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Owner's Manual

MXa Series

- ▲ **MX 1000a**
- ▲ **MX 1500a**
- ▲ **MX 2000a**
- ▲ **MX 3000a**



TD-000026-00
Rev. B

MXa Series Power Amplifier Operation Manual

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EXPLANATION OF GRAPHICAL SYMBOLS



The lightning flash with arrowhead symbol, within an equilateral triangle, is intended to alert the user to the presence of uninsulated “dangerous voltage” within the product’s enclosure that may be of sufficient magnitude to constitute a risk of electric shock to humans.



The exclamation point within an equilateral triangle is intended to alert the users to the presence of important operating and maintenance (servicing) instructions in the literature accompanying the product.

EXPLICATION DES SYMBOLES GRAPHIQUES



Le symbole éclair avec point de flèche à l’intérieur d’un triangle équilatéral est utilisé pour alerter l’utilisateur de la présence à l’intérieur du coffret de “voltage dangereux” non isolé d’ampleur suffisante pour constituer un risque d’électrocution.



Le point d’exclamation à l’intérieur d’un triangle équilatéral est employé pour alerter les utilisateurs de la présence d’instructions importantes pour le fonctionnement et l’entretien (service) dans le livret d’instruction accompagnant l’appareil.

ERKLÄRUNG DER GRAPHISCHEN SYMBOLE



Der Blitz nach unten zeigendem Pfeil in einem gleichseitigen Dreieck weist den Benutzer auf das Vorhandensein einer unisolierten, „gefährlichen Spannung“ im Gehäuse hin, die stark sein kann, einer Person einen elektrischen Schlag zu versetzen.



Das Ausrufzeichen in einem gleichseitigen Dreieck weist den Benutzer auf wichtige Betriebs- und Wartungsvorschriften in den beiliegenden Unterlagen des Gerätes hin.



CAUTION
RISK OF ELECTRIC SHOCK
DO NOT OPEN



CAUTION: To reduce the risk of electric shock, do not remove the cover. No user-serviceable parts inside. Refer servicing to qualified service personnel.

WARNING: To prevent fire or electric shock, do not expose this equipment to rain or moisture.



AVIS
RISQUE DE CHOC
ÉLECTRIQUE
NE PAS OUVRIR



ATTENTION: Pour éviter les risques de choc électrique, ne pas enlever le couvercle. Aucun entretien de pièces intérieures par l'utilisateur. Confier l'entretien au personnel qualifié.

AVIS: Pour éviter les risques d'incendie ou d'électrocution, n'exposez pas cet article à la pluie ou à l'humidité.



VORSICHT
GEFAHR EINES
ELEKTRISCHEN SCHLAGES.
NICHT ÖFFNEN!



VORSICHT: Um das Risiko eines elektrischen Schlages zu vermindern, Abdeckung nicht entfernen! Keine Benutzer Wartungsteile im Innern. Wartung nur durch qualifiziertes Wartungspersonal.

WARNUNG: Zur Vermeidung von Feuer oder elektrischen Schlägen, das Gerät nicht mit Regen oder Feuchtigkeit in Berührung bringen!

SAFEGUARDS

Electrical energy can perform many useful functions. This unit has been engineered and manufactured to assure your personal safety. Improper use can result in potential electrical shock or fire hazards. In order not to defeat the safeguards, observe the following instructions for its installation, use and servicing.

PRECAUTIONS

L'énergie électrique peut remplir de nombreuses fonctions utiles. Cet appareil a été conçu et réalisé pour assurer une sécurité personnelle entière. Une utilisation impropre peut entraîner des risques d'électrocution ou d'incendie. Dans le but de ne pas rendre inutiles les mesures de sécurité, bien observer les instructions suivantes pour l'installation, l'utilisation et l'entretien de l'appareil.

I. WARNING NOTICES

SPEAKER DAMAGE

The MXa Series amplifiers are among the most powerful professional amplifiers available and is capable of producing much more power than many loudspeakers can handle. It is the user's responsibility to use suitable speakers with the amplifier and to use them in a sensible way that will not cause damage.

QSC will not be responsible for blown speakers. Consult the speaker manufacturer for power-handling recommendations.

Either channel of the MX 3000a amplifier has special clip-limiting protection circuitry that reduces the signal level at the onset of heavy clipping. This not only allows the amplifier to operate at a high average power level without audible distortion occurring, but it also prevents the speakers' being destroyed by excessive clipping. However, if the amplifier is operating normally and your speakers fail anyway, it is virtually certain that they could not handle the high power, despite the lack of clipping.

Even if you reduce the gain using the amplifier's front panel attenuator controls, it is still possible to reach full output power if the input signal level is high enough.

A single high-power crescendo can blow high-frequency drivers almost instantaneously, while low-frequency drivers can usually withstand very high, continuous power levels for a few seconds before they fail. Reduce power immediately if you hear any speaker "bottoming out"—harsh pops or cracking distortion that indicate that the speaker voice coil or diaphragm is striking the magnet assembly.

QSC recommends that you use amplifiers of this power range for more headroom (cleaner sound) rather than for increased volume.

SPEAKER OUTPUT SHOCK HAZARD

An MXa amplifier is capable of producing hazardous output voltages. To avoid electrical shock, do not touch any exposed speaker wiring while the amplifier is operating.

RACK MOUNTING PRECAUTIONS

In portable racks, to avoid damage to either the amplifier mounting ears or the mounting rails, support the amplifier at all four corners. Contact the QSC Customer Service Department to order rear support brackets.

II. OVERALL DESCRIPTION

The MXa Series from QSC comprises four high-efficiency professional power amplifier models, each with two independent channels. The MX 1000a, MX 1500a, and MX 2000a, can deliver, respectively, 275, 400, and 475 watts into 8-ohm loads, and 400, 600, and 725 watts into 4-ohm loads

Either channel of the MX 3000a is capable of delivering 850 watts into 8-ohm loads, 1300 watts into 4-ohm loads, or more than 1600 watts into 2 ohms.

Each channel has its own transformer secondary (MX 1000a and MX 1500a) or power transformer (MX 2000a and MX 3000a) and bipolar multi-rail power supply. The power transformers are mounted in the front of the amplifier chassis, as close to the front mounting rails as possible; this keeps the unit's center of gravity forward to minimize the twisting force on the front mounting ears. Still, the amplifier should be supported at all four corners, especially if it is in a portable rack such as in touring or mobile applications.

The MX 1000a and MX 1500a are both two rack spaces high and weigh 19 kg (42 lb). The MX 2000a and MX 3000a occupy three rack spaces. The MX 2000a weighs 24.5 kg (54 lb), and the MX 3000a weighs 31 kg (69 lb).

The amplifiers require a rack depth of 18 inches (45.7 cm) to clear the rear support ears. Allow some additional clearance for input and output connectors at the rear panel, which is 16.9 inches (42.9 cm) behind the plane of the front mounting rails. The built-in cooling fan draws air in at the rear of the chassis and exhausts it through vents in the front panel. The flow-through cooling scheme allows you to rack-mount the amplifiers one atop the other, with no clearance necessary in between. This mounting technique also helps support the weight of the upper amplifiers.

The MXa Series derives much of its design from our high-end EX Series amplifiers. They are engineered for stability and exceptional reliability, with protection for open or short circuits and mismatched loads. To protect your loudspeakers, the outputs mute during turn-on and turn-off, and also in the event of a DC fault. All protection circuitry automatically resets to normal when conditions assure safe operation.

The amplifiers feature thermal protection. The MX 3000a features a variable-speed fan, which responds continuously to the cooling needs to minimize noise and dust build-up, and a thermal limiter that reduces gain up to 15 dB if the amplifier overheats above 80° C. The other models have a two-speed fan. If an MXa amplifier overheats to 85° C or higher, a protection circuit mutes the output.

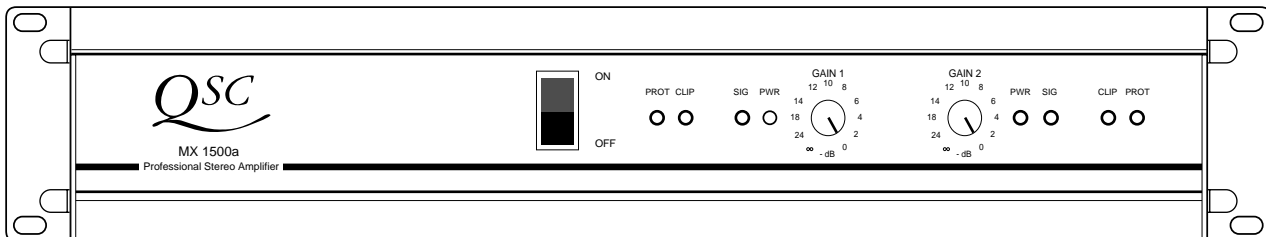


Figure 1: QSC MX 1500a Front Panel (identical to the MX 1000a)

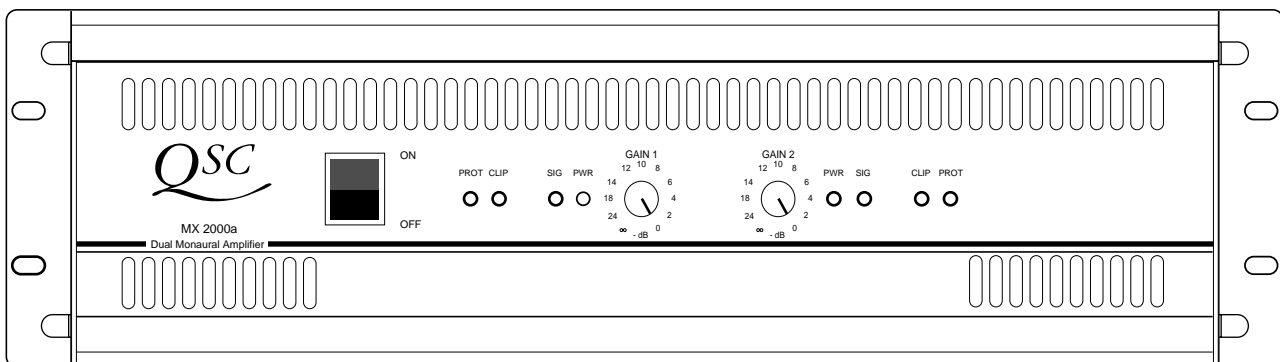


Figure 2: QSC MX 2000a Front Panel (identical to the MX 3000a)

III. INPUTS

An MXa amplifier features balanced inputs, connected via barrier strip terminals or 1/4" (6.3 mm) tip/ring/sleeve phone jacks. The tip of the input jack is wired for “negative” or inverted polarity, while the ring is the non-inverting input. Thus, if the voltage at the tip is positive with respect to that at the ring, the amplifier channel will produce a negative voltage at its output.

For use with unbalanced signals, connect the unused terminal to ground to avoid a reduction in gain caused by a floating input; use a two-conductor (tip/sleeve) plug, or connect a jumper between the inverting input terminals on the barrier strip and their adjacent ground terminal.

MX 1000a INPUTS

The amplifier’s input sensitivity is 1.1 volt rms; at this signal level and input attenuators set for full gain, the amplifier will produce full rated power—250 watts, 20Hz-20kHz, 0.1% THD—into an 8-ohm load. The input impedance is 20 kilohm balanced and 10 kilohm unbalanced, typical of QSC amplifiers.

MX 1500a INPUTS

The amplifier’s input sensitivity is 1.07 volt rms; at this signal level and any attenuators set for full gain, the amplifier will produce full rated power—350 watts, 20Hz-20kHz, 0.1% THD—into an 8-ohm load. The input impedance is 20 kilohm balanced and 10 kilohm unbalanced, typical of QSC amplifiers.

MX 2000a INPUTS

The amplifier’s input sensitivity is 1.05 volt rms; at this signal level and any attenuators set for full gain, the amplifier will produce full rated power—450 watts, 20Hz-20kHz, 0.1% THD—into an 8-ohm load. The input impedance is 20 kilohm balanced and 10 kilohm unbalanced, typical of QSC amplifiers.

MX 3000a INPUTS

The amplifier’s input sensitivity is 1 volt rms; at this signal level and any attenuators set for full gain, the amplifier will produce full rated power—800 watts, 20Hz-20kHz, 0.1% THD—into an 8-ohm load. The input impedance is 20 kilohm balanced and 10 kilohm unbalanced, typical of QSC amplifiers.

An MXa Series amplifier features a Level I Open Input Architecture slot. See Section 2 for more information about Open Input Architecture.

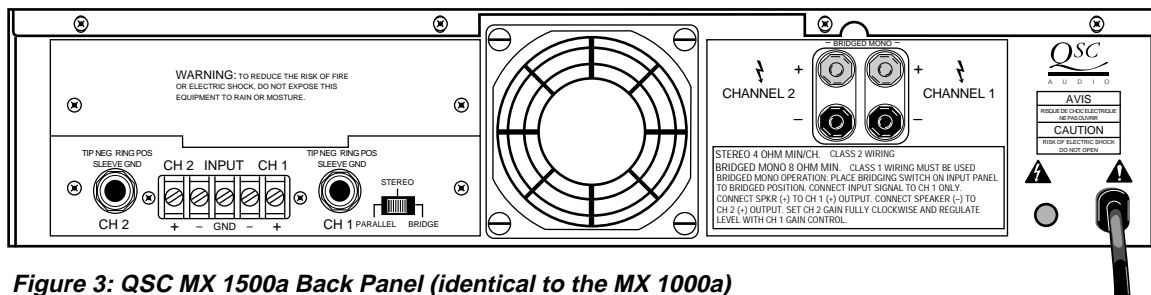


Figure 3: QSC MX 1500a Back Panel (identical to the MX 1000a)

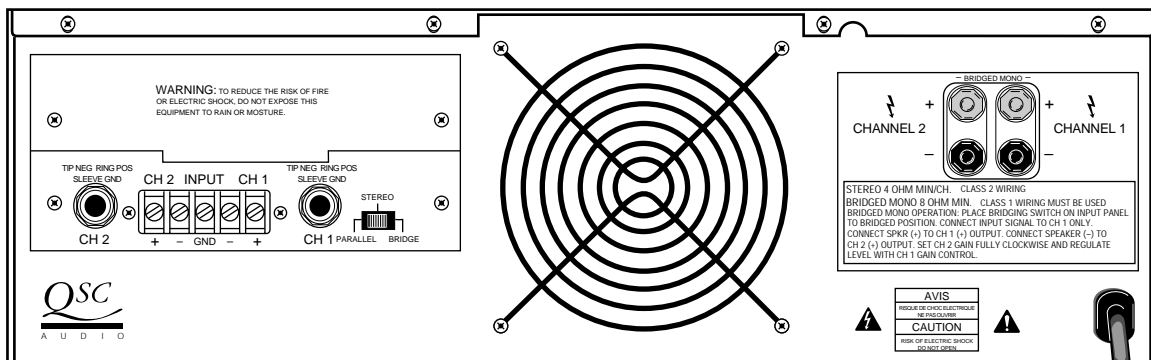


Figure 4: QSC MX 2000a Back Panel (identical to the MX 3000a)

IV. OUTPUTS

Four “touch-proof” binding posts—one pair per channel—on the rear panel allow speaker cable connections to the amplifier outputs. The special design allows connection of large diameter speaker cable while reducing shock hazard due to the high output power of MXa amplifiers. The “hot” terminal of each output pair is the red one; the black one is signal ground.

If you are operating the amplifier in “bridged” mode, connect the speaker load across the red terminals only; the red terminal of Channel 1 then is “hot” or “in-phase.” The red terminal of Channel 2 is not grounded, however, so use the same precautions in handling and dressing the wire that you would for the normal “hot” outputs.

CONTROLS AND DISPLAYS

The front panel-mounted attenuator controls are labeled in dB of attenuation and are continuously adjustable from 0 dB (full gain) to ∞ (full kill).

The LED displays for each channel function as follows:

LED	COLOR	
PWR	Green	Main power supply active on this channel.
SIG	Yellow	Shows signal is present
CLIP	Red	Shows output capability is being exceeded, with clipping distortion
PROT	Red	Shows when the output is muted by protection circuitry.

Table 1: LED Display Operation

AC POWER

Any MXa Series amplifier can be wired for 100, 120, or 220–240 VAC, 50 or 60 Hz operation. Unless it is specially ordered, each amplifier is configured for the line voltage in the market for which it is intended. For example, those intended for Japan are 100 VAC; for North and Central America, 120 VAC; for Europe and most of Asia, 220–240 VAC.

The power cord has a plug for connecting to a standard AC source. For 120-volt operation, the plug is a standard 15-ampere grounded NEMA fitting; it meets safety agency requirements for current consumption of less than 12 amperes during “normal” operation, but peak current draw under heavy usage can be much higher.

V. OPERATIONS

When the amplifier is first turned on, the red “PROT” LED on each channel will light for about three seconds, during which the output relays will stay open to mute the speakers. After the turn-on muting interval, the “PROT” LEDs turn off, the green “PWR” LEDs light, and the output relays close to enable the speaker outputs. Even during the muting interval, the yellow “SIG” and red “CLIP” LEDs operate normally if there is a signal present. If the “CLIP” LED is on while the amplifier is muted, cut the gain back immediately to avoid a full-power blast of sound when the output relays close. (Whenever it is practical, at turn-on you should have the attenuators all the way down to avoid this situation.) If a channel stays muted with “PROT” lit, or if its “SIG” or “CLIP” indicators light up when the gain is turned all the way down, it may be defective; see the troubleshooting segment for more information.

The “SIG” LED indicates signal levels that are -30 dB (referenced to full output power) or higher.

When the amplifier is shut off, the amplifier should mute both channels virtually instantaneously, with the “PROT” indicators lit until the power supplies are discharged.

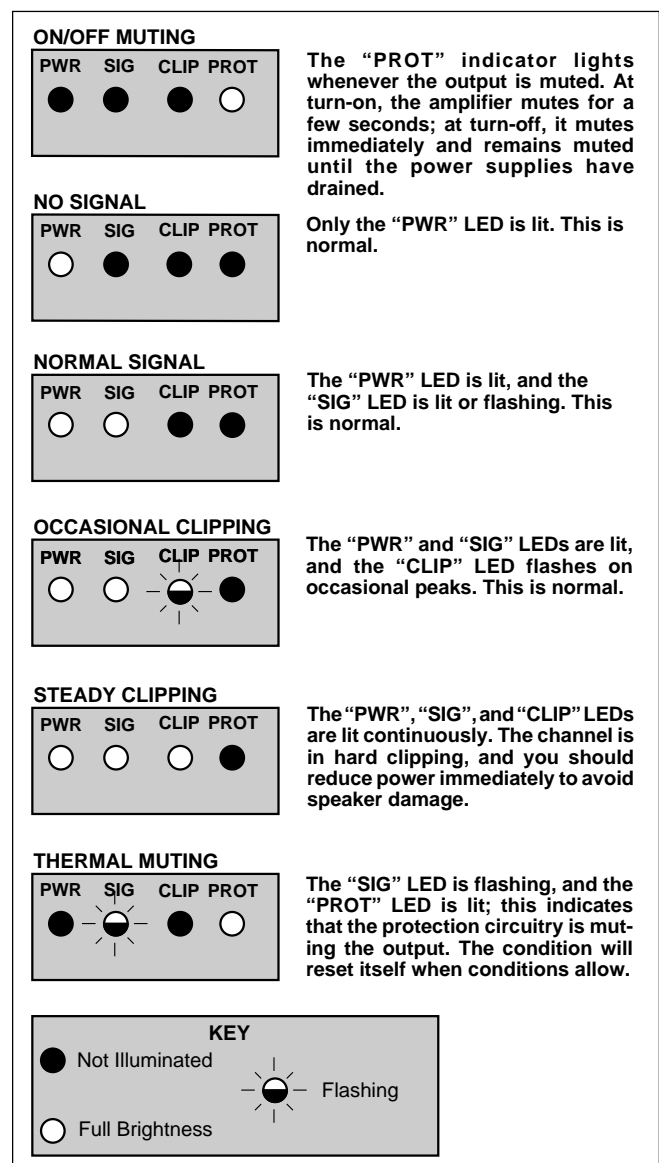


Figure 5: LED displays further explained.

TROUBLESHOOTING

PROBLEM: Channel will not come out of muting

- If reducing the gain control to ∞ attenuation does not release muting, the channel is defective or overheated (see “Overheating,” below).
- If reducing the gain releases the muting, raise the gain back up slowly while you watch the “SIG” and “CLIP” indicators; the problem may be an abnormal signal (with excessive ultrasonic energy, for example) that could otherwise damage your speakers.

PROBLEM: No sound

- Is the channel muted? (If the “PROT” indicator is lit, the channel is muted; see below.)
- Is the “SIG” LED lit or flashing? (If so, the speaker is open or blown, there is an open circuit in the speaker wiring, or there is an open circuit in the internal output wiring of the amplifier.)
- If the “SIG” indicator is dark, there is probably not enough signal, or even none at all. Try turning up the front panel attenuators or boosting the signal level at the input.
- If the “SIG” indicator shows little or no activity but the “CLIP” LED is lit or flashing, there is probably a short circuit in the speaker wiring. It is also possible, but less likely, that the channel’s output relay is defective and will not open, thereby short-circuiting the channel output and producing the same symptoms.

PROBLEM: Channel goes into muting, with “PROT” LED on

- If the fan is running full speed, the channel probably suffers from severe overheating. Unless there is a blockage in the flow of cooling air, the channel should return to normal within a minute or so (see “Overheating,” below).
- If the fan is not running at full speed, or the channel does not reset to normal after a cool-down period, the muting is probably because of a DC fault or other amplifier failure, especially if the “SIG” or “CLIP” indicators are lit even with the attenuator turned all the way down.

PROBLEM: Hum in the audio

- Because of its grounded-collector output transistor configuration, which maximizes thermal efficiency, the signal ground on an MXa amplifier cannot be lifted. The amplifier’s balanced inputs are meant to reject hum, but if hum remains a problem, check the tightness of the two mounting screws on the standard input panel; if they are loose, the panel itself might not be well grounded to the chassis. If you have any problems with these screws, contact the QSC Customer Service Department. In some cases, such as when the audio signal cables are routed near lighting dimmers that use triacs, you may need to use input isolation transformers because of the extremely high noise field produced by the dimmer circuitry. See the paragraphs on Open Input Architecture for further information on input transformers.

In addition, be sure to check wiring to assure that shields are properly terminated and no ground loops have been created.

PROBLEM: Overheating

- The thermal management system on an MXa Series amplifier features either a two-speed fan (MX 1000a, MX 1500a, and MX 2000a) or a variable-speed fan (MX 3000a) that modulates the cooling air flow over the heatsinks in response to the cooling needs. If the air flow is blocked, however, or if the amplifier is overdriven into very low impedance loads, the amplifier could overheat even though the fan is running at full speed.
- At approximately 55°C, the fan runs at high speed.
- At approximately 80° C, the thermal limiter on the MX 3000a will start to reduce gain, up to 15 dB as needed, to reduce the amount of heat produced.
- At approximately 85° C, the channel’s output relay will mute the output. The channel will remain muted until the temperature drops to a safe level. Even while the channel is muted, the “SIG” and “CLIP” indicators will function normally. If the “CLIP” indicator is flashing or continuously lit, reduce the gain to hasten the cool-down and prevent repeated thermal shutdowns.

SPECIFICATIONS

MODEL	FTC Watts Per Channel 20Hz-20kHz, 0.1% THD		EIA Watts Per Channel 1kHz, 1% THD		
	8Ω Load	4Ω Load	8Ω Load	4Ω Load	2Ω Load*
MX 1000a	250	350	275	400	500
MX 1500a	350	500	400	600	750
MX 2000a	450	650	475	725	1000
MX 3000a	800	1200	850	1300	1600

**typical*

MODEL	Bridged Mono 20Hz-20kHz, 0.1% THD		Bridged Mono 1kHz, 1% THD
	16Ω Load	8Ω Load	4Ω Load*
MX 1000a	500	700	1000
MX 1500a	700	1000	1500
MX 2000a	900	1300	2000
MX 3000a	1600	2400	3200

**typical*

	MX 1000a	MX 1500a	MX 2000a	MX 3000a
DYNAMIC HEADROOM				
8 ohms	2.0	2.0	2.0	1.9
4 ohms	2.3	2.5	2.5	2.9
DISTORTION				
SMPTE-IM	Less than 0.05%			
FREQUENCY RESPONSE	20 Hz to 20 kHz, ±0.15 dB 8 Hz to 100 kHz, +0, -3 dB			
DAMPING FACTOR	Greater than 200			
NOISE (A-weighted)	100 dB below rated output (20 Hz to 20 kHz)			
VOLTAGE GAIN , dB	40 (32 dB)	50 (34 dB)	56 (35 dB)	80 (38 dB)
SENSITIVITY , V RMS (for rated power, 8-ohms)	1.1	1.07	1.05	1.0
INPUT IMPEDANCE	10K unbalanced 20K balanced			
CONTROLS	Front: AC Switch, Ch. 1 and Ch. 2 Attenuator Knobs Rear: Parallel/Stereo/Bridge Switch			
INDICATORS (per channel)	PWR: Green LED SIG: Yellow LED CLIP: Red LED PROT: Red LED			

	MX 1000a	MX 1500a	MX 2000a	MX 3000a
CONNECTORS (each channel)	Input: Barrier strip and 1/4" RTS phone jack Output: "Touch-Proof" binding posts			
COOLING	MX 1000a, MX 1500a, MX 2000a: 2-speed fan with back-to-front air flow MX 3000a: Continuously variable speed fan, with back-to-front air flow			
AMPLIFIER PROTECTION	Output Averaging™ short-circuit protection, open circuit, ultrasonic, RF, thermal muting (thermal limiting also on MX 3000a). Stable into reactive or mismatched loads.			
LOAD PROTECTION	Turn-on/turn-off muting, clip limiting (MX 3000a only), DC-fault load grounding relay with internal fault fuses.			
OUTPUT CIRCUIT TYPE	MX 1000a, MX 1500a, MX 2000a: Complementary linear stage with 2-step high-efficiency circuit MX 3000a: Complementary linear stage 3-step high-efficiency circuit			
POWER REQUIREMENTS	100, 120, 220-240 VAC, 50/60 Hz			
POWER CONSUMPTION				
<i>Normal operation: 1/8 power @ 4Ω per channel</i>				
<i>Maximum: full power @ 2Ω per channel</i>				
<i>Divide current by 2 for 220-240 VAC operation</i>				
Normal Operation @ 120 VAC	4A	5.5A	7.5A	<12A
Maximum @ 120 VAC	22A	29A	38A	58A
DIMENSIONS				
Faceplate Width	Standard 19" (48.3 cm) Rack Mounting			
Chassis Depth	17.9" (45.5 cm) deep (to support rear ears)			
Faceplate Height (2 rack spaces)	3.5" (8.9 cm)	3.5" (8.9 cm)		
Faceplate Height (3 rack spaces)			5.25" (13.3 cm)	5.25" (13.3 cm)
WEIGHT				
Shipping, Lbs	49 lbs/22.2 kg	49 lbs/22.2 kg	62 lbs/28 kg	74 lbs/33.8 kg
Net, Lbs	42 lbs/19 kg	42 lbs/19 kg	54 lbs/24.5 kg	69 lbs/31 kg

OPEN INPUT ARCHITECTURE™ LEVEL I

On the rear of an MXa or EX amplifier are an upper and a lower input panel; both are easily removable for future upgrades. This is the concept of Open Input Architecture, and the opening in which the panels mount is called the "slot". As installed at the factory, the lower is the MXa or EX standard input panel and the upper one is a blank. A ribbon cable connects the "slot" panels to the rest of the amplifier. It carries input signals, speaker output monitor signals, muting status, and clip activity; these are for supporting future accessories and remote control systems. Although the physical dimensions of the MXa and EX panels are the same, their internal cabling is different and the MXa platform does not support all the EX functions. The MXa Open Input Architecture slot thus is designated as "Level I" and the EX as "Level II."

The standard input panel shipped with each MXa Series amplifier has balanced 1/4" (6.3 mm) RTS phone jacks and barrier strip inputs and the Parallel-Stereo-Bridge switch. The panel's circuit board has solder footprints for passive roll-off circuit components, input isolation transformers, and other special customizations.

The MX-1 Input Expander panel may be installed in the upper panel position. It features XLR inputs and additional 1/4" RTS inputs. Installation instructions are included with the expansion kit.

Other accessories include a stereo precision attenuator (for the lower panel position) and a cinema crossover (for the upper panel position). More are in development.

PARALLEL, STEREO, OR BRIDGED OPERATION

The Parallel-Stereo-Bridge switch is located on the input panel, next to the input jack for channel 1).

The most commonly used operating mode for a power amplifier is “Stereo,” in which the two channels are independent and separate all the way from input to output. Set the switch in the center position for stereo operation.

“Parallel” ties the two channel inputs together so that both will be driven by the same signal, without the need for external jumpers or wiring. After the inputs both channels operate independently; though they carry the same signal, their gain controls affect only their respective channels, and they must use separate speakers. Never parallel the speaker outputs!

The “Bridge” position uses both channels to provide about three times the power to a single speaker load that a single channel does. In this position the switch feeds channel 2 with an inverted signal from channel 1. Thus, when one channel “pushes,” the other “pulls,” providing twice the voltage swing of a single channel.

BRIDGED-MONO MODE CAUTION:

The voltage across the output terminals of a bridged MXa amplifier may equal or exceed 100 volts rms and may be as high as 170 volts (MX 3000a), 130 volts (MX 2000a), or 120 volts (MX 1500a). Use fully insulated CLASS ONE wiring, and the load must be rated for up to 2400 watts (@ 8 ohms) for the MX 3000a, 1300 watts (@ 8 ohms) for the MX 2000a, 1000 watts (@ 8 ohms) for the MX 1500a, and 700 watts (@ 8 ohms) for the MX 1000a.

VORSICHT BEIM ÜBERBRÜCKTEN MONO-MODUS:

Zwischen den überbrückten Terminals eines MXa-Verstärkers besteht eine Ausgangsspannung mit einem quadratischen Mittelwert von mehr als 100 Volt und vielleicht von bis zu 170 Volt (MX 3000a), 130 Volt (MX 2000a), oder 120 Volt (MX1500a). Zu verwenden ist voll isolierte Verdrahtung der US-Klasse Eins, und die angeschlossene Belastung muß für bis zu 2400 Watt (8 Ohm) beim MX 3000a, 1300 Watt (8 Ohm) beim MX 2000a, 1000 Watt (8 Ohm) beim MX 1500a, und 700 Watt (8 Ohm) beim MX 1000a ausgelegt sein.

INSTRUCTIONS FOR BRIDGED OPERATION

1. Set the switch to the “Bridge” position.
2. Connect the signal to channel 1’s input only. Do not connect anything to the input of channel 2.
3. Turn up the gain on channel 2 all the way. Use channel 1’s gain control to set the level. Both channels’ “SIG” and “CLIP” indicators should flash identically. (If you have used other amplifiers, this step may be different. But it is correct; in the bridged mode, channel 2 receives its feed from a sample of channel 1’s output. The sample is calibrated such that channel 2, at full gain, will produce a voltage equal in magnitude but opposite in polarity to channel 1’s.
4. Connect the single speaker load across the red binding posts of the amplifier outputs as shown in Figure 2-2. The positive speaker wire goes to channel 1, and the negative to channel 2.

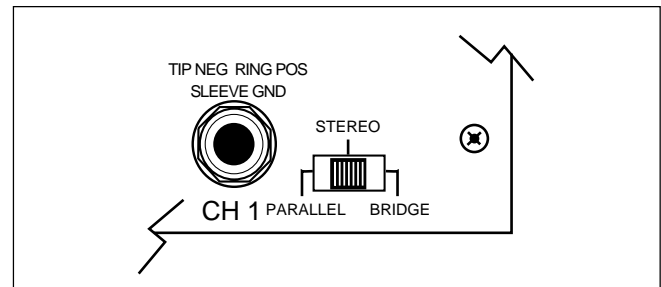


Figure 6: Parallel-Stereo-Bridge switch shown in the normal (Stereo) mode position.

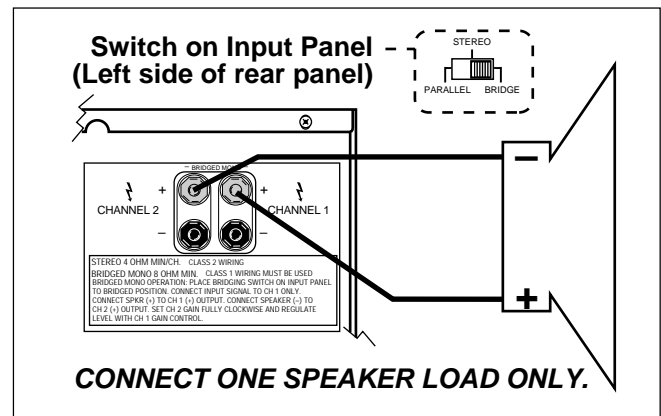


Figure 7: For Bridge mode, use CH 1 input only, and set Input switch and connect load as shown.

VI. LONG-TERM OUTPUT POWER

In a properly designed sound system, you can usually obtain the desired sound level without using the full output power of the amplifier; if the “CLIP” indicators flash once in a while, that is perfectly normal.

If the amplifier is operated at extremely high power levels, it may overheat or may even damage the speakers. The amount of stress on the amplifier depends largely on the load and how hard the amplifier drives it. In general, the lower the load impedance, the more stressful the load is.

8-Ohm Loads

The amplifier can operate at practically any power level without risk of overheating. However, if it is pushed hard enough to continually light the “CLIP” indicator, the amplifier’s average output power can reach 250 to 800 watts (depending on the model), which is more than many speakers can handle.

4-Ohm Loads

If the “CLIP” indicator flashes occasionally, the amplifier is approaching its maximum long-term power capacity. If it is lit about half the time, the amplifier channel will probably go into thermal protection within a few minutes.

2-Ohm Loads

Except for an occasional flash, keep the “CLIP” indicator dark to avoid overheating the amplifier channel.

AC CURRENT CONSUMPTION

A major objective in the design of the MXa Series amplifiers—even the highest-powered models—is to permit their operation from readily available, standard AC power sources. The MX 3000a can deliver 1600 watts per channel into 2-ohm loads—a total of 3200 watts—yet its rated current draw under “normal conditions” is less than 12 amperes at 120 volts AC, which is 1440 watts.

How is this possible? First, “normal conditions” in power amplifier rating means operation, using pink noise as a source, at an average power level equal to one-eighth of maximum power. This is recognized by most of the world’s safety agencies as the loudest you can play music through an amplifier and still keep the incidence of clipping to a reasonable minimum. An amplifier’s peak current draw at full output power into 2 ohms is several times what the “normal” draw is, but its various protection circuits will prevent this condition’s lasting more than a minute or two.

When you plan the AC power hookups for your amplifiers, use Table 2 to predict the current requirements per amplifier. You can use the one-eighth power figures to predict the normal continuous current draw, then add a safety margin to allow for occasional crescendos.

Table 2: Current requirements, in amperes, at 120 VAC under various conditions (divide by 2 for 220–240 VAC operation):

MODEL	Load	Output power	AC Current @ Full power	AC Current @ 1/3 power	AC Current @ 1/8 power	AC Current @ Idle
MX 1000a	8+8	275 x 2	10	5.5	3	1
	4+4	400 x 2	15	7.5	4	1
	2+2	500 x 2	22	10	5	1
MX 1500a	8+8	400 x 2	14	7	4	1
	4+4	600 x 2	21	11	5.5	1
	2+2	750 x 2	29	13	6.5	1
MX 2000a	8+8	475 x 2	16	9.5	5	1
	4+4	725 x 2	25	15	7.5	1
	2+2	1000 x 2	38	21	11	1
MX 3000a	8+8	850 x 2	25	16	9.5	1
	4+4	1300 x 2	40	31	15	1
	2+2	1600 x 2	58	42	20	1

HEAT EMISSIONS

Essentially, a power amplifier draws electrical energy from the AC mains, converts it to DC, and then converts it again into an analog of the input signal to send out to the loudspeakers. Any AC power that enters the amplifier through the power cord and does not exit through the speaker outputs turns into heat, which the amplifier must rid itself of by exhausting it to the outside. In indoor use this may present a sizeable challenge to a building's air conditioning system. Use Table 3 to predict the heat that will be emitted by your amplifier.

Table 3: Heat emissions of MXa amplifiers under various conditions:

MODEL	Load	1/3 Power, both channels		1/8 Power, both channels		Idle, both channels	
		BTU/hr	kcal/hr	BTU/hr	kcal/hr	BTU/hr	kcal/hr
MX 1000a	8Ω	1035	265	580	150	75	20
	4Ω	1430	365	270	915	75	20
	2Ω	2140	545	305	1035	75	20
MX 1500a	8Ω	1165	295	770	195	110	28
	4Ω	1875	475	1010	255	110	28
	2Ω	2770	700	1415	360	110	28
MX 2000a	8Ω	1850	470	1080	275	145	40
	4Ω	3100	785	1755	445	145	40
	2Ω	4730	1195	2760	700	145	40
MX 3000a	8Ω	2980	755	2015	510	200	50
	4Ω	7100	1795	3600	910	200	50
	2Ω	10280	2600	5040	1275	200	50

PROTECTION CIRCUITS

The design goal in high-efficiency, lighter-weight amplifiers such as the MXa Series is to control more power with fewer or smaller load-bearing components, e.g., resistors, transistors, transformers, etc. However, the higher power flow through these components makes effective, responsive protection circuitry absolutely vital. To this end, the design of the MXa series takes a comprehensive approach to protection.

As in all QSC amplifiers, the inputs are resistively buffered for overload and RF protection. Chassis bypass capacitors at inputs and outputs further improve RF rejection.

MXa amplifiers use the proven Output Averaging™ short circuit protection system. This circuit permits full output current even into resistive or reactive 2-ohm loads, but reduces the current safely by about 75% if the output is shorted.

Turn-on/turn-off muting keeps transients—both from the amplifier itself and from upstream equipment—from reach-

ing the speakers when the amplifier is turned on or off. The turn-on delay is approximately three seconds to allow the power supplies and circuitry to stabilize. Turn-off muting occurs almost immediately after power is shut off. Muting occurs whether power is turned on and off using the front panel power switch or externally at the AC source.

An NTC (negative temperature coefficient) thermistor in series with the power switch and transformer primary limits inrush current. The thermistor initially has a high resistance, which then diminishes rapidly as it warms, to avoid power loss. Typically, the inrush current of an MXa Series amplifier thus is equal to that of another amplifier of about 1/3 to 1/2 its power rating.

When the DC fault protection circuitry senses a DC voltage on the amplifier output, it activates a relay which shorts the output and load to ground. If the DC is due to a fault in the amplifier channel's output circuitry, it will probably produce enough current flow to blow the fault fuse in series with the output. This will disable the channel

output until it can be repaired, at which time the fuse should be replaced also.

Temperature sensors on the channel heatsinks and the power transformers are part of the thermal management circuitry. On the MX 1000a, MX 1500a, and MX 2000a, the temperature sensors govern whether the dual-speed fan should run at low or high speed. Below 55° C, the fan runs at low speed; above, it runs at high speed. At or above 85° C, the channel mutes to go into thermal protection.

On the MX 3000a, the thermal management circuitry controls the variable-speed fan according to how much cooling air flow is required. At and above 80° C, the thermal limiting circuit reduces the audio signal by up to 15 dB. At 85° C, the channel mutes to go into thermal protection.

VII. WARRANTY AND DISCLAIMERS

DISCLAIMER

QSC Audio Products, Inc. is not liable for any damage to speakers, amplifiers, or any other equipment that is caused by negligence or improper installation and/or use of the SPL-1.

PRODUCT WARRANTY

QSC Audio Products, Inc. guarantees the SPL-1 to be free from defective material and/or workmanship for a period of three years from date of sale, and will replace defective parts and repair malfunctioning products under this warranty when the defect occurs under normal installation and use—provided the unit is returned to our factory via prepaid transportation with proof of purchase (sales receipt). This warranty provides that examination of the returned product must disclose, in our judgment, a manufacturing defect. This warranty does not extend to any product which has been subject to misuse, neglect, accident, improper installation, or where the date code has been removed or defaced.

VIII. TECHNICAL ASSISTANCE & SERVICE

Servicing your unit requires a trained technician capable of performing the type of service you need. There are no user serviceable components inside your unit and the danger of electric shock exists. Additionally, some of the components in your unit has QSC specific parts that require QSC replacements. Comprehensive service manuals for some models are available at QSC.

TECHNICAL ASSISTANCE

If you suspect that your [product] is defective, check your system configuration and [product] settings to determine the origin of the problem. In many cases, incorrect audio interfacing, poor cabling, or other system level impairments are the cause of problems in audio systems. For technical assistance beyond the information given in this manual, QSC Technical Services may be contacted.

FACTORY SERVICE

In the event that your [product] does need factory service, you may reach QSC Technical Services for return instructions. A Return Authorization (RA) number must be obtained from QSC Technical Services. QSC may not account for products that are returned without a Return Authorization number.

Product Return Guidelines

1. Pack the product well for protection during shipment. QSC will provide the factory packaging free of charge upon request.
2. Include a copy of the sales receipt, your name, return address, phone number, and defect description with your return correspondence.
3. Call QSC Technical Services for a Return Authorization number.
4. Mark the Return Authorization number on the outside of the packaging.
5. Ship the product prepaid to QSC Audio Products. We recommend United Parcel Service (UPS).

QSC TECHNICAL SERVICES

1675 MacArthur Blvd
Costa Mesa, CA 92626

Telephone: (800) 772-2834
(714) 957-7150
(714) 754-6175

Fax: (714) 754-6173

Bulletin Board: (714) 668-7567

QUALIFIED SERVICE CENTERS

QSC maintains a service center network for your convenience. If you choose to return your product to a local service center, you may call QSC Technical Services for a referral. Accessories, input modules and other peripheral QSC products must be returned to the factory for service.

INTERNATIONAL SERVICING

For QSC products that are purchased outside of the United States, service must be referred to the distributor or dealer from where the product was purchased. There are numerous service centers in many countries. The service centers in your country may be located by your dealer, distributor, or by contacting QSC Technical Services.

IX. QSC ONLINE

If you have a computer with a modem you can take advantage of QSC's convenient technical support bulletin board system, **QSC OnLine**. Download software updates, messages, or hardware application notes; upload questions, comments, and useful tips, and more. This service is available free of charge, around the clock, 365 days a year (366 days in leap years).

As of March 18, 1994—

BBS Hours: 24 hours a day
BBS Telephone Number: **(714) 668-7567**

General

Automatic system maintenance hours:
1:00 a.m.–2:00 a.m. Pacific Time
(no log-ons during this hour)

System type: Open (no subscription fee)

Host location: QSC Customer Service Department
Costa Mesa, California

Support Areas

- Bulletins
 - Advertisements
 - Ordering and Support Information
 - Newsletter
- Conferences
- Mail Messages
 - General Forum
 - Parts & Accessory Ordering
 - Technical Commentary
 - QSCControl Hardware Support
 - QSCControl Software Support
 - EX, MXa, VS, USA, and Series One
 - Slot Accessories
 - General Notes

- File Library
 - QSCControl Hardware Support
 - QSCControl Software Support
 - EX, MXa, VS, USA, and Series One
 - Slot Accessories
 - General Notes

File Types

- Graphics
- Mechanical drawings
- Specifications
- Application notes
- Field service notes
- Service bulletins
- Schematics
- Pin-outs
- Owners manual text segments
- Environment files
- Computer utilities and drivers
- Service manual text segments
- Computer configuration tips
- Block diagrams

These are primarily text, graphics, utility, and program files.

Security Levels

New User	Cursory access, for review
Full User	Customer access
QSC User	Full access
Sysop	Supervisory access

User Privileges and Security

New User	30 minutes per day No uploads No downloads Standard messages access Bulletin access
Full User	90 minutes per day 5 uploads per day 5 downloads per day Standard messages access Bulletin access
QSC User	Unlimited time per day 10 uploads per day 10 downloads per day Unlimited messages access All menu and system access

*Uploads and messages subject to verification and editing by the sysop.

Communications Settings

14400 bps (also supports 1200, 2400, and 9600 bps)
8 bits, no parity, 1 stop bit

X. IMPORTANT ADDRESS AND TELEPHONE INFORMATION

Factory address:

QSC Audio Products, Inc.
1675 MacArthur Boulevard
Costa Mesa, California 92626-1468
USA

Factory telephone numbers:

Main Number	(714) 754-6175
Sales Direct Line	(714) 957-7100
Sales	(800) 854-4079 <i>(toll-free in U.S.A. only)</i>
Sales & Marketing FAX	(714) 754-6174
Customer Service	(714) 957-7150
Customer Service	(800) 772-2834 <i>(toll-free in U.S.A. only)</i>
Customer Service FAX	(714) 754-6173
QSC OnLine Technical	(714) 668-7567

