

M3D™ Line Array Loudspeaker

M3D-Sub Directional Subwoofer



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

The Manufacturer:

Meyer Sound Laboratories, Inc.
2832 San Pablo Avenue
Berkeley, California 94702-2204, USA

Declares that the product: M3D™, M3D-Sub

Conforms to the following Product Specifications

Safety: EN60065: 1998

IEC60065: 1998

EMC: EN55103-1: 1997 emission(1)

EN55103-2: 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.

Environmental Specifications For Meyer Sound Electronics Products:

Operating Temperature 0°C to + 45°C

Nonoperating Temperature <-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 30g 11 msec half-sine on each of 6 sides

Vibration 10Hz to 55Hz (0.010m

peak-to-peak excursion)



Made by Meyer Sound Laboratories
Berkeley, California USA
European Office:
Meyer Sound Lab. GmbH
Carl Zeiss Strasse 13
56751 Polch, Germany



Office of Quality Manager
Berkeley, California USA July 19, 2002

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M3D Line Array Loudspeaker Operating Instructions.

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Part Number: 05.105.022.01 Rev. A (08/02)

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 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 power-supply cord or plug is damaged, liquid has been spilled or objects have fallen into the loudspeaker, the loudspeaker has been exposed to rain or moisture, does not operate normally, or has been dropped.
15. This loudspeaker provides protection against direct sprays of water up to 15 degrees from vertical. Rating IP42 in accordance with IEC 60529.

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 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 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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M3D™ Line Array

INTRODUCTION

The M3D Line Array is a part of the Meyer Sound M Series, which is a fully integrated line of loudspeakers that brings singular advantages to real-world applications.

The M3D Line Array, shown in Figure 1, draws upon classic linear array principles and is a hybrid system using advanced engineering to optimize line array performance for consistent, reliable coverage. As are all M Series products, the M3D is self-powered, features Meyer Sound's QuickFly® rigging, and is configurable with most other Meyer Sound loudspeakers. RMS™ (Remote Monitoring System) is standard. The M3D is weather-protected for outdoor applications.



Figure 1. M3D Line Array with BroadBandQ™

The companion M3D-Sub Directional Subwoofer, shown in Figure 2, extends system frequency response to 30 Hz while maintaining low-frequency directional control and horizontal arrayability. Use of the M3D-Sub adds low frequency headroom to an M3D Line Array.



Figure 2. M3D-Sub Directional Subwoofer



NOTE: Please read this entire manual carefully before configuring and deploying systems. In particular, please pay careful attention to the sections about safety issues.

The Meyer Sound M3D is the first and only line array system to feature state-of-the-art BroadBandQ technology. BroadBandQ marries a remarkable new

high-frequency manifold system with Meyer's proprietary, award-winning, directional low-frequency technology to precisely control vertical and horizontal coverage between 35 Hz and 16 kHz. The result is truly optimized line array behavior, affording performance that is markedly superior to conventional systems.

To reproduce high frequencies, the M3D employs an REM (Ribbon Emulation Manifold) to feed a constant-directivity horn from two Meyer-manufactured compression drivers, each having a 1.5-inch exit (4-inch diaphragm). REM controls the output of the drivers and introduces it to the horn throat within a three-inch path length, dramatically minimizing distortion. The unique M3D horn design produces a coherent wave front that is characteristic of, but much more powerful than, a large ribbon driver. Vertical coverage is restricted to 10° (±5°) and interaction is minimized, yet distortion remains extremely low.

To ensure the smoothest response in the critical midrange, the M3D incorporates a complex active crossover design. At the lowest frequencies, two front-facing ferrofluid cooled, back-vented 15-inch drivers combine to reproduce powerful, coherent bass. These newly developed drivers feature lightweight neodymium magnet structures and are rated to handle 1200 AES watts. (Loudspeaker driven with a band-limited noise signal [125 Hz to 8 kHz] with 6-dB peak-to-average ratio for a period of 2 hours.) In the mid frequencies, the crossover feeds only one of the two drivers. This technique eliminates interference between the drivers that would otherwise occur at shorter wavelengths, and maintains optimal polar and frequency response characteristics.

At mid and low frequencies, the M3D employs a proprietary system of rear-facing 15-inch cone drivers, separately driven by a complex phase manipulation circuit, to generate a wave front that interacts with that produced by the front-facing, high-power 15-inch drivers. The result is directional low-frequency output to 35 Hz and a 25-dB reduction in sound level behind the cabinet.

Arrays of up to 16 cabinets (M3D, M3D-Sub, or a mixture of both), having 0° to 5° of splay between adjacent units, provide flexibility to tailor vertical coverage by varying the number and splay of cabinets in the array while maintaining 90° of usable horizontal coverage measured at the -6 db points.

To predict the coverage, frequency response, impulse response and maximum SPL output of arrayed M3Ds, use MAPP (Multipurpose Acoustical Prediction Program) Online (see "Meyer Sound MAPP Online™" on page 18).

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

<http://www.meyersound.com>

or you may contact Meyer Sound Technical Support at:

Tel: 510.486.1166

fax: 510.486.8356

email: techsupport@meyersound.com

AC POWER

When AC power is applied to the M3D or M3D-Sub, the Intelligent AC™ 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 difference mode radio frequencies (EMI)
- sustains operation temporarily during low-voltage periods
- provides soft-start power-up, which eliminates high inrush current

Refer to Table 2 on page 20 of Appendix A for a complete listing of power requirements and specifications for the M3D Line Array, or Table 3 on page 23 for the power requirements and specifications for the M3D-Sub Directional Subwoofer.

The M3D or M3D-Sub can withstand continuous voltages up to 275 V and allows any combination of voltage to GND (that is neutral-line-ground or line-line-ground).



CAUTION: Continuous voltages higher than 275 V can damage the unit.

The M3D or M3D-Sub uses a NEMA L6-20P, an IEC 309 or a multipin VEAM male power connector and satisfies worldwide product safety standards.

AC Power Distribution

All amplifier modules and the rest of the audio equipment connected to it (mixing consoles, processors, etc.) must be connected to the AC power distribution in a proper

way, 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) cables.

Bad grounding connections between speakers 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 speaker, be sure that the voltage potential difference between neutral and earth ground is less than 5 VAC.

Figure 3 shows a sample three-phase AC distribution system, with the load between speakers distributed among the three phases and all of the loudspeakers connected to common neutral and earth ground points.

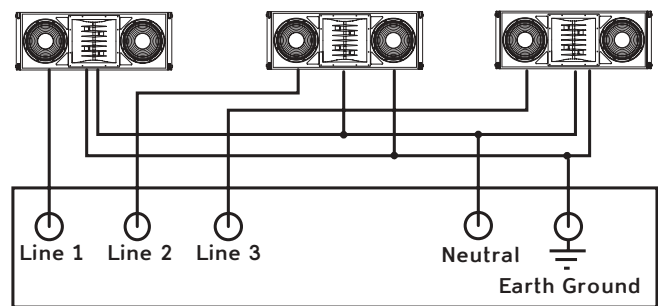


Figure 3. AC power distribution block diagram

Voltage Requirements

The M3D or M3D-Sub operates safely and without audio discontinuity if the AC voltage stays within either of two operating windows: 85–134 V or 165–264 V, at 50 or 60 Hz. Refer to Table 2 on page 20 for the M3D or Table 3 on page 23 for the M3D-Sub for detailed AC voltage requirements.

After applying AC power, the proper operating voltage is automatically selected, but the system is muted. During the next three seconds the following events occur:

1. The primary fans turn on.
2. The main power supply slowly ramps on.
3. The green Active LED on the user panel lights up, indicating that the system is enabled and ready to pass audio signals.



CAUTION: If the Active 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 the voltage decreases below the lower boundary of either operating range (brownout), the supply uses stored energy to continue functioning briefly.

The unit turns off only if the voltage does not increase above the threshold before the storage circuits are depleted. The time that the M3D or M3D-Sub continues to operate during brownout depends on how low the voltage drops and on the audio source level during this period.

If the voltage fluctuates within either operating range, automatic tap selection stabilizes the internal operating voltage. This tap selection is instantaneous, and there are no audible artifacts.

If the voltage increases above the upper boundary of either range, the power supply rapidly turns off, preventing damage to the unit.

If the M3D or M3D-Sub shuts down due to either low or high voltage, the power supply automatically turns on after three seconds if the voltage has returned to either normal operating range. If the M3D or M3D-Sub does not turn back on after ten seconds, remove AC power and refer to the previous Caution note.



NOTE: It is recommend that the supply be operated in the rated voltage windows, at least a few volts away from the turn on/off points so that small AC voltage variations do not cause the amplifier to cycle on and off.

CURRENT REQUIREMENTS

The M3D or M3D-Sub presents 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 continuous RMS current is the maximum RMS current in a period of at least ten seconds. It is used to calculate the temperature increase in cables, which is used to select cables that conform to electrical code standards. It is also used to select the cable size and gauge and the rating for slow-reacting thermal breakers.

The maximum burst RMS current is the maximum RMS current in a period of approximately one second. It is used to select the rating for most magnetic breakers. The maximum instantaneous peak current during burst is used to select the rating for fast-reacting magnetic breakers and to calculate the peak voltage drop in long AC cables according to the formula

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

For best performance, the AC Cable voltage drop should not exceed 10 Volts, or 10% at 115V and 5% at 230V. Use Table 1 below as a guide when selecting cable gauge size and circuit breaker ratings for your operating voltage.

Table 1. M3D and M3D-Sub Current Ratings

	115 VAC	230 VAC	100 VAC
Max continuous RMS	18A	9A	20A
Max. burst RMS	32A	16A	36A
Max. peak during burst	50A	25A	57A
Idle current	1.2A	0.6A	1.3A

The minimum electrical service amperage required by a system of M3D or M3D-Subs is the sum of their maximum continuous RMS current. We recommend allowing an additional 30% above the minimum amperage to prevent peak voltage drops at the service entry.



CAUTION: In the unlikely event that the circuit breakers trip (the white center buttons pop out), disconnect the AC power cable. **Do not reset the breakers with the AC connected.** Contact Meyer Sound for repair information.

Power Connector Wiring Conventions

The M3D or M3D-Sub requires a grounded outlet. It is very important that the system be properly grounded for both safety and proper operation. Use the following wiring diagram to create power cables and distribution systems.

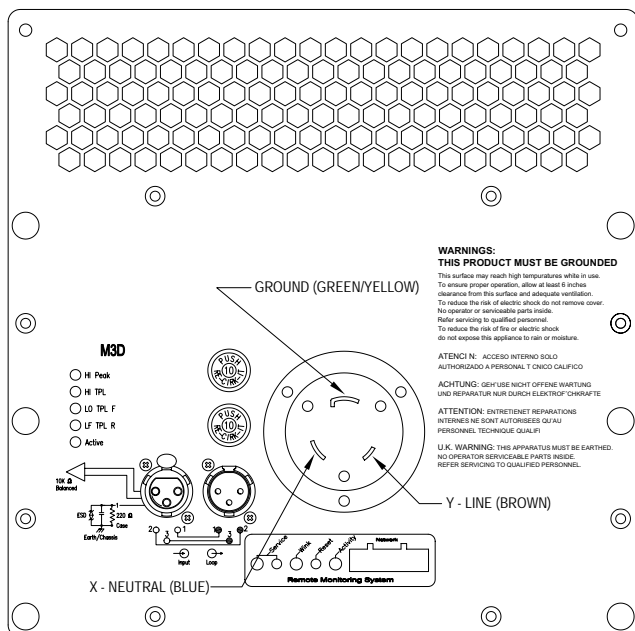


Figure 4. M3D user rear panel with L6-20 power connector

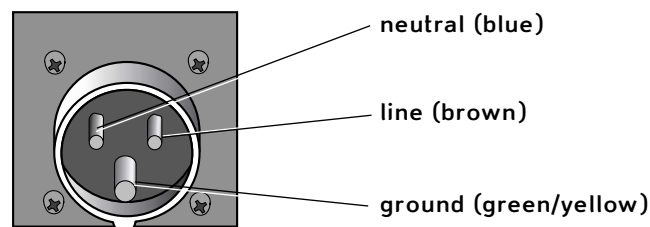


Figure 6. IEC 309 power connector pin-out

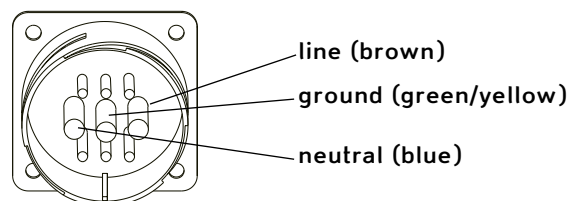


Figure 7. VEAM multipin connector power pin-out

For M3D or M3D-Sub loudspeakers fitted with the VEAM multipin connector please refer to the Meyer Sound document, *VEAM Cable Wiring Reference*, part number 06.033.113, for the wiring conventions and pinouts for the AC, audio, and RMS connections. Use the information in this document to create power cables and distribution systems.

Meyer Sound offers the VIM (VEAM interface module) to distribute power, audio, and RMS to M3D or M3D-Sub systems fitted with VEAM connectors. (See Figure 8.)

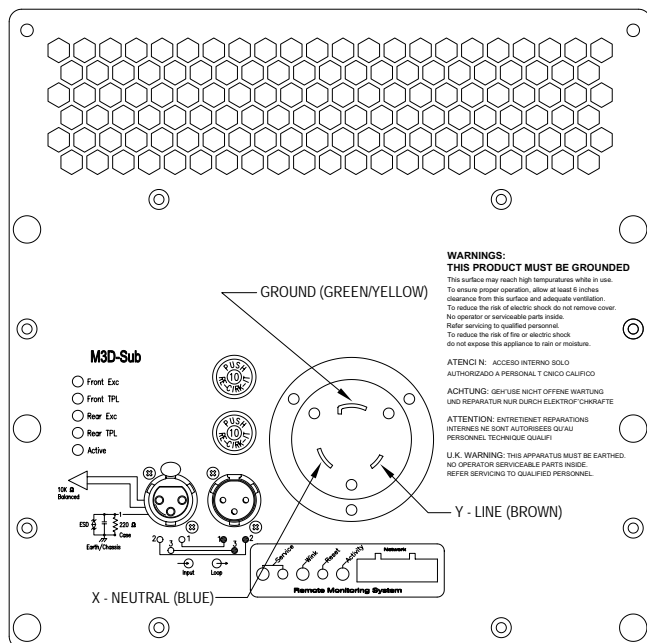


Figure 5. M3D-Sub user rear panel with L6-20 power connector

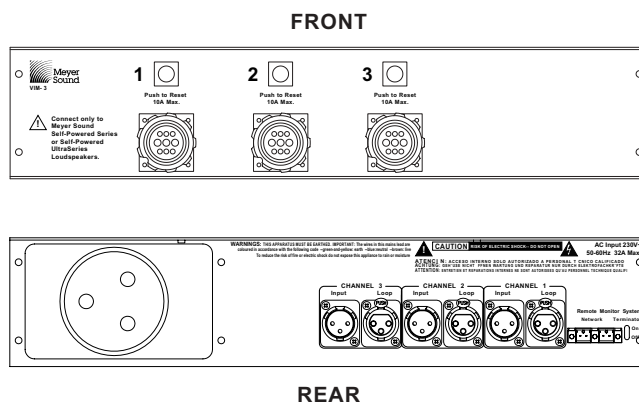


Figure 8. VIM-3 module

SAFETY ISSUES

Pay close attention to these important electrical and safety issues.



CAUTION: Do not use a power cord adapter to drive the M3D or M3D-Sub from a standard three-prong Edison outlet since that connector is rated for only 15 amps (NEMA 5-15R; 125 VAC max.)

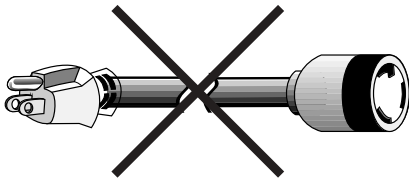


Figure 9. Do not use AC adapters



CAUTION: The M3D or M3D-Sub requires a ground connection. Always use a grounding outlet when connecting these units.

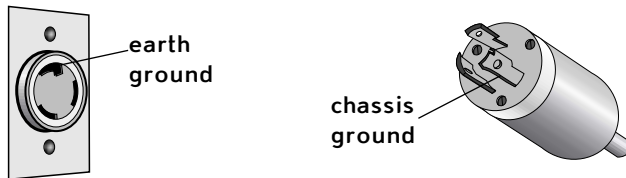


Figure 10. Grounded outlet and plug



WARNING: Keep all liquids away from the M3D or M3D-Sub amplifier to avoid hazards from electrical shock. Please refer to the section “Using and Replacing the Rain Hood” on page 9.



CAUTION: Do not operate the unit if the power cables are frayed or broken.



TIP: Use the rings located in the rear above the amplifier on the M3D or M3D-Sub to provide strain relief for the power and signal cables.

AUDIO INPUT

The M3D or M3D-Sub presents a 10k ohm balanced input impedance to a three-pin XLR connector with the following connectors:

- Pin 1 — 220k ohm to chassis and earth ground (ESD clamped)
- Pin 2 — Signal (+)
- Pin 3 — Signal (-)
- Case — Earth (AC) ground and chassis



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

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. 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.



TIP: If abnormal noises such as hiss and popping are produced by the loudspeaker, disconnect the audio cable from the speaker. 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.

Audio signals can be daisy-chained using the loop output connector on the user panel of the M3D or M3D-Sub. A single source can drive multiple M3Ds or M3D-Subs with a paralleled input loop, creating an unbuffered hard-wired loop connection.

When driving multiple M3Ds or M3D-Subs 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 dBV (10-Vrms into 600 ohms) in order to produce the maximum peak SPL over the operating bandwidth of the loudspeaker.

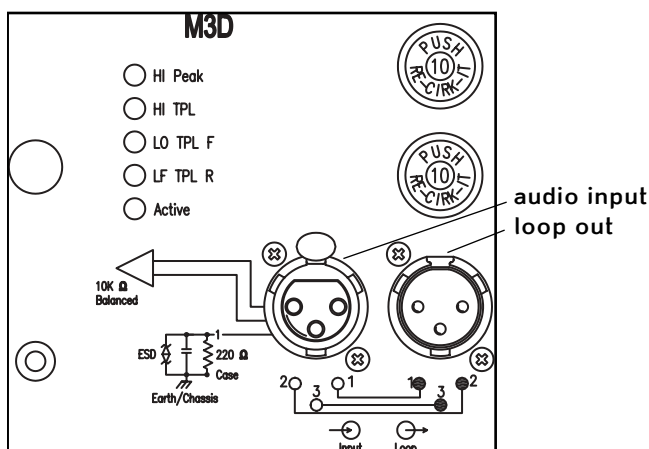


Figure 11. M3D rear panel audio input connectors

The input impedance for a single M3D or M3D-Sub is 10k ohms; if n represents the number of M3D or M3D-Sub loudspeakers in an array, paralleling the inputs of n M3Ds or M3D-Subs will produce a balanced input load of 10k ohms divided by n .

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

For example, cascading an array of ten units consisting of M3Ds and M3D-Subs produces an input impedance of 1000 ohms (10k ohms divided by 10). The source equipment should have an output impedance of 100 ohms or less.

This is also true when connecting in parallel (loop out) M3Ds or M3D-Subs with other self-powered Meyer Sound loudspeakers (M3D-Subs, 650-Ps, MSL-4s, and so on.)

An LD-1A, LD-2, or LD-3 line driver is highly recommended when driving systems using multiple loudspeakers, (See "Hybrid Line Arrays" on page 11.)

For details on the M3D audio input characteristics, amplification, and protection circuitry, refer to Appendix A, "Audio input" on page 21. For details on the M3D-Sub Audio Input Characteristics, Amplification, and Protection Circuitry refer to Appendix B, "Audio Input" on page 23.

AMPLIFICATION AND PROTECTION CIRCUITRY

The M3D or M3D-Sub is powered by the Meyer Sound HP-4 amplifier, a high-power four-channel amplifier (1125 watts/ch. RMS) with a total power of 4500 watts.

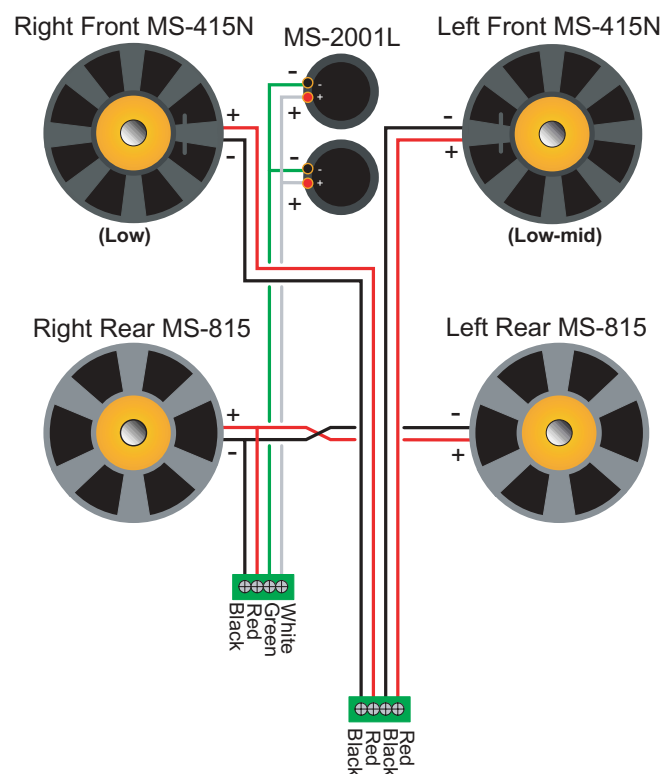
The HP-4 amplifier utilizes complementary-power MOSFET output stages (class AB/H). All the specific functions for the M3D and M3D-Sub such as crossovers, frequency, phase response, and driver protection are determined by the control card installed inside the HP-4 amplifier.

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.

M3D Interconnections

Each front 4 ohm, 15-inch, low-frequency driver is powered by one channel of the HP-4/M3D amplifier. While both rear 8 ohm, 15 inch low-frequency drivers are connected in parallel and driven by a single amplifier channel. The two 4-inch diaphragm high-frequency drivers share the fourth channel of the HP-4 amplifier.

Refer to Figure 12 on page 6 to see how the drivers are connected to the amplifier in the M3D.



(Positions are in reference to front of enclosure)

Figure 12. M3D internal wiring harness diagram

M3D-Sub Interconnections

Each front 4 ohm, 18-inch, low-frequency driver is powered by one channel of the HP-4/M3D-Sub amplifier; also, each rear 8 ohm, 15-inch low-frequency driver is powered by one amplifier channel. Figure 13 shows how the drivers are connected to the amplifier in the M3D-Sub.

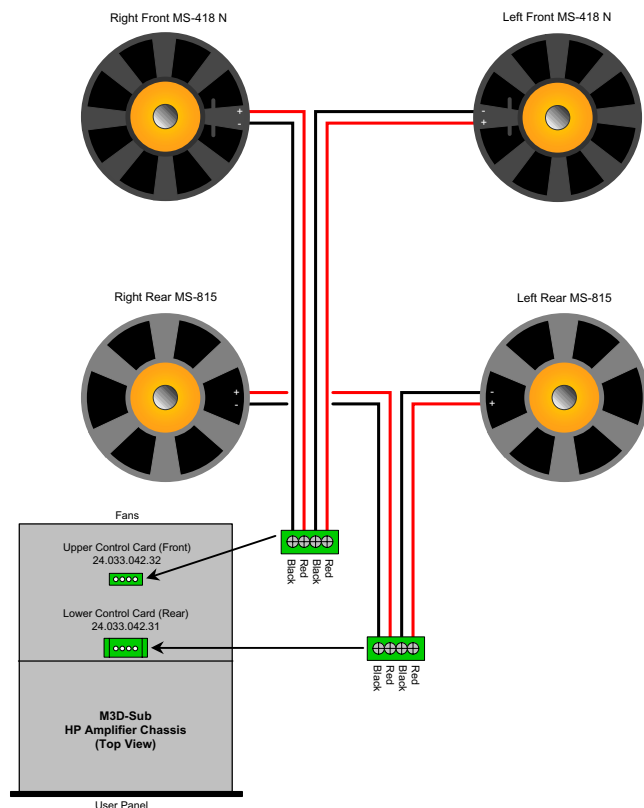


Figure 13. M3D-Sub internal wiring harness diagram

THE TRUPOWER™ LIMITING SYSTEM

Conventional limiters assume that the impedance of a speaker remains constant and set the limiting threshold by measuring voltage only. This method is inaccurate, because the speaker's impedance changes in response to the frequency content of the source material and thermal variations in the speaker's voice coil and magnet. Conventional limiters begin limiting prematurely, which under utilizes system headroom and deprives the speaker of its full dynamic range.

The TruPower Limiting (TPL) system accounts for varying speaker impedance by measuring current, in addition to voltage, to compute the actual power dissipation in the voice coil. TPL improves performance before and during limiting by allowing each driver to produce its maximum

SPL across its entire frequency range. TPL extends the lifetime of the drivers by controlling the temperature of the voice coil. In addition, TPL eliminates power compression when the system is operated at high levels for extended periods.

The true power is monitored for each of the four amplifier channels. When the safe continuous power level is exceeded, the TPL limiter controlling that amplifier channel engages. TPL activity is indicated by the LEDs on the user panel.

The M3D and M3D Sub perform within their acoustical specifications and operate at a normal temperature if the limit LEDs are lit 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 is 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.
- The lifespan of the drivers is reduced because they are subjected to excessive heat.

M3D TPL Limiters

The left-and-right front low-frequency drivers are driven by separate amplifier channels but are routed to one limiter; the LO TPL F LED on the user panel indicates TPL activity for the front drivers. The two rear low-frequency drivers are driven by one amplifier channel; the LO TPL R LED indicates TPL activity for the rear low-frequency drivers. The two high-frequency drivers are driven by one amplifier channel; the HI Limit LED, shown in Figure 14 on page 7, indicates TPL activity for the high-frequency drivers.

The limiters cease operation when the power level in the channel returns to normal and do not affect the signal when the LED is inactive.

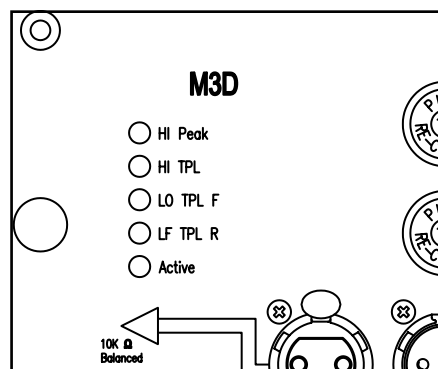


Figure 14. M3D Limit LEDs



NOTE: The TPL LEDs indicate when the safe power level is exceeded. If an entire system of M3Ds begins to limit before reaching the required sound pressure level (SPL), you should consider adding more loudspeakers.

M3D Peak Limiter

When engaged, the Peak Limiter prevents signal peaks from causing distortion in the high channel, preserving headroom and maintaining smooth frequency response at high levels. Peak limiting is indicated by the Hi Peak LED on the user panel; the same on/off cycle discussed for the TPL limiters applies to the Peak Limiter.

M3D-Sub TPL Limiters

The 18-inch front low-frequency drivers are driven by separate amplifier channels but are fed by one limiter; the LO TPL F LED on the user panel indicates TPL activity for these drivers. The rear 15-inch drivers are connected in parallel and driven by a single amplifier channel that is fed by one limiter; the Rear TPL LED on the user panel indicates TPL activity for the rear drivers. The limiters cease operation when the power level returns to normal, and do not affect the signal when the LED is inactive.

M3D-Sub Excursion Clamp

The drivers in the M3D-Sub are protected by an excursion clamping circuit that provides instantaneous braking for the drivers without the pumping effects commonly produced by compressor/limiters.

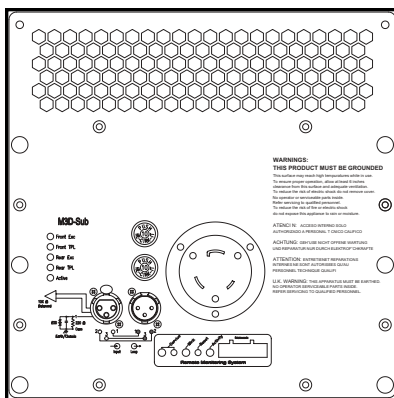


Figure 15. M3D-Sub limit LEDs

The circuit uses sophisticated filters to minimize the distortion normally caused by clamping and clipping. As the M3D-Sub's input signal is increased past the clamping point at each frequency, the output signal remains at a

fixed level for that frequency, protecting the drivers and minimizing negative sonic effects. The LED, shown in Figure 15, illuminates when the maximum allowed peak voltage at each frequency is reached. This circuit works for all frequencies, not just very low frequencies where the drivers are more vulnerable overexcursion.

The M3D-Sub operates safely if the Exc. Clamp LED is on for no longer than two seconds, and off for one second.

FANS AND COOLING SYSTEM

The M3D uses a forced-air cooling system with four fans to prevent the amplifier modules from overheating. The fans draw air in through ducts on the front of the cabinet, over the heatsinks, and out the rear of the cabinet. Because dust does not accumulate in the amplifier circuitry, its lifespan is increased significantly. The front grill surface acts as an air filter for the cooling system and should always be in place during operation.

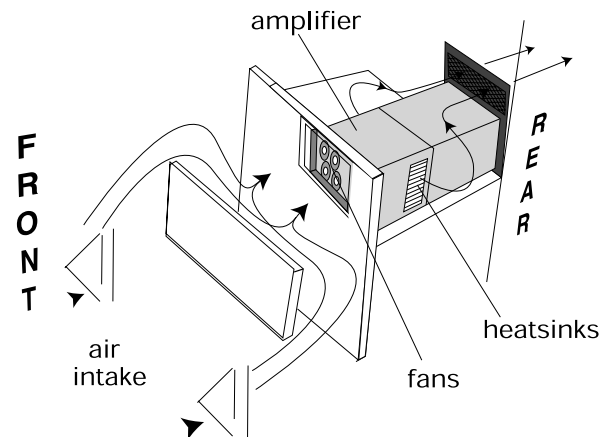


Figure 16. Airflow of M3D

Despite the filtering, extensive use or a dusty operating environment can allow dust to accumulate along the path of the airflow, preventing normal cooling. We recommend periodically removing the grill and amplifier module and using a vacuum cleaner to clear dust from the grill, fans, and heatsinks.



CAUTION: Be sure to unplug power to the unit before cleaning the air filter.

Make sure that the air ducts are clear.



NOTE: Always use the rain hood in the fully open position to maintain proper cooling of the amplifier.

Two variable-speed primary fans run continuously with an inaudible operating noise of 22 dBA at 1 m at their slowest speed. The primary fans begin increasing speed when either of the two heatsinks reaches 42°C. The fans reach full speed at 62°C and are barely audible near the cabinet, even without an audio signal. In the event that the heatsink temperature reaches 74°C, the secondary fans turn on and are clearly audible without an audio signal. The secondary fans turn on in response to:

- primary fan failure (check status immediately)
- high source levels for a prolonged period
- accumulation of dust along the cooling path

The secondary fans turn off when the temperature decreases to 68°C.



NOTE: In the highly unlikely event that the secondary fans do not keep the temperature below 85°C, the M3D automatically shuts down until AC power is removed and reapplied. If the M3D shuts down again after cooling and reapplying AC power, contact Meyer Sound for repair information.

USING AND REPLACING THE RAIN HOOD

The rain hood installed on the M3D user panel is provided to protect the loudspeaker's electronics from direct exposure to rainfall. Before using the M3D, open the rain hood as described in the following procedure.

Opening the Rain Hood

1. Pull the exterior Velcro straps off the hood, allowing it to open.
2. Lift the flap fully outward, and unfold the fabric rain hood.
3. With your other hand, reach into the hood and free the two PVC supports from their corner pockets in the outer flap.
4. Fold both supports out and reinsert them into the two pockets, shown in Figure 17, in the lower corners of the soft side flaps. This will hold the rain hood fully open for use, which is necessary for proper cooling of the M3D electronics.

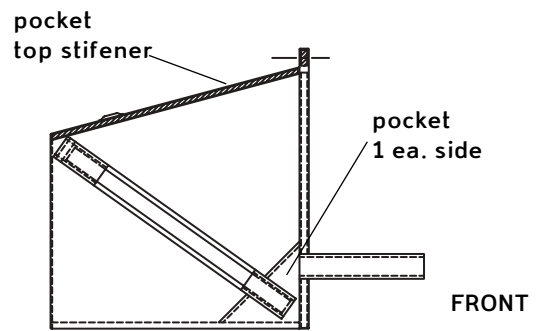


Figure 17. Rain hood stiffener pockets

See Figure 18 for an example of an installed rain hood.

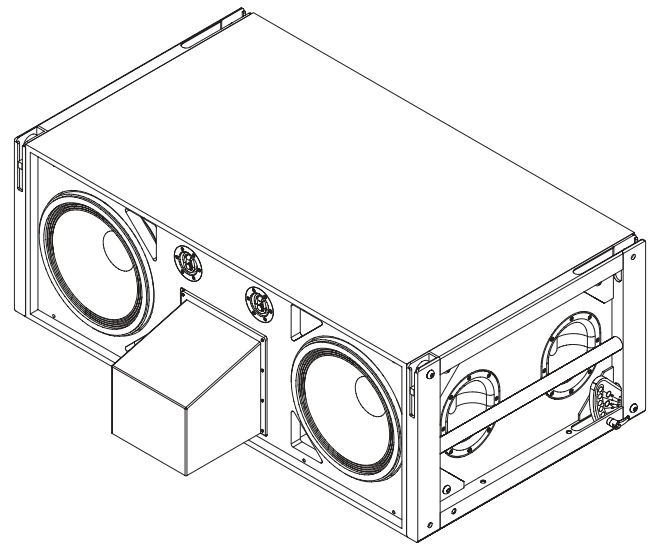


Figure 18. Fully open rain hood installed on a M3D



CAUTION: Always be sure the rain hood is fully open when operating an M3D. Leaving the hood partially open will limit the airflow through the amplifier, which could cause it to overheat and shut down.

Removing the M3D/M3D-Sub Amplifier

If you need to remove the M3D amplifier, you must first remove the rain hood, as follows:

1. Using a #2 Phillips screwdriver, remove all eight screws from the rain hood. This will free both the rain hood and the HP-4 electronics module from the M3D cabinet. (Refer to Figure 19.)

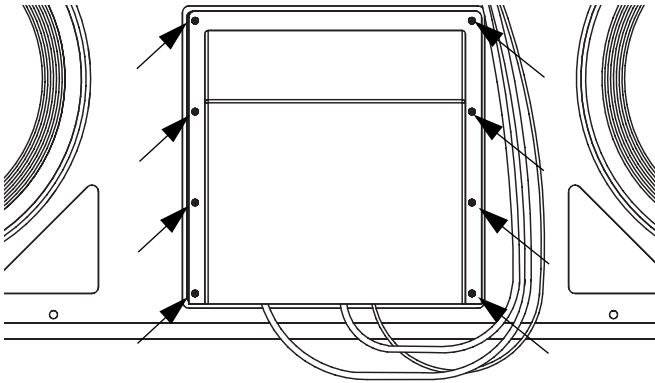


Figure 19. Location of eight screws securing rain hood

2. Lift off the rain hood carefully, pulling all eight screws through the panel.
3. Carefully slide the amplifier out using care not to stress the cables.
4. Disconnect the two 4-pin speaker connectors.

Replacing the M3D/M3D-Sub Amplifier

When you replace the amplifier and rain hood on the M3D cabinet, use the following procedure:

1. Gently slide the amplifier partially back into the M3D and connect the 2 speaker connectors. Make sure they are connected into the right connector. Please refer to Figure 12 and Figure 13.
2. Check to be sure that all three steel bars are correctly inserted in the three fabric pockets of the hood.



NOTE: The bars must be inside the fabric pockets to achieve proper water protection.

3. Carefully install the fabric rain hood, using the 1.75-inch stainless steel screws and washers provided in the kit.
4. Align all eight screws so that the washers are over the fabric.

5. Start all eight screws into the holes before tightening them.
6. Use the screws to sandwich the fabric and its gasket reinforcement bar over the external gasket.
7. Once all eight screws are started, tighten them using a #2 Phillips screwdriver.
8. Tighten the inner four screws first, and then tighten the remaining four corners.



CAUTION: Never use power tools to remove or replace the stainless steel rain hood screws on the M3D or M3D-Sub.

How Do Line Arrays Work?

Though hybrid line array systems are relatively new to the sound reinforcement industry, line arrays have been used since the 1950s. They have been described as a group of radiating elements arrayed in a straight line, closely spaced and operating with equal amplitude and in phase.

Line arrays achieve directivity through constructive and destructive interference. A simple thought experiment illustrates how this occurs.

Consider a speaker comprising a single 12-inch cone radiator in an enclosure. We know from experience that this speaker's directivity varies with frequency: at low frequencies, it is omnidirectional; as the sound wavelength grows shorter, its directivity narrows; and above about 2 kHz, it becomes too beamy for most applications. (This is why practical system designs employ crossovers and multiple elements to achieve more or less consistent directivity across the audio band.)

Stacking two of these speakers one atop the other and driving both with the same signal results in a different radiation pattern. At points on-axis of the two there is constructive interference, and the sound pressure increases by 6 dB relative to a single unit. At other points off-axis, path length differences produce cancellation, resulting in a lower sound pressure level. In fact, if you drive both units with a sine wave, there will be points where the cancellation is complete (this is best demonstrated in an anechoic chamber). This is destructive interference, sometimes referred to as combing.

A line array is a line of woofers carefully spaced so that constructive interference occurs on-axis of the array and destructive interference (combing) is aimed to the sides. While combing has traditionally been considered undesirable, line arrays use combing to work; without combing, there would be no directivity.

HYBRID LINE ARRAYS

The M3D is a high-powered BroadbandQ™ loudspeaker system. In order to effectively array, drive, and optimize a system to produce optimal results, it's important to understand how a hybrid line array loudspeaker works. For high frequencies, the M3D takes advantage of the control that wave guide horns provide. In the horizontal pattern of the array, these horns work just as any wave guide does to produce a consistent beamwidth of coverage. In the vertical, however, the REM™ is designed to produce very narrow coverage in order to minimize destructive interference between adjacent elements and maximize throw. As more elements are arrayed in a

vertical column, they throw high-frequency energy more effectively through coupling. The amount of energy can then be controlled using the relative splay between the elements.

For the mid-to-low frequencies, it's important to understand that even though the M3D's Broadband Q™ technology will maintain front-to-back attenuation from 580 Hz down to 35 Hz, line arrays must be coupled together to narrow their vertical polar response and throw mid and low energy to the far field. The more elements used, the narrower the vertical beamwidth becomes. (See Figure 20.)

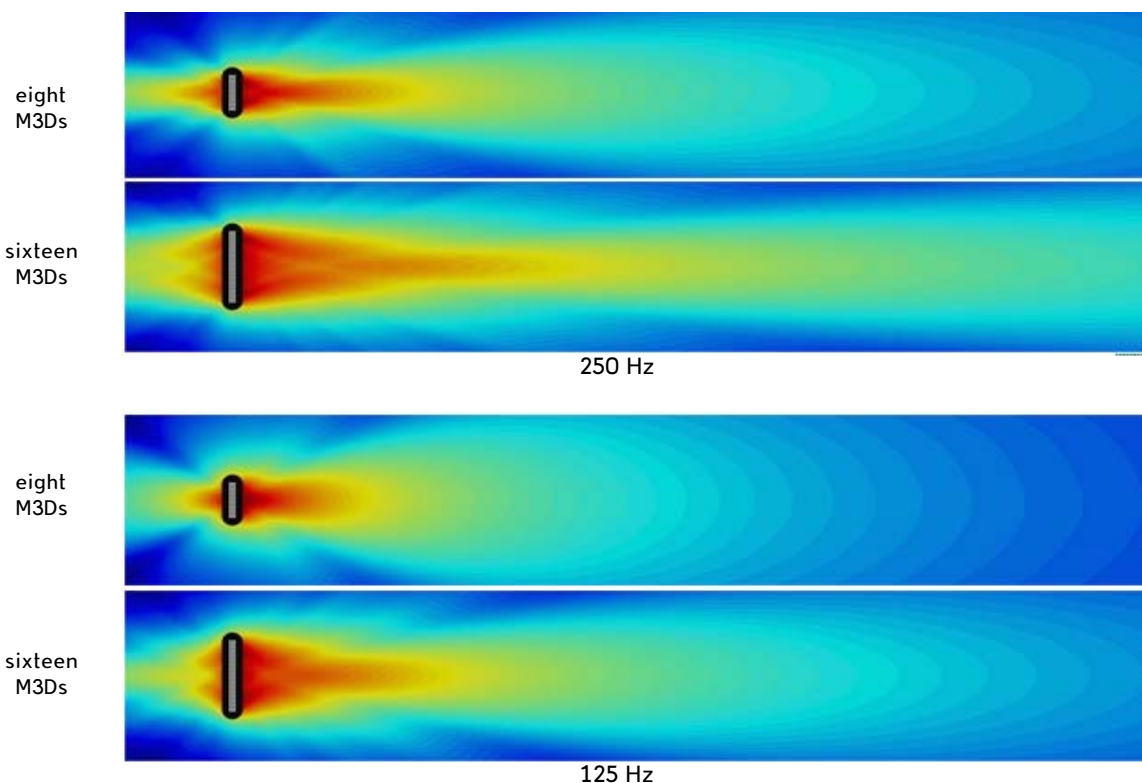


Figure 20. Eight versus sixteen M3D line arrays

Adjusting a Line Array's Coverage

The most effective method for adjusting a hybrid line array's vertical coverage is to adjust the mechanical splay between the elements. (Horizontal coverage for a single array is constant.) Narrower vertical splay angles

produce a higher-Q vertical beamwidth, while wider splay lowers the Q. The following is a case example showing a design where this principle is applied to a sloped outdoor venue.

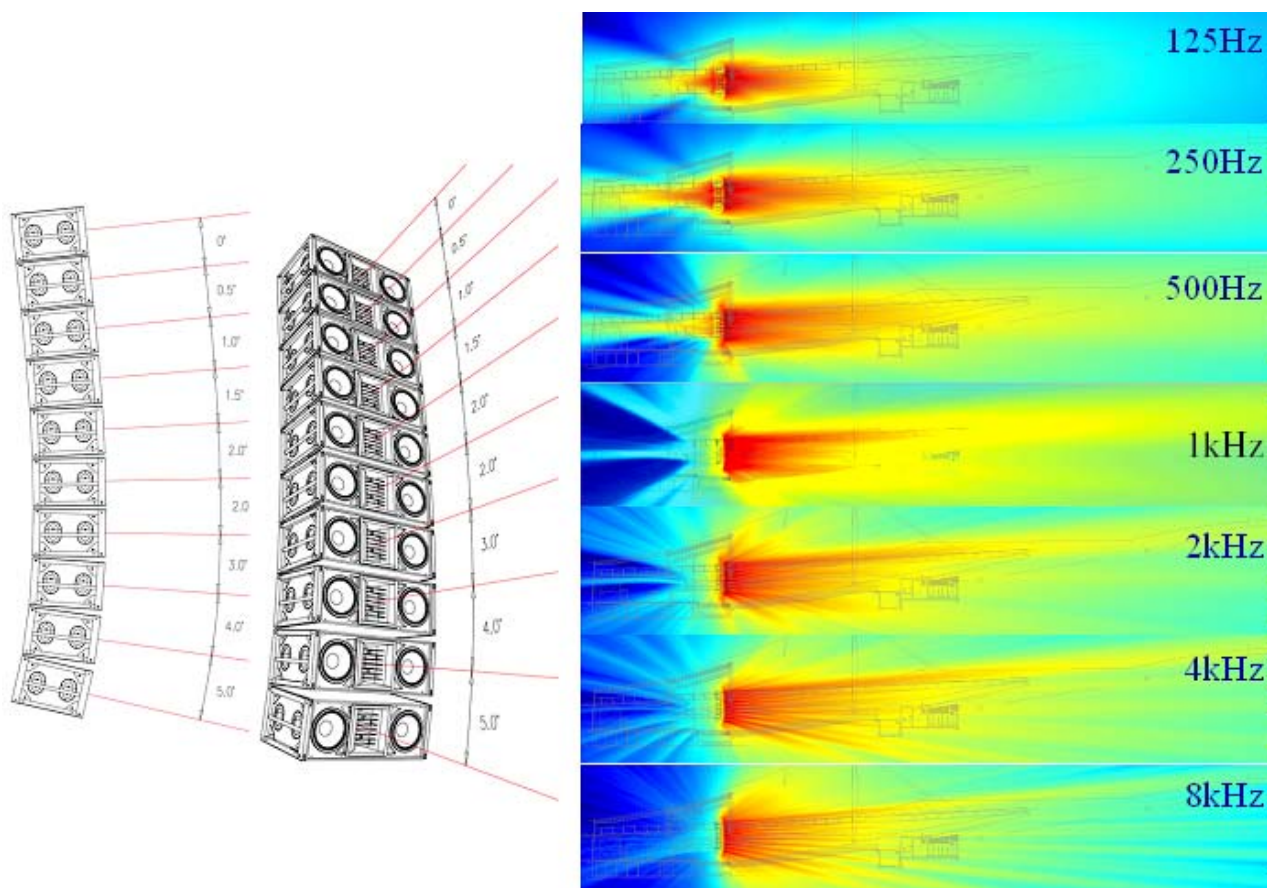


Figure 21. Using vertical splay to adjust a line array's coverage

With these two technologies (low-frequency line array and high-frequency wave guide) combined in a single product, it's important to understand how to best electronically drive a hybrid line array. The high-frequency section can, and usually should, be zoned for implementing different equalization into zones. The first step is to optimize the coverage using the relative mechanical splay between the array's elements. MAPP Online is an ideal tool for doing this and determining what will work best for the application. MAPP can also help to determine how to break up the electronic drive of the system using its Virtual SIM feature. For the far field, a smaller mechanical splay angle achieves superior throw to compensate for energy lost over distance.

While wave guides provide isolated control over various coverage areas, the low-frequency section of a line array still requires mutual coupling—with equal amplitude and phase—to achieve a narrow beamwidth. This is important to remember when optimizing the array

with multiple equalization channels. It is best to maintain a similar or identical equalization in the low-frequency filters, even though different equalization is being applied to each zone in the high frequencies.

This is also why gain tapering is not recommended for line arrays. Adjusting the various zones with an overall amplitude control for each zone results in the following:

1. Directionality decreases.
2. Overall low-frequency headroom decreases.
3. The length of the line array column is effectively shortened.

The following is a sample M3D system block diagram showing one method of driving an array, along with additional fill loudspeakers and subwoofers. Digital delays are included to provide a time adjustment to compensate for the various subsystems and subwoofers being geometrically out of plane with one another.

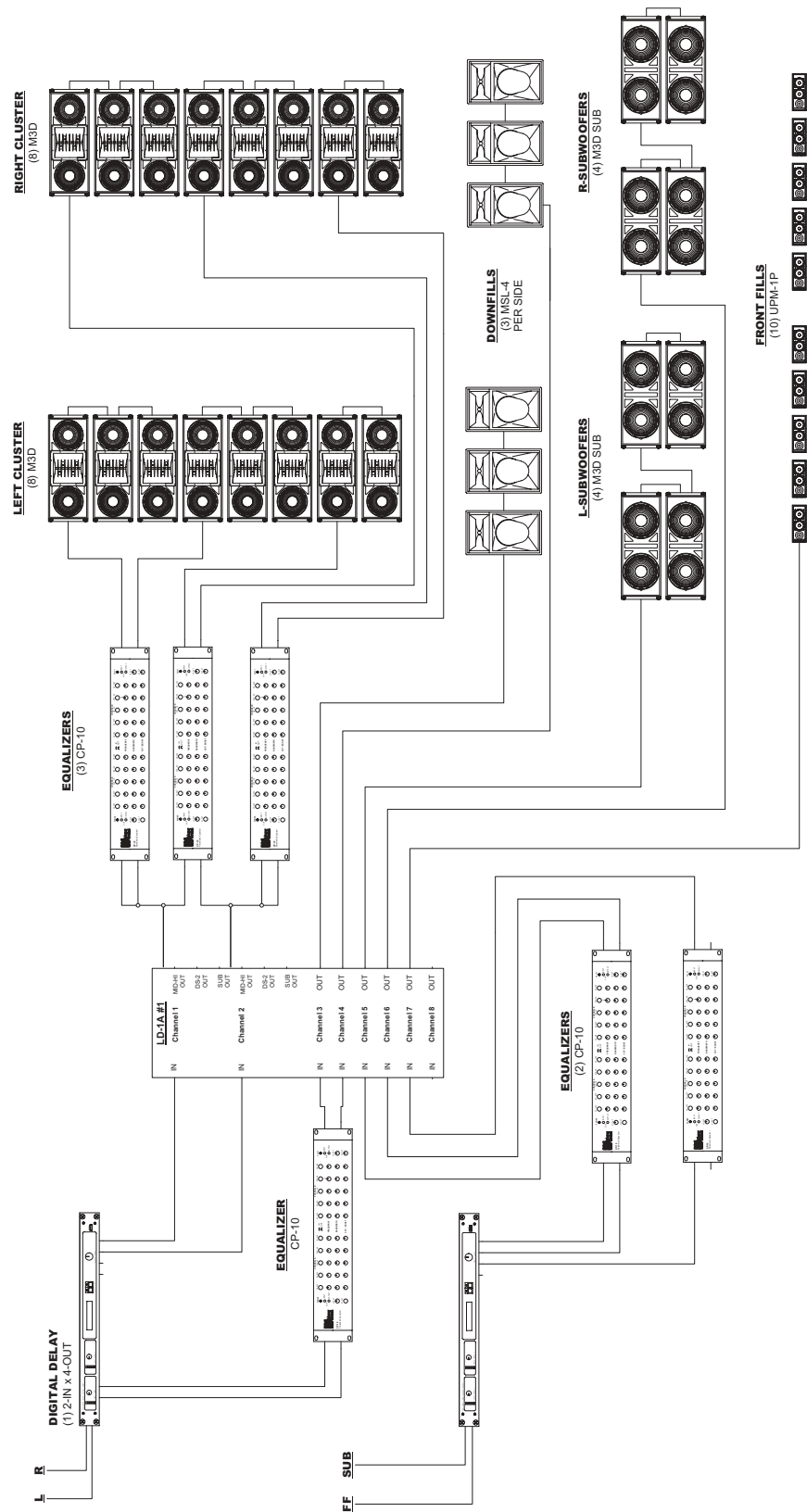


Figure 22. Wiring diagram of a typical M3D installation

CABLING

One method of cabling the system is using the Meyer Sound/VEAM cable system. This system incorporates power, signal, and RMS monitoring system all in one heavy-duty cable and connector per M3D cabinet.

The electrical, signal, and RMS cables for each cabinet can be consolidated to create a “three-pair” multi-conductor cable. This can be accomplished by using separate electrical and signal XLR cable. The electrical, signal, and RMS cable for each box can be loomed together per box to create a “three-pair” multi-conductor cable for each cabinet. This ensures no patching errors and a minimum of cables behind the array.

Two ring/stud fittings are provided on the back panel of each M3D and M3D-Sub for the purpose of strain relieving all cabling. Insert the signal, data, and AC connections into each loudspeaker as the array is being rigged, swag all cables under the rain hood’s side flaps, and tie them off onto either the left or right rings of the ring/stud fitting as shown in Figure 23. Using the strain reliefs will minimize the chance of cables being damaged during installation of the sound system.

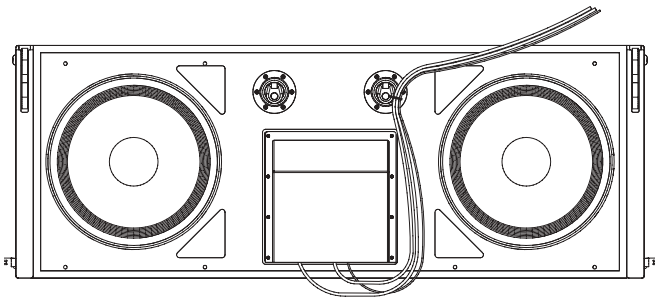


Figure 23. Tying off cables to rings.



CAUTION: The rear ring/stud fittings shown in Figure 23 must be used only to secure system cabling. These fittings are not intended to be used for system rigging or a pull-back motor (pulling the bottom of the array backward to increase downward tilt). The points are mounted on each side of the amplifier area, so as not to interfere with the rain hood and the amplifier fan exhaust area.

USING THE M3D-SUB WITH THE M3D LINE ARRAY LOUDSPEAKER

The M3D system will provide full bandwidth frequency response without M3D-Sub directional subwoofers. The height of the array (number of cabinets) and the desired SPL will determine how much sub-bass energy can be provided, proportional to the upper-frequency spectrum.

If higher SPL is necessary or the program content requires additional sub-bass energy, then M3D-Sub direction subwoofers can be used to augment the M3D line arrays.

There is no polarity switch on either the M3D Line Array or the M3D-Sub directional subwoofer. Both are wired pin 2 “hot” (positive acoustic pressure when a positive pulse is applied to pin 2).

The M3D Line Array frequency response operates down to 35 Hz, while the M3D-Sub operates in the range of 30 Hz to 80 Hz. The M3D-Sub therefore does not extend the system response appreciably; rather, it increases the acoustic power of the system in the lowest frequencies. This can be very useful in applications that require large amounts of low-frequency energy, such as the reinforcement of popular music.

Both the M3D Line Array and the M3D-Sub have a cardioid directional pattern and are designed to provide maximum cancellation from six to twelve meters behind the cabinet (–20 dB at 8 meters). When they are used together, in addition to increased forward power, the rear power cancellation also improves.

Driving the M3D-Sub

All Meyer Sound products have been optimized with internal crossover networks. When most Meyer Sound loudspeakers are used together, these networks provide maximum power addition through their respective overlapping frequency ranges when used in close proximity and co-planar to one another.

You may loop connections between the M3D Line Array and the M3D-Sub. This will result in 6 dB greater sound pressure in the 40 Hz to 100 Hz range, as shown in Figure 24, a ground-plane measurement taken at six meters.

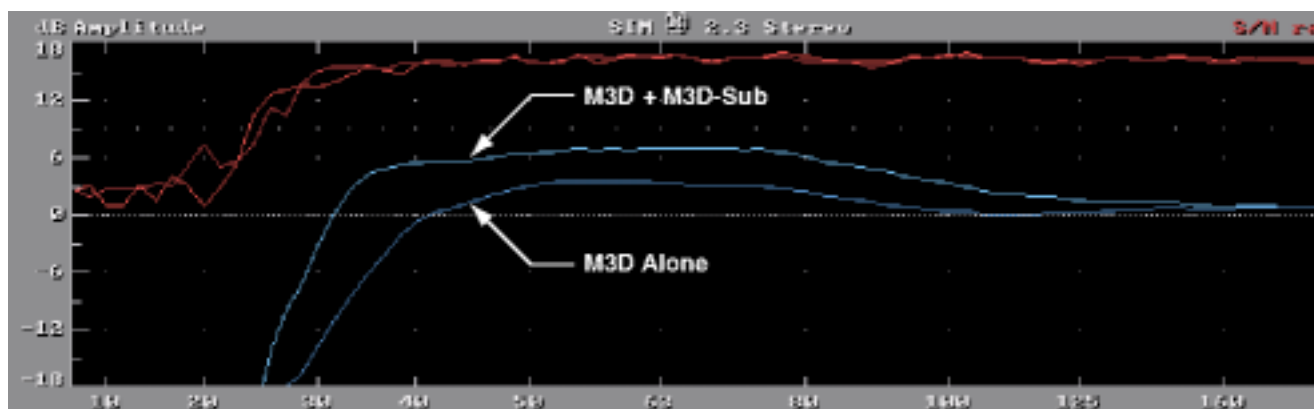


Figure 24. M3D Line Array and M3D-Sub with looped connections

When the two are driven with the same signal but the M3D-Sub is attenuated by 6 dB, the response is identical

to the M3D Line Array alone but extends to 30 Hz, as shown in Figure 25.

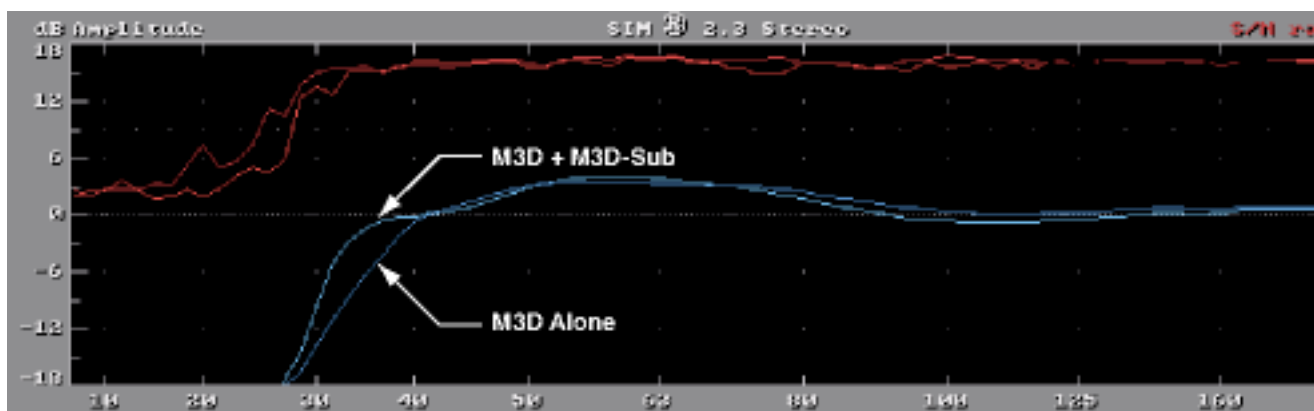


Figure 25. M3D Line Array and M3D-Sub with M3D-Sub attenuated by 6 dB

The third option provides optimal headroom to the M3Ds, while adding an often preferred frequency response bump centered around 65 Hz. This configuration, shown in Figure 26 and Figure 27, high passes the M3D loudspeakers in the array while letting the M3D Subs use their normal internal crossover frequencies. If the 65 Hz bump in the spectrum isn't desired, an equalization filter can be used to flatten the overall response, while still optimizing system headroom.

To achieve this, drive the M3D loudspeakers using the DS-2 (or mid bass) output of the LD-1A line driver, as shown in Figure 26 or the LD-2 line driver as shown in Figure 27, with the DS-2 crossover engaged and with no polarity reversal. This provides a crossover function by rolling off the M3D Loudspeakers below 80 Hz, as shown in Figure 28. increasing its headroom at very low frequencies.

The DS-2 & Sub Crossover network is composed of a low-pass and an elliptical filter. Pushing the switch in activates the two-way crossover, sending frequencies below 80 Hz to the Sub output and above 80 Hz to the DS-2 output. With the switch out, a full-range signal is sent to both the DS-2 and Sub outputs. Since this filter affects the DS-2 out and the SUB out the M3D-Subs need to be connected to the Mid-Hi output receiving a full range signal.



NOTE: Full-range signals may be applied to Meyer self powered subwoofers because they have built-in active crossovers that filter mid-hi frequencies; external crossovers are unnecessary.

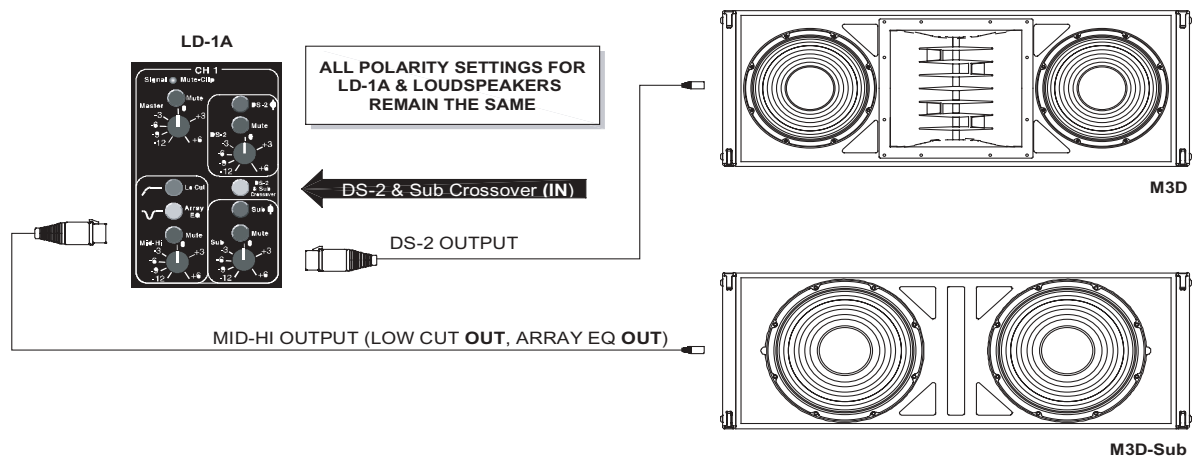


Figure 26. M3D and M3D-Sub headroom optimization using an LD-1A line driver

Figure 27 shows an LD-2 line driver configured to produce the same results as the LD-1A line driver shown

in Figure 26. The comparison plot when using these configurations is shown Figure 28.

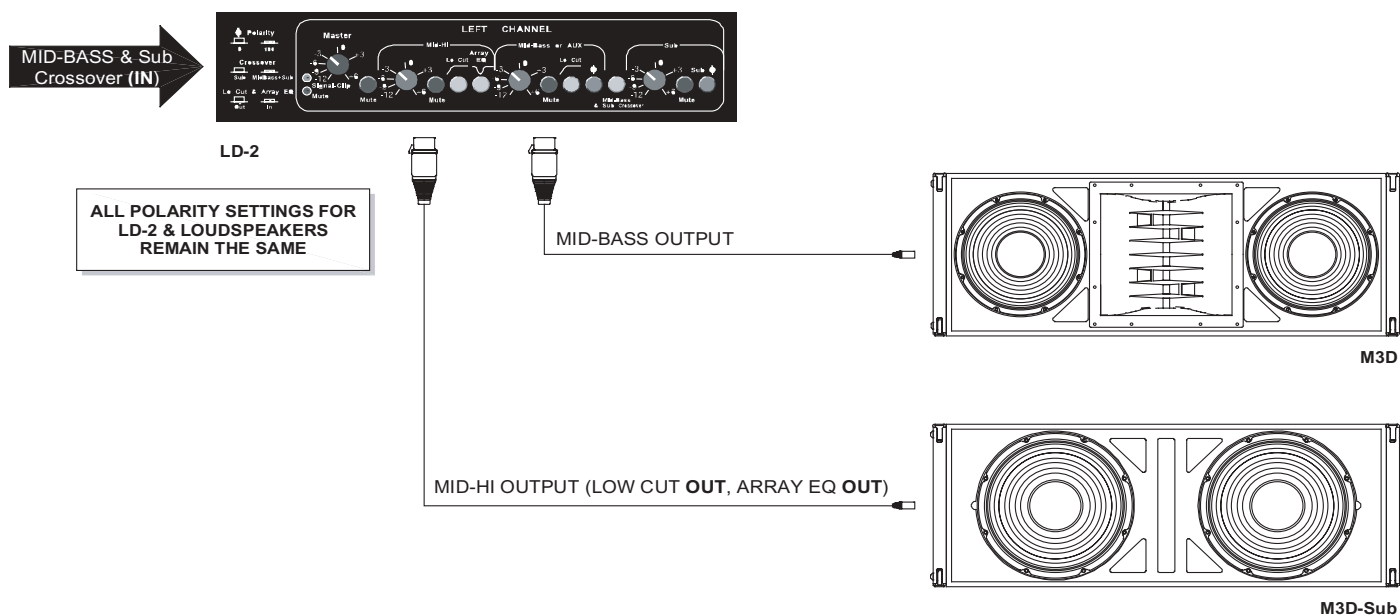


Figure 27. M3D and M3D-Sub headroom optimization using an LD-2 line driver

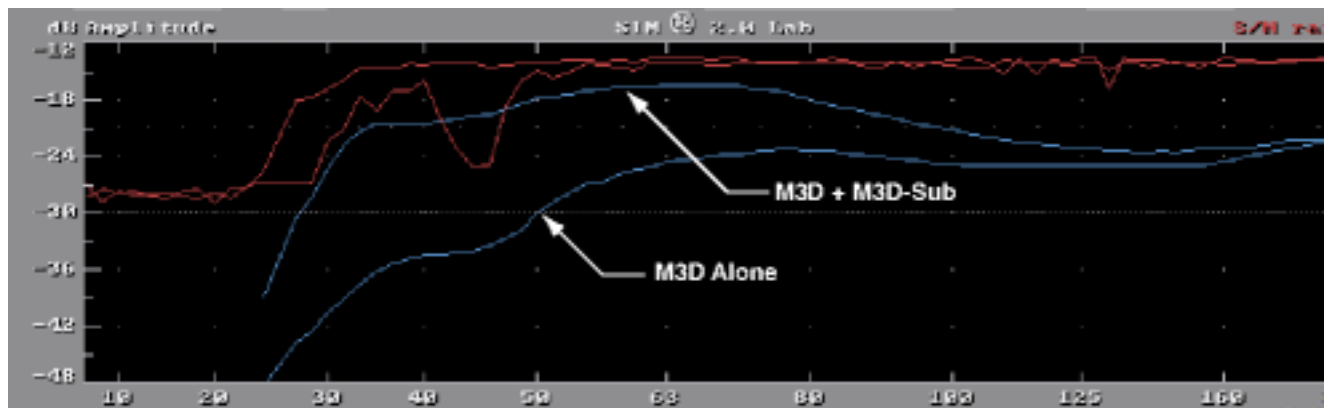


Figure 28. M3D driven from the mid-bass output of LD-1 line driver with the M3D-Sub driven with a full-range signal

SIM® SYSTEM II

SIM System II is a powerful, compact instrumentation product line comprising the SIM-2201 Sound Analyzer, SIM-2403 Interface Network, and a selection of software options, microphones and accessory cables. The instrument is optimized for making audio-frequency measurements of an acoustical system and applying precise electronic corrections to adjust the system response.

SIM System II 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 employed 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.)

Housed in a four-space rack-mountable industrial chassis, the SIM-2201 Sound Analyzer performs 32-bit floating-point audio signal measurements with >100-dB dynamic range (actual input signal range is greater because of selectable gain). The instrument permits two-port measurements between any two of three front-panel inputs (one microphone with switchable phantom power, two isolated line level), and incorporates a rear-panel multipin interface for automated measurements of two-channel systems. Optional hardware and software upgrades permit up to sixty-four analysis channel capacity.

Applications

You can use the SIM System II in the following applications:

- Loudspeaker system testing and alignment
- Microphone calibration
- Architectural acoustics
- Transducer evaluation and correction
- Echo detection and analysis
- Vibration analysis
- Underwater acoustics

Measurement Modes and Features

Measurement data may be displayed as amplitude versus time (impulse response), or amplitude and phase versus frequency (frequency response). A single-channel spectrum mode is provided, and frequency domain data are displayed with a logarithmic frequency axis. A Delay Finder function determines and internally compensates for propagation delays.

The SIM-2201 incorporates a front-panel-controllable precision signal generator with low-distortion sine wave, pink noise, and modulated, weighted pulse outputs; multi-segment level meters for each measurement input; a removable hard disk and DOS format 1.44-Mbyte floppy disk drive for data storage; high-resolution color monitor output; and dedicated rear-panel multipin system interface connectors. A headphone output is provided for aural monitoring of the measurement inputs. User-friendly software with pull-down menus streamlines operation, and measurement data may be exported to disk in ASCII format for post-processing or laser printed for presentation.

MEYER SOUND MAPP ONLINE™

MAPP (Multipurpose Acoustical Prediction Program) Online is a powerful, cross-platform, Java-based application for accurately predicting the coverage pattern, frequency response, impulse response, and maximum SPL output of arrayed Meyer Sound loudspeakers. Residing on the local host computer, the Java application 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 MAPP Online at:

www.meyersound.com/products/software/mapponline



NOTE: You will need to apply for use of MAPP Online by clicking on the appropriate link on the screen at the URL above. Once your registration is complete, you will be given a user name and password, which will be returned to you by email along with the address for the MAPP Online program itself. Follow the online instructions to install the program on your computer.

When a prediction is requested, data are sent over the Internet to a high-powered server computer 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 the local host in color.

With MAPP Online, 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 at the microphone position
- 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

MAPP Online enables sound system designers to come to an installation prepared with a wealth of information that ensures the system will satisfy their requirements “out of the box” – including basic system delay and

equalization settings. Its accurate, high-resolution predictions eliminate unexpected onsite adjustments and coverage problems. With MAPP Online, every sound system installation has the maximum chance of success.

MAPP Online is compatible with Windows, Linux, Unix, and Apple Macintosh computers running Mac OS X version 10.1.2 or higher. MAPP Online requires Java Web Start version 1.0.1_02 (included with Mac OS X).

RMS™ (REMOTE MONITORING SYSTEM)

Once an installation is complete, use Meyer Sound’s RMS system to monitor system performance.

RMS is a real-time monitoring system that connects the Meyer Sound self-powered speakers with an IBM-compatible computer at the sound mix position or other location. RMS software delivers extensive status and system performance data directly to the operator from every installed speaker.

RMS displays include amplifier voltages, limiting activity, power output, temperature, fan and driver status, warning alerts, and other key data for up to sixty-two speakers, without a network repeater, at a display update rate of two to five times per second. More information is available, and with greater convenience than from conventional monitor systems. The RMS Monitor Program interface can be learned quickly, and runs in a Microsoft Windows 95 or Windows 98, 2nd Edition environment.

Monitor Displays

Each speaker 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 user preference.

Each view contains speaker identification information and data from the amplifier, controller, driver, and power supply of that particular unit. System status conditions cause changes in Icon and bar graph indicators, alerting the operator to faults or excessive levels. The views are moveable and typically are arranged on the screen to reflect the physical layout of the loudspeakers. A user can design a screen “panel” of icons or meters, as shown in Figure 29, and save it on the computer’s hard disk, conveniently named for a unique arrangement or performer. If the speaker installation pattern changes completely, a new screen panel can be built. If a different subset of already installed speakers is to be used at the next show, only selected speakers need appear on the monitoring screen for that performance.

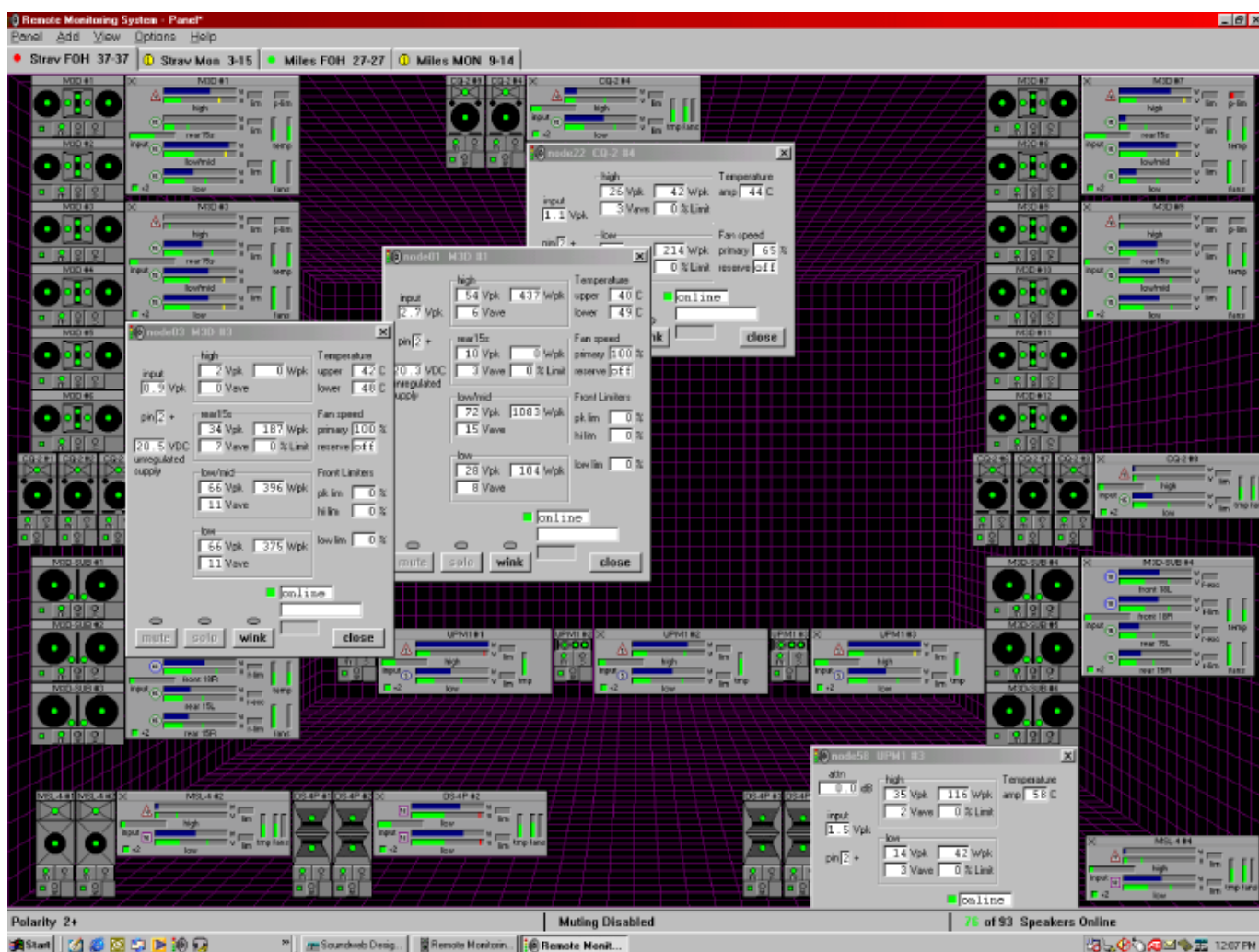


Figure 29. Sample RMS display panel

APPENDIX A – M3D LINE ARRAY SPECIFICATIONS

Table 2. M3D Line Array Specifications

Acoustical	
Note: The low-frequency power response of the system will increase according to the length and configuration of the array	
Operating frequency range	35 Hz to 16 kHz
Free field	±4 dB 42 Hz – 16 kHz; –6 dB @ 35 Hz and 16 kHz Note: Measured with 1/3 octave frequency resolution in fixed ISO bands at 4 meters.
Phase response	±30° 300 Hz – 14 kHz
Maximum peak SPL	145 dB Note: Measured with 1/3 octave frequency resolution in fixed ISO bands at 4 meters.
Dynamic range	> 110 dB
Horizontal coverage	Low frequency: Cardioid, with active pattern control High frequency: 90° Note: MAPP Online data available
Vertical coverage	Vertical coverage varies, depending on array length and configuration.
Acoustical crossover	580 Hz Note: At this frequency, the high- and low-frequency transducers produce equal sound pressure levels.
Transducers	
Low/mid frequency (front)	2 each 15-inch diameter cone drivers with Neodymium Magnets Nominal impedance: 4 ohms Voice coil size: 4 inches Power-handling capability: 1200 W Note: Power handling is measured under AES standard conditions: transducer driven continuously for two hours with a band-limited noise signal (125 Hz to 8 kHz) having a 6 dB peak-to-average ratio.
Note: To eliminate interference at short wavelengths, the two front-facing 15-inch drivers work in combination at low frequencies (35 Hz to 140 Hz). At mid frequencies (140 Hz to 580 Hz) only one driver is fed from the crossover to maintain optimal polar and frequency response characteristics.	
Low/mid frequency (rear)	2 each 15-inch diameter cone drivers Nominal impedance: 8 ohms Coil size: 3 inches Power-handling capability: 600 W Note: AES transducer rating wattage; loudspeakers driven with a band-limiting noise signal (125 Hz to 8 kHz) with 6-dB peak-to-average ratio for two hours.
Note: At low/mid frequencies the two rear-facing 15-inch drivers produce a wave front that interacts with, and is additive to, the wave front produced by the two front-facing drivers, while reducing sonic energy directed from the rear of the cabinet. The resultant directional low-frequency output extends to 35 Hz, with a 25 dB reduction in SPL behind the cabinet.	
High frequency	Two 4 inch diaphragm compression drivers coupled to a constant-directivity horn through a proprietary acoustical combining manifold Nominal impedance: 8 ohms Voice coil size: 4 inches Diaphragm size: 4 inches Throat size: 1.5 inches Power-handling capability: 200 W Note: AES transducer rating wattage; loudspeakers driven with a band-limiting noise signal (125 Hz to 8 kHz) with 6-dB peak-to-average ratio for two hours.

Table 2. M3D Line Array Specifications (continued)

Audio input	
Type	Differential, electronic balanced
Maximum common mode range	±15 V DC, clamped to earth for voltage transient protection
Connectors	Female XLR input with male XLR loop output
Input impedance	10k ohms differential between pins 2 and 3
Wiring	Pin 1: Chassis/earth through 220k ohm, 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
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)
Input level	Audio source must be capable of producing a minimum of 20 dBV (10 Vrms, 14 Vpk) into 600 ohms in order to produce maximum peak SPL over the operating bandwidth of the speaker.
Nominal input sensitivity	0 dBV (1 Vrms, 1.4 pk) continuous is typically the onset of TPL limiting for noise and music.
Amplifiers	
Amplifier type	Complementary power MOSFET output stages (class AB/H) based on 95 Vpk into 4 ohms
Output power	4500 watts (1125 watts/channel, xfour channels) Note: Amplifier wattage rating is based on the maximum unclipped burst sine-wave RMS voltage the amplifier will produce into the nominal load impedance; in this case, 67 Vrms (95 Vpk) into 4 ohms.
THD, IM TIM	< .02%
Load capacity	4 ohms minimum impedance each channel
Cooling	Forced air cooling, four fans total (two ultra high-speed reserve fans)
AC Power	
AC power connector	250VAC NEMA L6-20 (twistlock) inlet or IEC 309 male inlet Optional VEAM connector (integrates AC, audio and network)
Voltage selection	Automatic, two ranges, each with high-low voltage tap (uninterrupted)
Safety agency rated operating voltage	95 VAC–125 VAC, 208 VAC to 235 VAC, 50/60 Hz
Turn on/turn off points	85 VAC–134 VAC; 165 VAC – 264 VAC
Current Draw	
Idle current	1.2A RMS (115 VAC) 0.6A RMS (230 VAC) 1.3A RMS (100 VAC)
Max. long-term continuous current (>10 sec)	18 A RMS (115 V) 9 A RMS (230 V) 20 A RMS (280 V)

Table 2. M3D Line Array Specifications (continued)

Burst current (<1 sec)	32 A RMS (115 V) 16 A RMS (230 V) 36A RMS (100 V)
	Note: AC power cabling must be of sufficient gauge so that under burst current conditions, cable transmission losses do not drop voltage below specified operating range at the speaker.
Ultimate short-term peak current draw	50 A pk (115 VAC) 25 A pk (230 VAC) 57 A pk (100 VAC)
Inrush current	< 12 A at 115 VAC
RMS™ Network	Equipped for simple two conductor twisted-pair network, reporting all operating parameters of amplifiers to operator's host computer.

Physical	
Enclosure	Multi-ply hardwood
Finish	Black textured (weather protected)
	Note: Customer color available upon request
Protective grill	Powder-coated Hex stamped steel
Rigging	QuickFly MRF-3D rigging frame with integral CamLinks, rear connecting bars and captive quick-release pins
Weather protection	Standard
Dimensions	54" W x 20" H x 30.5" D (1372 mm x 508 mm x 762.5 mm)

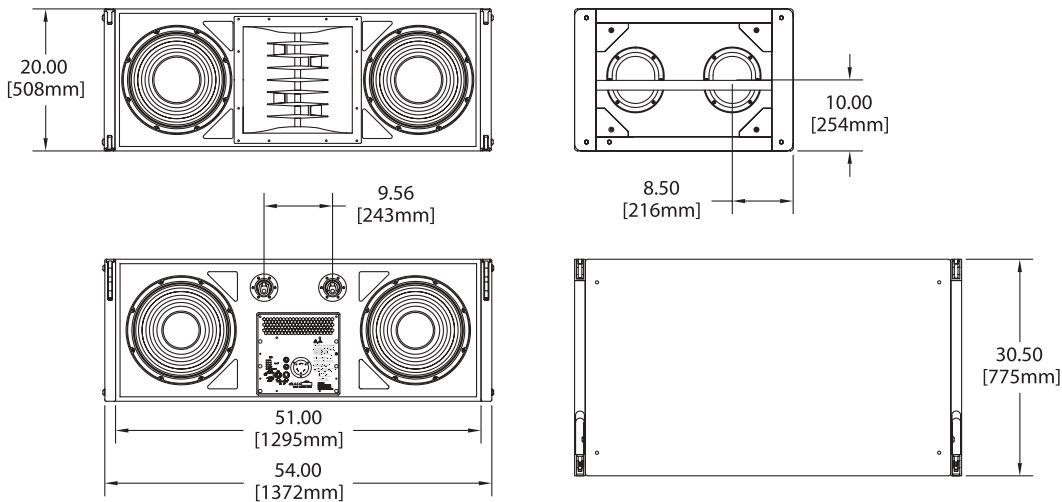


Figure 30. M3D Loudspeaker physical dimensions

Weight	Net: 415 lbs (188 kg) Shipping: 500 lbs (228 kg)
Safety Agency Recognitions	
CE	Compliant
UL	Listed
IEC 60065 (1998)	Compliant

APPENDIX B – M3D-SUB DIRECTIONAL SUBWOOFER SPECIFICATIONS

Table 3. M3D-Sub Directional Subwoofer

Acoustical	
Operating frequency range	±4dB 30 Hz – 88 Hz –6 dB at 29 Hz and 95 Hz
Phase response	±30° Hz – 95 Hz; + 90° at 30 Hz
Maximum peak SPL	>140 dB at 1 meter
Horizontal coverage	Cardioid response pattern
Transducers	
Low frequency	<p>Two each 18 inch diameter cone drivers Nominal impedance: 4 ohms Voice coil size: 4 inches Power-handling capability: 1200 W</p> <p>Two 15" cone drivers Nominal impedance: 8 ohms Coil size: 3 inches Power-handling capability: 600 W</p> <p>Note: Power handling is measured under AES standard conditions: transducer driven continuously for two hours with a band-limited noise signal (125 Hz to 8 kHz) having a 6 dB peak-to-average ratio.</p>
Audio Input	
Type	Differential, Electronic balanced"
Maximum common mode range	±15 VDC, clamped to earth for voltage transient protection
Connectors	Female XLR input with male XLR loop output
Input impedance	10k ohms differential between pins 2 and 3
Wiring	<p>Pin 1: Chassis/earth through 220k ohm, 1000 pF, 15 V clamp network to provide virtual ground lift at audio frequencies</p> <p>Pin 2: Signal +</p> <p>Pin 3: Signal –</p> <p>Case: Earth ground and chassis</p>
CMRR	> 50 dB, typically 80 dB (50 Hz–500 Hz)
RF filter	Common mode: 425k Hz Differential mode: 142 kHz
TIM filter	< 80 kHz (integral to signal processing)
Input level	Audio source must be capable of producing a minimum of 20 dBV (10 Vrms, 14 V pk) into 600 ohms in order to produce maximum peak SPL over the operating bandwidth of the speaker.
Nominal input sensitivity	0 dBV (1 Vrms, 1.4 pk) continuous average is typically the onset of TPL limiting for noise and music.
Amplifiers	
Amplifier type	Complementary power MOSFET output stages (class AB/H) based on 95 Vpk into 4 ohms
Output power	<p>4500 watts (1125 watts/channel, four channels)</p> <p>Note: Amplifier wattage rating is based on the maximum unclipped burst sine-wave RMS voltage the amplifier will produce into the nominal load impedance; in this case, 67 Vrms (95 V pk) into 4 ohms.</p>
THD, IM TIM	< .02%
Load capacity	4 ohms minimum impedance each channel

Table 3. M3D-Sub Directional Subwoofer (continued)

Cooling	Forced air cooling, four fans total, two ultra high-speed reserve fans
AC Power	
AC power connector	250VAC NEMA L6-20 (twistlock) inlet or IEC 309 male inlet Optional VEAM connector (integrates AC, audio and network)
Voltage selection	Automatic, two ranges, each with high-low voltage tap (uninterrupted)
Safety agency rated operating voltage	95 VAC to 125 VAC, 208 VAC to 235 VAC, 50/60 Hz
Turn on/turn off points	85 VAC–134 VAC; 165 VAC–264 VAC
Current Draw	
Idle current	1.2Arms (115 VAC) 0.6Arms (230 VAC) 1.3Arms (100 VAC)
Max. long-term continuous current (>10 sec)	18 Arms (115 VAC) 9 Arms (230 VAC) 20 Arms (280 VAC)
Burst current (<1 sec)	32 Arms (115 VAC) 16 Arms (230 VAC) 36Arms (100 VAC)
	Note: AC power cabling must be of sufficient gauge so that under burst current conditions, cable transmission losses do not drop voltage below specified operating range at the speaker.
Ultimate short-term peak current draw	50 A pk (115 VAC) 25 A pk (230 VAC) 57 A pk (100 VAC)
Inrush current	< 12 A at 115 VAC
RMS Network	Equipped for simple two conductor twisted-pair network, reporting all operating parameters of amplifiers to operator's host computer.
Physical	
Enclosure	Multi-ply hardwood
Finish	Black textured (weather protected)
	Note: Custom color available upon request
Protective grill	Powder-coated hex stamped steel
Rigging	QuickFly MRF-3D rigging frame with integral CamLinks, rear connecting bars and captive quick-release pins
Weather protection	Standard
Dimensions	54" W x 20" H x 30.5" D (1372 mm x 508 mm x 762.5 mm)

Table 3. M3D-Sub Directional Subwoofer (continued)

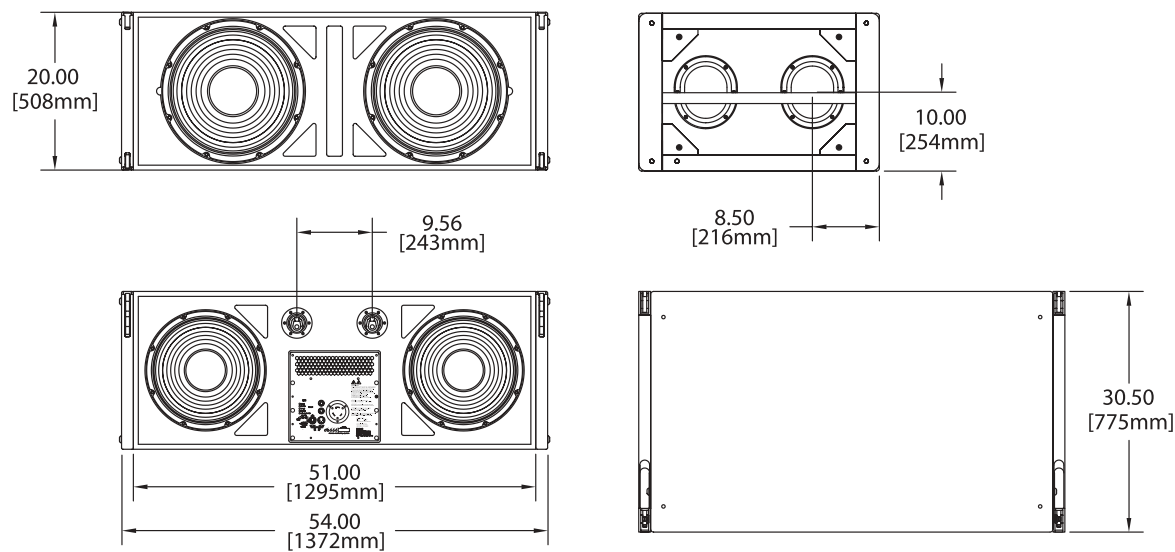


Figure 31. M3D-Sub Directional Subwoofer physical dimensions

Weight	Net: 395 lbs (179 kg)
Shipping weight	Net: 480 lbs (219 Kgs)
Safety Agency Recognitions	
CE	Compliant
UL	Listed
IEC 60065 (1998)	Compliant



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