



SOUND
DEVICES

MM-1

Microphone Preamplifier with Headphone Monitor

User Guide and Technical Information



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MM-1 Mic Preamp with Headphone Monitor

User Guide and Technical Documentation

General Description

Sound Devices MM-1 combines a high-performance microphone preamplifier with a flexible headphone monitor.

The full-featured, transformer-balanced microphone preamp produces low-noise, low-distortion gain at all switch positions. Its dual-stage limiter and high-pass filter prevent occasional signal extremes from overloading down-stream equipment.

The MM-1 is at home in a range of applications – film sound (boom operators), high-definition television production, corporate/industrial environments, radio/television announce booths, and music production. With its headphone monitoring function the MM-1 is a benefit in applications where communications channels and mix-minus feeds need to be monitored in headphones. The user can monitor both microphone audio and external audio sources in headphones with level control.

The MM-1 is designed for durability. Its extruded aluminum chassis, rugged end panels, machined knobs, and panel mounted connectors assure reliable mechanical operation.

Features

High Performance Microphone Preamplifier

- ◆ Maximum of 66 dB of gain, in eleven discrete steps for accurate, repeatable gain settings.
- ◆ Dynamic range exceeding 120 dB
- ◆ 10 Hz to 50 kHz audio bandwidth.
- ◆ High immunity to RF interference due to transformers, RF filtering, and all-metal construction
- ◆ High current line output driver capable of driving very long cable runs.
- ◆ Premium Lundahl input transformer with superior sonic quality and freedom from interference problems.
- ◆ Extended range peak limiter via dual opto-isolators makes preamplifier virtually "unclippable".
- ◆ Selectable 48-volt / 12-volt phantom power or 12-volt T-power for condenser microphones.
- ◆ High-pass filter with two selectable corner frequencies, 80 and 160 Hz, 6 dB per octave.

Headphone Monitoring

- ◆ Headphone monitoring of microphone audio, external monitor audio, or a mix of both.
- ◆ Monitor input accepts balanced or unbalanced mono line-level inputs on 1/4-inch tip-ring-sleeve connector.
- ◆ Separate level control of Monitor gain and overall headphone gain.
- ◆ Split ear function via DIP switches.

Portable

- ◆ Internal battery power (two-AA) for convenient, low cost power.
- ◆ Excellent battery life with alkaline or lithium primary cells.
- ◆ External 5-17 VDC powering (plug included).

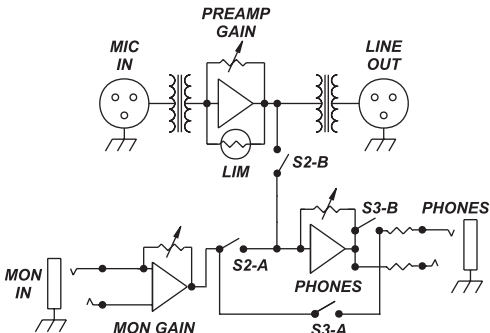
Durable Mechanical Construction

- ◆ High strength aluminum chassis withstands punishing field conditions.
- ◆ Panel-mounted connectors for strength and reliability.
- ◆ Easy access battery compartment for quick battery changes.
- ◆ Durable belt clip and end panels.

MM-1 Mic Preamp with Headphone Monitor

User Guide and Technical Documentation

Block Diagram

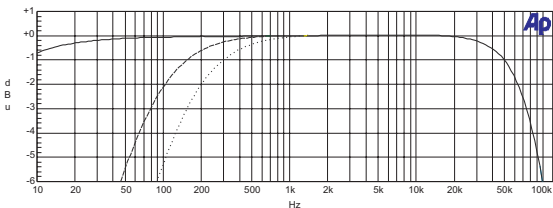


Specifications

Gain: (Mic - Line)	0 dB to 66 dB input to output, switch selectable
Gain Accuracy (Mic - Line)	+0.6, -0.1 dB with reference to front panel gain markings (150 ohm source, 100 k load impedances)
Frequency Response (Mic - Line)	20 Hz –20 kHz, +0.1, -0.5 dB, -1 dB at 50 kHz (relative to 1 kHz level with 150 ohm source)
Equivalent Input Noise: (Mic)	-126 dBu (-128 dBV) maximum (150 ohm source, flat weighting, 22 Hz – 22 kHz bandwidth gain setting 36 dB or greater)
Output Clipping Level: (Line)	+22 dBu minimum with 100k ohm load +20 dBu minimum with 600 ohm load
Input Clipping Level: (Mic)	+4 dBu minimum at the 0 or +18 dB gain setting
Dynamic Range: (Mic to Line)	122 dB minimum at the +18 dB gain setting
THD + Noise	0.05% maximum (from 50 Hz – 22 kHz @ +4 dBu output level, 22 Hz – 22 kHz filter bandwidth, +46 dB gain setting)
Common Mode Rejection Ratio:	100 dB minimum at 80 Hz 60 dB minimum at 10 kHz

MM-1 Frequency Response

- w/80 Hz HP
- .. w/160 Hz HP

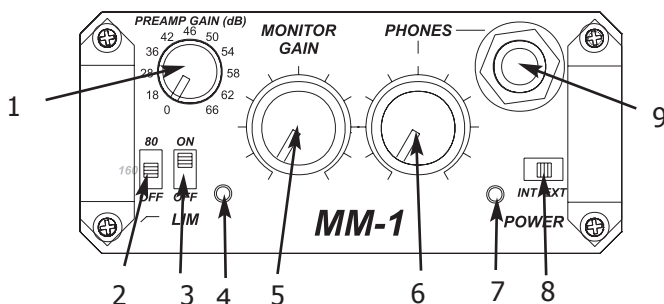


Input: (Mic)	Transformer-balanced, 2k ohm input impedance
Input: (Monitor)	Electronically-balanced, 22k ohm input impedance
Output: (Line)	Transformer-balanced, 130 ohm output impedance
Headphone Output Impedance:	Unbalanced, 200 ohms
Frequency Response: (Monitor In)	10 Hz – 50 kHz, ± 0.5 dB, gain at 50 %
Frequency Response: (Headphone Out)	10 Hz – 50 kHz, ± 0.5 dB, gain at 50 %
Input Clipping Level: (Monitor In)	greater than +30 dBu
High-Pass Filter:	80 Hz or 160 Hz (switch selectable), 6 dB per octave
Phantom Power:	12 V or 48 V (switch selectable), will supply 10 mA per DIN 45 596 specification
T-Power:	12 V via 180 ohm resistors, will supply 10 mA
Limiter:	Limits to +17 dBu output level, 10:1 limiting ratio 5 ms attack time, 100 ms release time Amber/Red LED indicates limiting/clipping
Internal Voltage Rails:	± 15 V, regulated
Power:	<u>Internal</u> : 2 x AA batteries <u>External</u> : 5 – 17 VDC via threaded coaxial jack, (5.5 mm outer diameter, 2.1 mm inner diameter), pin positive, sleeve negative. Voltages above 17 VDC cause no damage to unit but will open an internal poly fuse. Poly fuse will reset when voltage is removed.
Polarity:	All inputs to all outputs are non-inverting. <u>XL</u> R – pin 2 = hot, pin 3 = cold, pin 1 is ground. <u>TR</u> S – Tip = hot, ring = cold, sleeve = ground
Weight: (unit only)	0.64 kg 1.42 lbs.
Dimensions: (unit only)	49 mm x 95 mm x 166 mm (h x w x d) (1.95" x 3.75" x 6.55")
Included Accessories:	- Mating DC power connector - 4 rubber feet

MM-1 Mic Preamp with Headphone Monitor

User Guide and Technical Documentation

Front Panel Controls and Connectors



1. **PREAMP GAIN Switch (Rotary)**

Selects the amount of gain from input to output, adjustable in 11 increments.

2. **High-Pass Filter Switch**

Three-position switch inserts an 80 Hz or 160 Hz corner frequency filter, 6 dB per octave. Off position removes the filter from the signal path.

3. **LIMITER Switch**

Activates the peak limiter. Limits to +17 dBu output.

4. **LIMITER/Peak LED**

Bi-color LED illuminates red at 3 dB below clipping; illuminates amber to indicate limiter activity.

5. **MONITOR In Gain**

Controls the level of Monitor Input signal.

6. **PHONES Gain**

Controls the overall headphone monitor level of both preamp audio and monitor audio.

7. **POWER LED**

Bi-color LED illuminates green when the unit is powered and changes to red when approximately four hours of battery life remain.

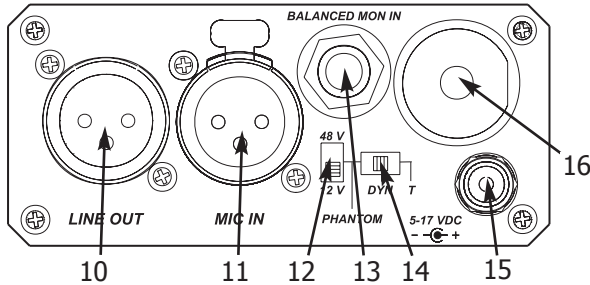
8. **POWER Switch**

Selects the power source for the unit, either Internal (battery) or External power.

9. **Headphone Connector**

1/4-inch TRS mono headphone output; microphone audio and/or monitor audio in headphones.

Back Panel Controls and Connectors



10. LINE OUT

Transformer-balanced line-level output. +22 dBu peak output level.

11. MIC IN

Transformer-balanced XLR input accepts microphone level signals.

12. Phantom Voltage Switch

Selects phantom voltages between 48 V or 12 V for mic powering.

13. Balanced Monitor Input

Active-balanced 1/4-inch connector accepts balanced or unbalanced line level signals from -10 dBu to +24 dBu.

14. Microphone Power Switch

Three-position switch selects Phantom power, T-power (12 Volts), or no power (DYN position).

WARNING: Do not use T-power with phantom powered or dynamic microphones (see "Microphone Powering").

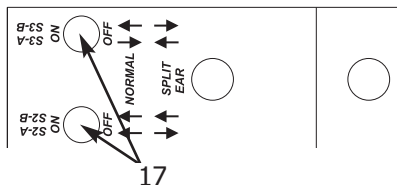
15. External DC Input Connector

Accepts 5 - 17 VDC, pin (+), sleeve (-).

16. BATTERY Compartment

Requires two AA batteries for operation. Insert positive (+) end of battery first.

Bottom Panel Switches



The bottom panel switches are accessible when the belt clip is removed. Use a 1/16-inch allen-head wrench.

17. DIP Switches

The "Split Ear" setting allows the a signal to be sent to the left headphone earpiece and a monitor signal to be sent to the right earpiece. Also, S2-B can mute the mic audio to the headphones.

MM-1 Mic Preamp with Headphone Monitor

User Guide and Technical Documentation

Operational Notes

Transformers

The isolation characteristics of transformers are superior to any other balancing technique, particularly for the adverse and uncontrolled environments of field production. Transformers provide galvanic isolation from the driving source, meaning there is no direct electrical connection. Signals are "transformed" magnetically. Both transformers in the MM-1 use premium magnetic core material to achieve high signal handling capability (especially at low frequencies) while keeping distortion to a minimum. Because of their inherently high common mode impedance, transformers are unrivaled by any other type of input for common-mode noise rejection.

Both the microphone input and line output of the MM-1 can be balanced or unbalanced without problems. When unbalancing (either input or output) ground pin 3 to pin 1. There is no change in gain with an unbalanced connection into or out of the MM-1.

Microphone Powering

Microphones requiring phantom power should use the lowest voltage acceptable to maximize battery life. Most electret-condenser microphones can operate on phantom voltages from 11-52 volts. There is typically no performance benefit to using 48-volts; therefore 12-volt phantom is appropriate. Some microphones which require 48-volt phantom will not operate, or may operate with lower headroom and increased distortion at 12 volts; therefore use 48-volt phantom. Consult your microphone documentation for the appropriate voltage.

Dynamic microphones do not require phantom power. A properly connected balanced, dynamic microphone will not be affected by the presence of phantom power nor will it draw any current. However, it is good practice to turn phantom power off if the microphone cable is suspect. Poor or incorrectly wired microphone cable can cause audible artifacts in the microphone signal. (Phantom is an excellent cable tester.)

T-powering is a specific powering topology needed **only for T-powered microphones**. T-power electrically is 12 volts applied to pin 2 with respect to pin 3 of the XLR connector. Because of the voltage differential of T-power, it is incompatible with dynamic or phantom powered microphones and can permanently damage dynamic and phantom powered mics.

High-Pass Filter

The two positions of the high-pass filter (low-cut) in the MM-1 are useful for removing excess low frequency energy in the audio signals. The 80 Hz position is appropriate when recording general speech, music, and ambient sound. The 160 Hz position is useful to enhance speech clarity. The high pass filter is a single pole design, 6 dB per octave.

When possible, attempt to equalize at the sound source with microphone selection, use of a windscreen, microphone placement, and onboard microphone filtering. A high-pass filter on the microphone and a high-pass filter on the MM-1 will give an additive effect, increasing the slope of the filter.

Limiter

The MM-1 has a built-in peak responding limiter which can be turned on or off by the front panel switch. The MM-1 limiter is two separate limiters circuits activated by the one switch; the first limiter keeps the input gain stage from clipping, and the second limiter limits the output to +17 dBu. The two limiters enable the MM-1 to limit in excess of 50 dB, meaning that it is very difficult to clip the unit, no matter the gain setting. The Limiter LED on the front panel illuminates amber in proportion to the amount of limiting.

Headphone Monitoring

With headphones connected to the front panel headphone jack the MM-1 can be used to monitor either microphone audio, monitor audio, or a mix of both signals. The Phones level controls the overall headphone volume. The Monitor Gain adjusts the level of the monitor input signal.

*** The MM-1 is capable of driving headphones to dangerously high levels. Take precautions to prevent hearing damage.**

Battery Life

Several factors affect battery life including - battery chemistry, ambient temperature of operation, microphone powering, and headphone drive levels. Experimentation is recommended to determine battery life for each individual setup. Note: Nickel-cadmium batteries are not recommended in the MM-1 since these batteries have lower energy per cell than other types and will result in very short service.

Battery Type	Operational Characteristics	Battery Life
Duracell AA MN 1500	Powered, idle	XX hrs.
Duracell AA MN 1500	Dynamic microphone, +4dBu output, 75 ohm headphones at moderate level	XX hrs.
Duracell AA MN 1500	Condenser microphone (48V), 75 ohm headphones at high levels	XX hrs.
1600 mAh NiMH AA	Dynamic microphone, +4dBu output, 75 ohm headphones at moderate level	XX hrs

(Test conditions: 70 degrees F)

MM-1 Mic Preamp with Headphone Monitor

User Guide and Technical Documentation

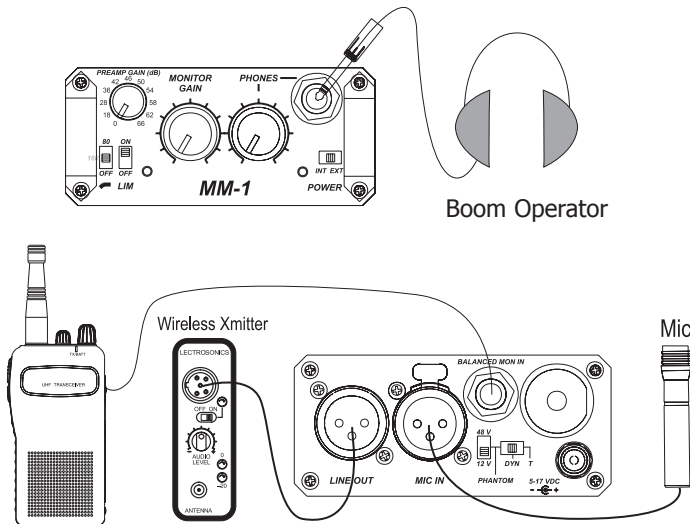
Application Notes

Line Driving/Mic Checking

Audio from remote microphones located more than 100 meters from a mixing console improve when sending line level signals to the mix position. Long cable runs at microphone level are more prone to noise and interference than line level signals. Phantom voltages can also drop over long cable runs - resulting in problems at the microphone. The MM-1 can be used to step microphone signals to line level, provide power to microphones, transformer-isolate grounds, and to verify microphone audio in headphones.

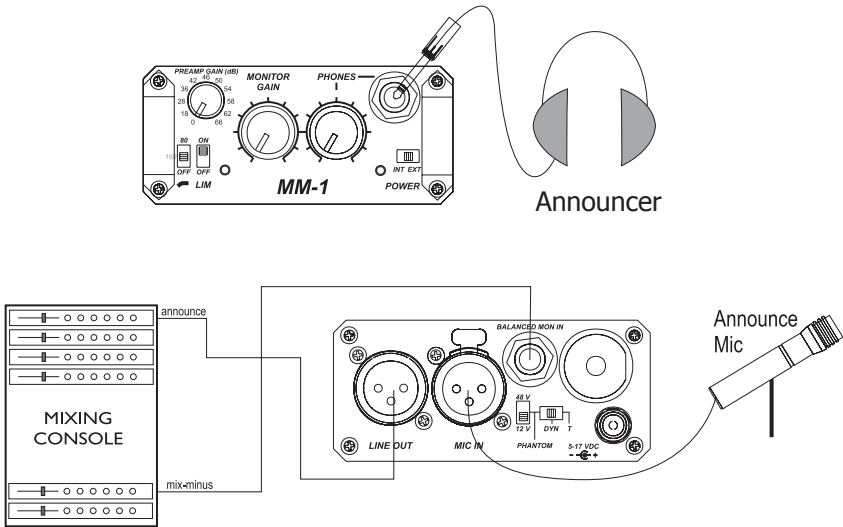
Wireless Boom Operator

The MM-1 can be used to allow a boom operator to have an un-tethered connection to a production van or mix position. The microphone is connected directly to the MM-1, and the "boom op" can hear microphone audio directly in headphones. The MM-1 is used to power the microphone and provide gain. The output of the MM-1 is connected to a body-pack wireless transmitter. A two-way radio's earpiece output is connected to the monitor input of the MM-1. Via the two-way the boom operator receives director's cues. The MM-1 allows the user to control monitoring levels of the comm feed and the microphone signal in headphones without affecting the microphone signal sent to the wireless transmitter.



Radio/Television Announcer Position

The MM-1 is used as a microphone preamplifier for an announcer's microphone and can pass a mix-minus headphone feed to the announcer. Sending a line level signal from the announcer position to the main mixing console is preferred over sending a mic level signal. When engaged, the limiter prevents distortion during shouting and high microphone signal levels.



In the set-up above the announcer has level control in the headphones of their overall audio level and the level of the mix-minus feed.

Podium Microphones

Often podium microphones need to carry long cable lengths and “see” multiple audio consoles. Using an MM-1 between podium microphones and mixing consoles provides needed isolation for the microphone. Because the MM-1 has transformer coupling for both inputs and outputs the potential for ground loops is substantially reduced. Driving line level signals to mixing consoles and powering microphones locally greatly improves the reliability and audio quality of a podium mic feeds. The microphone is connected directly to the MM-1, which provides gain, microphone power, filtering, and limiting. In addition, the microphone signal can be verified using the headphone output of the MM-1.

MM-1 Mic Preamp with Headphone Monitor

User Guide and Technical Documentation

FCC Statement

This device has been tested and found to comply with the limits for a class B digital device, pursuant to part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation.

Warranty

Sound Devices, LLC warrants the MM-1 Microphone Preamp with Headphone Monitoring against defects in materials and workmanship for a period of ONE (1) year from date of original retail purchase. This is a non-transferable warranty that extends only to the original purchaser. Sound Devices, LLC will repair or replace the product at its discretion at no charge. Warranty claims due to severe service conditions will be addressed on an individual basis. THE WARRANTY AND REMEDIES SET FORTH ABOVE ARE EXCLUSIVE. SOUND DEVICES, LLC DISCLAIMS ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. SOUND DEVICES, LLC IS NOT RESPONSIBLE FOR SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES ARISING FROM ANY BREACH OF WARRANTY OR UNDER ANY OTHER LEGAL THEORY. Because some jurisdictions do not permit the exclusion or limitations set forth above, they may not apply in all cases.

For all service, including warranty repair, please send the MM-1, along with proof of purchase date to:

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300 Wengel Drive
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