



Meyer Sound

Operating Instructions

HM-1

*Self-Powered
Reference Monitor*

Patents Pending



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Part # 05.039.003.01 Rev A2*

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Symbols Used

These symbols indicate important safety or operating features in this booklet and on the chassis.



Dangerous voltages: risk of electric shock	Important operating instructions	Frame or chassis	Protective earth ground
Pour indiquer les risques résultant de tensions dangereuses	Pour indiquer important instructions	Masse, châssis	Terre de protection
Zu die gefahren von gefährliche spanning zeigen	Zu wichtige betriebs- anweisung und unter- haltsanweisung zeigen	Rahmen oder chassis	Die schutzerde
Para indicar azares provengo de peligroso voltajes	Para indicar importante funcionar y mantenimiento instrucciones	Armadura o chassis	Tierra proteccionista

Declaration of Conformity

According to ISO/IEC Guide and EN 45014

The Manufacturer:

Name: Meyer Sound Laboratories
Address: 2832 San Pablo Avenue
 Berkeley, California 94702-2204, USA

declares that the product:

Product Name: HM-1
Product Options: All

conforms to the following Product Specifications:

Safety:	EN 60065: 1994
EMC:	EN 55022: 1987 - Class A
	IEC 801-2: 1984 - 8 kV
	IEC 801-3: 1984 - 3 V/m
	IEC 801-4: 1984 - 0.5 kV Signal Lines, 1.0 kV Power Lines

The product herewith complies with the requirements of the Low Voltage Directive 73/23/EEC and the EMC Directive 89/336/EEC.

Office of Quality Manager
Berkeley, California USA
April 1, 1997

Environmental Specifications for Meyer Sound Electronics Products	
Operating temperature:	0° C to +45° C
Nonoperating temp:	< -40° C or > +75° C
Humidity:	to 95% at 35°C
Operating altitude:	to 4600 m (15,000 ft)
Nonoperating altitude:	to 6300 m (25,000 ft)
Shock:	30 g 11 msec half-sine on each of 6 sides
Vibration:	10 – 55 Hz (0.010 m peak-to-peak excursion)



Introduction

The Meyer Sound HM-1 is a very compact, full-range self-powered loudspeaker system designed to serve in a wide variety of installed sound reinforcement and reproduction applications. The HM-1 incorporates significant design innovations that combine unprecedented performance with several practical advantages. In contrast to conventional small speaker systems, the vented cabinet is tuned at 40 Hz to provide flat, full-range response with half-space loading. The concentric tweeter mounting structure is optimized to minimize both back-wave interference and IM distortion. A constant-directivity high-frequency horn affords a 100° beam width, and sophisticated phase-correction circuitry assures true point-source performance without the off-axis cancellation effects that normally plague dual-concentric designs.

By implementing distributed amplification, the HM-1 affords substantial advantages in reliability and ease of installation when compared with constant-voltage (70 V) distributed systems. The HM-1 accepts a unipolar 48 VDC power source, which reduces induced noise significantly. The 48 VDC power may be supplied using twisted-pair wiring jacketed with the signal source conductors, eliminating the need for wiring conduits. Its amplifier and signal-processing circuits are designed to tolerate supply voltage drops of up to 25%, accommodating light-gauge cables and long cable runs. Internal energy storage circuits minimize the system's peak-to-average supply current demands, allowing efficient use of switched-mode regulated supplies.

The HM-1 is a two-way system comprising a 7" graphite cone low-frequency driver, and a concentrically-mounted 1" soft-dome high frequency driver with constant-directivity horn, in a vented cabinet; the drivers are magnetically shielded. The enclosure contains two 200 Watt amplifiers, an active crossover, driver protection voltage limiters, and frequency and phase response alignment circuitry. A laser-trimmed differential input stage affords superior common-mode rejection to accommodate simple twisted-pair signal distribution. Front-panel LEDs indicate power, signal limit, and thermal overload; a rear-panel circuit breaker provides overall DC power protection.

The HM-1 enclosure is coated with a textured black or white finish, and a variety of factory-installed mounting configurations may be ordered. Optional accessories include a remote switched-mode power supply, a variable-speed cooling fan assembly controlled from a rear-panel drive output, and an auxiliary subwoofer, powered by the HM-1 low-frequency amplifier, that extends the frequency response to 42 Hz in free field.

Power Requirements

The HM-1 requires a 48 VDC external power supply, which provides these benefits:

- Low voltage wiring simplifies installation.
- Utilizes telecom 48 V supply and bus standard.
- Eliminates 50/60 Hz AC noise coupling in wiring.

The HM-1 can be powered by the Meyer PS-1 AC adapter or a supply that conforms to the 48 VDC specifications detailed in this section.

Meyer PS-1 AC Adapter

Using the Meyer PS-1 AC adapter is the simplest way to power a pair of HM-1s, or a single HM-1 with a subwoofer. The AC adapter can be purchased through Meyer Sound and comes with two 10 ft power cables. The AC adapter has two output connectors that are wired together inside the supply, allowing either one connector to drive two speakers at the end of a single cable, or one connector and cable per speaker.

 Do not connect the outputs of multiple PS-1 AC adapters together!

For installations up to 10 HM-1s, using multiple PS-1 AC adapters is often the simplest and most cost-effective solution. Since the limited output power for each supply acts as circuit protection for light gauge cables, it is not necessary to install circuit breaker distribution panels. Using the PS-1 does, however, limit each 48 V line to two speakers. The dimensions of the AC adapter are 10" x 5" x 3". Contact Meyer Sound for further information on the PS-1 AC Adapter.



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

Power Supplies for Large Systems

If an installation includes a large number of speakers, or requires many speakers to operate from a single 48 V line, a single high output power supply should be considered. The following sections provide current and voltage specifications for the HM-1's power requirements.

Current Ratings

The wide dynamic range of audio signals normally causes a high peak-to-RMS ratio in an amplifier's DC supply currents. The HM-1 has internal storage circuits to minimize the peak-to-average ratio, which

- reduces the peak power rating required by the supply;
- allows efficient use of switched-mode power supplies which have similar peak and continuous ratings.

The following table lists the current and power draw for a single HM-1 at light, moderate, and maximum operating levels.

Current and Power Draw for 1 HM-1				
Operating Level	RMS Current	Peak Current	RMS Power	Peak Power
Light <i>(no limiting)</i>	1.5 A _{RMS}	2.0 A _{PEAK}	72 W _{RMS}	96 W _{PEAK}
Moderate <i>(occasional limiting)</i>	2.0 A _{RMS}	3.5 A _{PEAK}	96 W _{RMS}	168 W _{PEAK}
Maximum <i>(continuous limiting)</i>	3.0 A _{RMS}	5.0 A _{PEAK}	144 W _{RMS}	240 W _{PEAK}

Each HM-1 draws 0.4 ADC, 20 W in a quiescent state. The RMS current is measured over a 500 ms integration time. The peak current is measured over a 10 ms integration time.

Each HM-1 can drive a slaved Meyer subwoofer from a connection on the amplifier panel. Adding the subwoofer increases the amplifier's output current, which increases the power supply current. The current and power ratings for an HM-1 and a subwoofer are listed in the following table at light, moderate, and maximum operating levels.

Current and Power Draw for 1 HM-1 with Subwoofer				
Operating Level	RMS Current	Peak Current	RMS Power	Peak Power
Light <i>(no limiting)</i>	2.0 A _{RMS}	2.5 A _{PEAK}	96 W _{RMS}	120 W _{PEAK}
Moderate <i>(occasional limiting)</i>	2.5 A _{RMS}	4.0 A _{PEAK}	120 W _{RMS}	192 W _{PEAK}
Maximum <i>(continuous limiting)</i>	3.5 A _{RMS}	6.0 A _{PEAK}	168 W _{RMS}	288 W _{PEAK}

An HM-1 with subwoofer draws 0.4 ADC, 20 W in a quiescent state.

Voltage Ratings

The voltage operating range for the HM-1 is 48 VDC nominal, 52 VDC absolute maximum, and 35 VDC minimum without shutoff.

Allowing operation down to 35 VDC provides two benefits. First, a moderate voltage drop (up to 8 V) for long DC power cables has a minimal impact on audio performance, enabling the use of light-gauge cables for most installations.

Second, since some switched-mode power supplies slowly foldback the voltage if they experience *current-limit*, power supplies with lower power (current) ratings can be used efficiently. Since supplies with lower power ratings typically experience current-limit when the HM-1 is at *continuous limiting*, some voltage drop and loss of headroom is acceptable provided the voltage does not drop below 35 VDC. At 35 V, the maximum current draw is 25% lower than the values stated in the preceding tables.

NOTE: If the HM-1 will not be driven at continuous limiting, a power supply that satisfies the moderate specifications for voltage and current can be used safely without risk of sonic degradation or interruption.

It is important to understand how the selected power supply responds to current-limit, particularly for switched-mode supplies. Some supplies trip off and must be reset manually, while others remain off for a period of time and reset automatically. In both cases, the HM-1 suffers audio interruption. In the third, and preferable case, supplies that feature voltage foldback allow brief periods of current-limit without audio interruption; for this reason, we recommend using such supplies.

The HM-1 does not require tight voltage regulation and operates down to 35 V although peak SPL values are reduced. This operating voltage flexibility allows for wiring loss and voltage foldback without interruption or degradation of the audio signal.

Many high power industrial supplies (1–5 kWatt) are available for 19" EIA racks that are suitable for large installations with equipment rooms. Distribution panels with branch circuits can be used economically with up to 8 HM-1s on a branch. Contact Meyer Sound for information on tested and approved supplies.

Cable Requirements

Each HM-1 draws a maximum of 3 Arms and 5 Apk from a 48 V power supply at peak SPL. The cabling between the 48 V supply and the speaker adds resistance to the circuit and produces a voltage drop at the speaker. Decreasing the voltage at the speaker compromises the peak SPL so cable resistance should be minimized.

For best sonic performance, avoid voltage drops greater than 8 V at the speaker. Voltage drops greater than 15 V may cause the speaker to mute or distort. The maximum round-trip resistance for a cable attached to a single HM-1 should be no higher than 1.6 Ω , which keeps the voltage drop below 8 V during the maximum current draw of 5 Apk.

The following table helps select cable gauges for various cable lengths.

<i>Maximum Cable Length for < 8 V drop</i>			
# HM-1s at end of cable	18 AWG ft (m)	16 AWG ft (m)	14 AWG ft (m)
1	125 (38.0)	200 (61.0)	330 (100.6)
2	63 (19.2)	100 (30.5)	165 (50.3)
3	42 (12.8)	67 (20.4)	110 (33.5)
4	32 (9.8)	50 (15.2)	66 (20.1)
5	25 (7.6)	40 (12.2)	63 (19.2)

A single HM-1 attached to a 100 ft 18 AWG cable (1.27 Ω total) produces a 6.4 VDC loss at the speaker (41.6 V) during maximum audio bursts (5 A, 0.5 s). This results in a small loss in peak SPL.

Audio Input

The input impedance of an HM-1 is 10 k Ω . Pins 2 and 3 carry the input as a differential signal. Pin 1 and the case are connected to the HM-1 chassis. The power cable can be jacketed in the same sheath as the signal cable without adding noise to the input signal.

For best EMI immunity, it is desirable to use a twisted pair shielded cable with the twisted pair connected to pins 2 and 3, and the shield to pin 1. However, an unshielded twisted pair cable can be used effectively, even if it is jacketed with the power cable.

The input is RF and ESD protected, capacitive coupled, ± 50 V common mode to ground, +4 dBu nominal, +21 dBu max. Clipping occurs at the input at 12 Vpk. The Common Mode Rejection Ratio (CMRR) is greater than 80 dB.

The HM-1 is available with either an XLR or a terminal strip input connector.

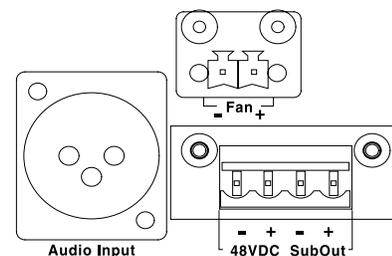
Interfacing Options

Two types of interface panel are available for the HM-1. One uses an XLR connector for the audio input, and a four-pin terminal connector for the power supply input and subwoofer output. The other interface panel type uses a seven-pin terminal connector for the audio input, power supply input, and subwoofer output. Both versions use a two-pin terminal connector for the fan power output.

The wiring for the terminal connectors is inserted into a keyed plug that fits only into the correct terminal connector. This section discusses both interface panel types.

XLR Connector

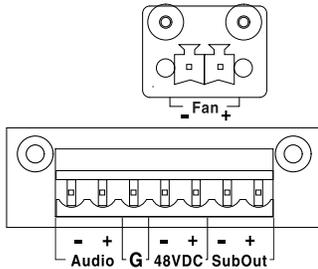
The XLR connector is standard for most audio devices. Pins 2 and 3 carry the input as a differential signal (pin 2 is hot) and pin 1 is connected to the chassis. The power supply input and subwoofer output connections are each made with a two-pin plug. Each plug is keyed such that it can be inserted only into the correct location. For example, the power supply plug does not fit into the subwoofer output.



Rear panel with XLR connector

Terminal Connector

The terminal connector combines the audio input, power supply input, and subwoofer output connections into a single seven-pin connector. The audio input uses two pins for the differential input signal, and one for ground; the subwoofer output and power supply input each use two pins. A seven-pin plug accepts the wiring and can be inserted into the terminal connector in the correct orientation only.



Rear panel with pluggable terminal strip input and fan connectors

The HM-1 Subwoofer

The low frequency response of an HM-1 can be extended down to 42 Hz if used with the HM-1 Subwoofer or placed next to a wall or ceiling (*half-space loading*). Each HM-1 can power a subwoofer from the male 3-pin EN3 **Sub** output connector on the rear panel. However, depending on the loading conditions, ample low frequency energy may be obtained by driving a single subwoofer from two HM-1s, resulting in a correctly-summed mono signal. Cables for connecting one HM-1 to a subwoofer and two HM-1s to a single subwoofer are shipped with each HM-1.

The addition of one subwoofer increases the maximum SPL of a single HM-1 by 4 dB (without sub: 116 dB SPL; with sub: 120 dB SPL). The HM-1 Subwoofer has the following specifications:

Transducer	10" low frequency cone driver
Enclosure/Finish	Medium Density Fiberboard (MDF) / Oak Veneer (natural or black)
Weight	33 lb (11.0 kg)
Dimensions	Height: 17.5"; Width: 12.3"; Depth: 9.3

A 3-pin terminal block connector is used to apply the amplifier signal from the HM-1 to the subwoofer.

Cooling and Fan Installation

The HM-1 depends on natural convection to cool the heatsinks that absorb heat from the amplifiers and radiate the heat into the surrounding air space. Natural convection requires free air in back of, and underneath the HM-1 to allow air to flow up over the heatsinks. The HM-1 reaches an equilibrium temperature in approximately 15 minutes at a steady operating level.

In free air, at a typical room temperature of 25°C, the HM-1 reaches an equilibrium temperature of

- 40°C in a quiescent state (no audio signal);
- 60°C at a moderate operating level (occasional limiting);
- 75°C at the maximum operating level (continuous limiting), or at a moderate level with a subwoofer.

If the temperature reaches 85°C, the thermal limiters activate (see *Protection and Limiting*) to prevent high source levels from further increasing the temperature and damaging the drivers and electronics. The thermal limiters provide 30 dB of muting until the temperature decreases to 75°C.

The HM-1 can be cooled by two fans, available as an accessory kit. The fans should be used if:

- the HM-1 is enclosed in a soffit or ceiling mount without adequate space for natural convection;
- the HM-1 is used in hot ambient temperatures or direct sunlight;
- the user wishes to avoid accidental contact with the heatsinks if the rear of the HM-1 is exposed.



Safety Summary



English

- To reduce the risk of electric shock, disconnect the loudspeaker from the AC adapter before installing audio cable. Reconnect the adapter only after making all signal connections.
- Connect the AC adapter to a two-pole, three wire grounding mains receptacle. The receptacle must be connected to a fuse or circuit breaker. Connection to any other type of receptacle poses a shock hazard and may violate local electrical codes.
- Do not install the loudspeaker in wet or humid locations.
- Do not allow water or any foreign object to get inside the loudspeaker. Do not put objects containing liquid on, or near, the unit.
- To reduce the risk of overheating the loudspeaker, avoid exposing it to direct sunlight. Do not install the unit near heat emitting appliances, such as a room heater or stove.
- This loudspeaker contains potentially hazardous voltages. Do not attempt to disassemble the unit. The unit contains no user serviceable parts. Repairs should be performed only by factory trained service personnel.

Français

- Pour réduire le risque d'électrocution, débranchez la prise principale de l'haut-parleur, avant d'installer le câble d'interface allant à l'audio. Ne rebranchez le bloc d'alimentation qu'après avoir effectué toutes les connexions.
- Branchez l'haut-parleur dans une prise de courant à 3 dérivations (deux pôles et la terre). Cette prise doit être munie d'une protection adéquate (fusible ou coupe-circuit). Le branchement dans tout autre genre de prise pourrait entraîner un risque d'électrocution et peut constituer une infraction à la réglementation locale concernant les installations électriques.
- Ne pas installer l'haut-parleur dans un endroit où il y a de l'eau ou une humidité excessive.
- Ne pas laisser de l'eau ou tout objet pénétrer dans l'haut-parleur. Ne pas placer de récipients contenant un liquide sur cet appareil, ni à proximité de celui-ci.
- Pour éviter une surchauffe de l'haut-parleur, conservez-la à l'abri du soleil. Ne pas installer à proximité d'appareils dégageant de la chaleur tels que radiateurs ou appareils de chauffage.
- Ce haut-parleur contient des circuits haute tension présentant un danger. Ne jamais essayer de le démonter. Il n'y a aucun composant qui puisse être réparé par l'utilisateur. Toutes les réparations doivent être effectuées par du personnel qualifié et agréé par le constructeur.

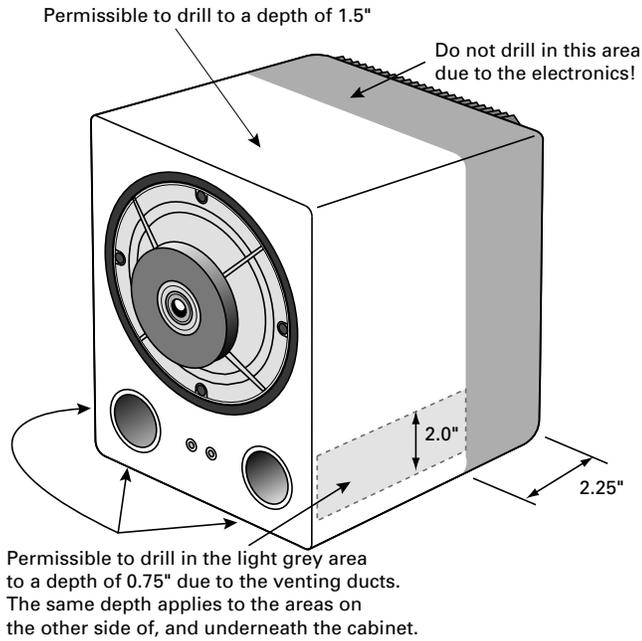
Deutsch

- Um die Gefahr eines elektrischen Schlages auf ein Minimum zu reduzieren, den Lautsprecher vom Stromnetz trennen, bevor ggf. ein Audio-Schnittstellensignalkabel angeschlossen wird. Das Netzkabel erst nach Herstellung aller Signalverbindungen wieder einstecken.
- Der Lautsprecher an eine geerdete zweipolige Dreiphasen-Netzsteckdose anschließen. Die Steckdose muß mit einem geeigneten Abzwegschutz (Sicherung oder Leistungsschalter) verbunden sein. Der Anschluß der unterbrechungsfreien Stromversorgung an einen anderen Steckdosentyp kann zu Stromschlägen führen und gegen die örtlichen Vorschriften verstoßen.
- Der Lautsprecher nicht an einem Ort aufstellen, an dem sie mit Wasser oder übermäßig hoher Luftfeuchtigkeit in Berührung kommen könnte.
- Darauf achten, daß weder Wasser noch Fremdkörper in das Innere den Lautsprecher eindringen. Keine Objekte, die Flüssigkeit enthalten, auf oder neben die unterbrechungsfreie Stromversorgung stellen.
- Um ein Überhitzen dem Lautsprecher zu verhindern, das Gerät vor direkter Sonneneinstrahlung fernhalten und nicht in der Nähe von wärmeabstrahlenden Haushaltsgeräten (z.B. Heizgerät oder Herd) aufstellen.
- Im Inneren diesem Lautsprecher herrschen potentiell gefährliche Spannungen. Nicht versuchen, das Gerät zu öffnen. Es enthält keine vom Benutzer reparierbaren Teile. Reparaturen dürfen nur von ausgebildetem Kundendienstpersonal durchgeführt werden.

Español

- Para reducir el riesgo de descarga eléctrica, desconecte de la red el altoparlante antes de instalar el cable de señalización de interfaz de la segnale. Vuelva a conectar el conductor flexible de alimentación solamente una vez efectuadas todas las interconexiones de señalización.
- Conecte el altoparlante a un tomacorriente bipolar y trifilar con neutro de puesta a tierra. El tomacorriente debe estar conectado a la protección de derivación apropiada (ya sea un fusible o un disyuntor). La conexión a cualquier otro tipo de tomacorriente puede constituir peligro de descarga eléctrica y violar los códigos eléctricos locales.
- No instale el altoparlante en lugares donde haya agua o humedad excesiva.
- No deje que en el altoparlante entre agua ni ningún objeto extraño. No ponga objetos con líquidos encima de la unidad ni cerca de ella.
- Para reducir el riesgo de sobrecalentamiento, no exponga la unidad a los rayos directos del sol ni la instale cerca de artefactos que emiten calor, como estufas o cocinas.
- Este altoparlante contiene niveles de voltaje peligrosos en potencia. No intente desarmar la unidad, pues no contiene piezas que puedan ser reparadas por el usuario. Las reparaciones deben efectuarse únicamente por parte del personal de mantenimiento capacitado en la fábrica.

Mounting Specifications



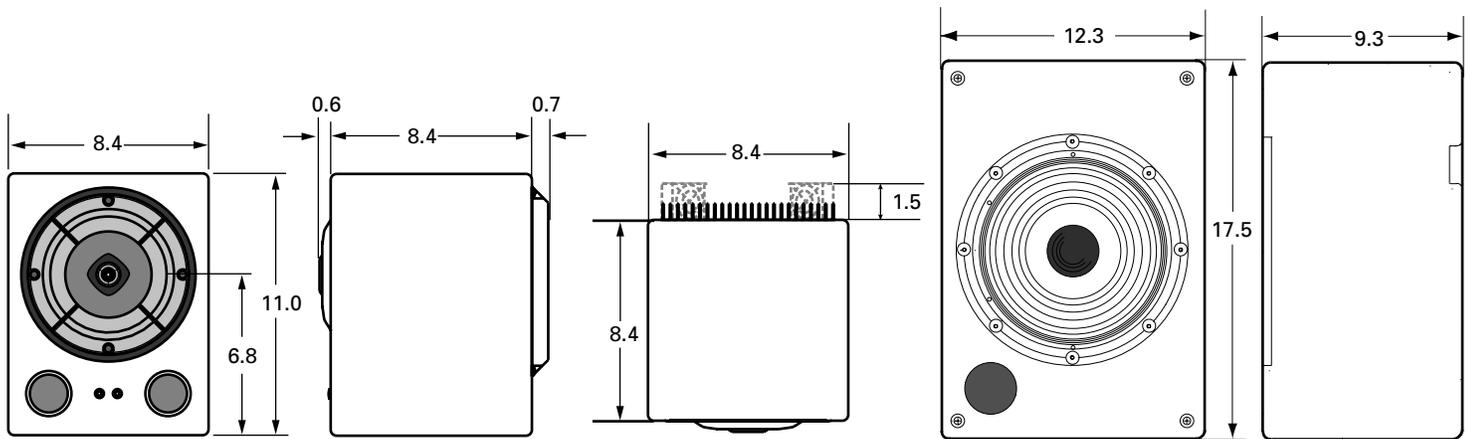
The HM-1 does not ship with mounting hardware, but its 9-ply birch wood construction easily accommodates a variety of user-installed mounting hardware using wood screws. Drilling areas and depths are indicated in the diagram at left. The weight of a single HM-1 is 11.0 lb (5.0 kg).

Do not to drill in the dark grey area due to the presence of sensitive amplifier and electronic circuitry. The light grey area indicates the location of the venting ducts that are essential to the tuning and performance of the enclosure. The same areas exist on the other side, and underneath the cabinet. It is permissible to drill in these areas to a depth of 0.75". It is permissible to drill in the white area to a depth of 1.5".

NOTE: All Meyer Sound products must be used in accordance with local, state, federal, and industry regulations. It is the owner's and/or user's responsibility to evaluate the reliability of any mounting method for their application. Mounting should be done only by experienced professionals.

Dimensions

All units in inches



HM-1 weighs 11.0 lb (5.0 kg)

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