HOLOPLOT

HOLOPLOT X2

Modul 30

Safety Instructions & User Manual
Version 1.1 en
04/2025

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Version: 1.1 en
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Keep this document with the product or in a safe place so that it is available for future reference.

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We recommend you regularly check the HOLOPLOT website for the latest version of this document.

Table of Contents

General Safety Instructions

Before using this product, carefully read the applicable items of the following safety instructions.

ENGLISH

1. Read and follow these instructions.
2. Keep these instructions for future reference.
3. Heed all warnings.
4. Do not install near any heat sources such as radiators, heat registers, or other devices that produce heat.
5. Avoid exposing it to direct sunlight to reduce the risk of overheating it.
6. Free flow of air behind the loudspeaker is necessary to maintain sufficient cooling. Do not obstruct airflow around the loudspeaker.
7. Do not operate the device if the Ethernet power cable is frayed or broken.
8. Use only with attachments, accessories, or hardware specified by HOLOPLOT.
9. Rigging used with this device must comply with the safety instructions in this manual.
10. Wear protective gloves during installation and handling.
11. The Wall Frame can support a single MD30. Exceeding this weight capacity can result in damage or injury.

FRANCAIS

1. Lisez et suivez ces instructions.
2. Conservez ces instructions pour référence future.
3. Respectez tous les avertissements.
4. N'installez pas près de sources de chaleur telles que radiateurs, bouches de chaleur ou autres dispositifs produisant de la chaleur.
5. Pour réduire le risque de surchauffe de l'appareil, évitez de l'exposer à la lumière directe du soleil.
6. Une circulation d'air libre derrière le haut-parleur est nécessaire pour maintenir un refroidissement suffisant. N'obstrue pas le flux d'air autour du haut-parleur.
7. N'utilisez pas l'appareil si le câble Ethernet d'alimentation est effiloché ou cassé.
8. Utiliser uniquement avec les accessoires, pièces jointes ou matériels spécifiés par HOLOPLOT.
9. Les équipements de levage utilisés avec cet appareil doivent être conformes aux consignes de sécurité de ce manuel.
10. Portez des gants de protection lors de l'installation et de la manipulation.
11. Le cadre mural peut supporter un seul MD30. Dépasser cette capacité de poids peut entraîner des dommages ou des blessures.

12. Ensure that mountings, for example, to walls or ceilings can carry the full weight of the loudspeaker in all circumstances, that the installations have been designed and implemented according to the local safety regulations, and that they follow principles of good workmanship.

13. When disassembling an MD30 from a Wall Frame in a tilted position, support the module securely with your hands to prevent accidental tilting or pivoting.

14. To prevent electrical or mechanical safety hazards, the device must be handled, installed, and maintained by suitably trained/instructed personnel.

15. Refer all servicing to HOLOPLOT authorized service personnel. Servicing is required when the device is damaged in any way, such as when the Ethernet connector is damaged, the device has been dropped, or when, for undetermined reasons, it does not operate normally.

16. Do not attempt to disassemble the device. Opening the device will void the warranty.

17. The loudspeaker is not disconnected from the power supply unless the CAT cable is removed from the loudspeaker or power source.

18. If the device is powered down, its power storage is still charged for a short time until complete discharge. Disassembling the device immediately after operation poses a high risk of electric shock.

19. Exposure to high sound pressure levels can cause permanent hearing loss. When exposed to high levels of acoustic pressure, use adequate protection, such as earplugs or protective earphones (see the datasheet at the end of this manual for the maximum sound pressure level this device can produce).

20. Do not touch exposed metal surfaces of the device during operation in hot environments and/or during direct sun exposure, as this can cause skin burn.

12. Assurez-vous que les fixations, par exemple aux murs ou aux plafonds, peuvent supporter le poids total du haut-parleur en toutes circonstances, que les installations ont été conçues et mises en œuvre selon les réglementations locales de sécurité, et qu'elles suivent les principes de bonne pratique.

13. Lorsque vous démontez un MD30 d'un cadre mural en position inclinée, soutenez fermement le module avec vos mains pour éviter qu'il ne bascule ou ne pivote accidentellement.

14. Pour éviter des risques électriques ou mécaniques, l'appareil ne doit être manipulé, installé et entretenu que par du personnel dûment formé ou instruit.

15. Confier toutes les opérations de maintenance au personnel autorisé de HOLOPLOT. Une réparation est nécessaire lorsque l'appareil est endommagé de quelque manière que ce soit, par exemple lorsque le connecteur Ethernet est endommagé, lorsque l'appareil est tombé ou lorsque, pour des raisons indéterminées, il ne fonctionne pas normalement.

16. N'essayez pas de démonter l'appareil. L'ouverture de l'appareil annulera la garantie.

17. Le haut-parleur n'est pas déconnecté de l'alimentation tant que le câble CAT n'est pas retiré du haut-parleur ou de la source d'alimentation. Éteindre le haut-parleur à l'aide de l'interrupteur d'alimentation ne coupe pas l'alimentation.

18. Si l'appareil est éteint, la batterie qu'il contient reste chargée pendant une courte période jusqu'à ce qu'elle soit complètement déchargée. Le démontage de l'appareil immédiatement après son utilisation présente un risque élevé de décharge électrique.

19. L'exposition à une pression acoustique élevée peut entraîner une perte auditive permanente. En cas d'exposition à des niveaux de pression acoustique élevés, utilisez une protection adéquate, comme des bouchons d'oreilles ou des écouteurs de protection (consultez la fiche technique à la fin de ce manuel pour connaître le niveau de pression acoustique maximal que cet appareil peut produire).

20. Ne touchez pas les surfaces métalliques exposées de l'appareil pendant le fonctionnement dans des environnements chauds et/ou lors d'une exposition directe au soleil, car cela peut causer des brûlures cutanées.

21. Frequent lifting and handling of the device by a single person can cause muscle soreness or injury.

22. To prevent issues with the PoE power sourcing equipment (PSE) and to ensure galvanic isolation between the MD30 and the PSE, the PSE (and/or its external power supply) needs to comply with the IEC 62368-1 safety standard or the equivalent country-specific safety standards.

23. Only connect the device to “4-pair” PoE++ (4PPoE) switches, Class 5 to 8 according to 802.3bt.

24. The utilized fault relay provides the following max. switching capability: 24 V DC; 1 A.

25. Only use Ethernet cables that comply with UL 2556 VW-1 or equivalent. Only use outdoor-rated cables for outdoor applications.

26. To prevent stress on the power supply cord (Ethernet cable), use a cable at least 1.5 m long. If the supply socket is close to the device, a shorter cable may be used, provided it remains free of stress.

27. For outdoor usage of the device, the “IP65 Kit” has to be mounted correctly to ensure ingress protection of the MD30 module and UV protection of the Connector Bay.

28. To mount the device in the Wall Frame, only the delivery-included screws or alternate M5x75 mm stainless steel screws are to be used.

29. To ensure secure rigging stability in a custom rigging structure, all 4 rear-facing attachment points (M6 threaded holes with a thread length of 12 mm) shall be used.

21. Le levage et la manipulation fréquents de l'appareil par une seule personne peuvent provoquer des douleurs musculaires ou des blessures.

22. Pour éviter les problèmes avec l'équipement d'alimentation PoE (PSE) et assurer une isolation galvanique entre le MD30 et le PSE, le PSE (et/ou son alimentation externe) doit être conforme à la norme de sécurité IEC 62368-1 ou aux normes de sécurité spécifiques au pays équivalentes.

23. Connectez uniquement l'appareil à des commutateurs PoE++ "4 paires" (4PPoE), Classes 5 à 8 selon 802.3bt.

24. Le relais de défaut utilisé offre les capacités suivantes pour éviter une source de risque externe potentielle : capacité de commutation max.: 24 V DC; 1 A.

25. N'utilisez que des câbles Ethernet conformes à UL 2556 VW-1 ou équivalent. N'utilisez que des câbles classés pour l'extérieur pour les applications en extérieur.

26. Pour éviter toute tension sur le cordon d’alimentation (câble Ethernet), utilisez un câble d’au moins 1,5 m de longueur. Si la prise d’alimentation est proche de l’appareil, un câble plus court peut être utilisé, à condition qu’il ne soit soumis à aucune tension.

27. Pour une utilisation extérieure de l'appareil, le “IP65 Kit” doit être monté correctement afin d'assurer la protection contre l'infiltration d'air du module MD30 et la protection contre les UV de la baie de connexion.

28. Pour monter l'appareil dans le cadre mural, seules les vis fournies ou des vis en acier inoxydable M5x75 mm alternatives doivent être utilisées.

29. Pour garantir la stabilité du gréement dans une structure de gréement personnalisée, les 4 points de fixation orientés vers l'arrière (trous filetés M6 avec une longueur de filetage de 12 mm) doivent être utilisés.

How to use this Manual

Make sure to read these instructions in their entirety before configuring a HOLOPLOT Audio 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:
Important knowledge for the topic under discussion as well as references to supplementary information

TIP:
Additional practical advice and helpful explanations

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

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

HOLOPLOT Customer Support is available at:
Mail: support@holoplot.com
Web: holoplot.com

HOLOPLOT Audio System

A HOLOPLOT Audio System consists of:

- **MODULES** – Audio-Beamforming and Wave Field Synthesis loudspeakers
- **CONTROLLER** – a rack-mountable device to manage HOLOPLOT Loudspeaker Modules
- **SOFTWARE SUITE** – for design and simulation, control and monitoring, as well as content production for HOLOPLOT Audio Systems

LOUDSPEAKER MODULES

HOLOPLOT modules are advanced Audio-Beamforming and Wave Field Synthesis loudspeakers equipped with integrated signal processing and amplification. They can be arrayed horizontally and vertically to form various sizes of HOLOPLOT Matrix Arrays.

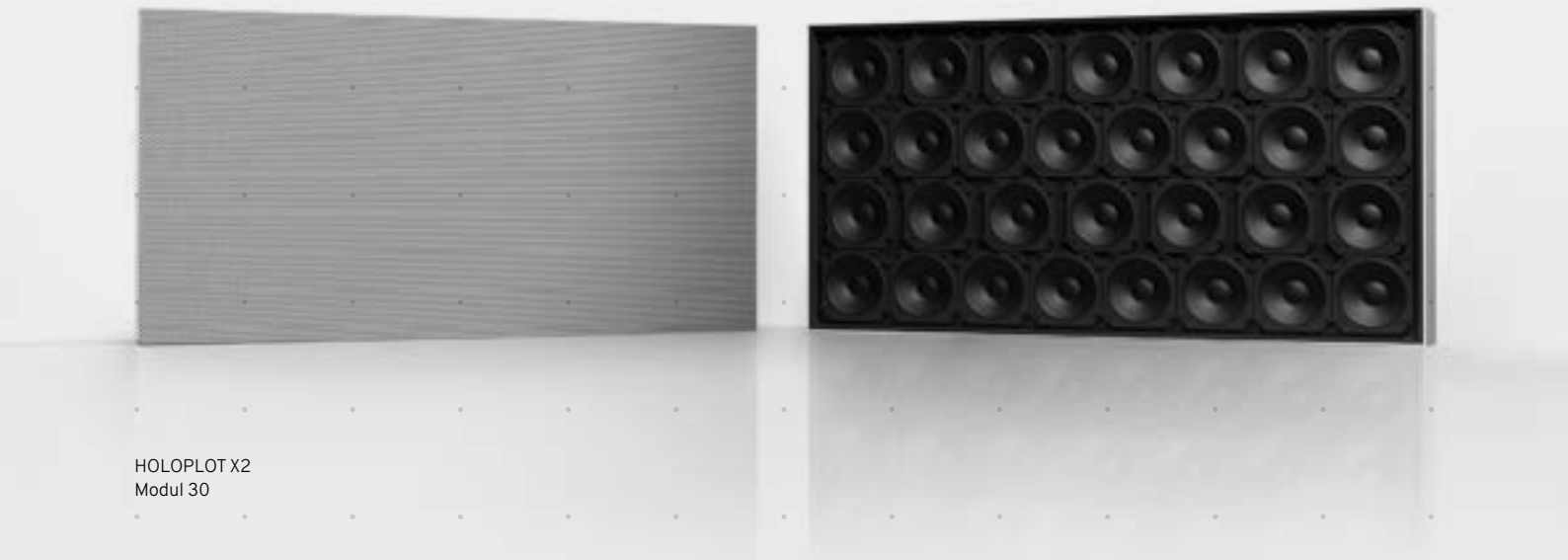
The HOLOPLOT X2 Loudspeaker Module, “Modul 30” (MD30), is designed for high-performance, speech-focused audio applications. The MD30 is a one-way Matrix Array Loudspeaker Module featuring 30 loudspeaker drivers, each with dedicated signal processing and amplification.

The MD30’s individual signal processing and amplification capabilities allow it to generate multiple sound fields. This feature enables simultaneous reproduction of multiple audio contents.

Modules can be used individually or can be combined to create a larger Matrix Array, and multiple Matrix Arrays can be used in a HOLOPLOT Audio System.

Each MD30 supports digital audio connectivity via AES67/Ravenna and includes two balanced analog audio inputs, accommodating up to 64 audio channels (62 AoIP + 2 analog). These streams can be processed in parallel and mapped or panned across multiple sound fields.

For applications requiring Dante® AoIP, the HOLOPLOT Controller offers optional Dante® to Ravenna stream conversion.



HOLOPLOT X2
Modul 30

CONTROLLER

The *HOLOPLOT Controller* manages a HOLOPLOT Audio System via a standard IP network, offering key functionalities such as general system control, AoIP stream management, signal routing, audio beam tuning, and system health and performance data collection.

HOLOPLOT Controllers are available in two variants:

CONTROLLER

- Based on Dell PowerEdge XR5610, a high-performance 1U rack-mount server in a rugged short-depth machine
- Offers high-performance network capabilities for large-scale applications
- Ideal for applications with more than 30 and up to 200 modules
- Features dual power supplies and redundant hard drives
- Supports single and redundant configurations

CONTROLLER LITE

- Based on Dell PowerEdge R360, a 1U entry-level rack-mount server
- Provides standard network capabilities for small- to mid-sized small-scale applications
- Ideal for applications with fewer than 30 modules
- Includes a single power supply and non-redundant storage
- Supports single and redundant configurations

Both Controller and Controller Lite can provide optional Dante® to Ravenna conversion if equipped with a HOLOPLOT Audio Bridge PCIe Card.

HOLOPLOT can advise which Controller is suitable for a given installation based on needs and performance.

SOFTWARE SUITE

HOLOPLOT OS

The HOLOPLOT Operating System (OS) is the intelligent software engine behind any HOLOPLOT system. It orchestrates Loudspeaker Modules to work in unison, forming Matrix Array systems of any scale, and leverages advanced Wave-Field Synthesis and 3D Audio-Beamforming technologies to deliver unparalleled audio experiences.

HOLOPLOT OS offers an integrated end-to-end workflow that streamlines execution time. As the backend for all software applications in the HOLOPLOT workflow, it provides a shared data model and ensures a cohesive process from planning to implementation.

By supporting both Dante® and Ravenna standards (including AES67 and ST2110), accommodating up to 256 channels with Seamless Protection Switching (ST-2022-7), it ensures robust, high-performance audio transmission with low latencies for HOLOPLOT systems.

HOLOPLOT API

The public HOLOPLOT API offers robust integration capabilities, enabling seamless connection with various show-control systems and the potential for custom integrations. It provides convenient access to system health reports and allows for specific state triggers using a REST API.

Key functionalities include changing presets, adjusting volume, and managing beam muting and soloing, along with monitoring the health of modules, controllers, and arrays, simplifying system control and oversight.

HOLOPLOT PLAN

A Mac and Windows compatible app that enables the design, simulation, and setup of a HOLOPLOT Audio System through an intuitive 3D graphic interface. Users can design Matrix Arrays in various configurations and create sound fields utilizing 3D Audio-Beamforming and Wave Field Synthesis technology.

Venue models can be easily imported from standard 3D modeling software, such as SketchUp. HOLOPLOT Plan also simulates and visualizes direct sound pressure levels, providing accurate predictions of audio quality in the venue. System designs can be exported to AFMG EASE for closed-room modeling, ray tracing, and simulations with additional third-party speakers.

HOLOPLOT CONTROL

A browser-based software application that streamlines the setup, management, and operation of HOLOPLOT Sound Systems, regardless of their complexity or size. It offers intuitive audio control features, enabling users to switch between presets, adjust system gain and EQ, monitor signal level meters, mute beams, and adapt beams to changing environmental conditions.

HOLOPLOT Control supports multi-user access, simplifies system setup through Module Pairing, and provides venue and system visualization via a 3D viewport. Furthermore, the software supports complex network deployments and standard audio protocols, making it a versatile tool for audio management.

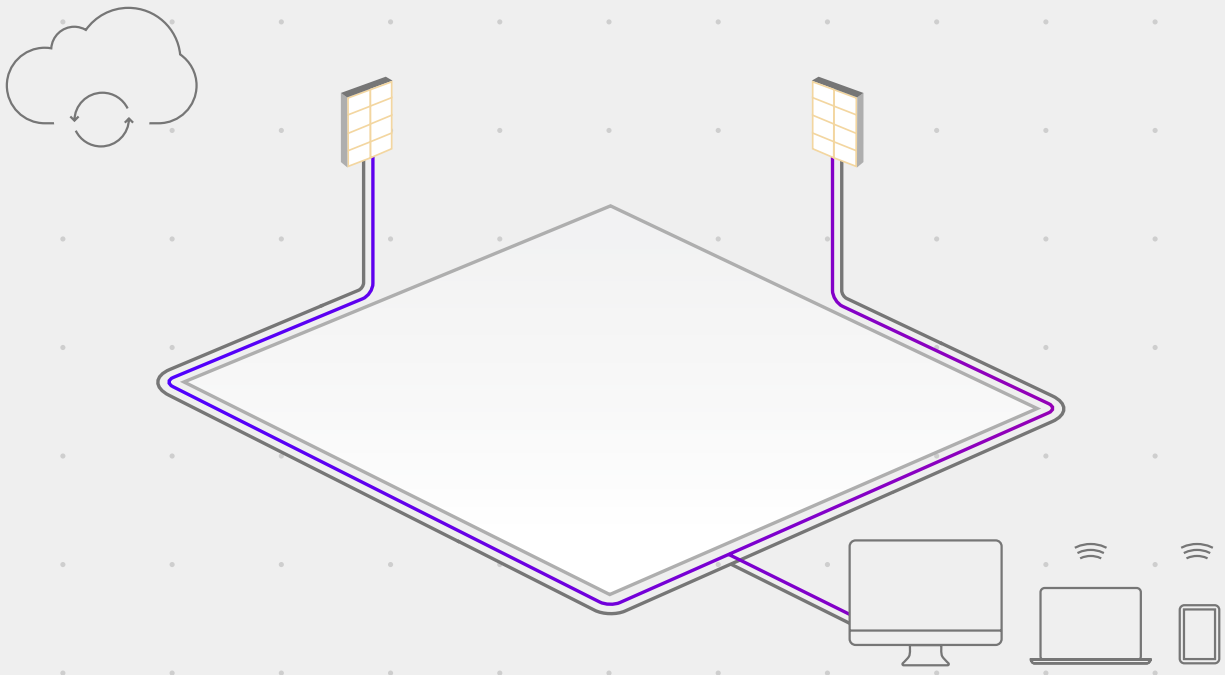
HOLOPLOT CREATE

A Mac Desktop app that enables auralization of HOLOPLOT systems for offline and off-site content production. It interfaces seamlessly with Digital Audio Workstations (DAWs), allowing content creators to mix and explore spatial HOLOPLOT audio environments.

CONNECTED SERVICES

Given an active internet connection, a HOLOPLOT Audio System can benefit from the latest software updates and algorithm improvements, as well as the optional Connected Services—a comprehensive cloud-based and IoT-enabled support plan.

- **Expert Support:** The HOLOPLOT system is directly connected with the HOLOPLOT support team for software support, hardware diagnostics, AoIP advice, and system performance checks.
- **Smart & Proactive Remote Servicing:** Being connected enables fast, smart, and proactive support. The ability to analyze systems remotely makes troubleshooting more targeted and efficient and reduces the need for high-effort hardware inspections.
- **Back-ups in the Cloud:** System configuration data is backed up in the cloud for quick recovery of previous states.
- **IoT Data in the Cloud:** Long-term system health and performance data is collected for advanced failure analysis.



HOLOPLOT Sound Field Control

A HOLOPLOT Audio System can be deployed as a single module or scaled up with multiple modules to form larger Matrix Arrays. Any size of Matrix Array can simultaneously generate multiple sound fields using HOLOPLOT's core technologies: 3D Audio-Beamforming and Wave Field Synthesis, each offering distinct characteristics and benefits.

3D AUDIO-BEAMFORMING
OPTIMIZED SOUND FOR AUDIENCE AREAS

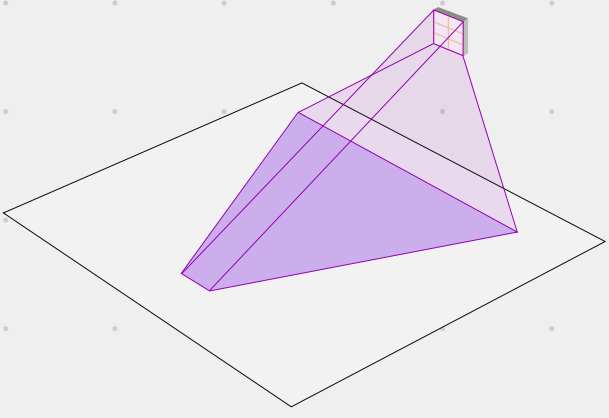
3D Audio-Beamforming uses an array of loudspeaker drivers to direct and control sound waves in three-dimensional space. By adjusting the phase and amplitude of each driver's signal, the system creates a precise radiation pattern through constructive interference in target directions and destructive interference in others.

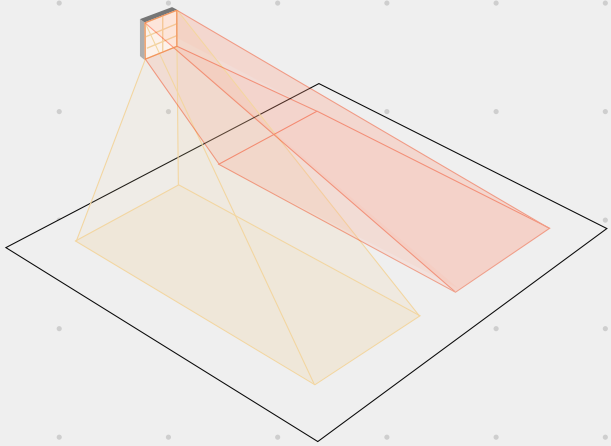
HOLOPLOT 3D Audio-Beamforming technology is typically used to achieve:

- Uniform coverage with consistent spectral performance across the audience area
- Enhanced speech intelligibility
- Reduced unwanted sound spill onto stages and into neighboring residential areas
- Minimized reflections and room reverberation artifacts

HOLOPLOT's beamforming algorithms allow Matrix Arrays to be configured in two distinct ways:

- **Parametric Beam**: This technique controls the radiation pattern of a Matrix Array using geometric parameters. A Parametric Beam's direction (vertical/horizontal steering angle) and width (vertical/horizontal opening angle) are set relative to the array's physical position and orientation.
- **Optimized Coverage Beam**: This approach fully tailors the beam to the geometry of the target zone, providing uniform coverage and high spectral consistency within the predefined audience area. By utilizing digital sound field control on both axes and directing sound where needed, reflections and spills are minimized.





WAVE FIELD SYNTHESIS
ACCURATE LOCALIZATION FOR LISTENERS

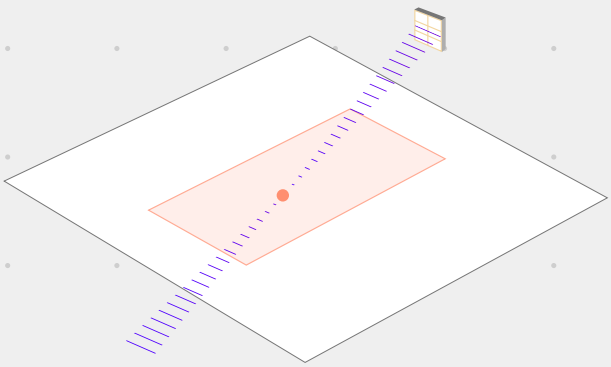
Wave Field Synthesis (WFS) is an advanced spatial audio technology that uses a large array of loudspeakers arranged in a Matrix Array to simulate and synthesize virtual acoustic environments. The key feature of WFS is its ability to reconstruct sound so it appears to originate from a specific virtual point, known as a **Virtual Source**, creating a highly realistic and immersive audio experience. This allows listeners to perceive the precise location of the sound source.

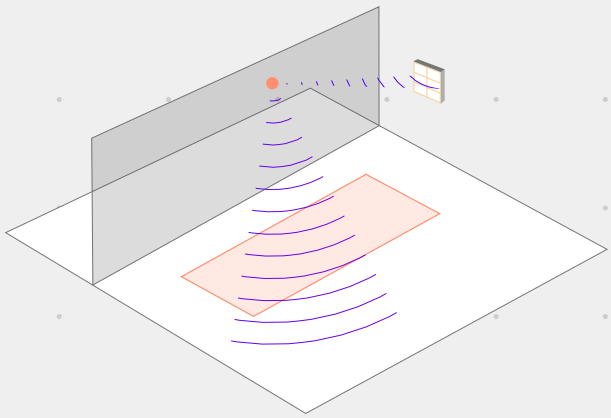
A single **HOLOPLOT Matrix Array** can generate multiple Wave Field Synthesis sound fields simultaneously, each reproducing different content. This capability enables the creation of complex auditory scenes with multiple localized sound sources.

Virtual Source positions can be defined in **HOLOPLOT Plan** using global, local, or angle coordinates, allowing them to be placed either behind or in front of the Matrix Array. Virtual Sources positioned behind the array are “visible” and accurately perceived within the audience area defined by the Field Of View (FOV). Listeners within the FOV can move freely while maintaining accurate perception of the Virtual Sound sources.

When Virtual Sources are placed in front of the Matrix Array, the audio wavefronts from all transducers in the array combine constructively at the Virtual Source location, also referred to as a **Focus Source**, resulting in a relatively high sound level compared to the rest of the listening area.

Virtual Sources offer powerful tools for creating in-field localization, targeted reflections, and special effects at specific listener positions, greatly expanding the creative possibilities for system designers.





MATRIX ARRAY SIZE

A single HOLOPLOT Matrix Array Loudspeaker Module can create multiple optimized 3D Audio-Beamforming and Wave Field Synthesis sound fields. However, multiple Loudspeaker Modules can be combined to create larger Matrix Arrays. An increased array size allows for higher SPL broadband values, improves coverage homogeneity in high frequencies, and reduces sound spill outside the targeted area. Furthermore, the larger an array, the greater the control over its sound field in low frequencies.

HOLOPLOT Matrix Arrays should be sized and shaped according to the acoustic requirements of the venue. Vertically oriented arrays suit long, narrow spaces, while horizontal arrays are ideal for focused coverage.

Sound fields created with HOLOPLOT Matrix Arrays are controllable independently both horizontally and vertically. The upper control frequency is dependent on the beam configuration. The respective amount of control in low frequencies is dependent on the array size in the corresponding axis.

The HOLOPLOT Hub provides in-depth guidance on HOLOPLOT system design: System design best practices and beam design best practices.

X2 MD30

The X2 MD30 is optimized to provide the best speech reinforcement while also supporting multi-purpose applications in a form factor designed for unobtrusive architectural integration - ideal for use in houses of worship, auditoria, corporate events, and as public address & voice alarm systems in train stations and airports.

THE X2 MODUL30 (MD30)

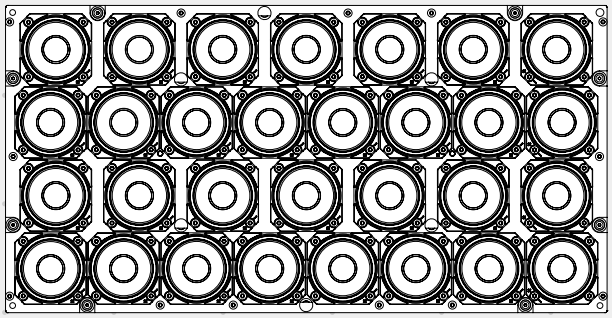
- Uses 3D Audio-Beamforming to provide optimal coverage and speech intelligibility - even in the most challenging acoustic spaces.
- Scalable and configurable to the application's demands through modular hardware and flexible software.
- Compact, lightweight, and available in custom colors.
- Can be discreetly placed behind acoustically transparent screens or wall panels - HOLOPLOT custom-screen optimization algorithms are able to compensate for the resulting transmission loss.
- Fully weatherized for long-term, reliable outdoor use in harsh environments when using the IP65 Kit accessories.
- Supports Audio-over-IP - Ravenna, AES67, and Dante® with an optional Dante® (via HOLOPLOT Controller).
- Supports analog audio inputs.
- Ready for integration in bespoke Voice Alarm and Evacuation Systems, allowing for deployment in safety-critical applications such as train stations and airports.
- Efficient to install and easy to service by a single person.
- Fully integrated into HOLOPLOT software and IoT landscape.

X2 MD30 KITS AND PACKAGING

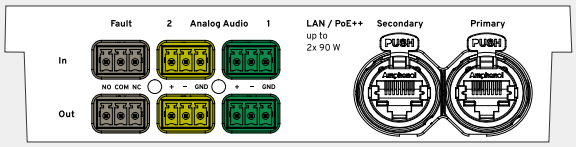
The X2 MD30 comprises the MD30 module and the Wall Frame Kit, both packaged separately. The Installation Kit and the IP65 Kit are accessories that are both sold and packaged separately.

X2 MD30

MD30 Module (1)



Colored Euroblock Connectors (6)



X2 MD30 WALL FRAME KIT

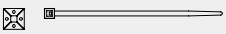
Grill (1)

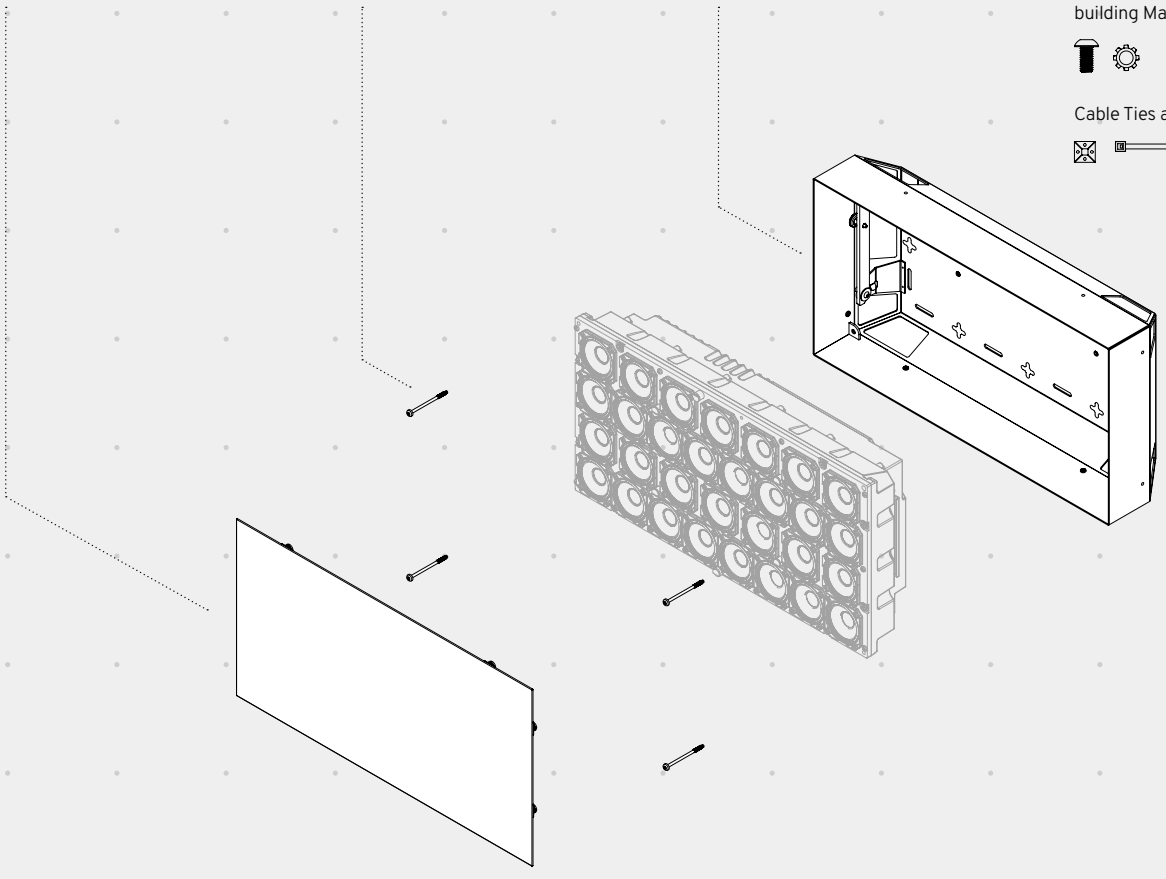
Custom M5x75
MAThread screws (4)

Wall Frame (1)

M4 Wall Frame Interconnection
Screws and washers for
building Matrix Arrays (4)

Cable Ties and Mounts (2)

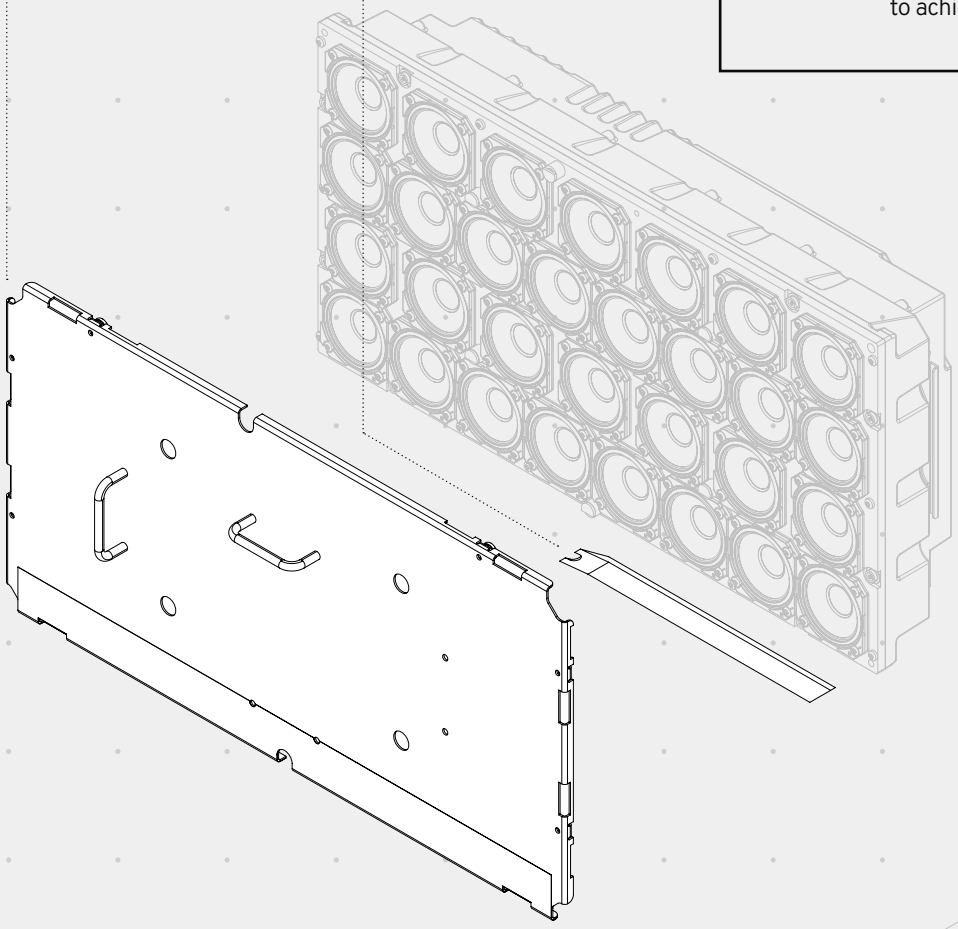




X2 MD30 INSTALLATION KIT

Handling Tool (1)

Lever (1)

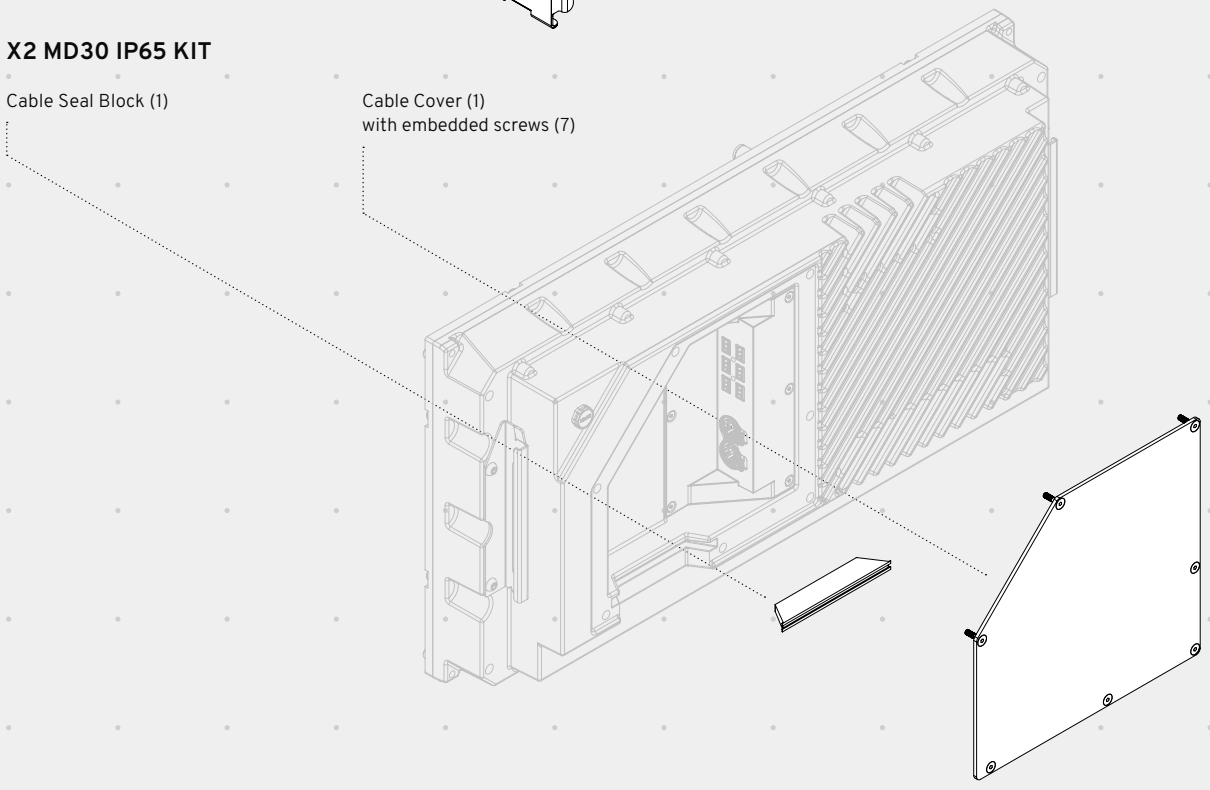


> The Handling Tool is required for handling an MD30 in any situation to avoid damaging the drivers.
>
> The IP65 Kit and Grill must be used to achieve an IP65 rating.

X2 MD30 IP65 KIT

Cable Seal Block (1)

Cable Cover (1)
with embedded screws (7)



HANDLING THE MD30

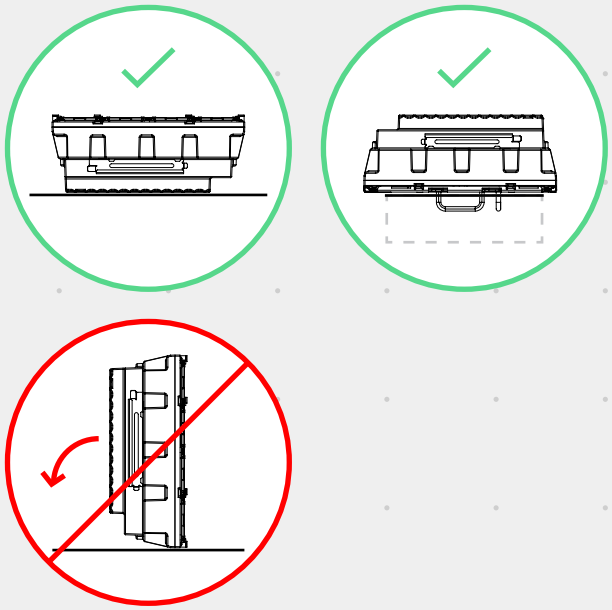
HANDLING

Always use two hands to handle the MD30. Always use the Handling Tool when transporting the MD30 from one location to another and when mounting it into the Wall Frame or other rigging options.

Don't place the MD30 on its side, as it might easily tip over.

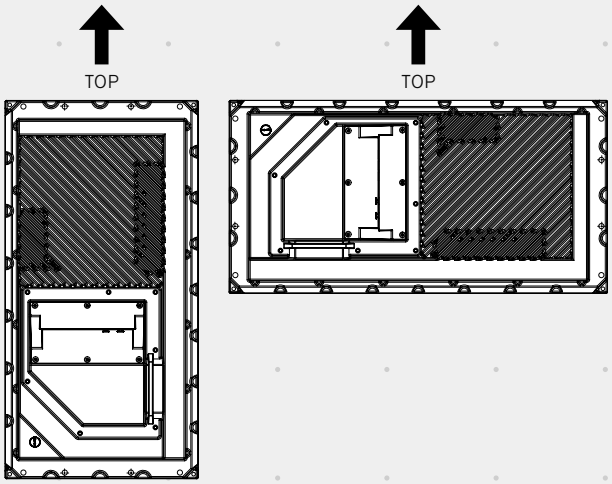
When preparing for installation, always place the MD30 on a flat surface, lying on its back and facing up. Always ensure the loudspeaker drivers are protected and take extra care that no pressure is exerted on the membranes of the loudspeaker drivers.

To access the Connector Panel, attach the Handling Tool and place the MD30 across two parallel elevated objects that are taller than the handle (for instance, blocks of wood or a box). This setup distributes the downward force away from the drivers.



ORIENTATION

The top of the module in both landscape and portrait orientation is easily identified as the side opposite of the Connector Bay opening.



STORING

The MD30 and its accessories should stay in their packaging to protect them from damage until installation. Store the packaging indoors in a safe environment from outside conditions:

- -40 °C to +70 °C (-40 °F to +158 °F)
- Up to 98 % humidity at +70 °C (158 °F)

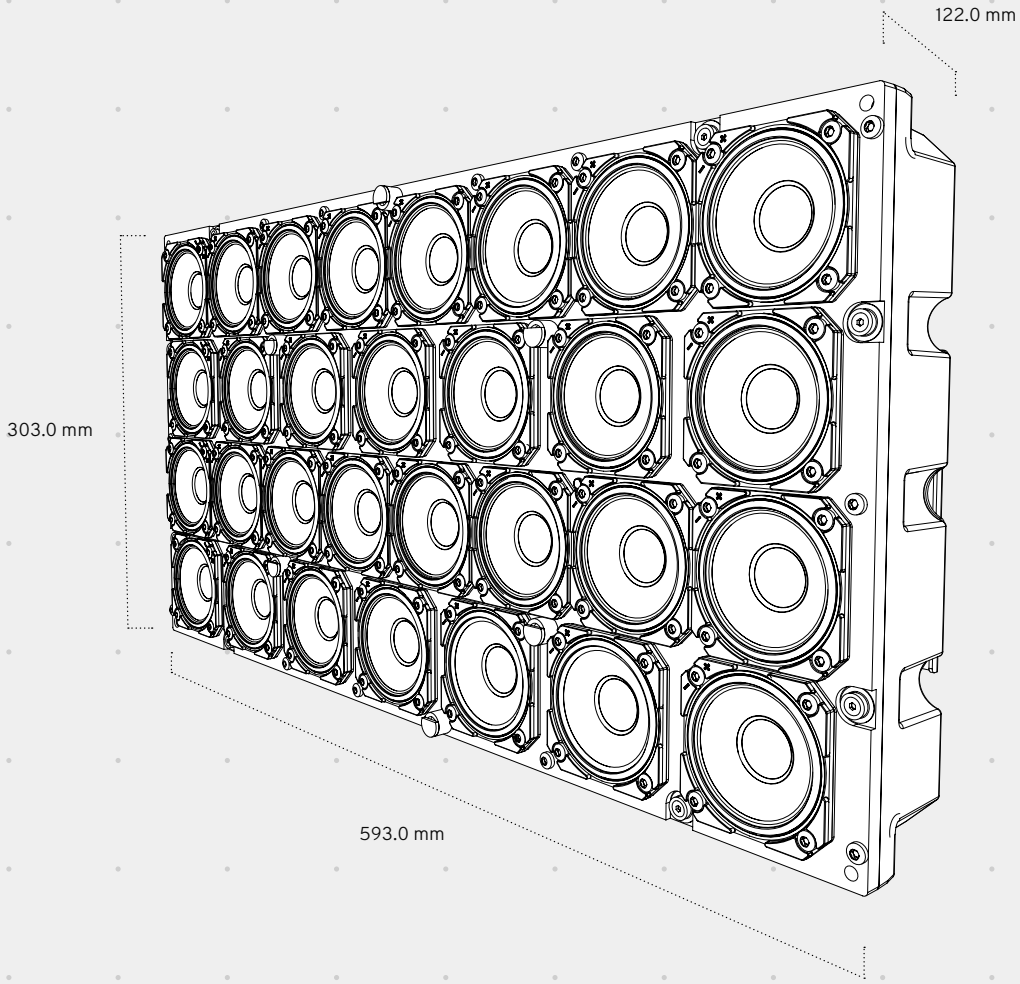
To prevent electrical or mechanical safety hazards, the device must only be handled, installed, and maintained by suitably trained/ instructed personnel.

Wear protective gloves during installation and handling.

THE LOUDSPEAKER MODULE

The MD30 is a Loudspeaker Module with 30x 2.5” full-range loudspeaker drivers in a one-layered matrix configuration.

The MD30 has the following main components: Driver Matrix, Chassis, Baffle, Mounting Rails, Internal Electronics, and the Connector Bay (including the Connector Panel). All electronic components are integrated directly within the MD30. The Chassis acts as a very efficient cooling body that enables a fan-less design.



DRIVER MATRIX

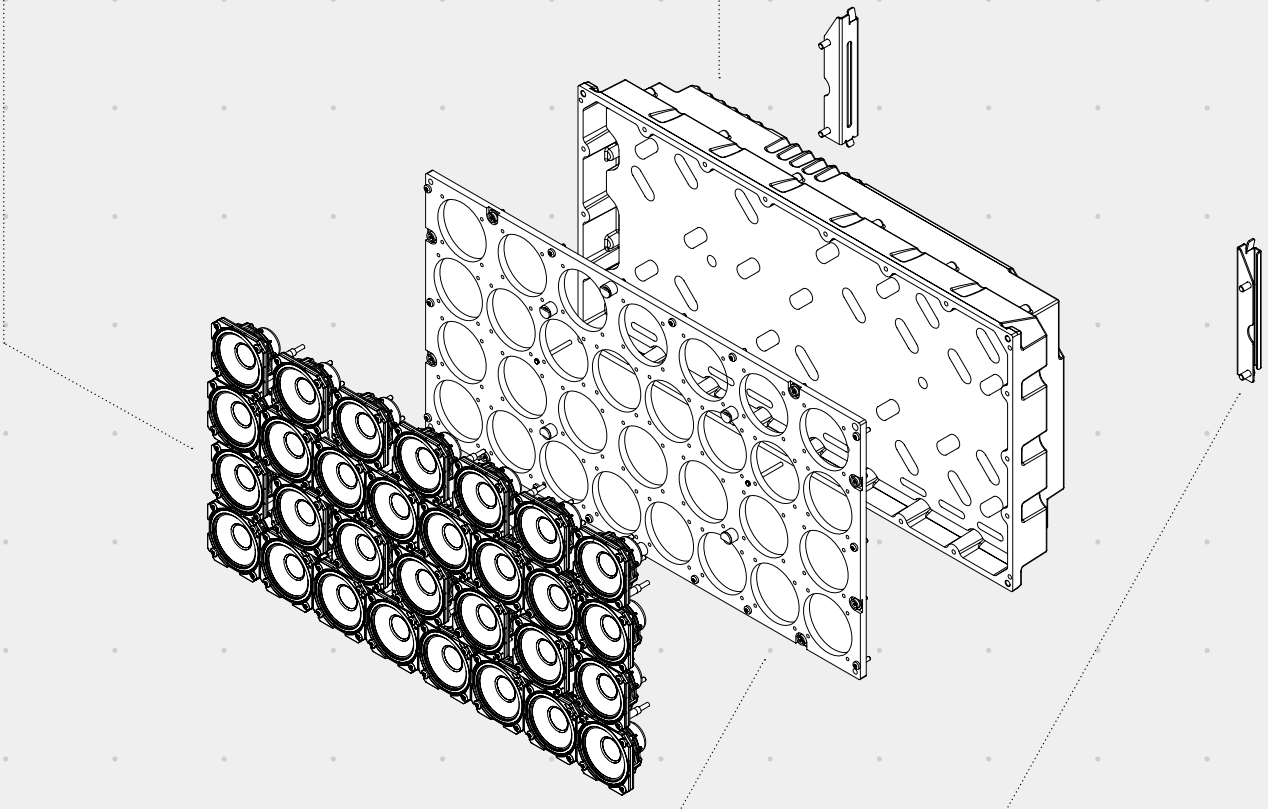
The MD30 features 30x 2.5” high-performance neodymium drivers with water-resistant, UV-stable diaphragms made of paper, polymer and rubber surrounds. The drivers are designed with a high excursion suspension for extended low-frequency performance.

The matrix arrangement of the drivers enables 3D Audio-Beamforming and Wave Field Synthesis.

CHASSIS

The MD30 Chassis houses all components, including all electronics and drivers. It is manufactured from powder-coated aluminum and protects internal components against mechanical damage, corrosion, and water ingress.

The MD30 Chassis has 4x rear-facing M6 threads for attaching Mounting Rails or other rigging accessories.



BAFFLE

The baffle forms a front face of the device to hold the drivers in their exact positions relative to each other. The positions of the drivers are critical for the driver matrix to maintain precise performance. The Baffle forms part of the enclosure, along with the Chassis, to protect components from damage and corrosion.

The Baffle is made of aluminum alloy with an anodized finish for strong corrosion resistance and sleek aesthetic.

MOUNTING RAILS

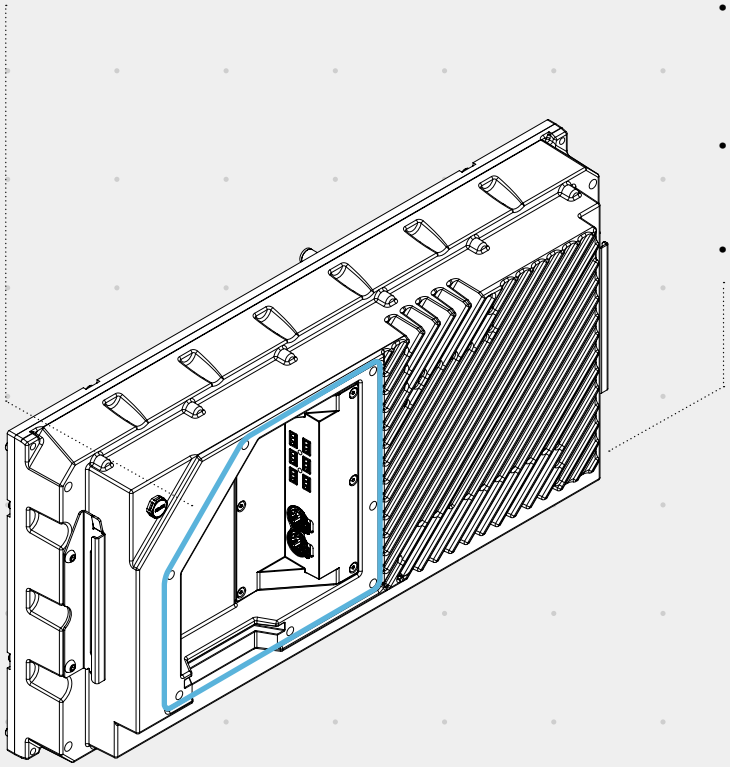
The stainless steel Rails are attached to the backside of the MD30 and are used in combination with the Wall Frame. They allow for precise positioning and locking of the MD30 into place.

The Rails can be removed to expose 4 threaded M6 holes that can be used to attach other rigging hardware.

CONNECTOR BAY

The Connector Bay functions as the interface to which Ethernet, analog audio, and fault relay cables from external devices are connected (see Connector Panel section below). It houses the Connector Panel and room for cable slack at their terminations.

The Connector Bay is sealed with the IP65 Kit for installations requiring IP65 rating.



INTERNAL ELECTRONICS

The internal electronics are housed within the Chassis behind the heatsink. The MD30 features

- Power supply for energy storage and power management
- Dual-core ARM® Cortex™- A53 running HOLOPLOT OS
- High-performance Field Programmable Gate Array (FPGA) computing for 3D Audio-Beamforming and Wave Field Synthesis algorithms
- 30x parallel amplifier channels for each of the 30x loudspeaker drivers.
- 2x front-facing LEDs

CONNECTOR PANEL

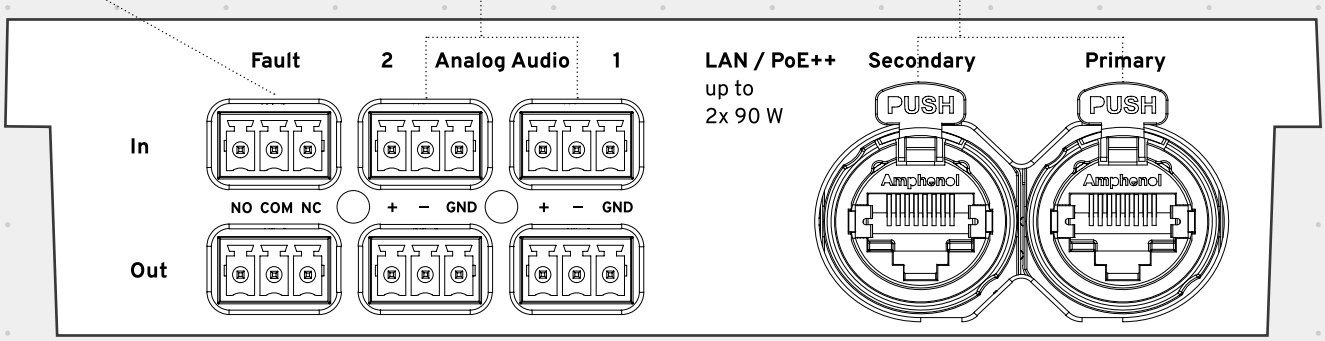
The Connector Panel is located within the Connector Bay and contains all connectivity to the MD30.

The maximum cable length supported for networking and PoE++ is 100 meters. Daisy-chaining network/PoE++ cable is not supported.

2x Fault Relay 'In' and 'Out' (thru) Euroblock connections for fault monitoring systems.

4x Analog Audio 'In' and 'Out' (thru) Euroblock connection for failover scenarios.

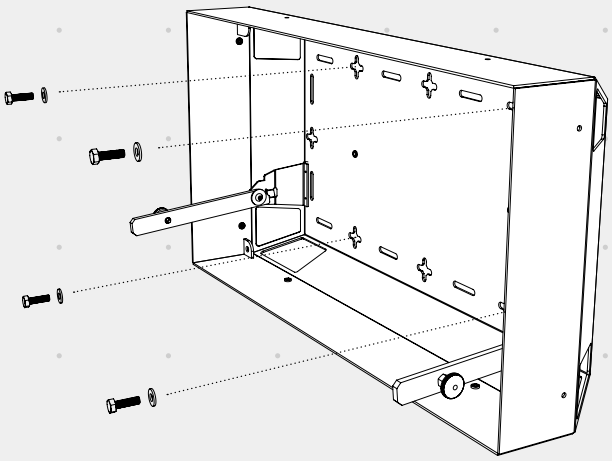
2x EtherCON RJ45 ports for dual power and redundant network connections.
- PoE++ power (802.3bt Type 3/4)
- Audio over IP (AoIP) streams
- Control, configuration, and monitoring



THE WALL FRAME

The Wall Frame is made of galvanized, duplex powder-coated steel. It is designed to securely mount an MD30 module onto a surface, using a sliding hinge mechanism for easy installation. The mounting surface and hardware must support the combined weight of 22.9 kg (7.3 kg for the frame and grill + 15.6 kg for the MD30) plus a factor for safety.

Several options for fastening points on the rear surface offer flexibility for various wall structures. The installation must be carried out with a minimum of four M6 fasteners, using washers for added stability. The fasteners must be distributed at least two per side (i.e. two on the top row and two on the bottom row of fastening points).

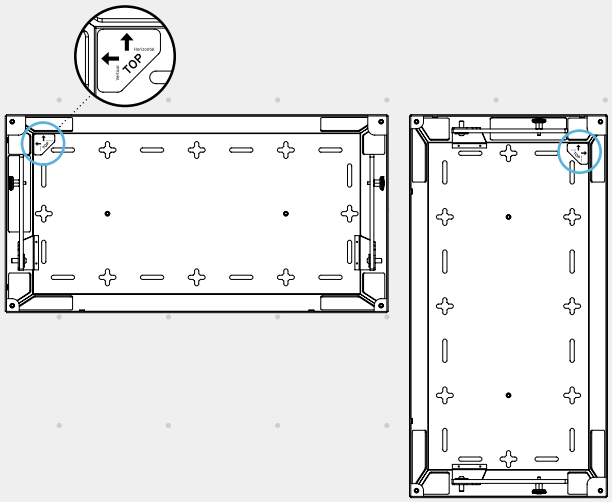


> ⚠ An assessment by the owner must be completed prior to installation to ensure the total weight of the frame and module can be supported and is compliant with local built structure regulations or codes.

ORIENTATION

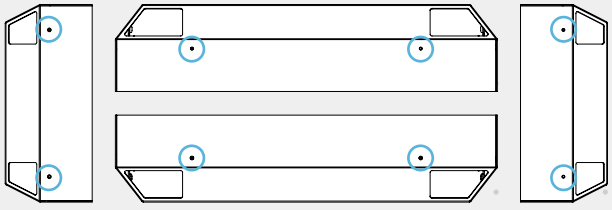
A reference sticker inside the frame indicates the orientation of both landscape and portrait. The precise orientation for each Wall Frame is crucial when creating Matrix Arrays, especially when mounting on ceilings.

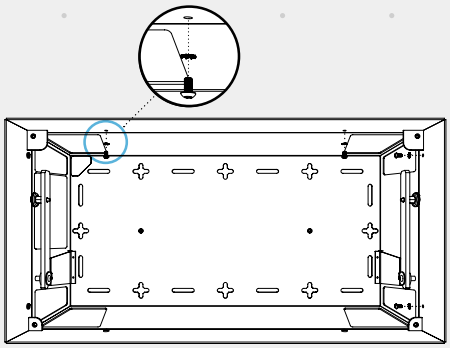
All Wall Frames in an array should be oriented alike to ensure consistent driver orientation that matches the virtual representations in HOLOPLOT Plan.

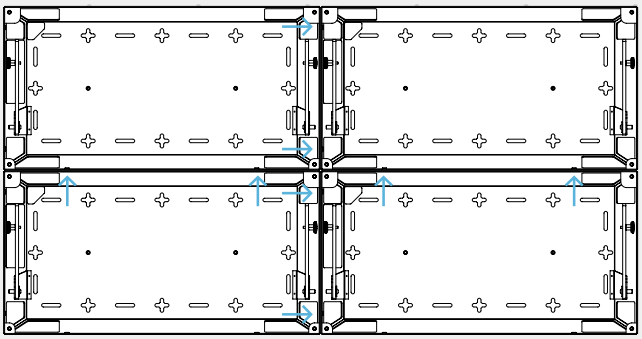


INTERCONNECTION

Each Wall Frame can be connected to its neighboring frame using the 4x provided screws and washers, ensuring a stable structure for larger arrays. The screws and washers should be used in the flush holes that extend into a fixed threaded screw hole in the neighboring Wall Frame.



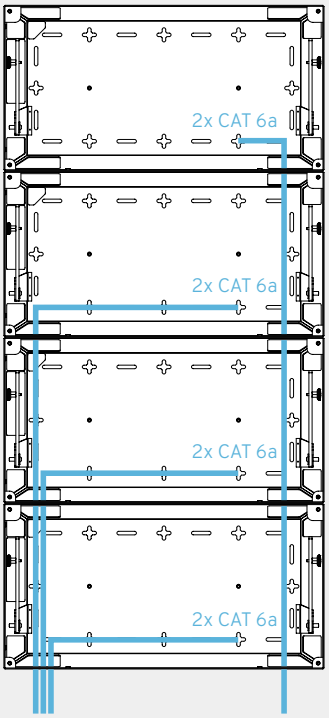


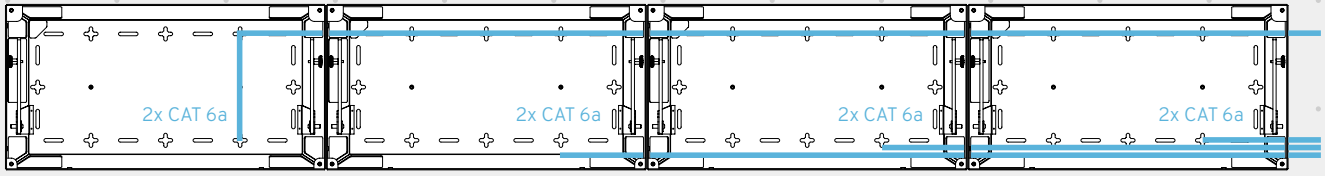


CABLING

The Wall Frame features a built-in cable management system with eight openings (two at each corner). This setup ensures smooth cable entry and exit without damaging the cables.

When used in larger Matrix Arrays, the cable management system helps maintain an organized setup and avoids clutter, contributing to the audio system's overall functionality and reliability.



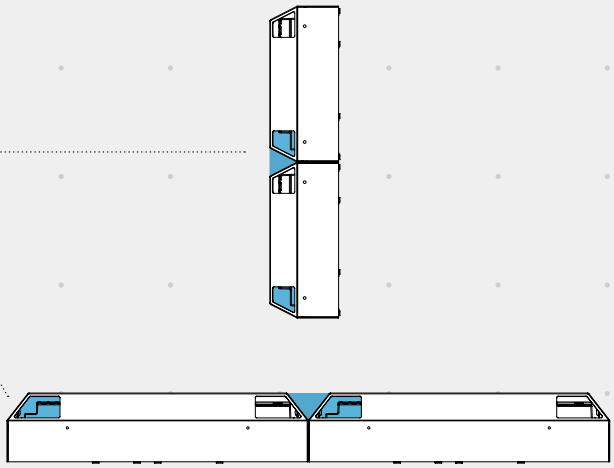


Though cables can enter from any opening, the Wall Frame cable management system has two main cable channels when the MD30 is closed against the Wall Frame:

- One along the bottom
- One along the left side

Up to six network cables can be routed along either of these channels.

Cables can also be routed between Wall Frames using the gaps created by the angular sides.

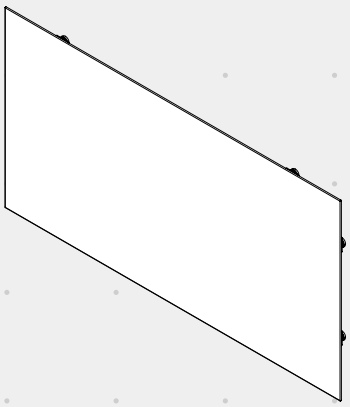


> ⚠ Avoid cables resting against the heatsink especially in hot climates.

THE MD30 GRILL

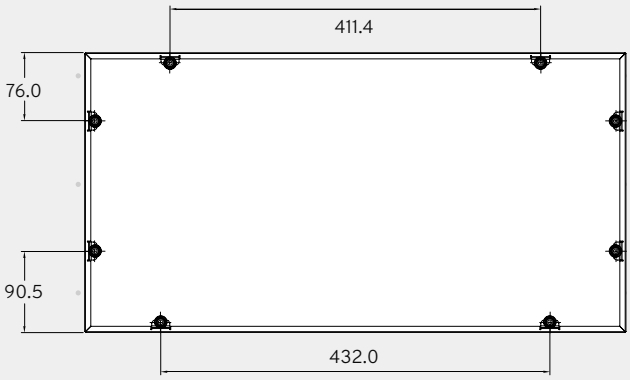
The corrosion-resistant MD30 Grill is a powder-coated, stainless steel mechanical part that protects the loudspeaker drivers. It is attached to the MD30 via button-style snap fasteners and installed after the MD30 is inserted into the Wall Frame.

The Grill fits onto the MD30 in only one direction. The top side buttons are slightly closer together than the bottom side buttons. The side buttons that are closest to the adjacent edge indicate the top side of the Grill.



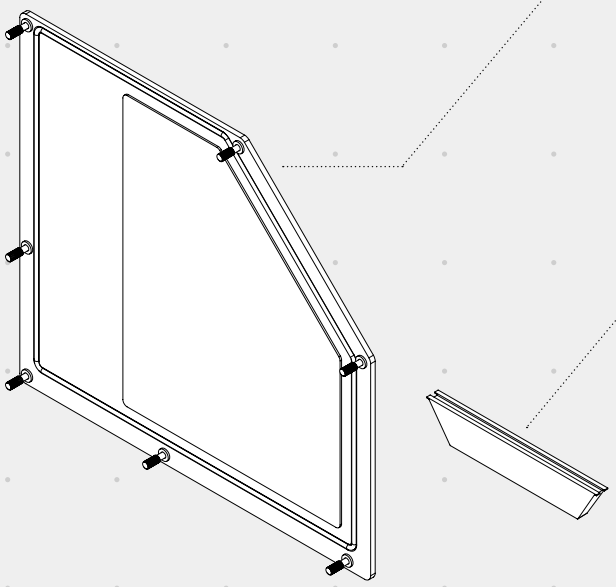
WARNING: Risk of electric shock if the grill is removed.

While the Grill has a high degree of acoustic transparency, it still introduces a small loss of 2 dB above 8 kHz, which is automatically corrected by the internal DSP. A small gain can be expected when the MD30 is used without the Grill; however, the IP65 rating will be lost.



IP65 KIT

To achieve an IP65 rating, the IP65 Kit must be used along with the Grill. The IP65 Kit protects the Connector Panel from outside elements and consists of two parts:



CABLE COVER

Powder-coated aluminum plate that protects the rear electronics from water ingress. It includes a form-in-place (FIP) gasket that seals between the Cable Cover and the Connector Bay, safeguarding internal components and achieving an IP65 protection rating. It uses seven fixed Hex 2.5-bit screws, which require tightening to 1 Nm to create a compressive seal.

CABLE SEAL BLOCK

A silicone rubber membrane that fits between the Cable Cover and the Chassis, sealing cable entry into the Control Bay. Punched holes in the Cable Seal Block allow cables to pass through while resisting water ingress.

To achieve IP65, use the Cable Seal Block. It must be punctured with wires fed through it and terminated. After connection to the various connectors, the Cable Seal Block (with the wires going through) shall be placed into position and held in place by the Cable Cover.

A leather rotary punch tool is suitable for puncturing holes in the Cable Seal Block. However, any tool that is capable of creating a small hole in the Block can be used. The hole diameter should be approximately 1-2 mm less than the diameter of the corresponding cable to maintain a seal.

COLOR CUSTOMIZATION

The MD30 Wall Frame and Grill cover the MD30 completely and define the color of the loudspeaker. The MD30 module color itself remains black.

The Wall Frame and Grill colors can be customized. For details about color customizations, contact info@holoplot.com.

The Wall Frame and Grill come in two standard colors:

Black (RAL 9005)

White (RAL 9003)

Environmental Considerations

The MD30 is designed for indoor and outdoor applications.
The MD30 can achieve IP65 rating with the IP65 Kit and Grill.

OPERATING ENVIRONMENTS

The MD30's performance and durability can be affected by harsh conditions. Following these guidelines for operation ensures optimal performance and longevity of the MD30 under variable conditions:

- Between -25 °C (-13 °F) and 60 °C (140 °F)
- Up to 95 % humidity at +60 °C (140 °F)

Below 0 °C, start at a low volume and gradually increase; for permanent cold installations, maintain a continuous playback of a low-level pink noise signal to protect components from freezing.

In high temperatures above 35 °C, avoid direct sun exposure and continuous operation at limiting levels to prevent overheating. In environments with high ambient temperatures, the devices should be protected from direct sun exposure (for example, through acoustically transparent panels).

The MD30 is suitable to operate in saline environments according to DIN EN 60068-2-11 when using the IP65 Kit.

Do not touch exposed metal surfaces of the device during operation in hot environments and/or during direct sun exposure, as this can cause skin burn.

IP65 RATING

The MD30 is capable of an IP65 rating (EN 60529). To achieve this rating, the IP65 Kit (Cable Entry Seal + Cable Cover) and Grill must be used.

These are **mandatory** accessories for permanent outdoor installations of MD30. The IP65 Kit ensures IP65 protection of the MD30 Connector Bay as well as UV protection.

Follow the installation guide to securely fit these components and ensure complete sealing.

INSTALLATION

1. Punch holes in the Cable Seal Block with a rotary punch tool (not included). Choose a hole size slightly smaller (1-2mm) than the cable diameter to ensure sealing.
2. Pass non-terminated cables through the newly created holes.
3. Fit the Cable Seal Block into the groove to maintain a tight seal with the Chassis, the Cable Cover, and the cables.
4. Install the Cable Cover by tightening the seven captive screws using a Hex 2.5 bit, with a torque of 1 Nm.

REGULAR INSPECTION

Immediately replace any worn or damaged components to maintain protection.

COOLING AND AIRFLOW REQUIREMENTS

The MD30 is passively cooled. The Chassis features an integrated heat sink design connected to the internal electronics.

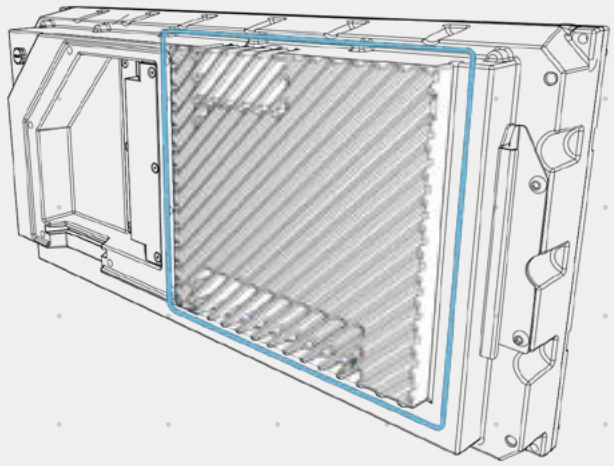
Depending on usage and environmental conditions, the MD30 requires sufficient airflow to handle up to 180 W / 614.5 BTU/hr per module.

A thermal limiter protects the device and the internal components from excessive temperatures.

The limiter will progressively reduce the MD30's output capacity. If the temperature measured inside the device reaches critical levels despite the output reduction, the device will automatically shut down to avoid any component damage.

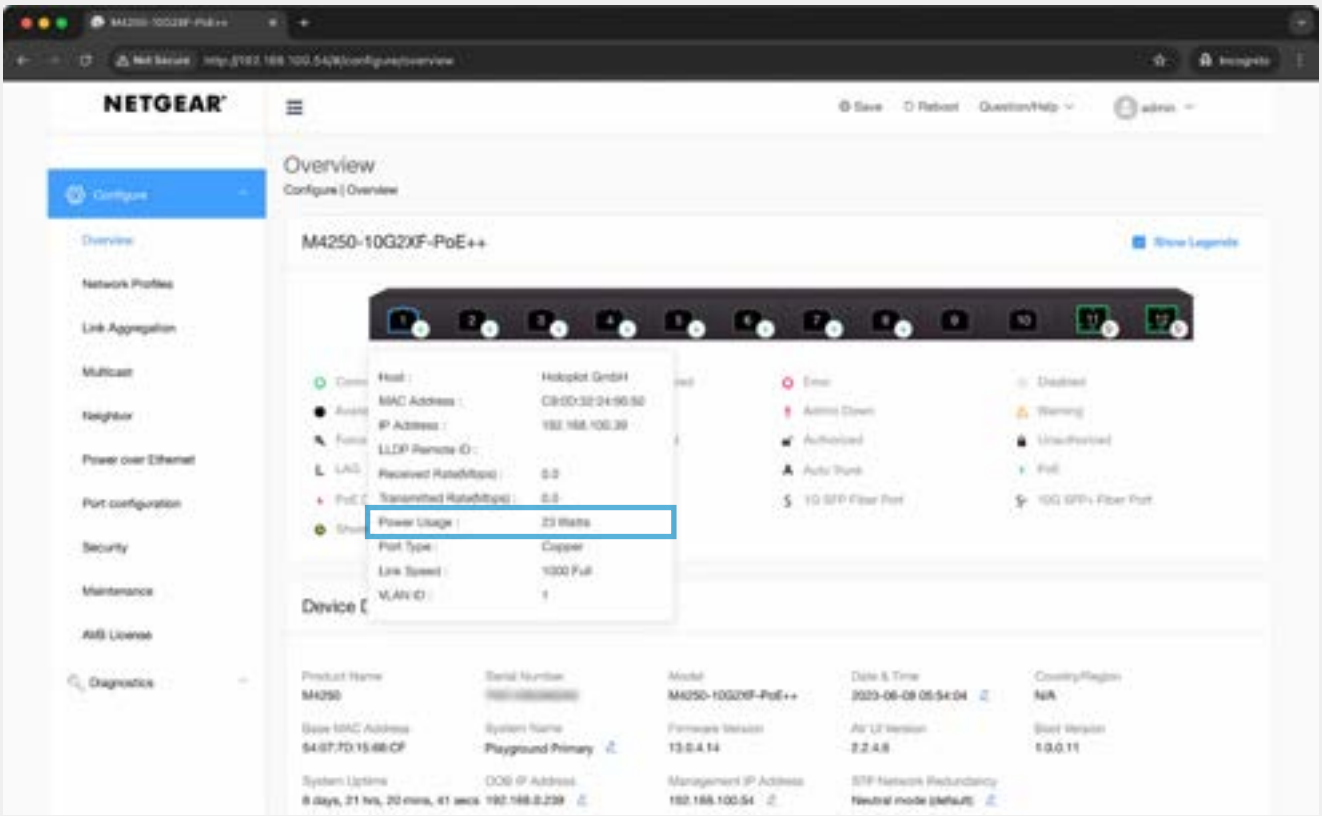
When building tall arrays, (more than five modules high) prioritize airflow to prevent heat accumulation at higher levels. For environments with limited ventilation or higher ambient temperatures, consider additional cooling strategies such as spaced mounting or external vent systems to enhance heat dissipation.At extreme conditions over a sustained period, component damage is possible.

To ensure optimal performance, monitor PoE power readings to assess real-time power consumption and adjust cooling measures accordingly.



Free airflow behind the loudspeaker is necessary to maintain sufficient cooling. Do not obstruct airflow around the loudspeaker.

Do not install near any heat sources such as radiators, heat registers, or other devices that produce heat.



Mounting and Rigging

The MD30 can be mounted with HOLOPLOT hardware or custom-designed rigging options to suit any installation.

MD30 WALL FRAME

Unbox and gather the following kits to install the MD30 into the Wall Frame:

- X2 MD30 Module
- X2 MD30 Wall Frame Kit
- X2 MD30 Handling Tool
- X2 MD30 Lever
- X2 MD30 IP65 Kit (optional)

Gather additional tools for the Job:

- Tools for creating mounting points on the chosen surface (drill etc.)
- Minimum 4x M6 screws and washers fit for the installation surface
- Loctite 248 or equivalent thread locking
- Leather hole punch tool (only required when IP65 Kit is used)
- Electric screwdriver
- TX25 bit
- Level

Use only with attachments, accessories, or hardware specified by HOLOPLOT.

Rigging used with this device must comply with the safety instructions in this manual.

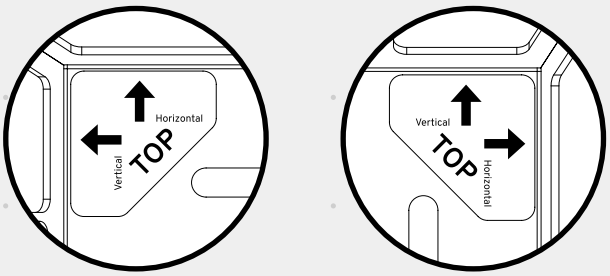
INSTALLING THE WALL FRAME

SCREW/BOLT TYPES

Select the hardware that will support the weight of the frame. Use at least 4x M6 screws or bolts with washers to hold the frame in place. HOLOPLOT is not liable for the choice of mounting hardware and its quality.

ORIENTATION

Use the orientation sticker inside the Wall Frame to correctly orient it. Maintain orientation when building Matrix Arrays with multiple Wall Frames.



Installations must be designed and implemented according to local safety regulations and follow principles of good workmanship

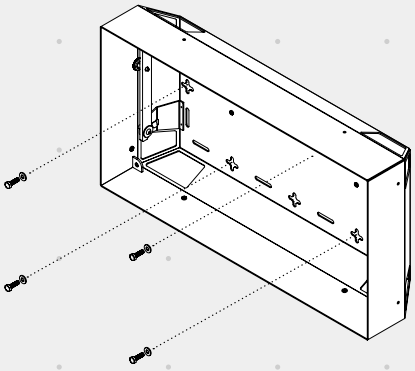
The mounting surface and hardware must support the combined weight of 22.9 kg per MD30 (7.3 kg for the frame and grill + 15.6 kg for the module) plus an appropriate factor for safety. Ensure that the mounting surface and method can hold one or multiple MD30 Wall Frames and Modules.

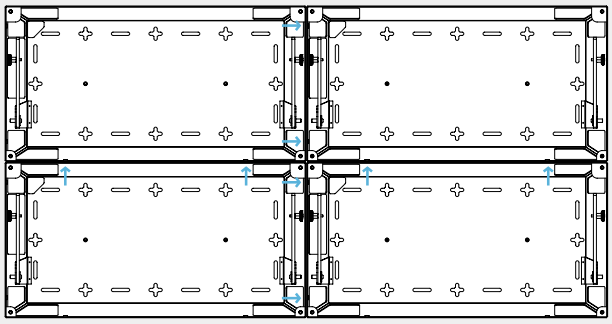
The Wall Frame can support a single MD30. Exceeding this weight capacity can result in damage or injury.

Do not terminate cables before starting the installation process when using the IP65 Kit.

MOUNTING THE WALL FRAME

1. Prepare a surface with mounting location holes for the Wall Frame. Ensure the mounting locations create a level plane.
2. Mount the Wall Frame in place with at least 4x M6 pan head screws and washers via the designated openings on the back of the Wall Frame.
3. Repeat steps 1 & 2 when creating Matrix Arrays. Use a level to ensure each Wall Frame is level with its neighbor.
4. For building arrays of multiple modules, thread the included interconnecting screws and washers through the holes to connect the Wall Frames.

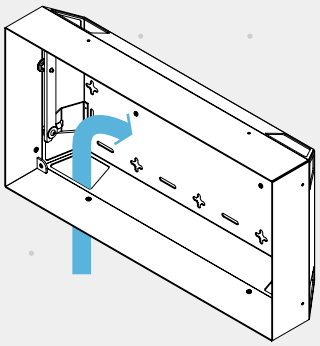




An alternative way is to connect multiple Wall Frames at the ground (see step #4) and then mount the larger assembly to the wall as one (following steps #1 - 3).

CABLE DRESSING

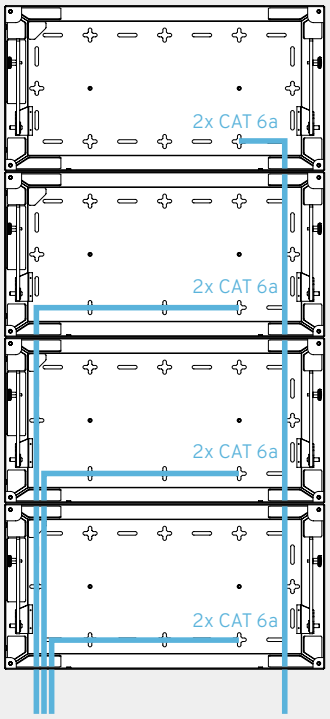
5. Arrange and dress all cables through the Wall Frame openings towards the MD30's Connector Bay location.

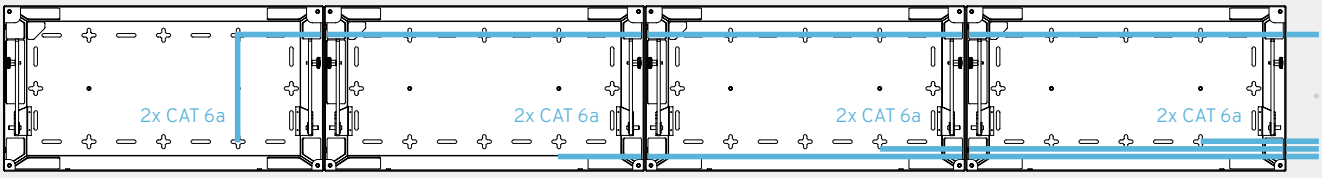


   a. When building larger arrays, pass cables to an inward-positioned frame through the adjacent cable guides from outward-positioned frames.

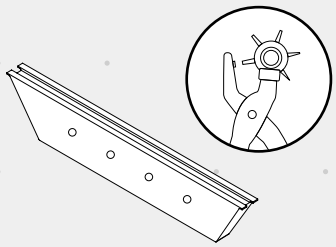
   b. Dress all cables using cable tie mounts so that the cables do not pinch when the MD30 is inserted and rotated in the frame.

   c. Be careful about the excess length of cables. All excess length needs to be dressable in the back space between the MD30 and the frame.

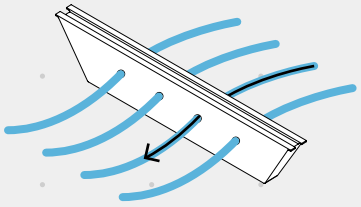




6. If using the IP65 Kit, prepare the Cable Seal Block by punching holes in the block that are slightly undersized with respect to the cable diameter. Ensure the holes are 1-2 mm less than the diameter of the corresponding cable to maintain a seal.

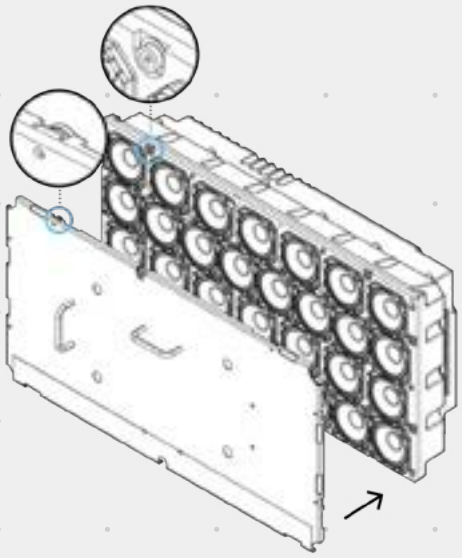


7. If using the IP65 Kit, pass the non-terminated cables through the Cable Seal Block before terminating the cables with the appropriate connectors.



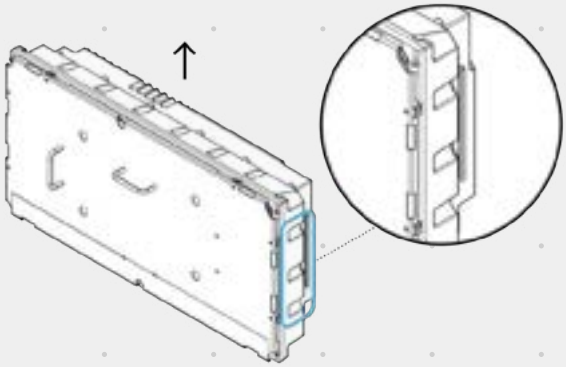
MOUNTING THE MD30 INSIDE A WALL FRAME

8. Attach the Handling Tool to the MD30, using the button-style snap fasteners. Be careful not to damage any loudspeaker drivers

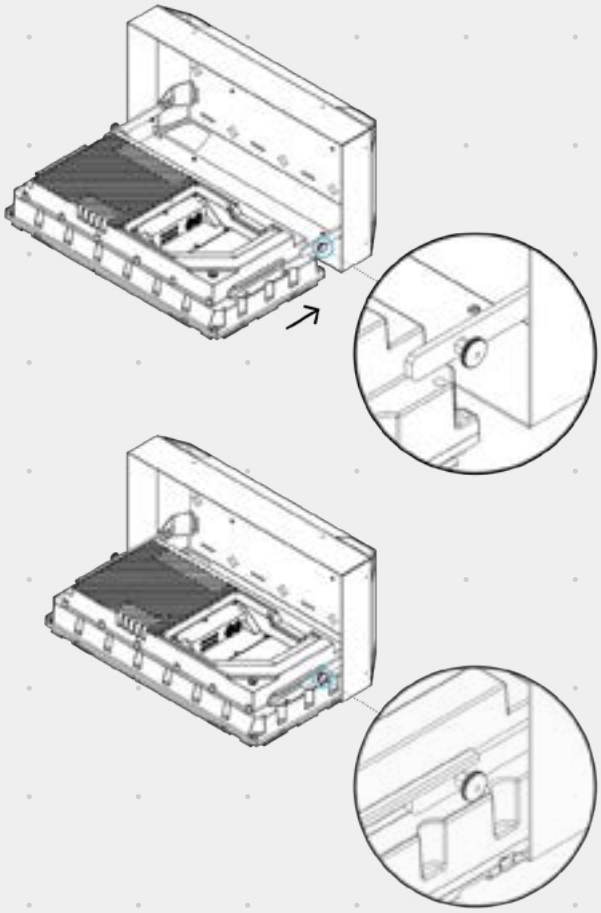


9. Grab the MD30 by its sides and ensure a secure grip. After that, lift the MD30 with two hands to transport it to the Wall Frame workspace.

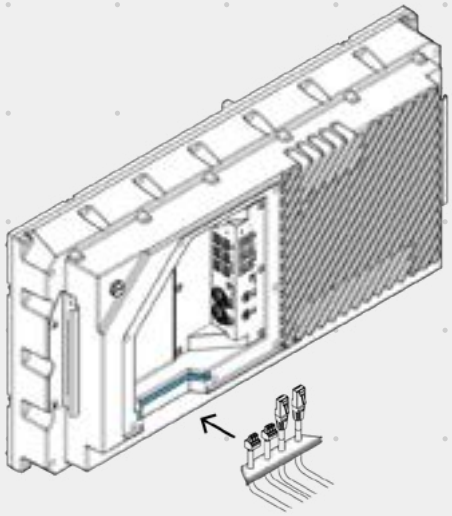
> ⚠ Do not use the handles to carry the weight of the module. Always grab the module by its sides with both hands.



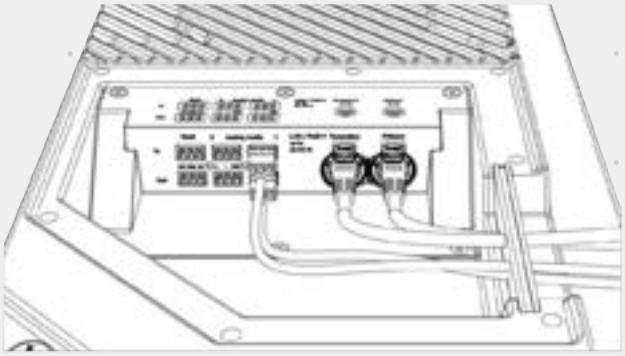
10. Insert the MD30 on the Wall Frame hinges by sliding the module rails onto the hinges. Make sure both hinges are inside the rails while you slide the module until both spring-locked mounting pins lock.



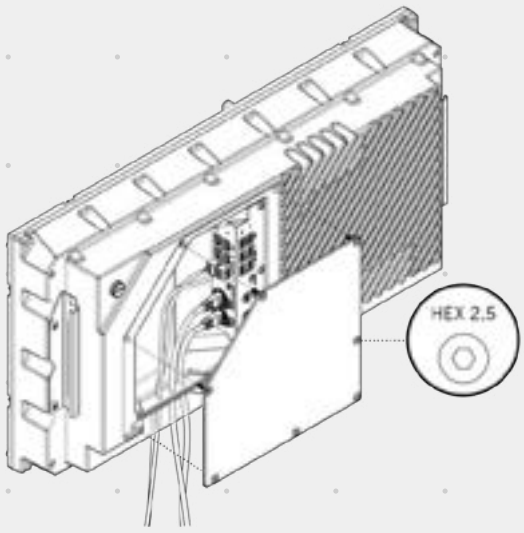
11. If using the IP65 Kit, insert the Cable Seal Block into the respective groove in the MD30.



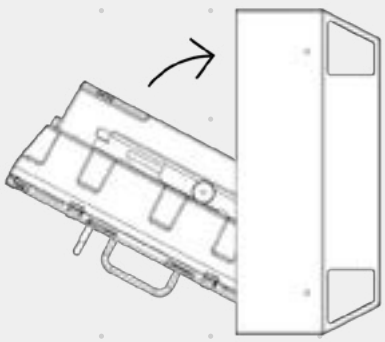
12. Insert all cables into the respective connectors on the MD30.



13. Mount the Cable Cover by tightening the seven captive screws using a Hex 2.5 bit, with a torque of 1 Nm.



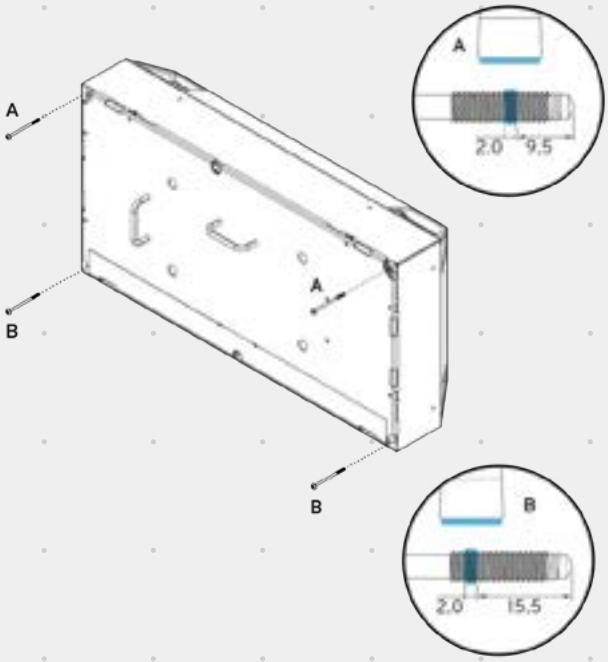
14. Carefully rotate the MD30 into the frame.



15. Apply 2 mm of Loctite 248 to the threads of the four MAThread M5x75 mm customized anti-cross thread screws. The screws require Loctite at different positions since the thread inside the frame sits at different distances:

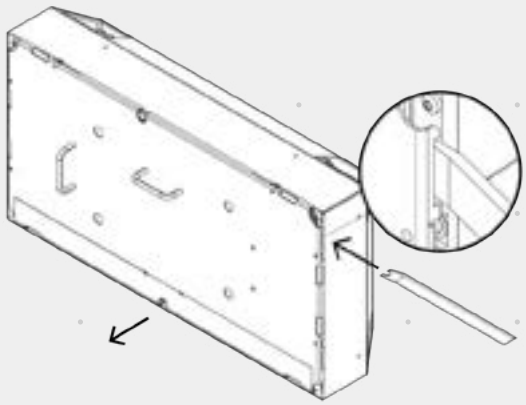
    A: Top (right in portrait) 15.5mm
    B: Bottom (left in portrait) 9.5mm

16. Hand thread the screws into their respective corner holes of the MD30. Use a TX25 bit to first tighten the two top screws, then the two bottom screws. All screws should be tightened to 3 Nm.

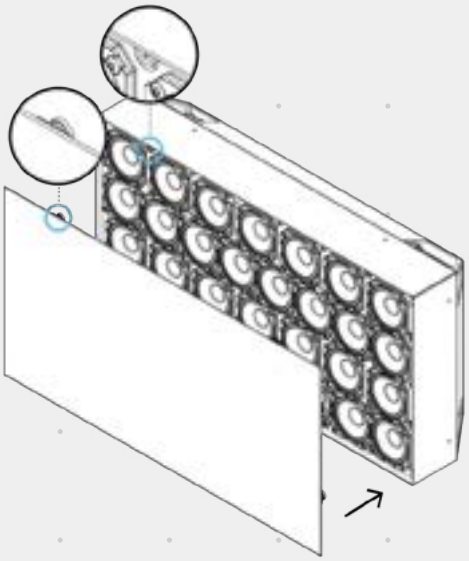


> ⚠ Do not exceed 3 Nm. Higher torque can strip the threads rendering the frame not functional.

17. Remove the Handling Tool with the Lever. Ensure the teeth face toward the Handling Tool and away from the drivers.



18. Install the front grill using the button-style snap fasteners. Be careful not to damage any loudspeaker drivers.



> ⚠ Ensure all 8 button fasteners are engaged before finishing the installation.

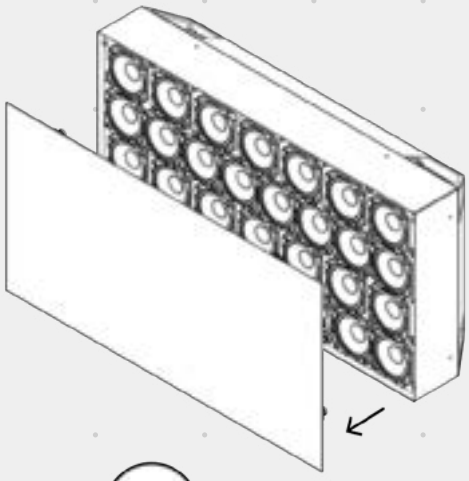
UNINSTALLING THE MD30

When disassembling a device from the Wall Frame when it is mounted in a tilted position, ensure to support the device securely with your hands to prevent accidental tilting or pivoting, which could lead to injury.

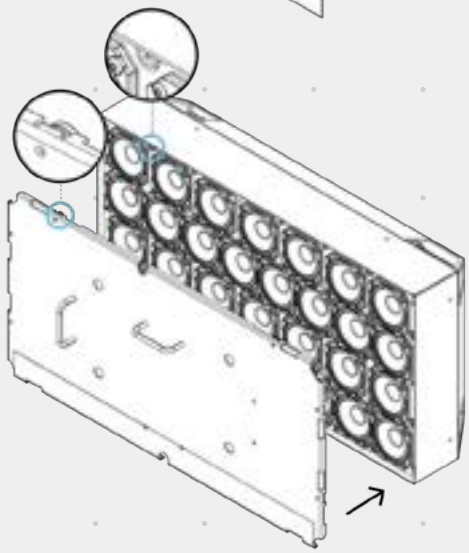
Disconnect the MD30 from power before handling/moving/rigging the device.

To disassemble the MD30 out of the Wall Frame, follow the sequence below:

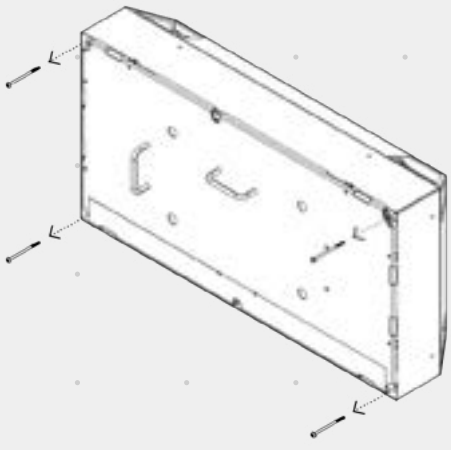
1. Remove the Grill from the MD30.



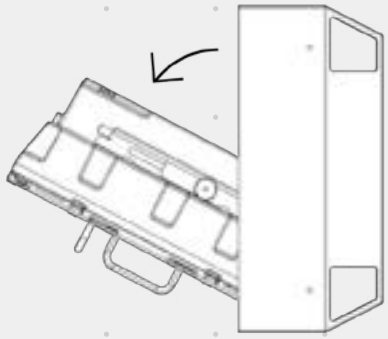
2. Attach the Handling Tool to the MD30, using the button-style snap fasteners. Be careful not to damage any loudspeaker drivers.



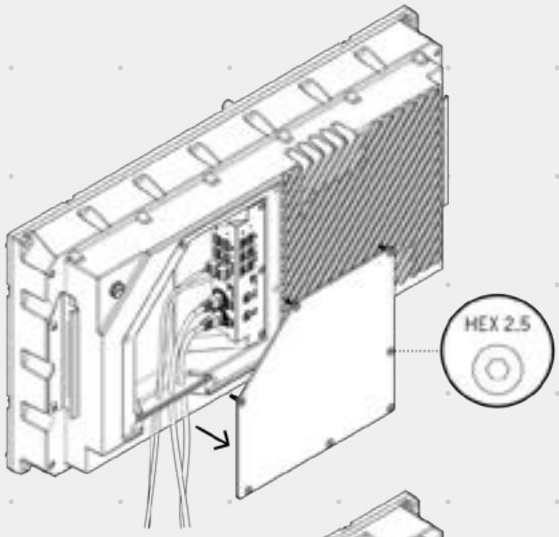
3. Use a TX25 bit to unscrew the 4x M5 MAThread screws in the corners of the MD30. Hold slight counter-pressure against the MD30 before unscrewing the last screw.



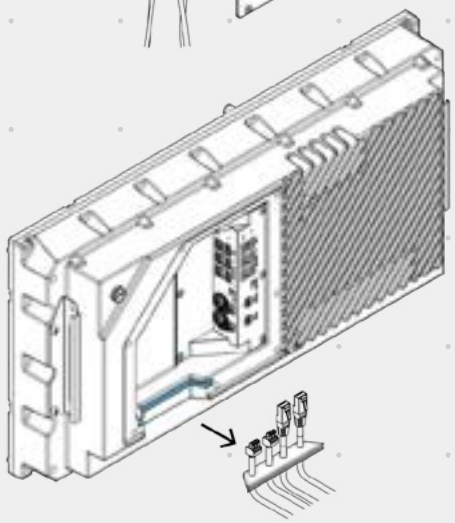
4. Carefully rotate the MD30 downwards to avoid collision. This is especially important when the MD30 is installed in a tilted position. A slight upward force may be required to fully rotate the MD30 out of the Wall Frame, especially in portrait orientation.



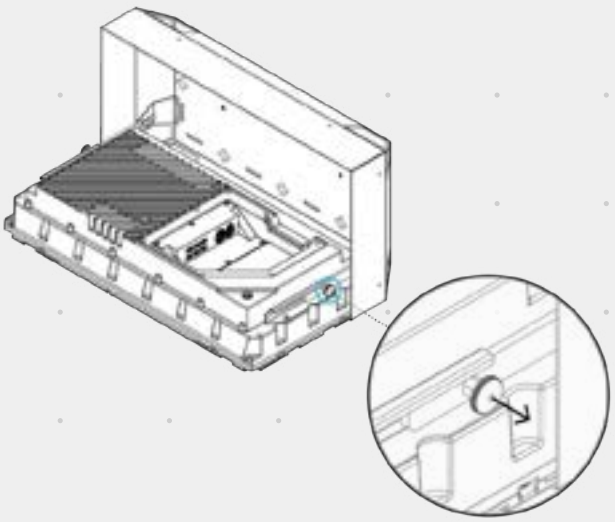
5. If using the IP65 Kit, remove the Cable Cover.



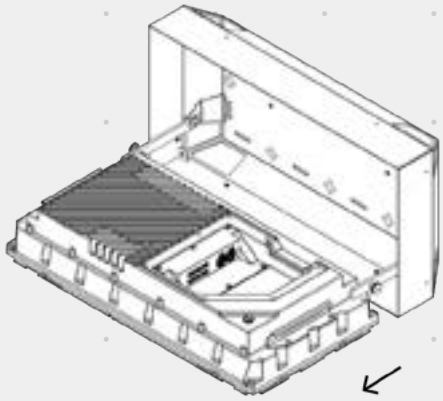
6. Disconnect cables and remove the Cable Seal Block if using the IP65 Kit.



7. Loosen one of the locking pins and pull the MD30 slightly out of the hinge.



8. Grab the MD30 by its sides, loosen the other locking pin, and start pulling out the MD30 until it's out of the Wall Frame hinges. Make sure to have a good grip on the MD30 during this step.



CEILING MOUNTING

The Wall Frame is designed for wall mounting but can also be used for ceiling mounting following the same installation steps.

Take additional precautions due to the new angle and gravitational pull on the MD30.

> ⚠ Work with a partner for safety and efficiency, and always plan for any additional safety needs.
>
> Define a safety zone below the work area before performing any work.

INSTALLING:

1. Ensure the selected hardware and mounting points support the downward force of 22.9 kg (7.3 kg for the frame and grill + 15.6 kg for the MD30), plus an added safety factor.
2. Position the working platform close to the ceiling to minimize vertical lifting effort.
3. Ensure the locking mechanism clicks when inserting the Wall Frame hinges into the MD30 mounting rails. Do not release the MD30 until it is securely attached to the Wall Frame hinges.
4. Maintain contact and an upward force on the MD30. Do not let the MD30 hang from the hinges.
5. One person rotates the module into place while another applies Loctite and threads the MAThread M5x75 mm screw into position. Maintain upward pressure on the module during this process.
6. Inspect all buttons on the Grill after installation to ensure no Grill detaches.

UNINSTALLING:

1. Slowly remove the Grill with two hands.
2. Work together to remove the screws. One person holds the MD30 in place while another removes the screws.
3. Slowly rotate the MD30 out of the Wall Frame.
4. Maintain a lifting force with the MD30 to support its weight. Do not let the MD30 hang from the hinges.
5. Work together to remove the MD30 from the Wall Frame. One person holds the MD30 with slight lifting force while the other opens the locking mechanism. Lower the MD30 slowly until free.

> ⚠ The hinges are not suitable to support the module in a hanging position. Do not, under any circumstances, let the module hang from the hinges.

CUSTOM RIGGING, INSTALLATION AND CONCEALMENT

The following information is intended to enable a third party to design a custom rigging system.

IMPORTANT SAFETY AND LEGAL NOTE:
A rigging system must be designed and used in accordance with local, state, federal, and industry regulations. It is the installer's responsibility to evaluate the reliability of any rigging method for their application. Rigging should only be designed and carried out by experienced and appropriately qualified professionals. Any rigging design must be verified and approved by a qualified structural engineer.

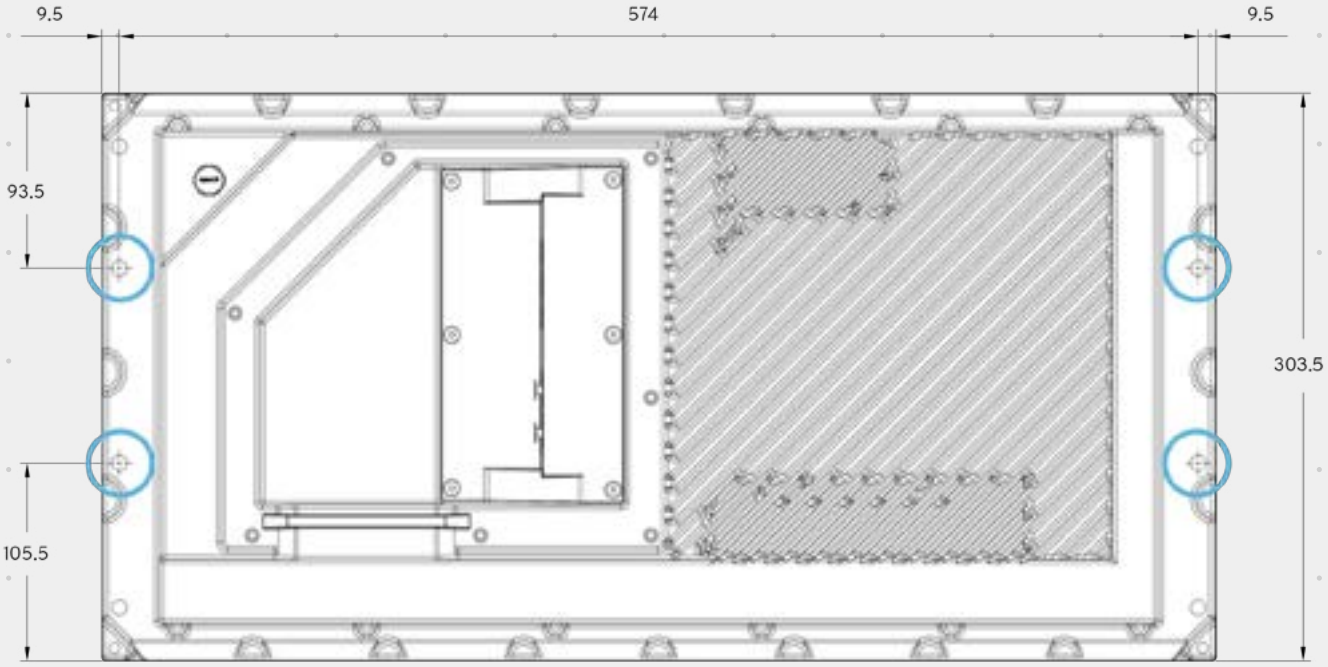
HOLOPLOT cannot take any liability and responsibility for any custom rigging system.

RIGGING POINTS

The MD30 includes 4x stainless steel (A2) M6 threaded holes, 12 mm deep, for custom rigging and mounting. The rigging holes are accessible after removing the Rails from each side of the module.

All 4 attachment points (highlighted in blue below) must be used to ensure safe rigging stability.

3D CAD files and additional technical drawings of the Loudspeaker Modules are available from HOLOPLOT on request.



AREAS NOT TO BE COVERED

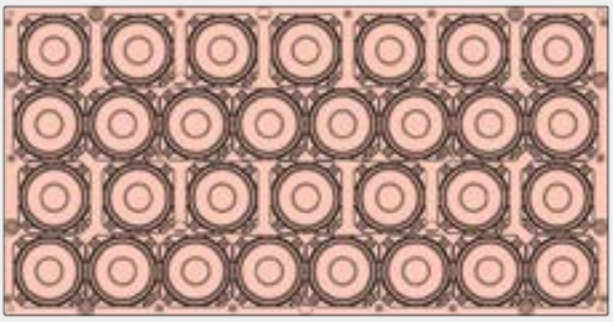
To ensure the best performance of an MD30, the loudspeaker drivers at the front of the MD30 should not be covered by the rigging system or any other physical structures.

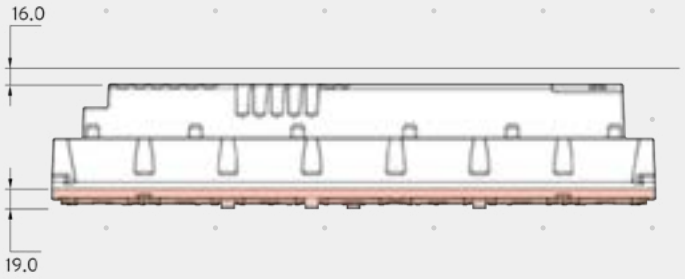
All rigging equipment must leave at least 16 mm from the back of the MD30 to ensure airflow.

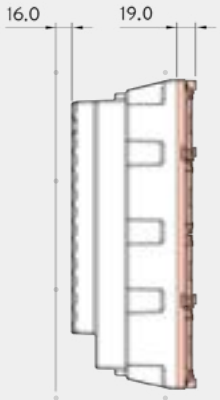
Custom Rigging should allow access to the Connector Panel and leave room for cable slack.

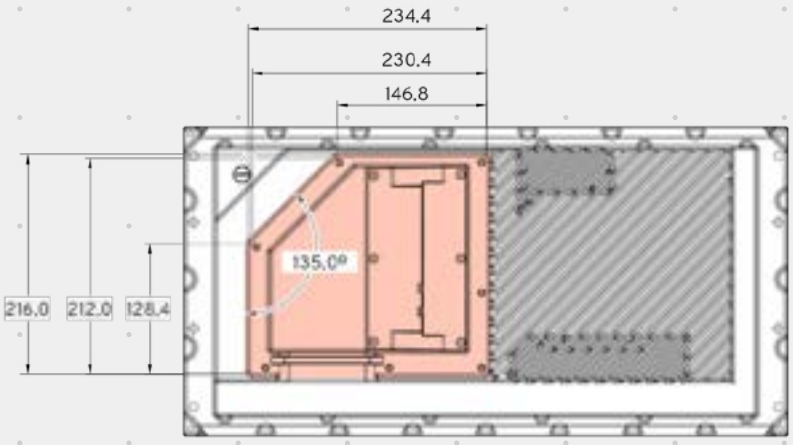
Free air flow behind the loudspeaker is necessary to maintain sufficient cooling. Do not obstruct airflow around the loudspeaker.

Do not install near any heat sources such as radiators, heat registers, or other devices that produce heat.







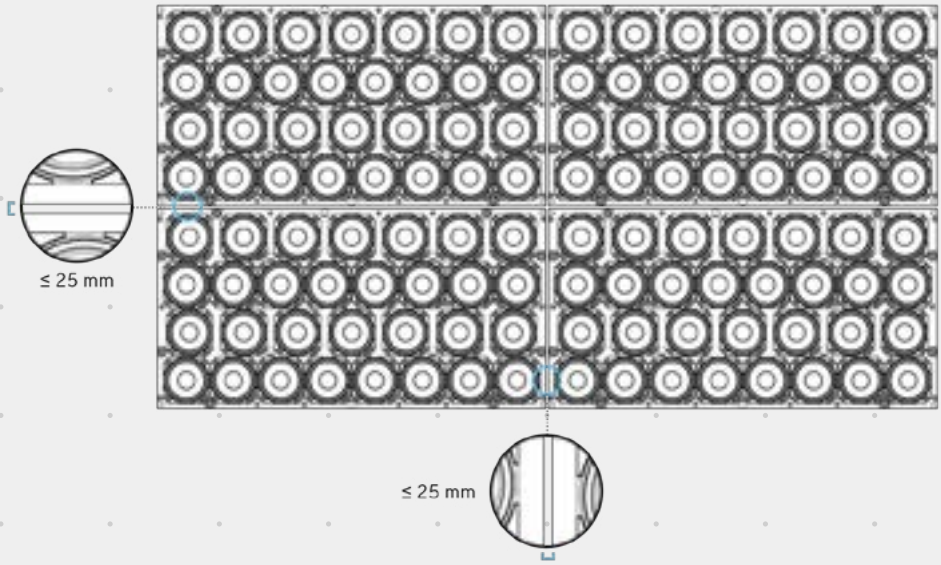


DISTANCES BETWEEN MD30 MODULES

Matrix Arrays require consistent spacing between loudspeaker drivers across multiple MD30 modules to maintain optimal performance.

When designing a rigging system for an array of MD30 modules, reduce the distance between neighboring MD30 modules to a minimum. The distance between modules should not exceed **25 mm** in the horizontal and vertical axes.

Arrays with custom rigging that cause any gap cannot be designed in HOLOPLOT Plan. Download the MD30 3D Assets from the HOLOPLOT Hub and design the rigged arrays in SketchUp, taking into account the gap caused by the rigging. Follow the SketchUp to HOLOPLOT Plan workflow guide in the HOLOPLOT Hub.



CUSTOM CONCEALMENT

The MD30 and HOLOPLOT software provide significant advantages over traditional loudspeaker systems when concealed behind acoustically transparent screens, perforated screens, and LED panels.

HOLOPLOT's proprietary compensation algorithms are able to address angle-dependent and frequency-dependent transmission losses caused by the concealing solution, functioning similarly to a directional spatial EQ.

As a general guideline, the front of the MD30 should be positioned as close as possible to the concealing solution. It is recommended not to place it more than 50 mm from the screen surface to minimize reflections between the MD30 and the screen..

HOLOPLOT must test a sample of your chosen solution to generate a customized compensation algorithm. Consult with HOLOPLOT for testing and approval before selecting a concealing method.

MD30 RIGGING SYSTEM

HOLOPLOT is currently developing an extensive rigging system for the MD30. Contact HOLOPLOT for more information (info@holoplot.com).

Power Setup and Requirements

The MD30 is a high-performance device with redundant PoE++ power capabilities. Understanding power distribution, voltage and current requirements, and electrical safety guidelines is critical for safe operation of the MD30.

It is important to understand that power draw and thus power budgeting is a combination of:

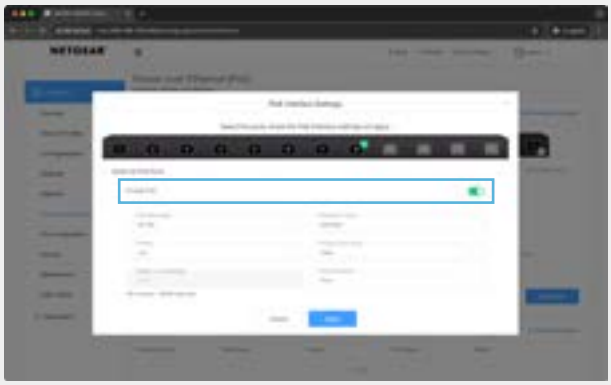
- Power Sourcing Equipment (PoE++ switches and injectors)
- Cable type and length (must not exceed 100 m)
- Single or dual PoE++ configuration
- Array size and Beam type
- Desired / Total SPL

PoE POWER SOURCING EQUIPMENT REQUIREMENTS

PoE infrastructure has two devices: the Power Sourcing Equipment (PSE) and the Power Device (PD). The MD30 is a PD, and a PoE++ switch or injector is the PSE.

PSEs must comply with IEC 62368-1 or the country-specific equivalent product safety standards (e.g. UL 62368-1). Use only 802.3bt Type 3/4 PSEs (“4-pair” PoE, 4PPoE) when connecting the MD30 to a PSE.

Some PoE++ switches may require the PoE functionality for a specific network port to be enabled through the switch’s setting menu. Please refer to the switch’s operating manual.



Network settings for Netgear PoE M4250 AVLine Switches: Port enablement for PoE

A list of recommended network devices, including suitable PoE++ switches, can be found on the HOLOPLOT Hub.

PoE++ switches and some injectors with internal fans can generate noticeable noise. To minimize noise from PoE++ switches and fan-equipped injectors, install PSEs in well-ventilated, low-noise areas like engineering rooms or isolated cooling racks, adhering to their cooling specifications.

To prevent issues with the PSE and to ensure galvanic isolation between the MD30 and the PSE, the PSE (and/or its external power supply) must comply with the IEC 62368-1 safety standard or the equivalent country-specific safety standards.

ETHERNET CABLE REQUIREMENTS

Select the appropriate cables to ensure safety and compliance with flammability standards when setting up Power over Ethernet (PoE) applications. For PoE++ circuits, which can draw up to 90 W of power, follow these specific guidelines to ensure safe operation:

FLAMMABILITY COMPLIANCE:

Only use Ethernet cables that comply with UL 2556 VW-1 or an equivalent standard. This ensures that the cables meet the necessary flammability resistance requirements.

OUTDOOR APPLICATIONS:

For outdoor installations, use only cables rated for outdoor use. These cables are designed to withstand various environmental conditions, ensuring durability and safety.

Do not exceed 100 m from the PSE to the MD30. Keep Ethernet cable runs to a minimum. Place PSE as close to the MD30 as possible.

Do not operate the device if the Ethernet power cable is frayed or broken.

PoE CABLE LOSS CALCULATION

Ethernet cables experience power loss over distance The reason for the power loss is that the CAT cable conductor is thin and has considerable resistance. The power loss increases with increasing cable length.

The maximum cable length is 100 m (333 ft) from the PoE++ switch or injector.

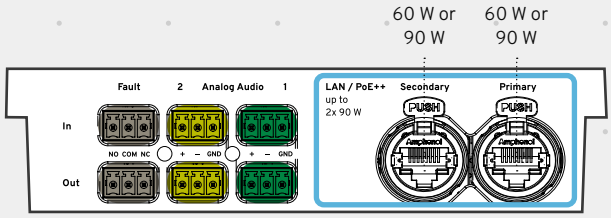
PoE++ devices have maximum power draw limits for each class. Longer cable runs will reduce the maximum power to the MD30.

To minimize the cable loss and maximize performance, consider positioning switches and power injectors close to the loudspeakers or short cable runs.

Take additional consideration for a cable's power loss depending on the cable's environment. For example, cables in hot outdoor environments may suffer more from power loss due to additional environmental heat.

MD30 POWER CONFIGURATIONS AND SETTINGS

The MD30 has two PoE++ EtherCON ports on the Connector Panel to power the module. Each port can draw power from a PSE to power the module and receive AoIP/Control data for audio playback and configuration.



POWER CONFIGURATIONS

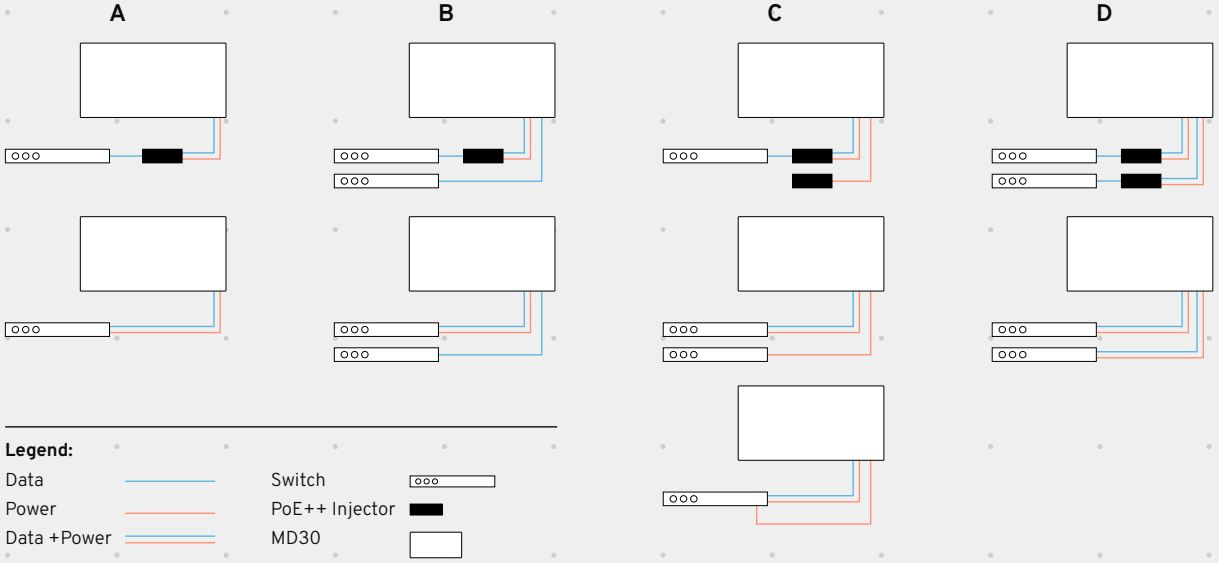
The MD30 has multiple power/data configurations with the two PoE++ ports. Either port can be deemed Primary or Secondary. Determine and adhere to a cabling pattern for consistency throughout an installation.

Dual power without a redundant network still requires network configuration depending on the PSE. Refer to NETWORKING CONFIGURATIONS to understand this process.

		Primary Port		Secondary Port	
		Power	**Data**	**Power**	**Data**
A	Single Power, No Redundancy	✓	✓		
B	Redundant Network Only	✓	✓		✓
C	Dual Power Only	✓	✓	✓	
D	Dual Power, Redundant Network*	✓	✓	✓	✓

* Dual power with network redundancy is highly recommended to increase power capacity and provide network failover.

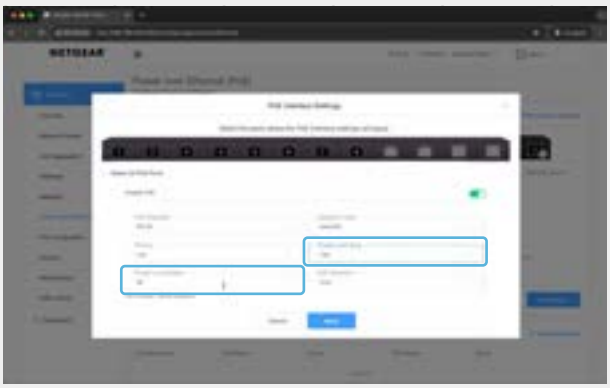
Power/data configuration examples:



PSE SETTINGS

The MD30 supports multiple power configurations defined by the number of PSE sources and the PSE settings. Both ports support 60 or 90 W according to 802.3bt Type 3 Class 6 and 802.3bt Type 4 Class 8.

The MD30 supports automatic negotiation with the IP switch or IP power injector to set the PoE power level. However, in some cases, it may be necessary to set the PoE power level in the switch manually.



Network settings for Netgear PoE M4250 AVLine Switches: PoE power level configuration

Maximum power remains constant at the PSE when the MD30 is drawing peak power. The table below demonstrates the PSE class selection, power configuration, and power range at the MD30 depending on cable length, i.e. minimum power value corresponds with maximum cable length of 100 m:

	Maximum Power			
	PSE	**MD30**	**Primary**	**Secondary**
IEEE 802.3bt (Type 3)	60 W	51 - 60 W	51 - 60 W	–
	120 W	102 - 120 W	51 - 60 W	51 - 60 W
IEEE 802.3bt (Type 4)	90 W	71.3 - 90 W	71.3 - 90 W	–
	180 W	142.6 - 180 W	71.3 - 90 W	71.3 - 90 W

The available power provided to the MD30 will affect constant SPL and the duration of peak SPL.

HOW PoE POWER MANAGEMENT WORKS

The MD30 has an internal power supply and limiters for power management that provide flexible and automatic operation for varying power and content scenarios.

POWER SUPPLY

The MD30's internal power supply stores energy to handle peak outputs that temporarily exceed input power, enabling it to manage high peaks in dynamic music and speech signals—even compressed wideband audio. The duration of these peaks is limited by the stored charge, and the recharge speed depends on the available power from the PSE. Using two 90 W PSE sources provides maximum power and the fastest recharge times.

When stored energy is depleted, an internal limiter reduces signals above the maximum sustained SPL to protect the system. If the input power at the MD30 is less than 51 W and demand is high, the continuous operation of the signal cannot be guaranteed.

Upon startup or when the power supply isn't at full capacity, the MD30 draws the maximum available power to recharge, always requesting the highest power class available from the PSE based on its settings. Otherwise, it draws power based on incoming signals during normal operation.

Even after powering down, the device's internal power supply remains charged for a short time, posing a risk of electric shock if disassembled immediately. Do not attempt to disassemble the device.

LEVEL REDUCTION IN CASE OF LOWER INPUT POWER

The MD30 employs internal limiters to protect the transducers and ensure signal delivery based on the negotiated PoE class and type. Dual 90 W PSE devices reach maximum power and provide the highest long-term output.

When a sustained high input signal is present, the duration of maximum output delivery (both RMS and peak levels) depends on the available power. This available power determines how quickly the power storage can charge. After delivering the expected maximum SPL for some time, if the available power is insufficient to maintain a sufficient charge level for the unit to operate continuously, the power limiters will reduce the signal level. Other module safety measures might affect the output level, such as temperature or driver excursion protection.

The table below illustrates how available power affects both short-term and long-term SPL for an optimized parallel beam configuration ("worst-case scenario") and a beam configuration which represents an average use case. The values are applicable across multiple input signal standards: AES 2, Speech (IEC 60268-16, Ed. 5.0), and AES 75. It is important to note that the crest factor for each signal is consistently maintained and delivered at all times.

Scenario	Input Power (W)					
	51	**60**	**71.3**	**90**	**120**	**180**
Long-term - "worst-case"	-2.8 dB	-2.4 dB	0 dB	-3.1 dB	-1.5 dB	0 dB
Long-term - "average use"	-1 dB	0.8 dB	0 dB	0 dB	0 dB	0 dB
Short-term (1-minute) - "worst-case" & "average use"	0 dB	0 dB	0 dB	0 dB	0 dB	0 dB

PoE BUDGET CALCULATION

Selecting the right power configuration and PSE is important for an MD30 installation.

Consider dual power configuration for applications requiring high SPL and low crest factor content, especially with small arrays. Dual power from separate sources is recommended to enhance reliability for PA/VA and voice alarm systems.

Consider single power configurations in scenarios with lower SPL demands, high crest factor content, and larger arrays.

Environmental factors like high ambient temperatures can increase cable losses. Use appropriate cable types suited for the installation environment.

Each PSE has a defined maximum output power capacity, which can limit the number of usable PoE++ outputs. Ensure that the total power required for all connected MD30 modules does not exceed the PSE's power capacity. Calculate 60 W or 90 W per switch port, depending on the PSE's power budget.

Considering the following table for a power budget example using a 16 port, 1440 W PoE++ Switch:

Total Switch Power	Total Ports	Watts Per Port	Total MD30s in Single Power	OR	Total MD30s in Dual Power
1,440 W	16	90	16		8
1,440 W	16	60	24		12

POWERING ON THE MD30

The MD30 has no physical power switch. It automatically negotiates PoE class and boots when connected to a PSE that provides power, requiring no user interaction.

LEDs on the front of the Module Blink when the Module is powered on.

Each MD30 draws maximum power during startup. Ensure the switch can supply maximum port power to all MD30 modules at that time. Rebooting the switch will cause all connected modules to reboot, briefly drawing maximum power to recharge their internal power supplies.

CIRCUIT PROTECTION

The MD30 is equipped with power-related protection circuits to prevent damage to the loudspeaker module:

- Short circuit protection
- Overload protection
- Thermal protection (against excessive internal temperatures)

Extensive built-in protection circuitry prevents electronic noise from interfering with PoE negotiation. If the MD30 fails to negotiate with the PoE switch, contact HOLOPLOT support for troubleshooting assistance (support@holoplot.com).

These can include:

- Removing all potential sources of electronic noise, such as the analog inputs and fault relay connections
- Grounding the Wall Frame
- Unifying ground for the analog audio input source and the PoE switch

Do not unplug an MD30 while it is powered, especially when the MD30 is under heavy load. Shut down the PSE or disengage power from the PSE port (via settings) before physically unplugging the MD30 from power. High-load PoE++ can spark and cause damage to the technician, the PSE, and the MD30, even with its circuit protection.

POWER STATES

The MD30 has the following power states that are set in HOLOPLOT Control:

		Power Consuption	
Mode		**Single PoE++**	**Dual PoE++**
Sleep/Power Saving		6 W	12 W
On	Idle	18 W	22 W
	Continuous	Defined by content, beams, array size, and available power	
	Max	Up to 90 W Defined by available power and configuration	Up to 180 W

POWER FAILOVER

When provided power from two independent PSEs, the MD30 will experience no downtime or interruption if one PSE fails. The maximum SPL capabilities will reflect the available power budget from the remaining supplied power source.

When power is restored to the secondary power source, the MD30 will automatically regain higher SPL potential.

Additional power states, such as a “green mode,” might be implemented through software updates and will be compatible with all MD30 modules.

Network & Audio over IP (AoIP) Setup and Requirements

HOLOPLOT is a fully network-based audio system. The MD30 uses network communication for both AoIP streams and Control system communication via HOLOPLOT Control.

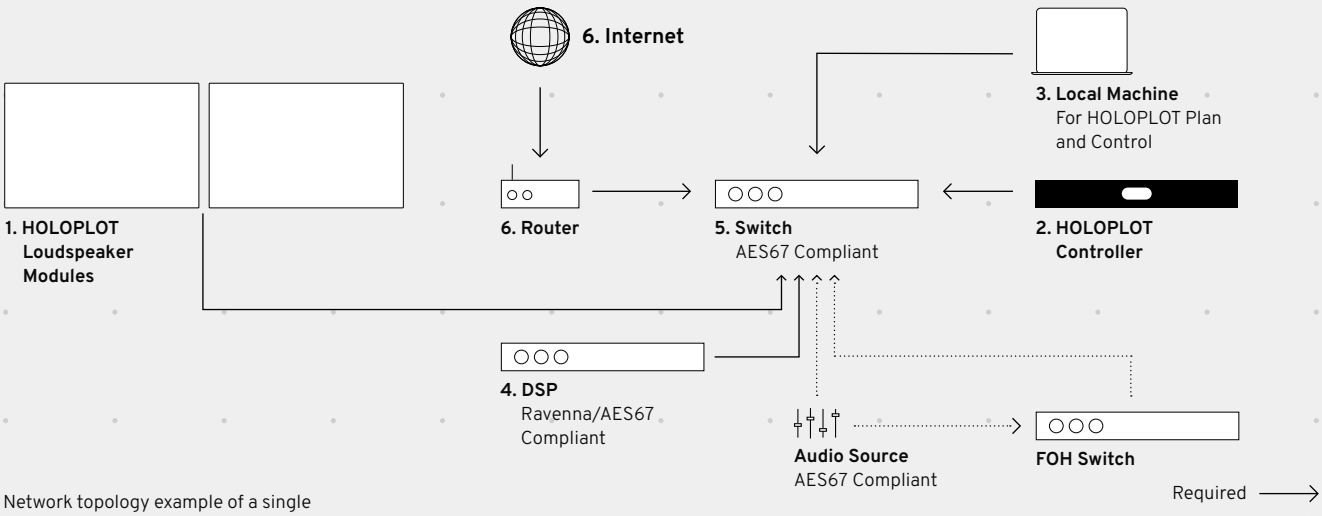
BASIC SYSTEM SETUP

The MD30 cannot operate independently and must be integrated into a HOLOPLOT Audio System with a HOLOPLOT Controller to function. Once connected, the MD30 can receive its position and sound field configuration data, allowing it to play AoIP audio streams.

The minimum system setup for operating an individual or multiple MD30s modules is:

1. At least 1 MD30,
2. HOLOPLOT Controller running the main system management services (HOLOPLOT OS),
3. PC or Mac running HOLOPLOT Plan to configure a system and to access HOLOPLOT Control via a web browser (a tablet can be used to access HOLOPLOT Control),
4. Ravenna/AES67 audio-over-IP source (Dante® enabled with an optional Dante® to Ravenna stream conversion in the Controller*),
5. Networking appliances: Managed AV PoE++ switch PoE++ switch (or managed AV switch in combination with PoE++ injectors) and DHCP server,
6. An internet connection is not required for a basic setup but is recommended.

Refer to the HOLOPLOT Hub for more details on networking of HOLOPLOT systems including a list of recommended networking appliances.



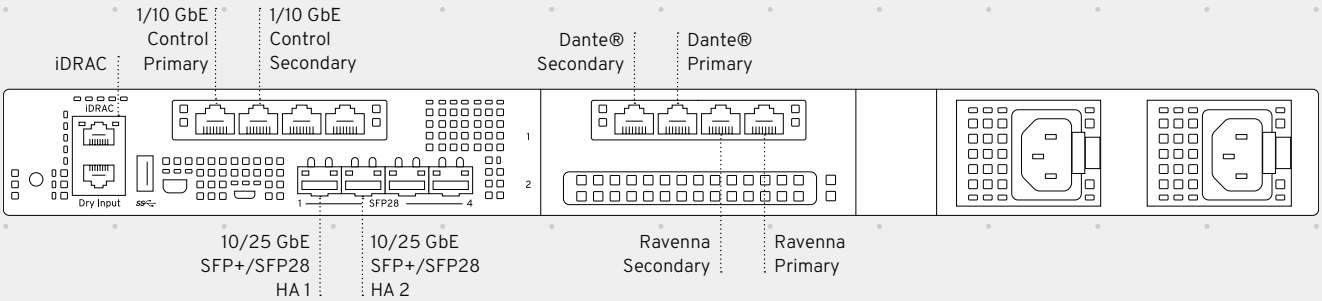
Network topology example of a single HOLOPLOT Controller deployment.

HOLOPLOT CONTROLLERS

HOLOPLOT Controllers manage, communicate, and store system data communicated between all HOLOPLOT Modules, including the MD30. HOLOPLOT offers two variants of the Controller:

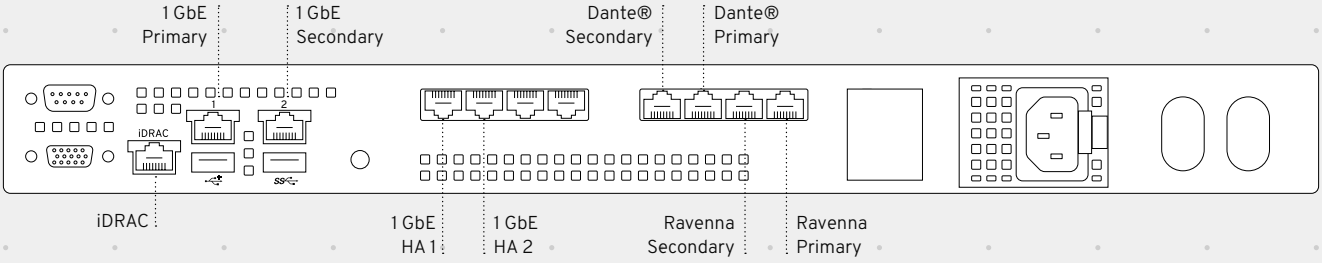
CONTROLLER

- Based on Dell PowerEdge XR5610, a high-performance 1U rack-mount server in a rugged short-depth machine
- Offers high-performance network capabilities for large-scale applications
- Ideal for applications with more than 30 and up to 200 modules
- Features dual power supplies and redundant hard drives
- Supports single and redundant configurations



CONTROLLER LITE

- Based on Dell PowerEdge R360, a 1U entry-level rack-mount server
- Provides standard network capabilities for small- to mid-sized applications
- Ideal for applications with fewer than 30 modules
- Includes a single power supply and non-redundant storage
- Supports single and redundant configurations



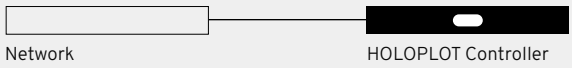
CONTROLLER REDUNDANCY

Both the Controller and Controller Lite can operate standalone, with a cold spare, or in a fully redundant configuration with seamless failover utilizing a cluster of three devices.

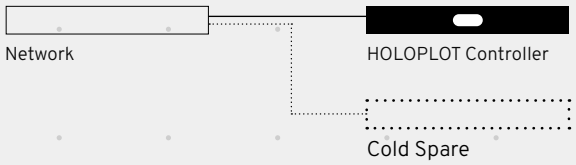
In the event of a Controller failure or failover, MD30 modules will retain their beam configurations as long as the MD30 maintains power. When using AES67 or Ravenna, the modules will also continue to play sound. In case of Dante®, audio playback will be interrupted until the Controller failover is complete.

In the event of a power loss, the MD30 will lose its configuration and will not be able to play audio if no Controller is present in the network when power is restored.

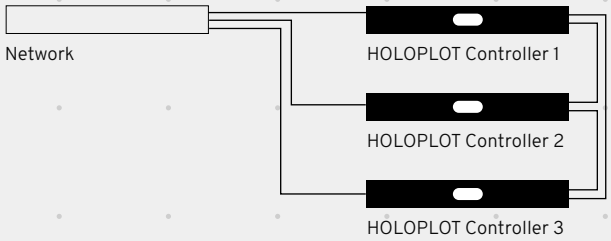
non-redudnant



non-redundant, cold spare



fully redundant



	Controller	Controller Lite
Non-Redundant		
• A single controller connected to one or both Control/AoIP networks (primary and secondary)	✓	✓
• No failover		
Non-redundant with a cold spare		
• Single Controller connected to one or both Control/AoIP networks (primary and secondary)		
• Manual failover to cold spare	✓	✓
• Cold spare should be pre-configured to the same settings as the active Controller		
• 5-10 minute failover from when the equipment is accessed		
Redundant		
• 3x Controllers connected to one or both Control/AoIP Networks (primary and secondary)		
• Interconnected in a ring configuration	✓	✓
• Seamless fault tolerance and automatic failover (as long as two out of three Controllers are functional)		

AoIP SYSTEMS

RAVENNA/AES67

The MD30 is an audio-over-IP (AoIP) streaming device that natively supports 24 bit / 48 kHz Ravenna/AES67 streams. The AoIP streaming technology automatically synchronizes these audio channels perfectly in time, forming a single audio system.

All networking hardware should be configured to support Ravenna/AES67 streams.

Each MD30 can subscribe to up to 62 Ravenna/AES67 channels. HOLOPLOT Control manages stream discovery, subscription, and routing.

The two EtherCON ports on the MD30 adhere to Primary and Secondary stream failover standards for Ravenna/AES67.

DANTE®*

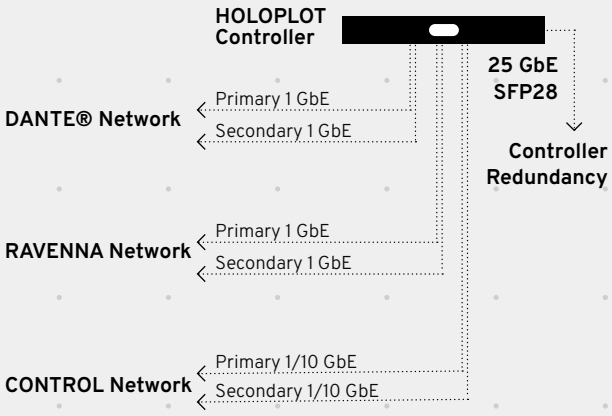
Dante®-based installations are supported through an optional Dante® to Ravenna stream conversion within the Controller. Both the HOLOPLOT Controller and HOLOPLOT Controller Lite support this conversion if equipped with a HOLOPLOT Audio Bridge PCIe Card.

When using the Dante® to Ravenna conversion (Dante® Primary/Secondary, Ravenna Primary/Secondary), up to four (4) additional network cables are required for each controller (pictured below).

Cabling to the MD30 for Primary and Secondary networks remains the same when using the Controller for converting from Dante® to Ravenna.

The Dante® Controller app handles Dante® configuration and routing to the HOLOPLOT Controller. These new Ravenna streams are then managed through HOLOPLOT Control.

Hardware-based Dante® devices can operate in AES67 mode without redundant network (SMPTE-2022-7). Refer to the HOLOPLOT Hub for more details on how to configure Dante devices in AES67 mode for HOLOPLOT systems.



NETWORKING REQUIREMENTS

Each MD30 has two network connections to support single and redundant networking for both audio and Control systems as well as power (PoE++).

NETWORKING APPLIANCES

Managed network switches allow users to configure, manage, and monitor the local area network, typically using a web browser user interface.

The switches should support Quality of Service (QoS) and must be configurable to support Ravenna/AES67 standards.

Switches connecting to an MD30 should support a minimum speed of 1 Gbps per port. Controllers support up to 10Gbps to switches for installations with high module counts; Controller Lite only supports up to 1Gbps for smaller installations.

Switches or injectors should be located near the MD30, and cable lengths must not exceed 100 meters.

NETWORK CONFIGURATION

A DHCP server must be present to provide all HOLOPLOT devices with IP addresses (MD30 modules and Controllers). The HOLOPLOT system does not work with static IP addresses, however DHCP IP reservations can be configured in the DHCP server.

Redundant networks require parallel network switches and DHCP servers where each MD30 is connected via two Ethernet cables, one from each switch, occupying both network ports.

The MD30 can request up to two IP addresses from the DHCP server, with one assigned to each network interface (primary and secondary). The HOLOPLOT controllers can request up to six IP addresses from the DHCP server: two for the CONTROL network (primary and secondary), two for the Dante® network (primary and secondary), and two for the Ravenna network (primary and secondary).

Primary and Secondary networks should be deployed with distinct network switches and VLANs to achieve full network redundancy. Primary and Secondary networks should not have overlapping IP Ranges.

Refer to the HOLOPLOT Hub for more details on network configurations for HOLOPLOT systems.

MD30 VLAN Configuration

The MD30 receives both Control and Audio network on the same network interface. The MD30 doesn't support VLANs. If the network network traffic for the MD30 has VLAN encapsulation, additional configuration on the network switch is required to ensure that the network packages arrive UNTAGGED for the MD30.

Multicast Traffic and IGMP Snooping

Configure network switches with IGMPv3 Snooping enabled to efficiently manage multicast traffic within the VLANs. This helps prevent unnecessary multicast flooding and optimizes network performance.

Accessing HOLOPLOT Control and API

To access HOLOPLOT Control or integrate the HOLOPLOT API with external control systems, ensure that network routes and permissions are configured.

INTERNET, NTP CLOCK SYNCHRONIZATION, AND CONNECTED SERVICES

HOLOPLOT systems can and should be connected to the internet when possible for two purposes:

NTP Clock Synchronization

An internet connection allows easy access to an NTP source. All HOLOPLOT devices use the Network Time Protocol (NTP) to synchronize local clocks across the control network. When connected to the internet, HOLOPLOT Controllers and any Loudspeaker Modules (including the MD30) will contact the NTP time server at ntp.google.com.

In cases where HOLOPLOT systems cannot reach ntp.google.com (no internet or regional restriction), a local NTP server must be provided in the network, and the DHCP server of the local network must provide the IP address or DNS name of the NTP server(s) in the leases it issues.

An NTP time source is not necessary for small, non-redundant Controller installations, although it is recommended.

NTP is mandatory for redundant Controller setups. The Controllers use synchronized clocks to accurately log and sync HOLOPLOT system data across all Controllers. The redundant Controllers will not function correctly without an NTP source.

HOLOPLOT Cloud and Connected Services

Given an active internet connection, a HOLOPLOT system can benefit from the latest software updates and algorithm improvements, as well as the optional Connected Services, i.e. a comprehensive cloud-based and IoT-enabled support plan.

For communication with the HOLOPLOT Cloud and provisioning of HOLOPLOT Connected Services, the network firewall in the deployment needs to be correctly configured. The following two firewall rules have to be set up:

- Allow all outbound/established HTTP connections (TCP 80) from the HOLOPLOT Controllers
- Allow all outbound/related UDP connections above port 1000 from the HOLOPLOT Controllers.

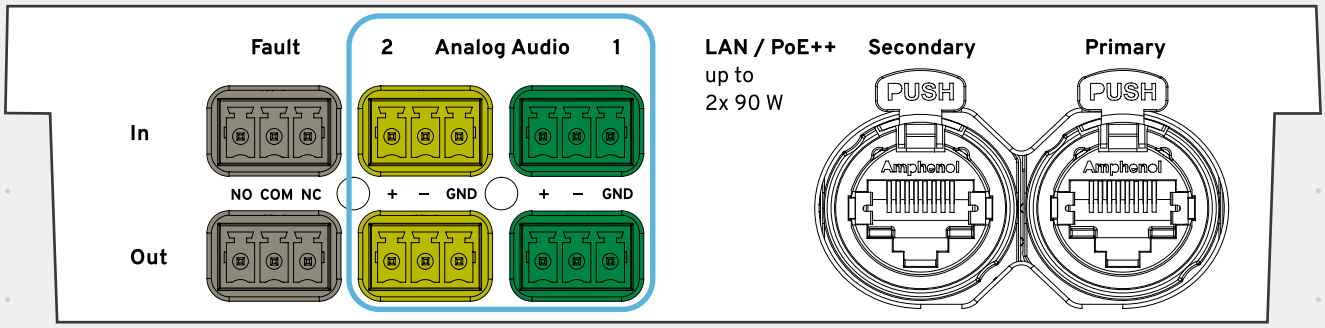
Analog In and Out

The MD30 features analog audio for failover and voice alarm system needs. The analog signal path is designed for scalability and supports daisy chaining multiple MD30 modules.

The MD30 has two sets of balanced, line-level analog audio In and Out (thru) connections via 3 pole, 3.81 mm pitch, screw-mount Euroblock connectors with a pin sequence of +, -, GND.

The MD30 includes 4 Euroblock connectors in the packaging that match the color schema on the Connector Panel:

- Analog In / Out 1 is GREEN
- Analog In / Out 2 is YELLOW

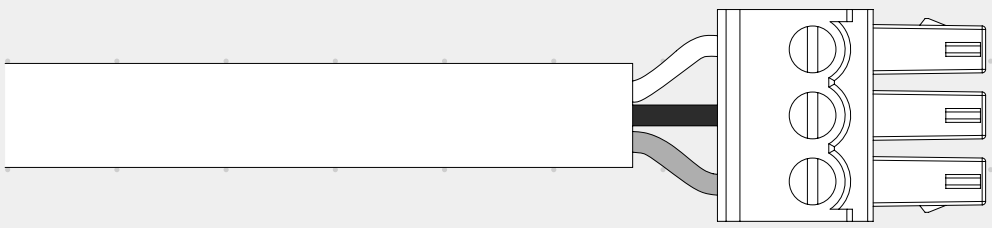


The Audio In 1 & 2 connections support line-level signals with a maximum input of +24 dBu.

Use balanced signals for the MD30 Analog In/Out 1 & 2 when possible. The analog input impedance is 42 kOhm for balanced signals and 18 kOhm for unbalanced.

70/100 V systems require signal transformers before reaching the MD30.

> ⚠ Under every circumstance, make sure that the voltage level on the analog inputs does not exceed 15 V RMS or 21.2 V peak (+25.7 dBu).



Pin 1: **Audio (+)**

Pin 2: **Audio (-)**

Pin 3: **Audio Shield (Ground)**

USAGE

Analog audio inputs can be routed to the audio inputs of any beam within a HOLOPLOT system.

The prioritization and failover options for analog inputs are:

Override

Switches the MD30 to the analog preset and analog audio inputs as soon as the signal level on one of the two analog input lines exceeds an input level threshold set in HOLOPLOT Control.

Fallback

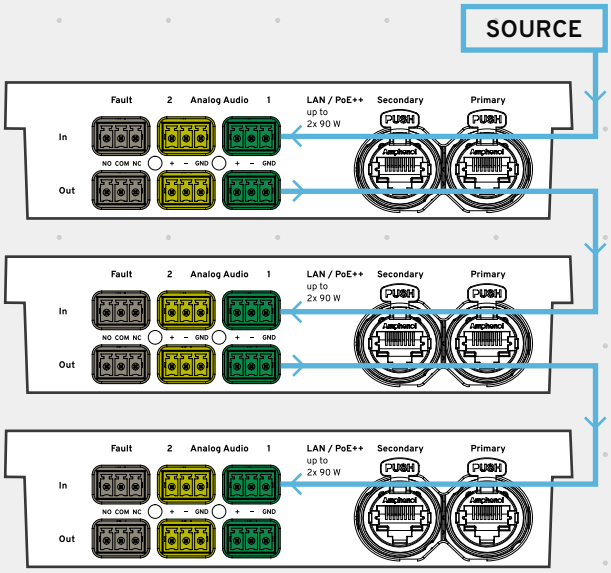
Switches the MD30 to the analog preset and analog audio inputs in case certain failure conditions on both primary and secondary AoIP streams are detected (i.e. network connection interrupted/faulty or pilot-tone-based), or in case the fallback is triggered via the HOLOPLOT API.

DAISY CHAINING

Analog In 1/2 receives audio from an external source. Analog Out 1/2 is a 'thru' connection from Analog In 1. This enables daisy chaining for multiple MD30 Modules.

When daisy-chaining loudspeakers, connect Out 1/2 to In 1/2 of the next MD30. The number of loudspeakers that can be on the same daisy chain is set by the capability of the source device analog output.

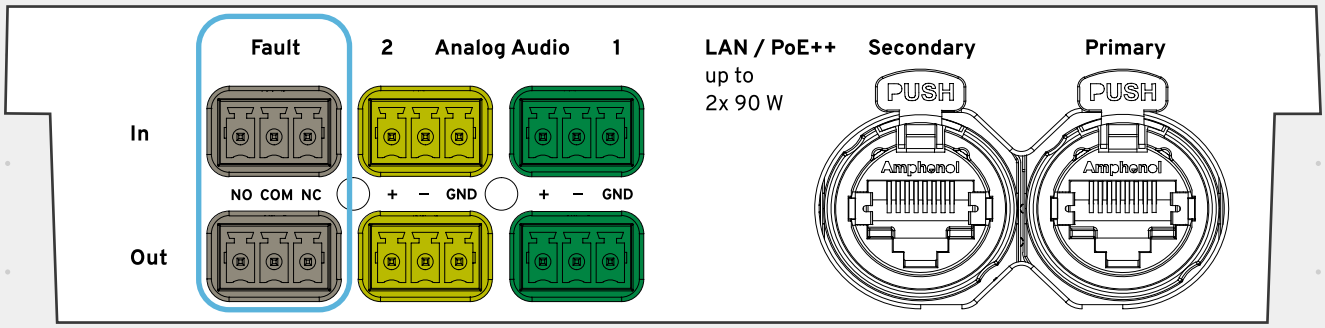
The daisy-chained loudspeakers appear electrically in parallel, reducing the load impedance presented to the source device. Typically, 10 to 20 loudspeakers can be connected on one balanced daisy-chain.



Fault Relay

The MD30 provides fault relay connections for external fault detection systems in operation critical environments.

The Connector Panel features two GRAY 3 pole, 3.81 mm pitch, screw-mount Euroblock connectors for Fault Relay In and Out (thru). Two GRAY Euroblock connectors are included in the packaging.



The Euroblock connectors support Normally Open (NO) and Normally Closed (NC) wiring configurations. NO is closed and NC is open with respect to COM when the device is in a non-faulty/healthy state.

The Fault Relay can be wired directly to each MD30 to locate faults at a single module.

The Fault Relay can be daisy-chained from one MD30 to the next, with the Out (thru) connector of one MD30 connected to the In connector of the next, to monitor a fault within an entire Matrix array.

The MD30 Fault Relay reacts to faults according to DIN EN 54-16.

Common faults are:

- Power supply loss, interruption or anomalies
- Network communication faults (shorts, interruptions)
- Amplifier faults (Malfunction, Overheat/Overload,...)
- Loudspeaker Driver faults (e.g. self-check faults)

Pin 1: **Normally Open (NO)**

Pin 2: **Common (COM)**

Pin 3: **Normally Closed (NC)**

Operating the MD30

The MD30 is fully controlled by software for easy setup and operation.

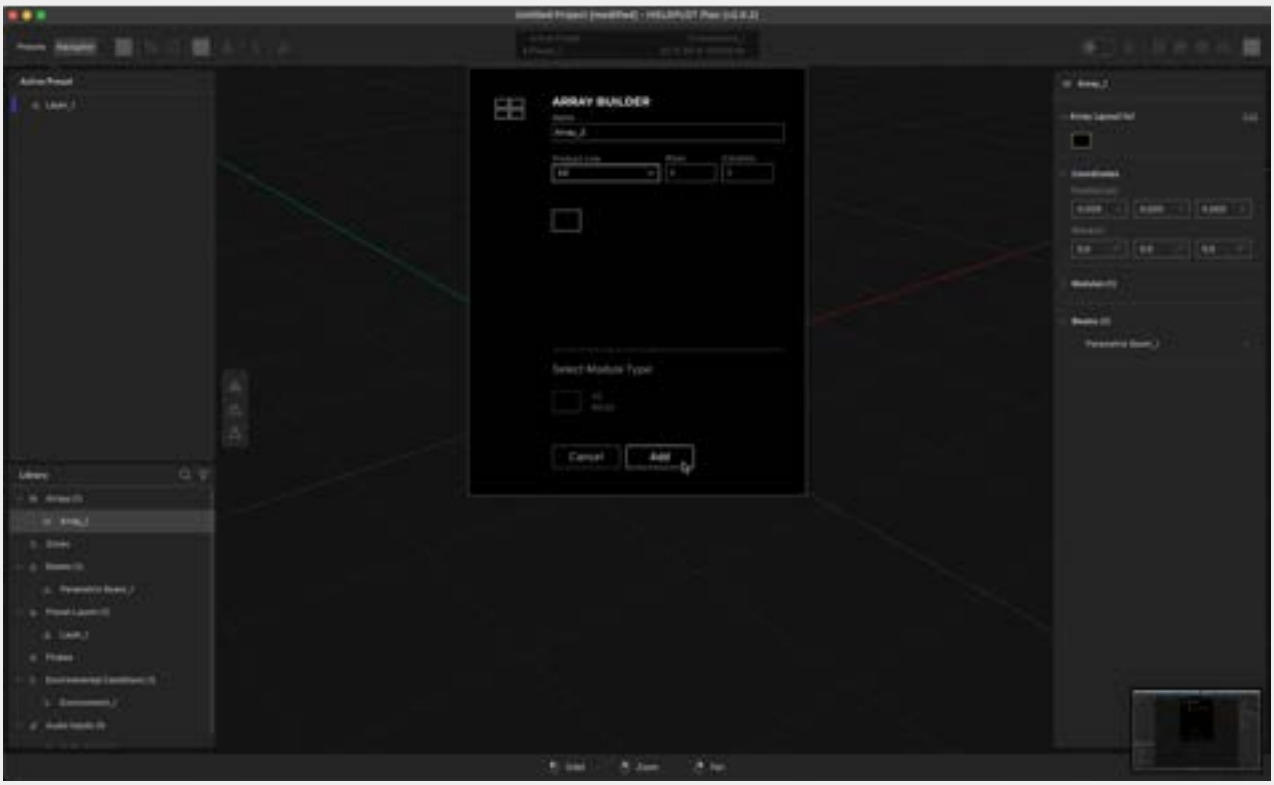
SYSTEM SETUP

After powering all devices, the following steps need to be carried out to play audio through the Modul 30:

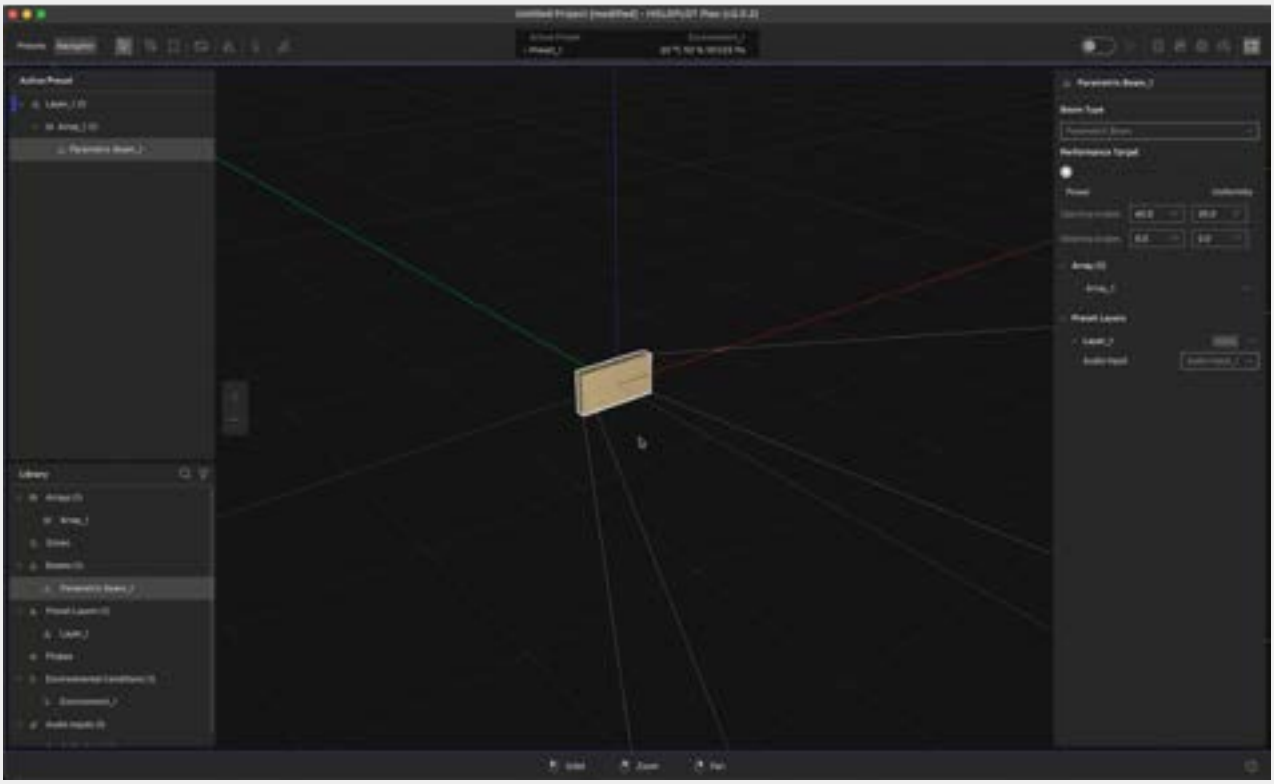
The HOLOPLOT Hub contains further information and user guides for designing a system in HOLOPLOT Plan and operating a system in HOLOPLOT Control.

HOLOPLOT PLAN

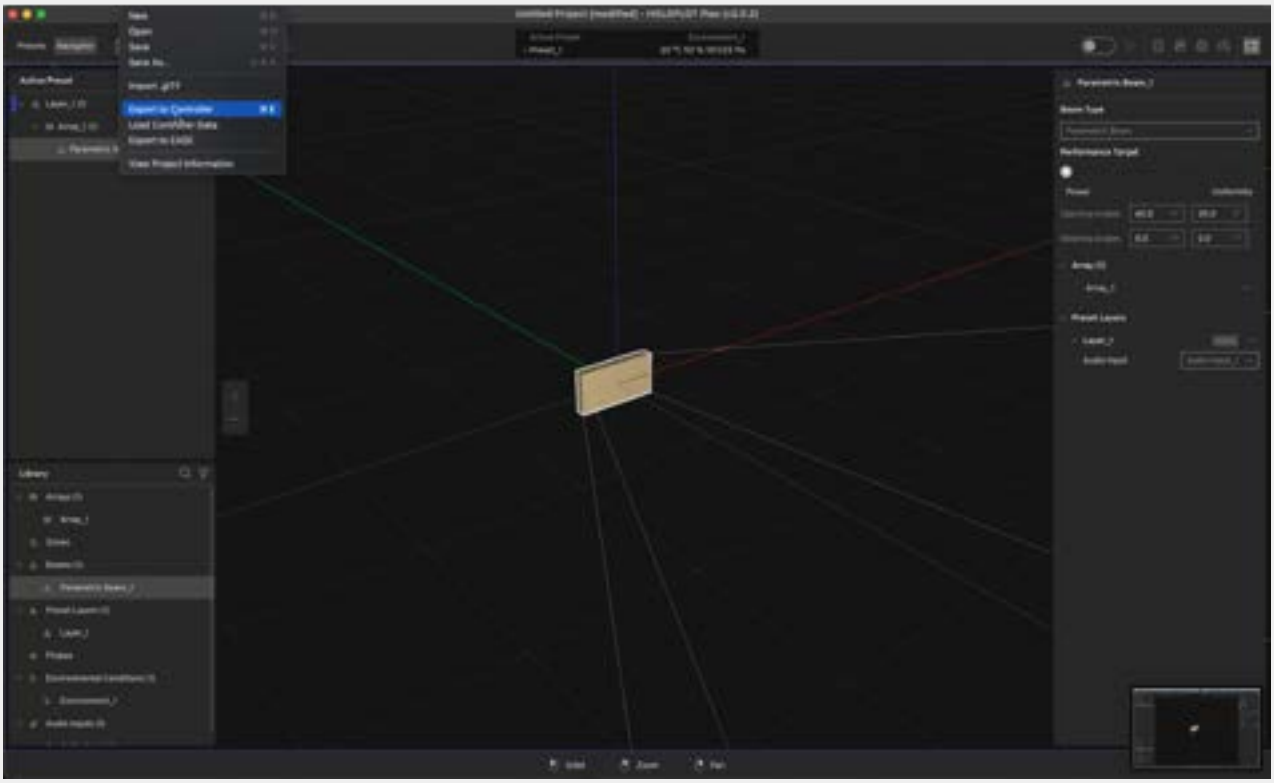
1. Use the **Array Builder** to create at least one MD30 or Matrix Array.



2. Add at least one beam to the MD30 or Matrix Array and the necessary Audio Inputs. HOLOPLOT Plan will generate ‘Audio Input_1’ and map it to the first beam created in the project.



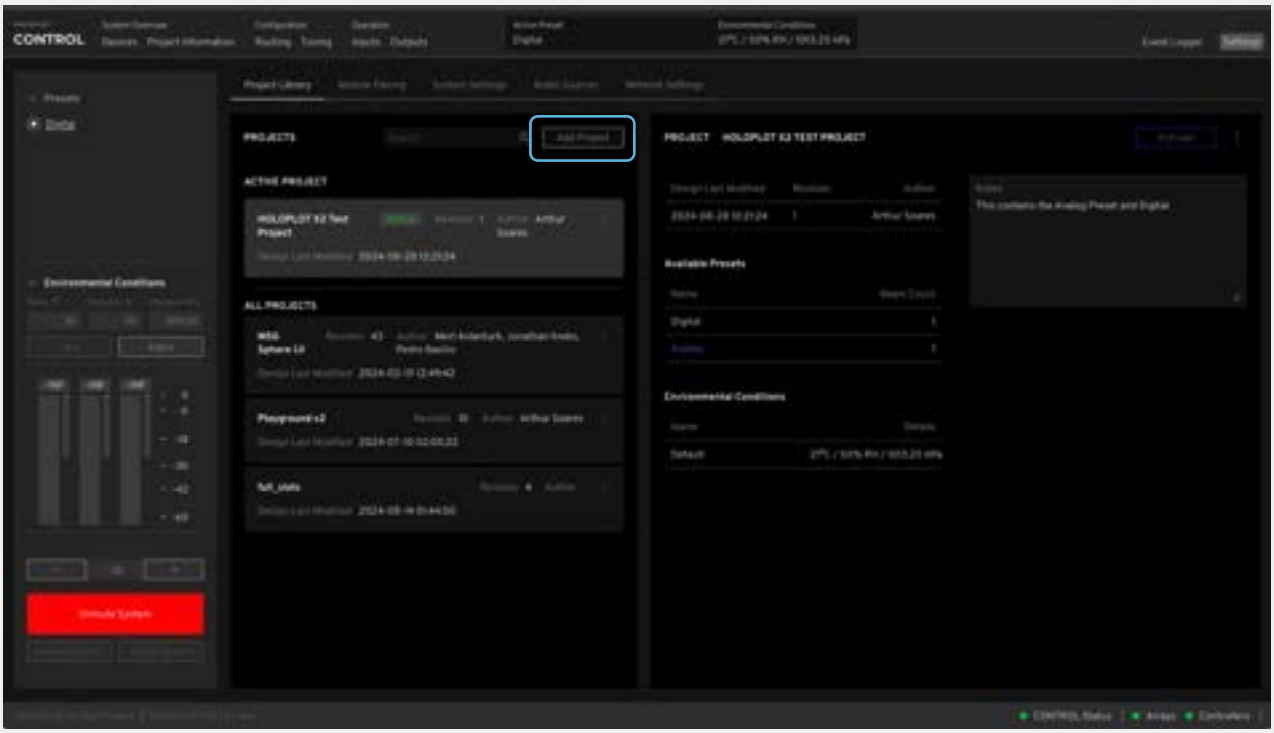
3. Export a .holoplot project using **File > Export to Controller**



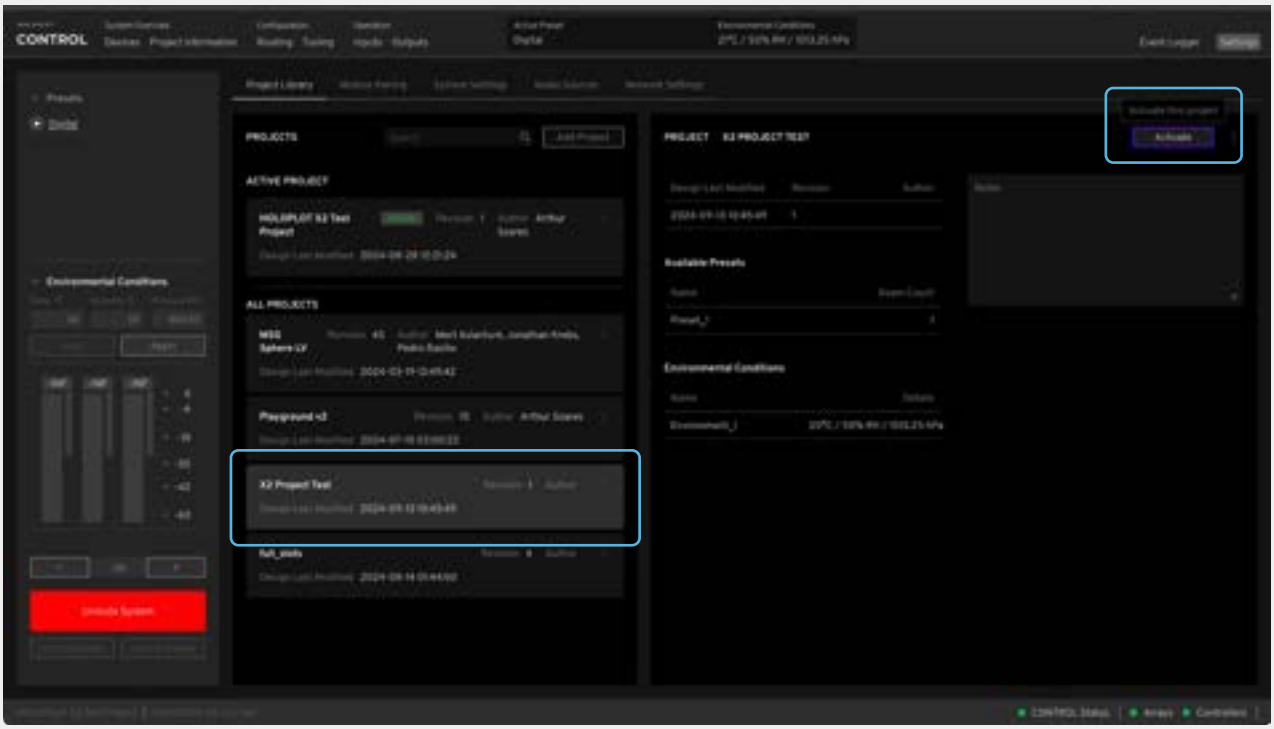
4. Connect to the Controller network.

5. Open Control at http://AAA-0123.local where AAA-0123 is the Controller ID listed on the device

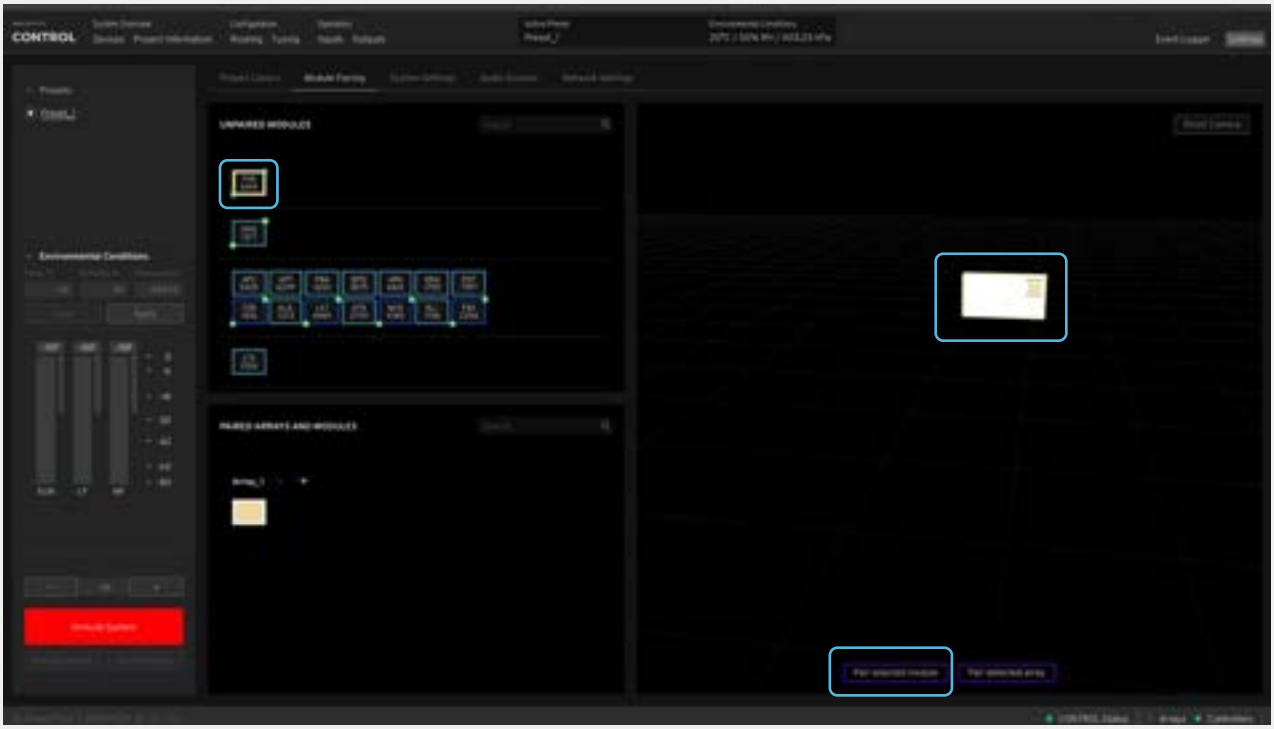
6. Navigate to **Settings > Project Library** and click **Add Project** to add the Plan project to the Controller. Browse to the .holoplot project and click **Open.**



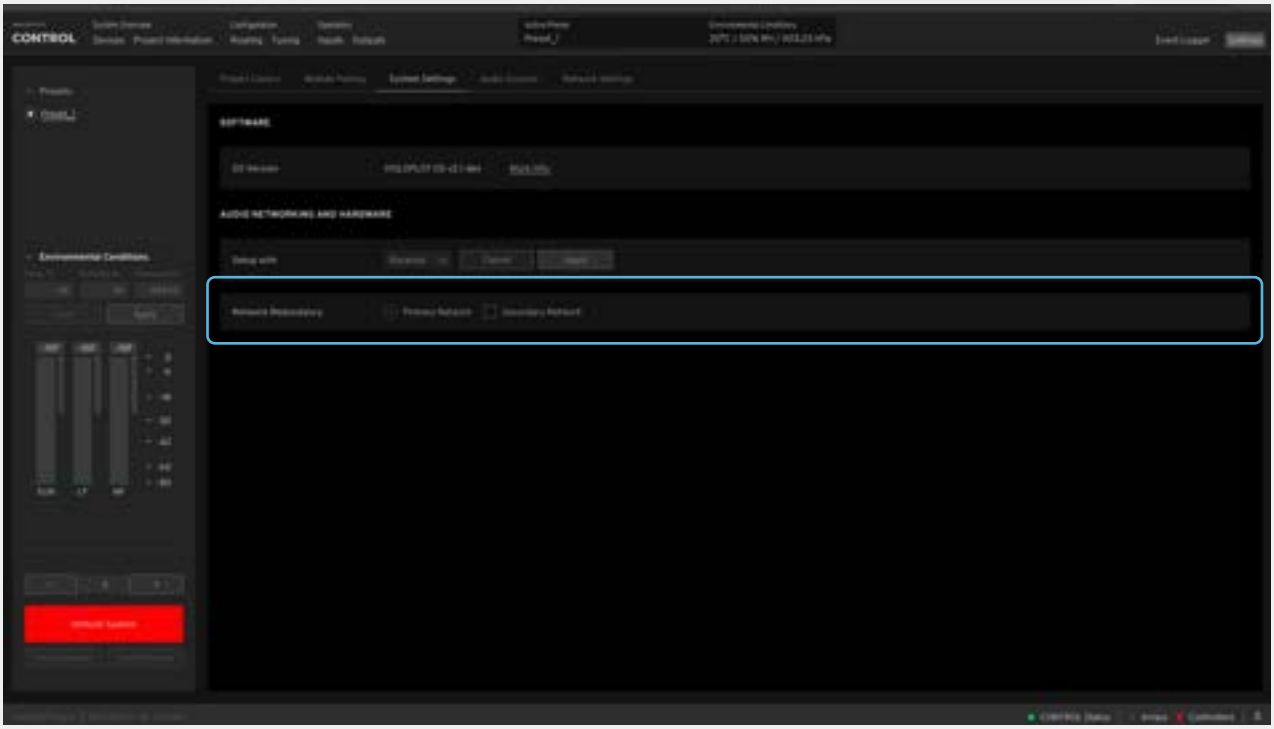
7. Select the project under **All Projects** and click **Activate** in the top right corner to Activate the Project.



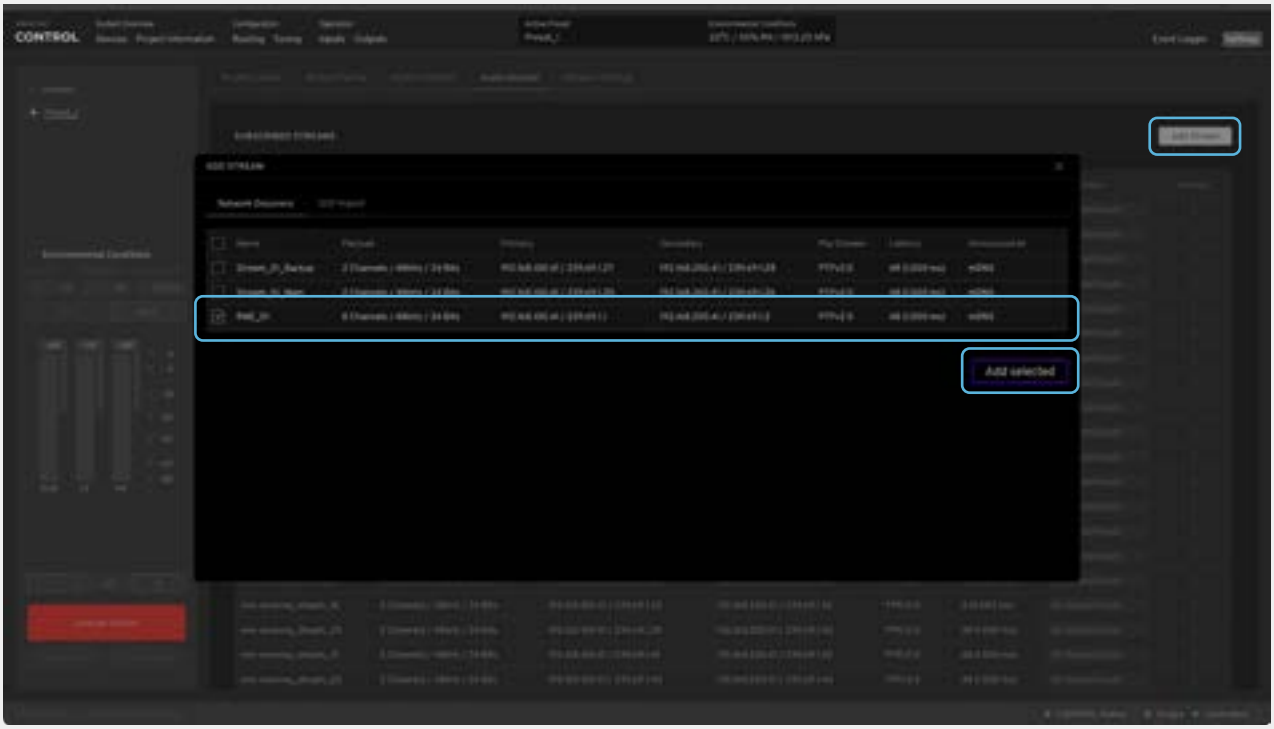
8. Navigate to the **Module Pairing tab**. Select the unpaired modules in the **Unpaired Modules** list, then select the corresponding module in the 3D viewport. Click **Pair** selected module to pair the virtual and physical module.



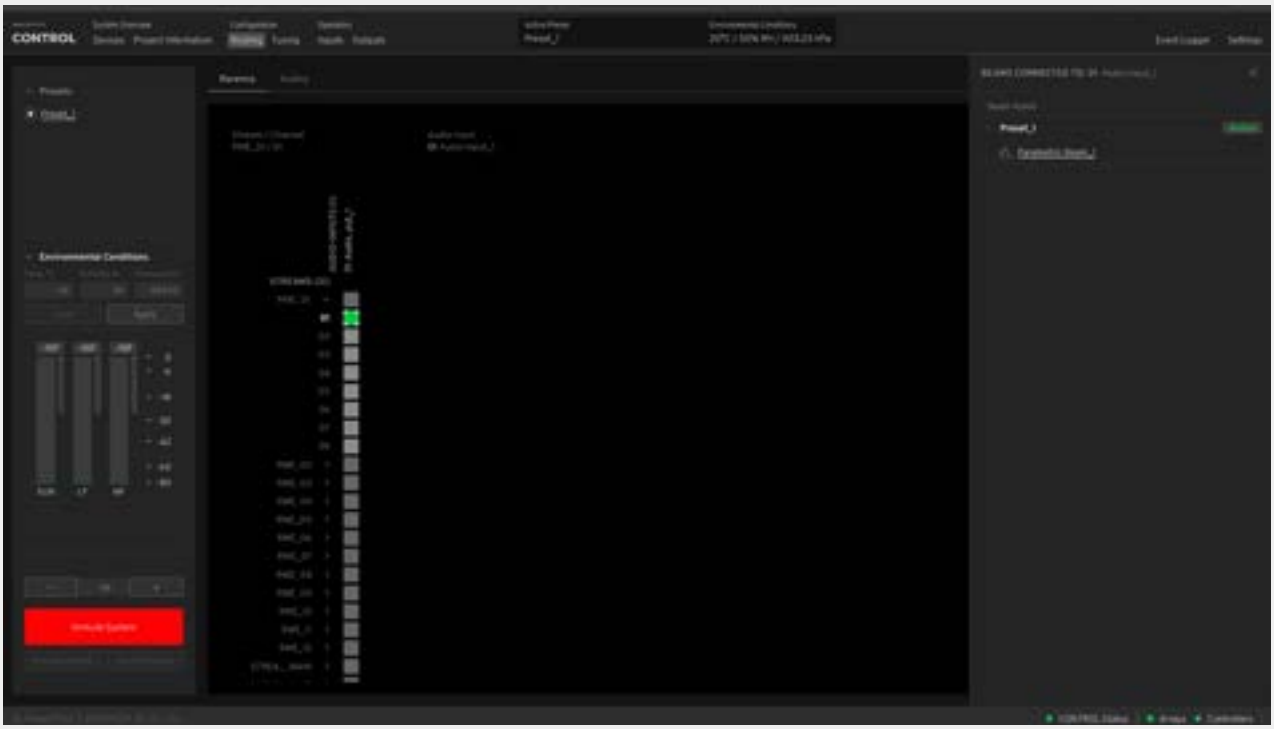
9. Navigate to the **System Settings** tab. Use the **Setup** with dropdown to select **Ravenna** and click **Apply.**



10. Navigate to the **Audio Sources** tab to discover and subscribe to a Ravenna / AES67 stream. **Click Add Stream** to launch the Add Stream window. Click the check box next to the new stream (if the stream is not already present). Click **Add Selected.**



11. Navigate to the **Routing** tab. Route the stream (Ravenna / AES67) to an **Audio Input.**



12. Play audio using a third-party audio source.

AUDIO PLAYBACK

X2 MD30 modules and HOLOPLOT Controllers do not store or play audio; all audio must come from an AoIP source like a DSP, mixing console, or network-enabled microphone.

The MD30 supports multiple audio streams based on its beam configuration. Use HOLOPLOT Plan to configure the system, defining Beam types, presets, and audio inputs. Use HOLOPLOT Control to route AoIP streams, adjust beam levels and EQs, and manage system mutes.

Analog Audio In 1&2 will only play sounds after the module is configured to do so.

MD30 modules natively support Ravenna/AES67 AoIP streams. Use the optional Dante® to Ravenna stream converter on the Controller for Dante® based installations, available Q1 2025.

MONITORING AND CONTROLLING THE MD30 DURING OPERATION

HOLOPLOT Control, a browser-based interface, is used to manage, update, and monitor a HOLOPLOT Audio System installation.

Connect a Mac, PC, or tablet to the HOLOPLOT network. Open Control at http://AAA-0123.local where AAA-0123 is the Controller ID, which can be found on the product label of the Controller.

The HOLOPLOT Hub contains further information and user guides for monitoring and controlling Audio Systems in HOLOPLOT Control.

STATUS LEDS

The MD30 has two RGB status LEDs on the front of the module, visible through the Grill. The LEDs provide information about the MD30's general state, including health (left) and power (right).

The LEDs blink when the MD30 is powered on and report status for 2 seconds before fading away.

Statuses

In HOLOPLOT Control, the “Blink” icon (☼) next to an MD30 flashes the LEDs to identify modules during setup and pairing. The LEDs on the MD30 will blink for 2 seconds and will represent the current health and power status:

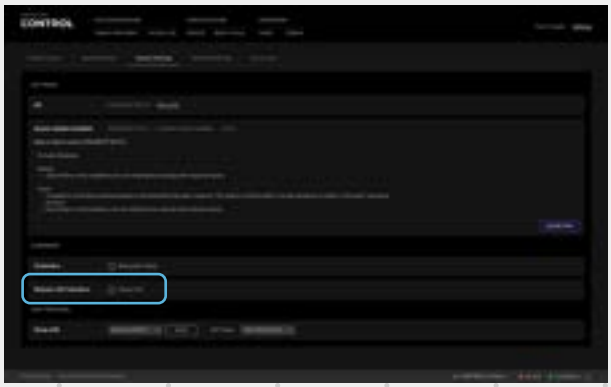
Left LED	Health Status	Right LED	Health Status
Green (static)	Functional	White	Awake/On
Orange (static)*	Hardware & Network Unknown, Warning, Error and Critical	Light blue	Transition states going to sleep, waking up
		Blue	Deep sleep / Sleep / Power saving

* Exact errors are reported in Control

Always On

The Settings page in Control contains an **Always On** toggle that changes the behavior of all Loudspeaker Module LEDs in an active system. This toggle can be useful to quickly diagnose the status visually.

Always On is **disabled** by default.



Always On (disabled)

- Used for regular operation.
- LEDs are visible during power status changes, then return to **OFF.**
- Clicking the Blink icon will flash the LEDs for 2 seconds for identification. Once the **Blinking** sequence is finished, the LEDs will return to an **OFF** state.

Always On (enabled)

- Useful when setting up a system for the first time.
- All Loudspeaker Module LEDs are constantly **ON** and show their current health and power status.
- Clicking the Blink icon (☼) will flash the LEDs for 2 seconds for identification. Once the **Blinking** sequence is finished, the LEDs will return on an **ON** state.

STATUS AND ERRORS IN CONTROL

HOLOPLOT Control will report the status and errors of all MD30 (and other module types) in a system.

The Device List tab details system statuses in real-time at various detail levels—system level, array level, or module specific.

For all statuses, HOLOPLOT Control represents the severity level in 5 statuses:

Refer to the HOLOPLOT Hub for more details on health monitoring.

Status	Arrays / Modules
OK	Everything is functioning correctly. Sound can be played without issues.
Warning	Sound can be played, but minor issues might compromise the system's performance. The show can go on, but the error should be investigated later.
Error	Modules can still make sound, but the system's performance is severely degraded. They should be checked as soon as possible.
Critical	Modules are severely compromised and might not make sound.
Unknown	Modules are not reporting any information, or we cannot accurately report its health.

TURNING OFF THE MD30

The MD30 does not integrate a power switch. To safely power down the system, power down the PSE or turn off specific PoE++ ports in the switch settings.

Do not unplug the Ethernet cables from an MD30 or its PSE while powered, especially when the MD30 is under heavy load.

Servicing

Do not open the device. In case of any damage, do not operate the device under any circumstances.

Refer servicing only to qualified service personnel authorized by HOLOPLOT. In particular if:

- Objects or liquids have entered the module Chassis.
- The device does not operate normally.
- The device was dropped or the housing was damaged.

Standard operating procedures for field serviceable parts can be made available upon request, such as the loudspeaker drivers and Connector Bays. Contact info@holoplot.com.

PHYSICAL INSPECTION

Physical inspections should be performed when any issues seem to arise with the device's performance. Inspections may also be required after significant environmental events.

To physically inspect the drivers, remove the Grill or any other concealing material. Gently use a compressed air canister from a safe distance to dust off any environmental residue. Do not spray directly onto the driver at close range. Avoid touching the drivers directly with your hands or clothes.

Remove the module for servicing or replacement if any drivers are punctured or damaged.

When the IP65 Kit is used, follow steps 1-6 in UNINSTALLING THE MD30 to access the Cable Seal Block. Inspect the block and the quality of the holes through which the cables pass. If the cables slide loosely, replace the block immediately to retain IP65 rating.

MODULE DRIVER TESTS

The module's driver test performs an impedance measurement of all drivers (based on an inaudible 22 kHz test tone) to determine if they are within normal operational thresholds or exhibit abnormal behavior. The driver test can either be manually initiated in HOLOPLOT Control, or set up to automatically run in periodic intervals.

Before running the driver test, make sure all modules are online and awake.

> ⚠ During the test, all Modules will play a test tone.

HOW TO RUN A DRIVER TEST IN CONTROL

- In the Device List section's right panel, click on the three-dot menu at the top right and click Run Driver Test.
- Click the Start button and let the test run.
- Once done, the results are displayed on the same window.
- The results can be exported and shared with HOLOPLOT for further maintenance.

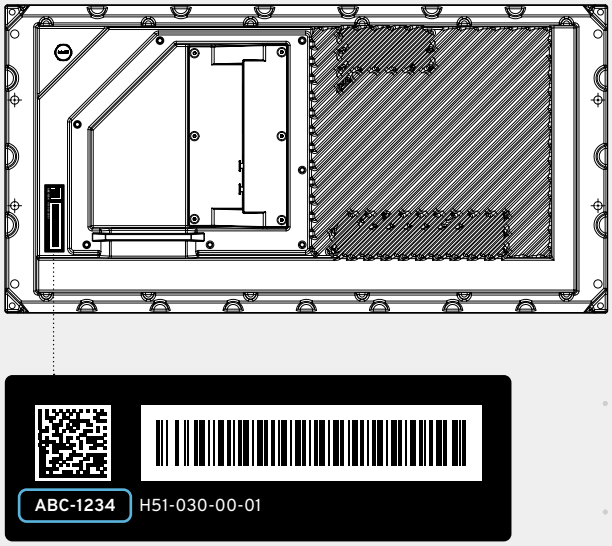
READING THE RESULTS

The test results are recorded in the Event Logger and can be accessed anytime. The results of the Driver Test will overwrite the module's current health status. This result is only valid until a module is rebooted and a new Driver Test is conducted

Results	Details
Pass	Drivers are functioning correctly. Operation is normal.
Fail	Drivers are faulty. Contact HOLOPLOT for further assistance.
Unknown	Drivers are not reporting any information, or we cannot accurately report its status. Check modules are online and awake, and repeat the test.

MODULE ID

The Module ID is the unique identifier of the Loudspeaker Module. It is located on the small serial number label on the back of the device..



X2 Modul 30 (MD30) Data Sheet

CONFIGURATION: SINGLE-LAYER MATRIX ARRANGEMENT	
Full range drivers	30x 2.5” cone driver

MAXIMUM SPL [1] utilizing dual PoE++	
at 1 m	125 dB

FREQUENCY RANGE	
±3 dB	100 - 18,000 Hz
-10 dB	80 - 20,000 Hz

BEAMFORMING CAPABILITIES: HOLOPLOT 3D AUDIO-BEAMFORMING	
Number of 3D sound fields/beams [2]	A single X2 MD30 array can simultaneously reproduce up to 4 optimized 3D Audio-Beamforming sound fields, targeting different audience areas and reproducing the same or different content for each area.
	The HOLOPLOT Optimization Algorithms ensure uniform coverage and spectral consistency within a zone, while preventing sound from hitting reflective surfaces in the respective architectural surroundings and reducing unwanted sound spill into adjacent areas.
	A single MD30 can, in addition, reproduce up to 8 parametric beams simultaneously. Opening and steering angles are user-adjustable (0.1° steps) in both horizontal and vertical planes.
	In total, up to 12 simultaneous beams per X2 Matrix Array - each beam with its own audio input channel, equalization, level, shape, and position.

[1] Max. SPL capabilities are dependent on beam configuration (incl. the cut-off frequency) as well as array size, and should be assessed using *HOLOPLOT Plan*. Peak level referred back to 1 m under free field conditions using bandpass filtered pink noise signal with a 12 dB crest factor according to IEC 60268 and an optimized parallel beam configuration.

[2] Beamforming capabilities are dependent on the array size and should be assessed using *HOLOPLOT Plan*.

AMPLIFICATION	
Type	Digital amplifier
Number of Channels	30 (one per loudspeaker driver)

PROCESSING	
Type	High-performance Field Programmable Gate Array (FPGA) computing the HOLOPLOT proprietary digital signal processing algorithms for 3D Audio-Beamforming and Wave Field Synthesis
	Dual-core ARM® Cortex™-A53 running HOLOPLOT OS, a Linux-based, distributed audio operating system
DSP Channels	30 (one per amplifier channel/loudspeaker driver)

PROTECTION CIRCUITS	
	The MD30 is equipped with power-related protection circuits to prevent damage to the loudspeaker module or the power distribution system: • Short circuit protection • Overload protection • Thermal protection (against excessive internal temperatures)

STATUS AND ERROR INDICATION	
	• On-device front LED for status indication (operating modes and error states) • Detailed monitoring of device state and component health via network • Remote monitoring possible via HOLOPLOT Connected Services • Pilot tone-based monitoring

POWER CONSUMPTION	
Sleep	6 W single PSE, 12 W dual PSE
Idle	22 W
Max. Power	IEEE standard 802.3bt Type 3/4
	1x PoE++: 60 W / 90 W 2x PoE++: 120 W / 150 W / 180 W

CONNECTIVITY	
Ethernet for Audio / Control / Power	2x etherCON Cat 6A (RJ45) - primary & secondary The use of the secondary port is optional, providing redundant communication and power and increasing the continuous power capacity
	Power: PoE++ (802.3bt Type 3/4) Audio-over-IP: RAVENNA, optional Dante® (via Controller) Control-over-IP: HOLOPLOT Control Network
Analog Audio	2x 3-pin Euroblock Connector - input & through primary 2x 3-pin Euroblock Connector - input & through secondary
	Input impedance: >40 kOhm balanced differential Max. input level: +24 dBu
Fault Relay	2x 3-pin Euroblock Connector - input & through - voltage-free contacts (common / normally open / normally closed) to indicate fault/lack of power in the module
	Max. switching capability: 24 V DC, 1 A

PHYSICAL CHARACTERISTICS

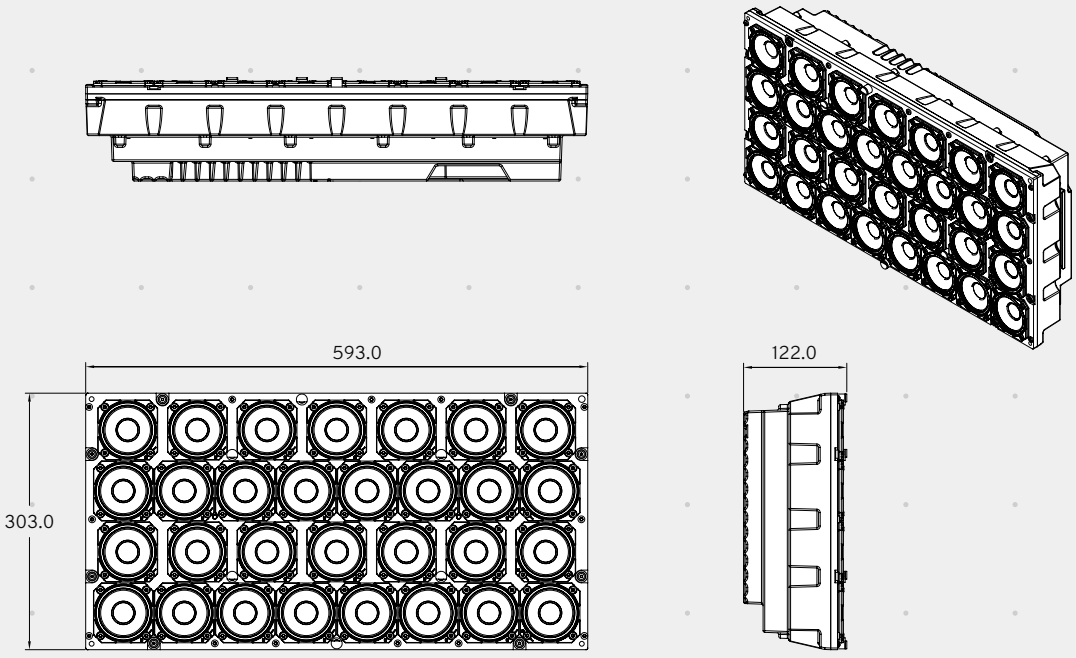
Dimensions (w x h x d)	601 mm x 311 mm x 140 mm / 23.7″ x 12.2″ x 5.5″ (±2 mm / ±0.08″)
Weight	Module: 15.6 kg / 34.4 lbs Wall Frame and Grill: 7.3 kg / 16.1 lbs
Color	Module: Black (RAL 9005) Wall Frame and Grill: black (RAL 9005), white (RAL 9003), or custom colors (RAL classics, NCS, and Pantone)
Mounting	• Wall Frame has mounting points for direct wall-mounting. • Wall Frame is used for arraying and includes a system for cable management within an array.
Other	• Resistant to shock and vibration

ENVIRONMENTAL CONDITIONS

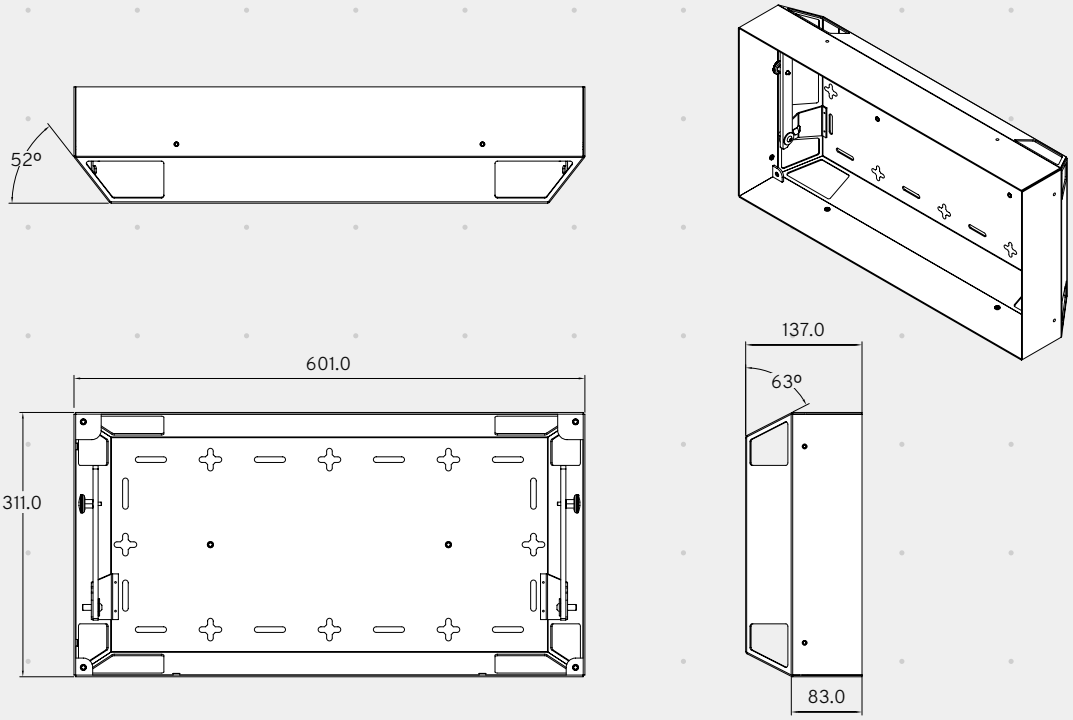
Device Condition	Ingress Protection	Temperature (Ambient)	Humidity	Altitude
Stored in shipping box	n.a.	-40 °C to +70 °C / -40 °F to +158 °F	5 - 98 % at +70 °C / +158 °F	n.a.
Operating	IP65 (IEC EN 60529)	-25 °C to +60 °C / -13 °F to +140 °F	to 95 % at +60 °C / +140 °F	Up to 4000 m
	only with “IP65 Kit”	with no direct sun exposure	non-condensing	

MECHANICAL DETAILS
All dimensions in mm; tolerance ±2 mm

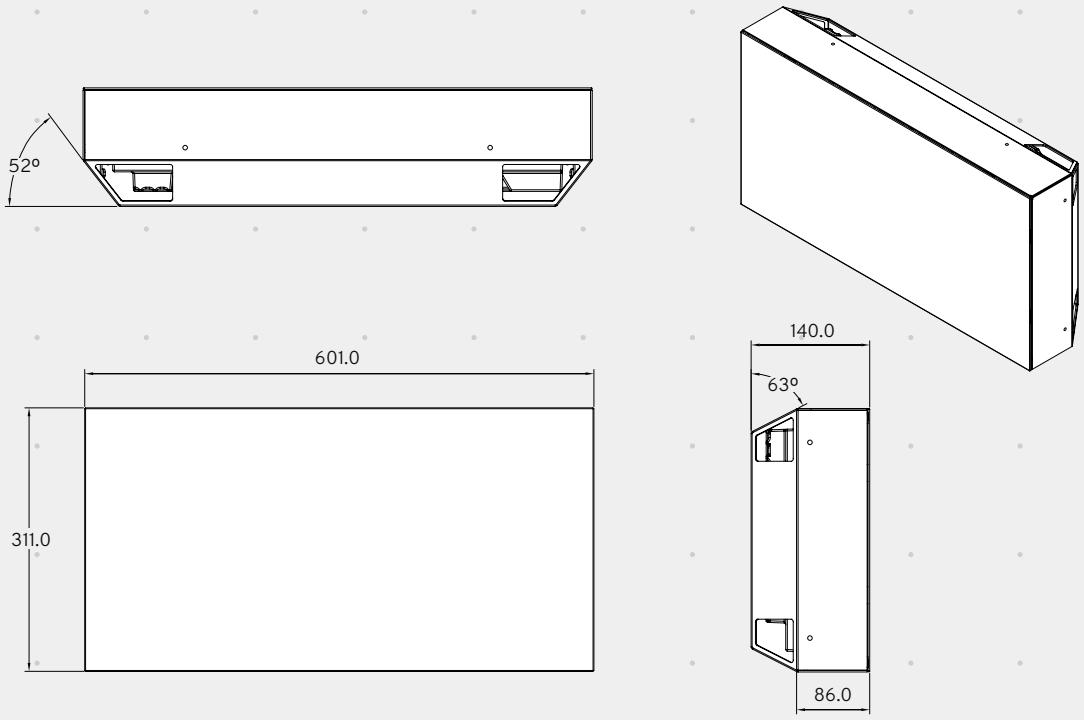
MD30 Module



Wall Frame



MD30 in Wall Frame with Grill



Manufacturer’s Declarations

WEEE DECLARATION
(DISPOSAL)

Electrical and electronic equipment must be disposed of separately from normal waste at the end of its operational lifetime. Please dispose of this product according to the respective national regulations or contractual agreements. If there are any further questions concerning the disposal, please contact HOLOPLOT.

EU DECLARATION OF CONFORMITY
(CE SYMBOL)

CE

Holoplot GmbH hereby declares that this product is in compliance with the requirements and relevant provisions of Directive 2014/35/EU and all other applicable EU directive requirements. A detailed declaration is available on request.

UKCA DECLARATION OF CONFORMITY
(UKCA SYMBOL)

UK CA

Holoplot GmbH hereby declares that these products are in conformity with the provisions of the respective UKCA directives including all applicable amendments. A detailed declaration is available on request.

FCC STATEMENT OF CONFORMITY

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment.

This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications.

Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at their own expense.

This device complies with Part 15 of the FCC rules and regulations for information technology equipment. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

ISED CANADA STATEMENT OF CONFORMITY

This Class A digital apparatus complies with Canadian ICES-003. / Avis de conformité à la réglementation D’industrie Canada: Cet appareil numérique de la classe A est conforme à la norme NMB-003 du Canada.

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