

M1D Ultra-Compact Curvilinear Array Loudspeaker
M1D-Sub Ultra-Compact Subwoofer



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DECLARATION OF CONFORMITY ACCORDING TO ISO/IEC GUIDE 22 AND EN 45014

Manufacturer's Name:

Meyer Sound Laboratories Inc.

Manufacturer's Address:

2832 San Pablo Avenue
Berkeley, CA 94702-2204, USA

Declares that the products

Product Name: M1D and M1D-Sub Loudspeakers

Product Options: All

Safety: IEC 60065:1998
EN 60065:1998
UL 6500/09.99
CAN/CSA E60065-00

EMC: EN 55103-1: 1997 emission(1)
EN 55103-2: 1997 immunity(2)

This device complies with the requirements of the Low Voltage Directive 73 / 23 / EEC and the EMC Directive 89 / 336 / EEC.

This device also complies with EN 55103-1 & -2. 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.

Note: Installation restrictions may be applied by supply authorities in relation to harmonics and voltage fluctuations (flicker).

Supplementary Information

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
October 28, 2003

European Contact: Your local Meyer Sound dealer or Meyer Sound Germany, GmbH. Carl Zeiss Strasse 13, 56751 Polch, Germany.
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Environmental specifications for Meyer Sound Electronics products

Operating Temperature	0° C to + 45° C
Non operating Temperature	<-40° C or > +75° C
Humidity	to 95% at 35° C
Operating Altitude	to 4600 m (15,000 ft)
Non operating Altitude	to 6300 m (25,000 ft)
Shock	30 g 11 msec half-sine on each of 6 sides
Vibration	10 Hz to 55 Hz (0.010 m peak-to-peak excursion)



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M1D/M1D-Sub Operating Instructions

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

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Printed in the U.S.A.


Part Number: 05.115.200.01, Rev A

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 betriebsanweisung und unterhaltsanweisung zeigen	Rahmen oder chassis	Die schutzerde
Para indicar voltajes peligrosos.	Instrucciones importantes de funcionamiento y/o mantenimiento	Armadura o chassis	Tierra proteccionista

IMPORTANT SAFETY INSTRUCTIONS

1. Read these instructions.
 2. Keep these instructions.
 3. Heed all warnings.
 4. Follow all instructions.
 5. Do not use this loudspeaker near water.
 6. Clean only with dry cloth.
 7. Do not block any ventilation openings. Install in accordance with Meyer Sound's installation instructions.
 8. Do not install near any heat sources such as radiators, heat registers, stoves, or other apparatus that produce heat.
 9. Do not defeat the safety purpose of the grounding-type plug. A grounding type plug has two blades and a third grounding prong. The third prong is provided for your safety. If the provided plug does not fit into your outlet, consult an electrician for replacement of the obsolete outlet.
 10. Protect the power cord from being walked on or pinched, particularly at plugs, convenience receptacles, and the point where they exit from the loudspeaker. The AC mains plug or appliance coupler shall remain readily accessible for operation.
 11. Only use attachments/accessories specified by Meyer Sound.
 12. Use only with the caster rails or rigging specified by Meyer Sound, or sold with the loudspeaker. Handles are for carrying only.
-
- 

CAUTION: Rigging should only be done by experienced professionals.
-
13. Unplug this loudspeaker during lightning storms or when unused for long periods of time.
 14. Refer all servicing to qualified service personnel. Servicing is required when the loudspeaker has been damaged in any way, such as when the power-supply cord or plug has been damaged; liquid has been spilled or objects have fallen into the loudspeaker; rain or moisture has entered the loudspeaker; the loudspeaker has been dropped; or when for undetermined reasons the loudspeaker does not operate normally.

SAFETY SUMMARY

English

- To reduce the risk of electric shock, disconnect the loudspeaker from the AC mains before installing audio cable. Reconnect the power cord only after making all signal connections.
- Connect the loudspeaker 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 without using weather protection equipment from Meyer Sound.
- 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, débrancher la prise principale de l'haut-parleur, avant d'installer le câble d'interface allant à l'audio. Ne rebrancher le bloc d'alimentation qu'après avoir effectué toutes les connections.
- 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, conserver-la à l'abri du soleil. Ne pas installer à proximité d'appareils dégagant 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 Abzweigschutz (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 dieses 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 de voltaje el altoparlante antes de instalar el cable de señal de audio. Vuelva a conectar la alimentación de voltaje una vez efectuadas todas las interconexiones de señalización de audio.
- 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.

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INTRODUCTION

HOW TO USE THIS MANUAL

As you read this manual, you'll find figures and diagrams to help you understand and visualize what you're reading. You'll also find numerous icons that serve as cues to flag important information or warn you against improper or potentially harmful activities. These icons include:



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



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



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

INTRODUCING THE M1D AND M1D-SUB LOUSPEAKERS

As part of Meyer Sound's M Series™, the M1D ultra-compact curvilinear line array loudspeaker and M1D-Sub ultra-compact subwoofer bring singular advantages to small venue applications. Self-powered, with QuickFly® rigging and Meyer Sound's RMS™ remote monitoring system as standard, the loudspeakers can be deployed as self-contained systems or configured along with other Meyer Sound loudspeakers in more complex systems.

Operating at a frequency range of 60 Hz to 18 kHz, the M1D loudspeaker's extremely compact enclosure (Figure i.1) enables it to function discreetly, yet it provides extraordinary sound quality and flexibility.

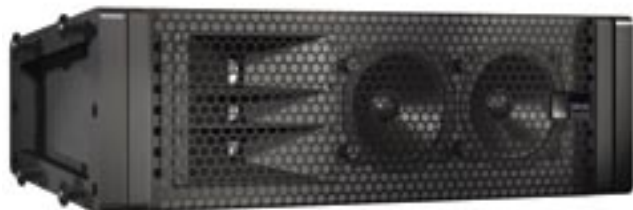


Figure i.1: M1D ultra-compact curvilinear array loudspeaker

Multiple M1D loudspeakers can create very compact vertical curvilinear arrays of up to 16 cabinets with a 7:1 safety factor, having 0° to 8° of splay between adjacent units. Vertical coverage can be tailored by varying the number and splay of cabinets in the array, while maintaining a consistent 100° of horizontal coverage.

To reproduce high frequencies, the M1D employs three high-power neodymium magnet metal dome tweeters coupled to a horn with a 100° constant directivity horizontal pattern. The tweeters act as a small line array, affording very tight vertical coverage while utilizing the M1D wave guide to provide wide horizontal coverage. Vertical coverage of a single M1D loudspeaker is restricted to approximately 10° (±5°) making it ideal for applications that require very precise and narrow vertical coverage such as front fill.



NOTE: Please read this entire manual carefully before configuring and deploying the system — particularly sections concerning safety issues and important cautions.

To ensure smooth response in the critical midrange, the M1D loudspeaker incorporates a complex crossover design. At the lowest frequencies, two 5-inch cone drivers combine to reproduce coherent bass, while in the mid frequencies the crossover feeds only one of the two drivers. This technique, used successfully for many years in Meyer Sound's UPM loudspeakers, eliminates interference near the crossover frequencies and maintains optimal polar and frequency response characteristics.

The companion M1D-Sub (Figure i.2) loudspeaker operates at a frequency range of 32 Hz to 180 Hz. Designed specifically to work with the M1D loudspeaker, it extends overall system power bandwidth and frequency response down to 32 Hz.



Figure i.2: M1D-Sub ultra-compact subwoofer

The M1D-Sub loudspeaker employs two back-vented 10-inch cone drivers featuring lightweight neodymium magnet structures to reproduce powerful, coherent bass from an extraordinarily small and light package. Both the M1D and M1D-Sub loudspeakers incorporate a complementary MOSFET two-channel power amplifier module with active crossover and optimized phase and frequency response correction circuitry. The two-channel amplifier is used to power, in a bi-amplified mode, the M1D loudspeaker using one channel for the low-frequency drivers and one channel for the high-frequency dome tweeters. The amplifier is used to power the M1D-Sub loudspeaker using one channel for each of the low-frequency 10-inch cone drivers.

Intelligent AC™ circuitry automatically adjusts for AC mains voltage allowing the M1D and M1D-Sub loudspeakers to be used effortlessly worldwide. Integral peak and rms limiters protect the transducers from over-excursion and over-heating. The M1D and M1D-Sub loudspeakers come standard fitted with Meyer Sound's RMS remote monitoring system, allowing the full range of operating parameters to be monitored continuously over a network using a Windows® computer.

M1D and M1D-Sub loudspeakers incorporate QuickFly rigging, and utilize a unique custom link secured by quick release pins to an integral steel and aluminum rigging frame to provide easy splay adjustments. Up to 16 M1D cabinets (or equivalent weight of M1D and M1D-Sub loudspeakers) may be assembled in a single array, with 0° to 8° of splay between cabinets.



NOTE: The Meyer Sound MAPP Online® acoustical prediction program allows quick prediction of coverage, frequency response, impulse response and maximum output of arrayed M1D and M1D-Sub loudspeakers.

Information and specifications are applicable as of the date of this printing. Updates and supplementary information are posted on the Meyer Sound web site at:

<http://www.meyersound.com>

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CHAPTER 1: POWER REQUIREMENTS

Self-powered and ultra-compact, the M1D and M1D-Sub loudspeakers represent advanced technology with equally advanced power capabilities. Understanding power distribution, voltage and current requirements, as well as electrical safety issues, is critical to their safe operation and deployment.

AC POWER

The M1D and M1D-Sub loudspeakers use a PowerCon® 3-pole AC mains system with locking connectors to prevent accidental disconnection. Two female inlets (one colored blue and the other gray) are provided. The blue connector serves as the power input. To loop additional units, simply attach a cable from the gray connector of the first loudspeaker system to the blue connector of the second, and so on (Figure 1.1).

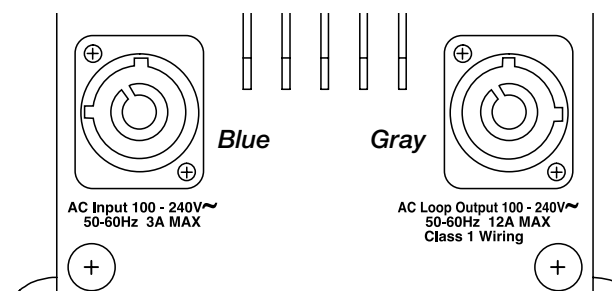


Figure 1.1. You can daisy-chain M1D loudspeakers and/or M1D-Sub subwoofers using the gray connector.



NOTE: A 10-foot blue power connector cable is provided with the M1D and M1D-Sub loudspeakers, as well as a gray loop out connector. Additional looping cables are available from Meyer Sound.



CAUTION: Do not loop more than four M1D/M1D-Sub cabinets from the loop out connector when connected at 115 V and not more than eight when driven at 230 V.



CAUTION: Ensure that you select the correct power plug for the AC power in the area in which you use the M1D or M1D-Sub loudspeaker.

When AC power is applied to the M1D and M1D-Sub loudspeakers, the Intelligent AC power supply automatically selects the correct operating voltage, allowing the loudspeakers to be used internationally without manually setting voltage switches. The Intelligent AC supply performs the following protective functions to compensate for hostile conditions on the AC mains:

- Suppresses high-voltage transients up to several kilovolts
- Filters common mode and differential mode radio frequencies (EMI)
- Sustains operation temporarily during low-voltage periods

AC Power Distribution

All amplifier modules and directly associated audio equipment (mixing consoles, processors, etc.) must be connected to the AC power distribution in a proper manner, preserving AC line polarity and connecting earth ground such that all grounding points are connected to a single node or common point using the same cable gauge as the neutral and line(s) cable(s).

Improper grounding connections between loudspeakers and the rest of the audio system may produce noise, hum and/or serious damage to the input/output stages in the system's electronic equipment.



CAUTION: Before applying AC to any Meyer Sound self-powered loudspeaker, be sure that the voltage potential difference between neutral and earth ground is less than 5 V AC.

The M1D and M1D-Sub loudspeakers can withstand continuous voltages up to 264 V and allow any combination of voltage to GND (that is neutral-line-ground or line-line-ground).



CAUTION: Continuous voltages higher than 264 V may damage the loudspeaker.

Voltage Requirements

The M1D and M1D-Sub loudspeakers operate safely and without audio discontinuity if the AC voltage stays within the operating window of 90 to 264 V AC, at 50 or 60 Hz.

After applying AC power, the system is muted while the circuitry charges up and stabilizes. During the next two seconds the following events occur:

1. The fan turns on.
2. The main power supply slowly ramps on.
3. The green On/Temp LED on the user panel lights up, indicating that the system is enabled and ready to pass audio signals.



CAUTION: If the On/Temp LED does not illuminate or the system does not respond to audio input after ten seconds, remove AC power immediately. Verify that the voltage is within the proper range. If the problem persists, please contact Meyer Sound or an authorized service center.

If voltage drops below the low boundary of its safe operating range (brownout), the loudspeakers use stored energy to continue functioning briefly, and shut down only if voltage does not rise above the low boundary before storage circuits are depleted. How long the loudspeaker will continue to function during brownout depends on the amount of voltage drop and the audio source level during the drop.

If the voltage increases above the upper boundary of the range, the power supply can be damaged.



NOTE: It is recommended that the supply be operated in its rated voltage window at least a few volts away from the turn on/off points. This ensures that that AC voltage variations from the service entry – or peak voltage drops due to cable runs – do not cause the amplifier to cycle on and off or cause damage to the power supply.

CURRENT REQUIREMENTS

Each M1D and M1D-Sub loudspeaker requires approximately 3 A rms max at 115 V AC for proper operation. This allows up to five M1D and/or M1D-Sub loudspeakers to be powered from one 15 A breaker.

The M1D and M1D-Sub loudspeakers present a dynamic load to the AC mains, which causes the amount of current to fluctuate between quiet and loud operating levels. Since different cables and circuit breakers heat up at varying rates, it is essential to understand the types of current ratings and how they correspond to circuit breaker and cable specifications.

The *maximum long-term continuous current* is the maximum rms current during a period of at least 10 seconds. It is used to calculate the temperature increase in cables, in order to select a cable size and gauge that conforms to electrical code standards. It is also used to select the rating for slow-reacting thermal breakers.

The *burst current* is the maximum rms current during a period of approximately one second, used to select the rating of most magnetic breakers and to calculate the peak voltage drop in long AC cables according to the formula:

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

The *ultimate short-term peak current* is used to select the rating of fast reacting magnetic breakers.

Use Table 1.1 as a guide when selecting cable gauge size and circuit breaker ratings for your operating voltage.

Table 1.1 M1D/M1D-Sub Current Ratings

Current Draw	115 V AC	230 V AC	100 V AC
Max. long-term continuous	3.2 A rms	1.65 A rms	3.7 A rms
Burst current	5 A rms	2.5 A rms	5.8 A rms
Ultimate short-term peak	17 A pk	8.5 A pk	20 A pk
Idle current	0.41 A rms	0.33 A rms	0.42 A rms



NOTE: For best performance, the AC cable voltage drop should not exceed 10 volts, or 10 percent at 115 volts and 5 percent at 230 volts. Make sure that even with the AC voltage drop, the AC voltage always stays in the operating windows.

The minimum electrical service amperage required by an M1D/M1D-Sub system is the sum of each loudspeaker's maximum continuous rms current. An additional 30 percent above the minimum amperage is recommended to prevent peak voltage drops at the service entry.

Power Connector Wiring

The M1D and M1D-Sub loudspeakers require a grounded outlet. It is very important that the system be properly grounded in order to operate safely and properly. Use the following AC cable wiring diagram to create international or special-purpose power connectors:

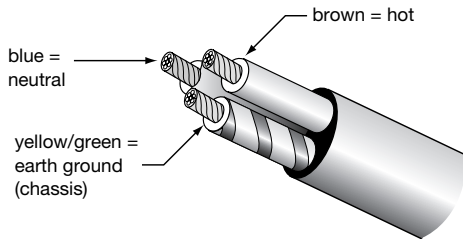


Figure 1.2. AC cable color code

If the colors referred to in the diagram don't correspond to the terminals in your plug, use the following guidelines:

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



CAUTION: The loudspeakers require a ground connection. Always use a grounded outlet and plug.

CHAPTER 2: AMPLIFICATION AND AUDIO

More than just self-powered loudspeakers, the M1D and M1D-Sub use sophisticated amplification and protection circuitry to produce consistent and predictable results in any system design. This chapter will help you understand and harness the power of the M1D and M1D-Sub amplification and audio systems.

The rear panels of the M1D and M1D-Sub loudspeakers (Figure 2.1) provide two slots for processor modules. The upper slot contains the Audio Input, while the RMS™ module is located in the lower slot.

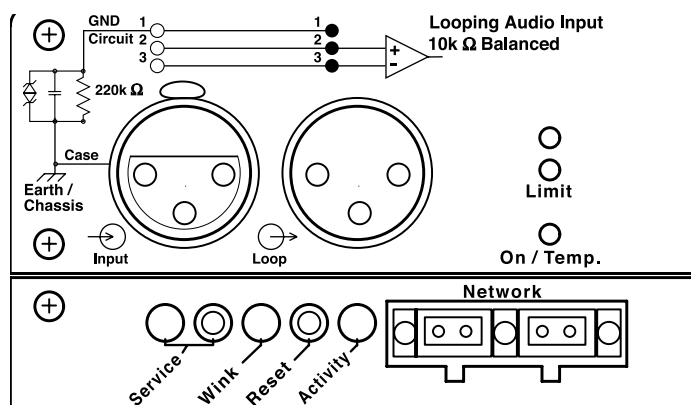


Figure 2.1. The rear panel of the M1D and M1D-Sub

AUDIO INPUT

Pins 2 and 3 carry the input as a differential signal; pin 2 is hot relative to pin 3, resulting in a positive pressure wave when a positive signal is applied to pin 2. Pin 1 is connected to earth through 220 kOhm, 1000 pF, 15 V clamp network. This ingenious circuit provides virtual ground lift for audio frequencies, while allowing unwanted signals to bleed to ground. Use standard audio cables with XLR connectors for balanced signal sources. Make sure that pin 1 (shield) is always connected on both ends of the cable. Telescoping grounding schemes are not recommended.

CAUTION: Ensure that all cabling carrying signal to M1D and M1D-Sub loudspeakers in an array is wired correctly: Pin 1 to Pin 1, Pin 2 to Pin 2, and so forth, to prevent the polarity from being reversed. Any number of loudspeakers — even one in the array — with reversed polarity will result in severe degradation in frequency response and coverage.

Audio signals can be daisy-chained using the loop output connector on the user panel (Figure 2.1). A single source can drive multiple M1D and M1D-Sub loudspeakers with a paralleled input loop, creating an unbuffered hard-wired loop connection.

When driving multiple M1D and/or M1D-Sub loudspeakers in an array, make certain that the source device can drive the total load impedance presented by the paralleled input circuit of the array. The audio source must be capable of producing a minimum of 20 dB volts (10 volts rms into 600 ohms) in order to produce the maximum peak SPL over the operating bandwidth of the loudspeaker.

To avoid distortion from the source, make sure the source equipment provides an adequate drive circuit design for the total paralleled load impedance presented by the array. The input impedance for a single loudspeaker is 10 kOhms: if n represents the number of M1D and M1D-Sub loudspeakers in an array, paralleling the inputs of n loudspeakers will produce a balanced input load of 10 kOhms divided by n .

NOTE: Most source equipment is safe for driving loads no smaller than 10 times the source's output impedance.

For example, cascading an array of 10 units consisting of M1D and/or M1D-Sub loudspeakers produces an input impedance of 1000 ohms (10 kOhms divided by 10). The source equipment should have an output impedance of 100 ohms or less. This is also true when connecting M1D and M1D-Sub loudspeakers in parallel (loop out) with other self-powered Meyer Sound loudspeakers.

CAUTION: Shorting an input connector pin to the case can form a ground loop and cause hum.

TIP: If abnormal noises such as hiss and popping are produced by the loudspeaker, disconnect the audio cable from the loudspeaker. If the noise stops, then most likely the problem is not with the loudspeaker. Check the audio cable, source, and AC power for the source of the problem.

M1D Interconnections

For the low to low-mid frequencies, the M1D loudspeaker utilizes two 8 ohm, 5-inch cone drivers. These drivers are rated to handle 200 AES watts (loudspeaker driven with a band-limited noise signal with 6-dB peak-to-average ratio for a period of 2 hours).

A complex passive network connected between the amplifier and the drivers is used to ensure smooth response in the critical midrange. At the lowest frequencies, the two 5-inch drivers combine to reproduce coherent low frequencies. In the mid frequencies, the passive network feeds only one of the two drivers while correcting the phase shift at low frequencies for proper addition with the other driver. This technique eliminates interference between the high-frequency and low-frequency drivers that would otherwise occur near the crossover frequency, and maintains optimal polar and frequency response characteristics.

To reproduce high frequencies, the M1D loudspeaker employs three high-power neodymium magnet metal dome tweeters coupled to a 100° constant-directivity horn. The tweeters behave like a small line array affording very tight vertical coverage while utilizing the M1D wave guide to provide wide horizontal coverage.



CAUTION: All Meyer Sound loudspeakers are shipped with the drivers in correct alignment. However, if a driver needs to be replaced, make sure the replacement is reinstalled with the correct polarity. Incorrect driver polarity impairs the system performance and may damage the drivers.

M1D Amplification and Limiting

All five drivers in the M1D loudspeaker are powered by a two-channel proprietary Meyer Sound amplifier utilizing complementary MOSFET output stages (class AB/bridged) capable of delivering 500 watts total. The amplifier employs electronic crossover, phase, and frequency response correction filters as well as protection circuitry to process the audio signal. All the specific functions for the M1D loudspeaker are determined by the control module installed inside the amplifier; one channel of the amplifier drives the low and low-mid section of the M1D loudspeaker through the passive network while the other channel drives the high frequency section.

Each channel of the amplifier has peak and rms limiters to prevent driver over-excursion and regulate the temperature of the voice coil. Limiter activity for high and low channels is indicated by two yellow Limit LEDs on the M1D rear panel (Figure 2.2).

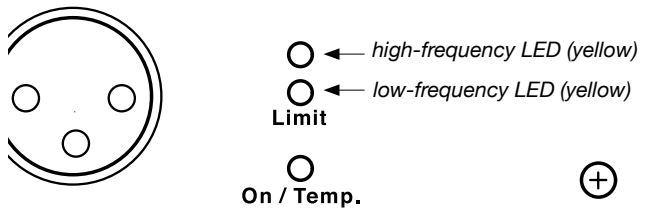


Figure 2.2: M1D high-frequency and low-frequency limiter activity is shown by the Limit LEDs.

M1D-Sub Interconnections

The M1D-Sub loudspeaker utilizes two 4 ohm, 10-inch, cone drivers. These newly developed drivers feature lightweight neodymium magnet structures and are rated to handle 400 AES watts (loudspeaker driven with a band-limited noise signal with 6-dB peak-to-average ratio for a period of 2 hours).



CAUTION: All Meyer Sound loudspeakers are shipped with the drivers in correct alignment. However, if a driver needs to be replaced, make sure the replacement is reinstalled with the correct polarity. Incorrect driver polarity impairs the system performance and may damage the drivers.

M1D-Sub Amplification and Limiting

Each 10-inch cone driver in the M1D-Sub loudspeaker is powered by one channel of a two-channel proprietary Meyer Sound amplifier capable of delivering 450 watts total. The amplifier employs electronic crossover, phase, and frequency response correction filters as well as protection circuitry to process the audio signal. All of the specific functions for the M1D-Sub are determined by the control module installed inside the amplifier; a limiter controlling both channels prevents driver over-excursion and regulates the temperature of the voice coil. Limiter activity is indicated by the lower yellow Limit LED on the M1D-Sub rear panel, as shown in Figure 2.3.

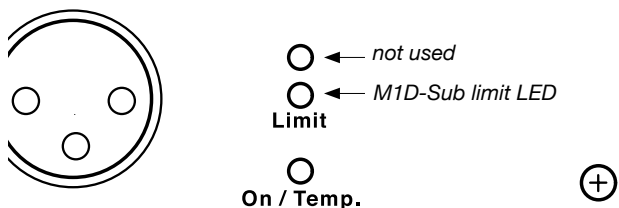


Figure 2.3: M1D-Sub limiter activity is shown by the Limit LEDs.

M1D and M1D-Sub Limiting at Work

The M1D and M1D-Sub loudspeakers perform within their acoustical specifications and operate at a normal temperature if the limit LEDs are on for no longer than two seconds, and off for at least one second. If either LED remains on for longer than three seconds, that channel incurs hard limiting with the following negative consequences:

- Increasing the input level will not increase the volume.
- The system distorts due to clipping and nonlinear driver operation.
- Unequal limiting between the low and high frequency drivers can alter the frequency response (M1D).
- The lifespan of the drivers is reduced because they are subjected to excessive heat.

While the limiters protect the system under overload conditions and exhibit smooth sonic characteristics, it is recommended that you do not drive the M1D or M1D-Sub loudspeaker into continuous limiting.



NOTE: The Limit LEDs indicate when the safe power level is exceeded. For example, if an entire system of M1Ds begins to limit before reaching the required sound pressure level (SPL), you should consider adding more loudspeakers to the array.

The limiters cease operation when the level in the channel returns to normal. Limiters have no effect on the signal when the LED is inactive.

AMPLIFIER COOLING SYSTEM

The M1D/M1D-Sub amplifier employs a combination of natural convection and forced air in its cooling system. The large heatsink used in the amplifier allows natural convection cooling from air flowing over the fins. A low noise fan forces air to the fins, keeping the temperature on the amplifier low even when the loudspeakers are being used at high ambient temperature, in tightly packed conditions and/or at high continuous levels.

If the temperature of the heatsink reaches 75° C (167° F), the fan switches to high speed and the On/Temp. LED on the rear panel turns from green (On) to red (Temp.). The unit continues to operate normally even if the On/Temp LED is red.



CAUTION: To keep the heatsink from getting too hot, ensure proper ventilation around the loudspeaker, especially when using the loudspeakers in tightly packed conditions.

When the heatsink temperature decreases to 65° C (145° F), the On/Temp. LED changes from red to green.




CAUTION: The heatsink can reach temperatures up to 75° C (167° F) during normal operation. Use extreme caution when approaching the rear of the cabinet.

CHAPTER 3: RMS REMOTE MONITORING SYSTEM

The M1D and M1D-Sub loudspeakers are fitted standard with an RMS communication module installed in the amplifier. RMS is a real-time networked monitoring system that connects Meyer Sound self-powered loudspeakers with a Windows-based PC at the sound mix position or other desired remote location. Optional RMS software delivers extensive status and system performance data directly to you from every installed loudspeaker.

RMS allows you to monitor amplifier voltages, limiting activity, power output, temperature, fan and driver status, warning alerts, and other key data for up to 62 loudspeakers without a network repeater; data is updated two to five times per second.

 **NOTE:** Optional Loudspeaker Mute and Solo functions, helpful for acoustic setup or troubleshooting, are also available. A jumper must be installed in the RMS communication module in order to enable Mute and/or Solo functionality; the software also needs to be enabled for these functions.

The M1D and M1D-Sub loudspeakers are shipped with these functions disabled. Once enabled, the jumper(s) can still be removed to eliminate any chance of an operator error (a muting error, for example) during a performance, and both functions can be controlled by software commands in any case. Also note that RMS does not control loudspeaker volume or AC power.

Loudspeakers are identified on the network by Node Names assigned during a one-time “commission” (Figure 3.1) into the RMS database that resides on your computer (as a part of the software).

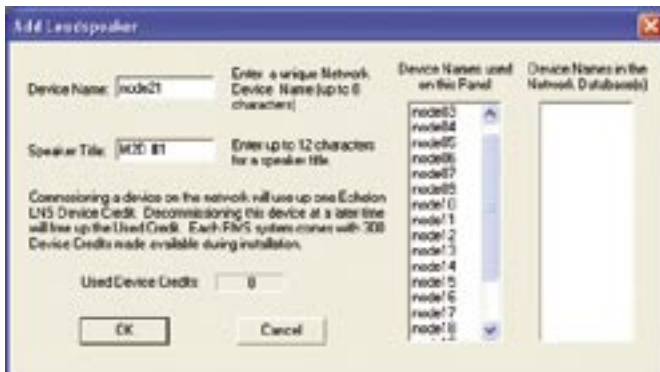


Figure 3.1. Commissioning an M1D loudspeaker using RMS

This information is permanently stored within each RMS communication module and in the computer RMS database unless you modify it. Speaker Titles can be changed at any time, allowing you to customize how you view the data. In addition, any M1D or M1D-Sub loudspeaker can be physically identified from RMS software by activating the *Wink* function – a *Wink LED* will turn on the RMS communication module that corresponds to its Node Name.

M1Ds and M1D-Sub loudspeakers are identified using the RMS software by activating the “service” function; an icon will show up on the RMS screen corresponding to its Node Name (Figure 3.2). This makes verifying Speaker Titles and speaker field labels easy, using the *Wink* or *Service Button* commands.

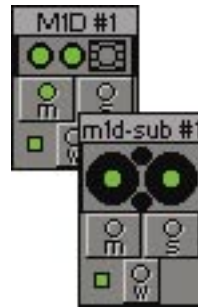



Figure 3.2. RMS M1D and M1D-Sub icons

 **NOTE:** With RMS version 4.5 or higher, if the loudspeaker's amplifier heatsink temperature exceeds 75° C (167° F), the user panel On/Temp LED will turn red, while the loudspeaker icon in the RMS host software will respond by displaying yellow – indicating that the loudspeaker is running hot, but still within safe operating limits. If the color in the RMS host software changes to red, then the loudspeaker is operating above its 98° C (212° F) maximum safe operating temperature. Should such conditions occur, check to ensure that the cabinet is properly ventilated and/or decrease the loudspeaker's audio output signal immediately.

UNDERSTANDING THE RMS USER PANEL

The RMS user panel has three LEDs and two buttons (Figure 3.3). The following sections describe their functions.

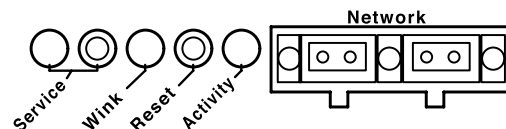


Figure 3.3. The RMS user panel

Service LED (Red)

When blinking once every two seconds, the Service LED indicates that the network hardware is operational, but the loudspeaker is not installed (commissioned) on the network. When a loudspeaker has been installed on the network the, Service LED will be unlit and the Activity LED will flash continuously.



NOTE: When continuously lit, the Service LED indicates that the loudspeaker has had a local RMS hardware failure. In this case, the RMS communication module may be damaged and you should contact Meyer Sound Technical support.

Service Button

Pressing the Service button will notify the corresponding loudspeaker display icon on the RMS screen. When used in combination with the Reset button, the card will be decommissioned from the network and the red Service LED will blink.

Reset Button

Pressing the Reset button will cause the firmware code within the RMS card to reboot. However, the commissioning state of the card will not change (this is stored in flash memory). When used in combination with the Service Button, the card will be decommissioned from the network and the red Service LED will blink.

Activity LED (Green)

When the loudspeaker has been commissioned, the Activity LED will flash continuously. When the Activity LED is unlit the loudspeaker has not been installed on the network.



NOTE: The LEDs and buttons on the user panel of the RMS communication module shown in Figure 3.3 are used exclusively by RMS, and have no effect on the acoustical and/or electrical activity of the M1D or M1D-Sub itself – unless Mute or Solo are enabled at the module and from the RMS software.

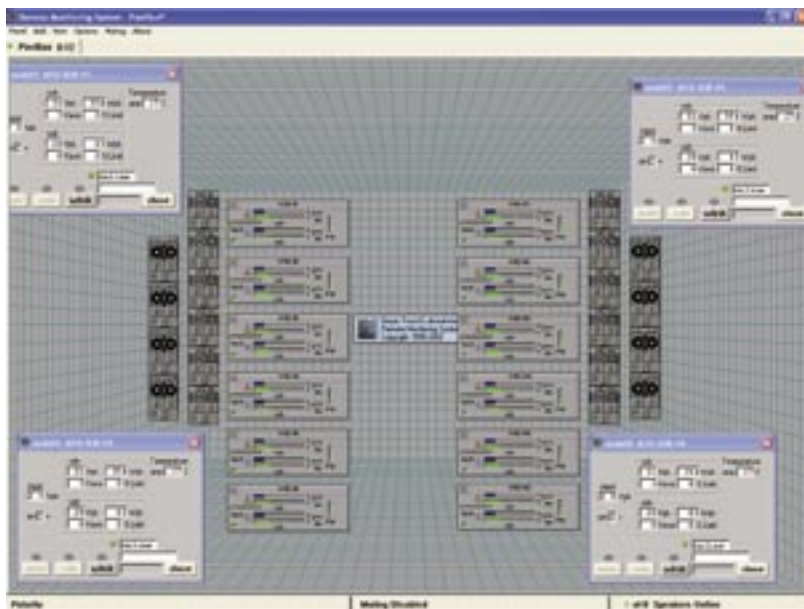


Figure 3.4: Sample RMS display panel

Wink LED (green)

When lit, the Wink LED indicates that an ID signal has been sent from the host station computer to the loudspeaker. This is accomplished using the Wink button on the loudspeaker Icon, Meter or Text views in the RMS monitoring program.

USER INTERFACE

The RMS software features an intuitive, graphical Windows user interface. As mentioned earlier, each loudspeaker appears on the computer's color monitor as a "view" in the form of a status icon, bar graph meter, or text meter (numerical values), depending on your preferences.

Each view contains loudspeaker identification and data from the unit's amplifier, controller, drivers and power supply. System status conditions cause changes in icon and bar graph indicators, alerting the operator to faults or excessive levels. The views are moveable and are typically arranged on the screen to reflect the physical layout of the loudspeakers. You can design a screen "panel" of icons or meters, as shown in Figure 3.4, and save it on the computer's hard disk, with the panel conveniently named for a unique arrangement or performer.

If the installation pattern changes completely, a new screen panel can be built. If a subset of installed loudspeakers will be used for a subsequent event, only selected loudspeakers need to appear on screen for that performance.



NOTE: For more information on RMS, please refer to the RMS User Guide included with the software.

CHAPTER 4: USING THE M1D WITH THE M1D-SUB

The M1D loudspeaker provides full bandwidth frequency response down to 60 Hz. However, if the application or the program content requires additional low-frequency energy (e.g., clubs and popular music reinforcement), the M1D-Sub loudspeaker is naturally the best way to augment your M1D system. The M1D-Sub loudspeaker can achieve frequency response down to 32 Hz, extending system response appreciably and increasing the acoustic power of a system in the lowest frequencies.

In addition, the use of high-pass filters to drive an M1D system with the M1D-Sub loudspeaker flattens overall frequency response and slightly increases M1D headroom in the lowest end of its usable spectrum.

The ideal ratio of M1D to M1D-Sub loudspeakers depends on the configuration of the system, the application, and the frequency content of the signal being reproduced. For most applications, two M1D loudspeakers for each M1D-Sub loudspeaker yields good results in frequency response and headroom.



NOTE: The M1D-Sub loudspeaker's limit LEDs indicate when its safe power level is exceeded. If the M1D-Sub loudspeakers used in a system begin to limit before reaching the required SPL at low frequencies, you may need to add more M1D-Sub loudspeakers to satisfy the SPL requirements without exposing the drivers to excessive heat and/or excursion.

The M1D and M1D-Sub loudspeakers can accommodate three basic connection options.

DAISY-CHAINED

When M1Ds and M1D-Sub loudspeakers are daisy-chained using the loop feature on the Audio Input panel, the result will have a fairly flat frequency response. However, at a ratio of two M1D loudspeakers to each subwoofer, the response will have a small rise in the 80 to 150 Hz range where the frequency response of the M1D and M1D-Sub loudspeakers overlap.



CAUTION: Always ensure that the last device in the chain of source equipment can drive the total load of the paralleled system.



NOTE: When both M1D and M1D-Sub loudspeakers are used in their full-range configuration (e.g., looped audio or the same audio feed), their polarities should be kept the same if they are co-planar or near each other. If they are separated – or delay must be used between them – a measurement system such as Meyer Sound's SIM® audio analyzer should be used to determine the correct delay and polarity.

ADDING A LINE DRIVER

Driving an M1D and M1D-Sub system with the same signal from different outputs using a line driver allows adjustments to the gain and polarity of each sub-system, and could be used effectively to compensate for the ratio of loudspeakers or acoustical conditions. If the gains are adjusted to the same level, the combined response is identical to a daisy-chain configuration with a rise in level on the overlapping range.



NOTE: When driving M1D loudspeakers from the Mid-Hi output of the LD-1A, LD-2 or LD-3 line driver, with M1D-Sub loudspeakers in their Sub out full-range configuration, their polarities should be kept the same if they are co-planar or near each other.

If your M1D or M1D-Sub loudspeakers are separated – or delay must be used between them – a measurement system such as the SIM audio analyzer should be used to determine the correct delay and polarity to optimize their phase relationship through crossover.

Engaging the Lo-Cut Filter

Using the LD-1A, LD-2 or LD-3 driver's Lo-Cut filter (the 160 Hz HPF position on the LD-3) can produce a system (in close proximity and co-planar) with very flat frequency response and a minimal area of overlap. The M1Ds in the system receive their signal following a high-pass filter, while the M1D-Sub loudspeakers apply their normal internal crossover frequencies to a full-range signal.



NOTE: When driving M1D loudspeakers from the Mid-Hi output of the LD-1A, LD-2 or LD-3 line driver with the Lo-Cut filter engaged and M1D-Sub loudspeakers in their Sub-out full-range configuration, their polarities should be kept the opposite if they are co-planar or near each other.

This can be achieved by engaging the polarity reverse switch on the subwoofer output of the line driver. If your M1D and M1D-Sub loudspeakers are separated – or delay must be used between them – a measurement system such as the SIM audio analyzer should be used to determine the correct delay and polarity.



TIP: How flat the response will be is, in any case, dependent on proximity to boundary surfaces.

While the change of polarity with respect to a daisy-chained configuration is needed due to the phase shift caused by the high-pass filter at overlapping frequencies, placing M1D-Sub loudspeakers more than 4 feet apart from M1D loudspeakers may require reversing the polarities once again to compensate for the delay propagation.

LD-3 OPTIONS

In addition to the 160 Hz high-pass filter on the LD-3 compensating line driver, the LD-3 provides additional filtering capabilities (Table 4.1) to help you further fine-tune an M1D/M1D-Sub system.

Table 4.1 M1D and M1D-Sub Frequency Response Results with Different Filter Configurations

HPF	LPF	∅ Reverse Switch	Result
Off	Off	Off	Flat response (Small rise in the 80 to 150 Hz range)
80	80	Engaged	Flat response, +3 dB sub gain recommended

DIGITAL SIGNAL PROCESSORS

Full-range signals may be applied to Meyer Sound’s self-powered loudspeakers because they have built-in active crossover circuits; external crossovers and digital signal processors (DSP) are optional and should be used very carefully due to phase shifts that can cause cancellations.

If DSP is used, both M1D and M1D-Sub loudspeakers should be fed from the DSP in order to keep their delay time the same. Otherwise you may experience phase shift differences between the M1D and M1D-Sub loudspeakers. In addition, you should verify the delay time between channels: Some DSPs may develop channel-to-channel delay errors when the DSP is near maximum throughput, which becomes more likely as the number of filters the DSP is using increases.

In no case should a filter higher than 2nd-order be used. The additional phase shift introduced deteriorates the impulse response and higher roll-off does not improve crossover interaction. In fact, it is highly recommended that the crossover/filter are set to emulate the low-cut LD-1A/LD-2 and LD-3 (160 Hz position) characteristics themselves, as shown in Table 4.2.

Table 4.2: LD-1, LD-2 and LD-3 (LD-3 at 160 Hz) “Lo-Cut Filter” Parameters

Type	Order	Pole Frequency	Q
High Pass	2nd (-12dB/oct)	162Hz	0.82*

* If the DSP does not have variable Q for high-pass filters, the filter should be set to “Butterworth” (Q ≈ .7).

If the loudspeakers are going to be driven directly from DSP, verify that the outputs of the processor have the driving capabilities to drive the total load presented by the loudspeakers connected to it.



NOTE: When precise array design, subwoofer integration, DSP and delay systems, and compensation for acoustical conditions all come into play, measurement and correction tools are a must. Meyer Sound’s SIM audio analyzer and the CP-10 parametric equalizer are both highly recommended.

CHAPTER 5: SYSTEM DESIGN AND INTEGRATION

Meyer Sound offers two comprehensive tools to assist you with the acoustical and functional requirements of system design and optimization. This chapter introduces you to the Meyer Sound MAPP Online acoustical prediction tool, and the SIM audio analyzer — a robust instrumentation package for system measurement, analysis, and more.

MEYER SOUND MAPP ONLINE

The MAPP Online prediction program is a powerful, cross-platform, Java-based application for accurately predicting the coverage pattern, frequency response, impulse response, and maximum SPL output of single or arrayed Meyer Sound loudspeakers.

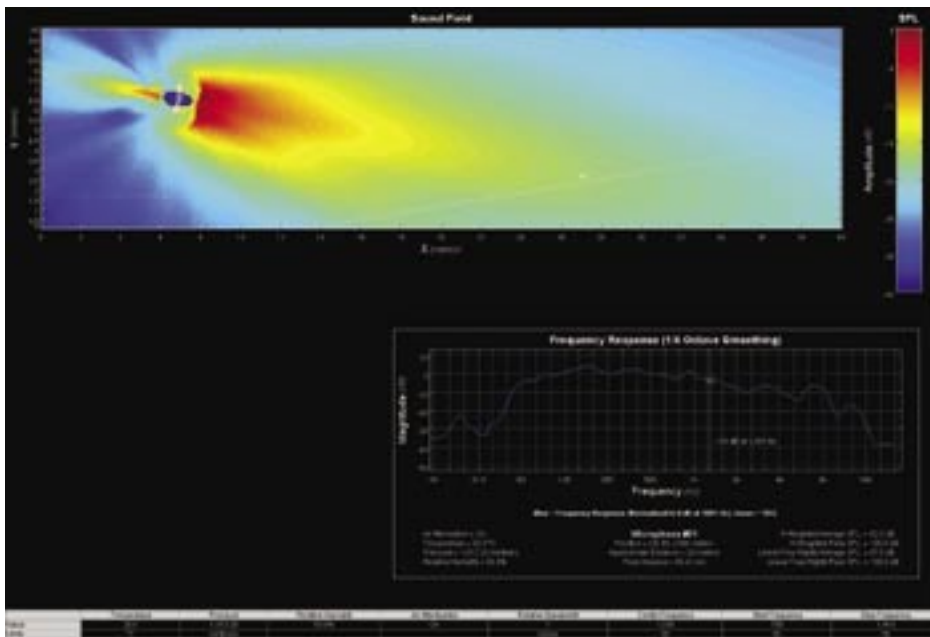


Figure 5.1. MAPP Online is an intuitive, powerful system design tool

Residing on your computer, the MAPP Online prediction program facilitates configuring arrays of a wide variety of Meyer Sound products and, optionally, defines the environment in which they will operate, including air temperature, pressure, and humidity, as well as the location and composition of walls. You can find the program at:

www.meyersound.com/products/software/mapponline



NOTE: In order to use the MAPP Online prediction program, you will need to register by clicking “Apply for MAPP Online” on the website listed above. After registration and upon approval, an e-mail will be sent to you with a username and password along with the address for the website where you can download MAPP Online.

As its name indicates, the MAPP Online prediction program is an online application: when a prediction is requested, data is sent over the Internet to a high-powered server at Meyer Sound that runs a sophisticated acoustical prediction algorithm using high-resolution, complex (magnitude and phase) polar data. Predicted responses are returned over the Internet and displayed on your computer in color.

With the MAPP Online prediction program, you can:

- Plan an entire portable or fixed loudspeaker system and determine delay settings for fill loudspeakers.
- Clearly see interactions among loudspeakers and minimize destructive interference.
- Place microphones anywhere in the sound field and predict the frequency response, impulse response, and sound pressure level at the microphone position using MAPP Online’s Virtual SIM feature.
- Refine your system design to provide the best coverage of the intended audience area.
- Use a virtual VX-1 program equalizer to predetermine the correct control settings for best system response.
- Gain valuable load information about the array to determine rigging capacities.

The MAPP Online prediction program enables you to come to an installation prepared with a wealth of information that ensures the system will satisfy your requirements “out of the box” – including basic system delay and equalization settings. Its accurate, high-resolution predictions eliminate unexpected onsite adjustments and coverage problems.

MAPP Online is compatible with Windows, Linux®, Unix®, and Apple® Macintosh® computers running Mac OS® X version 10.1.2 or higher. The MAPP Online Web page above lists additional system requirements and recommendations.

SIM MEASUREMENT SYSTEM

Meyer Sound's SIM audio analyzer is a measurement and instrumentation system including a selection of hardware and software options, microphones and accessory cables. The SIM analyzer is optimized for making audio frequency measurements of an acoustical system with a resolution of up to 1/24 of an octave; the high resolution enables you to apply precise electronic corrections to adjust system response using frequency and phase (time) domain information.

Source Independent Measurement Technique

The SIM audio analyzer implements the Meyer Sound source independent measurement technique, a dual-channel method that accommodates statistically unpredictable excitation signals. Any excitation signal that encompasses the frequency range of interest (even intermittently) may be used to obtain highly accurate measurements of acoustical or electronic systems. For example, concert halls and loudspeaker systems may be characterized during a musical performance using the program as the test signal, allowing you to:

- View measurement data as amplitude versus time (impulse response) or amplitude and phase versus frequency (frequency response)
- Utilize a single-channel spectrum mode
- View frequency domain data with a logarithmic frequency axis
- Determine and internally compensate for propagation delays using SIM Delay Finder function

Applications

The main application of the SIM audio analyzer is loudspeaker system testing and alignment. This includes:

- Measuring propagation delay between the subsystems to set correct polarities and set very precise delay times
- Measuring variations in frequency response caused by the acoustical environment and the placement and interaction of the loudspeakers to set corrective equalization
- Optimizing subwoofer integration
- Optimizing loudspeaker arrays

The SIM audio analyzer can also be used in the following applications:

- Microphone calibration and equalization
- Architectural acoustics
- Transducer evaluation and correction
- Echo detection and analysis
- Vibration analysis
- Underwater acoustics

CHAPTER 6: QUICKFLY RIGGING

The M1D and M1D-Sub loudspeakers feature Meyer Sound's QuickFly rigging system with rugged, reliable and deceptively simple components. QuickFly rigging facilitates constructing rigid, ground-stacked or flown M1D and M1D-Sub arrays, and eases integration of M1D-Sub with M1D loudspeakers in unitary, full-range curvilinear arrays.

This chapter gives an overview of the M1D and M1D-Sub rigging accessories. For complete information on how to set up and use the rigging accessories, refer to Meyer Sound's assembly guides at www.meyersound.com/products.



CAUTION: 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 rigging method for their application. Rigging should be carried out only by experienced professionals.

Fitted as standard on all M1D and M1D-Sub loudspeakers, the MRF-1D and MRF-1D-Sub rigging frames (Figure 6.1) also accommodates all the parts necessary to couple an M1D/M1D-Sub vertical array.

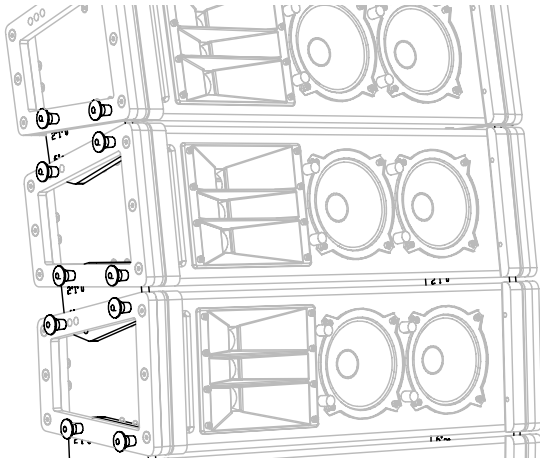


Figure 6.1. MRF-1D rigging frame

The MRF-1D and MRF-1D-Sub rigging frames utilize links to connect adjacent cabinets, allowing vertical splay to be set from 0° to 8° using quick release pins. The links are easily reconfigured to allow arrays to be hung with the horns on the left or right side. The MRF-1D frame provides a rigid angle between cabinets, maintaining the predetermined vertical splay as the array is tilted up or down.

M1D RIGGING LINK

The M1D rigging link works by enabling you to set individual angles at the top and bottom of the link. Simply adding the angles produces the desired vertical splay between two cabinets. Table 6.1 lists all of the possible splay angle combinations using the M1D rigging link.

Table 6.1 M1D Splay Angles

Link Top Angle	Link Bottom Angle	Splay
0°	0°	0°
	3°	3°
	6°	6°
1°	0°	1°
	3°	4°
	6°	7°
2°	0°	2°
	3°	5°
	6°	8°

For example, setting the top of the link to 1° and the bottom of the link to 6° produces a splay angle of 7°, as shown in Figure 6.2.

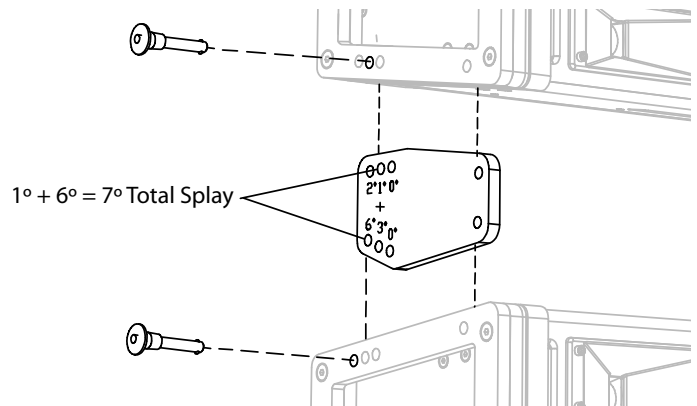


Figure 6.2. M1D splay angle of 7°

MG-1D Multipurpose Grid

The MG-1D multipurpose grid (Figure 6.3) allows M1D and M1D-Sub loudspeakers to be flown or ground stacked.

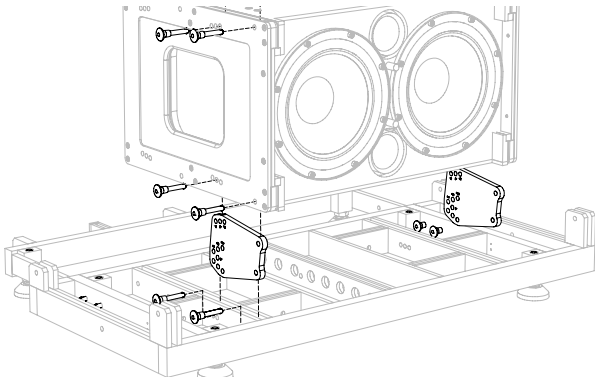


Figure 6.3. MG-1D multipurpose grid

An adjustable extension frame provides flexibility for severe up-tilt and down-tilt in flown applications as well as increasing the stability in ground-stacked applications. Up to 16 M1D loudspeakers (or the equivalent weight of M1D and M1D-Sub loudspeakers) may be suspended from single or multiple rigging points of appropriate rating, with a safety factor of 7:1.

The MG-1D grid provides additional functionality, such as transitioning from the bottom of an M2D and/or M2D-Sub array to:

- An M1D and/or M1D-Sub array;
- One UPA-1P compact wide coverage loudspeaker;
- Three UPA-2P compact narrow coverage loudspeakers;
- Two MSL-4 horn-loaded long-throw loudspeakers; or
- Two DS-4P horn-loaded mid-bass loudspeakers

MTG-1D Top Grid

The MTG-1D top grid (Figure 6.4) provides multiple hanging configurations for M1D and M1D-Sub arrays.

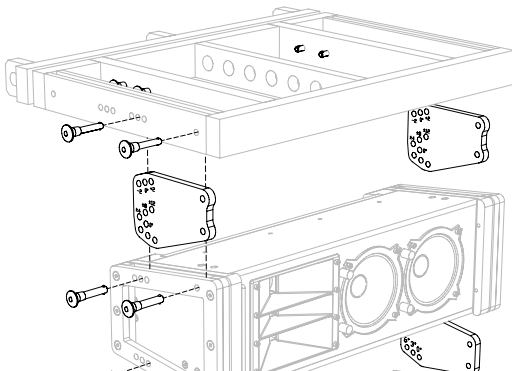


Figure 6.4. MTG-1D top grid

The MTG-1D grid allows single- or multi-point support and bridles. An adjustable rear extension frame provides flexibility for severe up-tilt and down-tilt applications. Up to 16 M1D loudspeakers (or the equivalent weight of M1D and M1D-Sub loudspeakers) may be suspended from single or multiple rigging points of appropriate rating, with a safety factor of 7:1.

MUB-1D Mounting U-Bracket

The MUB-1D multipurpose U-bracket (figure 6.5) is mainly designed to support and aim a single M1D loudspeakers in a floor or ceiling mounted configuration. However, it is robust and versatile enough for flying small arrays of M1D loudspeakers. Multiple mounting holes provide maximum flexibility.

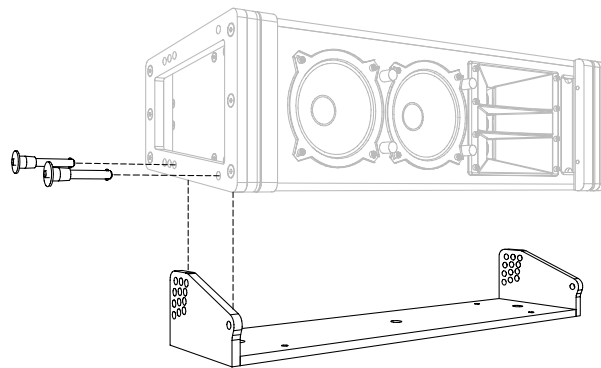


Figure 6.5. MUB-1D mounting U-bracket



NOTE: The MUB-1D multipurpose U-bracket does not have the strength or functionality of a rigging grid and therefore it is not recommended for large arrays or arrays that include M1D-Subs. For these and other flown applications that require the strength and functionality of a rigging grid, the MTG-1D top grid or the MG-1D multipurpose grid should be used.

APPENDIX A

TROUBLESHOOTING

This section contains possible solutions to some common problems encountered by M1D and M1D-Sub loudspeaker users and is not intended to be a comprehensive troubleshooting guide.

The On/Temp. LED does not illuminate and there is no audio.

1. Make sure the AC power cable is the correct type for the regional voltage and that it is securely connected to the AC inlet, then unplug and reconnect the AC cable.
2. Use an AC voltmeter to verify that the AC voltage is within the range of 90 to 264 V AC.
3. Call Meyer Sound Technical Support.

The On/Temp. LED is illuminated green but there is no sound.

1. Verify that the audio source (mixer, EQ, delay) is sending a valid signal.
2. Make sure the XLR cable is securely fastened to the XLR audio input connector.
3. Verify that the XLR cable is functioning by substituting another cable or by using the cable in question in a working system.
4. Send the audio signal to another loudspeaker to insure signal presence and that the level is within the proper range. Turn the source level down before reconnecting the audio input and increase the level slowly to avoid a sudden blast of sound.
5. If possible, monitor the audio source with headphones.

Hum or noise is produced by the loudspeaker.

1. Disconnect the audio input. If the noise persists, the problem is within the loudspeaker. In this case return the unit to the factory or nearest authorized service center. If the hum ceases, the noise originates somewhere earlier in the signal path.
2. Make sure the XLR cable is securely fastened to the XLR audio input connector.
3. Send the audio signal to another loudspeaker to insure signal presence and that the level is within the proper range. Turn the source level down before reconnecting the audio input and increase the level slowly to avoid a sudden blast of sound.
4. Hum or noise can be produced by a ground loop. Since the M1D and M1D-Sub loudspeakers are effectively ground-lifted, the loop must be broken elsewhere in the system.

The audio produced by the loudspeaker is distorted or compressed but the limit light is not illuminated.

1. Make sure the XLR cable is securely fastened to the XLR audio input connector.
2. Send the audio signal to another loudspeaker to insure that the level is within the proper range. Turn the source level down before reconnecting the audio input and increase the level slowly to avoid a sudden blast of sound.
3. Monitor the audio source with headphones.

The audio produced by the loudspeaker is highly compressed and the limit light is constantly yellow.

1. Turn down the level of the input signal to the speaker system.

The On/Temp. LED is illuminated red.

This occurs when the heatsink temperature reaches 75°C (167°F). The user should use caution to avoid injury due to the high heat. However, the unit will continue to operate NORMALLY and there is NO risk of damage to the amplifier until the temperature reaches above 100 C. To prevent the temperature from continuing to increase, take the following steps:

1. Turn down the level of the input signal to the loudspeaker system.
2. Make sure the fan is working properly.
3. Make sure there is sufficient air flow around the unit.
4. Avoid exposing the heatsink to direct sunlight if the ambient temperature is high.

See the sections Amplification and Limiting, and Amplifier Cooling sections beginning on page 8 for a complete discussion about the cooling system.

Only the high or low drivers seem to produce sound (M1D).

1. Make sure the audio signal is full-range and has not been filtered in a previous stage of the signal chain. If possible, monitor the audio source with high-quality headphones.
2. Send the audio signal to another loudspeaker to insure that the signal is full-range. Turn the source level down before reconnecting the audio input and increase the level slowly to avoid a sudden blast of sound.
3. Use a sine wave and/or pink noise generator to send a variety of frequencies to the loudspeaker.

APPENDIX B

M1D SPECIFICATIONS

ACOUSTICAL	
Note: The low-frequency power response of the system will increase according to the length of the array.	
Operating frequency range	60 Hz - 18 kHz Note: Recommended maximum operating frequency range. Response depends upon loading conditions and room acoustics.
Frequency response	75 Hz - 15 kHz ± 4 dB Note: Free field, measured with 1/3 octave frequency resolution at 4 meters.
Phase response	800 Hz - 12 kHz $\pm 45^\circ$
Maximum peak SPL	125 dB at 1 m Note: Measured with music at 1 meter.
Dynamic range	>110 dB
Horizontal coverage	100°
Vertical coverage	Varies, depending on array length and configuration; for a single loudspeaker, 10° minimum.
Acoustical crossover	1900 Hz Note: At these frequencies, the transducers produce equal sound pressure levels.
TRANSDUCERS	
Low frequency	Two 5" cone drivers Nominal impedance: 8 Ω Voice coil size: 1" Power-handling capability: 200 W (AES) Note: Power handling is measured under AES standard conditions: transducer driven continuously for two hours with band limited noise signal having a 6 dB peak-average ratio.
Note: To eliminate interference at short wavelengths, the two 5" drivers work in combination at low frequencies (60 Hz – 1000 Hz). At mid frequencies (1000 Hz – 1900 Hz) only one cone driver is fed from the crossover to maintain optimal polar and frequency response characteristics.	
High frequency	Three 0.75" metal dome tweeters with neodymium magnets Nominal impedance: 8 Ω Voice coil size: 20 mm Power-handling capability: 15 W (AES) Note: Power handling is measured under AES standard conditions: transducer driven continuously for two hours with band limited noise signal having a 6 dB peak-average ratio.
Note: The three drivers are coupled to a constant-directivity horn.	
AUDIO INPUT	
Type	Differential, electronically balanced
Max. common mode range	± 15 V DC, clamped to earth for voltage transient protection
Connectors	Female XLR input with male XLR loop output
Input impedance	10 k Ω differential between pins 2 and 3
Wiring	Pin 1: Chassis/earth through 220 k Ω , 1000 pF, 15 V clamp network to provide virtual ground lift at audio frequencies Pin 2: Signal + Pin 3: Signal - Case: Earth ground and chassis
DC Blocking	Differential DC blocking up to max common mode voltage
CMRR	>50 dB, typically 80 dB (50 Hz – 500 Hz)
RF filter	Common mode: 425 kHz; Differential mode: 142 kHz
TIM filter	<80 kHz, integral to signal processing

Nominal input sensitivity	0 dBV (1 V rms, 1.4 V pk) continuous is typically the onset of TPL limiting for noise and music.
Input level	Audio source must be capable of producing a minimum of +20 dBV (10 V rms, 14 V pk) into 600 ohms in order to produce maximum peak SPL over the operating bandwidth of the loudspeaker.

AMPLIFIERS

Amplifier type	Two-channel complementary power MOSFET output stages (class AB/bridged)
Output power	500 W total
	Note: Wattage rating is based on the maximum unclipped burst sine-wave rms voltage the amplifier will produce into the nominal load impedance — low channel 30 V rms (42 V pk); high channel 27 V rms (38 V pk)
THD, IM TIM	< .02%
Load capacity	4 Ω low channel, 2 Ω high channel
Cooling	Forced air cooling over amplifier heatsink

AC POWER

AC power connector	PowerCon with looping output
Voltage selection	Automatic
Safety agency rated operating voltage	100 V AC - 240 V AC; 50/60 Hz
Turn on/turn off points	Continuous 90 V AC - 264 V AC; 50/60 Hz
	Note: No automatic turn-off voltages. Voltages above 264 V AC are fuse protected but may cause permanent damage to the power supply. Voltages below 90 V AC may result in intermittent operation.

Current Draw

Note: Current draw for a single loudspeaker. Loop out not used.

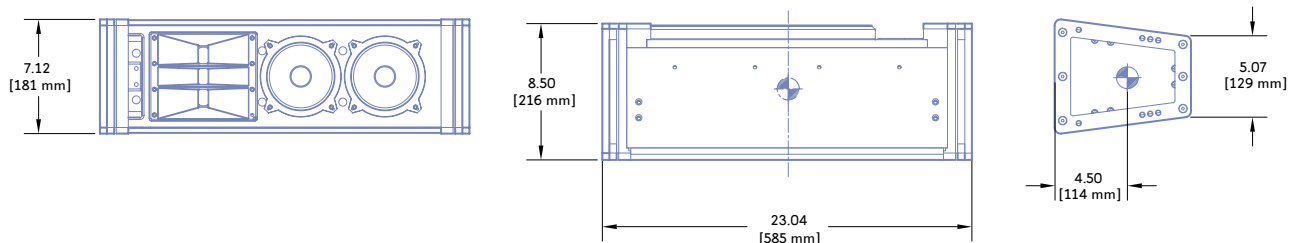
Idle current	0.41 A rms (115 V AC); 0.33 A rms (230 V AC); 0.42 A rms (100 V AC)
Max. long-term continuous current (>10 sec)	3.2 A rms (115 V AC); 1.6 A rms (230 V AC); 3.7 A rms (100 V AC)
Burst Current (<1 sec)	5.0 A rms (115 V AC); 2.5 A rms (230 V AC); 5.8 A rms (100 V AC)
Ultimate Short-Term Peak Current Draw	17 A pk (115 V AC); 8.5 A pk (230 V AC); 20 A pk (100 V AC)
Inrush Current	15 A pk (115 V AC); 13 A pk (230 V AC); 15 A pk (100 V AC)

RMS NETWORK

	Equipped for two conductor twisted-pair network, reporting all operating parameters of amplifiers to system operator's host computer.
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PHYSICAL

Enclosure	Multi-ply hardwood
Finish	Black textured
Protective grille	Powder-coated hex stamped steel
Rigging	QuickFly MRF-1D rigging frame with links and quick release pins
Dimensions	23.04" W x 7.12" H x 8.50" D (585 mm x 181 mm x 216 mm)
Weight	31 lbs (14.06 kg); shipping 35 lbs (15.88 kg)



M1D-SUB SPECIFICATIONS

ACOUSTICAL	
Note: The low-frequency power response of the system will increase according to the length of the array.	
Operating frequency range	32 Hz - 180 Hz Note: Recommended maximum operating frequency range. Response depends upon loading conditions and room acoustics.
Frequency response	35 Hz - 160 Hz ± 4 dB Note: Free field, measured with 1/3 octave frequency resolution at 4 meters.
Phase response	50 Hz - 120 Hz $\pm 45^\circ$
Maximum peak SPL	130 dB at 1 m Note: Measured with music at 1 meter.
Dynamic range	>110 dB
Horizontal coverage	360°
Vertical coverage	Varies, depending on array length and configuration.
TRANSDUCERS	
Low frequency (front)	Two 10" cone drivers with neodymium magnets Nominal impedance: 4 Ω Voice coil size: 2" Power-handling capability: 400 W (AES) Note: Power handling is measured under AES standard conditions: transducer driven continuously for two hours with band limited noise signal having a 6 dB peak-average ratio.
AUDIO INPUT	
Type	Differential, electronically balanced
Max. common mode range	± 15 V DC, clamped to earth for voltage transient protection
Connectors	Female XLR input with male XLR loop output
Input impedance	10 k Ω differential between pins 2 and 3
Wiring	Pin 1: Chassis/earth through 220 k Ω , 1000 pF, 15 V clamp network to provide virtual ground lift at audio frequencies Pin 2: Signal + Pin 3: Signal - Case: Earth ground and chassis
DC Blocking	Differential DC blocking up to max common mode voltage
CMRR	> 50 dB, typically 80 dB (50 Hz – 500 Hz)
RF filter	Common mode: 425 kHz; Differential mode: 142 kHz
TIM filter	<80 kHz, integral to signal processing
Nominal input sensitivity	0 dB V (1 V rms, 1.4 pk) continuous is typically the onset of TPL limiting for noise and music.
Input level	Audio source must be capable of producing a minimum of +20 dBV (10 V rms, 14 V pk) into 600 ohms in order to produce maximum peak SPL over the operating bandwidth of the loudspeaker.
AMPLIFIERS	
Amplifier type	Two-channel complementary MOSFET output stages (class AB/bridged)
Output power	450 W total Note: Wattage rating is based on the maximum unclipped burst sine-wave rms voltage the amplifier will produce into the nominal load impedance — both channels 30 V rms (42 V pk).
THD, IM TIM	< .02%
Load capacity	4 Ω each channel
Cooling	Forced air cooling over amplifier heatsink

AC POWER	
AC power connector	PowerCon with looping output
Voltage selection	Automatic
Safety agency rated operating voltage	100 V AC - 240 V AC; 50/60 Hz
Turn on/turn off points	Continuous 90 V AC - 264 V AC;50/60 Hz
	Note: No automatic turn-off voltages. Voltages above 264 V AC are fuse protected but may cause permanent damage to the power supply. Voltages below 90 V AC may result in intermittent operation.

Current Draw

Note: Current draw for a single loudspeaker. Loop out not used.

Idle current	0.41 A rms (115 V AC); 0.33 A rms (230 V AC); 0.420 A rms (100 V AC)
Max. long-term continuous current (>10 sec)	3.2 A rms (115 V AC); 1.6 A rms (230 V AC); 3.7 A rms (100 V AC)
Burst Current (<1 sec)	5.0 A rms (115 V AC); 2.5 A rms (230 V AC); 5.8 A rms (100 V AC)
Ultimate Short-Term Peak Current Draw	17 A pk (115 V AC); 8.5 A pk (230 V AC); 20 A pk (100 V AC)
Inrush Current	15 A pk (115 V AC); 13 A pk (230 V AC); 15 A pk (100 V AC)

RMS NETWORK

Equipped for two conductor twisted-pair network, reporting all operating parameters of amplifiers to system operator's host computer.

PHYSICAL

Enclosure	Multi-ply hardwood
Finish	Black textured
Protective grille	Powder-coated hex stamped steel
Rigging	QuickFly MRF-1D-Sub rigging frame with links and quick release pins
Dimensions	22.62" W x 13.00" H x 17.50" D (589 mm x 330 mm x 445 mm)
Weight	70 lbs (31.75 kg); shipping 75 lbs (34 kg)

