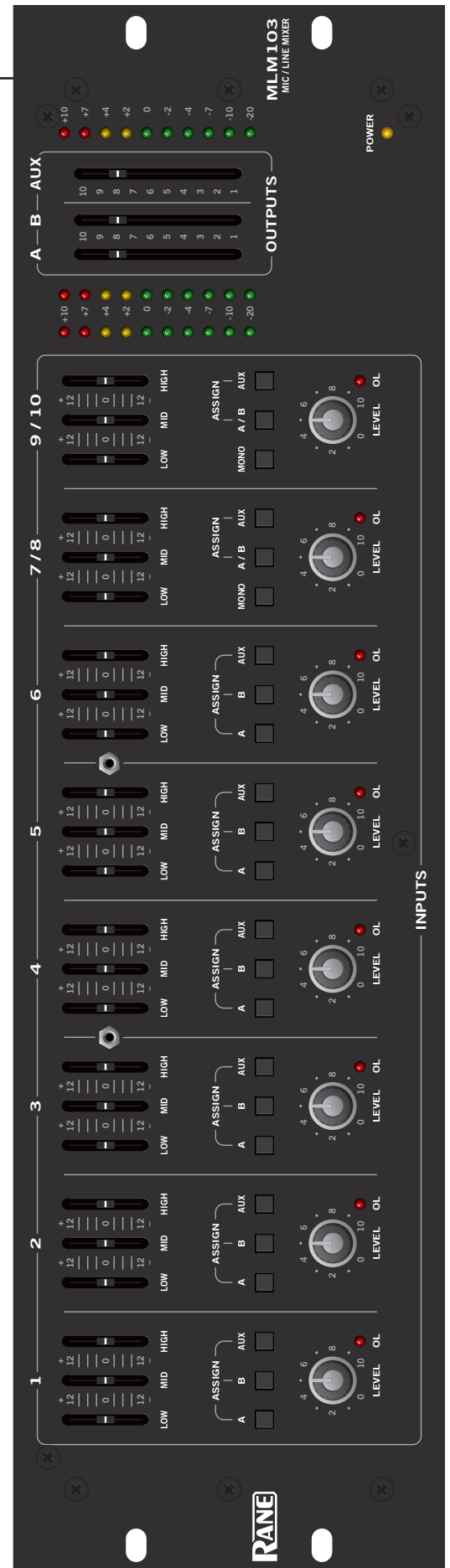




MLM103

MIC / LINE MIXER



CONTENTS *(in order of appearance)*

Important Safety Instructions
MLM103 Manual
MLM103 Data Sheet
Sound System Interconnection
Warranty
Declaration of Conformity

Schematics are downloadable at www.rane.com/mlm103.html





22359

IMPORTANT SAFETY INSTRUCTIONS



1. Read these instructions.
2. Keep these instructions.
3. Heed all warnings.
4. Follow all instructions.
5. Do not use this apparatus near water.
6. Clean only with a dry cloth.
7. Do not block any ventilation openings. Install in accordance with manufacturer's instructions.
8. Do not install near any heat sources such as radiators, registers, stoves, or other apparatus (including amplifiers) that produce heat.
9. 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 third prong is provided for your safety. If the provided plug does not fit into your outlet, consult an electrician for replacement of the obsolete outlet.
10. Protect the power cord and plug from being walked on or pinched particularly at plugs, convenience receptacles, and the point where it exits from the apparatus.
11. Only use attachments and accessories specified by Rane.
12. Use only with the cart, stand, tripod, bracket, or table specified by the manufacturer, or sold with the apparatus. When a cart is used, use caution when moving the cart/apparatus combination to avoid injury from tip-over.
13. Unplug this apparatus during lightning storms or when unused for long periods of time.
14. Refer all servicing to qualified service personnel. Servicing is required when the apparatus has been damaged in any way, such as power supply cord or plug is damaged, liquid has been spilled or objects have fallen into the apparatus, the apparatus has been exposed to rain or moisture, does not operate normally, or has been dropped.
15. The plug on the power cord is the AC mains disconnect device and must remain readily operable. To completely disconnect this apparatus from the AC mains, disconnect the power supply cord plug from the AC receptacle.
16. This apparatus shall be connected to a mains socket outlet with a protective earthing connection.
17. When permanently connected, an all-pole mains switch with a contact separation of at least 3 mm in each pole shall be incorporated in the electrical installation of the building.
18. If rackmounting, provide adequate ventilation. Equipment may be located above or below this apparatus, but some equipment (like large power amplifiers) may cause an unacceptable amount of hum or may generate too much heat and degrade the performance of this apparatus.
19. This apparatus may be installed in an industry standard equipment rack. Use screws through all mounting holes to provide the best support.

WARNING: To reduce the risk of fire or electric shock, do not expose this apparatus to rain or moisture. Apparatus shall not be exposed to dripping or splashing and no objects filled with liquids, such as vases, shall be placed on the apparatus.

<p style="text-align: center;">WARNING</p> <div data-bbox="116 1150 721 1310"><div><div><p>CAUTION</p><p>RISK OF ELECTRIC SHOCK</p><p>DO NOT OPEN</p></div><div></div></div><p>ATTENTION: RISQUE DE CHOCS ELECTRIQUE - NE PAS OUVRIR</p><p>To reduce the risk of electrical shock, do not open the unit. No user serviceable parts inside. Refer servicing to qualified service personnel.</p></div>	<p>The symbols shown below are internationally accepted symbols that warn of potential hazards with electrical products.</p> <div data-bbox="841 1163 987 1289"></div> <p>This symbol indicates that a dangerous voltage constituting a risk of electric shock is present within this unit.</p> <div data-bbox="841 1310 987 1436"></div> <p>This symbol indicates that there are important operating and maintenance instructions in the literature accompanying this unit.</p>
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WARNING: This product may contain chemicals known to the State of California to cause cancer, or birth defects or other reproductive harm.

NOTE: This equipment 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. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

CAUTION: Changes or modifications not expressly approved by Rane Corporation could void the user's authority to operate the equipment.

INSTRUCTIONS DE SÉCURITÉ



1. Lisez ces instructions.
2. Gardez précieusement ces instructions.
3. Respectez les avertissements.
4. Suivez toutes les instructions.
5. Ne pas utiliser près d'une source d'eau.
6. Ne nettoyer qu'avec un chiffon doux.
7. N'obstruer aucune évacuation d'air. Effectuez l'installation en suivant les instructions du fabricant.
8. Ne pas disposer près d'une source de chaleur, c-à-d tout appareil produisant de la chaleur sans exception.
9. Ne pas modifier le cordon d'alimentation. Un cordon polarisé possède 2 lames, l'une plus large que l'autre. Un cordon avec tresse de masse possède 2 lames plus une 3^e pour la terre. La lame large ou la tresse de masse assurent votre sécurité. Si le cordon fourni ne correspond pas à votre prise, contactez votre électricien.
10. Faites en sorte que le cordon ne soit pas piétiné, ni au niveau du fil, ni au niveau de ses broches, ni au niveau des connecteurs de vos appareils.
11. N'utilisez que des accessoires recommandés par Rane.
12. N'utilisez que les éléments de transport, stands, pieds ou tables spécifiés par le fabricant ou vendu avec l'appareil. Quand vous utilisez une valise de transport, prenez soin de vous déplacer avec cet équipement avec prudence afin d'éviter tout risque de blessure.
13. Débranchez cet appareil pendant un orage ou si vous ne l'utilisez pas pendant un certain temps.
14. Adressez-vous à du personnel qualifié pour tout service après vente. Celui-ci est nécessaire dans n'importe quel cas où l'appareil est abîmé : si le cordon ou les fiches sont endommagés, si du liquide a été renversé ou si des objets sont tombés sur l'appareil, si celui-ci a été exposé à la pluie ou l'humidité, s'il ne fonctionne pas correctement ou est tombé.
15. La fiche du cordon d'alimentation sert à brancher le courant alternatif AC et doit absolument rester accessible. Pour déconnecter totalement l'appareil du secteur, débranchez le câble d'alimentation de la prise secteur.
16. Cet appareil doit être branché à une prise terre avec protection.
17. Quand il est branché de manière permanente, un disjoncteur tripolaire normalisé doit être incorporé dans l'installation électrique de l'immeuble.
18. En cas de montage en rack, laissez un espace suffisant pour la ventilation. Vous pouvez disposer d'autres appareils au-dessus ou en-dessous de celui-ci, mais certains (tels que des gros amplificateurs) peuvent provoquer un buzz ou générer trop de chaleur au risque d'endommager votre appareil et dégrader ses performances.
19. Cet appareil peut-être installé dans une baie standard ou un chassis normalisé pour un montage en rack. Visser chaque trou de chaque oreille de rack pour une meilleure fixation et sécurité.

ATTENTION: afin d'éviter tout risque de feu ou de choc électrique, gardez cet appareil éloigné de toute source d'humidité et d'éclaboussures quelles qu'elles soient. L'appareil doit également être éloigné de tout objet possédant du liquide (boisson en bouteilles, vases,...).

ATTENTION



Afin d'éviter tout risque de choc électrique, ne pas ouvrir l'appareil. Aucune pièce ne peut être changée par l'utilisateur. Contactez un SAV qualifié pour toute intervention.

Les symboles ci-dessous sont reconnus internationalement comme prévenant tout risque électrique.



Ce symbole indique que cette unité utilise un voltage élevé constituant un risque de choc électrique.



Ce symbole indique la présence d'instructions d'utilisation et de maintenance importantes dans le document fourni.

REMARQUE: Cet équipement a été testé et approuvé conforme aux limites pour un appareil numérique de classe B, conformément au chapitre 15 des règles de la FCC. Ces limites sont établis pour fournir une protection raisonnable contre tout risque d'interférences et peuvent provoquer une énergie de radiofréquence s'il n'est pas installé et utilisé conformément aux instructions, peut également provoquer des interférences aux niveaux des équipements de communication. Cependant, il n'existe aucune garantie que de telles interférences ne se produiront pas dans une installation particulière. Si cet équipement provoque des interférences en réception radio ou télévision, ceci peut être détecté en mettant l'équipement sous/hors tension, l'utilisateur est encouragé à essayer de corriger cette interférence par une ou plusieurs des mesures suivantes:

- Réorienter ou déplacer l'antenne de réception.
- Augmenter la distance entre l'équipement et le récepteur.
- Connecter l'équipement à une sortie sur un circuit différent de celui sur lequel le récepteur est branché.
- Consulter un revendeur ou un technicien radio / TV expérimenté.

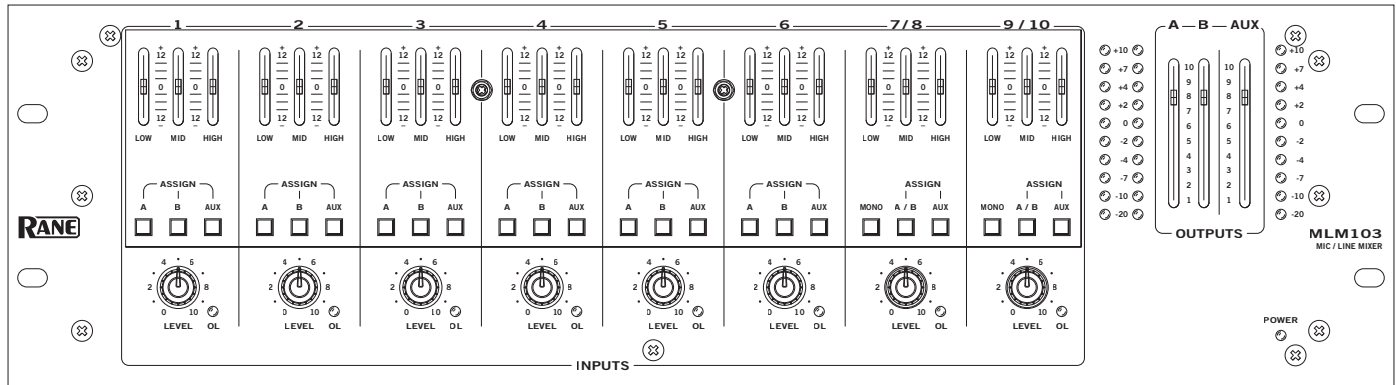
ATTENTION: Les changements ou modifications non expressément approuvés par Rane Corporation peuvent annuler l'autorité de l'utilisateur à manipuler cet équipement et rendre ainsi nulles toutes les conditions de garantie.

CAN ICES-3 (B)/NMB-3(B)



Cartons et papier à recycler.

RANE



QUICK START

If you don't get any further, at least read this section to get the best gain structure out of the MLM103.

INPUTS 1 through **6** may be microphone or line level. The choice between the two is made by setting the Input's **LINE** push-button on the rear panel.

Push the **PHANTOM POWER** button (when needed) for each pair of Inputs.

Using a screwdriver, adjust the **TRIM** for each Input so that the front panel **OL** LED illuminates only occasionally during extreme peaks. The three-band Equalizer settings will influence this, so keep an eye on the **OL** when making EQ adjustments. Now adjust the **LEVEL** for each Input.

Assign each Input to the desired Output by pushing any combination of the **A**, **B**, or **AUX** **ASSIGN** buttons.

INPUTS 7/8 and **9/10** are stereo line level Inputs.

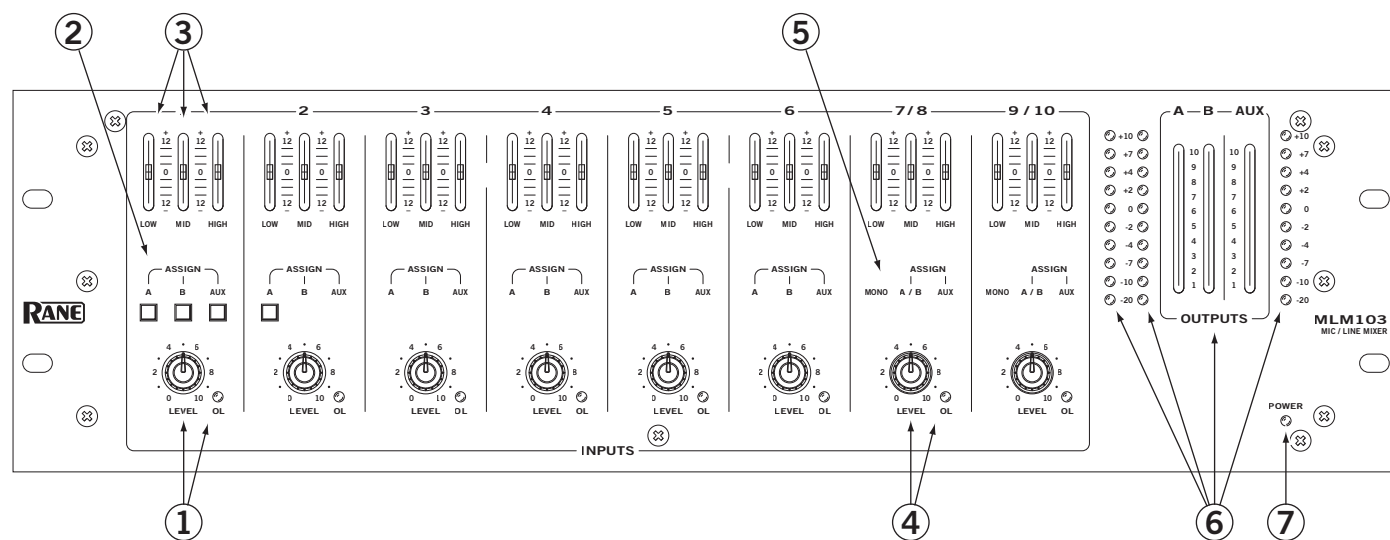
Assign each stereo input to the desired output as follows:

When the **ASSIGN** button is engaged and the **MONO** button is *not* engaged, **INPUT 7** (or **9**) is routed to the **A** Output, while **INPUT 8** (or **10**) is routed to the **B** Output.

When the both the **ASSIGN** and **MONO** buttons are engaged, both Inputs of **7/8** (or **9/10**) will route to both the **A** and **B** Output.

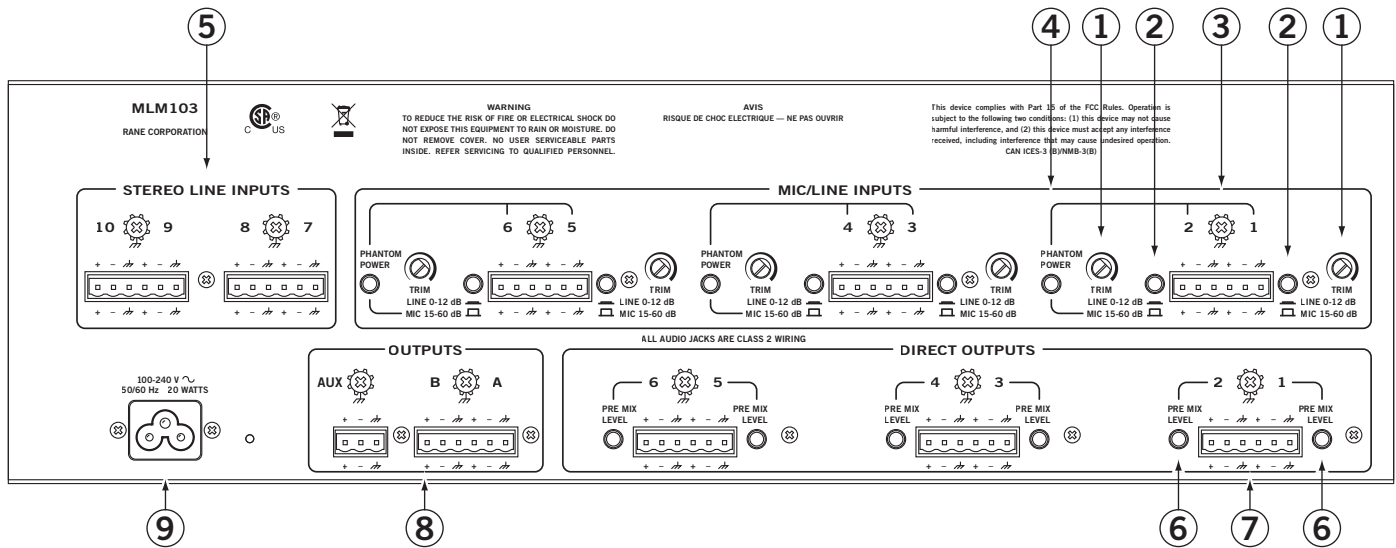
The **AUX** **ASSIGN** button is always a mono mix of the stereo channel.

FRONT PANEL DESCRIPTION



- ① **Mic/Line Input LEVEL controls 1-6** determine the amount of signal to be delivered to the assigned Outputs. The Overload light monitors the signal level before and after the Equalizer. If this illuminates steadily, turn down the LEVEL or EQ controls to prevent distortion.
- ② **Mic/Line Output ASSIGN** buttons. When the A button is engaged, the Mic/Line Input's audio is routed to Output A. When the B button is engaged, the Input's audio is routed to Output B. When the AUX button is engaged, the Input's audio is routed to the Aux Output. Any (or all) of the ASSIGN buttons can be engaged simultaneously.
- ③ **Equalizer controls** are used to contour the frequency response of the desired Input. LOW affects frequencies below 300 Hz, MID affects 300 Hz to 3.3 kHz, and HIGH affects frequencies above 3.3 kHz. The Equalizer sounds best and potential overload is avoided when at least one of the three bands is set to cut (below 0).
- ④ **Stereo Line INPUT LEVEL controls 7/8 and 9/10** determine the amount of stereo or mono line signal to be delivered to the assigned Outputs. The Stereo Line Overload light monitors the signal levels after the Equalizer and after the line gain stage. If this illuminates steadily, turn down the LEVEL or EQ controls to prevent distortion.
- ⑤ **Stereo Line Output ASSIGN buttons.** When the A/B assign button is engaged and the MONO button is not engaged, Input 7 (or 9) is routed to the A Output, while Input 8 (or 10) is routed to the B Output. When both the A/B ASSIGN and MONO buttons are engaged, both Inputs of 7 and 8 (or 9 and 10) will be routed to both the A and B Output. The AUX ASSIGN button is a mono mix of the stereo Inputs.
- ⑥ **A, B and AUX OUTPUT LEVEL controls** set the Output Level for A, B and AUX Outputs. The Output Meters indicate the overall levels of Output A, Output B and the AUX Output. The Meters are "peak hold".
- ⑦ **POWER indicator** lights whenever adequate power is applied to the unit.

REAR PANEL DESCRIPTION



- ① **MIC/LINE INPUT TRIM controls 1-6** adjust the input gain of the Mic/Line Inputs. The gain range for Mic level is 12 to 60 dB. The gain range for Line level is -4 to 12 dB.
- ② **LINE/MIC INPUT buttons 1-6** switch the sensitivity and input impedance for either a microphone or line input. Mic level is selected when the button is in the “out” position. Line level is selected when the button is in the “in” position.
- ③ **MIC/LINE INPUT connectors 1-6** are balanced Euroblocks that connect either microphone or line signals.
- ④ **PHANTOM POWER button** applies 12 volt phantom power to each pair of Mic/Line Inputs, only when the LINE/MIC INPUT button (②) is set to the MIC “out” position.
- ⑤ **STEREO LINE INPUTS 7/8 and 9/10** are pairs of balanced Euroblock connectors, accommodating stereo or mono line level signals.
- ⑥ **PRE/post MIX LEVEL DIRECT OUTPUT buttons.** When this switch is in the “in” position, the Direct Output signal is *not* affected by the Input’s Level control. When this switch is in the “out” position, the Direct Output signal *is* affected by the Input’s Level control.
- ⑦ **DIRECT OUTPUTS** are balanced Euroblocks that directly connect each Mic/Line Input signal to other audio devices as needed. These Direct Outputs are post-Equalizer.
- ⑧ **A, B and AUX OUTPUT connectors.** One 6-post balanced Euroblock connects the A mix and the B mix to other audio devices as needed. The other 3-post balanced Euroblock connects the AUX mix to other audio devices as needed.
- ⑨ The IEC appliance input jack uses a C5 cord, connected to AC mains using a line cord appropriate for your area. The high efficiency switching power supply used in the MLM103 operates at voltages from 100 VAC to 240 VAC, 50 or 60 Hz. To prevent accidental shutoff during the president’s speech, there is no front panel power switch. When applying power to the system, remember to turn power amplifiers on *last*.

CONNECTION

INPUTS

The MLM103 has ten balanced Euroblock Inputs. Use only shielded cable, #12 to #24 AWG. For best noise rejection use two-conductor-plus-shielded wire, even for unbalanced operation. Connect the non-inverting (positive) audio lines to the “+” terminals, and the inverting (negative) lines to the “-” terminals. Connect the shields to the “ground” terminals.

For those installations where the MLM103's internal shield-to-chassis connection causes interference, connect the shields directly to chassis PEM nuts directly above each pair of Euroblock connectors. Be sure to bite through the paint with the star washer and keep the shields wrapped around the audio conductors as much as possible. For the “theoretical” best ElectroMagnetic Interference (EMI) immunity, connect the shields at both ends of the cables. (For more information on connections, see the RaneNote, “Sound System Interconnection” later in this manual or on Rane's website.)

MONO INPUTS 1-6 can accept either mic or line level sources. When connecting line level signals, push the rear panel button *in* for LINE. For mic signals, be sure the button is in the MIC (*out*) position.

STEREO INPUTS 7/8 and 9/10 accept line level stereo and mono sources.

OUTPUTS

The MLM103's OUTPUTS (and DIRECT OUTPUTS) are balanced. The same wiring conventions as the Euroblock Inputs apply.

OPERATION

MONO MICROPHONE/LINE LEVEL INPUTS 1-6

The rear-panel MIC/LINE INPUT TRIM adjusts the input gain before the front panel LEVEL controls. When an Input's LINE/MIC button is in the “out” position (Mic Level), the gain range is 12 to 60 dB. When an Input's LINE/MIC button is in the “in” position (Line Level), the gain range is -4 to 12 dB.

First, input some “loud” source material (like a pop metal or disco CD, give a kid a mic, etc). Then, using a screwdriver, adjust the TRIM for each Input so that the front panel OL LED illuminates only occasionally during extreme peaks. The 3-band Equalizer settings will influence this, so keep on eye on the OL when making EQ adjustments.

Push the PHANTOM POWER button (when needed) for each pair of Inputs. If the LINE/MIC button is engaged (Line Level), Phantom Power is automatically defeated for that Input. The PHANTOM POWER button activates 12 volts which is sufficient power for all but the most esoteric condenser mics. If in doubt, check the manufacturer's microphone specs.

Assign each Input to the desired Output by pushing any combination of the A, B or AUX ASSIGN buttons.

The LEVEL of each Input can now be adjusted as needed without danger of blowing your speakers, or scaring the neighbors, whichever you deem worse.

STEREO LINE LEVEL INPUTS 7/8 and 9/10

When a stereo source (CD, DVD, Satellite radio, etc.) is connected to Inputs 7/8 (or 9/10), the routing is as follows:

When the ASSIGN button is engaged and the MONO button is *not* engaged, INPUT 7 (or 9) is routed to the A Output, while INPUT 8 (or 10) is routed to the B Output.

When both the ASSIGN and MONO buttons are engaged, a mono mix of INPUTs 7/8 (or 9/10) will be routed to both the A and B Outputs.

The AUX ASSIGN button is always a mono mix of the stereo channel.

OUTPUT LEVELS

After all of the Mic/Line and Stereo Input Levels have been adjusted and routed, adjust the OUTPUT faders so the Meters peak average around 0 to +2.

SECURITY COVER

The MLM103 comes with an installed security cover for the EQ and ASSIGN switches only, leaving the LEVEL controls and metering exposed for regular operation. This feature is valuable when you want to protect those painstaking settings from casual operators.

The cover is removed and replaced by two screws. If the security cover will not be used, remove the chrome standoffs from the front panel and replace with the black screws in these same locations.



General Description

The Rane MLM103 Mic & Line Mixer features six balanced studio-grade microphone inputs, and two balanced stereo line-level inputs. The microphone preamplifiers feature direct outputs. These can monitor the signal 'pre' or 'post' the mix Level control via rear panel switches. Each microphone and *stereo* line input features three-band EQ and mix level controls. Input overload indicators are peak detecting and illuminate 4 dB before clipping. Three balanced outputs are provided. A and B outputs may be used as a stereo pair in a single zone or as two independent mono zones. The AUX output is mono. All connections are via Euroblock connectors.

Inputs 1 through 6 may be individually switched between Mic or Line level via rear panel switches. Inputs operate in Mic mode with a gain range of +12 dB to 60 dB. Each *pair* of Inputs may operate with or without 12 volt phantom power via rear panel switches. When Inputs are operated in Line mode, the gain range is -4 to 12 dB. When Line mode is selected, phantom power is defeated. Each Input may be assigned to the A, B or AUX Output.

Stereo Line Inputs 7 through 10 accommodate +24 dBu signal levels. The gain range is $-\infty$ to +12 dB. The A/B Assign switch for Inputs 7/8 assigns 7 to Output A *and* 8 to Output B. The A/B Assign switch for Inputs 9/10 assigns 9 to Output A *and* 10 to Output B. The Mono switch sends the *sum* of Inputs 7 and 8 (or 9 and 10) to buses A *and* B. Assigning 7/8 or 9/10 to AUX sends the *sum* of Input 7/8 (or 9/10) to the AUX Output.

The A, B and AUX Outputs feature independent level controls and 10 segment meters with peak hold. Each balanced Output provides an additional 6 dB of gain and delivers a minimum signal level of +24 dBu into a 10 k Ω load.

The MLM103 features a built-in high efficiency, universal voltage power supply that can operate in almost any country in the world. A security cover for the EQ and Assign switches is included with the unit.

This product has not been tested to the current CE requirements and is not available in markets requiring CE compliance.

Features

- **Six Studio-grade Mic Preamplifier Inputs**
 - Mic or Line-level Operation
 - +12 volt Phantom Power
 - Continuously Variable Gain Trim
 - Direct Outputs (pre- or post- mix level)
 - A/B/AUX Assign Switches
 - Input Overload Indicator
 - EQ & Assign Switch Security Cover Included
- **Two Balanced Stereo Line-level Inputs**
 - Mono Switch
 - A/B/AUX Assign Switch
 - Input Overload Indicator
- **A/B/AUX Balanced Outputs**
 - Independent Level Control
 - 10-Segment Meter with Peak Hold
- **Euroblock Audio Connections**

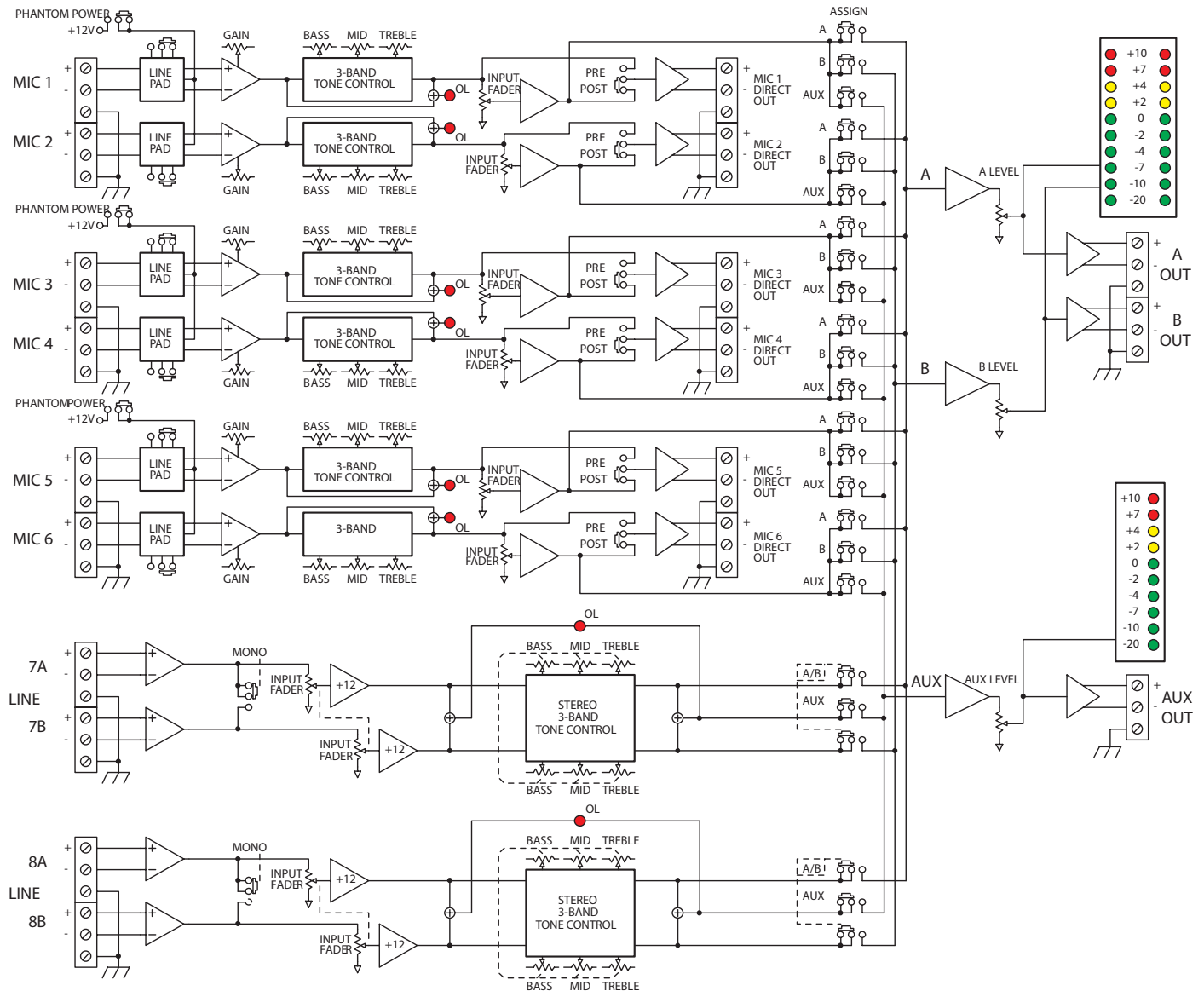


Includes Security Cover for EQ and Assign Switches.

Parameter	Specification	Limit	Units	Conditions/Comments
Mic Inputs: Type	Active balanced			
.....Connectors	Euroblock			Accepts 12-24 AWG wire
.....Input Impedance Mic Mode	1.49 k	1%	Ω	745 Ω each leg, 1 kHz
.....Input Impedance Line Mode	8 k	1%	Ω	4 k Ω each leg, 1 kHz
.....Gain Range Mic Mode	12 to 60	2	dB	Min/max, 1 kHz
.....Max Input Mic Mode	+8 / -40		dBu	Min/max gain, 1 kHz
.....Gain Range Line Mode	-4 / +12	1	dB	Min/max, 1 kHz
.....Max Input Line Mode	+24 / +8		dBu	Min/max gain, 1 kHz
.....Frequency Response	50 Hz-50 kHz	+5,-3	dB	Mic gain=60 dB
	10 Hz-50 kHz	+5,-3	dB	Mic gain=12 dB
.....Equivalent Input Noise	-127	typ	dBu	Mic gain 60 dB, Rs=150 Ω 20Hz-20kHz
.....Common Mode Rejection	60	min	dB	1 kHz, Rs=150 Ω , gain=60 dB
.....THD+N	0.01	typ	%	Mic gain=40 dB, +4 dBu, 20 Hz-20 kHz
.....Phantom Power	12	5%	VDC	Disabled in Line mode
Stereo Line Inputs: Type	Active balanced			
.....Connectors	Euroblock			
.....Input Impedance	10 k	1%	Ω	Each leg, common mode or differential
.....Gain Range	-infinity to +12	typ.	dB	1 kHz
.....Maximum Input	+24 / +12		dBu	Min/max gain, 1 kHz
.....Frequency Response	10 Hz-50 kHz	+5/-3	dB	
.....Common Mode Rejection	40	min	dB	1 kHz, Rs=150 Ω
.....THD+N	0.005	typ	%	20 Hz-20 kHz, +4 dBu, Load=10 k Ω
Tone Controls: Type	Baxandall			2 stage, bass and treble shelving
.....Boost/Cut Range	± 12	typ	dB	All filters
.....Low	± 6	typ	dB	Boost/cut at 300 Hz
.....Mid	± 6	typ	dB	Boost/cut at 300 Hz & 3.3 kHz, center 1 kHz
.....High	± 6	typ	dB	Boost/cut at 3.3 kHz
Outputs: Type	Active balanced			
.....Connector	Euroblock			Accepts 12-24 AWG wire
.....Output Impedance	200	1%	Ω	100 Ω each leg, 1 kHz
.....Maximum Output	+24	min	dBu	Load=10 k Ω , 1 kHz
.....Noise Floor	-100	typ	dB	No inputs assigned
	-89	typ	dB	Any line-level input assigned, output levels at max, 20 Hz to 20 kHz, re +4 dBu
.....Crosstalk	-80	max	dB	Any input to any output @ 1 kHz
.....Control Feed-through	-80	max	dB	All front panel assign and level controls
Meters: Type	Average dBu			
.....Range	-20 to +10		dBu	
.....Number of Segments	10			
.....Peak Hold	1 sec			
Power Supply Requirement	100 to 240		VAC	50/60 Hz, 20 watts
Unit: Conformity	FCC, cCSAus			247105
.....Construction	All Steel			
.....Size	5.25"H x 19"W x 5.3"D (3U)			(13.3 cm x 48.3 cm x 13.5 cm)
.....Weight	9 lb			(4.1 kg)
Shipping: Size	11" x 23" x 16"			(27.9 cm x 58.4 cm x 40.6 cm)
.....Weight	13 lb			(5.9 kg)

Note: 0 dBu=0.775 Vrms

Block Diagram



Applications

Applications can include hotels, churches, conference rooms, schools and rental sound systems. The direct outputs may be used with other mixers for applications requiring room combining and/or flexible zone distribution. The studio-grade specifications of the MLM103 allow many other applications such as sub-mixing, recording and post-production.

MLM103

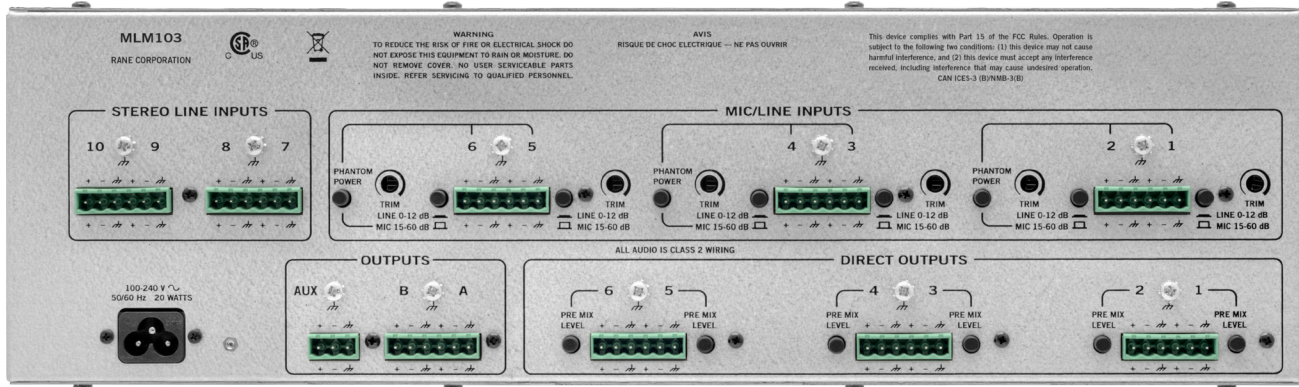
MIC & LINE MIXER



Front Panel with Security Cover Installed



Rear Panel



Architectural Specifications

The Mixer shall be a high performance Mic/Line Mixer featuring six balanced, studio-grade microphone inputs and two balanced, stereo line-level inputs. The microphone preamplifiers shall feature direct outputs able to monitor the signal pre- or post- the mix Level control. Each microphone and stereo line input shall feature three-band EQ and mix level controls. Peak detecting input overload indicators shall be provided. The Mixer shall have A, B and AUX outputs with independent level controls and 10 segment level meters with peak hold. Each balanced output shall provide an additional 6 dB of gain and deliver a minimum signal level of +24 dBu into a 10 kΩ load. All connections shall be via Euroblock connectors.

Microphone inputs shall operate in Mic mode with a gain range of +12 dB to 60 dB. Each pair of microphone inputs may operate with or without 12 volt phantom power. Each microphone input shall be capable of line-level operate with a gain

range of -4 to 12 dB. If Line mode is selected, phantom power is defeated. Each microphone input may be assigned to the A, B or AUX output bus.

Stereo Line inputs shall accommodate +24 dBu signal levels with a gain range is $-\infty$ to +12 dB. Each stereo line input shall feature a mono switch, A-B and AUX assign switch.

The Mixer shall include a security cover for the equalizer section and output assign switches, leaving only the level controls and metering exposed.

The Mixer shall feature a built-in, high efficiency, universal voltage power supply capable of operating from 100 to 240 VAC, 50-60 Hz. The unit shall feature an IEC socket and line cord. The unit shall meet UL/CSA and CE safety requirements. The unit shall be constructed of cold-rolled steel and mount into a standard 19" 3U EIA rack.

The unit shall be a Rane MLM103 Mic & Line Mixer.

Sound System Interconnection

- Cause & prevention of ground loops
- Interfacing balanced & unbalanced
- Proper pin connections and wiring
- Chassis ground vs. signal ground
- Ground lift switches

Rane Technical Staff

RaneNote 110

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Introduction

This note, originally written in 1985, continues to be one of our most useful references. It's popularity stems from the continual and perpetual difficulty of hooking up audio equipment without suffering through all sorts of bizarre noises, hums, buzzes, whistles, etc.— not to mention the extreme financial, physical and psychological price. As technology progresses it is inevitable that electronic equipment and its wiring should be subject to constant improvement. Many things *have* improved in the audio industry since 1985, but unfortunately wiring isn't one of them. However, finally the Audio Engineering Society (AES) has issued a standards document for interconnection of pro audio equipment. It is AES48, titled "*AES48-2005: AES standard on interconnections — Grounding and EMC practices — Shields of connectors in audio equipment containing active circuitry.*"

Rane's policy is to accommodate rather than dictate. However, this document contains suggestions for external wiring changes that should ideally only be implemented by trained technical personnel. Safety regulations require that all original grounding means provided from the factory be left intact for safe operation. No guarantee of responsibility for incidental or consequential damages can be provided. (*In other words, don't modify cables, or try your own version of grounding unless you really understand exactly what type of output and input you have to connect.*)

Ground Loops

Almost all cases of noise can be traced directly to ground loops, grounding or lack thereof. It is important to understand the mechanism that causes grounding noise in order to effectively eliminate it. Each component of a sound system produces its own ground internally. This ground is usually called the audio *signal* ground. Connecting devices together with the interconnecting cables can tie the signal grounds of the two units together in one place through the conductors in the cable. Ground loops occur when the grounds of the two units are also tied together in another place: via the third wire in the line cord, by tying the metal chassis together through the rack rails, etc. These situations create a circuit through which current may flow in a closed “loop” from one unit’s ground out to a second unit and back to the first. It is not simply the presence of this current that creates the hum—it is when this current flows through a unit’s audio signal ground that creates the hum. In fact, even without a ground loop, a little noise current always flows through every interconnecting cable (i.e., it is impossible to eliminate these currents entirely). The mere presence of this ground loop current is no cause for alarm if your system uses properly implemented and *completely* balanced interconnects, which are excellent at rejecting ground loop and other noise currents. Balanced interconnect was developed to be immune to these noise currents, which can never be entirely eliminated. What makes a ground loop current annoying is when the audio signal is affected. Unfortunately, many manufacturers of balanced audio equipment design the internal grounding system

improperly, thus creating balanced equipment that is not immune to the cabling’s noise currents. This is one reason for the bad reputation sometimes given to balanced interconnect.

A second reason for balanced interconnect’s bad reputation comes from those who think connecting unbalanced equipment into “superior” balanced equipment should improve things. Sorry. Balanced interconnect is not compatible with unbalanced. The small physical nature and short cable runs of completely unbalanced systems (home audio) also contain these ground loop noise currents. However, the currents in unbalanced systems never get large enough to affect the audio to the point where it is a nuisance. Mixing balanced and unbalanced equipment, however, is an entirely different story, since balanced and unbalanced interconnect are truly *not compatible*. The rest of this note shows several recommended implementations for all of these interconnection schemes.

The potential or voltage which pushes these noise currents through the circuit is developed between the independent grounds of the two or more units in the system. The impedance of this circuit is low, and even though the voltage is low, the current is high, thanks to Mr. Ohm, without whose help we wouldn’t have these problems. It would take a very high resolution ohm meter to measure the impedance of the steel chassis or the rack rails. We’re talking thousandths of an ohm. So trying to measure this stuff won’t necessarily help you. We just thought we’d warn you.

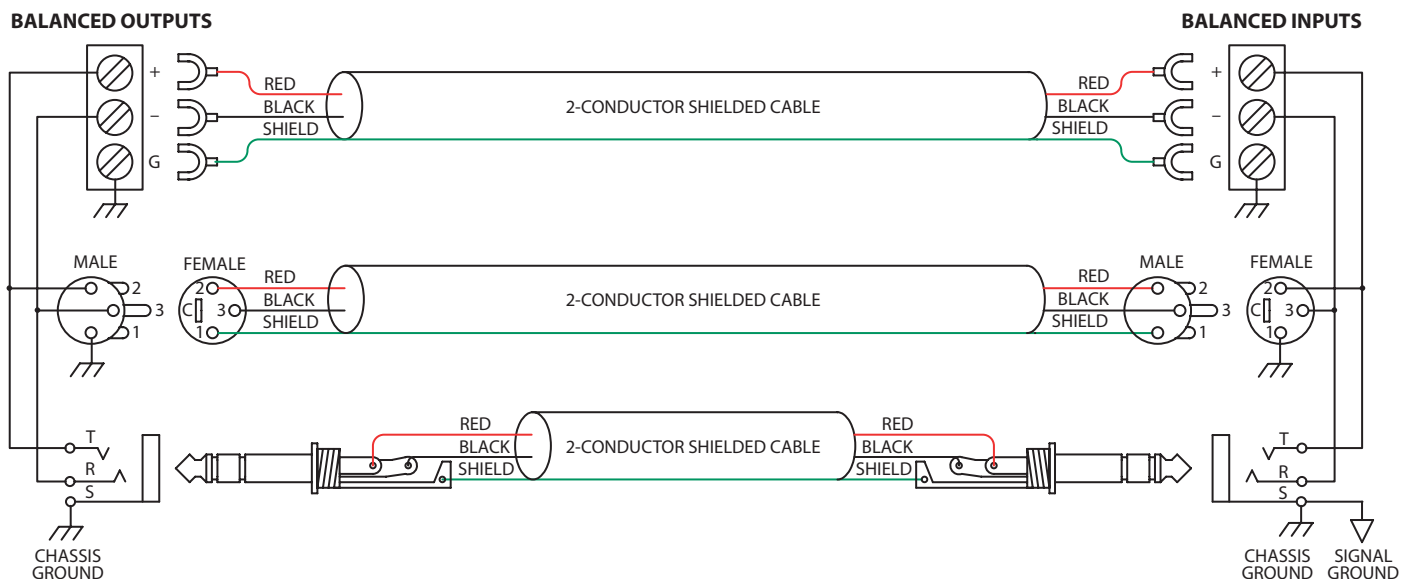


Figure 1a. The right way to do it.

The Absolute Best Right Way To Do It

The method specified by AES48 is to use balanced lines and *tie the cable shield to the metal chassis (right where it enters the chassis) at both ends of the cable*.

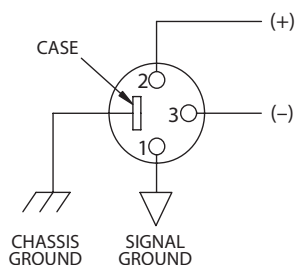
A balanced line requires three separate conductors, two of which are signal (+ and -) and one shield (see Figure 1a). The shield serves to guard the sensitive audio lines from interference. Only by using balanced line interconnects can you *guarantee* (yes, *guarantee*) hum-free results. Always use twisted pair cable. Chassis tying the shield at each end also *guarantees* the best possible protection from RFI [radio frequency interference] and other noises [neon signs, lighting dimmers].

Neil Muncy¹, an electroacoustic consultant and seasoned veteran of years of successful system design, chairs the AES Standards Committee (SC-05-05) working on this subject. He tirelessly tours the world giving seminars and dispensing information on how to successfully hook-up pro audio equipment². He makes the simple point that it is absurd that you cannot go out and buy pro audio equipment from several different manufacturers, buy standard off-the-shelf cable assemblies, come home, hook it all up and have it work hum and noise free. *Plug and play*. Sadly, almost never is this the case, despite the science and rules of noise-free interconnect known and documented for over 60 years (see References for complete information).

It all boils down to using balanced lines, only balanced lines, and nothing but balanced lines. This is why they were developed. Further, that you *tie the shield to the chassis, at the point it enters the chassis, and at both ends of the cable* (more on 'both ends' later).

Since standard XLR cables come with their shields tied to pin 1 at each end (the shells are not tied, nor need be), this means equipment using 3-pin, XLR-type connectors *must tie pin 1 to the chassis* (usually called chassis ground) — not the audio signal ground as is most common.

COMMON (WRONG) PRACTICE



RECOMMENDED PRACTICE

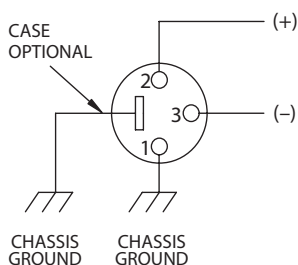


Figure 1b. Recommended practice.

Not using *signal ground* is the most radical departure from common pro-audio practice. Not that there is any argument about its validity. There isn't. **This is the right way to do it.** So why doesn't audio equipment come wired this way? Well, some does, and since 1993, more of it does. That's when Rane started manufacturing some of its products with balanced inputs and outputs tying pin 1 to chassis. So why doesn't everyone do it this way? Because life is messy, some things are hard to change, and there will always be equipment in use that was made before proper grounding practices were in effect.

Unbalanced equipment is another problem: it is everywhere, easily available and inexpensive. All those RCA and 1/4" TS connectors found on consumer equipment; effect-loops and insert-points on consoles; signal processing boxes; semi-pro digital and analog tape recorders; computer cards; mixing consoles; et cetera.

The next several pages give tips on how to successfully address hooking up unbalanced equipment. Unbalanced equipment when "blindly" connected with fully balanced units starts a pattern of hum and undesirable operation, requiring extra measures to correct the situation.

The Next Best Right Way To Do It

The quickest, quietest and most foolproof method to connect balanced and unbalanced is to **transformer isolate all unbalanced connections**. See Figure 2.

Many manufacturers provide several tools for this task, including Rane. Consult your audio dealer to explore the options available.

The goal of these adaptors is to allow the use of *standard cables*. With these transformer isolation boxes, modification of cable assemblies is unnecessary. Virtually any two pieces of audio equipment can be successfully interfaced without risk of unwanted hum and noise.

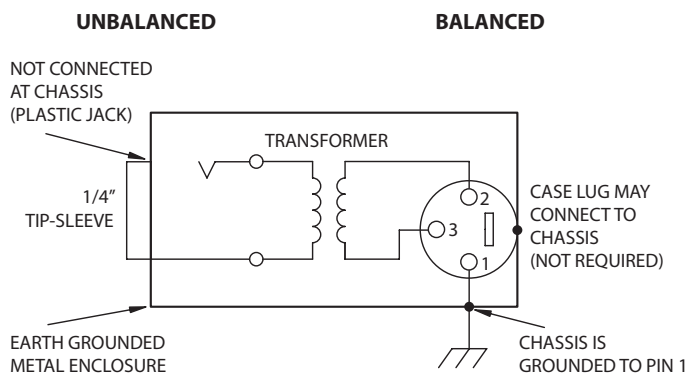


Figure 2. Transformer Isolation

Another way to create the necessary isolation is to use a *direct box*. Originally named for its use to convert the high impedance, high level output of an electric guitar to the low impedance, low level input of a recording console, it allowed the player to plug “directly” into the console. Now this term is commonly used to describe any box used to convert unbalanced lines to balanced lines.

The Last Best Right Way To Do It

If transformer isolation is not an option, special cable assemblies are a last resort. The key here is to prevent the shield currents from flowing into a unit whose grounding scheme creates ground loops (hum) in the audio path (i.e., most audio equipment).

It is true that connecting both ends of the shield is theoretically the best way to interconnect equipment — though this assumes the interconnected equipment is internally grounded properly. Since most equipment is *not* internally grounded properly, connecting both ends of the shield is not often practiced, since doing so usually creates noisy interconnections.

A common solution to these noisy hum and buzz problems involves disconnecting one end of the shield, even though one can not buy off-the-shelf cables with the shield disconnected at one end. The best end to disconnect is the receiving end. If one end of the shield is disconnected, the noisy hum current stops flowing and away goes the hum — but only at low frequencies. A ground-sending-end-only shield connection minimizes the possibility of high frequency (radio) interference since it prevents the shield from acting as an antenna to the next input. Many reduce this potential RF interference by providing an RF path through a small capacitor (0.1 or 0.01 microfarad ceramic disc) connected from the lifted end of the shield to the chassis. (This is referred to as the “hybrid shield termination” where the sending end is bonded to the chassis and the receiving end is capacitively coupled. See Neutrik’s EMC-XLR for example.) The fact that many modern day installers still follow this one-end-only rule with consistent success indicates this and other acceptable solutions to

RF issues exist, though the increasing use of digital and wireless technology greatly increases the possibility of future RF problems.

If you’ve truly isolated your hum problem to a specific unit, chances are, even though the documentation indicates proper chassis grounded shields, the suspect unit is not internally grounded properly. Here is where special test cable assemblies, shown in Figure 3, really come in handy. These assemblies allow you to connect the shield to chassis ground *at the point of entry*, or to pin 1, or to lift one end of the shield. The task becomes more difficult when the unit you’ve isolated has multiple inputs and outputs. On a suspect unit with multiple cables, try various configurations on each connection to find out if special cable assemblies are needed at more than one point.

See Figure 4 for suggested cable assemblies for your particular interconnection needs. Find the appropriate output configuration (down the left side) and then match this with the correct input configuration (across the top of the page.) Then refer to the following pages for a recommended wiring diagram.

Ground Lifts

Many units come equipped with ground lift switches. In only a few cases can it be shown that a ground lift switch improves ground related noise. (Has a ground lift switch ever *really* worked for you?) In reality, the presence of a ground lift switch greatly reduces a unit’s ability to be “properly” grounded and therefore immune to ground loop hums and buzzes. Ground lifts are simply another Band-Aid® to try in case of grounding problems. It is true that an entire system of properly grounded equipment, without ground lift switches, is guaranteed (yes *guaranteed*) to be hum free. The problem is most equipment is *not* (both internally and externally, AC system wise) grounded properly.

Most units with ground lifts are shipped so the unit is “grounded” — meaning the chassis is connected to audio signal ground. (This should be the best and is the “safest” position for a ground lift switch.) If after hooking up your system it exhibits excessive hum or

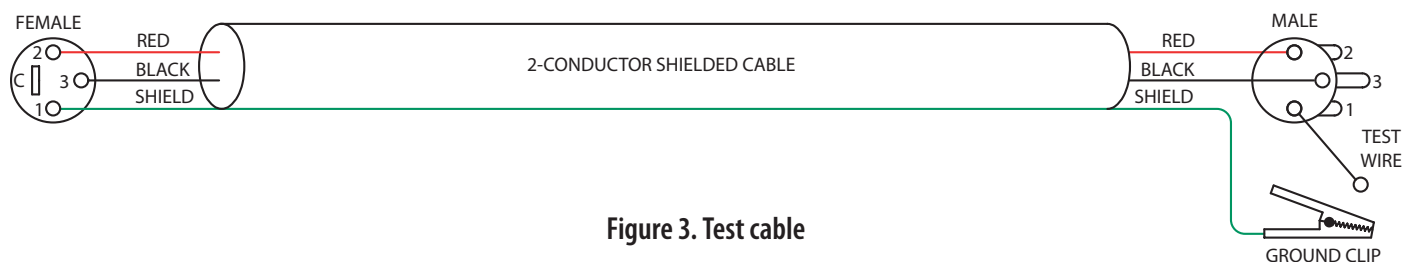


Figure 3. Test cable

buzzing, there is an incompatibility somewhere in the system's grounding configuration. In addition to these special cable assemblies that may help, here are some more things to try:

1. Try combinations of lifting grounds on units supplied with lift switches (or links). It is wise to do this with the power off!
2. If you have an entirely balanced system, verify all chassis are tied to a good earth ground, for safety's sake and hum protection. Completely unbalanced systems never earth ground anything (except cable TV, often a ground loop source). If you have a mixed balanced and unbalanced system, do yourself a favor and use isolation transformers or, if you can't do that, try the special cable assemblies described here and expect it to take many hours to get things quiet. May the Force be with you.
3. Balanced units with outboard power supplies (wall warts or "bumps" in the line cord) do *not* ground the chassis through the line cord. Make sure such units are solidly grounded by tying the chassis to an earth ground using a star washer for a reliable contact. (Rane always provides this chassis point as an external screw with a toothed washer.) Any device with a 3-prong AC plug, such as an amplifier, may serve as an earth ground point. Rack rails may or may not serve this purpose depending on screw locations and paint jobs.

Floating, Pseudo, and Quasi-Balancing

During inspection, you may run across a ¼" output called floating unbalanced, sometimes also called pseudo-balanced or quasi-balanced. In this configuration, the sleeve of the output stage is not connected inside the unit and the ring is connected (usually through a small resistor) to the audio signal ground. This allows the tip and ring to "appear" as an equal impedance, not-quite balanced output stage, even though the output circuitry is unbalanced.

Floating unbalanced often works to drive either a balanced or unbalanced input, depending if a TS or TRS standard cable is plugged into it. When it hums, a special cable is required. See drawings #11 and #12, and do not make the cross-coupled modification of tying the ring and sleeve together.

Winning the Wiring Wars

- Use balanced connections whenever possible, with the shield bonded to the metal chassis at both ends.
- Transformer isolate all unbalanced connections from balanced connections.
- Use special cable assemblies when unbalanced lines cannot be transformer isolated.
- Any unbalanced cable must be kept under 10 feet (3 m) in length. Lengths longer than this will amplify all the nasty side effects of unbalanced circuitry's ground loops.

Summary

If you are unable to do things correctly (i.e. use fully balanced wiring with shields tied to the *chassis* at both ends, or transformer isolate all unbalanced signals from balanced signals) then there is no guarantee that a hum-free interconnect can be achieved, nor is there a definite scheme that will assure noise-free operation in all configurations.

References

1. Neil A. Muncy, "Noise Susceptibility in Analog and Digital Signal Processing Systems," presented at the 97th AES Convention of Audio Engineering Society in San Francisco, CA, Nov. 1994.
2. *Grounding, Shielding, and Interconnections in Analog & Digital Signal Processing Systems: Understanding the Basics*; Workshops designed and presented by Neil Muncy and Cal Perkins, at the 97th AES Convention of Audio Engineering Society in San Francisco, CA, Nov. 1994.
3. The entire June 1995 AES Journal, Vol. 43, No. 6, available \$6 members, \$11 nonmembers from the Audio Engineering Society, 60 E. 42nd St., New York, NY, 10165-2520.
4. Phillip Giddings, *Audio System Design and Installation* (SAMS, Indiana, 1990).
5. Ralph Morrison, *Noise and Other Interfering Signals* (Wiley, New York, 1992).
6. Henry W. Ott, *Noise Reduction Techniques in Electronic Systems*, 2nd Edition (Wiley, New York, 1988).
7. Cal Perkins, "Measurement Techniques for Debugging Electronic Systems and Their Instrumentation," *The Proceedings of the 11th International AES Conference: Audio Test & Measurement*, Portland, OR, May 1992, pp. 82-92 (Audio Engineering Society, New York, 1992).
8. Macatee, *RaneNote*: "Grounding and Shielding Audio Devices," Rane Corporation, 1994.
9. Philip Giddings, "Grounding and Shielding for Sound and Video," *SEVC*, Sept. 20th, 1995.
10. AES48-2005: *AES standard on interconnections — Grounding and EMC practices — Shields of connectors in audio equipment containing active circuitry* (Audio Engineering Society, New York, 2005).

Band-Aid is a registered trademark of Johnson & Johnson

To Input

From Output

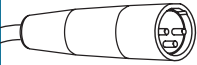
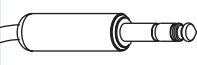
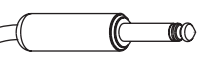
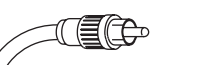

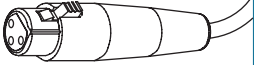
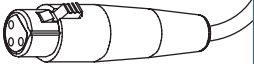
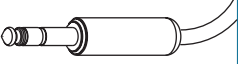
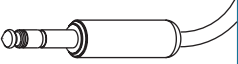
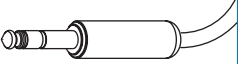
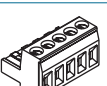
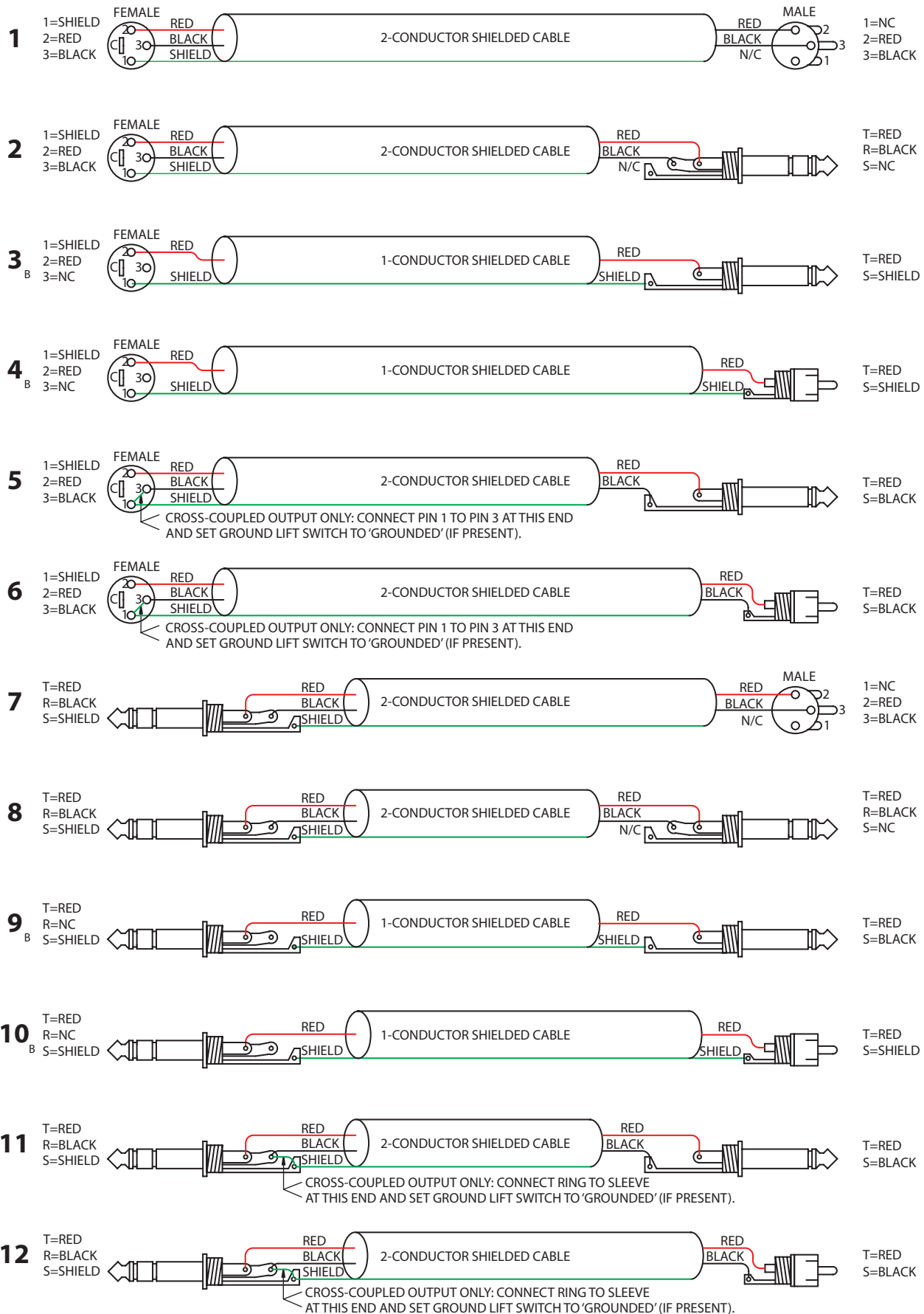
CABLE CONNECTORS	 MALE BALANCED XLR	 1/4" BALANCED TRS (TIP-RING-SLEEVE)	 1/4" OR 3.5mm UNBALANCED TS (TIP-SLEEVE)	 UNBALANCED RCA	 BALANCED EUROBLOCK
 FEMALE BALANCED XLR (NOT A TRANSFORMER, NOR A CROSS-COUPLED OUTPUT STAGE)	1	2	3_B	4_B	+ to + - to - SHIELD NC
 FEMALE BALANCED XLR (EITHER A TRANSFORMER OR A CROSS-COUPLED OUTPUT STAGE)	1	2	5	6	+ to + - to - SHIELD NC
 1/4" BALANCED TRS (NOT A TRANSFORMER, NOR A CROSS-COUPLED OUTPUT STAGE)	7	8	9_B	10_B	+ to + - to - SHIELD ONLY TO EUROBLOCK
 1/4" BALANCED TRS (EITHER A TRANSFORMER OR A CROSS-COUPLED OUTPUT STAGE)	7	8	11	12	+ to + - to - SHIELD NC
 1/4" FLOATING UNBALANCED TRS (TIP-RING-SLEEVE) (SLEEVE IN UNIT = NC)	21_A	22_A	11	12	+ to + - to - GROUND to GROUND
 1/4" OR 3.5 mm UNBALANCED TS (TIP-SLEEVE)	13	14	15_A	16_A	23
 UNBALANCED RCA (TIP-SLEEVE)	17	18	19_A	20_A	23
 BALANCED EUROBLOCK	+ to + - to - SHIELD ONLY TO XLR PIN 1	+ to + - to - SHIELD ONLY TO TRS SLEEVE	24	24	+ to + - to - GROUND to GROUND

Figure 4. Interconnect chart for locating correct cable assemblies on the following pages.

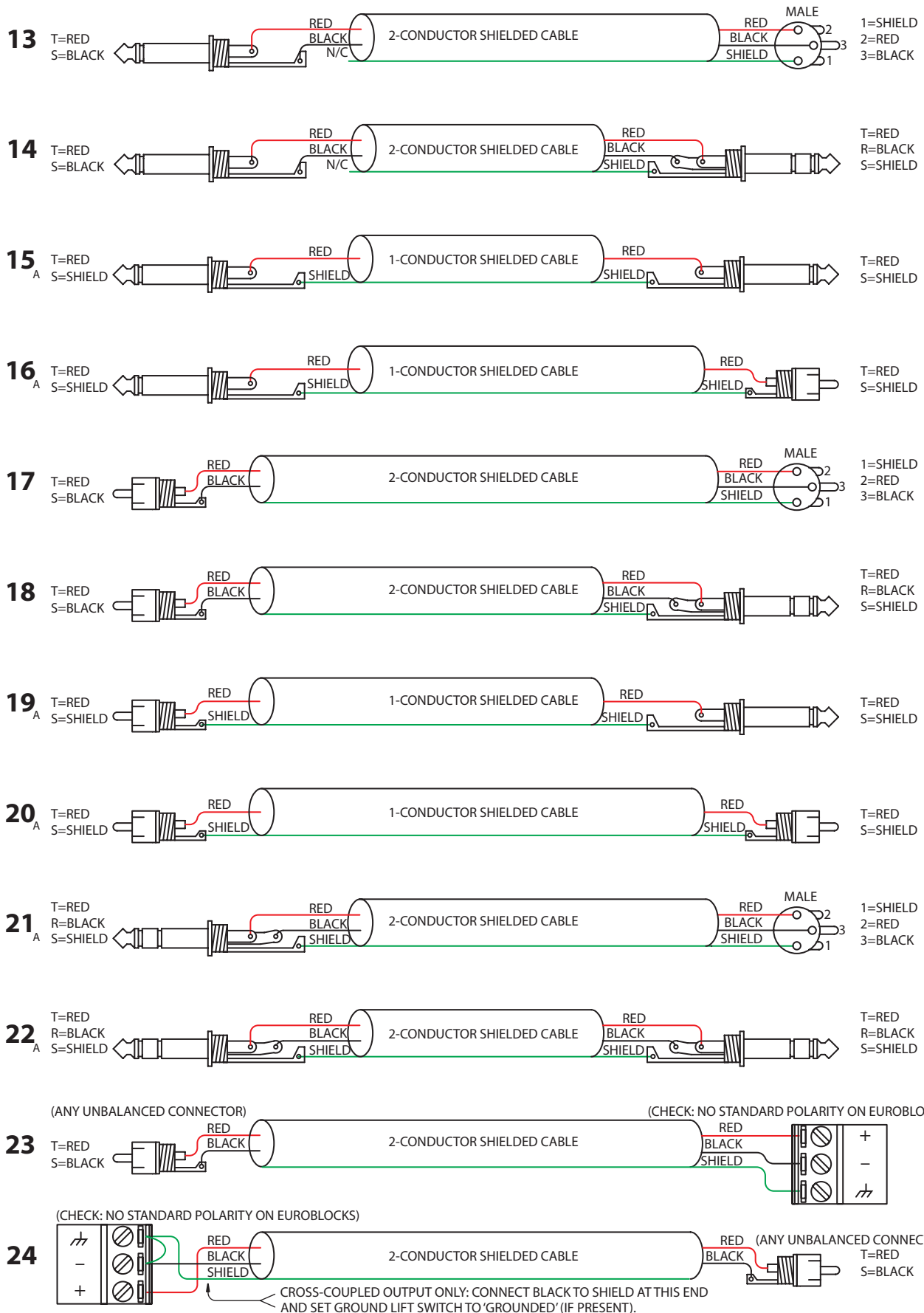
Note: (A) This configuration uses an "off-the-shelf" cable.

Note: (B) This configuration causes a 6 dB signal loss. Compensate by "turning the system up" 6 dB.



From Output

To Input





FACTORY AUTHORIZED SERVICE

Your unit may be serviced by the Rane Factory or any Authorized Rane Service Center. To find a Service Center near you, please call the Rane factory, or check the Rane website. Please do not return your unit to Rane without prior authorization.

Rane Corporation

To obtain service or a Return Authorization, please phone 425-355-6000

or Fax 425-347-7757

The current list of U.S. Rane Authorized Service Centers is found on our website: www.rane.com/service.html

LIMITED DOMESTIC WARRANTY

RANE CORPORATION WARRANTS ALL RANE PRODUCTS (EXCEPT THOSE ITEMS CLASSIFIED AS *WEAR PARTS*, AND LISTED ON THE MANUAL-1 PAGE OF EACH OPERATORS MANUAL) PURCHASED IN THE USA AGAINST DEFECTS IN MATERIAL OR WORKMANSHIP FOR A PERIOD OF TWO (2) YEARS. *WEAR PARTS* ARE LIMITED TO A PERIOD OF NINETY (90) DAYS FROM THE INITIAL DATE OF RETAIL PURCHASE FROM AN AUTHORIZED RANE DEALER—WEAR PARTS REQUIRE PROOF OF PURCHASE DATE. This limited warranty extends to all purchasers or owners of the product during the warranty period beginning with the original retail purchase. Rane Corporation does not, however, warrant its products against any and all defects: 1) arising out of material or workmanship not provided or furnished by Rane, or 2) resulting from abnormal use of the product or use in violation of instructions, or 3) in products repaired or serviced by other than authorized Rane repair facilities, or 4) in products with removed or defaced serial numbers, or 5) in components or parts or products expressly warranted by another manufacturer. Rane agrees to supply all parts and labor to repair or replace defects covered by this limited warranty with parts or products of original or improved design, at its option in each respect, if the defective product is shipped prior to the end of the warranty period to any Rane authorized warranty repair facility in the U.S. or to the Rane factory in the original packaging or a replacement supplied by Rane, with all transportation costs and full insurance paid each way by the purchaser or owner.

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ALL REMEDIES AND THE MEASURE OF DAMAGES ARE LIMITED TO THE ABOVE SERVICES, IT IS POSSIBLE THAT ECONOMIC LOSS OR INJURY TO PERSON OR PROPERTY MAY RESULT FROM THE FAILURE OF THE PRODUCT; HOWEVER, EVEN IF RANE HAS BEEN ADVISED OF THIS POSSIBILITY, THIS LIMITED WARRANTY DOES NOT COVER ANY SUCH CONSEQUENTIAL OR INCIDENTAL DAMAGES. SOME STATES OR COUNTRIES DO NOT ALLOW THE LIMITATIONS OR EXCLUSION OF INCIDENTAL OR CONSEQUENTIAL DAMAGES, SO THE ABOVE LIMITATION MAY NOT APPLY TO YOU.

ANY AND ALL WARRANTIES, EXPRESS OR IMPLIED, ARISING BY LAW, COURSE OF DEALING, COURSE OF PERFORMANCE, USAGE OF TRADE, OR OTHERWISE, INCLUDING BUT NOT LIMITED TO IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, ARE LIMITED TO A PERIOD OF TWO (2) YEARS FROM EITHER THE DATE OF ORIGINAL RETAIL PURCHASE OR, IN THE EVENT NO PROOF OF PURCHASE DATE IS AVAILABLE, THE DATE OF MANUFACTURE, SOME STATES OR COUNTRIES DO NOT ALLOW LIMITATIONS ON HOW LONG AN IMPLIED WARRANTY LASTS, SO THE ABOVE LIMITATIONS MAY NOT APPLY TO YOU. THIS LIMITED WARRANTY GIVES YOU SPECIFIC LEGAL RIGHTS, AND YOU MAY ALSO HAVE OTHER RIGHTS WHICH VARY FROM STATE TO STATE, COUNTRY TO COUNTRY.

WARRANTY PROCEDURE - Only Valid in the USA

NOTICE! You must complete and return the warranty card or register your product online to extend the Warranty from 2 years to 3 years!

TO VALIDATE YOUR EXTENDED WARRANTY: Use the postcard that came in the box with your unit, or go to www.rane.com and click on **New Product Registration**. Fill out the warranty completely, being sure to **include the model and serial number** of the unit since this is how warranties are tracked. If your Rane product was purchased in the USA, mail the completed card or register online with to Rane Corporation within 10 days from the date of purchase. **If you purchased the product outside the USA you must file your warranty registration with the Rane Distributor in that country.** It is advised that you keep your bill of sale as proof of purchase, should any difficulties arise concerning the registration of the warranty card. **NOTICE: IT IS NOT NECESSARY TO REGISTER IN ORDER TO RECEIVE RANE CORPORATION'S STANDARD TWO YEAR LIMITED WARRANTY.**

WARRANTY REGISTRATION is made and tracked by **model and serial numbers only**, not by the purchaser's or owner's name. Therefore any warranty correspondence or inquires **must** include the model and serial number of the product in question. Be sure to fill in the model and serial number in the space provided below and keep this in a safe place for future reference.

WARRANTY SERVICE MUST BE PERFORMED ONLY BY AN AUTHORIZED RANE SERVICE FACILITY LOCATED IN THE COUNTRY WHERE THE UNIT WAS PURCHASED, OR (if product was purchased in the USA) AT THE RANE FACTORY IN THE USA. If the product is being sent to Rane for repair, please call the factory for a Return Authorization number. We recommend advance notice be given to the repair facility to avoid possible needless shipment in case the problem can be solved over the phone. UNAUTHORIZED SERVICE PERFORMED ON ANY RANE PRODUCT WILL VOID ITS EXISTING FACTORY WARRANTY.

FACTORY SERVICE

If you wish your Rane product to be serviced at the factory, **it must be shipped fully insured, in the original packing box or equivalent.** This warranty will **not** cover repairs on products damaged through improper packaging. If possible, avoid sending products through the mail. Be sure to include in the package:

1. Complete return street shipping address (P.O. Box numbers are **not** acceptable).
2. A detailed description of any problems experienced, including the make and model numbers of any other system equipment.
3. Remote power supply, if applicable.

Repaired products purchased in the U.S. will be returned prepaid freight via the same method they were sent to Rane. Products purchased in the USA, but sent to the factory from outside the USA **must** include return freight funds, and the sender is fully responsible for all customs procedures, duties, tariffs and deposits.

In order to qualify for Rane's one year extended warranty (for a total of 3 years parts and labor), the warranty must be completely filled out and sent to us immediately. Valid in USA only.

We recommend you write your serial number here in your owners manual and on your sales receipt for your records.

SERIAL NUMBER: _____ **PURCHASE DATE:** _____

Declaration of Conformity

Application of Council Directive(s):

2002/96/EC
2004/108/EC
2011/65/EU

Standard(s) to which conformity is declared:

EN60065: 2002/A1:2006/A11:2008
EN55103-1:2009
EN55103-2:2009
EN50581:2012
ENVIRONMENT E2
Serial Numbers 900000-999999

Manufacturer:

Rane Corporation
10802 47th Avenue West
Mukilteo WA 98275-5000 USA

This equipment has been tested and found to be in compliance with all applicable standards and regulations applying to the Electromagnetic Compatibility (EMC) directive 2004/108/EC. In order for the customer to maintain compliance with this regulation, high quality shielded cable must be used for interconnection to other equipment. Modification of the equipment, other than that expressly outlined by the manufacturer, is not allowed under this directive. The user of this equipment shall accept full responsibility for compliance with the EMC directive in the event that the equipment is modified without written consent of the manufacturer. This declaration of conformity is issued under the sole responsibility of Rane Corporation.

Type of Equipment: Professional Audio Signal Processing

Brand: Rane

Model: MLM103

Immunity Results:

Test Description

RF Electromagnetic Fields Immunity

80 MHz - 1000 MHz, 1 kHz AM, 80% depth, 3V/m

A-weighted quasi-peak Noise

Specification

Conditions

< -50 dBu

Conducted RF Disturbances Immunity

150 kHz - 80 MHz, 1 kHz AM, 80% depth, 3V RM

< -70 dBu

Power Lines, 150 kHz - 80 MHz

< -76 dBu

Signal & Control Lines, 150 kHz - 80 MHz

Magnetic Fields Immunity

50Hz - 10kHz, 4.5 A/m

< -70 dBu

50 Hz - 10 kHz

I, the undersigned, hereby declare that the equipment specified above conforms to the Directive(s) and Standard(s) shown above.


(Signature)

Roy G. Gill

(Full Name)

Compliance Engineer

(Position)

June 30, 2010

(Date)

Mukilteo WA USA

(Place)

MLM103
RANE CORPORATION

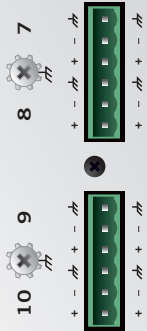


WARNING
TO REDUCE THE RISK OF FIRE OR ELECTRICAL SHOCK DO NOT EXPOSE THIS EQUIPMENT TO RAIN OR MOISTURE. DO NOT REMOVE COVER. NO USER SERVICEABLE PARTS INSIDE. REFER SERVICING TO QUALIFIED PERSONNEL.

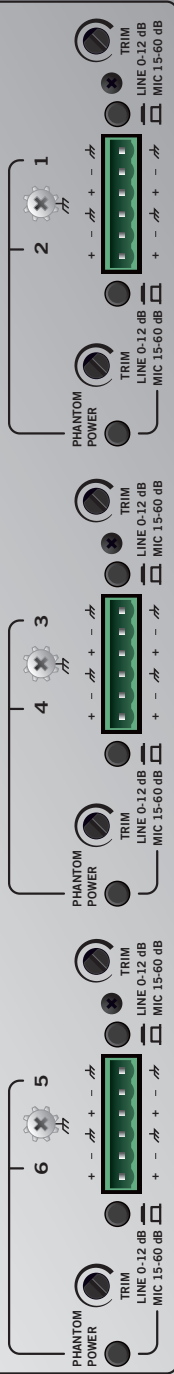
AVIS
RISQUE DE CHOC ELECTRIQUE — NE PAS OUVRIR

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.
CAN ICES-3 (B)/NMB-3(B)

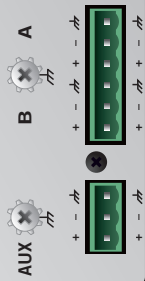
STEREO LINE INPUTS



MIC/LINE INPUTS

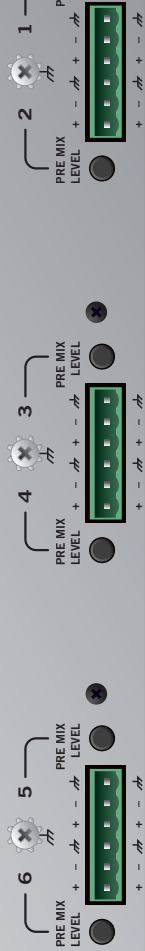


OUTPUTS



ALL AUDIO JACKS ARE CLASS 2 WIRING

DIRECT OUTPUTS



MLM103

MIC / LINE MIXER

