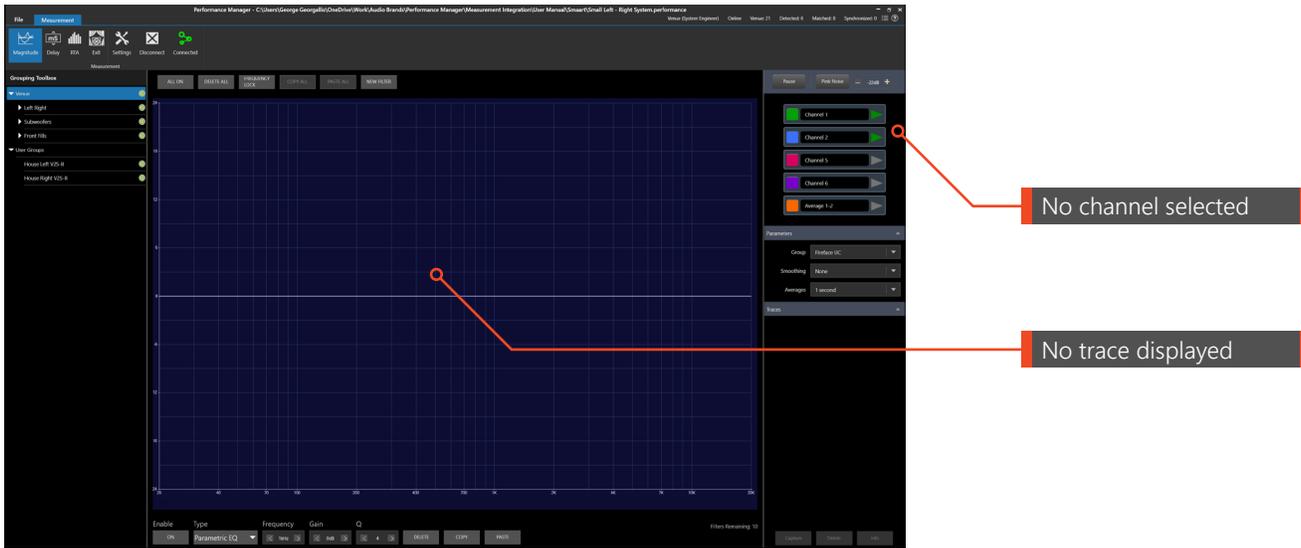
Below is the Measurement Configuration panel in Smart. All channels, averages and names are synced to Performance Manager. For more information on how to create channels in Smart, please refer to the Smart User Guide.



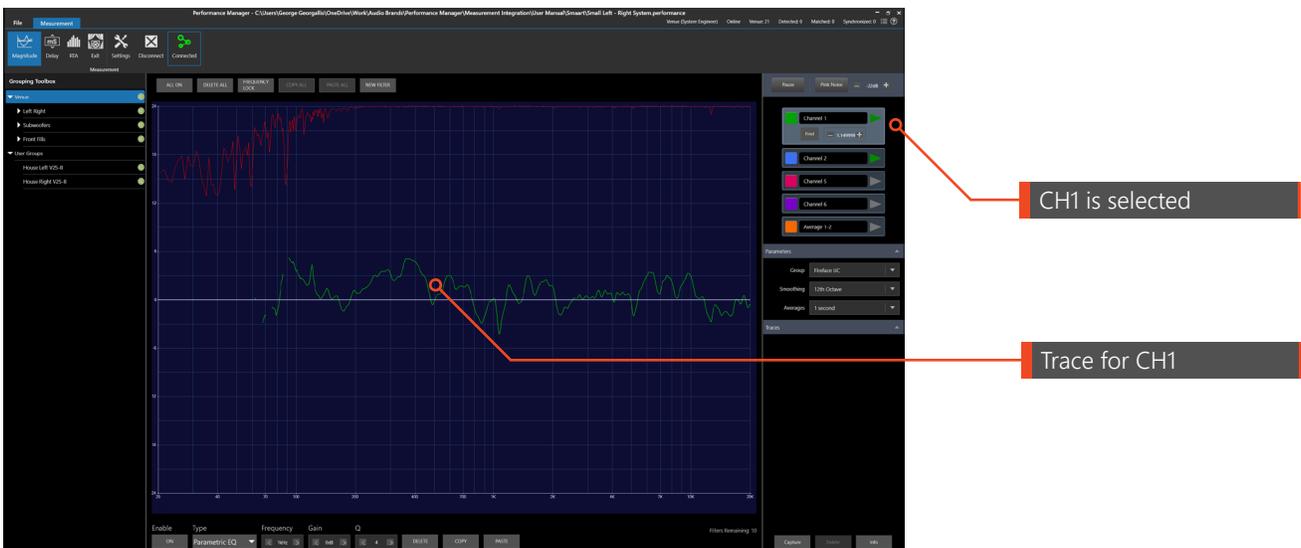
## 6.2 Working with Live Channels

Unlike Smart, Performance Manager can only display one measurement trace at a time and it can be a **Live Channel** or a **Live Average**. Any number of channels can be active and running in the background but only one trace is displayed. The Play / Stop button on each channel starts or stops the measurement channel in Smart. When a channel is selected, the channel will become highlighted and expand, and the trace for the channel will be displayed in the Measurement window. The Coherence trace always follows the selected channel. To select a channel, simply left click on the channel box. Below are some examples of how the selection works:

**Example:** Channels 1 & 2 are active and running but no traces are displayed.



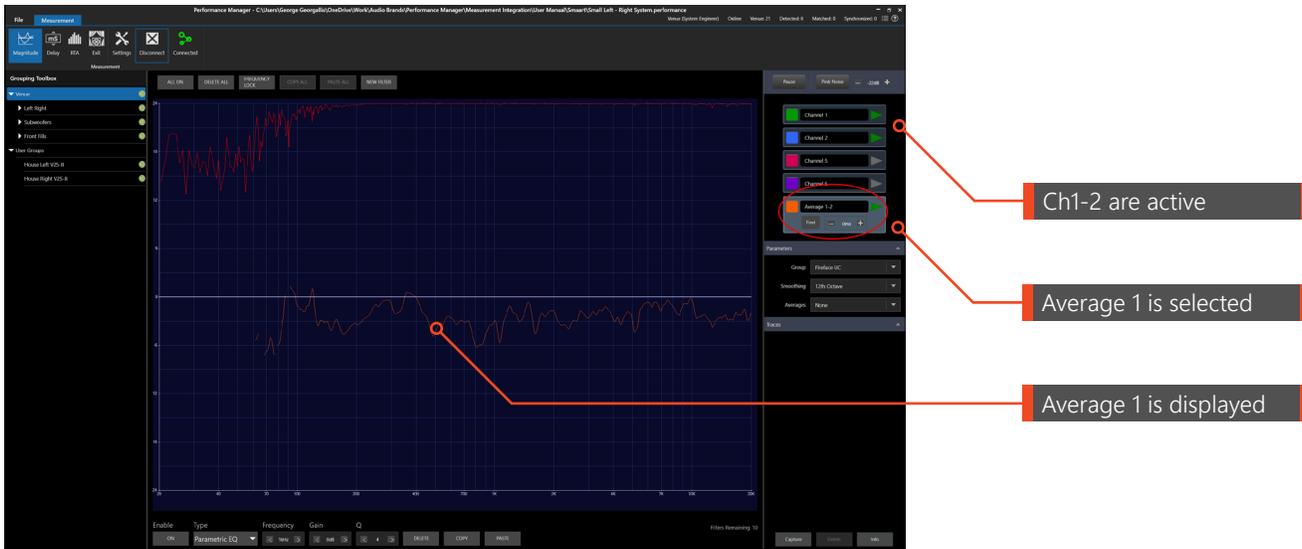
**Example:** Channels 1 & 2 are active and Channel 1 is displayed.



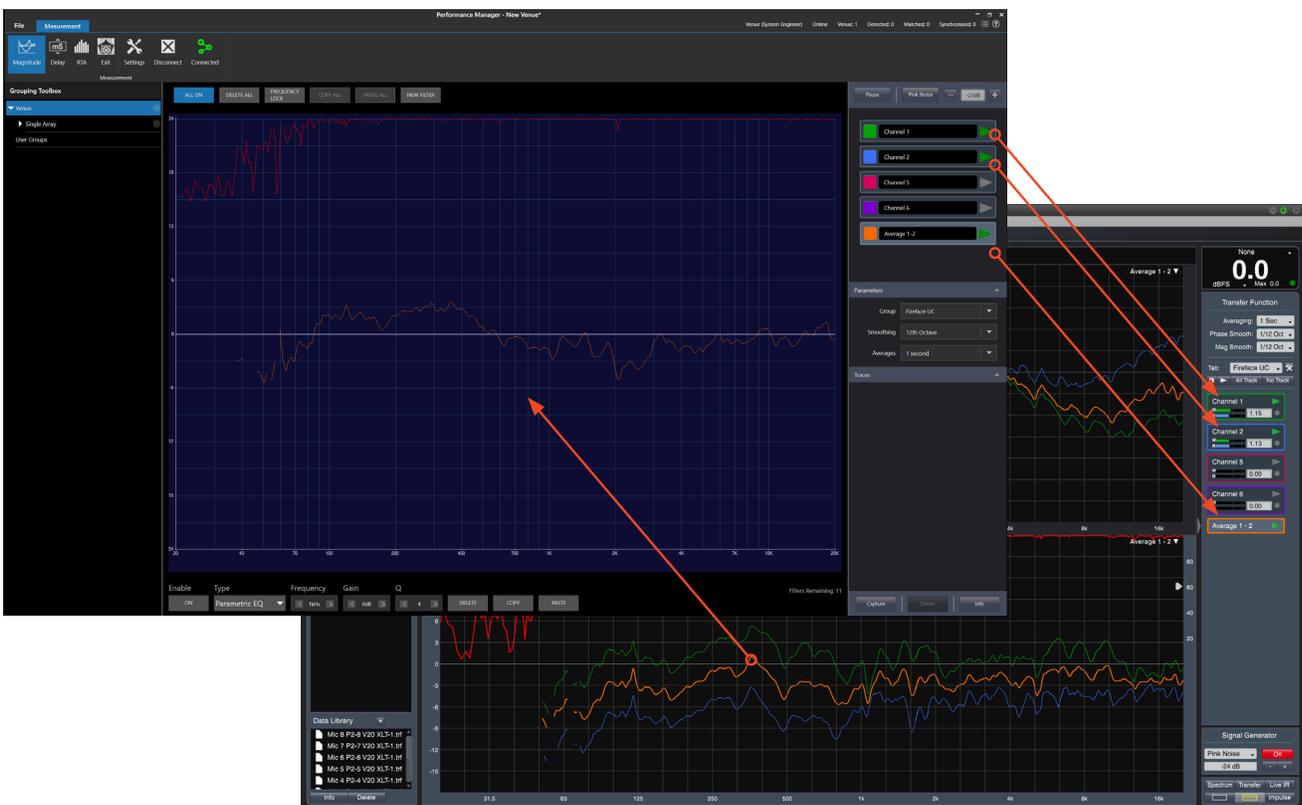
The channel selection (show / hide trace) is local to Performance Manager and does not affect what is displayed in Smart. The Start / Stop functions on the other hand are common across both programs. Starting a channel in Performance Manager starts a channel in Smart and vice versa.

**Live Averages** work the same way as **Live Channels** and follow the same selection process.

**Example:** Channels 1 & 2 are active but running in the background. Average 1 is active and displayed.

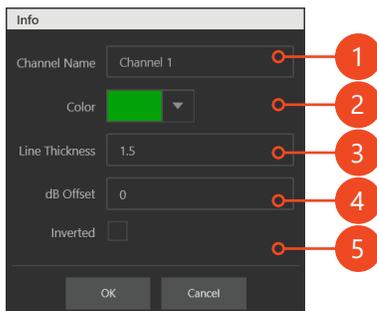


The view below compares what is shown in Performance Manager to what is happening in Smart. The main difference is that Smart can display multiple Live Channels at a time, whereas Performance Manager can display only one Live Channel at a time. The Start / Stop buttons are always synced.



## 7 Editing Live Channels

Certain parameters of Live Channels and Live Averages can be edited using the **Info** panel. The below steps explain how to edit the parameters of a Live Channel:



- **Select** the Live Channel to be edited and then double-click anywhere on the panel to open the **Info** panel.

1. **Channel Name** - The channel name for Live Channels is received from Smaart and **cannot** be changed from Performance Manager. This option is disabled.

2. **Trace Color** - To change the trace color, click on the color box to open the color selection panel. Select the desired color and click **OK**. The trace color is local to Performance Manager and it is independent from Smaart.

3. **Line Thickness** - The thickness of the trace line can be adjusted here. The default value is 2 and the maximum value is 5 points. Adjusting the line thickness can make traces more visible when displayed on high-resolution computer screens.

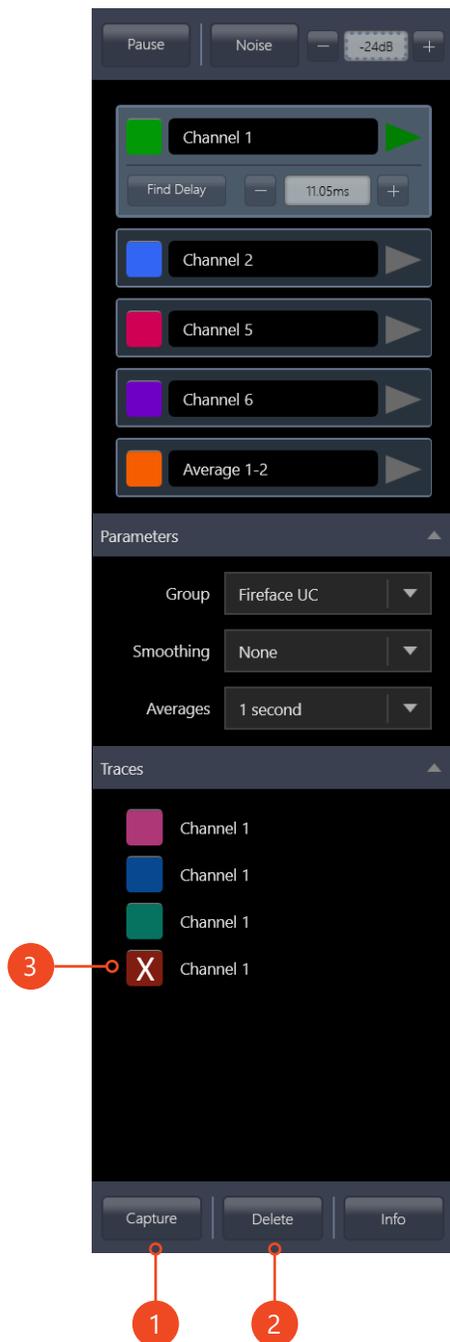
4. **dB Offset** - The dB Offset parameter adjusts the trace position within the EQ graph. Adjusting this parameter to line the trace up with the 0dB line provides a reference and makes it easier to adjust EQ settings.

5. **Inverted** - Checking this option inverts the trace on the Y axis (amplitude). This is described in further detail later in this document.

# 8 Capturing and Editing Traces

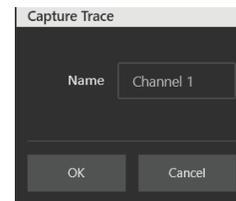
## 8.1 Capturing and Deleting Traces

Traces can be captured and temporarily stored in Performance Manager. Captured traces are supported in Magnitude (Frequency Response) and Delay (Phase) modes. Traces are stored for the duration of the session, and when exiting Performance Manager, the traces are deleted. The traces are stored in both Performance Manager and Smaart, and a copy of the traces are always available in Smaart until manually deleted. Trace parameters such as the name, color and values are local to Performance Manager and do not have any effect on the traces stored in Smaart.



1. **Capturing Traces** - Select the appropriate channel to be captured and then click the Capture button. The Capture Trace panel appears with the option to enter a new name for the trace. Click **OK** to store the new trace. A new trace is placed under the Traces section.

**Keyboard Shortcut:** Space bar



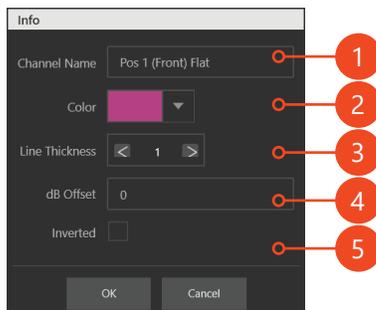
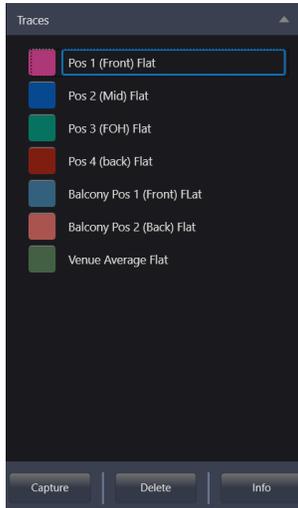
2. **Deleting Traces** - Select the trace to be deleted. When a trace is selected, a blue outline will appear around the trace name. Click the **Delete** button at the bottom of the Measurement section. Multiple traces can be deleted by selecting the traces while holding the **Ctrl** key on the computer's keyboard.

**Keyboard Shortcut:** Delete key

3. **Show / Hide Traces** - Traces can be switched ON / OFF without having to delete them. To Show / Hide a trace, click on the color box in front of the trace name. The **X** sign indicates a hidden trace.

## 8.2 Editing Stored Traces

Stored traces are edited using the **Info** button at the bottom of the measurement panel.



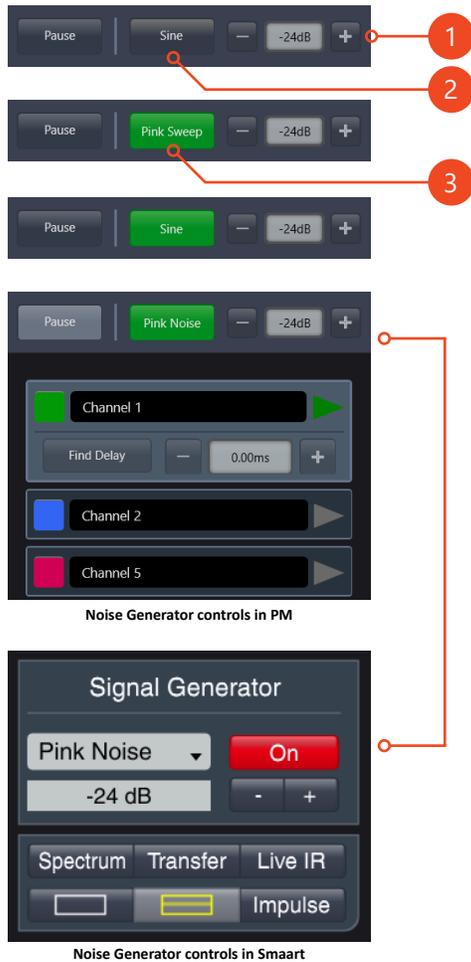
- Selecting Traces** - Left click to select a stored trace. When a trace is selected, a blue border appears around the trace name. After a trace is selected, the **Info** button is enabled.
- Channel Name** - The trace name defaults to the Live Channel name that it was captured from. To change the name, click in the channel name box and choose a new name. Each trace has to include a unique name. The trace names are local to Performance Manager and are not in sync with Smaart.
  - Color** - Click on the color box to open the color selection panel. Select the desired color and click OK. The trace color is local to Performance Manager and independent from Smaart.
  - Line Thickness** - The thickness of the trace line can be adjusted here. The default value is 1 and the maximum value is 5 points. Adjusting the line thickness can make traces more visible when displayed on high-resolution computer screens.
  - dB Offset** - The dB Offset parameter adjusts the trace position within the EQ graph. Adjusting this parameter to line the trace up with the 0dB line provides a reference and makes it easier to adjust EQ settings.
  - Inverted** - Checking this option inverts the trace on the Y axis (amplitude). This is described in further detail later in this document.

**Note:** Traces and trace edits are local to Performance Manager and are not synchronized with Smaart. Changing the name of a trace in Performance Manager will only affect Performance Manager, and changing or deleting a trace in Smaart will only affect Smaart.

# 9 Master Section

## 9.1 Signal Generator Section

Performance Manager can remotely control the internal Smart **Signal Generator**. When in **Magnitude** or **Delay** modes, stopping the Noise Generator will also freeze the measurement trace. Access to the Generator's gain is also available.



- Gain Control** - The Noise Generator level can be adjusted within Performance Manager. To adjust the level, use the UP / DOWN buttons or type in the value in the display box. Gain adjustments can be made in Smart or Performance Manager and will update bi-directionally.
- Noise ON / OFF** - The Noise button controls the Noise Generator ON / OFF function in Smart. The Generator can be switched ON / OFF from Smart or Performance Manager and will update bi-directionally.
- Noise Type** - The Noise type must be selected from Smart — selection is then displayed within the Noise Generator ON / OFF button.

**Keyboard Shortcut:** G

## 9.2 Pause Button

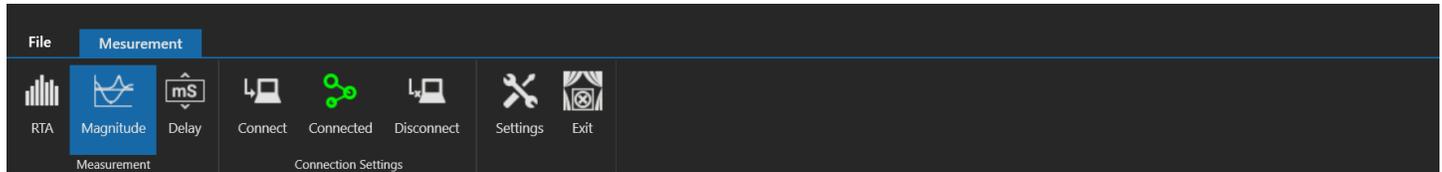


- Pause Button** - The Pause button freezes the Live Traces and discontinues all network communication with Smart. This is done to preserve network bandwidth during times when network communication with Smart is not necessary. This can especially be beneficial for wireless networks. It is recommended that the network be paused whenever measurements are not in use. Exiting the Measurement mode also pauses the network.

**Keyboard Shortcut:** P

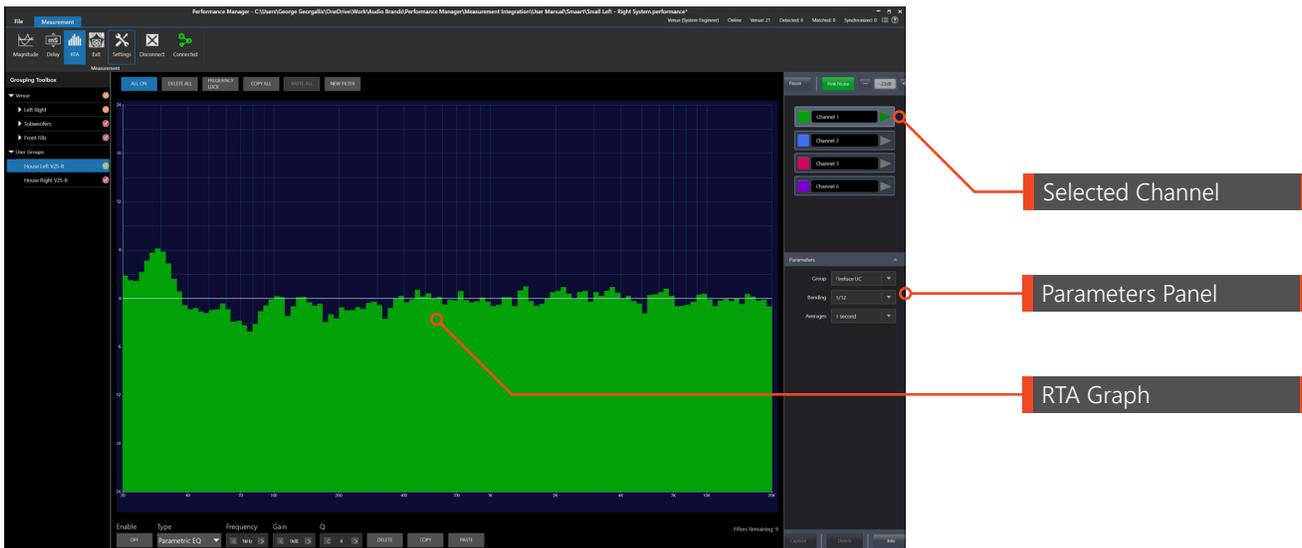
# 10 Measurement Modes

Performance Manager supports 3 measurement modes. **RTA**, **Magnitude** and **Delay**. Each mode offers different functionality. Following is a description of each.



## 11 RTA Mode

RTA mode refers to the single-channel **Spectrum** measurements in Smaart. The RTA allows the spectral content of various audio signals in a system to be examined. The graph shows **Frequency** on the **X-Axis** and **Decibels (dB)** on the **Y-Axis**. As each Live Channel is selected, the real-time display in the graph will update accordingly. The display scale and averaging can be refined for different tasks using the Parameters section.



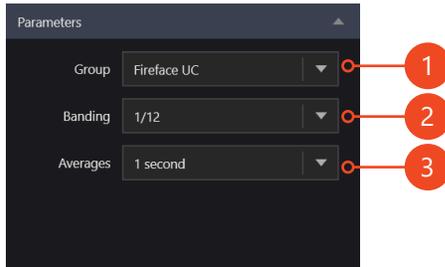
### 11.1 RTA Live Channels

The available channels in Spectrum mode are controlled by the selected **Group**. To add, remove or change channels, adjust the Group assignments in Smaart. Multiple RTA channels can be active and running at the same time but only one RTA channel is displayed at any given time in Performance Manager. The colors of the RTA bars can be adjusted from the **Info** panel. Storing traces is not supported in RTA mode.

RTA mode, among other things, can be used for the identification of feedback frequencies in sound reinforcement systems. For example, a measurement mic can be placed in front of a monitor enclosure. When feedback occurs, the RTA graph will identify the problematic frequency and a Group EQ filter can be used to address the issue.

## 11.2 RTA Mode Parameters Panel

The *speed (Averages)* and *resolution (Banding)* of the RTA graph are adjusted from the *Parameters* panel. These adjustments are local to Performance Manager and do not affect what is displayed in Smart.



1. **Group** - Groups allow for selecting between different Live Channel layouts. Groups are created in Smart and then read in Performance Manager.
2. **Banding** - Banding controls the graph resolution. Octave, 1/3, 1/6, 1/12, 1/24 Octave options are available.
3. **Averaging** - Averaging controls the movement speed for the graph. A number of options are available to adjust the graph speed to suit the application.

## 11.3 RTA Mode Banding Examples



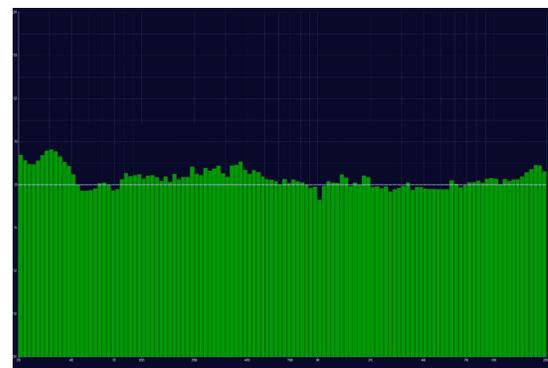
Octave banding



1/3<sup>rd</sup> Octave Banding



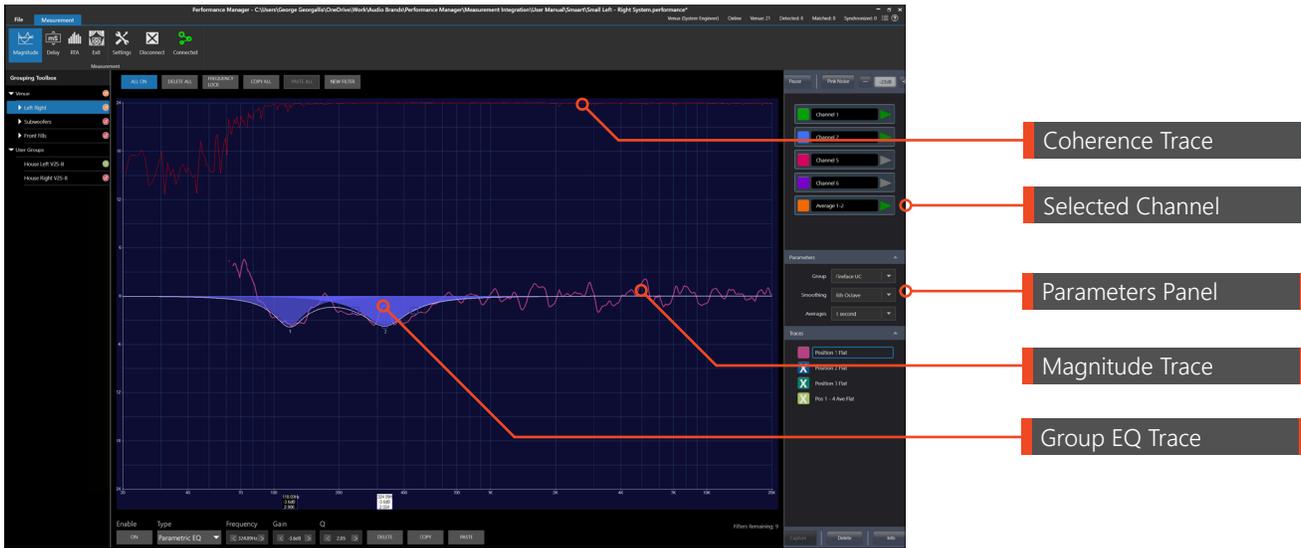
1/6<sup>th</sup> Octave banding



1/12<sup>th</sup> Octave Banding

# 12 Magnitude Mode

Magnitude mode is the same as Transfer mode in Smaart. The Smaart transfer function is a dual-channel measurement technique that determines a system's frequency response by comparing its input signal (the reference signal) to its output (measurement signal). The result of this measurement is a complex signal that represents the difference between the measurement and reference signals in both magnitude and phase. The measurement results show the response of the sound system as a function of frequency or time. This type of measurement is extremely useful for equalization, time alignment and sound system optimization. A separate **Coherence** trace is also calculated from the same data. Coherence is displayed on the Magnitude graph as an indicator of the quality of the data transfer function. More information about Transfer Functions and the benefits of dual-channel measurement techniques can be found in the Smart User Guide.



Performance Manager Measurement Integration combines the functionality of Smaart's Transfer mode with the EQ functionality built into Performance Manager. This allows a system's frequency response measurement to be viewed in the same window as the Group EQ. The EQ curve can be used in conjunction with the traces from Smaart to equalize a system. This allows for precise EQ manipulation since the Frequency center, Gain and Q are immediately obvious.

## 12.1 Find Delay and Delay Compensation

Under each Live Channel panel are controls for adjusting the measurement channel delay time. A transfer function is a 2-channel process (dual input), where the analyzer is comparing the information measured (measurement input) to a known reference signal (reference channel input) and presenting the difference. The reference signal is typically connected directly to the measurement system (sound card input) and is considered to be at time 0 (no latency). The measurement signal (which in this case is the output from the sound system's speakers) has to travel through the entire system signal chain. This includes the various electronic circuits, as well as the distance traveled through the air (from the speakers to the measurement microphone), which all adds latency to the signal. This can result in a considerable time offset between the measurement and reference signals, which has to be compensated for by applying delay to the measurement input.

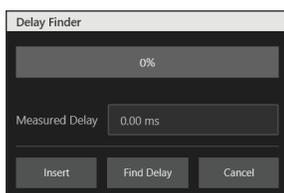


If multiple inputs are used, each measurement input has to be compensated independently. Each Live Channel includes its own set of delay controls that can be used for this purpose. Left click on the Live Channel to expand the channel's panel and reveal the delay controls. These delay adjustments are sent to Smart and applied to the appropriate inputs.

Live Averages use the independent Live Channel delays and do not need their own compensation delay.

## 12.2 Applying Delay

There are many ways to determine the relative delay between the measurement and reference inputs, but the easiest method is to use Smart's built-in Delay Finder function. Delay Finder works by measuring the impulse response of the system and then scanning the IR (impulse response) to find the highest peak. The arrival time of the first peak can then be applied to the channel delay. To start the process, click the Find Delay button under each channel's panel to open the Delay Finder windows.

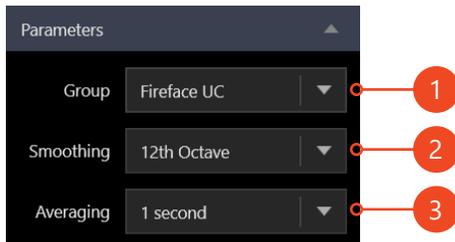


Once the Delay Finder window is open, Smart starts the process of finding the impulse's peak. This process typically takes a couple of seconds and Performance Manager will display a progress bar indicating status. When Smart finishes, the delay is presented in the **Measured Delay** box. If the value appears to be correct, click **Insert** to use the delay. If not, click **Find Delay** to repeat the measurement.

**Keyboard Shortcut:** L

## 12.3 Magnitude Mode Parameters Panel

The **speed (Averages)** and **resolution (Smoothing)** of the RTA graph are adjusted from the **Parameters** panel. These adjustments are local to Performance Manager and do not affect what is displayed in the Smaart application.



- 1. Group** - The Group drop-down menu is used to select between different Live Channel layouts. These can include Live Channels or real-time Averages of multiple channels. Groups are created in Smaart and then synced to Performance Manager.
- 2. Smoothing** - Smoothing is used to filter out small fluctuations in magnitude and phase, making larger features and trends in the data easier to identify.
- 3. Averaging** - Averaging the signal over time increases the signal-to-noise ratio of a measurement. The noisy parts of the incoming data, being more random than the signal component, tend to cancel each other out over time. The actual signal, being less random than the noisy parts, tends to average out, becoming smoother and easier to see. The trade-off is responsiveness. Excessive averaging makes the measurement slow to respond to changes in system settings such as equalization and delay adjustments. **Averaging of 1 Second** provides good balance between trace accuracy and responsiveness.

## 12.4 Magnitude Smoothing Examples



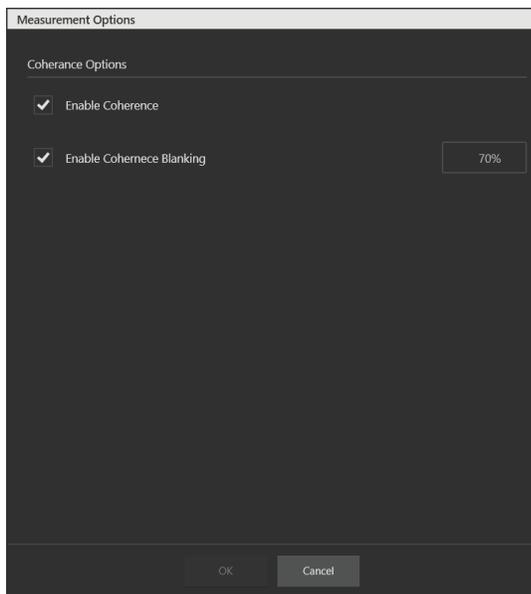
No Smoothing



1/6<sup>th</sup> Octave Smoothing

## 12.5 Coherence Trace

The Coherence trace can be used to validate a transfer function measurement. Coherence does a good job of detecting contamination of the measurement signal by unrelated signals such as background noise and reverberation, and it is sensitive to timing mismatches as well. The Coherence trace provides some guidance as to whether a system anomaly is part of the reference signal or not. The trace is percentage-based, with 100% coherence representing a good measurement and 0% coherence representing a measurement that has no commonality with the reference signal. Coherence is presented at the top of the Group EQ window and it's always red in color.



1. **Coherence ON / OFF** - The Coherence trace can be switched ON / OFF from the Measurement Options panel.

### Keyboard Shortcut: P

2. **Coherence Blanking** - When switched ON, Coherence Blanking removes questionable data from the active magnitude trace at any frequency where coherence does not meet or exceed the specified threshold. Coherence Blanking works on both the Live Channels and the Average Live Channels. This function can be switched ON / OFF from the Measurement Options panel. The threshold can also be specified in %. The default value is 70%.

Coherence and Coherence Blanking work on both Live traces and Stored traces. The Coherence trace at the top of the Group EQ window follows the active (highlighted) channel or trace. This means only one Coherence trace will be visible at a time, avoiding clutter and confusion. This trace is local to Performance Manager and does not affect the Coherence trace in Smart.

## 12.6 Coherence Blanking Examples

The example below show the effects of Coherence Blanking (70% in this case) on a Live Channel trace. As can be seen, Performance Manager removed all information below 100Hz because of the lower Coherence values for the data in that frequency range.



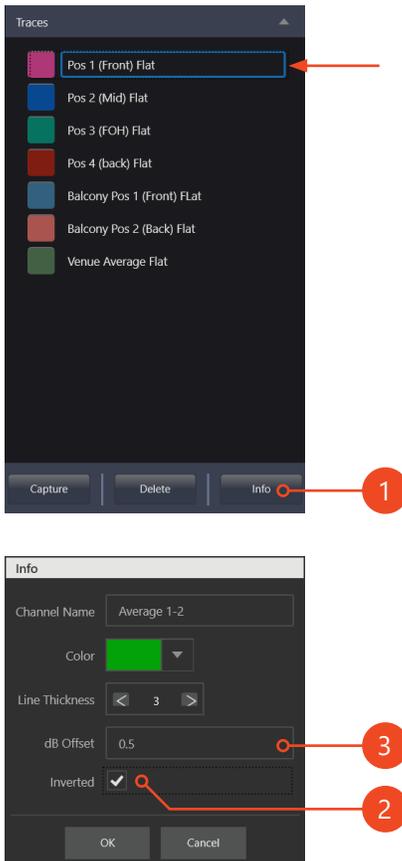
With Coherence Blanking Turned ON



With Coherence Blanking Turned OFF

## 12.7 Inverting a Trace

The Trace Invert feature is specifically used when equalizing a system to flatten its frequency response. Using this feature makes it easy to flatten the system since the EQ curve simply needs to be adjusted to match the inverted trace curve. The invert feature is available from the Info panel.



1. To invert a trace, select a Live Channel or Stored trace and then click the Info button at the bottom of the measurement section.
2. In the trace Info panel, enable the invert option to invert the trace. The trace can be switched back to Normal at any time.
3. The **dB Offset** setting can be used to adjust a **Live Channel** or **Stored** trace so that the flattest portion of the measurement lines up with the 0dB line of the Group EQ windows. This will help ensure that the minimum amount of EQ necessary is used.

## 12.8 Inverted Trace Examples

The example below shows the effects of inverting a trace. The **Invert** feature is available for both **Live** and **Stored** traces



System Response - Normal



System Response - Inverted

## 12.9 Equalizing with an Inverted Trace



- **Step 1** - Capture a system trace of the part of the system to be equalized. It's always best when equalization is applied to an average trace that represents as many listening positions as possible. This helps avoid EQ correction of an anomaly that was only measured in one position.



- **Step 2** - Select the **Live** or **Stored** trace and click the Info button to open the panel. Select **Invert** and click **OK**.



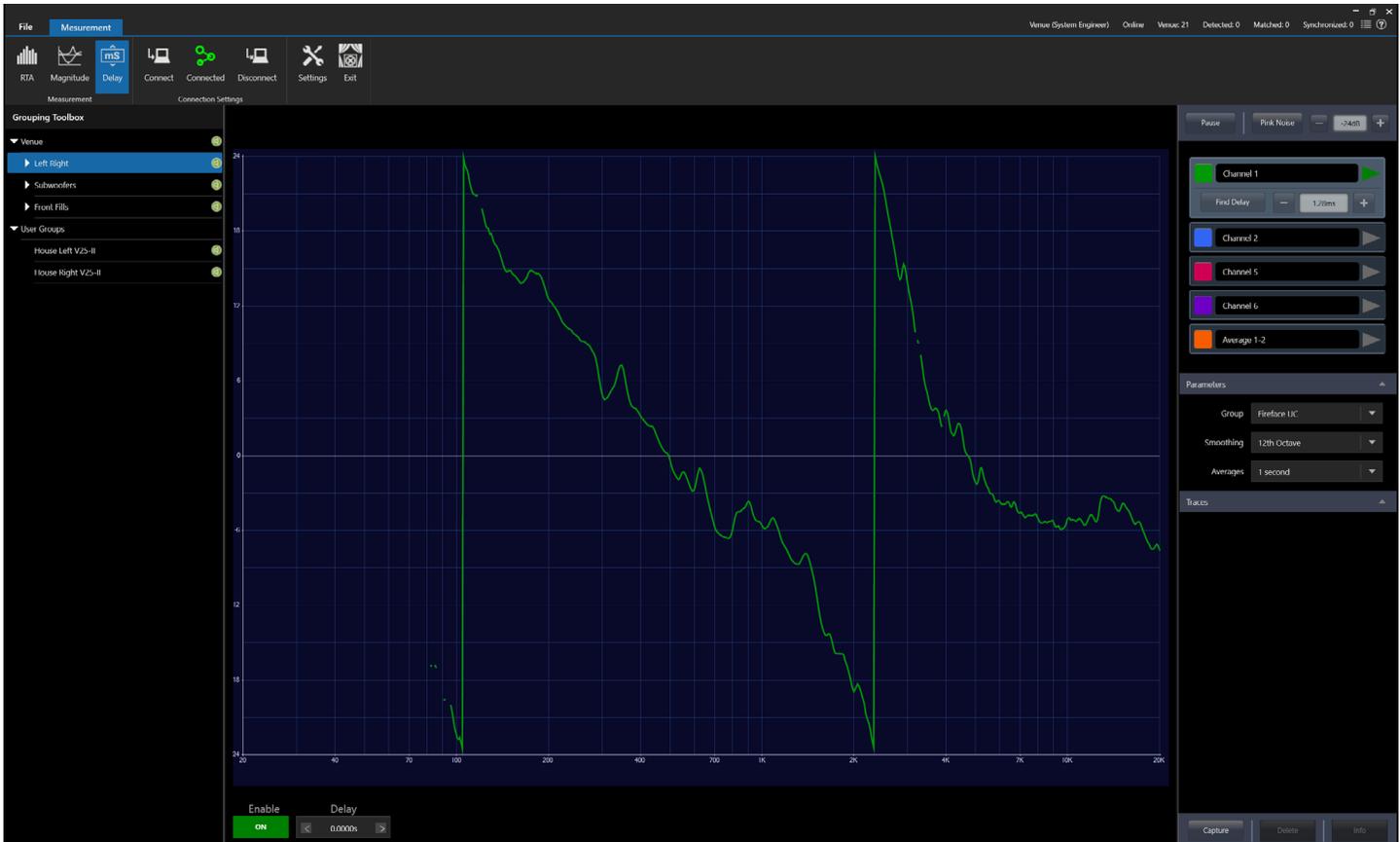
- **Step 3** - After the trace is inverted, make sure it is lined up with the 0dB line of the Group EQ. The **dB Offset** adjustment can be used if needed.
- Insert PEQs and adjust their parameters to match the frequency response trace. Try using the least amount of filters.



- **Step 4** - Measure the system one more time to verify that the system response is as desired.

## 13 Delay Mode

Delay mode refers to **Transfer** mode in Smaart and displays **Phase** response in the Group EQ window. This Performance Manager mode is used to time align systems. When Delay mode is active, the EQ filter adjustment controls at the bottom of the screen are replaced with group delay adjustment controls. Selecting a group from the Grouping Toolbox enables the delay control, allowing delay time to be adjusted for the selected group. Note that some groups, like the Venue and Circuit groups, do not allow for delay adjustments.



In Delay mode, phase is displayed in real time, allowing system delay adjustments to be made while monitoring phase. This mode works especially well for time / phase aligning main speakers to subwoofers. And since system mutes and delay adjustment controls are combined in one window, this process can be performed faster and without errors.

Traces can be stored in Delay mode. The traces stored in Delay mode are the same as those displayed in Magnitude mode. These traces contain magnitude, phase and coherence and can be used interchangeably. The **Coherence** trace is not displayed but **Coherence Blanking** is active.

## Contact Information

### Harman Professional Headquarters

8500 Balboa Blvd.

Northridge, CA 91329

+1 (800) 852-5776

[www.jblpro.com](http://www.jblpro.com)

### Worldwide Customer Service:

Monday through Friday

8:00am -5:00pm

Pacific Coast Time in the U.S.A.

(800) 8JBLPRO (800.852.5776)

[www.JBLservice.com](http://www.JBLservice.com)

### Worldwide Technical Support:

Monday through Friday

8:00am -5:00pm

Pacific Coast Time in the U.S.A.

(800) 8JBLPRO (800.852.5776)

[support@jblpro.com](mailto:support@jblpro.com)

### Professional Contacts, Outside the USA:

Contact the JBL Professional Distributor in your area.

A complete list of JBL Professional international distributors is provided at our U.S.A. website: [www.jblpro.com](http://www.jblpro.com)

**JBL**

**PROFESSIONAL**