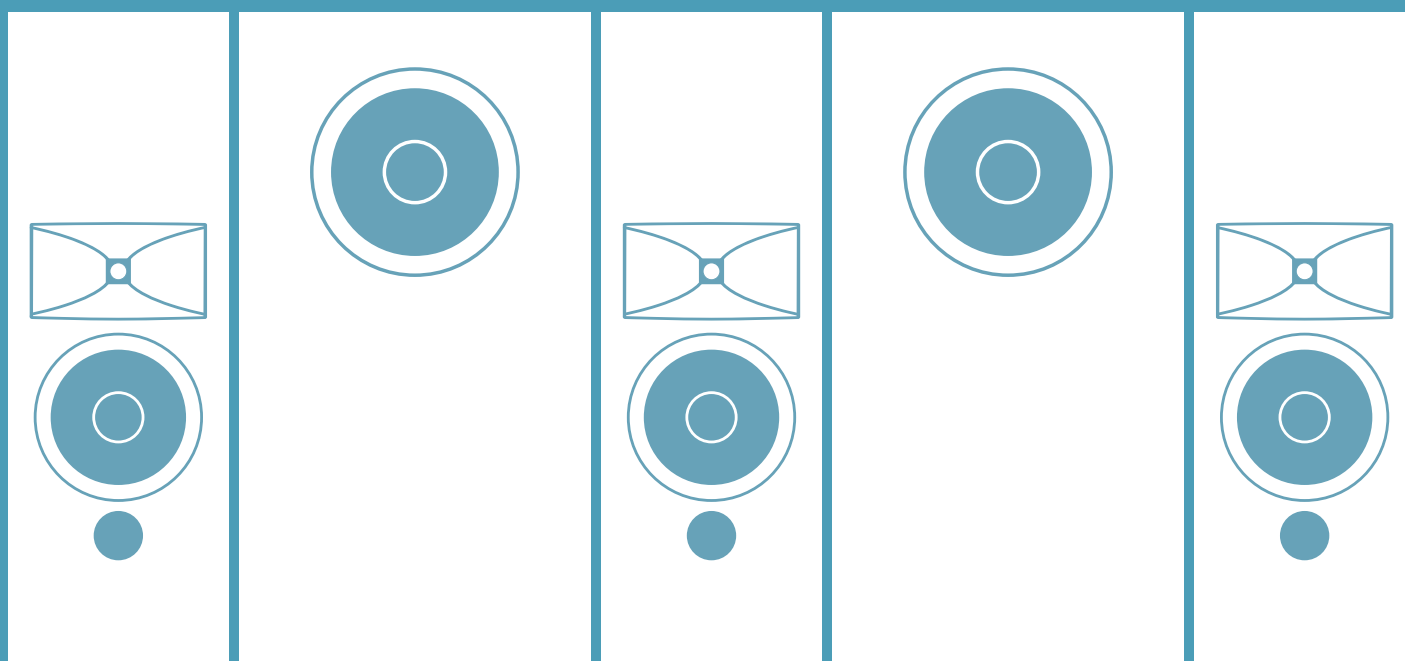


MX-5 & MX-10 INSTALLATION MANUAL



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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 and waveguide

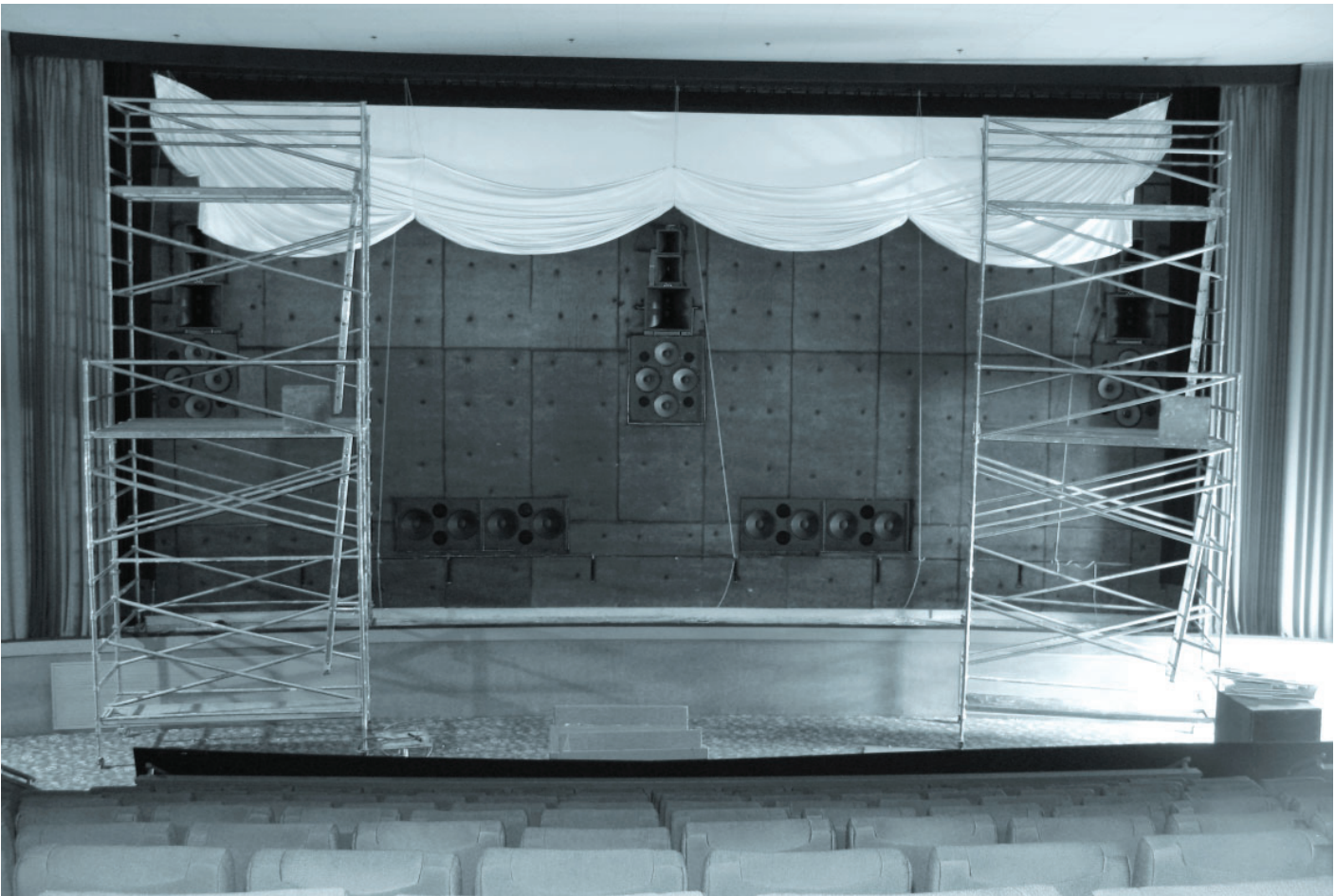
loudspeakers, leading to improvements in efficiency, directivity and distortion characteristics. Krix innovations have resulted in several patents in the area of constant directivity horns and places Krix as a leader in technology and design in the cinema audio industry.

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 of each speaker is covered with an acoustic absorbent material to absorb sound reflections off the back of the screen. This also assists 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. Commerical cinema installation featuring a 'Baffle Wall', Krix commerical 4-Way loudspeakers and dual 18" subwoofers.

ROOM SUITABILITY

The MX-5 and MX-10 systems are designed for media rooms and dedicated home cinemas. They are capable of delivering very high sound pressure levels (SPL) 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 maximises the available space in the home cinema (see front wall construction section for more details).

As the Series MX loudspeakers are capable of producing much higher sound pressure levels (SPL) than conventional 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 reducing leaks in the room can greatly increase the effectiveness of room isolation at a moderate expense; openings in the room, door seals, windows and air conditioning vents are all possible sources of sound leakage.

If sound isolation is a concern to you, it is highly recommended 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, and strategically placed diffusion to maintain a natural sound and give the room a larger sense of space. Untreated, hard surfaces adjacent to the loudspeakers are not ideal.

To get the best performance from your home cinema, it is recommended 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.

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.

ROOM SIZE

In a commercial setting, 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. To achieve ‘reference sound pressure levels’, room size and speaker sensitivity ratings play a large role in determining amplifiers power output requirements.

A dedicated home cinema with a larger screen, particularly one with multiple rows of seats, places viewers further away from

the screen and therefore requires higher sensitivity speakers and/or higher powered amplifiers. Smaller rooms, particularly those with lowered SPL requirements, allow more options when deciding the Series MX system.

The Series MX loudspeaker systems have been designed to suit a range of room sizes to best deliver a true cinematic experience. The table below illustrates the ideal room size range for each Series MX screen speaker system and expected sound pressure levels.

Sound pressure levels should also be considered for surround and overhead effect speakers, to maintain the dynamic soundtage throughout the room. These speakers are

generally closer to the listening position than the main front speakers, and therefore lower sensitivity speakers or less amplifier power may be sufficient.

As the Series MX speakers and subwoofers have higher sensitivity than typical hi-fi speakers, 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-5 and MX-10 main speakers can be powered successfully with a mid to top tier AV receiver.

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.

AMPLIFICATION

With all MX series subwoofers, it is strongly recommended that a professional style power amplifier is employed which has a selectable output limiter and high-pass filtering options. Failure to set these options may result in damage to the subwoofers. For more information regarding the configuration of these options, see the Equalisation section on Page 14.

Each MX-5 subwoofer has a rated power handling capacity of 350 Watts (W) into 4 Ohms (Ω), while each MX-10 subwoofer has a rated power handling capacity of 500 Watts (W) into 4 Ohms (Ω).

To avoid damage to the subwoofer drivers, it is recommended to not exceed these power ratings.

A suitable example to power the 2 x MX-5 subwoofers is a Yamaha PX3 amplifier rated at 2 x 500 Watts into 4 Ω (limit to 350W).

A suitable example to power the 2 x MX-10 subwoofers is a Yamaha PX3 amplifier rated at 2 x 500 Watts into 4 Ω .

Reference Level 105dB

‘Reference Level’ is the calibrated volume of sound reproduction utilised in commercial and high end home cinemas. It is the volume level that directors intend to deliver the full dynamic range of movie dialogue, music and effects with 105dB peaks. From quiet whispers to huge explosions – the viewer can experience lifelike transients at the height of realism.

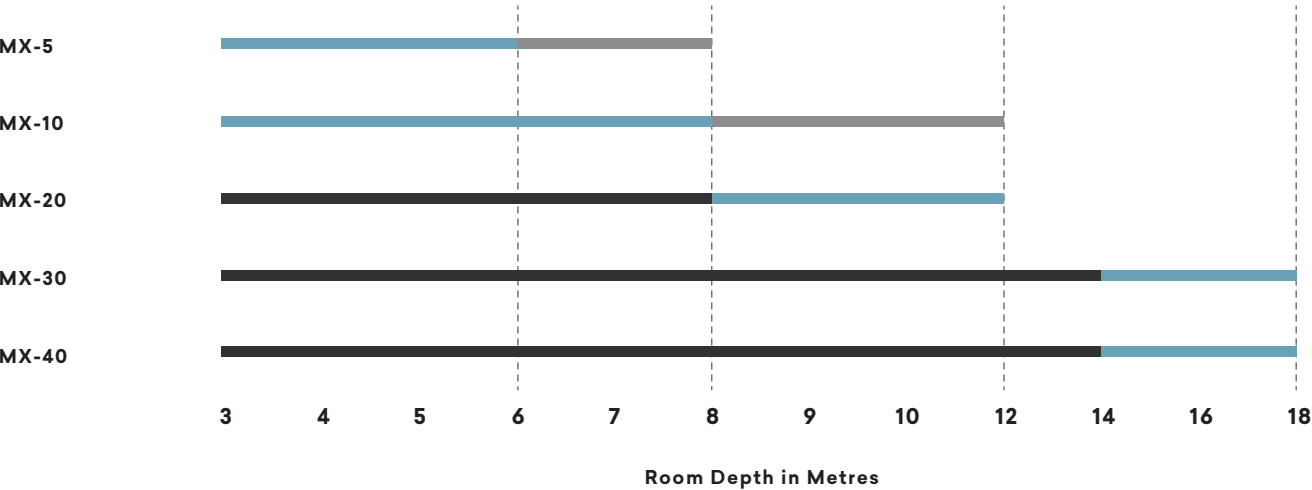
Performance Level 102dB

The ‘Performance Level’ volume of audio playback with 102dB peaks is still very close to the reference playback level of legacy commercial cinema formats. This level maintains almost all of the dynamic range of movie soundtracks and delivers an incredibly immersive experience from the most intricate sounds to the most explosive.

High Level 99dB

While reference level is the epitome of movie reproduction, not every home cinema owner may need, or want, to reach this level. The ‘High Level’ volume of audio playback reaches peaks of 99dB and should not be underestimated. Clean, powerful and lifelike dialogue and effects are more than achievable at this level.

Series MX SPL Performance



SYSTEM DIMENSIONS

Series MX systems are designed to fit into a niche or cavity within the wall behind the projector screen (shown in Figure 1). This method creates an infinite baffle wall as previously described in the Introduction.

If budget or construction constraints require a less bespoke solution, alternative solutions are suggested in the Screen Wall Construction section (Pg 11).

Overall dimensions

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

The tables in Figures 2 and 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.

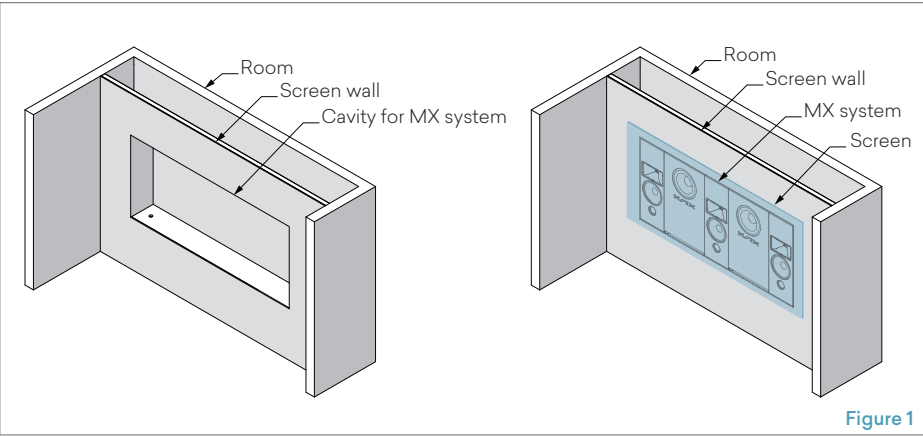


Figure 1

SYSTEM POSITIONING

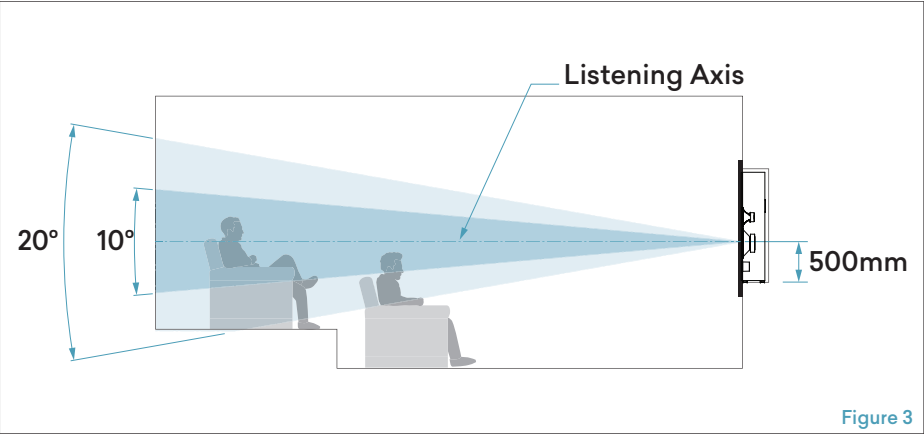


Figure 3

Vertical positioning

When planning a dedicated home cinema, consideration should first be made for seating locations followed by the screen size and position. Once these have been decided, the listening axis of the speaker should be considered for best audio performance (500mm from base of speaker module, figure 3). Try to position the speaker cavity behind the screen so that the listening axis of the speaker is within 10 degrees of the listener's seated ear level. 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.

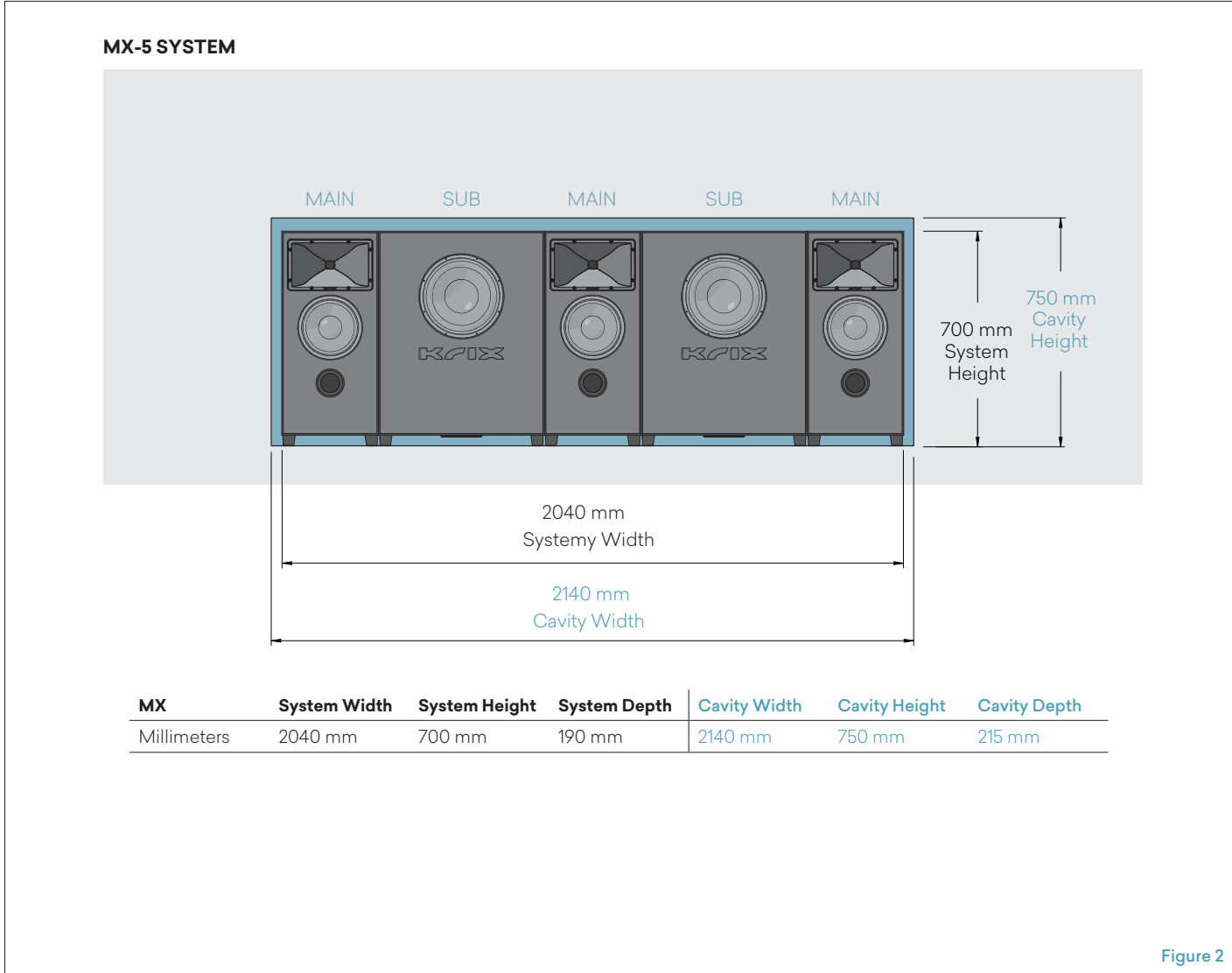


Figure 2

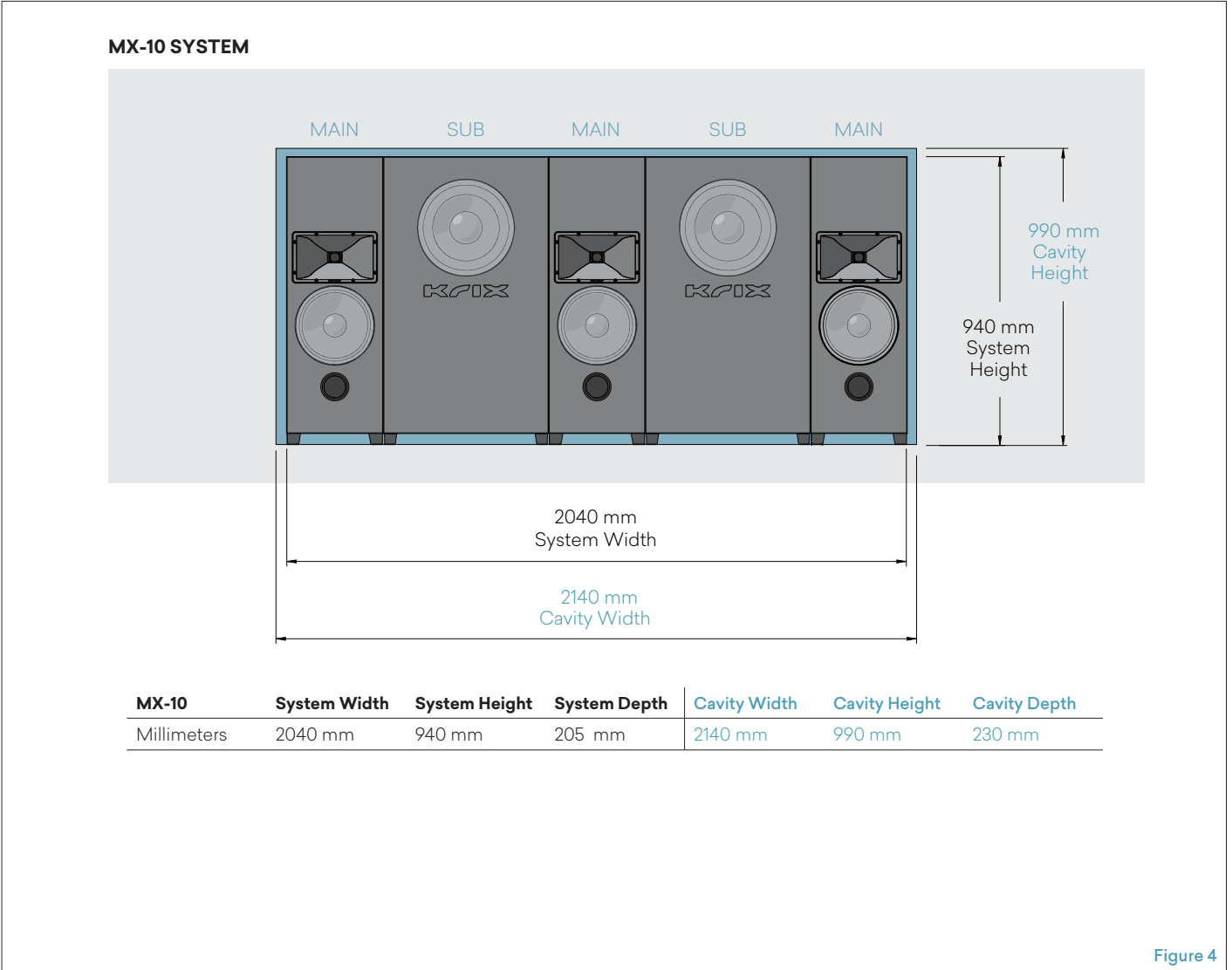


Figure 4

SCREEN WALL CONSTRUCTION

The MX-5 and MX-10 systems can be installed in different ways, depending on room layout, building requirements or budget. They can be installed underneath a TV or projector screen, but we recommend using an acoustically transparent screen. Positioning the speakers directly behind the screen will improve the listening axis and create a more cinema-like experience. The following two installation methods allow the MX system to be placed directly behind the screen.

The first, and preferred installation method is to construct a false wall. 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.

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.

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.

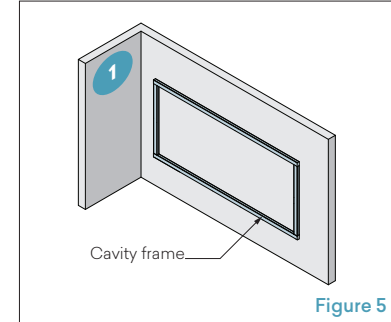


Figure 5

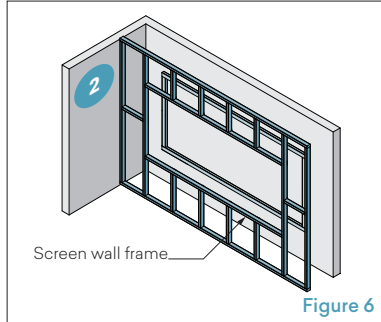


Figure 6

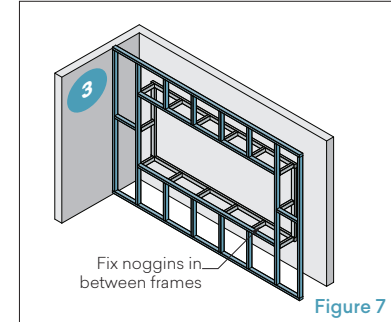


Figure 7

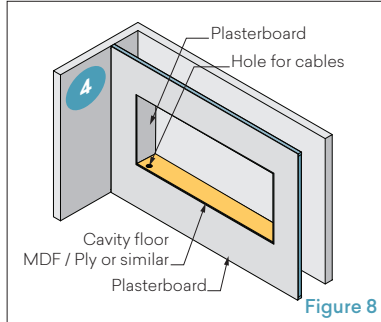


Figure 8

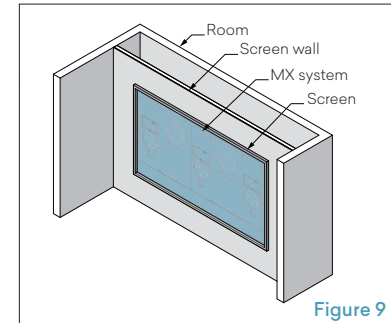
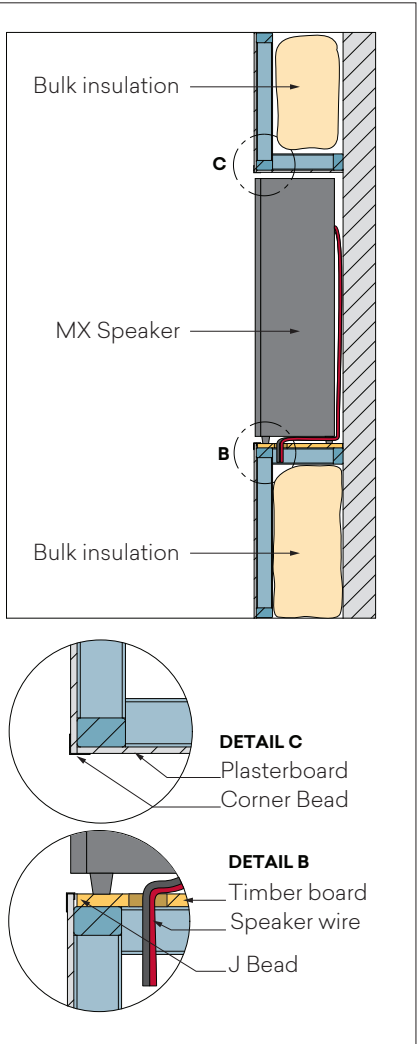


Figure 9



SCREEN WALL CONSTRUCTION

Plinth or shelf construction

The second and most economical solution is to build or purchase a plinth, cabinet or shelf that the MX system will stand on.

This will also raise the listening axis to an ideal position for the listener, and hide the speakers behind the screen. It is essential that any item used to support the MX system has the acceptable load rating. If a shelf is being used, appropriate fixings into solid substrate are essential.

1. Construct or purchase appropriate items to support the MX system at the ideal listening axis height. A bulkhead or bracket will also be required for the screen to mount to. (Figure 10)
2. Place the MX System onto the cabinet or plinth. (Figure 11)
3. Mount the screen to bulkhead. (Figure 12)

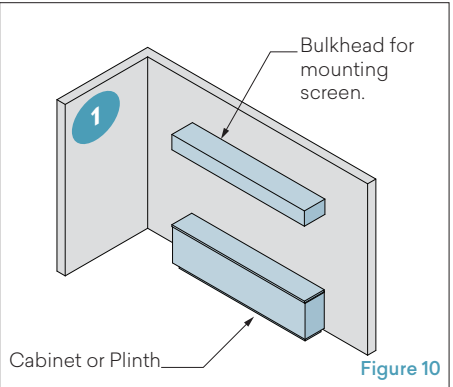


Figure 10

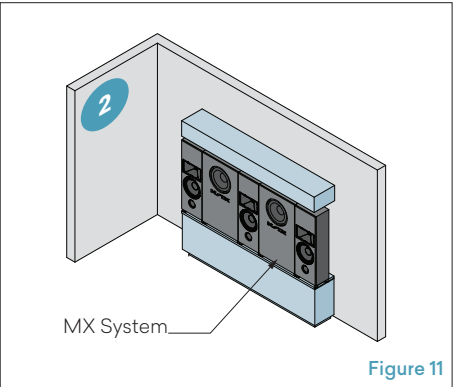


Figure 11

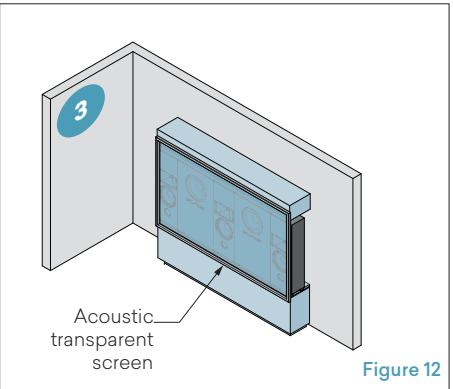
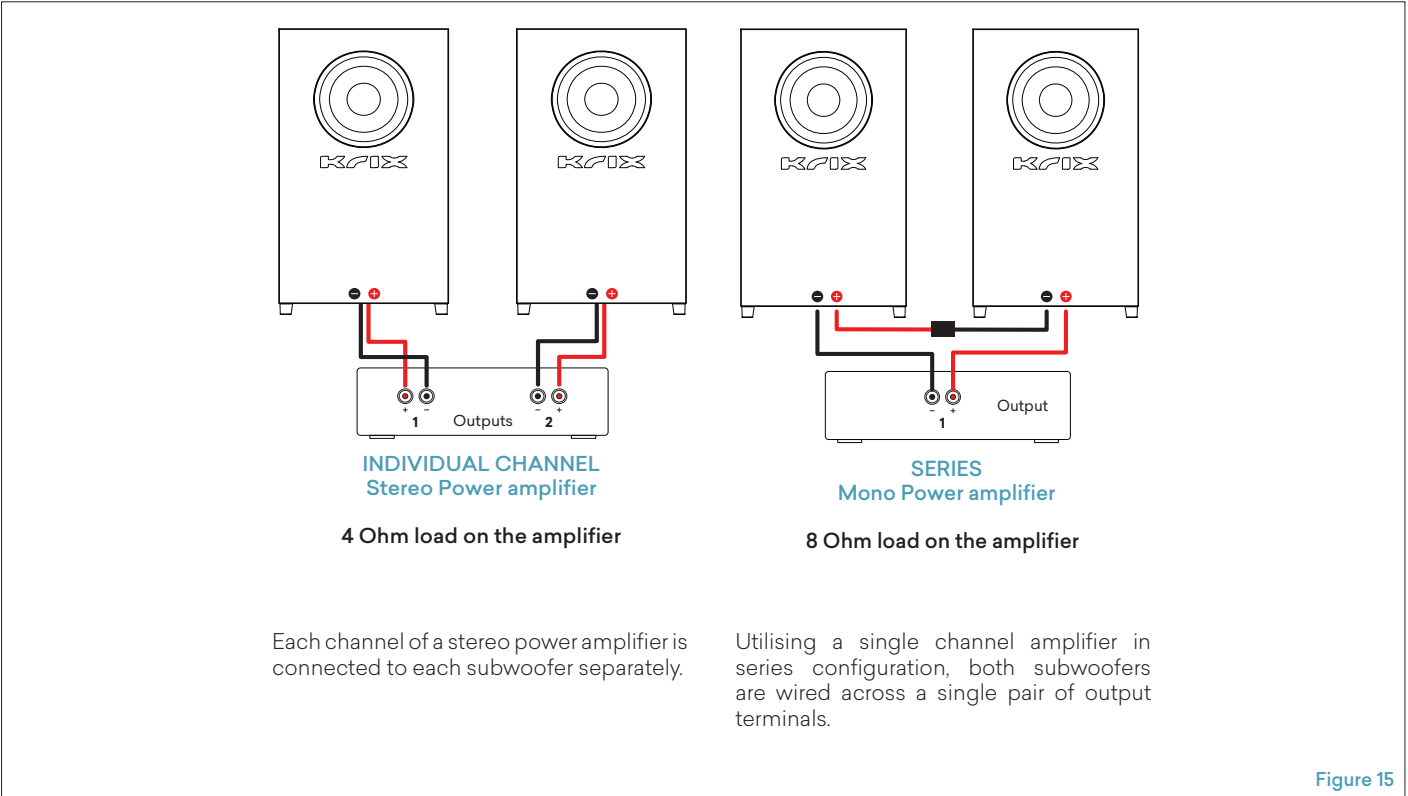


Figure 12

SUBWOOFER SETUP AND CONFIGURATION

The MX-5 and MX-10 systems feature a dual subwoofer configuration. It is recommended to wire up the pair of subwoofers in either of the following ways:



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

WIRING

The terminals for each speaker are located at the rear of the speaker. Wiring the speakers will need to be done before placing the speakers in position.

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 12m in length, a minimum 14AWG gauge cable should be specified. Refer to the table below for maximum recommended cable lengths for each speaker wire gauge. Thicker, heavier gauge cables have a lower AWG number. For longer cable runs ensure heavier gauge cables are used. If in doubt, consult your Krix authorised dealer or system designer for recommendations regarding the gauge of cable.

Recommended maximum cable lengths considering cable thickness

Wire Size	MX-5/MX-10 Subwoofers	MX-5/MX-10 Mains
14 AWG (2.08 mm2)	12 m (40 ft)	24 m (80 ft)
12 AWG (3.31 mm2)	18 m (60 ft)	36 m (120 ft)
10 AWG (5.26 mm2)	30 m (100 ft)	61 m (200 ft)

EQUALISATION

Due to the use of Krix constant directivity horns and waveguides, the 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 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-5 & MX-10 Mains – recommended to set speakers to small with 80Hz crossover



Subwoofer power amplifier configuration

Limiter:

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.

Recommended limiter settings:

MX-5: Limiter On - 350 Watts
MX-10: Limiter On - 500 Watts

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.

MX-5 & MX-10 – 30Hz high pass,
24dB /Oct,
Butterworth

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.

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.

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

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

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.

When using an automated DSP system that also allows for manual adjustment of a target frequency response (or target curve), a gentle roll-off of 2-5dB between 1-20Khz can be

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

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

desirable, resulting in a warmer, 'big speaker' sound.

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 manually equalising an MX system without using an automated DSP, microphone assisted setup procedure.

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