



# Bose CSP & AVM-1 AutoVolume

Application Guide

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## Overview

This document provides information about Bose AutoVolume, an ambient noise compensation (ANC) function, available on Bose CSP processors.

AutoVolume compensation continuously monitors and adjusts the output level based on the ambient noise detected in a listening area. This feature requires the Bose AVM-1 sense microphone accessory, which must be calibrated before it can be used for the first time.

AutoVolume compensation is designed to work only in background music applications where you want program audio to be at a lower level than the ambient noise. AutoVolume compensation is not designed to work in applications where you want program audio to rise above the level of ambient noise.

## AVM-1 Sense Microphone

For complete installation instructions, see the installation guide included with the AVM-1 or online at [PRO.BOSE.COM](http://PRO.BOSE.COM).

### General Installation Guidelines

Before installing the AVM-1 sense microphone, please note the following:

Do not install the AVM-1 in a ceiling or ceiling tile that is thicker than **2.5 centimeters** (1 inch).

Avoid placing the AVM-1 near vents, HVAC equipment, or other machinery that could produce vibrations or sounds that would be detected by the microphone.

We recommend using wire no longer than **610 meters** (2,000 feet) to connect the AVM-1 to the Bose CSP. Use shielded twisted-pair plenum wire (**AWG 28 to AWG 20** [0.08 mm<sup>2</sup> to 0.52 mm<sup>2</sup>]).

We recommend installing the AVM-1 in a ceiling directly above the center of the area where ambient noise is likely to occur. If the ceiling is **less than 3.6 meters** (12 feet) high, install the AVM-1 in a wall rather than the ceiling.

Place the AVM-1 at least **1.8 meters** (6 feet) from loudspeakers and at or above the height of the highest loudspeaker. Make sure other loudspeakers are not pointed directly at the AVM-1. This will reduce the possibility of the microphone detecting sounds that are not part of the ambient noise.

We recommend installing the AVM-1 in a ceiling, but if you must install the AVM-1 in a wall, place the AVM-1 at least **3 meters** (10 feet) above the ground and no higher than **7.3 meters** (24 feet). In addition, place the AVM-1 at least **0.9 meters** (3 feet) away from any boundary or structure (ceiling, HVAC materials, pipes, etc.).



### Guidelines for Installation of Multiple Microphones

If you plan to install two or more AVM-1 microphones:

Maintain at least **10.7 meters** (35 feet) between microphones.

Do not install multiple AVM-1 microphones if the loudspeakers in the room are installed at a height **greater than 7.6 meters** (25 feet).

If the loudspeakers in the room are installed at a height of **3.7 meters to 7.6 meters** (12 feet to 25 feet), install one AVM-1 for every **324 square meters** (3,600 square feet).

If the loudspeakers in the room are installed at a height **less than 3.7 meters** (12 feet), install one AVM-1 for every **162 square meters** (1,800 square feet).

Assign each AVM-1 to a unique listening area in the CSP Configuration Utility, and calibrate each AVM-1 for its assigned listening area. Configure the space as though it were divided into separate rooms with physical walls, each with a single AVM-1 and with independent loudspeakers and controllers.

# Bose CSP-428/CSP-1248 Commercial Sound Processors

For complete instructions on installing a Bose CSP and accessing its CSP Configuration Utility, see the installation guide included with the Bose CSP or online at [PRO.BOSE.COM](http://PRO.BOSE.COM).



## AutoVolume Controls

The **AutoVolume Calibration** section on the **Configuration > Listening Areas** page of the CSP Configuration Utility includes the following settings:

**AutoVolume Microphone:** Select the AutoVolume Microphone input that you want to configure and calibrate from the **AutoVolume Microphone** drop-down menu.

**AV: OFF/ON:** Click the **AV** toggle to enable or disable the AutoVolume function in the selected listening area.

**Note:** You can also enable/disable AutoVolume for a listening area on the **Configuration > Schedules** page or by using *ControlSpace Remote (CSR)*.

**Relative Gain:** Determines the volume difference between the background noise and the input assigned to the listening area.

**Note:** You can use the up and down arrows or type directly in the field to adjust the relative gain.

**Note:** When AutoVolume is enabled, you can control this value by using a *ControlCenter* digital zone controller or the *ControlSpace Remote (CSR)* app.

**Advanced:** Opens the **Relative Gain O set** window. The Relative Gain O set value sets the baseline volume level of the listening area. Adjusting this value increases or decreases the overall volume in the listening area.

**Note:** The *Relative Gain O set* value is determined by the AutoVolume calibration algorithm. This advanced setting can be adjusted, but it should be used with caution.

**Note:** The *Advanced* setting appears only after the AVM-1 microphone in the selected listening area has been calibrated and the toggle is set to **AV: ON**. For instructions on adjusting the *Relative Gain O set* value, see **Relative Gain O set (Advanced)** (Page 7).

### AUTOVOLUME CALIBRATION

**AUTOVOLUME MICROPHONE**

source 1
▼

Assigned to zone: 1

Recalibrate
Advanced

**AV: ON**

**RELATIVE GAIN ⓘ**

▼
0.0
▲

**PERFORMANCE METERING**

Metering displays 60 seconds average

**INPUT LEVEL**

**SENSE MIC LEVEL**

**AV GAIN**

## AutoVolume Calibration

To calibrate AutoVolume compensation:

1. Ensure that the system hardware installation is complete and all components are properly connected.
2. Ensure that all inputs that were configured with a **Type** of **AutoVolume Microphone** are included in the **AutoVolume Microphone** drop-down menu, and select the AutoVolume microphone that you want to calibrate.
3. Click the **Calibrate** (or **Recalibrate**, if applicable) button that corresponds to the AutoVolume microphone that you want to calibrate.

**Note:** The button label changes from **Calibrate** to **Recalibrate** after the AVM-1 microphone in the selected listening area has been calibrated.

The **AutoVolume Calibration** window appears.

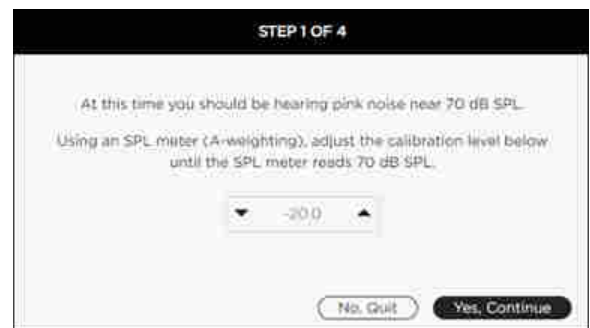
4. Confirm that the AutoVolume microphone installation is complete and that there is no ambient noise. Click **Yes, Continue** to proceed with calibration.

The **Step 1 of 4** window appears.



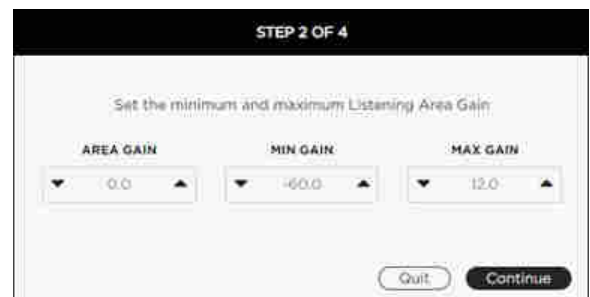
5. As the system plays pink noise, use an SPL meter and adjust the calibration level in the window. When you are finished, click **Yes, Continue**.

The **Step 2 of 4** window appears.

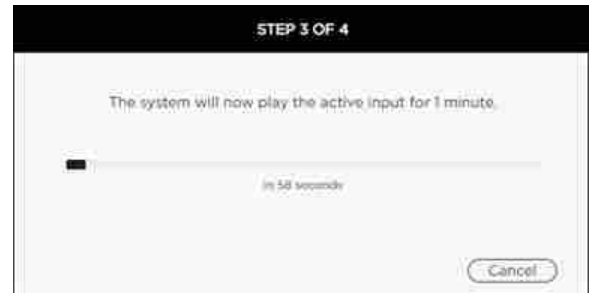


6. Set the **Area Gain**, **Min Gain** (minimum), and **Max Gain** (maximum) gain for the listening area in the window. When you are finished, click **Continue**.

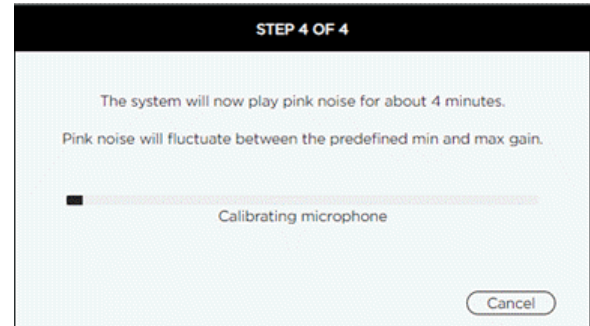
**Note:** In this step, area gain is used to adjust the level of the program material currently being played in the listening area. Use the up/down arrows or type directly in the text box to adjust the **Area Gain** until you reach the desired minimum and maximum gain levels, and then set the respective **Min Gain** and **Max Gain** values. The **Min Gain** and **Max Gain** settings represent the levels between which the AutoVolume algorithm will make adjustments.



The **Step 3 of 4** window appears, and the system plays the active input for one minute.



Next, the **Step 4 of 4** window appears, and the system plays pink noise for approximately four minutes.



7. If the calibration process is successful, the **Calibration Success** window appears. If the process is not successful, the **Calibration Failure** window appears. In either case, click **OK** to close the window.

AutoVolume calibration may fail if the process cannot obtain an adequate source level. This may be due to installation issues or any of the following conditions:

- The loudspeaker tap settings are too high.

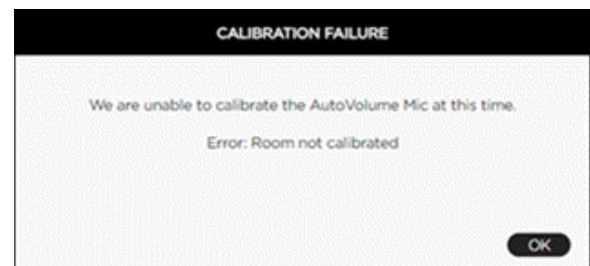
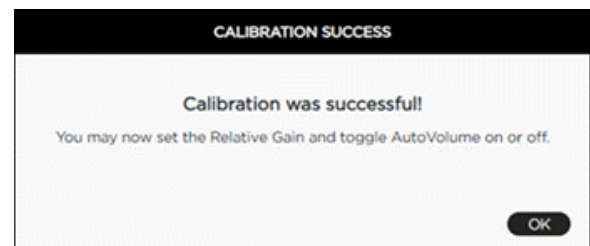
- The maximum output gain is less than  $-20$  dB.

- The input is not operating.

- The input level is too low.

**Note:** After successful calibration, you must set the toggle to **AV: ON** to enable AutoVolume compensation.

After AutoVolume calibration is complete, the AutoVolume function maintains the **Relative Gain** that you configured for the listening area.



## Relative Gain Offset set (Advanced)

The **Relative Gain Offset** set value sets the baseline volume level of the listening area. Adjusting this value increases or decreases the overall volume in the listening area.

**Note:** The **Relative Gain Offset** set value is determined by the AutoVolume calibration algorithm. This advanced setting can be adjusted, but it should be used with caution.

To adjust the **Relative Gain Offset** set value:

1. Complete the AutoVolume calibration procedure as described in **AutoVolume Calibration** (Page 5).
2. Play program material in the AutoVolume listening area.
3. Adjust the **Relative Gain** setting (in the **AutoVolume Calibration** section of the **Configuration > Listening Areas** page) to increase/decrease the overall volume in the listening area. Alternatively, if you have set up a ControlCenter digital zone controller for the listening area, you can use it to adjust the relative gain.

### Notes:

*Adjustments should be made in increments no larger than 3 dB.*

*Adjustments will take effect after a set amount of time, as follows:*

*Increasing gain takes 60 seconds.*

*Decreasing gain takes 120 seconds.*

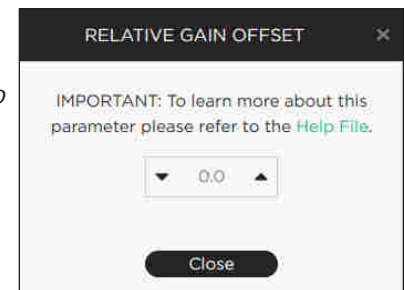
*Wait one to two minutes after adjusting the gain to ensure it is within the appropriate range.*

4. When you are satisfied with the volume level of the room, apply the **Relative Gain** value to the **Relative Gain Offset** set value. For example, if you adjust the **Relative Gain** to **+3.0** and the calibration results in a **Relative Gain Offset** set of **-16.5**, then you would change the **Relative Gain Offset** set to **-13.5**.
  - i. Click **Advanced** (next to the **Recalibrate** button).

**Note:** The **Advanced** setting appears only after the AVM-1 microphone in the selected listening area has been calibrated and the toggle is set to **AV: ON**.

The **Relative Gain Offset** set window appears.

- ii. In the **Relative Gain Offset** set window, use the up/down arrows or type directly into the text box to specify the **Relative Gain Offset** set.
- iii. When you are finished, click **Close**.



**Note:** Use caution when adjusting the **Relative Gain Offset** set. Increasing the **Relative Gain Offset** set allows the user to increase the **Relative Gain** from **-10** to **+6** dB. Setting the **Relative Gain Offset** set too high can lead to a situation in which the user can adjust the **Relative Gain** too high as well. This can cause the system to “run away” (program audio continues to increase until the **Max Gain** setting is reached, and may not decrease in level until the system is restarted). This occurs when the microphone detects the program audio from the loudspeakers at a level that is higher than the ambient noise level.

## Recalibration

Recalibrate AutoVolume compensation if any of the following items change:

- the location of an AVM-1
- the listening area’s physical layout or acoustic dampening
- the model or position of any loudspeaker in the room
- the equalization of a loudspeaker or equalization of a listening area
- the firmware of the Bose CSP

## Confirmation/Testing

To ensure that AutoVolume is functioning properly, we recommend the following:

Use a point-source loudspeaker to project ambient noise into the room.

When increasing the volume level of the ambient noise, allow 60 seconds for the algorithm to begin increasing the volume level of the program audio.

When decreasing the volume level of the ambient noise, allow 120 seconds for the algorithm to begin decreasing the volume level of the program audio.

When configuring settings in the **AutoVolume Calibration** section of the **Configuration > Listening Areas** page in the CSP Configuration Utility:

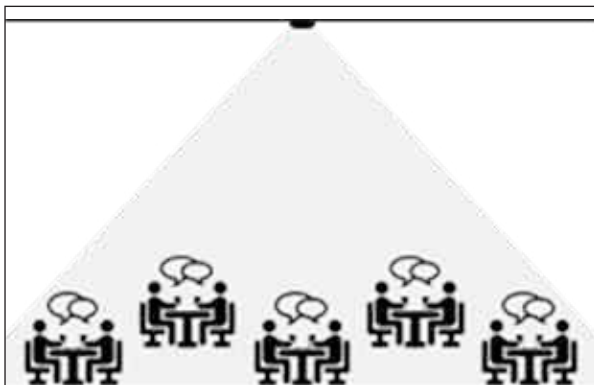
Set the **Relative Gain** to its maximum value of **10 dB**.

Increase the volume level of ambient noise in the room until the **Relative Gain** reaches the **Max Gain** value.

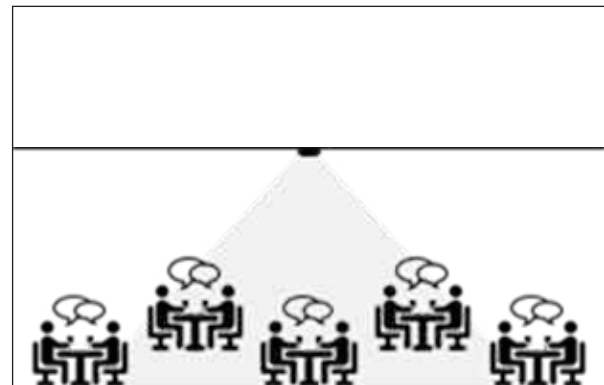
Reduce the volume level of ambient noise in the room and verify that the volume decreases appropriately.

In general, microphones can detect sound at greater distances and at lower and higher frequency ranges than the human ear. Vibrations or sounds outside of your hearing range may be detected by the microphone during calibration, which will cause the volume level of the program audio to be louder than desired. You can compensate for this by lowering the **Relative Gain** value.

The AVM-1 sensing microphone's detection area is limited when it is installed in a low ceiling, as shown in the following illustrations. When a listening area is more crowded, noise is concentrated in the area closest to the microphone, which has greater influence over the volume level of the program audio. You can compensate for this by lowering the **Relative Gain** setting to a negative value.



High-ceiling installation



Low-ceiling installation



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