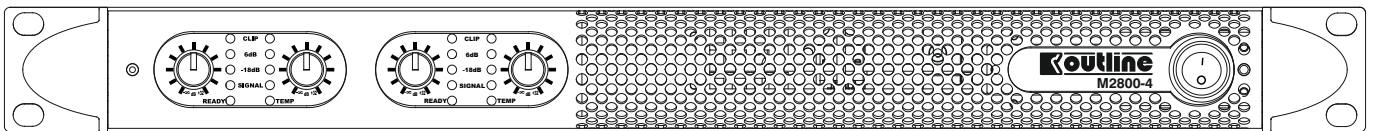




M2800-4

FOUR-CHANNEL AMPLIFIER



USER GUIDE

The Sound of Big Ideas

M2800-4

User Guide

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I Important safety instructions



CAUTION: TO REDUCE THE RISK OF ELECTRIC SHOCK, DO NOT ATTEMPT TO OPEN ANY PART OF THE UNIT. NO USER-SERVICEABLE PARTS INSIDE. REFER SERVICING TO QUALIFIED SERVICE PERSONNEL.

WARNING: TO REDUCE THE RISK OF FIRE OR ELECTRIC SHOCK, DO NOT EXPOSE THIS APPARATUS TO RAIN OR MOISTURE. OBJECTS FILLED WITH LIQUIDS, SUCH AS VASES, SHOULD NOT BE PLACED ON THIS APPARATUS.

TO COMPLETELY DISCONNECT THIS APPARATUS FROM THE AC MAINS, DISCONNECT THE POWER SUPPLY CORD PLUG FROM THE AC RECEPTACLE.

THE MAINS PLUG OF THE POWER SUPPLY CORD MUST REMAIN READILY ACCESSIBLE.

SAFEGUARDS: 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 safe guards, observe the following instructions for its installation, use and servicing.

- ▶ Read these instructions.
- ▶ Keep these instructions.
- ▶ Heed all warnings.
- ▶ Follow all instructions.
- ▶ Do not use this amplifier near water.
- ▶ Clean only with a dry cloth.
- ▶ Ensure a proper ventilation.
- ▶ Install in accordance with Outline instructions.
- ▶ Do not install near any heat sources or apparatus that produce heat.
- ▶ Protect the power cord from being walked on or pinched particularly at plugs, convenience receptacles, and the point where they exit from the apparatus.
- ▶ Do not defeat the safety purpose of the polarized or grounding-type plug. A polarized plug has two blades with one wider than the other. A grounding type plug has two blades and a third grounding prong. The wide blade or the third prong are provided for your safety. If the provided plug does not fit into your outlet, consult an electrician for replacement of the obsolete outlet.
- ▶ Unplug this amplifier during lightning storms or when unused for long periods of time.
- ▶ Contact the authorized service center for ordinary and extraordinary maintenance.
- ▶ Only use attachments/accessories specified by Outline .

NOTES: This equipment has been tested and found to comply by Competent Body (Directive 2004/108 / EC) pursuant to the product family standard for audio professional use: EN 55103-1 and EN 55103-2 standard.

This equipment has been tested and found to comply by Notified Body 2014 (Directive 2006/ 95 / EC) pursuant to the audio apparatus safety requirements: EN 60065 and EN 6006/A1 standard.

EXPLANATIONS 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 enclosure that may be of sufficient magnitude to constitute a risk of shock to persons.



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

2 Precautions regarding installation

2.1 Location



Install the amplifier in a well-ventilated location where it will not be exposed to high temperature or humidity.

Do not install the amplifier in a location that is exposed to direct sun rays, or near hot appliances or radiators. Excessive heat can adversely affect the cabinet and internal components. Installation of the amplifier in a damp or dusty environment may result in malfunction or accident.



Placing and using the amplifier for long periods of time on heat generating sources will affect its performance. Avoid placing the amplifier on heat generating sources. Install this amplifier as far as possible from tuners and TV sets. An amplifier installed in close proximity of such equipment may experience noise or generic performance degradation.



No naked flame sources such as lighted candles should be placed on the amplifier.

Do not spill water or other liquids into or on the amplifier.



WARNING

To prevent fire or electric shock:

- ▶ The ventilation openings must not be impeded by any item such as newspapers, tablecloths, curtains etc; keep a distance of at least 50 cm from the front and rear ventilation openings of the amplifier.
- ▶ Do not expose this amplifier to rain or moisture.
- ▶ This equipment must not be exposed to dripping or splashing liquids: objects filled with liquids, such as vases, must not be placed on the amplifier.

2.2 Wiring



This device must be powered exclusively by earth connected mains sockets in electrical networks compliant to the IEC 364 or similar rules. It is absolutely necessary to verify this fundamental requirement of safety and, in case of doubt, require an accurate check by qualified personnel.

OUTLINE cannot be considered responsible for eventual damages caused to persons, things or data due to an improper or missing ground connection.

- ▶ Before powering this amplifier, verify that the correct voltage rating is being used.
- ▶ Verify that your mains connection is capable of satisfying the power ratings of the device.
- ▶ Do not use this amplifier if the electrical power cord is frayed or broken.
- ▶ Do not remove the cover. Failing to do so will expose you to potentially dangerous voltage.
- ▶ Provide a sectioning breaker between the mains connections and the amplifier. The suggested device is a 16A/250V AC, C or D curve, 10 kA.
- ▶ Switching mode amplifier is capable of producing hazardous output voltages. To avoid electrical shock, do not touch any exposed speaker wiring while the amplifier is operating.

2.3 Speaker damage



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

Outline will not be held responsible for damaged speakers. Consult the speaker manufacturer for power handling recommendations.

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

A single high-power tone can damage 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.

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

This manual contains important information on operating your Outline amplifier correctly and safely. Please read it carefully before operating your amplifier. If you have any questions, contact your Outline dealer.

3 Mechanical drawings

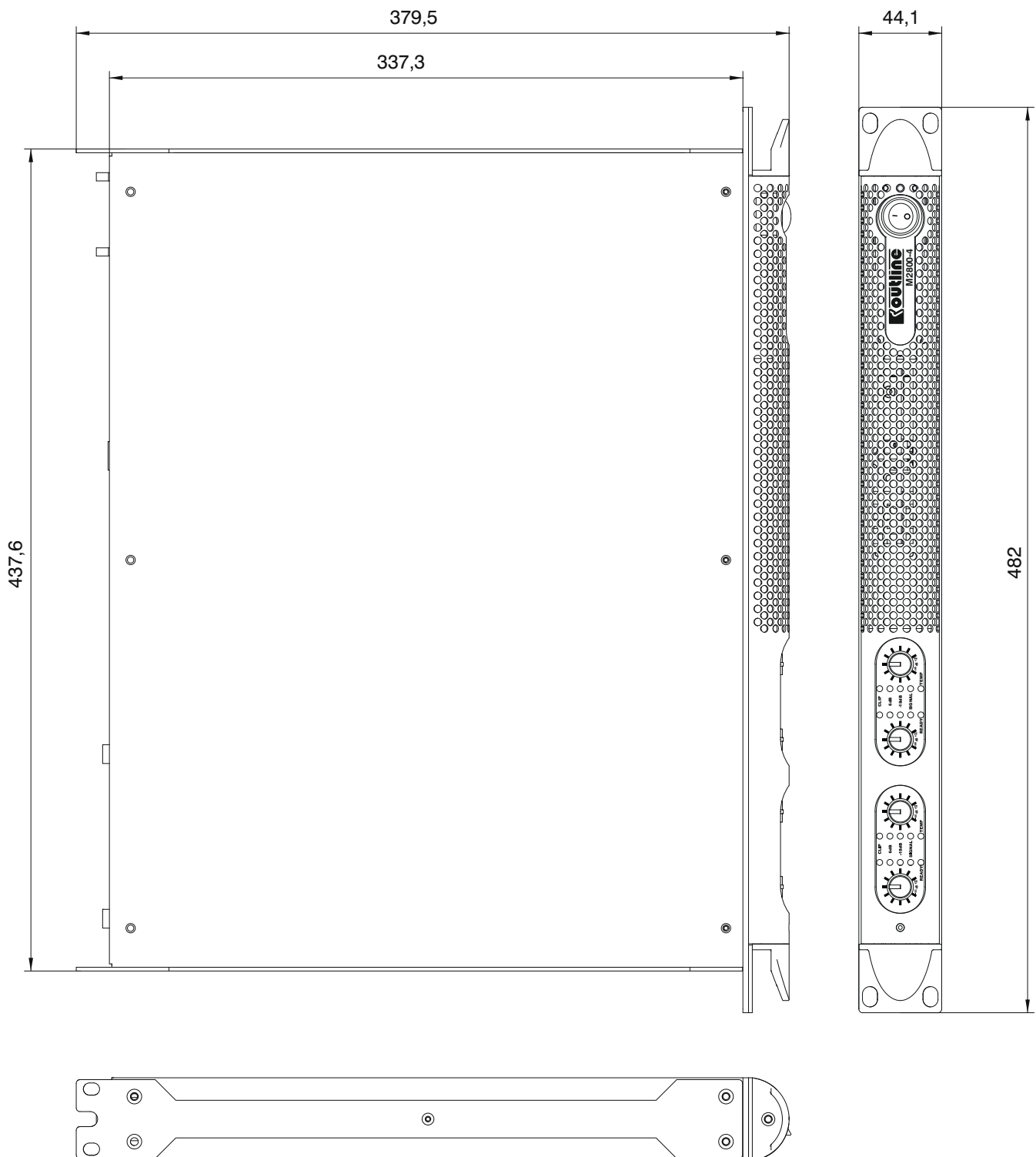


FIGURE 1: M2800-4 mechanical drawing. All dimensions in millimeters.

4 Interfaces

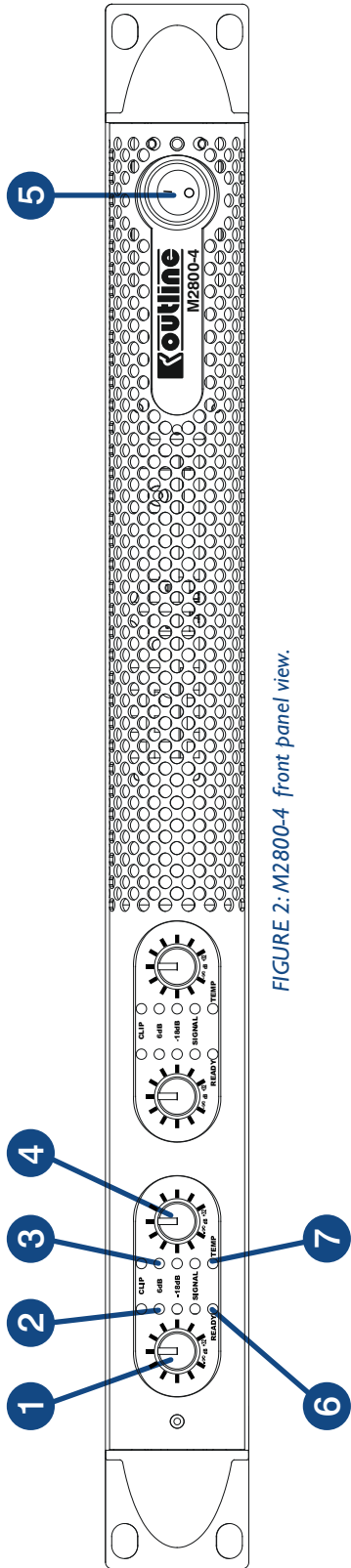


FIGURE 2: M2800-4 front panel view.

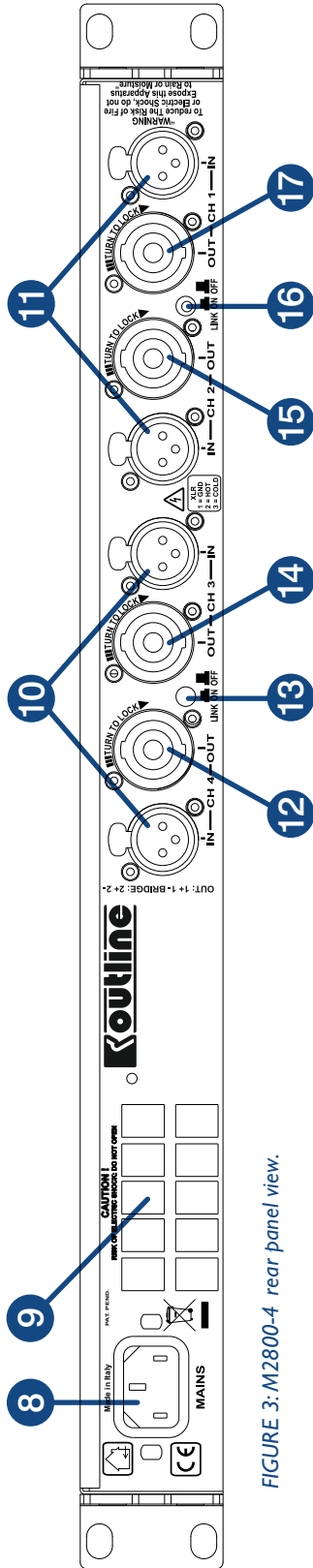


FIGURE 3: M2800-4 rear panel view.

- | | |
|--|--|
| <ul style="list-style-type: none"> 1. Channel 1 input attenuator 2. Channel 1 meter LEDs 3. Channel 2 meter LEDs 4. Channel 2 input attenuator 5. On/off power switch 6. Channels 1&2 ready LED 7. Channels 1&2 temperature warning LED 8. AC mains power plug 9. Air vents | <ul style="list-style-type: none"> 10. Channels 3&4 line input XLR connector 11. Channels 1&2 line input XLR connector 12. Channel 4 output XLR connector 13. Link switch channels 3-4 14. Channel 3 output XLR connector 15. Channel 2 output XLR connector 16. Link switch channels 1-2 17. Channel 1 output XLR connector |
|--|--|

M2800-4

User Guide

5 Welcome

Congratulations on buying a Outline M2800-4 amplifier! Outline is a leading company in the field of high efficiency audio power management. The Outline switching mode technology has changed the way the world looks at professional audio amplification: no other amplifier's performance comes close for applications demanding high power and long term reliability. Thanks to amazing reductions in heat output and weight, without sacrificing output powers, Outline amplifiers can be used in an unlimited range of PA applications such as opera houses, theaters, churches, cinema, and theme parks.

6 Description

M2800-4 amplifier is specifically designed for touring and live applications. This amplifier offer smaller dimensions, lighter weight and the traditionally amazing sound quality and reliability of all Outline products. M2800-4 amplifier have power ratings suitable for a vast range of common applications.

6.1 More sound and less weight

Switching mode technology based amplifiers are highly efficient, delivering greater power to speakers with reduced heat dissipation: typical running efficiency of output stages is 95%, with only 5% of input energy dissipated as heat. This allows for smaller dimensions, weight and power consumptions.

Contrary to conventional amplifiers which achieve highest efficiency only at full rated power output, Class D efficiency is almost independent of output level. Music has an average power density of 40% of its peak value; this means that other (non-class D) amplifiers can easily generate 10 times more heat than Outline products for the same sound pressure level.

Outline amplifiers deliver crystal-clear highs, and a tight, well-defined low end: the most accurate reproduction of an audio signal. Solid time proven design features ensure extremely high performance in terms of super low total harmonic distortion, optimal frequency response, high power bandwidth and damping factor across a vast number of application scenarios.

Multi patented application of Pulse Width Modulation (PWM) high frequency sampling techniques is just one of the many factors contributing to the M2800-4 high performance ratings across the audio bandwidth.

The M2800-4 offers complete protection against any possible operation error. It is designed to work under a large range of possible conditions, delivering maximum power with maximum safety and an outstanding long term reliability. Anticipating potential problems at the design stage means your show always goes on!

7 Installation

7.1 Unpacking

Carefully open the shipping carton and check for any noticeable damage; the FIGURE 4 shows the packing view. Every Outline amplifier is completely tested and inspected before leaving the factory and should arrive in pristine condition. In the unlikely event that you should encounter any damage, please notify the shipping company immediately. Be sure to save all packing materials for the carrier's inspection.

The M2800-4 amplifier box contains the following:

- ▶ 1 amplifier.
- ▶ 1 x AC Mains cord with 3-pin plug 15 A for US or IEC 'Schuko' 16 A for every other nation.
- ▶ 1 x User Guide.

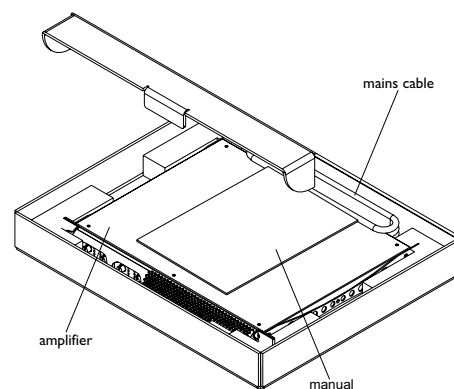


FIGURE 4: M Series package

7.2 Mounting

All Outline amplifiers are designed for standard 19" rack mounting with four front panel holes and two rear-lateral holes. In order to limit the risk of mechanical damages, amplifiers must be fixed to the rack using both frontal as well as rear mounting holes (see FIGURE 9).

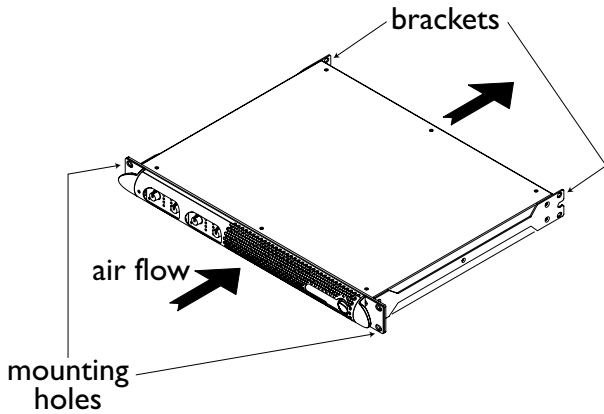


FIGURE 5: M2800-4 air flow.

7.3 Cooling

All Outline amplifiers implement a forced-air cooling system to maintain low and constant operating temperatures. Drawn by an internal fan, air enters through the slots in the front panel and is forced over all components, exiting at the back of the amplifier.

The amplifier's cooling system features an "intelligent" variable-speed DC fan which is controlled by heat sink temperature sensing circuits: the fan speed will increase only when the temperature recorded by the sensors rises over carefully predetermined values. This ensures that fan noise and internal dust accumulation are kept to a strict minimum. Should however the amplifier be subject to an extreme thermal load, the fan will force a very large volume of air through the heat sink. In the extremely rare event that the amplifier should dangerously overheat, sensing circuits shut down all channels until the amplifier cools down to a safe operating temperature. Normal operation is resumed automatically without the need for user intervention.

Caution regarding heat escape should be exercised when mounting M2800-4 amplifier. Exhaust cooling air is forced out through the rear of the chassis (see FIGURE 5); make sure there is enough space around the back of the amplifier for this air to escape. M2800-4 amplifiers can be stacked one on top of the other due to the efficient cooling system they are equipped with. There is however a safety limit to be observed: in case a rack with closed back panels is used, leave one rack unit empty every four installed amplifiers to guarantee adequate air flow.

7.4 Operating precautions

Make sure the power switch is off before attempting to make any input or output connections.

Make sure the AC mains voltage used is within the acceptable operating voltage range specified in the M2800-4 documentation (factory selected 115 V / 230 V \pm 15%), depending on your country

mains standard. Damage caused by connecting the amplifier to an improper AC mains voltage is not covered by the warranty.

By using good quality input and speaker cables, the likelihood of erratic signal behavior is reduced to a minimum. Whether you make them or buy them, look for good quality wires, connectors and soldering techniques.

7.5 Grounding

There is no ground switch or terminal on the M2800-4 amplifier. All shield terminals of input connections are directly connected to the chassis. This means that the unit's signal grounding system is automatic. In order to limit hum and/or interference entering the signal path, use balanced input connections.

In the interests of safety, the unit **MUST** always operate with electrical safety earth connected to the chassis via the dedicated wire in the 3-wire cable. Never disconnect the ground pin on the AC mains power cord.

7.6 AC mains connection

The AC Mains connection is made via the IEC type connector on the back of the amplifier. Please make sure your AC mains power source operates within the voltage limits indicated on this manual (factory selected 115 V / 230 V \pm 15%).

Safety warning!
Ground wires must be connected!
Do not use adapters that disable grounding.

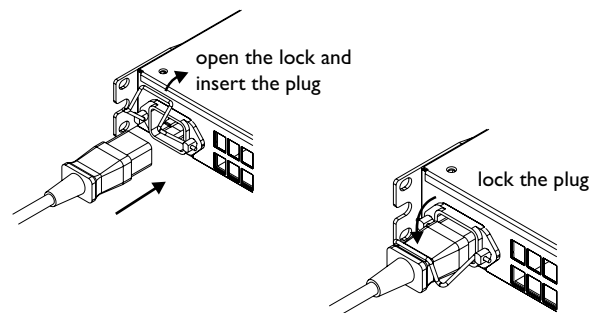


FIGURE 6: AC mains plug connection.

8 Connections and Operation

This section provides information on amplifier connection and operation. For optimal amplifier performance, it is important to understand the meaning of the information that M2800-4 amplifier can provide regarding its status and configuration.

8.1 Front panel air filters access

The grey front panel of M2800-4 amplifier can be removed to access the air filters. This is useful when the air filters need to be cleaned due to dust accumulating and clogging the filters thus hindering proper air circulation vital for cooling purposes.

To take off the grey colored front panel, remove the two screws highlighted in with a Philips screwdriver. The panel will easily separate from the amplifier exposing the sponge-like air filters.

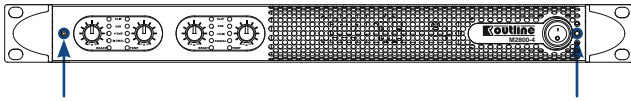


FIGURE 7: Unscrew and remove the front panel.

Before replacing the front panel, remember to reposition the air filter on the chassis by placing it on its designated area, then reposition and tighten the two frontal screws.

8.2 Front panel adjustments

The front panel of M2800-4 amplifier has one stepped attenuation pot for each channel. Turning the pot counterclockwise, the user can modify the level of the input signal in steps corresponding to a gain reduction ranging in:

$-\infty, 4, 14, 18, 20, 22, 24, 26, 28, 30, 32$ dB.

8.3 Front panel monitoring

The M2800-4 front panel provides important information on the state of the amplifier. It is important to know and understand the meaning of every front panel indicator LED in order to have crucial information on the amplifier status.

There are two sets of LEDs on the M2800-4 front panel: channel indicators and status indicators. Channel indicators: each channel has its own column set of 4 LEDs. The top LED is red, and the following three are green. Status indicators: each channel pair has one set of two green status indicator LEDs.

The function of both families of LEDs is summarized in TABLE I.

Channel indicators			
LED	Color	Solid ON	Label
	RED	Channel output level has reached clipping limits OR Short circuit protection has been engaged	CLIP
	GREEN	Channel output level is above -6 dB of max output level	-6 dB
	GREEN	Channel output level is above -18 dB of max output level	-18 dB
	GREEN	Input signal presence	SIGNAL
Status indicators			
LED	Color	Solid ON	Label
	GREEN	Channel is ready	READY
	YELLOW	Output power is being reduced due to heat sink temperature exceeding 75 °C	TEMP

* Should the temperature exceeds 85 °C, the LED will stay on and the channel will be muted. The amplifier will resume normal functioning and the LED will turn off automatically when the temperature falls below 75 °C.

TABLE I: M2800-4 LEDs chart.

8.4 Connecting audio inputs

Audio input connections are made via four XLR connectors found on the rear of the amplifier. Signal looping (i.e. link thru) is possible using the two XLR male connectors which are also found on the back panel. The Link on/off buttons allows to connect input channels 1 and 2 (and/or channels 3 and 4) in parallel.

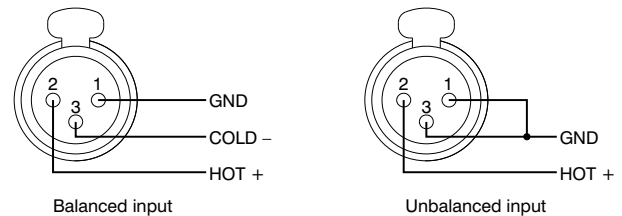


FIGURE 8: Balanced and unbalanced input XLR connections.

8.5 Connecting audio outputs

WARNING!

Lethal voltage levels may be present at the loudspeaker connectors when the amp is turned on!

All output connections are made via speakON connectors. Both bridge as well as single channel output connection modes are available. In the single channel mode wiring, the I+ pin of the connector corresponds to the positive output of the channel, the I- to ground (see FIGURE 9); for bridge mode refer to Section 8.5.1.

The M2800-4 amplifier manage bridge and single channel mixed configuration; for example, channels 1 and 2 can be set in bridge mode, and channels 3 and 4 single-ended.

8.5.1 Bridge Mode Connection

Bridge mode connection of outputs is possible only in lo-Z operational mode: minimum load impedance shall be 8Ω.

Bridging of adjacent channels is possible for the following pairs: channels 1 with 2 and channels 3 with 4.

Bridging is NOT possible for other pairs, for example channels 1 and 3.

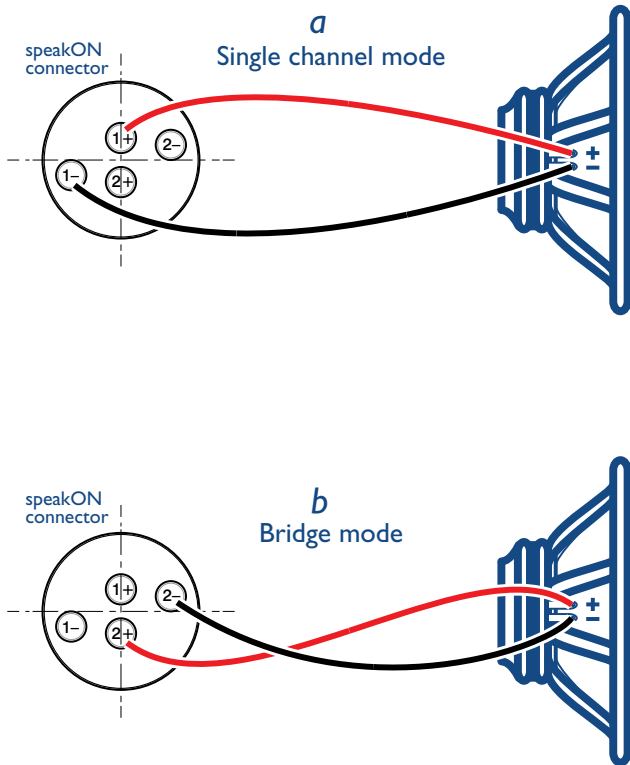


FIGURE 9: Loudspeaker wiring;
 a) single channel mode, low impedance loudspeaker;
 b) bridge mode.

In order to set the output in bridge mode:

- ▶ parallel the input by pressing on the link button;
- ▶ connect the loudspeaker to just one speakON: 2+ pin is the positive and the 2- the negative;
- ▶ minimum load impedance shall be 8 Ω

9 Protection

In order to protect your device and your speakers from accidental damage, M2800-4 amplifier include an extensive automatic protection system. In the following sections, potentially dangerous scenarios and the amplifiers' corresponding protective response are explained in detail.

9.1 Turn on/Turn off muting

Class D amplifiers may cause severe speaker damage at power up due to the high voltage levels at the output stage. In order to

avoid this, the outputs are muted for less than 2 seconds (less than 5 seconds for DSP models) after turn on. Similarly, turning off the amplifier can cause the same problem: outputs are muted immediately at turn off.

9.2 Short circuit protection

Short circuits or very low impedance loads may destroy the output stage of any amplifier. In order to protect the amplifier from the dangerously high current surges arising from accidental output short circuits or low impedance loads, all M series amps block channel activity when the current drawn from the load rises above a set value. The channel is muted for 2 seconds after which the amplifier will unmute the channel and check whether the current draw is still over the safety threshold. Should this be the case, the amplifier will mute the channels for another 2 seconds and the procedure will reiterate. The red "CLIP" LED will be turned off only when the output current draw will have returned within safe limits.

9.3 Thermal protection

Outline M2800-4 amplifier have variable speed fans to assist cooling. If for some reason the cooling system can't dissipate the produced heat correctly, a thermal protection system is automatically activated to avoid permanent damages. Every channel pair has a temperature sensor on the output stage heat sink. Two different protection strategies are implemented depending on the severity of the overheating. In order to protect internal components, the amplifier may automatically reduce output power until the internal temperature returns to safe levels.

9.4 Thermal warning

If the heat sink reaches a temperature of approximately 75 C, the front panel red "TEMP" LED corresponding to the overheated channel pair turns on to warn the user of a potentially dangerous thermal event. Output power is reduced to prevent damages to the output stage.

9.5 Thermal shutdown

If the heat sink temperature rises above 85 C, the thermal sensing circuitry will mute each power section of each compromised channel pair. Only after the heat sink has cooled down to below 75 C the channel pair will automatically unmute and the red "TEMP" LED will be turned off.

9.6 DC fault protection

In order to protect your speakers from mechanical damage caused by a DC signal coming from the amplifier's output, a DC detection circuit is placed between the amplifier's output stage and power supply. If a DC signal or excessive subsonic energy appears at a channel output an instantaneous protection circuit will mute the compromised channel pair. The red "CLIP" LED will turn on to signal that protective measures have been engaged.

9.7 Input/output protection

Interference protection is implemented in the M Series to limit out of band noise carried by the input lines. Disturbing frequencies can interact with the output stage, causing unpredictable amplifier behavior. A filtering system is used to stop infrasonic and VHF signals from entering the signal path.

10 User Maintenance

10.1 Cleaning

Before attempting to clean any part of the amplifier, first disconnect the AC main source. Use a soft cloth and mild non-abrasive solution to clean the faceplate and chassis.

WARNING! Never let any liquid reach the internal parts of the amplifier.

10.2 Service

There are no user-serviceable parts in your amplifier. Refer servicing to qualified technical personnel. If your amplifier needs repair contact your Outline dealer. You can also contact the Outline Technical Service department.

10.3 Dust Removal

In dusty environments, the front side air filters clog with dust after prolonged use. The dust gathered in the filters will interfere with cooling. You may use compressed air to remove the dust from filters. To remove air filters please refer to the front panel removal procedure (see Section 8.1). Air filter cleaning should be scheduled according to the dust levels in the amplifier's operating environment.

11 Warranty

11.1 Product warranty

Outline guarantees its manufactured products to be free from defective components and factory workmanship for a period of 48 (forty eight) months, starting from the date of purchase printed on Outline (or any of its Authorized Dealer's) invoice to the end customer. All warranty repairs and retrofits must be performed at Outline facilities or at an Authorized Service Center at no cost for the purchaser. Warranty exclusion: Outline's warranty does not cover product malfunctioning or failure caused by: misuse, abuse, repair work or alterations performed by non-authorized personnel, incorrect connections, exposure to harsh weather conditions, mechanical damages (including shipping accidents), and normal wear and tear. Outline will perform warranty services provided that the product is not damaged during transportation.

11.2 Repair or replacement

Outline reserves the right to repair or replace any defective goods covered by product warranty at its sole discretion and as it deems best.

11.3 Cost and responsibility of transport

The purchaser (or end user/customer) is solely responsible for all transportation costs and risks associated with sending warranty covered goods to Outline or its Authorized Service Center. Outline will assume full responsibility and cover all costs incurred to send the goods back to the purchaser (or end user/customer).

12 Power rating

Single-channel mode		Distributed lines		Mono-bridge mode
4 Ω	8 Ω	70 V	100 V	8 Ω
700 W	350 W	no	no	1400 W

13 Specifications

General				
Number of channels	4 mono, bridgable per channel pair			
Max output power per channel*	single channel mode		bridge mode	
	4 Ω / Ch	8 Ω / Ch	8 Ω / Ch pair	
	700 W	360 W	1400 W	
Max output voltage	85V _{peak} / 60 A _{peak}			
AC Mains Power				
Power supply	Universal, regulated switch mode			
Nominal power requirements	AC 115V - 230V (factory selection), 50/60 Hz			
Operating range	AC 97V - 264V			
Inrush current	< 26 A _{rms}			
Consumption / current draw	230V		115V	
Idle	62 W	0.51 A	64 W	0.6 A
1/8 of max power @ 4 Ω	580 W	3.74 A	580 W	7.48 A
1/4 of max power @ 4 Ω	1066 W	6.52 A	1066 W	13.04 A
Thermal				
Environmental operating temperature	0 - 45 C / 32 - 113 F			
Thermal dissipation	Fan, variable speed, temperature controlled front to rear airflow			
Idle	212 BTU/h		53 kcal/h	
1/8 of max power @ 4 Ω	785 BTU/h		198 kcal/h	
1/4 of max power @ 4 Ω	1249 BTU/h		315 kcal/h	
Audio				
Gain	32 dB, 30 dB, 28 dB, 26 dB, 24 dB, 22 dB, 20 dB, 18 dB, 14 dB, 4 dB, - ∞ , user selectable			
Frequency response	10 Hz - 30 kHz \pm 3 dB @ 1 W, 8 Ω			
S/N ratio (amplifier section)	> 111 dB (20 Hz - 20 kHz, A weighted)			
Crosstalk separation	>70 dB @ 1 kHz			
Input sensitivity @ 8 Ω	1.34V _{rms} / 4.76 dBu			
Max input level	6 V _{rms} / +17.8 dBu			
Input impedance	10 k Ω			
THD+N / SMPTE IMD	<0.05% @ 1/2 full power			
DIM100 IMD	typ. <0.005% (<0.02% @ >0.1W)			
Slew rate	40V/ μ s @ 8 Ω input filter bypassed			
Damping factor @ 8 Ω	> 5000 @ 100 Hz			
Front panel				
Indicators	4 LEDs per channel: 3 x green, 1 x red; 4 status LEDs: 2 x green, 2 x yellow			
Controls	1 stepped level attenuator pot per channel; mains switch			
Maintenance	Dust filter foam behind front panels			
Rear panel				
Controls	2 x link switch, linking analog inputs 1&2 and 3&4			
Input / Output connectors	4 x balanced Neutrik® XLR female 4 x Neutrik® Speakon NL4MD			
AC mains	IEC C13 16 A connector; AC mains cord with 3-pin plug 15 A for US, IEC Schuko 16 A for every other nation			
Construction				
Dimensions	L x W x H: 483 mm x 44.5 mm x 379 mm / 19" x 3.5" x 14.9"			
Weight	7.3 kg/ 16 lb			

Outline carries out on-going research for product improvement. New materials, manufacturing methods and design upgrades are introduced to existing products without prior notice as a routine result of this philosophy. For this reason, any current Outline product may differ in some aspect from its description, but will always equal or exceed the original design specifications unless otherwise stated.

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 Operating manual product code: Z OMM2800-4
 Release: 150422