CAL™ Column Array Loudspeaker

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CHAPTER 1: INTRODUCTION

HOW TO USE THIS MANUAL
Make sure to read these instructions in their entirety before configuring a CAL loudspeaker system. In particular, pay close attention to material related to safety issues.

As you read these instructions, you will encounter the following icons for notes, tips, and cautions:

**NOTE:** A note identifies an important or useful piece of information relating to the topic under discussion.

**TIP:** A tip offers a helpful tip relevant to the topic at hand.

**CAUTION:** A caution gives notice that an action may have serious consequences and could cause harm to equipment or personnel, or could cause delays or other problems.

Information and specifications are subject to change. Updates and supplementary information are available at www.meyersound.com.

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CAL COLUMN ARRAY LOUDSPEAKER

The CAL™ steerable column array loudspeaker incorporates over three decades of technological innovation and advanced research to achieve unprecedented accuracy in sound reproduction. The first loudspeaker to be certified by the AVnu Alliance, the self-powered CAL is designed primarily for vocal reproduction in fixed installations, offering variable vertical beam spread (as narrow as 5 degrees and as wide as 30 degrees) that can be digitally steered up or down by 30 degrees. CAL’s beam steering takes the practice of directing sound to the next level, and with a smart, lean profile, CAL sets the standard for high-quality sound installations.

CAL 96, CAL 64, and CAL 32 (Shown without Grille Frames)
CAL is available in three models, each providing a different output level — up to a maximum peak SPL of 106 dB at 90 meters with CAL 96 — over an operating frequency range of 100 Hz to 16 kHz. Providing a horizontal coverage of 120 degrees, as well as the flexibility of vertical beam steering, a single unobtrusive CAL delivers clear vocal reproduction over a large area while minimizing undesirable reflections.

Discrete onboard class D amplifier channels, processed by sophisticated algorithms, power each driver and tweeter. The amplitude and phase response of each driver are engineered to produce interactions that yield the desired vertical spread. Controlling each element individually yields greater flexibility and precision than other beam steering systems that control modules comprised of multiple drivers.

The accuracy of CAL’s vertical steering allows system designers to pinpoint coverage, even when mounting options in a venue do not allow for physically aiming a loudspeaker toward a coverage area. CAL 96 and CAL 64 include split beams that can be configured to fit the application, for example, to avoid hitting a reflective balcony surface. To meet the high intelligibility requirement for vocal reproduction, CAL maintains accurate beam steering up to 10 kHz, well beyond the benchmark of 4 kHz used in traditional single-driver loudspeakers.

CAL loudspeakers include an AVB-enabled Ethernet port that accepts AVB audio streams as source signals, and also provides computer control of CAL via Meyer Sound’s Compass® control software, which allows beam control and RMS™ real-time monitoring of each loudspeaker on the network.

CAL comes standard with adjustable mounting brackets for installation on walls or columns. The low-profile aluminum enclosure is available in white, black, and custom colors, allowing it to blend easily into any background. Weather protection permits outdoor installations in most environments.

**CAL INSTALLATION OVERVIEW**

Below is a basic overview for installing and using the CAL loudspeaker. It is recommended that you read the remainder of this document in its entirety before proceeding.

1. Use CAL’s included mounting brackets to mount the loudspeaker on a wall or column. For more information, see Chapter 6, “Mounting CAL Loudspeakers.”
2. Remove CAL’s user panel cover. For more information, see “User Panel Cover” on page 20.
3. Connect CAL to an appropriate power source with the included power cable. For power requirements, see Chapter 2, “Power Requirements.”
4. Connect an audio source to one of CAL’s three analog balanced audio inputs, to its AES/EBU digital input, or to its AVB port. For more information, see “Audio Input” on page 15.

   **TIP:** You can connect a second audio source to one of the audio inputs to be used as an override signal.

5. Connect to CAL’s logic I/O ports any external devices you want to use for muting and overriding audio sources, detecting loudspeaker faults, and changing presets. For more information, see “Logic I/O Ports” on page 17.
6. Connect CAL to your computer’s Ethernet port or to a network router or network switch using a CAT-5e cable. For more information, see “Ethernet and AVB Ports” on page 19.
7. Install Compass control software and any supporting software. For installation details, refer to the Compass documentation included with CAL (also available at www.meyersound.com).
8. Launch Compass control software and configure CAL’s audio inputs, vertical beam spread, vertical beam angle, and processing. For more information, refer to the Compass documentation included with CAL (also available at www.meyersound.com).
9. Reattach CAL’s user panel cover. For more information, see “User Panel Cover” on page 20.

   **CAUTION:** When installing CAL outdoors, the user panel cover should always be attached to protect the user panel connectors from the weather elements.
CHAPTER 2: POWER REQUIREMENTS

CAL loudspeakers combine advanced loudspeaker technology with equally advanced power capabilities. Understanding voltage and current requirements, as well as electrical safety issues, is critical to CAL's safe operation.

AC INPUT CONNECTOR

CAL receives AC power from its 3-pole powerCON 20 locking connector. Located on the unit's rear panel, the connector is rated at 20 A and provides locking connections to avoid accidental disconnections. A 10-foot AC power cable, rated at 15 amps, is included with each CAL loudspeaker.

CAL loudspeakers require a grounded outlet. To operate safely and effectively, it is extremely important that the entire system be properly grounded.

If you replace the included AC power cable, make sure to use a cable that is wired correctly and equipped with the appropriate power plug (on the other end) for the area in which you will operate the unit.

WIRING FOR AC CONNECTIONS

CAL loudspeakers require a grounded outlet. To operate safely and effectively, it is extremely important that the entire system be properly grounded.

**AC Cable Wiring Scheme**

When wiring international or special-purpose AC power cables and connectors, use the following wiring scheme:

- Connect the blue wire to the black terminal, or the terminal marked with an N.
- Connect the brown wire to the red terminal, or the terminal marked with an L.
- Connect the yellow and green wire to the green (or green and yellow) terminal, or the terminal marked with an E.

**CAUTION:** When creating AC power cables, it is important to preserve AC line polarity and connect the earth ground on both ends of the cable. CAL requires a grounded connection. Always use a grounded outlet and plug. It is extremely important that the system be properly grounded in order to operate safely and properly. Do not ground-lift the AC cable.
CHAPTER 2: POWER REQUIREMENTS

CAL VOLTAGE REQUIREMENTS
CAL operates as intended when the AC voltage stays within the rated voltage range of 100–240 V AC ± 10% at 50–60 Hz.

If the voltage drops below 90 V, CAL uses stored power to continue operating temporarily; the power supply turns off if the voltage does not return to normal levels.

If the voltage rises above 264 V, the CAL power supply immediately turns off to prevent damage to the unit.

If CAL turns off due to either low or high voltage, its power supply automatically turns on again after 3 seconds, so long as the voltage has returned to normal levels. If CAL does not turn back on after 10 seconds, remove AC power immediately and contact Meyer Sound Technical Support.

CAUTION: The power source for CAL should always operate within the required voltage range, at least a few volts from the upper and lower ranges. This will ensure that AC voltage variations from the service entry — or peak voltage drops due to cable runs — will not cause the loudspeaker’s amplifiers to cycle on and off or cause damage to the power supply.

NOTE: When voltage fluctuates within CAL’s rated voltage range, automatic tap selection stabilizes the operating voltage. This tap selection is instantaneous with no audible artifacts.

NOTE: Since CAL does not require a dedicated neutral line, and it can tolerate elevated voltages from the ground line, it can be connected to line-line terminals in 120 V, 3-phase Wye systems. This results in 208 V AC between lines (nominal) and therefore draws less current than when using 120 V AC (line-neutral). Make sure that the voltage remains within CAL’s recommended operating window (100–240 V AC ± 10%). The ground line must always be used for safety reasons and the line-to-ground voltage should never exceed 264 V AC (typically 120 V AC from line-to-ground).

POWERING ON CAL LOUDSPEAKERS
When AC power is applied to CAL, its Intelligent AC™ power supply automatically selects the correct operating voltage, allowing it to be used internationally without manually setting voltage switches. In addition, Intelligent AC provides soft-start power on, eliminating high inrush currents; suppresses high-voltage transients up to several kilovolts; filters common mode and differential mode radio frequencies (EMI); and sustains operation temporarily during low-voltage periods.

When powering on CAL, the following startup events occur over several seconds:

1. Audio output is muted.
2. Voltage is detected and the power supply mode is automatically adjusted as necessary. The power supply ramps up.
3. After the power on sequence and system check have completed, the ON/Status LED turns solid green, indicating the loudspeaker is ready to reproduce audio.

CAUTION: If the ON/Status LED does not turn solid green after powering on and audio is muted, the loudspeaker has encountered a failure and may need to be serviced. Contact Meyer Sound Technical Support.

CAL CURRENT REQUIREMENTS
The current draw for CAL is dynamic and fluctuates as operating levels change. Since different cables and circuit breakers heat up at varying rates, it is important to understand the following types of current ratings and how they affect circuit breaker and cable specifications.

■ Idle Current — The maximum rms current during idle periods.

■ Maximum Long-Term Continuous Current — The maximum rms current during a period of at least 10 seconds. The Maximum Long-Term Continuous Current is used to calculate temperature increases for cables, to ensure that cable sizes and gauges conform to electrical code standards. The current rating is also used as a rating for slow-reacting thermal breakers.
■ **Burst Current** — The maximum rms current during a period of around one second. The Burst Current is used as a rating for magnetic breakers. It is also used for calculating the peak voltage drop in long AC cable runs according to the following formula:

\[ V_{pk} \text{ (drop)} = I_{pk} \times R \text{ (cable total)} \]

The Burst Current can also be used to calculate the AC looping capability of CAL.

■ **Ultimate Short-Term Peak Current** — A rating for fast-reacting magnetic breakers.

■ **Inrush Current** — The spike of initial current encountered when powering on.

You can use the following table as a guide for selecting cable gauges and circuit breaker ratings for the system’s operating voltage.

### CAL Current Draw

<table>
<thead>
<tr>
<th>Current Draw</th>
<th>Model</th>
<th>115 V AC</th>
<th>230 V AC</th>
<th>100 V AC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Idle</td>
<td>CAL 96</td>
<td>1.98 A rms</td>
<td>1.63 A rms</td>
<td>2.32 A rms</td>
</tr>
<tr>
<td></td>
<td>CAL 64</td>
<td>1.24 A rms</td>
<td>0.99 A rms</td>
<td>1.42 A rms</td>
</tr>
<tr>
<td></td>
<td>CAL 32</td>
<td>0.58 A rms</td>
<td>0.45 A rms</td>
<td>0.65 A rms</td>
</tr>
<tr>
<td>Maximum Long-Term</td>
<td>CAL 96</td>
<td>8.3 A rms</td>
<td>4.2 A rms</td>
<td>9.4 A rms</td>
</tr>
<tr>
<td>Continuous</td>
<td>CAL 64</td>
<td>6.1 A rms</td>
<td>3.1 A rms</td>
<td>6.9 A rms</td>
</tr>
<tr>
<td></td>
<td>CAL 32</td>
<td>3.3 A rms</td>
<td>1.7 A rms</td>
<td>3.7 A rms</td>
</tr>
<tr>
<td>Burst</td>
<td>CAL 96</td>
<td>14.7 A rms</td>
<td>7.3 A rms</td>
<td>18.5 A rms</td>
</tr>
<tr>
<td></td>
<td>CAL 64</td>
<td>10.8 A rms</td>
<td>5.4 A rms</td>
<td>13.6 A rms</td>
</tr>
<tr>
<td></td>
<td>CAL 32</td>
<td>5.9 A rms</td>
<td>2.9 A rms</td>
<td>7.4 A rms</td>
</tr>
<tr>
<td>Maximum Instantaneous</td>
<td>CAL 96</td>
<td>33 A peak</td>
<td>18 A peak</td>
<td>40 A peak</td>
</tr>
<tr>
<td>Peak</td>
<td>CAL 64</td>
<td>24 A peak</td>
<td>13 A peak</td>
<td>29 A peak</td>
</tr>
<tr>
<td></td>
<td>CAL 32</td>
<td>13 A peak</td>
<td>7 A peak</td>
<td>16 A peak</td>
</tr>
<tr>
<td>Inrush</td>
<td>CAL 96</td>
<td>90 A peak</td>
<td>75 A peak</td>
<td>65 A peak</td>
</tr>
<tr>
<td></td>
<td>CAL 64</td>
<td>40 A peak</td>
<td>65 A peak</td>
<td>40 A peak</td>
</tr>
<tr>
<td></td>
<td>CAL 32</td>
<td>20 A peak</td>
<td>60 A peak</td>
<td>23 A peak</td>
</tr>
</tbody>
</table>

The minimum electrical service amperage required by a CAL loudspeaker system is the sum of the Maximum Long-Term Continuous Current for each loudspeaker. An additional 30 percent above the minimum amperage is recommended to prevent peak voltage drops at the service entry.

**NOTE:** For best performance, the AC cable voltage drop should not exceed 10 V, or 10 percent at 115 V and 5 percent at 230 V. Make sure that even with AC voltage drops that the AC voltage always remains within the recommended operating window.

### ELECTRICAL SAFETY ISSUES

Pay close attention to these important electrical and safety issues.

■ CAL requires a grounded outlet. Always use a grounded outlet and plug.

■ Do not use a ground-lifting adapter or cut the AC cable ground pin.

■ Make sure the AC power cable for the loudspeaker has the appropriate power plug (on the other end) for the area in which you will operate the loudspeaker. In addition, the AC power cable must be rated for the total current draw of all loudspeakers looped from the power source.

■ Do not operate the unit if its power cable is frayed or broken.

■ Keep all liquids away from CAL loudspeakers to avoid hazards from electrical shock.
CHAPTER 3: CAL USER PANEL

The CAL user panel includes audio input connectors, both analog and digital (AES/EBU), for receiving audio source signals. It also includes logic connectors for selecting presets, overriding and muting audio output, and monitoring loudspeaker faults. The Ethernet and AVB ports allow interfacing with a Mac® or Windows®-based computer running Compass control software. The AVB-enabled Ethernet port can also be used for receiving AVB audio streams as audio source signals.

AUDIO INPUT

CAL includes four numbered audio inputs: three analog and one digital. The three analog inputs also provide loop output for looping multiple loudspeakers from a single audio source. In Compass control software, a single input is specified as the active input, and another input can be specified as an override input (when the installation requires CAL to function as part of a fire alarm or evacuation system).

NOTE: AVB audio streams received by the AVB port can also be used as audio sources. For more information, see “OLED Button” on page 19.

NOTE: CAL ships from the factory with Analog Input 1 selected as the active input, and no input selected for the override input. These inputs can be changed with Compass control software. For more information, refer to the Compass documentation included with CAL (also available at www.meyer-sound.com).

Analog Inputs (1–3)

The three analog inputs use Phoenix 6-pin male connectors and accept balanced audio signals with an input impedance of 10 kOhm. The analog audio source is received via the connector’s top three pins (shield, positive, and negative). The signal is looped to the connector’s bottom three pins (also shield, positive, and negative) for output when looping multiple loudspeakers from a single audio source. The pins for the analog connectors are clearly labeled on the CAL user panel.
CHAPTER 3: CAL USER PANEL

The positive (+) and negative (–) pins carry the input as a differential signal. The shield (S) pin is connected to earth through a 1 kOhm, 1000 pF, 15 V clamped network. This circuitry provides virtual ground lift for audio frequencies while allowing unwanted signals to bleed to ground. When assembling cables, make sure all three pins are connected on both ends. Telescopic grounding is not recommended, and shorting an input connector pin to the case may cause a ground loop, resulting in hum.

Looping CAL Loudspeakers

The Analog input connectors allow multiple CAL loudspeakers to be looped from a single audio source. Connect the loop output pins of the first loudspeaker to the input pins of the second loudspeaker, and so forth. The loop output pins are wired in parallel to the input pins and transmit the unbuffered source signal even when the loudspeaker is powered off.

NOTE: Make sure that cabling for looped loudspeakers is wired correctly (shield to shield, positive to positive, and negative to negative) to prevent the polarity from being reversed. If one or more loudspeakers in a system have reversed polarity, frequency response and coverage can be significantly degraded.

Digital AES/EBU (4)

The digital input uses a Phoenix 6-pin male connector and accepts an AES3 digital audio signal. The digital audio source is received via the connector’s top three pins (shield, positive, and negative). The connector’s bottom three pins are not used. The pins for the digital connector are clearly labeled on the CAL user panel.

NOTE: The AES/EBU port accepts single-channel (mono) digital audio sources. When connecting AES/EBU audio sources to CAL, you must specify in Compass control software whether the left channel (AES L) or right channel (AES R) will be used.

ON/STATUS LED

During normal operation, CAL’s On/Status LED is green. If the loudspeaker’s internal temperature reaches 75° C (167° F), the LED turns solid yellow and the loudspeaker’s gain is reduced by 3 dB. Though CAL will continue to operate normally with the lower gain, when the On/Status LED is yellow, this is an indication that the loudspeaker is reaching its maximum heat dissipation and a reduction in SPL is rec-
ommended. When the loudspeaker's internal temperature cools to 60° C (140° F), the amplifier returns to normal operation.

**TIP:** When CAL is connected to a computer running Compass control software, the RMS tab provides additional feedback and warnings, if encountered, on the loudspeaker's operating temperature.

### LIMIT LEDS

Limit LEDs

When source levels for CAL exceed the maximum input levels for its drivers, limiting is engaged and is indicated by the two Limit LEDs on the CAL user panel. The left LED indicates limiting for low-frequency channels while the right LED indicates limiting for high-frequency channels. When engaged, limiting not only protects the drivers, but also prevents signal peaks from causing excessive distortion in the amplifier channels, thereby preserving headroom and maintaining smooth frequency responses at high levels. When source levels return to normal, below the limiter's threshold, limiting ceases.

CAL performs within its acoustical specifications when the Limit LEDs are unlit, or if the LEDs are lit for 2 seconds or less and then turn off for at least 1 second. If an LED remains lit for longer than 3 seconds, the loudspeaker enters hard limiting where:

- Increases to the input level have no effect.
- Distortion increases due to clipping and nonlinear driver operation.
- Drivers are subjected to excessive heat and excursion, which will compromise their life span and may eventually cause damage over time.

**CAUTION:** The Limit LEDs indicate when a safe, optimum level is exceeded. If a CAL loudspeaker begins to limit before reaching the required SPL, consider replacing it with a CAL model with more amplifier channels, or consider adding more CAL loudspeakers to the system to achieve the desired SPL without exposing the loudspeakers to excessive levels and possible overheating.

### LOGIC I/O PORTS

The Logic I/O connectors provide a range of control and monitoring for CAL, including changing presets, overriding and muting the input signal, monitoring loudspeaker faults, and providing voltage output. The Logic I/O connectors are optically isolated from the CAL loudspeaker circuitry. The three COM pins are isolated from each other to set the reference voltage for their associated logic pins. A logic pin is triggered when it receives a voltage of 3 to 20 V DC greater than its associated COM voltage.

**CAUTION:** Do not send voltages greater than 20 V DC to the Logic I/O pins as this may damage the input circuitry.

### Presets 1–4

CAL presets recall loudspeaker settings for beam control and processing (5-band parametric EQ, gain, and delay). Presets are edited in Compass control software. An unlimited number of presets can be saved and stored on your computer but only four presets can be stored in the CAL loudspeaker. When CAL is not connected to a computer, presets can be selected by sending control voltages to the A1 and A2 pins.

Table 1 illustrates the logic for selecting presets with control voltages.

<table>
<thead>
<tr>
<th>Preset</th>
<th>A1</th>
<th>A2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preset 1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Preset 2</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Preset 3</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Preset 4</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

For example, to select preset 2, a voltage of 3 V DC is sent to the A2 pin while 0 V DC is sent to the A1 and COM A2.

**NOTE:** The A1 and A2 pins are triggered when receiving a voltage of 3 to 20 V DC greater than their associated COM voltage.
CAL Factory Presets

A summary of the beam settings for the CAL factory presets is shown in Table 2. CAL ships from the factory with these presets loaded into the loudspeaker. The presets can be edited and overwritten with Compass control software. For more information, refer to the Compass documentation included with CAL (also available at www.meyersound.com).

Table 2: CAL Factory Presets

<table>
<thead>
<tr>
<th>Preset</th>
<th>Vertical Beam Angle</th>
<th>Vertical Beam Spread</th>
<th>Vertical Beam Split</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preset 1</td>
<td>0 degrees</td>
<td>5 degrees</td>
<td>None</td>
</tr>
<tr>
<td>Preset 2</td>
<td>5 degrees</td>
<td>5 degrees</td>
<td>None</td>
</tr>
<tr>
<td>Preset 3</td>
<td>-17 degrees</td>
<td>25 degrees</td>
<td>None</td>
</tr>
<tr>
<td>Preset 4</td>
<td>-30 degrees</td>
<td>5 degrees</td>
<td>None</td>
</tr>
</tbody>
</table>

Fault Contact Pins

The Fault Contact pins report when CAL shuts down or is no longer active. When CAL is powered on and working normally, the NO (normally-open) pins are open and the NC (normally-closed) pins are shorted together. When the loudspeaker is powered off, its internal relays switch so that the NO (normally-open) pins are shorted and the NC (normally-closed) pins are opened. The three Fault Contact pins are provided to accommodate monitoring for either short circuits or open circuits.

Override and Mute

For installations where CAL is part of a fire alarm or evacuation system, the loudspeaker’s active audio input (main program source) can be muted or replaced with an override input (alarm or emergency announcement source). The mute or override can be triggered with a relay closure attached to the Mute or Override pins.

The Mute pin is triggered when it receives a voltage of 3 to 20 V DC greater than its associated COM pin. When triggered, the Mute pin instructs CAL to mute its audio output.

The Override pin is triggered when it receives a voltage of 3 to 20 V DC greater than its associated COM pin. When triggered, the Override pin instructs CAL to override the active audio input with the override input. Both the active input and override input are specified in Compass control software.

+5 V DC Power Source

CAL offers a local +5 V DC power source as a convenient means for controlling its Logic I/O features. The +5 V DC pins provide an isolated +5 V DC output that can be connected to any of the Logic I/O pins through an external relay or switch, eliminating the need for an external control voltage. The +5 V DC pin is fused at 0.35 A.
ETHERNET AND AVB PORTS

CAL’s Ethernet and AVB ports use RJ-45 Ethernet connectors and allow the loudspeaker to be connected to a standard computer Ethernet port, network router, or switch with a CAT-5e cable. Each port uses the IPv6 protocol for network communication and has an independent Media Access Control (MAC) address that is static and preassigned.

**NOTE:** The Ethernet and AVB ports do not provide loop output and do not allow looping of multiple CAL loudspeakers from a single audio source.

When CAL is connected to a Mac or Windows-based computer, Compass control software lets you configure beam spread and beam angle, and upload these settings as a preset to CAL. Compass also includes an RMS tab for remote monitoring of all CAL loudspeakers on the network.

**Ethernet Port**
The Ethernet port accepts Ethernet connections for local control of CAL using Compass control software. This port is not AVB-enabled.

**AVB Port**
The AVB port accepts AVB-enabled Ethernet connections for integrated AVB audio and Compass control. AVB audio stream inputs received by CAL’s AVB port can be used as audio sources. In Compass control software, AVB audio streams for the port can be specified as the active input or override input.

**Ethernet and AVB Port LEDs**
The yellow and green LEDs on each port indicate connection status and data traffic, as on standard Ethernet ports.

OLED BUTTON

The OLED button is located in the upper right of the CAL user panel and provides visual feedback on the unit. During startup, the OLED displays CAL’s Network port addresses. The addresses can also be viewed after startup.

To view CAL’s Network port addresses:

- Press and hold the OLED button until the addresses appear.

The address for the left (Ethernet) port is displayed when the OLED button displays a left arrow. The address for the right (AVB) port is displayed when the OLED button displays a right arrow.

AMPLIFIER COOLING SYSTEM

CAL employs a combination of natural convection and forced air in its cooling system. The amplifier’s heat sink provides natural convection cooling from the air flowing near its fins. In addition, a single-speed fan circulates air internally to ensure that CAL remains operational when exposed to high ambient temperatures or when driven continuously at high output levels.

**CAUTION:** The CAL heat sink can reach temperatures up to 85° C (185° F) during extreme operation. Use caution when approaching the rear of the loudspeaker.
CHAPTER 3: CAL USER PANEL

USER PANEL COVER
A user panel cover is included with CAL to protect the connectors from dust in indoor installations and the weather elements in outdoor installations. The cover is installed by default and must be removed to gain access to the user panel.

CAUTION: When installing CAL outdoors, the user panel cover should always be attached to protect the user panel connectors from the weather elements.

Removing and Installing the User Panel Cover
To remove and install the user panel cover:
1. Use a hex wrench to remove the four hex screws, flat washers, and lock washers securing the user panel cover to the CAL loudspeaker.
2. Attach any required cables to the user panel connectors.
3. Reattach the user panel cover, securing it with the previously removed hex screws, lock washers, and flat washers. Install the flat washers before the lock washers so the user cover panel is adequately sealed.

CAL User Panel Cover

CAL with User Panel Cover Attached (Shown Transparent)
CHAPTER 4: CAL COVERAGE

SUMMARY OF CAL COVERAGE

Below is a summary of the supported horizontal and vertical coverages for the three CAL loudspeaker models.

Table 3: CAL Coverage

<table>
<thead>
<tr>
<th>Model</th>
<th>Horizontal Fixed Coverage</th>
<th>Vertical Beam Spread</th>
<th>Vertical Beam Angles</th>
<th>Vertical Beam Splits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CAL 96</td>
<td>120°</td>
<td>5° to 30° (in 5° increments)</td>
<td>±30° (in 1° increments)</td>
<td>Top, Bottom</td>
</tr>
<tr>
<td>CAL 64</td>
<td>120°</td>
<td>5° to 30° (in 5° increments)</td>
<td>±30° (in 1° increments)</td>
<td>Center</td>
</tr>
<tr>
<td>CAL 32</td>
<td>120°</td>
<td>5° to 30° (in 5° increments)</td>
<td>±30° (in 1° increments)</td>
<td>None</td>
</tr>
</tbody>
</table>

**NOTE:** Beams are configured in Compass control software and can be saved as part of a preset. For more information, refer to the Compass documentation included with CAL (also available at www.meyersound.com).

**NOTE:** For a list of the beam coverages included with the CAL factory presets, see “CAL Factory Presets” on page 18.

HORIZONTAL FIXED COVERAGE

All CAL loudspeakers include 120 degrees of fixed horizontal coverage.
CHAPTER 4: CAL COVERAGE

VERTICAL BEAM ANGLE
All CAL loudspeakers include vertical beam angles of ±30 degrees in 1-degree increments. The beams can also be of any supported vertical spread (from 5 to 30 degrees).

+30° Beam Angle with 5° Beam Spread

-30° Beam Angle with 5° Beam Spread

VERTICAL BEAM SPREAD
All CAL loudspeakers include vertical beams with variable spreads from 5 to 30 degrees in 5-degree increments. The vertical beams can also be steered.

Minimum Vertical Beam Spread, 5°

Maximum Vertical Beam Spread, 30°
Figure 1 illustrates the vertical acoustical center points for the three CAL models, from which the beams emanate. The acoustical center points also represent the axis for beam angles.

**NOTE:** For the acoustical center points of beam split configurations, see “Vertical Beam Splits” on page 23.

**VERTICAL BEAM SPLITS**

The CAL 64 and CAL 96 models include beam split coverage modes to aim sound toward two destinations or to avoid reflective surfaces such as a balcony. The beam splits can also be configured with beam angles (see “Vertical Beam Angle” on page 22) and beam spreads (see “Vertical Beam Spread” on page 22).

**CAL 64 Center Split Beams**

The CAL 64 model includes a center split beam coverage with the top beam emanating from the top 32 drivers and the bottom beam emanating from the bottom 32 drivers. Figure 2 shows a CAL 64 with center split beams, each with 5-degree beam spread. Also illustrated are the beams’ acoustical center points.

![Figure 2: CAL 64 Center Split Beams with 5° Beam Spread](image)
CAL 96 Top Split Beams

The CAL 96 model includes a top split beam coverage with the top beam emanating from the top 32 drivers and the bottom beam emanating from the bottom 64 drivers. Figure 3 shows a CAL 96 with top split beams, each with 5-degree beam spread. Also illustrated are the beams’ acoustical center points.

NOTE: When using the CAL 96 top split beam configuration, the bottom beam utilizes more driver channels and therefore yields greater SPL than the top beam.

CAL 96 Bottom Split Beams

The CAL 96 model also includes a bottom split beam coverage with the top beam emanating from the top 64 drivers and the bottom beam emanating from the bottom 32 drivers. Figure 4 shows a CAL 96 with bottom split beams, each with 5-degree beam spread. Also illustrated are the beams’ acoustical center points.

NOTE: When using the CAL 96 bottom split beam configuration, the top beam utilizes more driver channels and therefore yields greater SPL than the bottom beam.
CHAPTER 5: COMPASS CONTROL SOFTWARE

Compass control software provides comprehensive control of CAL through a graphical user interface. The software enables easy access to all CAL features and even provides control of multiple units. Compass runs on a Mac or Windows-based computer.

With Compass you can:

- Set the active input and override input
- Configure vertical beam spread, vertical beam angle, and beam split
- Assign processing to beams, including gain, delay, and parametric EQ
- Edit, store, recall, and organize CAL presets
- Test logic I/O, including input mute, input override, fault contact, and preset selection
- Monitor loudspeaker system status and performance data from the RMS tab

Compass includes full copy and paste of all settings and groups of settings, and multiple levels of undo. The tabbed interface can be scaled to any display resolution and the colors can be configured for day or night. Compass has the same user interface, whether running on a Mac or Windows-based computer, so switching between platforms is completely transparent.

The Beam Control tab displays CAL’s vertical beam spread and vertical beam angle, both of which can be altered by entering angle values or by dragging in the beam view area. Beam splits can also be configured on the Beam Control tab (CAL 64 and CAL 96 only).

The RMS tab reports extensive system status and performance data for each CAL loudspeaker on the network, including amplifier voltage, limiting activity, power output, driver status, and temperature. The RMS Overview tab displays all CAL loudspeakers on the network with loudspeaker icons with color-coded feedback for the different loudspeaker components.

Compass Control Software, RMS Overview Tab

TIP: For information on installing and using Compass control software, refer to the Compass documentation included with CAL (also available at www.meyersound.com).
CHAPTER 6: MOUNTING CAL LOUDSPEAKERS

CAL comes standard with adjustable brackets that allow it to be mounted on walls or columns.

**NOTE:** Before mounting CAL, make sure to allow for the necessary cable runs to its audio sources, host computer, and any control devices or switches you intend to use.

**IMPORTANT SAFETY CONSIDERATIONS!**

When installing Meyer Sound loudspeakers, the following precautions should always be observed:

- All Meyer Sound products must be used in accordance with local, state, federal, and industry regulations. It is the owner’s and user’s responsibility to evaluate the reliability of any rigging or mounting method for their application. Rigging should only be carried out by experienced professionals.

- Use mounting and rigging hardware that has been rated to meet or exceed the weight being hung.

- Make sure to attach mounting hardware to the building’s structural components (studs or joists), and not just to the wall surface. Verify that the building’s structure and the anchors used for the installation will safely support the total weight of the mounted loudspeakers.

- Use mounting hardware appropriate for the material where the loudspeaker will be installed.

- Make sure bolts are tightened securely. Meyer Sound recommends using Loctite® on bolt threads.

- Inspect mounting and rigging hardware regularly. Immediately replace any worn or damaged components.

### CAL WALL MOUNT BRACKETS

CAL comes standard with wall mount brackets that include the following components.

**CAL Wall Mount Bracket Components**

<table>
<thead>
<tr>
<th>Item</th>
<th>Part Number</th>
<th>Fasteners Included?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wall Mount Plate (Top)</td>
<td>64.210.018.01 (Black) 64.210.018.02 (White)</td>
<td>No (Use fasteners appropriate for wall material)</td>
</tr>
<tr>
<td>Wall Mount Plate (Bottom)</td>
<td>64.210.031.01 (Black) 64.210.031.02 (White)</td>
<td>No (Use fasteners appropriate for wall material)</td>
</tr>
<tr>
<td>Loudspeaker Bracket (Top)</td>
<td>64.210.015.01 (Black) 64.210.015.02 (White)</td>
<td>Yes (Hardware included to attach bracket to loudspeaker)</td>
</tr>
<tr>
<td>Loudspeaker Bracket (Bottom)</td>
<td>64.210.032.01 (Black) 64.210.032.02 (White)</td>
<td>Yes (Hardware included to attach bracket to loudspeaker)</td>
</tr>
<tr>
<td>Endcap (Top)</td>
<td>60.210.012.01 (Black) 60.210.012.02 (White)</td>
<td>Yes (Hardware included to attach endcap to loudspeaker)</td>
</tr>
<tr>
<td>Endcap (Bottom)</td>
<td>60.210.013.01 (Black) 60.210.013.02 (White)</td>
<td>Yes (Hardware included to attach endcap to loudspeaker)</td>
</tr>
<tr>
<td>5/16 x 5” Quick-release pins (2)</td>
<td>134.046</td>
<td>—</td>
</tr>
</tbody>
</table>
MOUNTING CAL LOUDSPEAKERS

CAL loudspeakers come preconfigured with their loudspeaker brackets already installed. After installing the wall mount plates, install CAL onto the wall, rotate the loudspeaker to adjust its horizontal coverage, tighten the top and bottom nuts, and attach the endcaps.

To mount CAL on a wall:

1. Mount the top and bottom wall mount plates on the wall:
   - Mark two holes on the wall for each wall mount plate using their center mounting holes as a guide.
   - If you are mounting CAL on a wall with wood studs, locate the wall stud.
   - Orient the wall mount plates with the side slots up and make sure the top plate (the smaller one) is mounted the appropriate distance above the lower plate for your CAL loudspeaker.

   ![Top wall mount plate]

   ![Bottom wall mount plate]

   **NOTE:** Orient the wall mount plates with the side slots up.

   ![Diagram of wall mount plates]

   Use a level and straight edge to make sure the top and bottom wall mount plates are vertically aligned.

   ![Diagram showing vertical alignment of wall mount plates]

   **NOTE:** Orient the wall mount plates with the side slots up.

2. Drill pilot holes at the four marked locations. Make sure not to over-drill the pilot holes. The depth and diameter of the pilot holes should be around 50 percent of the length and diameter of the fasteners.

   **NOTE:** The center mounting holes for the wall mount plates are 0.28 inches (7.1 mm) in diameter.

3. If mounting CAL on a concrete or metal wall, install wall anchors (not included) in the pilot holes. Install the wall anchors so they are flush with the wall surface.

4. Secure the wall mount plates to the wall with fasteners (not included) appropriate for the wall material and rated to hold the weight of the loudspeaker.

   CAL 96 weight: 173 lbs (78.5 kg)
   CAL 64 weight: 124 lbs (56.2 kg)
   CAL 32 weight: 80 lbs (36.3 kg)

   **NOTE:** Weights include top and bottom loudspeaker brackets, top and bottom endcaps.
2. If they have not already been attached, attach the loudspeaker brackets to CAL:
   - Place the loudspeaker face down on a soft flat surface.
   - Attach the top loudspeaker bracket (the smaller one) to the top of the loudspeaker and secure it with the included hex nut, lock washer, steel flat washer, nylon flat washer, and spacer. Hand-tighten the hex nut.
   - Attach the bottom loudspeaker bracket (the larger one) to the bottom of the loudspeaker and secure it with the included hex nut, lock washer, steel flat washer, nylon flat washer, and spacer. Hand-tighten the hex nut.

3. Mount CAL on the wall:
   - Insert the bottom of the loudspeaker into the bottom wall mount plate. The loudspeaker bracket should rest cleanly in the wall plate.
   - **TIP:** An eye nut (not included) can be temporarily attached to CAL's 1/2"-13 top attachment bolt (instead of the loudspeaker plate) to lift up the unit when inserting the bottom of the loudspeaker into the bottom wall mount plate. The eye nut can then be removed and replaced with the top loudspeaker bracket.
   - While resting the bottom of the loudspeaker in the lower wall mount plate, slowly hinge the top of the loudspeaker toward the wall until it aligns with the top wall mount plate.
   - Insert the included quick-release pin into the screw hole of the top loudspeaker bracket (either side). The quick-release pin holds the loudspeaker in place.
CHAPTER 6: MOUNTING CAL LOUDSPEAKERS

■ Insert the included quick-release pin into the screw hole of the bottom loudspeaker bracket (either side). The quick-release pin holds the loudspeaker in place.

■ Secure the top of the loudspeaker with the included 3/8"-16 hex screws, lock washers, and flat washers (both sides).

■ Secure the bottom of the loudspeaker with the included 3/8-16 hex screws, lock washers, and flat washers (both sides).

4. Rotate CAL left or right to position its horizontal dispersion for the desired coverage.

5. Fully tighten the hex nuts securing the top and bottom loudspeaker brackets.

6. Attach the endcaps to CAL:

■ Align the top endcap (the one without the drainage slot) with the top screw holes and secure the endcap with the included 10-32 panhead screws and washers.

■ Align the bottom endcap (the one with the drainage slot) with the bottom screw holes and secure the endcap with the included 10-32 panhead screws and washers.
## APPENDIX A: CAL SPECIFICATIONS

### ACoustical

<table>
<thead>
<tr>
<th>Specification</th>
<th>CAL 96 (24) 4-inch cone drivers, (72) 20-mm tweeters</th>
<th>CAL 64 (16) 4-inch cone drivers, (48) 20-mm tweeters</th>
<th>CAL 32 (8) 4-inch cone drivers, (24) 20-mm tweeters</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating Frequency Range</td>
<td>100 Hz – 16 kHz&lt;br&gt;Note: Recommended maximum operating frequency range. Response depends on loading conditions and room acoustics.</td>
<td>105 Hz – 15 kHz ±4 dB&lt;br&gt;Note: Measured free field with 1/3-octave frequency resolution at 4 meters.</td>
<td>230 Hz – 16.9 kHz ±45 degrees&lt;br&gt;Note: Measured with single beam, 5-degree vertical spread, and no steering.</td>
</tr>
<tr>
<td>Frequency Response</td>
<td>106 dB peak at 90 m (295 ft)</td>
<td>106 dB peak at 60 m (196 ft)</td>
<td>106 dB peak at 30 m (98 ft)</td>
</tr>
<tr>
<td>Phase Response</td>
<td>±45 degrees</td>
<td>±45 degrees</td>
<td>±45 degrees</td>
</tr>
<tr>
<td>Maximum Peak SPL</td>
<td>CAL 96</td>
<td>CAL 64</td>
<td>CAL 32</td>
</tr>
<tr>
<td>Horizontal Coverage</td>
<td>120 degrees</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vertical Beam Spread</td>
<td>Variable, 5 degrees to 30 degrees in 5-degree increments</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vertical Beam Angle</td>
<td>±30 degrees in 1-degree increments</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vertical Beam Splits</td>
<td>CAL 96 Top split, bottom split</td>
<td>CAL 64 Center split</td>
<td>CAL 32 None</td>
</tr>
</tbody>
</table>

### CROSSOVER

<table>
<thead>
<tr>
<th>Specification</th>
<th>2 kHz&lt;br&gt;Note: At this frequency, the transducers produce equal sound pressure levels.</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Crossover</td>
<td>2 kHz</td>
<td></td>
</tr>
</tbody>
</table>

### TRANSDUCERS

<table>
<thead>
<tr>
<th>Specification</th>
<th>CAL 96 (24) 4-inch cone drivers, (72) 20-mm tweeters</th>
<th>CAL 64 (16) 4-inch cone drivers, (48) 20-mm tweeters</th>
<th>CAL 32 (8) 4-inch cone drivers, (24) 20-mm tweeters</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low-frequency and high-frequency</td>
<td>(24) 4-inch cone drivers, (72) 20-mm tweeters</td>
<td>(16) 4-inch cone drivers, (48) 20-mm tweeters</td>
<td>(8) 4-inch cone drivers, (24) 20-mm tweeters</td>
</tr>
</tbody>
</table>

### AUDIO / CONTROL

<table>
<thead>
<tr>
<th>Specification</th>
<th>3 (Phoenix 6-pin male connectors for balanced audio input and loop output)</th>
<th>1 (Phoenix 6-pin male connector for AES/EBU input&lt;br&gt;Note: The connector’s bottom three pins are not used.)</th>
<th>1 (AVB-enabled Ethernet port for integrated audio streaming, beam control and RMS monitoring via Compass control software.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Analog Audio</td>
<td>(3) Phoenix 6-pin male connectors for balanced audio input and loop output</td>
<td>1 Phoenix 6-pin male connector for AES/EBU input&lt;br&gt;Note: The connector’s bottom three pins are not used.</td>
<td>1 AVB-enabled Ethernet port for integrated audio streaming, beam control and RMS monitoring via Compass control software.</td>
</tr>
<tr>
<td>Digital Audio</td>
<td>(1) Phoenix 6-pin male connector for AES/EBU input&lt;br&gt;Note: The connector’s bottom three pins are not used.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ethernet</td>
<td>(1) Ethernet port for beam control and RMS monitoring via Compass control software</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AVB</td>
<td>(1) AVB-enabled Ethernet port for integrated audio streaming, beam control and RMS monitoring via Compass control software.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Processing</td>
<td>Mute, gain, 5-band parametric EQ, and delay, stored in four onboard presets&lt;br&gt;Note: Processing and beam settings can be edited in Compass control software and saved in four onboard presets.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Logic I/O</td>
<td>Phoenix 6-pin male connector, recalls onboard presets, reports relay closures (and openings) for fault reports; Phoenix 5-pin male connector, triggers emergency mute and input override</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Display</td>
<td>OLED button displays CAL’s network addresses during startup or when the button is pushed</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### AMPLIFIER

<table>
<thead>
<tr>
<th>Specification</th>
<th>Multichannel class D, one channel per driver</th>
</tr>
</thead>
</table>
**CAL Specifications**

<table>
<thead>
<tr>
<th>Number of Channels</th>
<th>CAL 96</th>
<th>96</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>CAL 64</td>
<td>64</td>
</tr>
<tr>
<td></td>
<td>CAL 32</td>
<td>32</td>
</tr>
<tr>
<td>Cooling</td>
<td>Convection</td>
<td></td>
</tr>
<tr>
<td><strong>AC POWER</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Connector</td>
<td>powerCON 20</td>
<td></td>
</tr>
<tr>
<td>Rated Voltage Range</td>
<td>100–240 V AC, 50–60 Hz</td>
<td></td>
</tr>
<tr>
<td>Turn-on and Turn-off Points</td>
<td>90 V AC turn-on; 264 V AC turn-off</td>
<td></td>
</tr>
<tr>
<td><strong>Current Draw</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Idle</td>
<td>CAL 96</td>
<td>1.98 A rms (115 V AC)</td>
</tr>
<tr>
<td></td>
<td>CAL 64</td>
<td>1.24 A rms (115 V AC)</td>
</tr>
<tr>
<td></td>
<td>CAL 32</td>
<td>0.58 A rms (115 V AC)</td>
</tr>
<tr>
<td>Maximum Long-Term Continuous (&gt;10 sec)</td>
<td>CAL 96</td>
<td>8.3 A rms (115 V AC)</td>
</tr>
<tr>
<td></td>
<td>CAL 64</td>
<td>6.1 A rms (115 V AC)</td>
</tr>
<tr>
<td></td>
<td>CAL 32</td>
<td>3.3 A rms (115 V AC)</td>
</tr>
<tr>
<td>Burst (&lt;1 sec)</td>
<td>CAL 96</td>
<td>14.7 A rms (115 V AC)</td>
</tr>
<tr>
<td></td>
<td>CAL 64</td>
<td>10.8 A rms (115 V AC)</td>
</tr>
<tr>
<td></td>
<td>CAL 32</td>
<td>5.9 A rms (115 V AC)</td>
</tr>
<tr>
<td>Maximum Instantaneous Peak</td>
<td>CAL 96</td>
<td>33 A peak (115 V AC)</td>
</tr>
<tr>
<td></td>
<td>CAL 64</td>
<td>24 A peak (115 V AC)</td>
</tr>
<tr>
<td></td>
<td>CAL 32</td>
<td>13 A peak (115 V AC)</td>
</tr>
<tr>
<td>Inrush</td>
<td>CAL 96</td>
<td>90 A peak (115 V AC)</td>
</tr>
<tr>
<td></td>
<td>CAL 64</td>
<td>40 A peak (115 V AC)</td>
</tr>
<tr>
<td></td>
<td>CAL 32</td>
<td>20 A peak (115 V AC)</td>
</tr>
</tbody>
</table>

**PHYSICAL**

| Enclosure | Extruded aluminum |
| Finish    | White, black, and custom colors |
| Weather Protection | Suitable for outdoor installations, rain hood included |
| Rigging | Adjustable brackets included for mounting on walls or columns |
| Dimensions (with mounting hardware) | CAL 96 | 121.12 in H x 7.75 in W x 9.93 in D (3076 mm x 197 mm x 252 mm) |
|          | CAL 64 | 87.72 in H x 7.75 in W x 9.93 in D (2228 mm x 197 mm x 252 mm) |
|          | CAL 32 | 54.32 in H x 7.75 in W x 9.93 in D (1380 mm x 197 mm x 252 mm) |
| Weight (with mounting hardware) | CAL 96 | 173 lbs (78.5 kg) |
|          | CAL 64 | 124 lbs (56.2 kg) |
|          | CAL 32 | 80 lbs (36.3 kg) |

**Note:** Weights include top and bottom loudspeaker brackets, top and bottom endcaps.

**ENVIRONMENTAL**

| Operating Temperature | 0° C to +45° C |
| Non-Operating Temperature | −40° C to +75° C |
CAL Specifications

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Humidity</td>
<td>To 95% at 35°C</td>
</tr>
<tr>
<td>Operating Altitude</td>
<td>To 4600 m (15,000 ft)</td>
</tr>
<tr>
<td>Non-Operating Altitude</td>
<td>To 6300 m (25,000 ft)</td>
</tr>
<tr>
<td>Shock</td>
<td>30 g 11 msec half-sine on each of 6 sides</td>
</tr>
<tr>
<td>Vibration</td>
<td>10 Hz – 55 Hz (0.010 m peak-to-peak excursion)</td>
</tr>
</tbody>
</table>

**CAL 96 DIMENSIONS**
CAL 64 DIMENSIONS

CAL 64 Dimensions (with Mounting Hardware)
CAL 32 DIMENSIONS

CAL 32 Dimensions (with Mounting Hardware)

CAL COMPLIANCE

[Certificate and Compliance Symbols]