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Engineering	Francisco Pflaum	Sept. 5, 2014	L. Brown

Introduction

This document describes the installation and configuration of the Auro-3D® option for the RS20i cinema processor. It also describes Bass Management setup, Auro speaker configuration, and Output Preset setup.

About Auro-3D

The Datasat RS20i with Auro-3D makes full immersive 3D sound available for the first time. Auro 3D adds height and top layers to standard digital surround sound. This provides a much more natural listening experience in which the texture and directional nature of the sound can be fully appreciated.

Auro-3D creates an immersive sound experience using one of the Auro Speaker configurations. Auro processing works in one of two ways. Auro-encoded input signals, natively recorded and/or mixed for an Auro-3D configuration, will be decoded with the built-in Auro-3D® decoding engine. Alternatively, legacy content (standard stereo, surround and mono sources) are up-mixed using the Auro-3D® upmix engine.

Auro-3D mode is available on the RS20i only when the Auro upgrade option is installed.

Installation of Auro Feature

RS20i software version 1.03.02 or higher is required to handle Auro.

The RS20i may come with the Auro Feature Option installed at the factory. If Auro-3D has been installed, then the Auro-3D button will be one of the Process choices when the Surround button on the Home screen is tapped (see Figure 2).

The Auro-3D option can be purchased for the RS20i and updated for Auro-3D in the field. If you purchase the Auro-3D option separately you will receive an email containing the 8-digit Feature Key that will unlock Auro-3D functionality. To purchase an Auro-3D license, contact Datasat with the serial number or MAC address for your RS20i processor. The MAC address can be found on the System Info screen (**Setup > System Setup > System Info**).

Follow these steps to activate the Auro license after receiving the feature key from Datasat.

1. Go to the Setup > System Setup and press More. The System Setup (2) screen appears.
2. Press **Feature Key**. The virtual keyboard appears.
3. Enter the 8-digit key and press **OK**. The **Auro Enabled** message appears.
4. Press **Dismiss**.
5. Cycle power (on/off) to the RS20i.

> **Note**: Once installed, the Auro-3D feature key is persistent, and is unaffected by updates to the RS20i software. There is no need to reinstall it.

When Auro-3D has been enabled on the RS20i, some additional menu features are available—such as new speaker configurations and decoder options.

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On the Base Management Setup screen, in the Speaker Configuration pulldown, the Auro speaker configurations 9.1 through 13.1 are listed, as shown right.

For details, see the topic *Bass Management Setup Screen*, page 13.
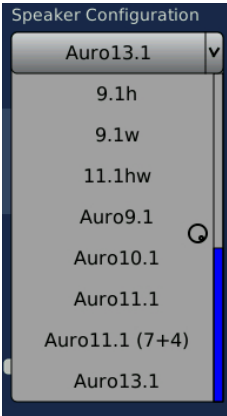
On the Surround Decoder Setup screen, in the Postprocess pulldown, the Auro-3D decoder is listed, as shown right.
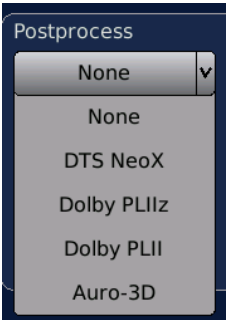
Post Processing Modes

This section describes the RS20i post processing modes. We assume here that the RS20i has already been installed and configured.

Touch the **Surround** button on the Home screen.

Figure 1. RS20i Home screen with Auro-3D installed

The post processing mode can be selected through the **Surround** button that appears on the Home screen. A pop-up selection window appears with the post processing options along the top row of buttons (see Figure 2). The available selections depend on the speaker configuration of the system. Possible selections are DTS NeoX, Dolby PLII, Dolby PLIIx, Dolby PLIIz, and Auro-3D.

The second and third row of buttons in the **Process** group are available options for the currently selected processing mode.

In Figure 2 below, Auro 11.1 speaker configuration has already been selected.

Figure 2. Surround > Process screen for Auro 11.1 configuration

Note: When None is selected, no processing is done.

The table below shows which processing modes are available for different speaker configurations. Note that Auro-3D only shows up when the Auro-3D option has been installed in the RS20i.

Table 1.   Speaker Configurations

Speaker Configuration	Button 1	Button 2	Button 3	Button 4	Button 5
2.0	None	Auro-3D			
2.1	None	Auro-3D			
3.1	None	DTS Neo:X	Dolby PLII		
4.1	None	DTS Neo:X	Dolby PLII		
5.1	None	DTS Neo:X	Dolby PLII	Auro-3D	
7.1 h	None	DTS Neo:X	Dolby PLIIz	Dolby PLII	
7.1 w	None	DTS Neo:X	Dolby PLII		
9.1 hw	None	DTS Neo:X	Dolby PLIIz	Dolby PLII	
7.1	None	DTS Neo:X	Dolby PLIIx	Auro-3D	
9.1h	None	DTS Neo:X	Dolby PLIIz	Dolby PLIIx	
9.1w	None	DTS Neo:X	Dolby PLIIx		
11.1 hw	None	DTS Neo:X	Dolby PLIIz	Dolby PLIIx	
Auro 9.1	None	DTS Neo:X	Dolby PLIIz	Dolby PLII	Auro-3D
Auro 10.1	None	DTS Neo:X	Dolby PLIIz	Dolby PLII	Auro-3D
Auro 11.1	None	DTS Neo:X	Dolby PLIIz	Dolby PLII	Auro-3D
Auro 11.1 (7+4)	None	DTS Neo:X	Dolby PLIIz	Dolby PLIIx	Auro-3D
Auro 13.1	None	DTS Neo:X	Dolby PLIIz	Dolby PLIIx	Auro-3D

Auro-3D

Select **Auro-3D** in the Process screen to create an immersive sound experience using one of the Auro Speaker configurations. When selected, the Auro processing works in one of two ways. Auro-encoded input signals, natively recorded and/or mixed for an Auro-3D configuration, will be decoded with the built-in Auro-

Codec® Decoder. Alternatively, legacy content (standard stereo, surround and mono sources) may be up-mixed using the Auro-Matic® Pro upmixer module.

Figure 3. Auro-3D selection and options

These are configuration options for Auro mode:

Preset – These are Auro-Matic® upmixer options to adjust the 3D affect for different content or preferences.

- Small
- Medium
- Large
- Speech

Mode

- Auro-3D – Full 3D audio experience
- Surround – Does not use High channels. Plays in 5.1 or 7.1 configurations.
- Stereo – Plays in stereo (Left Front/Right Front)

Strength: 1 to 16 – Adjusts the strength of the Auro-Matic® upmixer where 16 is the highest amount of upmixing.

DTS Neo X

DTS Neo:X is available for all speaker configurations except 2.0 and 2.1. Figure 4 shows the audio processing options with **DTS NeoX** selected.
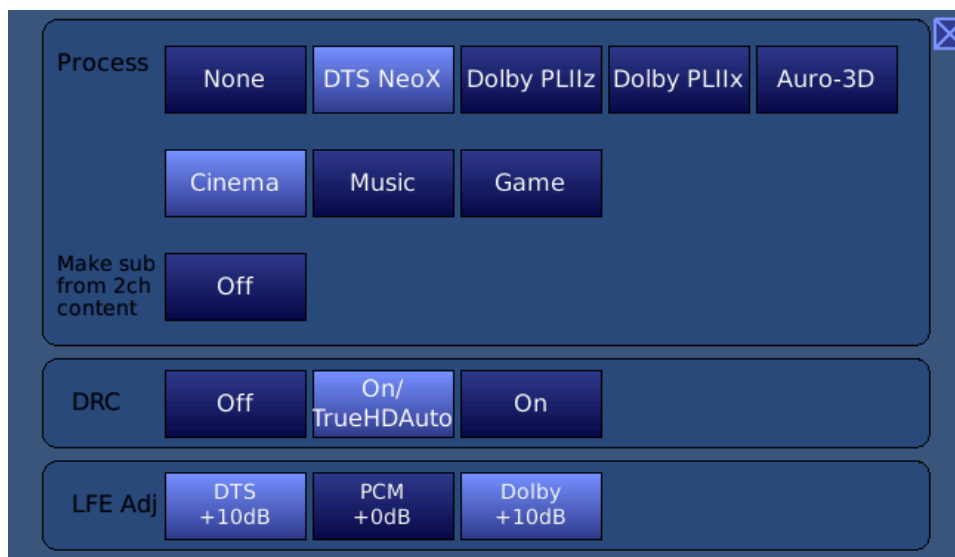

Figure 4. DTS NeoX Cinema Mode

These are configuration options for DTS NeoX mode:

Cinema– Neo:X Cinema creates 6.1-channels, from 2-channel movie sources, by removing in-phase information from the Left/Right signals and using it to create the center channel; and extracting out-of-phase information which is sent to the surround channels.

Music – NeoX Music keeps the front left and right channels intact while synthesizing the center and surround channels from the 2-channel source.

Game – surround mode optimized for video game presentation

Make sub from 2ch content: Extract SW Off/On – if set ON, then when the unit receives 2-channel source content a subwoofer channel will be created from the low frequencies of the content. If set OFF, there will be no subwoofer output with 2-channel source content.

Dolby PLII

Figure 5 shows the audio processing setup with Dolby PLII selected.

Figure 5. Dolby PLII Mode

These are configuration options for Dolby PLII mode:

Dolby Pro Logic

Music

- Panorama On or Off – create a seamless wraparound surround effect.
- Center Width – from 0 (off) to 7 (Phantom). This controls the balance of the main vocals in the center and front channels for more natural sound.
- Dimension – adjusts the balance of the surround sound from +7 (Full to Surround) to -7 (Full to Front).

Movie – optimized for movie presentation

Dolby PLIIz

Figure 6 shows the audio processing setup with Dolby **PLIIz** selected.

Figure 6. Dolby PLIIz Mode

These are configuration options for Dolby PLIIz mode:

Height Gain: Low, Mid, or High – This determines how much of the audio gets pushed up to the higher speakers (measured in dB). When set to **high**, more sound will come from the left high and right high speakers.

Dolby PLIIx

Figure 7 shows the audio processing setup with Dolby **PLIIx** selected.

Figure 7. Dolby PLIIx Mode

These are configuration options for Dolby PLIIx mode:

Music

- Panorama On or Off – create a seamless wraparound surround effect.
- Center Width – from 0 (off) to 7 (Phantom). This controls the balance of the main vocals in the center and front channels for more natural sound.
- Dimension – adjusts the balance of the surround sound from +7 (Full to Surround) to -7 (Full to Front).

Movie – surround mode optimized for movie presentation

Dolby D EX – For Dolby Digital EX content use the Dolby Digital EX decoder to produce a back surround channel

DRC

Dynamic Range Control (DRC) is used to reduce the audio volume range between soft and loud sounds. The louder volumes are decreased and the quieter volumes increased. The amount that the range is reduced is determined dynamically by the metadata stream of the particular decoder that is being used. DRC works only with some Dolby or DTS content, depending on how it was created.

- Off – no range control is applied
- On/TrueHD Auto – range control is applied on TrueHD content only if enabled by the content. For DTS content, it is the same as ON.
- On – it is applied by the DTS or Dolby decoder

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LFE Adj

Apply LFE +10dB options: this adjustment can be made here or configured in the Surround Decoder Setup screen.

It removes the +10dB LFE (sub woofer) boost applied to the LFE channels when playing DTS decoded audio.

> **Note**: LFE Adj is only required when playing old DTS discs that did not have correct LFE encoding level. Normally it should be +10 dB, the same as for Dolby.

Creating Output Preset for Auro

The Output Preset in the RS20i is a named set of configuration items that relate to the channel definitions. There may be more than one Output Preset used and assigned to different input selections.

To access the Output Preset Setup:

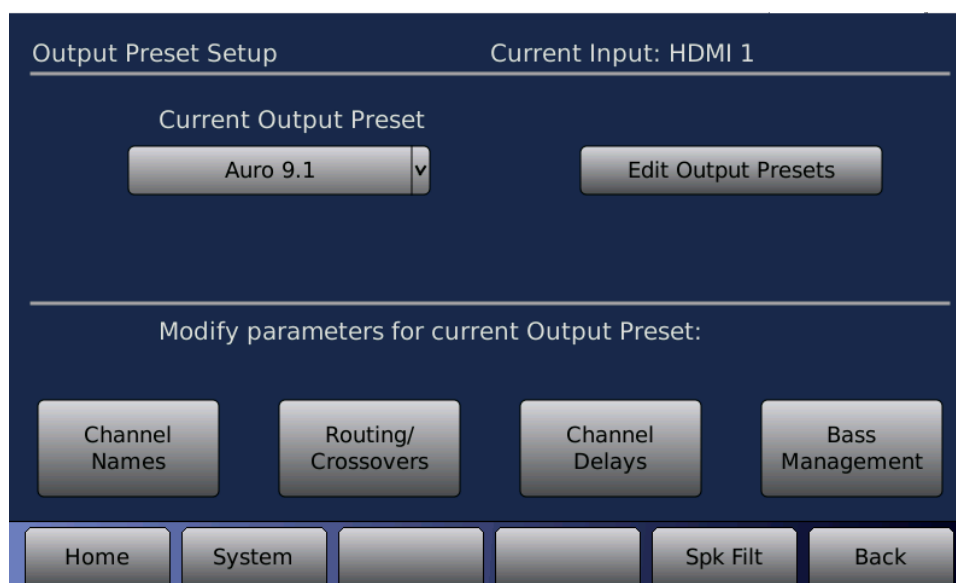**Setup > System Setup > Inputs > Output Preset**

Figure 8. Output Preset Setup screen

Current Output Preset

The current output preset is displayed in the Current Output Preset drop-down box. In the example above, it's Auro 9.1. Before making changes to the output preset, always verify that you are in the desired input (check the upper right corner of the Output Preset screen). In the example above, it's HDMI 1.

To select a different output preset, touch the down arrow and select an output preset from the list. Any changes made to the Channel Names, Routing/Crossovers, Channel Delays and Bass Management will be made for the selected output preset only, and will affect other inputs with this same output preset assigned.

Under factory default configuration, the unit has an Output Preset named 7.1 that has speaker configuration and channel names set for a 7.1 installation. There is also a defined Output Preset named 5.1 that can be selected from the Current Output Preset dropdown list. If the RS20i has the Auro-3D option installed at the factory, there will also be Output Presets for Auro 9.1, Auro 11.1, and Auro 13.1. If the Auro-3D option was

installed in the field, then the desired Auro-3D option can be created by using the **Copy Default to Output Preset** function.

Edit Output Preset

Select the **Edit Output Presets** button to enter the **Edit Output Presets** screen as shown below. This allows you to create new presets, as well as to rename or delete existing presets.
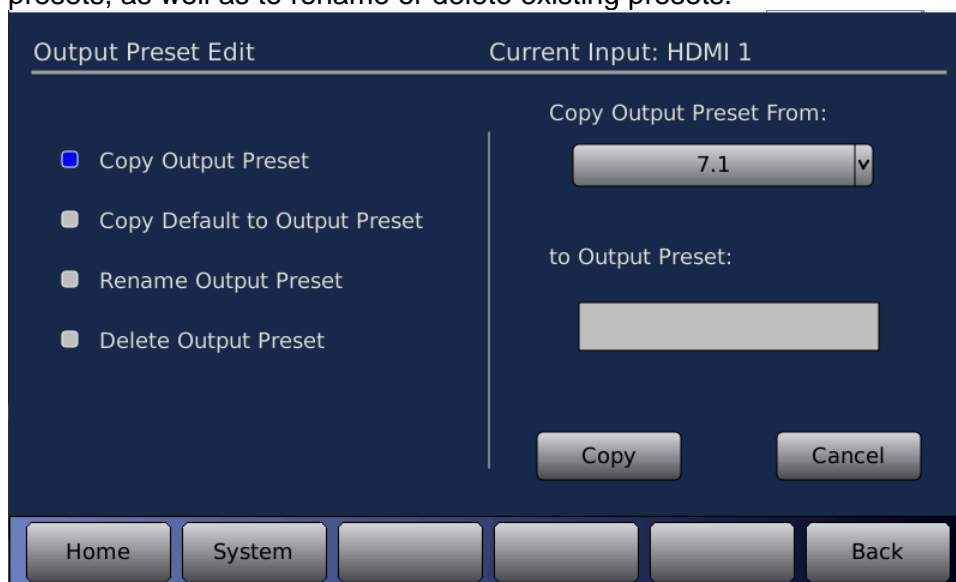

Figure 9. Output Preset Edit

Copy Output Preset – Use an existing output preset as a template for a new one. Select the output preset you wish to copy from by selecting it from the drop down box. Then, touch the "to Output Preset" box to bring up the virtual keyboard and enter a name for the new output preset. Press the Copy button to complete the process, or press Cancel to quit.

Copy Default to Output Preset – Select the default output preset and use it as a template for a new one. Select the output preset you wish to copy from by selecting it from the drop down box. Then, touch the "to Output Preset" box to bring up the virtual keyboard and enter a name for the new output preset. Press the Copy button to complete the process, or press Cancel to quit.

This may be used for convenience to create a new profile using default settings. Select one of the default Output Presets to create an Output Preset definition that best matches the intended speaker configuration. The default profile will be set for that speaker configuration, as well as channel assignments and Vu selections. Other configuration items in the Preset are set to their factory default values. Once created, any of the Output Preset configurations may be changed as desired.

The table below shows the speaker configuration and channel numbers assigned for the different Default Output Presets. The Auro default presets appear on the list only when the Auro-3D option is installed.

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Table 2. Options under Copy Default to Output Preset

Default Name	Speaker Configuration	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
5.1	5.1	L	R	C	SW	Ls	Rs										
7.1	7.1	L	R	C	SW	Ls	Rs	Lb	Rb								
11.4	11.4	L	R	C	Sw 1	Ls	Rs	Lb	Rb	HL	HR	Lw	Rw	Sw 2	Sw 3	Sw 4	
Auro 9.1	Auro 9.1	L	R	C	Sw 1	Ls	Rs	-	-	HL	HR	HLS	HRS	Sw 2	Sw 3	Sw 4	-
Auro 11.1	Auro 11.1	L	R	C	Sw 1	Ls	Rs	-	-	HL	HR	HLS	HRS	Sw 2	Sw 3	HC	T
Auro 13.1	Auro 13.1	L	R	C	Sw 1	Ls	Rs	Lb	Rb	HL	HR	HLS	HRS	Sw 2	Sw 3	HC	T

Rename Output Preset – Give an existing output preset a new name. Select an existing output preset from the drop-down list on the right side of the screen. Touch the "To" box to bring up the virtual keyboard and enter a new name for the output preset. Press the Rename button to complete the process, or press Cancel to quit.
Note: The Output Preset name is changed for all Inputs that use the Output preset.

Delete Output Preset – Select an existing output preset from the drop-down list on the right side of the screen. Press the Delete button to complete the process, or press Cancel to quit.

Channel Names

Select Channel Names button to enter the Channel Names assignment screen as shown below.

Depending how the RS20i is connected, sixteen channels are available. Channel assignments can be different in other output presets. The top title bar displays the current input and output preset.

> **Note**: In general, the **default assignments** must be preserved for the first 8 channels in order to maintain compatibility with the HDMI input channel. Default channel names are indicated in Figure 10, below.

The factory default channel configuration for the RS20i is 8 channels.

The output preset channel name refers to the input channel only. The channel name for the output channel (as shown on the Third Octave EQ screen using "line out") is a combination of the corresponding input and its crossover ID selected on the Crossover/Routing screen (for example, Left-H).

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Figure 10. Assign Channel Names Screen (for Auro 9.1 Preset)

To change or enter a new channel name select the white field next to the desired channel. A virtual keyboard will appear allowing you to enter text. Type in the channel name then select **OK**. The channel name will now appear in the field and on the Home Screen along the X axis of the graph).

When a Vu button is highlighted blue (rather than white), that channel will display Vu bars on the Home screen.

To turn off the Vu meter in the Home Screen simply touch the blue Vu symbol next to the channel name. It will change to from blue to white and will no longer be displayed on the Home Screen X axis.

Figure 11. Home screen with Auro 9.1 Output Preset

Bass Management Setup Screen

This section describes how to configure the bass management on the RS20i using the Setup screens. This assumes that you are familiar with the RS20i bass management features and concepts. If not, you are

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encouraged to review the Bass Management Theory section of this document (page 22) before proceeding with the setup.

The Bass Management configuration, including the Speaker Configuration, is contained within an Output Preset configuration of the RS20i. Therefore, the configuration changes made in the Setup screens are applied to the currently selected Output Preset. Separate Output Presets can be made with different Bass Management and Speaker Configuration settings.

Figure 12 shows the main bass management screen. To access this screen, press:

Setup (System) > Inputs > Output Preset > Bass Management
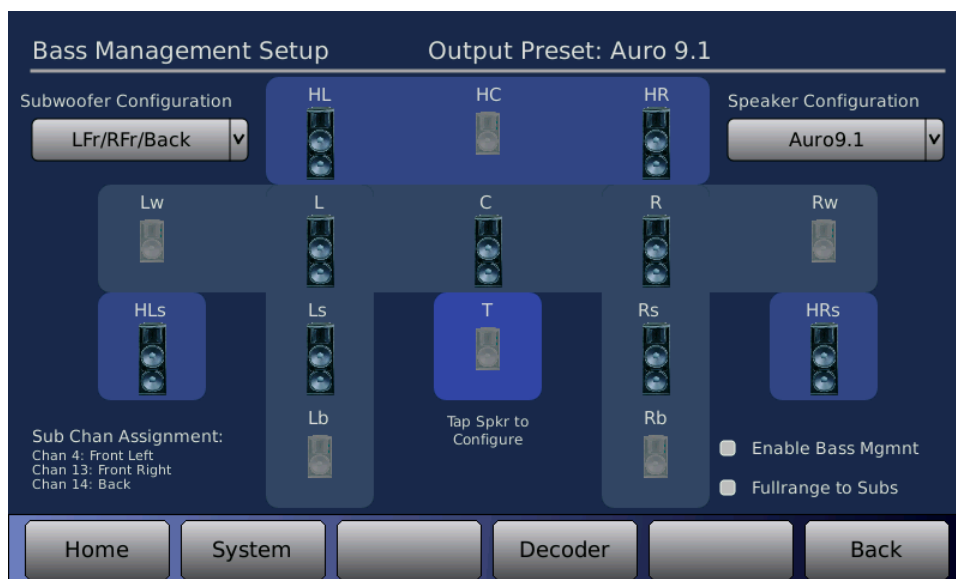

Figure 12. Bass Management Setup Screen

The screen above shows all available speakers, although Auro 9.1 uses only 9 of these plus a subwoofer. The images in the screen above that are faded out are not used with Auro 9.1.

Table 3.   Bass Management Setup Screen

Controls	Description
Speaker Configuration	Select speaker configuration that matches the installation. Only the speakers available for the chosen configuration will be active for setup. Unavailable speakers will be disabled and grayed out on the screen. Use the up/down arrow keys (or mouse wheel) on your connected computer to view choices and select.
Subwoofer Configuration	Select number and positions for subwoofers. See Subwoofer Configuration options (Table 4).
Enable Bass Mgmnt	Global enable for all bass management functions.
Full Range to Subs	When enabled, omits the Low Pass filters for all channels crossed to the subwoofer.
Speaker icons	Touch an icon to open a speaker setup screen.

Subwoofer Configuration

The subwoofer configuration option configures the bass management with the number of subwoofer channels from 0 to 4.

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Table 4.   Subwoofer Configuration

Subwoofer Configuration Options	Number of Subwoofers	Subwoofer Channel Assignments
No Subs	0	None
Mono	1 to 4	Ch4, Ch13, Ch 14, Ch 15
LFront/RFront	2	Ch4 - Left Front Ch13 - Right Front
Front/Back	2	Ch4 - Front Ch13 - Back
LFront/RFront/Back	3	Ch4 - Left Front Ch13 - Right Front Ch14 - Back
LFront/RFront LBack/RBack	4	Ch4 - Left Front Ch13 - Right Front Ch14 - Left Back Ch15 - Right Back **Note**: This option is not available for speaker configurations with HC (Auro11.1 or Auro13.1).

Speaker Options Configuration Screen

Each speaker or speaker pair can be individually configured in Bass Management by selecting the speaker icon on the Bass Management screen.

Any Left/Right paired speakers share the same settings, so the configuration needs to be set only on one of the two. For example, when the Left Front speaker is configured, the Right Front speaker will use that configuration. Speaker pairs that share configurations are L/R, Ls/Rs, Lb/Rb, HL/HR, HLs/HRs, and Lw/Rw.

Each speaker or speaker pair may display a different set of options. Figure 13 shows Bass Management Center Speaker Options for a configuration with Subwoofers. To access this screen, tap the icon of the Center Speaker, in the Bass Management Setup screen.

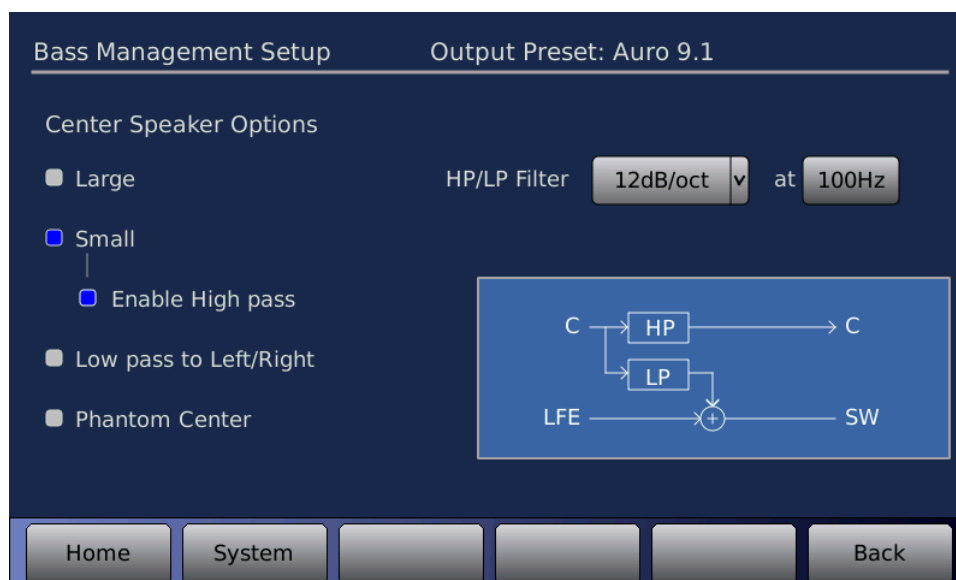**Setup (System) > Inputs > Output Preset > Bass Management > Center**

Figure 13. Bass Management Center Speaker Options

HP/LP Filter

This configures the high pass and low pass filters when Small speaker option is selected. The HP and LP use is illustrated in the screen image. The HP and LP both use the same configuration.

The slope can be set at either 12dB/octave or 24dB/octave. The cutoff frequency can be set between 31Hz and 160Hz.

> **Note**: If the bass management option for full range to subs is selected, then there is no low pass filter. All frequencies in the signal are sent to the sub.
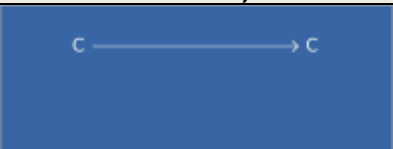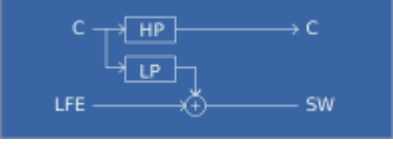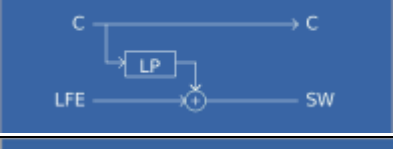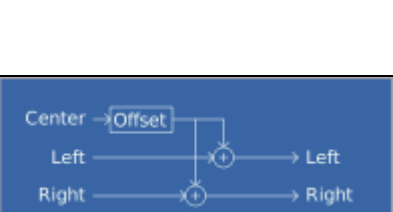
Offset

The offset control appears only for phantom speaker options. It allows the level for that speaker to be adjusted before being mixed with the left or right speaker. The offset level can be adjusted from +3dB to -10dB.

Bass Management Options for Speakers

Table 5 shows the possible types of speaker configuration options available when the speaker configuration includes one or more subwoofers.

Table 5.   Speaker Option with One or More Subwoofers

Controls	Applicable Channels	Diagram (replace center with applicable channel)	Description
Large	All		No modifications to channel
Small, Enable High Pass	All		Crossed with LFE High pass on channel audio Low pass to LFE
Small, High Pass Not Enabled	Center, Left/Right		Channel audio is crossed with LFE Low pass to LFE
Small, cross to (other speaker)	Depends on speaker: C cross to L/R Ls/Rs cross to L/R Lb/Rb cross to L/R HL/HR cross to L/R HC cross to C HLs/HRs cross to Ls/Rs T cross to L/R/LS/RS		When this option is used, the "other" speaker must be large. If it is not, there will be an error message in **red text** displayed below the diagram on the screen.
Phantom Center	Center		Center channel offset and mixed with Left and Right channels.

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Controls	Applicable Channels	Diagram (replace center with applicable channel)	Description
Phantom Surround	Left Surround/ Right Surround		Left Surround offset and mixed with Left channel Right Surround offset and mixed with the Right channel.

Table 6 shows the possible types of speaker configuration options available when the speaker configuration includes no subwoofer.

Table 6.   Speaker Options with No Subwoofers

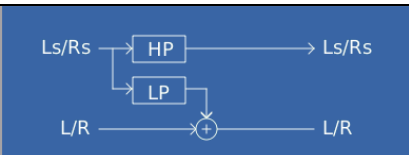| Controls	Applicable Channels	Diagram (replace center with applicable channel)	Description
Large	All	For L/R and Ls/Rs: For other speakers:	For L/R and/or Ls/Rs: the LFE signal will be added to those speakers.
Small, Enable High Pass	All		No LFE added to audio channel High pass on channel
Small, High Pass Not Enabled	Center, Left/Right		No LFE added to channel
Small, cross to (other speaker)	Depends on speaker: C cross to L/R Ls/Rs cross to L/R Lb/Rb cross to L/R HL/HR cross to L/R HC cross to C HLs/HRs cross to Ls/Rs T cross to L/R/LS/RS		When this option is used, the "other" speaker <u>must be large</u>. If it is not, there will be an error message in **red text** displayed below the diagram on the screen.
Phantom Center	Center		Center channel offset and mixed with Left and Right channels.

Controls	Applicable Channels	Diagram (replace center with applicable channel)	Description
Phantom Surround	Left Surround/ Right Surround		Left Surround offset and mixed with Left channel Right Surround offset and mixed with the Right channel.

Bass Management Setup Procedure

The Bass Management screen is where you set the speaker configuration.

To access the Base Management screen, press:

Setup > System Setup > Inputs > Output Preset > Bass Management.

1. Select the Speaker Configuration, from the drop down on the Bass Management Setup screen, that matches the installation. The channel definitions for each speaker configuration are given in Table 7.

Table 7.   Bass Management Speaker Configuration

Speaker Configu-ration	Channels															
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
2.0	L	R														
2.1	L	R		Sw1									Sw2	Sw3	Sw4	
3.1	L	R	C	Sw1									Sw2	Sw3	Sw4	
4.1	L	R		Sw1	Ls	Rs							Sw2	Sw3	Sw4	
5.1	L	R	C	Sw1	Ls	Rs							Sw2	Sw3	Sw4	
7.1 h	L	R	C	Sw1	Ls	Rs	Lb	Rb					Sw2	Sw3	Sw4	
7.1w	L	R	C	Sw1	Ls	Rs					Lw	Rw	Sw2	Sw3	Sw4	
9.1hw	L	R	C	Sw1	Ls	Rs			HL	HR	Lw	Rw	Sw2	Sw3	Sw4	
7.1	L	R	C	Sw1	Ls	Rs	Lb	Rb					Sw2	Sw3	Sw4	
9.1h	L	R	C	Sw1	Ls	Rs	Lb	Rb	HL	HR			Sw2	Sw3	Sw4	
9.1w	L	R	C	Sw1	Ls	Rs	Lb	Rb			Lw	Rw	Sw2	Sw3	Sw4	
11.1 hw	L	R	C	Sw1	Ls	Rs	Lb	Rb	HL	HR	Lw	Rw	Sw2	Sw3	Sw4	
Auro 9.1	L	R	C	Sw1	Ls	Rs			HL	HR	HLs	HRs	Sw2	Sw3	Sw4	
Auro 10.1	L	R	C	Sw1	Ls	Rs			HL	HR	HLs	HRs	Sw2	Sw3	Sw4	T
Auro 11.1	L	R	C	Sw1	Ls	Rs			HL	HR	HLs	HRs	Sw2	Sw3	HC	T
Auro 11.1 (7+4)	L	R	C	Sw1	Ls	Rs	Lb	Rb	HL	HR	HLs	HRs	Sw2	Sw3	Sw4	
Auro 13.1*	L	R	C	Sw1	Ls	Rs	Lb	Rb	HL	HR	HLs	HRs	Sw2	Sw3	HC	T

*Note: When Auro 13.1 is selected, a checkbox labeled "Phantom HC" appears on the Bass Management screen, for selecting a 13.1 configuration <u>without</u> the HC speaker. When selected, the HC channel is downmixed with HL and HR.

2. Activate **Enable Bass Management**. This is the master enable that turns on all Bass Management functions.

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DEPARTMENT	CREATED BY:	EFFECTIVE DATE	REVIEWED BY:
Engineering	Francisco Pflaum	Sept. 5, 2014	L. Brown

3. Select the **Subwoofer Configuration** (from the drop-down list) with the appropriate number and position of the subwoofers used. The subwoofer configuration option configures the bass management with the number of subwoofer channels from 0 to 4. See Table 4 Subwoofer Configuration (page 15) for the available configurations and channel definitions.

Skip to page 21 to setup bass management for a configuration with no subwoofers.

Configuration using 1 or more subwoofers

1. Select Full-Range to Subs only if you wish to omit the Low Pass filter for all channels crossed to the subwoofer.

    For steps 2 through 10, tap on the speaker below its label and set the options for that speaker. Skip any speakers that do not apply to the current speaker configuration. Use the Back button to return to the main Bass Management screen to select the next speaker. Those speakers that are not used will be grayed out and cannot be selected. The speakers that are specific to Auro (HLs, HRs, HC, T) are displayed only if the unit has the Auro option installed.

2. C – **Center** speaker Options:

    A. **Large** – (default) Speaker can handle full range of frequencies.

    B. **Small** – Cross with the subwoofer(s). Select the desired crossover filter frequency and slope. The high-pass filter to the Center speaker may be disabled if desired.

    C. **Low Pass to Left/Right** – Cross the center channel to the Left and Right Front speakers. Adjust the crossover frequency and slope as needed.

    D. **Phantom Center** – Use this if there is no center speaker installed. This divides the center channel between the left and right speakers. The offset can be adjusted. **Note**: when this is selected, the speaker is grayed out on the main Bass Management screen.

3. **L, R** – **Left** and **Right** speaker options:

    A. **Large** – (default) Speaker can handle full range of frequencies.

    B. **Small** – Cross with the subwoofer(s). Select the desired crossover filter frequency and slope. The high-pass filter to the Left and Right speaker may be disabled if desired.

4. **Ls, Rs** – **Left Surround** and **Right Surround** speaker options:

    A. **Large** – (default) Speaker can handle full range of frequencies.

    B. **Small** – Cross with the subwoofer(s). Select the desired crossover filter frequency and slope.

    C. **Small, cross to L/R** – The Left Surround will be crossed to the Left Front speaker and Right Surround will be crossed to the Right Front speaker. Select the desired crossover filter frequency and slope. In order to use this option, the Left and Right Front speakers should be defined as Large. If not, an error message will appear on the screen.

    D. **Phantom Surround** – Use this if Left and Right Surround speakers are not installed. The Left Surround channel is mixed with the Left Front speaker and the Right Surround channel is mixed with the Right Front speaker. The offset can be adjusted.

5. **Lb, Rb** – **Left Back** and **Right Back** speaker options:

    A. **Large** – (default) Speaker can handle full range of frequencies.

    B. **Small** – Cross with the subwoofer(s). Select the desired crossover filter frequency and slope.

C. **Small, cross to L/R** – The Left Back will be crossed to the Left Front speaker and Right Back will be crossed to the Right Front speaker. Select the desired crossover filter frequency and slope. In order to use this option, the Left and Right Front speakers should be defined as Large. If not, an error message will appear on the screen.

6. **Lw, Rw** – **Left Wide** and **Right Wide** speaker options:

A. **Large** – (default) Speaker can handle full range of frequencies.

B. **Small** – Cross with the subwoofer(s). Select the desired crossover filter frequency and slope.

7. **HL, HR** – High Left and High Right speaker options:

A. **Large** – (default) Speaker can handle full range of frequencies.

B. **Small** – Cross with the subwoofer(s). Select the desired crossover filter frequency and slope.

C. **Small, cross to L/R** – The High Left will be crossed to the Left Front speaker and High Right will be crossed to the Right Front speaker. Select the desired crossover filter frequency and slope. In order to use this option, the Left and Right Front speakers should be defined as Large. If not, an error message will appear on the screen.

8. **HC** – High Center speaker options:

A. **Large** – (default) Speaker can handle full range of frequencies.

B. **Small** – Cross with the subwoofer(s). Select the desired crossover filter frequency and slope.

C. **Small, cross to C** – The High Center will be crossed to the Center speaker. Select the desired crossover filter frequency and slope. In order to use this option, the Center speaker should be defined as Large. If not, an error message will appear on the screen.

9. **HLs, HRs** – **High Left Surround** and **High Right Surround** speaker options:

A. **Large** – (default) Speaker can handle full range of frequencies.

B. **Small** – Cross with the subwoofer(s). Select the desired crossover filter frequency and slope.

C. **Small, cross to Ls/Rs** – The High Left Surround will be crossed to the Left Surround speaker and High Right Surround will be crossed to the Right Surround speaker. Select the desired crossover filter frequency and slope. In order to use this option, the Left Surround and Right Surroung speakers should be defined as Large. If not, an error message will appear on the screen.

10. **T** – **Top** speaker options:

A. **Large** – (default) Speaker can handle full range of frequencies.

B. **Small** – Cross with the subwoofer(s). Select the desired crossover filter frequency and slope.

C. **Cross to L/R/Ls/Rs** – Top speaker will be crossed with the Left Front, Right Front, Left Surround, and Right Surround speakers. In order to use this option, the L, R, LS, and Rs speakers should be defined as Large. If not, an error message will appear on the screen.

All speaker configuration options are described in text next to the speaker. This completes the bass management setup using one or more subwoofers.

Configuration with no subwoofers

For the following steps, tap on the speaker below its label and set the options for that speaker. Skip any speakers that do not apply to the current speaker configuration. Use the Back button to return to the main Bass Management screen to select the next speaker. Those speakers that are not used will be grayed out and cannot be selected. The speakers that are specific to Auro (HLs, HRs, HC, T) are displayed only if the unit has the Auro option installed.

1. C – **Center** speaker Options:

   A. **Large** – (default) Speaker can handle full range of frequencies.

   B. **Small** – Apply high pass filter to Center channel. Select the desired filter frequency and slope. The high-pass filter to the Center speaker may be disabled, in which case it works the same as using the option Large.

   C. **Low Pass to Left/Right** – Cross the center channel to the Left and Right Front speakers. Adjust the crossover frequency and slope as needed.

   D. **Phantom Center** – Use this if there is no center speaker installed. This divides the center channel between the left and right speakers. The offset can be adjusted. **Note**: when this is selected, the speaker is grayed out on the main Bass Management screen.

2. **L, R** – **Left** and **Right** speaker options:

   A. **Large** – (default) Mix LFE channel with this speaker.

   B. **Small** – Do not mix LFE channel with this speaker. A high pass filter is applied to the Left Surround and Right Surround channels. Adjust the high pass frequency and slope as needed.

3. **Ls, Rs** – **Left Surround** and **Right Surround** speaker options:

   A. **Large** – (default) Mix LFE channel with this speaker.

   B. **Small** – Do not mix LFE channel with this speaker. A high pass filter is applied to the Left Surround and Right Surround channels. Adjust the high pass frequency and slope as needed.

   C. **Small, cross to L/R** – The Left Surround will be crossed to the Left Front speaker and Right Surround will be crossed to the Right Front speaker. Select the desired crossover filter frequency and slope. In order to use this option, the Left and Right Front speakers should be defined as Large. If not, an error message will appear on the screen.

   D. **Phantom Surround** – Use this if Left and Right Surround speakers are not installed. The Left Surround channel is mixed with the Left Front speaker and the Right Surround channel is mixed with the Right Front speaker. The offset can be adjusted.

4. **Lb, Rb** – **Left Back** and **Right Back** speaker options:

   A. **Large** – (default) Speaker can handle full range of frequencies.

   B. **Small** – A high pass filter is applied to the Left Back and right Back channels. Adjust the high pass frequency and slope as needed.

   C. **Small, cross to L/R** – The Left Back will be crossed to the Left Front speaker and Right Back will be crossed to the Right Front speaker. Select the desired crossover filter frequency and slope. In order to use this option, the Left and Right Front speakers should be defined as Large. If not, an error message will appear on the screen.

5. **Lw, Rw** – **Left Wide** and **Right Wide** speaker options:

A. **Large** – (default) Speaker can handle full range of frequencies.

B. **Small** – A high pass filter is applied to the Left Wide and Right Wide channels. Adjust the high pass frequency and slope as needed.

6. **HL, HR** – High Left and High Right speaker options:

A. **Large** – (default) select this option if the front high speakers can handle all frequencies.

B. **Small** – A high pass filter is applied to the High Left and High Right channels. Adjust the high pass frequency and slope as needed.

C. **Small, cross to L/R** – The High Left will be crossed to the Left Front speaker and High Right will be crossed to the Right Front speaker. Select the desired crossover filter frequency and slope. In order to use this option, the Left and Right Front speakers should be defined as Large. If not, an error message will appear on the screen.

7. **HC** – High Center speaker options:

A. **Large** – (default) select this option if the front high speakers can handle all frequencies.

B. **Small** – A high pass filter is applied to the Center channel. Adjust the high pass frequency and slope as needed.

C. **Small, cross to C** – The High Center will be crossed to the Center speaker. Select the desired crossover filter frequency and slope. In order to use this option, the Center speaker should be defined as Large. If not, an error message will appear on the screen.

8. **HLs, HRs** – **High Left** Surround and **High Right Surround** speaker options:

A. **Large** – (default) select this option if the high surround speakers can handle all frequencies.

B. **Small** – A high pass filter is applied to the High Left Surround and High Right Surround channels. Adjust the high pass frequency and slope as needed.

C. **Small, cross to Ls/Rs** – The High Left Surround will be crossed to the Left Surround speaker and High Right Surround will be crossed to the Right Surround speaker. Select the desired crossover filter frequency and slope. In order to use this option, the Left Surround and Right Surround speakers should be defined as Large. If not, an error message will appear on the screen.

9. **T** – **Top** speaker options:

A. **Large** – (default) select this option if the Top speaker can handle all frequencies.

B. **Small** – A high pass filter is applied to the Top speaker channel. Adjust the high pass frequency and slope as needed.

C. **Cross to L/R/Ls/Rs** – The Top speaker will be crossed with the Left Front, Right Front, Left Surround, and Right Surround speakers. In order to use this option, the L, R, LS, and Rs speakers should be defined as Large. If not, an error message will appear on the screen.

All speaker configuration options are described in text next to the speaker. This completes the bass management setup using no subwoofers.

Bass Management Theory

Auro Configuration is set up using the Bass Management screen. Bass management balances the bass portion of the audio system based on the speaker configuration. Sub-bass configurations vary from none up to 4 subwoofers.

Crossed Speakers

Each channel may be combined with the LFE channel in order to extend the low range beyond what can be heard from the channel's speaker. The software allows you to set crossover filter frequency and slope to best match the speaker(s). The high pass and low pass filters range from 31Hz to 160Hz, and use either 12dB/octave or 24dB/octave.

Figure 14 illustrates how the left channel input may be divided between the left channel and the LFE channel. Each channel works in a similar fashion. The high pass filter can optionally be bypassed.
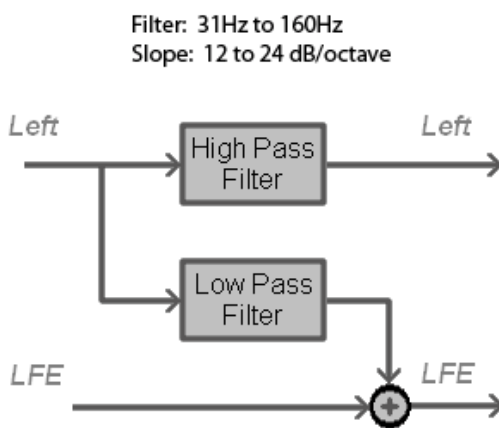
Figure 14. Dividing the Left Channel

There is one configuration for each of the channel pairs, and a separate configuration for the Center, High Center, and Top channels. Individual configurations can be made for the following speakers or speaker pairs:

- Left Front, Right Front (L/R)
- Left Wide Front and Right Wide Front (Lw/Rw)
- Center Speaker (C)
- Left Surround and Right Surround (Ls/Rs)
- Left Back Surround and Right Back Surround (Lb/Rb)
- High Left Front and High Right Front (HL/HR)
- High Center (HC)
- High Left Surround and High Right Surround (HLs/HRs)
- Top (T)

The speakers that are selectable for bass management crossover options depends on the speaker configuration.

Single Subwoofer

A bass management configuration with a single subwoofer will mix the low frequency of all crossover channels with the subwoofer. You can select which speakers to cross by assigning them to be "small" speakers in the bass management configuration setup screens.

Multiple Subwoofers

When there is more than one subwoofer channel assigned using bass management the LFE channel is evenly mixed between all of the subwoofer channels. The LFE input for the subwoofers is attenuated to compensate for having more than one subwoofer. The summed output level can be adjusted for each subwoofer on the Audio Levels screen.

The subwoofers may be configured as either "Mono" or with specific positioning. The Mono subwoofer configuration sets each subwoofer with the same audio mix of the LFE channel with all other channels that are crossed with the subwoofer. There are other subwoofer configurations that identify left/right and front/back positions assigned to each subwoofer.

When left/right subwoofers are used, the speakers on the left will be crossed with the left positioned subwoofer while speakers on the right are crossed with the right positioned subwoofer. The Center, High Center and Top speakers would always be crossed evenly between both sides.

When using Front/Back subwoofers, the front speakers are crossed with front subwoofer while surrounds are crossed with back subwoofer (Sw2). The Top channel is crossed evenly between both Front and Back subwoofers.

An option for three subwoofers is available which has two front subwoofers (left and right), and the third subwoofer in the back. Finally, a 4-subwoofer configuration has left front and right front subwoofers, and left back and right back subwoofers.

Subwoofer Audio Processing

Each subwoofer channel from the bass management output can be adjusted downstream the same as other channels. The downstream processing includes Dirac filters, 1/3 octave EQ, Parametric EQ, output channel routing, and high pass /low pass filtering.

No Subwoofers

When no subwoofer is installed, the LFE can be mixed with the Left/Right and/or Left Surround/Right Surround speakers by having those speakers selected as "Large" in the Speaker Options screen.

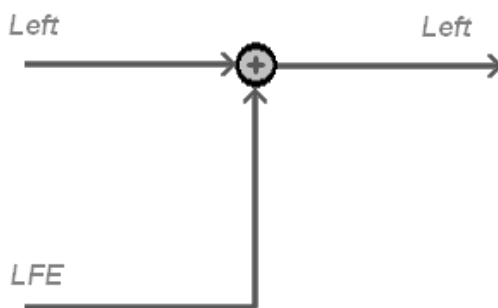Figure 15 illustrates the LFE input being mixed with the left channel.

Figure 15. LFE Mixed with Left Channel

Low Pass to Other Speaker

Certain speakers have an option to have the low end cross with another speaker, instead of a subwoofer. This may help to keep the positioning of the speaker's low end sound, and also to avoid a large number of

speakers being crossed with the subwoofers. This can only be done if the corresponding speaker is defined as a large speaker.

The following speakers can be crossed to other speakers:

- Ls/Rs may crossed to L/R
- Lb/Rb may be crossed to L/R
- HL/HR may be crossed to L/R
- HC may be crossed to C
- T may be crossed to L/R/Ls/Rs.

Phantom Center Option

The Phantom Center option allows you to direct the center channel to the left and right speakers if there is no Center speaker. There is an offset configuration used to increase or decrease the center channel level. Note that 0dB offset is the default and includes the 3dB signal level attenuation needed to account for the sound being sent to 2 speakers.

Phantom Surround Option

The Phantom Surround option allows you to direct the surround channels to the front speakers. This is used for an installation without the surround channels. The left surround channel will be mixed into the left front channel and the right surround channel will be mixed with the right front channel.

HP/LP Filter

The slope can be set at either 12dB/octave or 24dB/octave. The cutoff frequency can be set between 31Hz and 160Hz.

Offset

The offset control appears only for phantom speaker options. It allows the level for that speaker to be adjusted before being mixed with the left or right speaker. The offset level can be adjusted from +3dB to -10dB.

Auro Speaker Configuration

Auro-3D is a sound format that adds both height and top layers of audio to create a fully immersive surround sound experience. Auro-3D incorporates both a decoder, to play back discrete 3D sound mixes (up to 13.1 channels) in their native format and an upmixer, which can create an Auro-3D soundtrack from any source.

Auro 9.1

The minimum configuration for Auro-3D is Auro 9.1, which starts with a base 5.1 layer and adds height speakers corresponding to the Left, Right, Left Surround and Right Surround channels. The height speakers should be placed directly above their corresponding lower layer speakers. The ideal height placement is 30 degrees above horizontal from the listening position. The height speakers may be angled down slightly, but not so much that the speakers are pointed at the listening position.
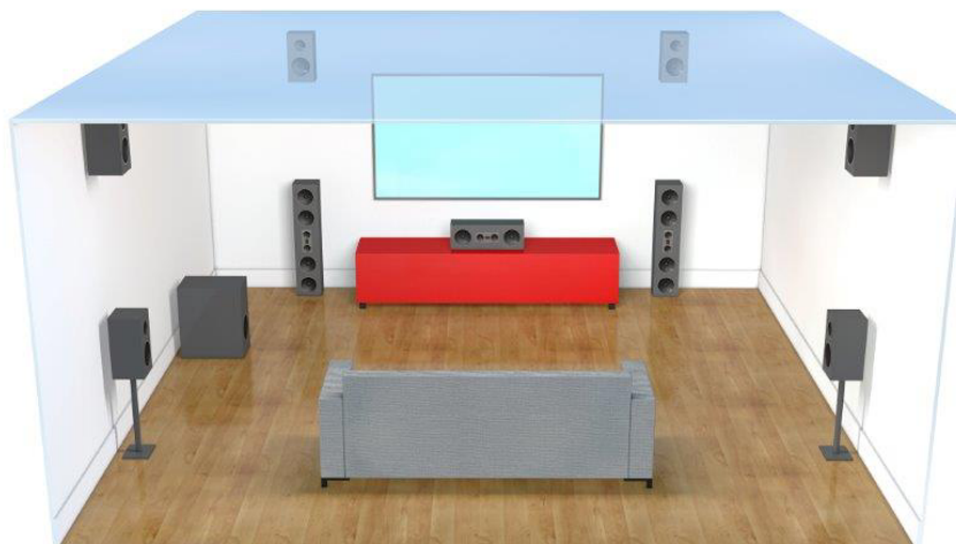
Figure 16. Auro 9.1 Speaker Setup

Auro 10.1

Auro 10.1 adds a recommended overhead speaker, directly above the listening position.

Figure 17. Auro 10.1 Speaker Setup

Auro 11.1

For large rooms, such as those with an acoustically transparent screen, Auro 11.1 completes the height layer by adding a height speaker corresponding to the Center channel.
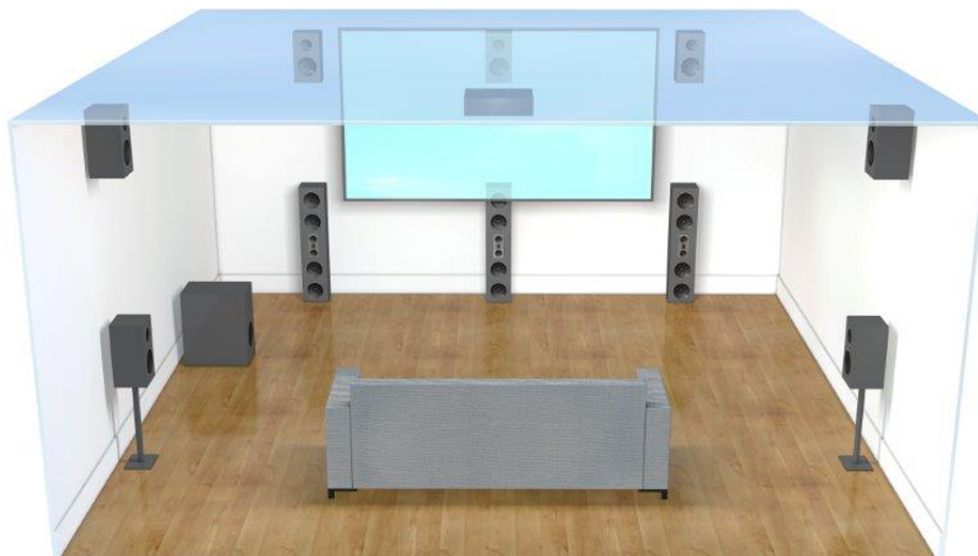

Figure 18. Auro 11.1 Speaker Setup

Auro 13.1

The full configuration for Auro-3D is 13.1, which adds to the 11.1 configuration the Left Back and Right Back speakers used in 7.1 configurations. For a very large room, you may add Left Back Height and Right Back Height speakers, which are ganged with the Left Surround Height and Right Surround Height speakers to create an enveloping sound field for the height layer. Although the Auro format uses a mono overhead channel, you may also for large rooms wish to use more than one overhead speaker to provide even coverage of the listening position from the top layer.

Figure 19. Auro 13.1 Speaker Setup

—END—