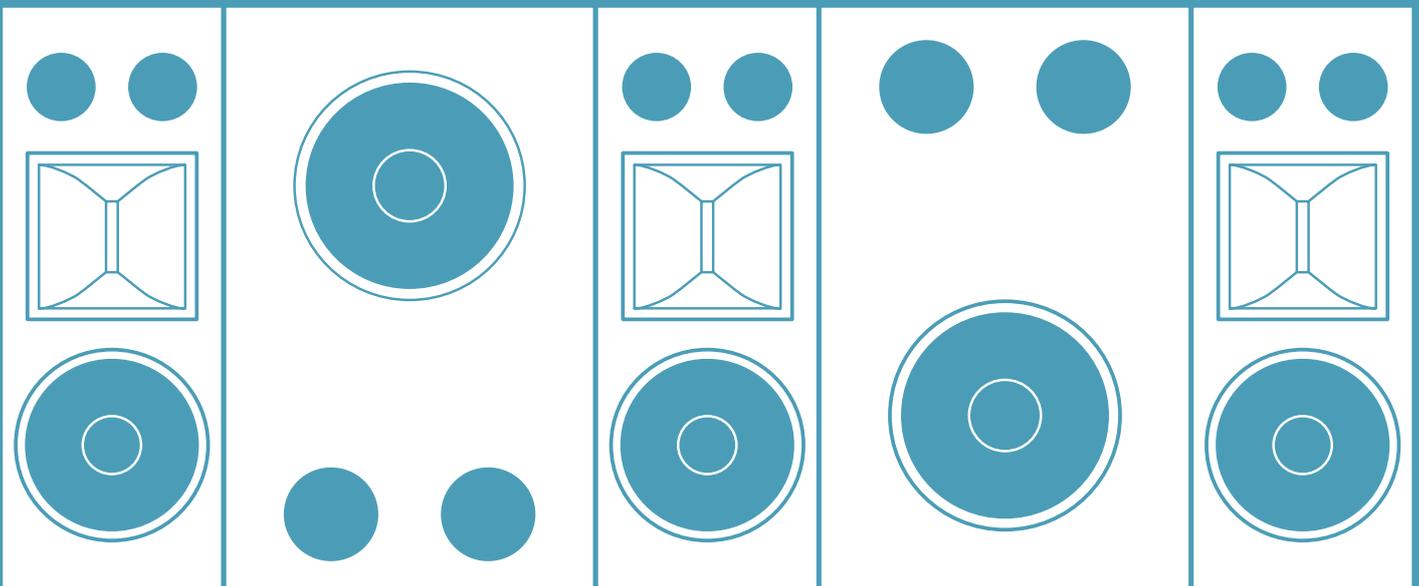


SERIES MX
INSTALLATION MANUAL



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INTRODUCTION

Krix have been providing audio solutions for commercial cinemas for over 35 years, with loudspeakers being installed in over 3,000 cinemas in more than 30 countries worldwide. A large part of the success Krix has enjoyed in the commercial cinema market is due to the development of the infinite baffle wall concept.

The infinite baffle wall concept provides a solid wall or half space that is continuous with the speaker front baffles. This alleviates any sound leakage into the space behind the screen, which can affect sound clarity by mixing reflected sound with direct sound from the loudspeakers.

Krix has also undertaken extensive research and development on horn loaded

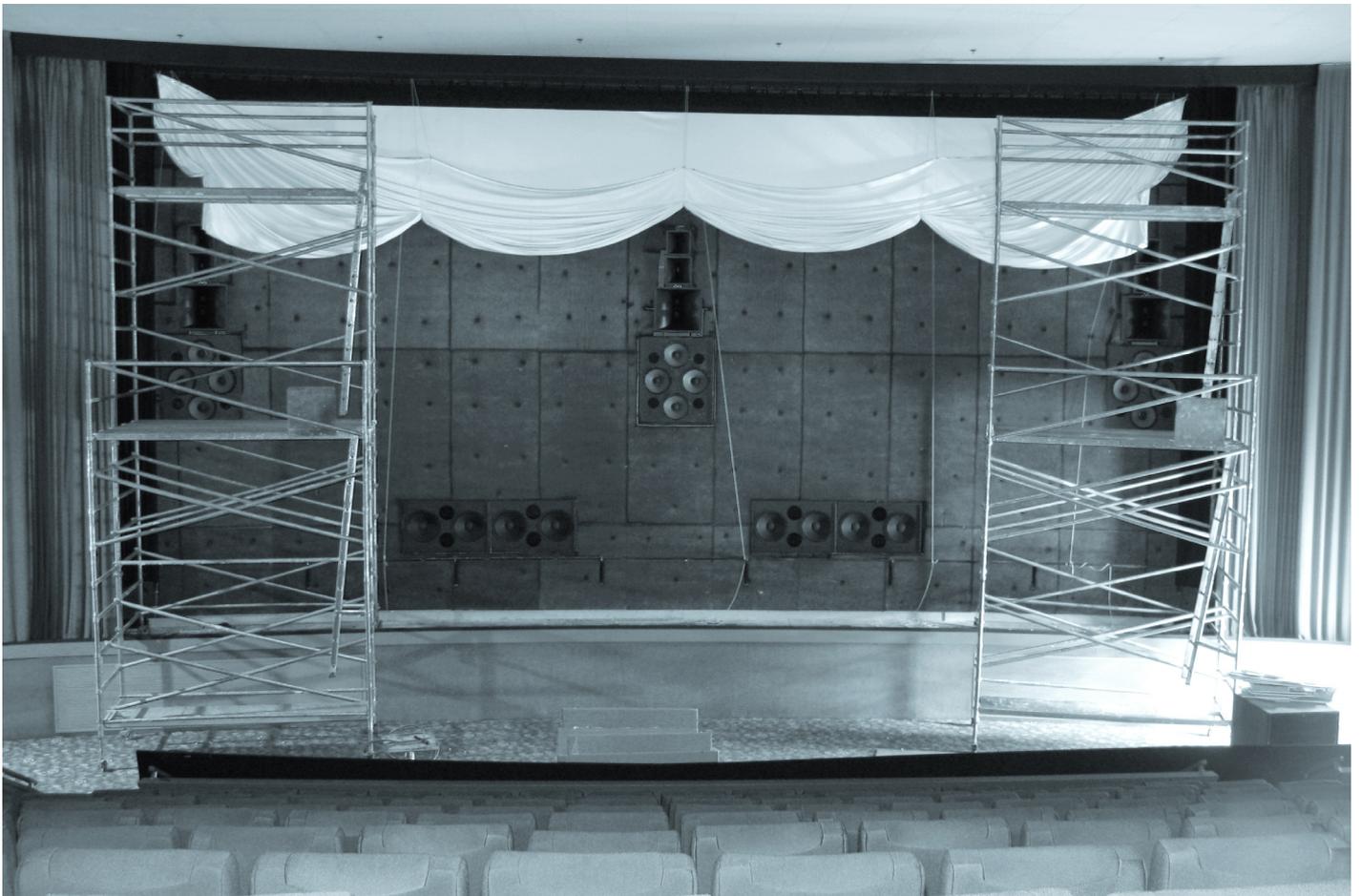
loudspeakers and waveguides to determine their effect on efficiency, directivity and low distortion characteristics. This research has resulted in several Krix patents in the area of constant directivity horns and places Krix as a leader in technology and design in the cinema audio industry.

Both the infinite baffle wall and horn design technologies have been successfully combined in our Series MX range of dedicated home cinema loudspeaker systems. They are designed to be flush mounted into a false wall, with an acoustically transparent screen placed over the front, replicating the concept of a commercial cinema. The Series MX modular systems feature the left, centre and right screen loudspeaker modules and two

passive subwoofer modules, all the same height and depth.

This modular concept not only simplifies the design and construction of the false wall at the front of the home cinema, but also minimises the depth required from the room. The front baffle of each module is covered with an acoustic absorbent material to absorb any sound reflecting off the back of the screen or the room itself. This assists greatly with the acoustic treatment of the room to ensure better intelligibility and overall sound performance.

The Series MX range delivers the visual experience and dynamic impact of real cinema at home.



Wallis Cinema, Noarlunga, South Australia. Commercial cinema installation featuring a 'Baffle Wall', Krix commercial 4-Way loudspeakers and dual 18" subwoofers.

ROOM SUITABILITY

The Series MX systems are designed for dedicated home cinema rooms, rather than open plan living spaces. They are capable of delivering sound pressure levels (SPL) equivalent to commercial cinemas and therefore are best installed in an enclosed room to avoid disturbing other occupants of the home.

Ambient light levels in the room should be fully controlled to maintain the best image contrast, as these speaker systems are intended to be used with a projector in conjunction with an acoustically transparent screen. This is best achieved in an enclosed space with no windows or openings to other living spaces.

Room ratios are important. A rectangular room is usually the most suitable shape for a home cinema with the main speakers

firing down the length of the room. The slim design of the Series MX main speaker and subwoofer modules minimise the space required behind the screen and maximise the viewing distance in the home cinema (see section 5 - front wall construction for more details).

Due to the capability of higher SPL's than typical home entertainment systems, it is recommended that allowances are made in the room design and construction for sound proofing or isolation. Sound isolation is generally required to reduce or eliminate:

- extraneous noises (eg traffic noise from the street outside or internal plumbing) entering the home cinema and disturbing the soft passages of the film or music.
- excessive noise (particularly low frequencies) emanating from the home

cinema and disturbing other members of the household or neighbours.

Sound proofing a room for home cinema use is best achieved during the construction phase of the building. It is also possible to retrofit an existing space with some additional effort. Attention should be paid to the thickness and density of the building materials that form the boundaries of the room (walls, ceiling and floor as applicable). Focusing on all the openings in the room, door seals, windows and air conditioning vents can greatly increase the effectiveness of room isolation at a moderate expense.

It is best to work with an acoustic consultant to determine the level of sound proofing required to best suit your situation.

ACOUSTIC CONSIDERATIONS

The acoustics of the room have a major influence on the overall performance of any audio system in a home cinema installation. Reflections off walls and ceilings, slap echo and uncontrollable bass can all be detrimental to the overall clarity and intelligibility of the audio system and therefore the overall enjoyment for the listeners.

A room with mostly hard surfaces and glass can sound too "lively" with a reverberation time which is often excessively long. In such environments, the dialogue and soundtrack in general can lack definition and clarity. Conversely, a room which has an excess of heavy acoustic treatment around every wall can sound flat and unnaturally dead.

The ideal scenario is to create a balance between absorption and diffusion by adding sufficient soft material to reduce the reverberation time of the space. Untreated, hard surfaces adjacent to the loudspeakers are not ideal. Placing bass traps in appropriate positions within the home cinema can help to moderate bass response variations and will result in a more defined bass that is realistic, particularly when listening to sound effects like gun shots or explosions.

It is highly recommended when designing a dedicated home cinema that you consult with an acoustic engineer to assist with the acoustic treatment of the space. Some manufacturers of acoustic treatments offer a

design service when using their products. A detailed plan of the room with all dimensions is required, which should also include the seating layout and speaker positions.

Below is a link to an article written by acoustic engineer Andrew Steel, with some hints on acoustically treating a home cinema room and some general tips for room isolation.

Note:- Sound proofing or isolation is very different to acoustically treating a room. It is a common mistake to concentrate on room isolation and not consider room acoustics.

<http://www.krix.com.au/acoustictreatment/>

ROOM SIZE

The Krix engineering team has extensive experience in audio system design for commercial cinema applications. This experience has shown that the size of the room and therefore the listening distance from the speakers, plays a significant part in determining the ideal speaker system.

Commercial cinemas are normally designed and calibrated to produce “reference level” at the central seating area of the auditorium. Reference level has been historically determined by organisations such as Dolby® and THX® to be the ideal sound pressure level (SPL) required to deliver the dynamic range, impact and realism of modern movie soundtracks. A dedicated home cinema with larger screen, particularly one with multiple rows of seats, usually places viewers much further away from the screen and speakers than in a typical living room. Therefore, the sensitivity of the speakers and the power

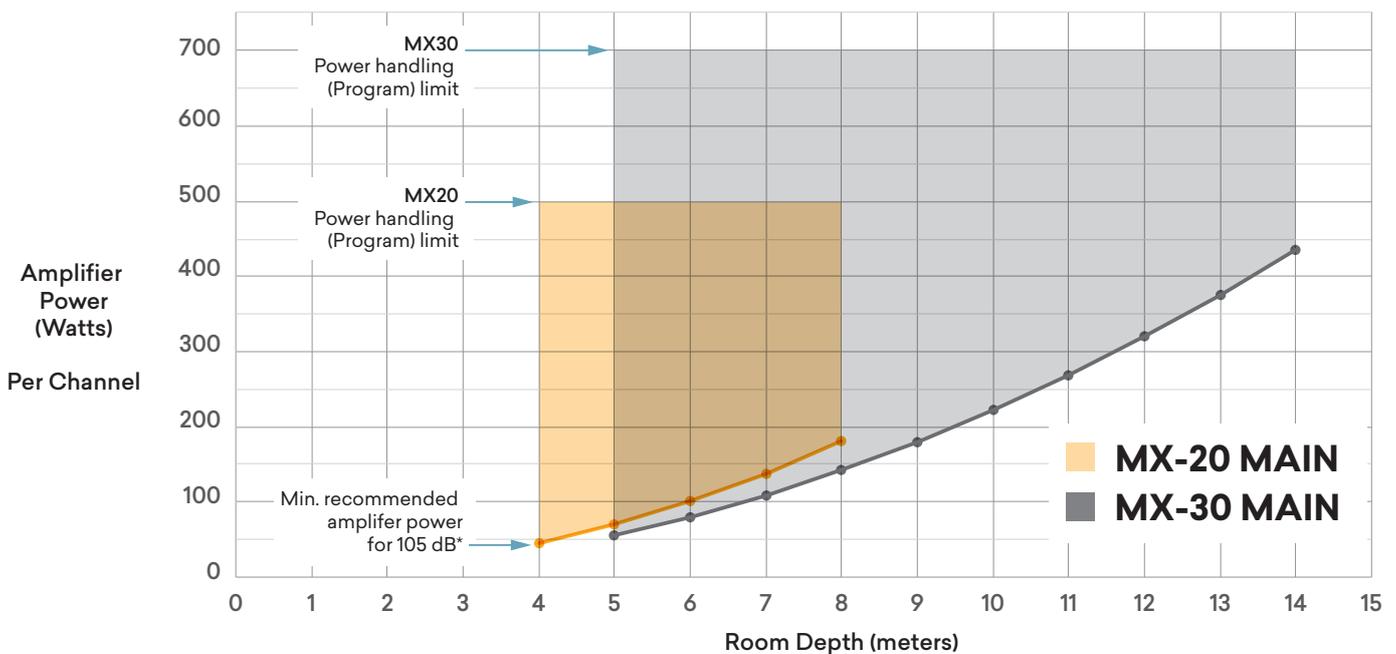
output of the amplifiers need to be carefully considered if the desired Dolby® reference level is to be achieved.

The Series MX loudspeaker systems have been designed to suit a range of room sizes to best deliver a true cinematic experience. Taking into account the average number of seats each room size can accommodate, the table below illustrates the ideal room size range for each Series MX screen speaker system.

Note: - The Series MX system should be chosen based on room size, rather than being chosen based on budget or other limiting criteria. Selecting an MX-20 system for a room 10 meters in length could result in a less than optimal experience for people sitting near the back of the room. In this example, the SPL in the back row of seats will be lower than expected and clarity, intelligibility and the overall impact of the movie sound track will be significantly diminished.

| System | MX20 | MX30 |
|------------------------------|------------------------|-------------------------|
| Recommended Room Size | 20 - 40 m ² | 30 - 140 m ² |
| Maximum Room Length | 8 m | 14 m |

MX MAIN SPEAKER AMPLIFIER POWER



AMPLIFICATION

To deliver Dolby® reference sound pressure levels (SPL) in the home cinema, three main design elements are critical to this outcome. The size of the room, the sensitivity of the speakers and the power output of the amplifiers.

The Series MX speakers and subwoofers have much higher sensitivity than typical hi-fi speakers. This means that the amplifier power requirements are not excessive, even when installed in larger than average room sizes.

When used in a room of recommended size, the MX-20 Main speakers can be powered successfully with a mid to top tier AV receiver.

The MX-30 system is best utilised in larger home cinemas and it is recommended that all speakers are driven with a separate processor and power amplifiers, rather than an all-in-one AV receiver.

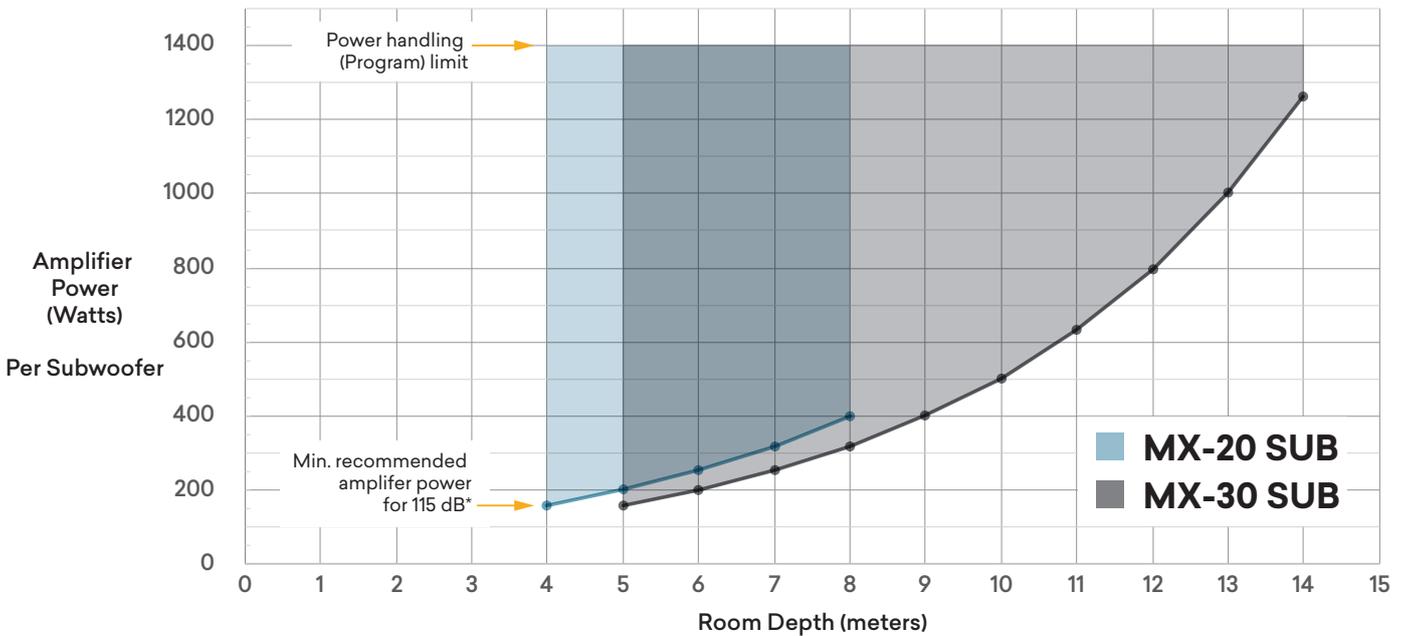
Separate power amplifiers (including ones with multiple channels) have the capability to deliver more current and therefore produce the dynamics and impact desired for a true cinematic experience.

As the subwoofers in the Series MX systems are passive (not self-powered), an independent power amplifier, connected to the LFE channel(s) of the AV receiver/processor, is required to power these units.

For best results with all MX series subwoofers, it is strongly suggested that a professional style power amplifier is employed which has a selectable output limiter and high-pass filtering options. For more information regarding the configuration of these options, see the Equalisation section on Page 14.

Below are two graphs of the recommended amplifier power for each Series MX model in relation to room size. The minimum power line will provide cinema Dolby ATMOS® reference levels (105dB mains, 115dB LFE). Anything above this will allow additional headroom.

MX SUBWOOFER SPEAKER AMPLIFIER POWER



SYSTEM DIMENSIONS

MX systems are designed to fit into a niche or cavity in the front wall. This cavity is located directly behind the screen (shown in Figure 1).

Overall dimensions

The choice of MX system needs to be considered in conjunction with the screen size.

Spacer modules are available to increase the distance between left and right modules to accommodate wider screen formats and improve stereo separation.

The tables in Figures 2 & 4 show the overall dimensions along with recommended cavity size for each MX system. Use these dimensions as a guide to match up to your selected screen size:

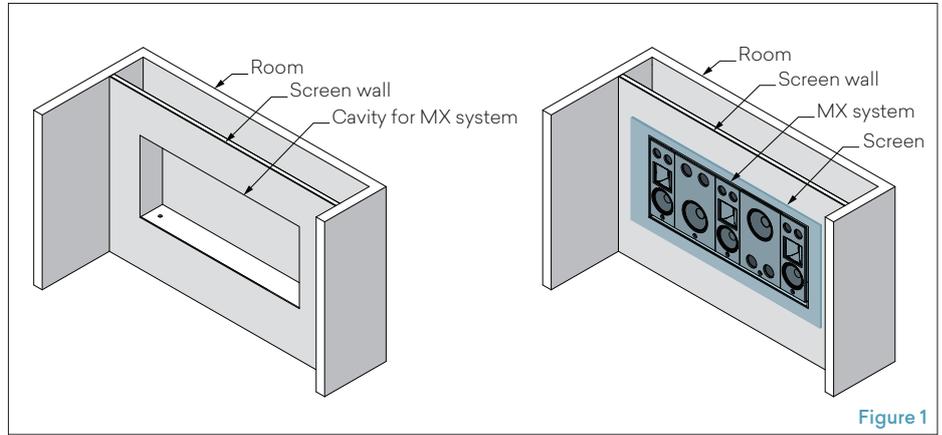
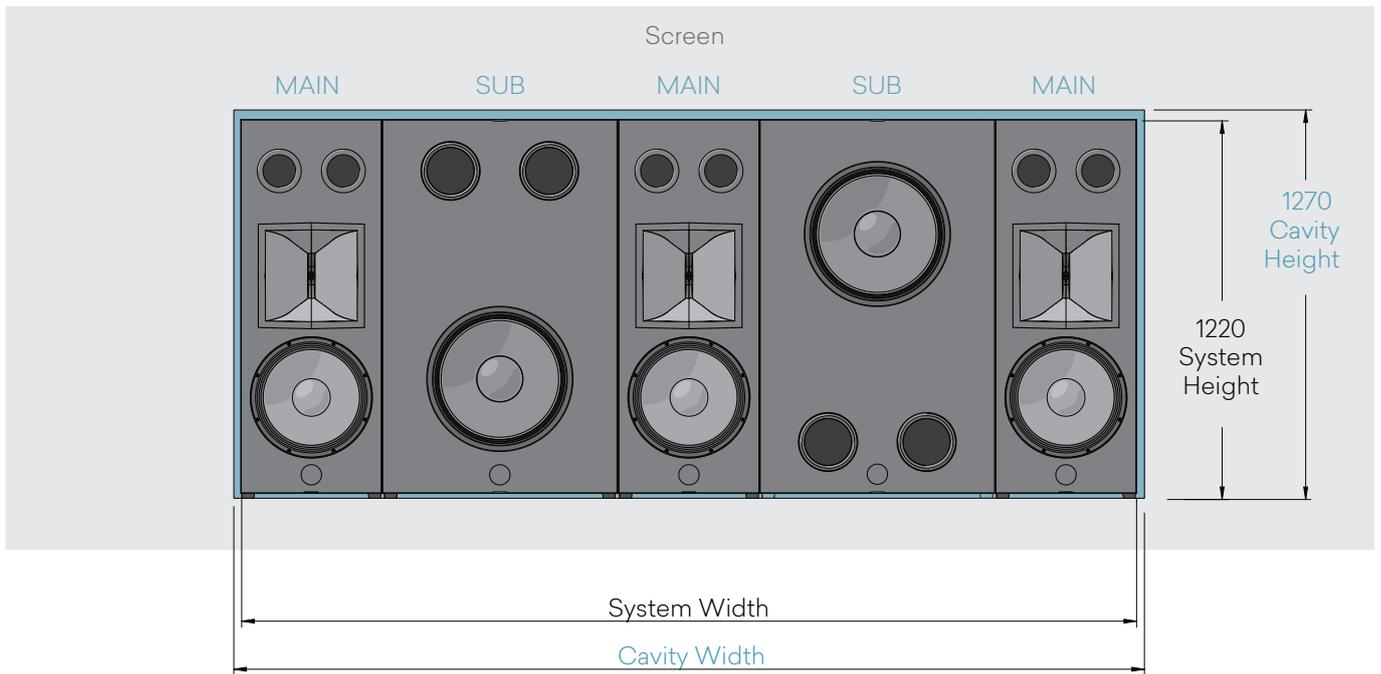


Figure 1

MX SYSTEM, Without Spacers



| System | System Width | System Height | System Depth | Cavity Width | Cavity Height | Cavity Depth |
|--------|--------------|---------------|--------------|--------------|---------------|--------------|
| MX20 | 2210 mm | 1220 mm | 295 mm | 2260 mm | 1270 mm | 320 mm |
| MX30 | 2865 mm | 1220 mm | 335 mm | 2915 mm | 1270 mm | 400 mm |

Figure 2

SYSTEM POSITIONING

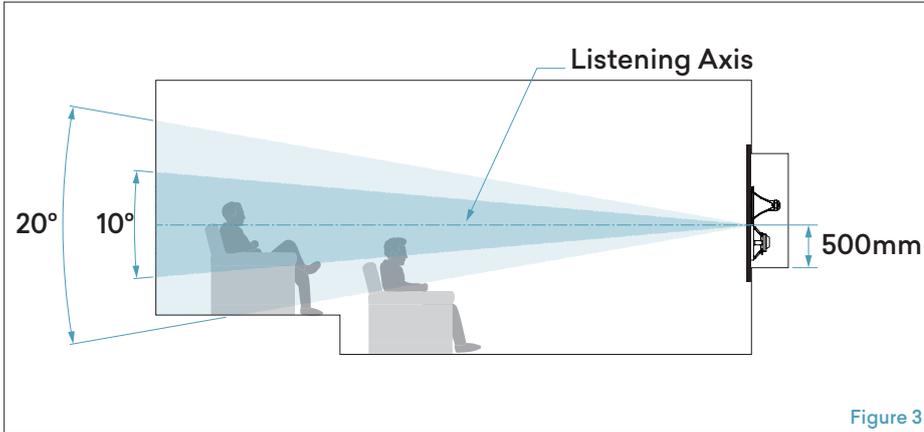


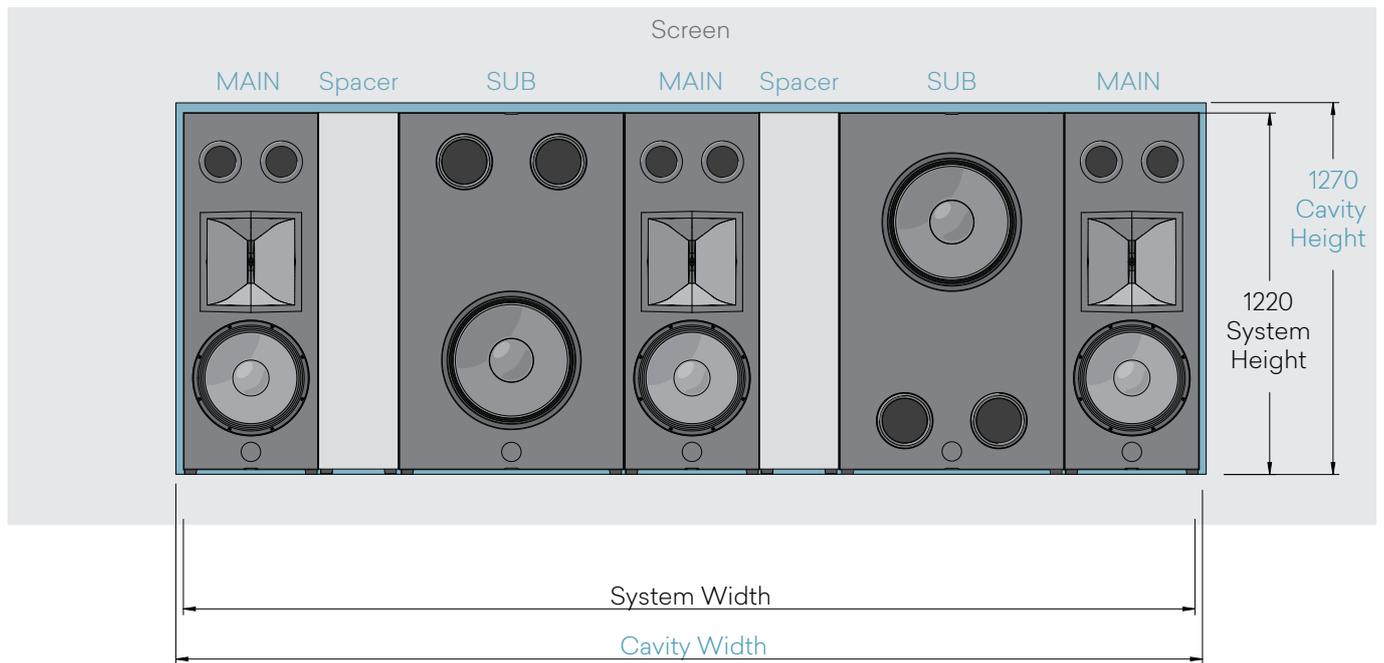
Figure 3

Vertical positioning

When planning a dedicated home cinema, consideration should first be made for seating locations and then screen size. Once these have been decided, due consideration should then be given to the vertical positioning of the cavity behind the screen, so that the seated ear level of the listeners is within 10 degrees of the listening axis of the speaker (500mm from base of speaker module). For secondary viewing rows, it is recommended to keep this angle within 20 degrees.

Care should also be taken to ensure the first row of viewers do not obstruct the sound path for viewers behind them. Raising the platform height for subsequent rows can help to alleviate these issues.

MX SYSTEM, With Spacers



| System | Spacer Width | System Width | System Height | System Depth | Cavity Width | Cavity Height | Cavity Depth |
|--------|--------------|--------------|---------------|--------------|--------------|---------------|--------------|
| MX20 | 200 mm | 2610 mm | 1220 mm | 295 mm | 2660 mm | 1270 mm | 320 mm |
| | 325 mm | 2860 mm | 1220 mm | 295 mm | 2910 mm | 1270 mm | 320 mm |
| MX30 | 200 mm | 3265 mm | 1220 mm | 335 mm | 3315 mm | 1270 mm | 400 mm |
| | 325 mm | 3515 mm | 1220 mm | 335 mm | 3565 mm | 1270 mm | 400 mm |

Figure 4

SCREEN WALL CONSTRUCTION

The construction of the false wall to suit the MX system is fairly straight forward. It is recommended that the designer should consider the need for sound isolation into adjoining rooms as applicable.

For example, if the wall adjoins a utilities room such as a laundry or garage then it may be deemed that sound leakage into these spaces is not an important consideration.

Alternatively, if the wall adjoins a living space such as a bedroom or lounge room area then it may be beneficial to build the wall in such a way to reduce the sound transmission into the neighbouring space.

There are two recommended methods of constructing the screen wall depending on building constraints and budget.

Extra care should be taken to ensure fixings have been properly anchored and that plasterboard is sufficiently adhered to studwork. Any loose construction increases the chance of unwanted resonance.

Fixing the cavity directly to the rear wall is the simplest method, although increases the likelihood of sound transmission through to the adjoining rooms. This technique is outlined under the section **Fixed directly to rear wall.**

To reduce the sound transmission as much as possible, it is recommended to create a stand-alone screen wall. This particular technique is outlined under the section **Isolated from rear wall.**

Fixed directly to rear wall

Using this construction method, the shelf studwork supporting the MX modules is fixed securely with construction adhesive in conjunction with screws or nails to the baffle wall and also to the rear wall of the adjoining room.

1. Fix the cavity frame to the rear wall. (Figure 5)
2. Erect a frame for the screen wall and fix this to the floor, ceiling and adjoining walls. (Figure 6)
3. Fix noggins in between frames so that plasterboard or engineered timber board can be fixed. At this point, it is recommended to insulate the void around the speaker cavity as much as possible using bulk insulation or similar. The more material placed into the cavity, the better for sound energy absorption. (Figure 7)
4. Finish the wall off using plasterboard or timber board on the wall panels and timber board on the cavity floor. (Figure 8)
 - It is important to use a timber board with a minimum thickness of 16mm for the cavity floor.
 - A hole for the speaker cabling is best placed at the front corner of the cavity floor.

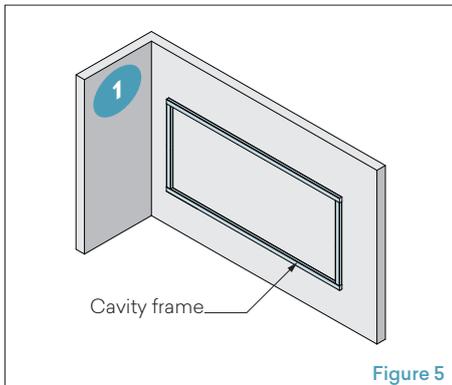


Figure 5

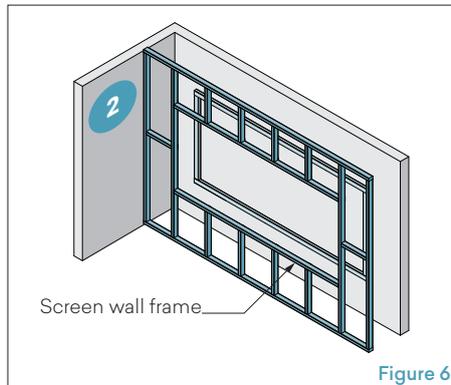


Figure 6

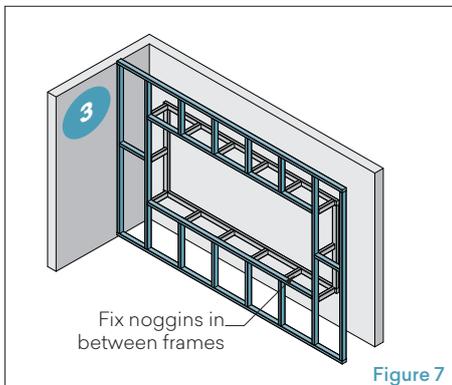


Figure 7

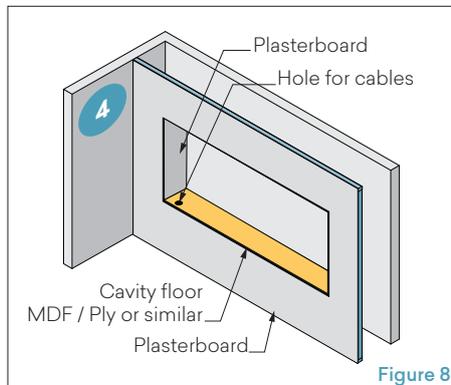


Figure 8

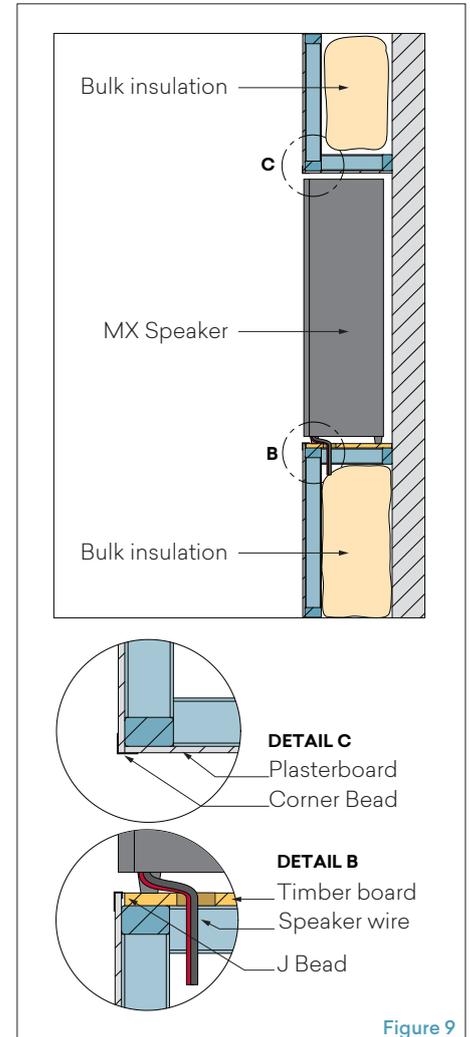


Figure 9

SCREEN WALL CONSTRUCTION

Isolated from rear wall

Using this construction method, the objective is to de-couple the false wall and speakers from the adjoining room wall. The shelf studwork supporting the MX modules is fixed securely with construction adhesive in conjunction with screws or nails to the baffle wall but is not directly connected to the adjoining rear wall.

Vertical studs at the rear of the support shelf should be secured to the floor, ceiling and side walls. To reduce the incidence of sound transmission, additional sheets of plasterboard can be applied to the inside face of the adjoining rear wall.

It is also strongly recommended that the cavity created between the false wall and adjoining room wall should be filled with bulk fill insulation of a sufficient density to contact the fascia sheeting. This will avoid the storage of vibrational energy both within the structure and standing wave build-up within the void.

1. Erect a false wall frame adjacent to the rear wall. Fix this wall to the floor and the ceiling. (Figure 10)

- Where possible, fill cavity with bulk insulation and then line the frame with plasterboard or other sheeting.

2. Erect a frame for the screen wall, and fix this to the floor, ceiling and adjoining walls. (Figure 11)

3. Fix noggins in between frames so that plasterboard or engineered timber board can be fixed. (Figure 12)

- At this point it is recommended to insulate the void around the speaker cavity as much as possible using bulk insulation or similar. The more material placed into the cavity, the better for sound energy absorption.

4. Finish the wall off using plasterboard or timber board on the wall panels and timber board on the cavity floor. (Figure 13)

- It is important to use a timber board with a minimum thickness of 16mm for the cavity floor.

- A hole for the speaker cabling is best placed at the front corner of the cavity floor.

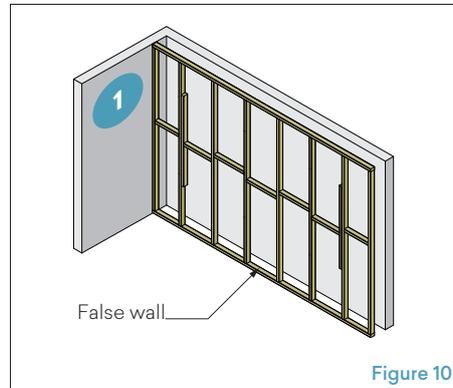


Figure 10

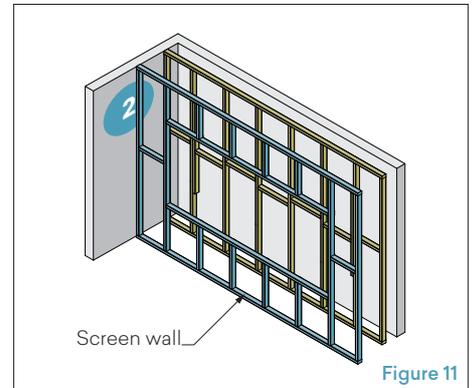


Figure 11

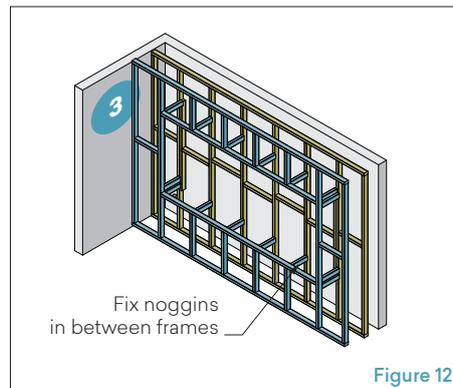


Figure 12

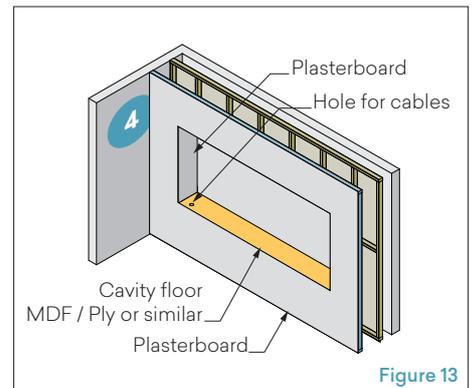


Figure 13

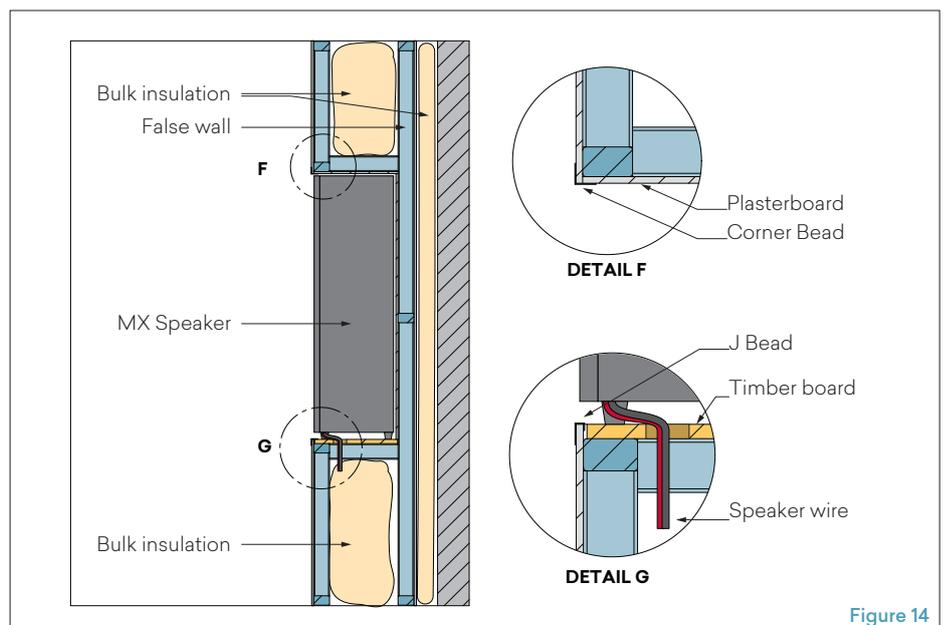
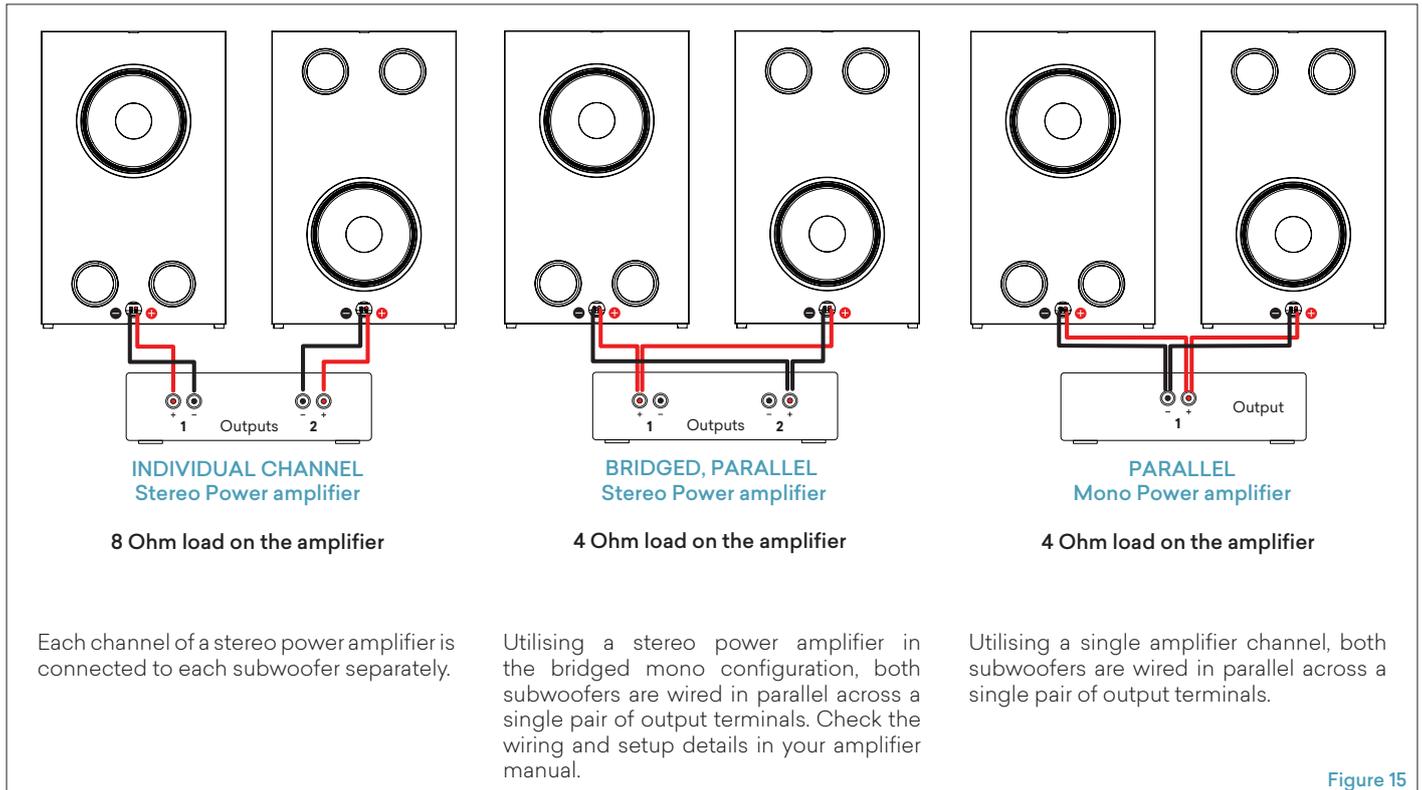


Figure 14

SUBWOOFER SETUP AND CONFIGURATION

All Series MX systems feature a dual subwoofer configuration. The subwoofers are deliberately orientated in an asymmetrical “up” and “down” configuration that will help balance the in-room low frequency response.

It is possible to wire the two subwoofer loudspeakers in the following ways:



Note - By wiring the subwoofers in parallel, the load impedance presented to the amplifier is halved to 4 Ohms, which consequently demands double the output current from the amplifier. Care should be taken to ensure that the specifications of the amplifier explicitly allow the increased loading of 4 Ohms, especially when used in a bridged mono configuration.

It is strongly recommended to run separate cabling for all channels in the MX modular loudspeaker system back to the central amplifier rack to permit future flexibility with the wiring configuration.

WIRING

The Series MX systems are installer friendly, with convenient terminal placement allowing easy installation of wiring along the bottom front edge of the loudspeaker enclosures. (Refer Figures 9 or 14)

The left, centre and right main speakers are not designed to be connected to an amplifier in a bi-amp configuration. Each main speaker has only one set of speaker terminals, so therefore only one length of 2 core speaker cable is required.

Processors, amplifiers and other components may be mounted remotely in equipment racks at considerable distances from the screen loudspeakers. Therefore, the use of high quality, flexible, multi-stranded copper cables of suitable gauge are recommended for best performance.

For cable runs up to 10m in length, a minimum 14AWG gauge cable should be specified for the main left, main centre and main right loudspeakers, and at least 12AWG cable for the subwoofers. For longer cable runs consider using thicker cable. If in doubt, consult your Krix authorised dealer or system designer for recommendations regarding the gauge of cable.

MAXIMUM WIRE LENGTHS FOR TWO CONDUCTOR COPPER WIRE

| Wire Size | 4 Ω Load | 6 Ω Load | 8 Ω Load |
|--------------------------------------|-----------------|-----------------|-----------------|
| 18 AWG (0.823 mm²) | 4.9 m (16 ft) | 7.3 m (24 ft) | 9.7 m (32 ft) |
| 16 AWG (1.31 mm²) | 7.3 m (24 ft) | 11 m (36 ft) | 15 m (48 ft) |
| 14 AWG (2.08 mm²) | 12 m (40 ft) | 18 m (60 ft) | 24 m (80 ft) |
| 12 AWG (3.31 mm²) | 18 m (60 ft) | 27 m (90 ft) | 36 m (120 ft) |
| 10 AWG (5.26 mm²) | 30 m (100 ft) | 46 m (150 ft) | 61 m (200 ft) |

EQUALISATION

Due to the use of Krix constant directivity horns and waveguides, the Series MX systems have an advantage over conventional speakers as they deliver more direct sound to the listener and less sound reflecting off the walls and ceiling. The baffle wall design of the MX system also launches the sound from a flat plane, ensuring the frequency response is unhampered by acoustic diffraction effects and front wall reflections associated with conventional home theatre installations. The MX systems are therefore less influenced by the acoustics of the room.

Before attempting to perform equalisation of your processor or receiver, please ensure that adequate attention has been given to the acoustics of the room and acoustic treatment options have been explored. Equalisation can only partially compensate for a room with poor acoustics.

As an initial step, Krix suggest configuring your AV receiver/processor with manual equalisation settings to achieve a simple and faithful re-production of the source material.

Automated equalisation procedures may also be employed, but the results will vary depending on the algorithms and microphone placement techniques.

Speaker distances and dB levels

Automated speaker configuration systems are very good at setting the speaker distances (delays) and setting dB levels for each speaker in a system. If using this approach, it is advised to check the settings manually for any anomalies. In some instances, increasing the centre channel level by 1-3dB is preferred for increased dialogue intelligibility. Adjusting the subwoofer level manually is often required to suit the listener preferences. Boosting or cutting the subwoofer level by up to 9dB is not uncommon to achieve the desired result.

Speaker size

Automated setup procedures may also be used to set the size of each speaker, but the results should be checked and adjusted where necessary.

Although the MX-20 and MX-30 main speakers are physically 'large', setting them to small allows the lower bass frequencies to be sent to the subwoofers that are better suited to reproducing the lowest frequency content.

MX-20 Main – recommended to set speakers to small with 60Hz crossover

MX-30 Main – recommended to set speakers to small with 40Hz crossover

Subwoofer power amplifier configuration

Limiters:

Where available, the use of a power amplifier's soft limiter function is strongly recommended on MX subwoofers.

If the power amplifier driving the subwoofers is inadvertently overdriven on program peaks, the use of an effective soft limiter will protect the loudspeaker driver against clipping damage and will also reduce the incidence of adverse distortion when the amplifier is faced with signals in excess of its peak rating.

High pass filter

The MX subwoofer can benefit from the use of an appropriately selected high pass filter. By filtering out the subsonic frequencies, the overall system power handling is improved.

MX20 Sub – 25Hz high pass 12dB /Oct

MX30 Sub – 20Hz high pass 12dB /Oct

Dynamic Compression / Night Listening

The MX systems are capable of reproducing the full dynamic range of a movie, therefore it is recommended that dynamic compression or night listening mode settings are disabled in both the AV receiver/processor and blu-ray player configuration menus. This will allow the reproduction of the movie soundtrack's full dynamic range, as the director intended.

Dynamic Equalisation / Loudness Controls

'Loudness' type settings adjust the equalisation of the system by boosting the bass and treble due to the human ears lack of acuity over these frequency ranges at low listening levels. Unless you intend to do a lot of listening at low volume levels it is best to disable this setting to maintain a faithful reproduction of the source material.

Room equalisation

The native response of the MX system is designed to be consistent across the frequency range, however some room equalisation is often beneficial in tuning the response of the system to the environment. Room equalisation involves dealing with the somewhat complicated subject of room acoustics and to clarify this often-confusing subject it may help to consider the different characteristics of the room environment and system equalisation separately.

Room size and 'liveness' / reverberation time

The reverberation time of the room is the time taken for reflected sound energy in the room to reduce to a low level. Highly treated rooms have lots of absorbing surfaces that are particularly effective at higher frequencies. This type of room can benefit from a lift in the treble to avoid the system sounding too dull or 'soft'. Alternatively, larger rooms may be perceived as sounding too bright when combined with speakers that have a flat frequency response and so a gentle treble roll-off may be preferable. The MX systems have a slight treble roll-off and therefore will tend to sound most balanced in larger, moderately treated rooms. In smaller and/or well treated rooms, some treble lift is recommended. Also, some treble lift may be required to compensate for treble loss through perforated acoustic screens. Woven screens are acoustically superior and suffer from very little treble loss.

EQUALISATION

Standing-wave issues

Small to moderate size rooms with standard height ceilings are prone to standing wave issues below 500Hz, resulting in peaks and dips in the system response. Automated DSP based solutions can be good at addressing these issues but results will vary depending on the algorithms employed by the DSP and the number and positions of the microphone measurement points used during the equalisation process. Small to moderate size rooms tend to skew the bass and mid-bass response of the system due to the close proximity of the sidewalls and ceiling to the speaker array. Applying some cut to the mid-bass (100-250Hz) region in small to medium rooms can help to combat the issues mentioned above.

Automated room correction and speaker equalisation.

There are many room equalisation products on the market that attempt to combat the issues highlighted previously, but these systems often target a flat frequency response which can sound too bright, forward and harsh in an average home cinema environment. Some also pull too much energy out of the mid bass region, resulting in a 'thin' sounding system that lacks 'warmth' and 'weight'. Listen for these issues when evaluating the results of an automated room correction system.

Manual graphic equalisation.

Manual graphic equalisation allows for a gentler equalisation curve to be applied allowing the large 'cinema sound' of the MX system to be maintained. Below are some suggested equalisation settings to use for the MX systems.

Use these settings as a guide when equalising an MX system:

Highly treated room under 8m deep

| Frequency | Gain |
|-----------|------|
| 63Hz | -3dB |
| 125Hz | -3dB |
| 250Hz | -3dB |
| 500Hz | -2dB |
| 1kHz | -1dB |
| 2kHz | 0dB |
| 4kHz | 0dB |
| 8kHz | 0dB |
| 16kHz | +4dB |

Lightly treated room under 8m deep

| Frequency | Gain |
|-----------|------|
| 63Hz | -3dB |
| 125Hz | -3dB |
| 250Hz | -3dB |
| 500Hz | -2dB |
| 1kHz | -1dB |
| 2kHz | 0dB |
| 4kHz | 0dB |
| 8kHz | 0dB |
| 16kHz | +1dB |

Highly treated room over 8m deep

| Frequency | Gain |
|-----------|------|
| 63Hz | 0dB |
| 125Hz | 0dB |
| 250Hz | 0dB |
| 500Hz | 0dB |
| 1kHz | 0dB |
| 2kHz | 0dB |
| 4kHz | 0dB |
| 8kHz | 0dB |
| 16kHz | +3dB |

Lightly treated room over 8m deep

| Frequency | Gain |
|-----------|------|
| 63Hz | 0dB |
| 125Hz | 0dB |
| 250Hz | 0dB |
| 500Hz | 0dB |
| 1kHz | 0dB |
| 2kHz | 0dB |
| 4kHz | 0dB |
| 8kHz | 0dB |
| 16kHz | 0dB |

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