



# SM82S

STEREO LINE MIXER



## CONTENTS *(in order of appearance)*

- Important Safety Instructions
- SM82S Manual
- SM82S Data Sheet
- Sound System Interconnection Schematics
- Warranty
- Declaration of Conformity

# 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.

## WARNING



To reduce the risk of electrical shock, do not open the unit. No user serviceable parts inside. Refer servicing to qualified service personnel.

The symbols shown below are internationally accepted symbols that warn of potential hazards with electrical products.



This symbol indicates that a dangerous voltage constituting a risk of electric shock is present within this unit.



This symbol indicates that there are important operating and maintenance instructions in the literature accompanying this unit.

**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.

This Class B digital apparatus complies with Canadian ICES-003.

Cet appareil numérique de la classe B est conforme à la norme NMB-003 du Canada.

# 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<sup>e</sup> 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 de 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 châssis 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:

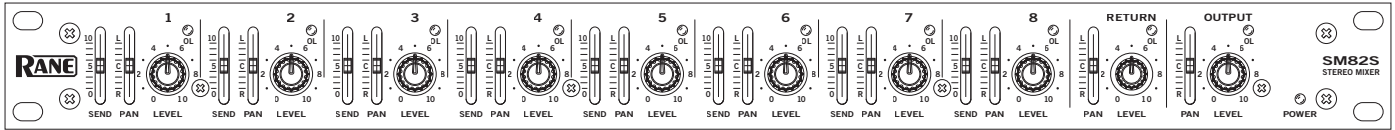
- Réorienter ou déplacer l'antenne de réception.
- Augmenter la distance entre l'équipement et le récepteur.
- Connecter l'équipement à une sortie sur un circuit différent de celui sur lequel le récepteur est branché.
- Consulter un revendeur ou un technicien radio / TV expérimenté.

**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.

Cet appareil numérique de classe B est conforme à la norme Canadienne ICES-003.

Cet appareil numérique de classe B est conforme à la norme Canadienne NMB-003.

**RANE**



## QUICK START

No one likes to read manuals. Everyone likes to just start pushing buttons and turning knobs until the desired results magically emerge. That's usually OK, and with a very few exceptions, damage is unlikely to result from such procedures with the SM82S.

This product is quite obvious: Input **LEVEL** controls make Inputs louder or not, the stereo **SENDS** make things happen at the **LOOP SEND** outputs, and so on. No real magic there. You should be aware, however, that if you want to connect a mono source to the SM82S, use only the **LEFT** Input of a channel so that the mono source will drive both the Left and the Right channels.

Set the levels of the mixer so that the red lights stay off. If they come on, you are overdoing it and distortion will result.

## SM82S CONNECTION

When connecting the SM82S to other components in your system for the first time, *leave the power supply for last*. This will give you a chance to make mistakes and correct them before any damage is done to your fragile speakers and ears.

If you are making your own cables, or experience any hum problems after hookup, please refer to the RaneNote, "Sound System Interconnection" (supplied with this manual and available at rane.com).

### INPUTS

The SM82S's Inputs are unbalanced. This means that standard ¼" connectors on the ends of any good quality cable will work well between your signal sources, signal processing and amplification. **For best rejection of nasty things like hum and RF, keep input cables under 10 feet (3 meters) in length.**

Most sources give you the choice of stereo or mono output. The mixer gives you the same choice. You will note that nomenclature has been placed beneath the input jacks indicating which is **RIGHT** and which is **LEFT (MONO)**. If a source is plugged only into the Left jack and not into the Right, both Right and Left channels will be fed with the Left Input. This allows the use of either stereo or mono sources.

### OUTPUTS

The SM82S offers balanced main outputs only. This means that you may use them as either balanced or unbalanced, the choice being made by the way the connectors are wired. It's a good idea to always use a TRS or stereo connector in the outputs no matter which mode you are using. If a "mono" connector is used, inserting it into the output will short the ring (-) to ground and could conceivably cause a small amount of distortion to be placed on the tip (+). While this is not destructive, it may be significant

enough to be audible. Balancing therefore requires that both tip (+) and ring (-) be wired to the following device. Unbalanced requires only tip and sleeve connected, leaving the unused ring open.

### EFFECTS DEVICES

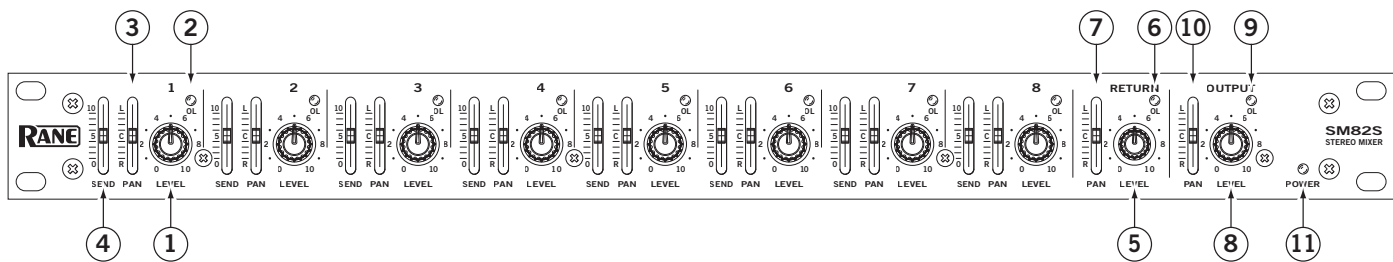
External devices which might be used could be either mono in and out, while some may be mono in and stereo out, while still others may be stereo on both ends. The SM82S easily accommodates all of these varieties. If your effect is mono on both ends, connect its input to the SM82S **LEFT LOOP SEND** and the effect's output to the SM82S **LEFT LOOP RETURN**. This configuration will sum Right and Left Loop Outputs to the mono effect input and will sum the mono effect output to the Left and Right Input buses. A mono-in stereo-out device would connect to the loop outputs in the same way; however the stereo outputs connect to the respective **LEFT** and **RIGHT LOOP RETURNS**.

### EXPANDING

Connecting two or more SM82Ss together to achieve more than eight stereo Inputs requires that a stereo cable (tip, ring, sleeve) be connected between the **MAIN EXPAND OUTPUT** of the first mixer and the **MAIN EXPAND INPUT** of the second. All 32 inputs will then appear at the main **OUTPUT** of mixer number two. Only the first sixteen Inputs will be available at the main Outputs of mixer number one. Should you wish to have all Loop buses tied, connect the **LOOP SENDS** of mixer one to the **LOOP EXPAND INPUT** of mixer two. All sixteen stereo sends will then become active at the **LOOP SENDS** of the second mixer. The expand Inputs and Outputs are unbalanced signals, so to prevent hum, **keep expand cables under 10 feet (3 meters) in length.**

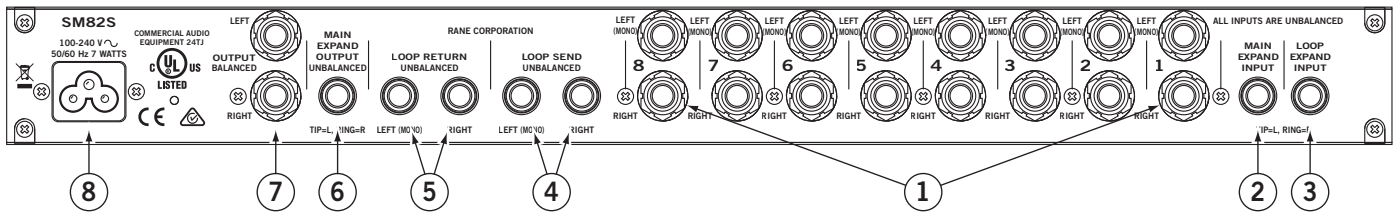
**WEAR PARTS:** This product contains no wear parts.

## FRONT PANEL DESCRIPTION

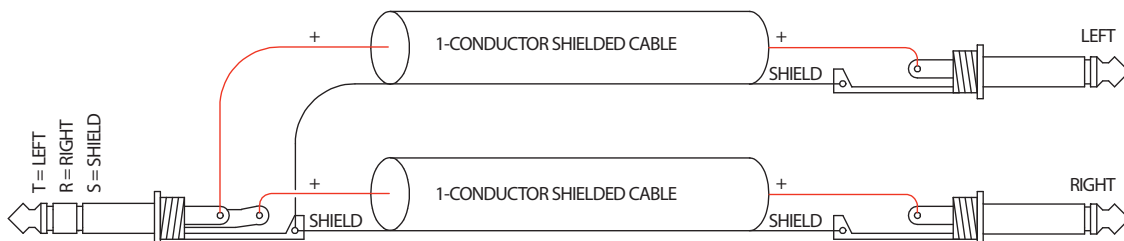


- ① **Input LEVEL controls:** are rotary stereo attenuators that adjust the amount of both Left and Right signals applied to an Input. Outputs are summed for mixing with all other Inputs. The unity gain position of this control is located at “7.5.”
- ② **Input OverLoad indicators:** glow red whenever its corresponding Input’s output exceeds a level 4 dB below clipping, letting you know it’s a good idea to turn this Input down a bit.
- ③ **Input PAN controls:** operate as ‘PAN’ with a mono signal, and ‘BALANCE’ with a stereo signal.  
**PAN:** When a mono input is used (no plug in the RIGHT Input jack), the signal ‘moves’ from the Left to Right channels. At the “L” extreme top of travel the sound source is heard from the Left output; at the other “R” extreme bottom it is heard only from the Right output. In the middle, the sound is heard equally from each output, but is reduced in level by 3 dB relative to its original value. This guarantees that as the sound is panned from one side to the other, it maintains equal loudness (power) for all positions.  
**BALANCE:** In its center detent, Left and Right signals to each channel are allowed to pass at their original relative levels, therefore preserving the stereo image from devices connected to both of the Inputs. When the control is moved vertically toward the “L” position, the Right channel level is *decreased* while the Left channel level is *maintained*. The opposite occurs if the control is moved from the detent down toward the “R”.
- ④ **Input SEND Level controls:** determine the amount of *Post-Fade* stereo Input is fed to the Loop Send buses. Each Input’s stereo SEND is summed on this bus and is available at the respective LEFT and RIGHT LOOP SENDS on the rear of the mixer.
- ⑤ **RETURN LEVEL control:** is a rotary stereo attenuator that controls the amount of Return which is to be added to the Main Output. The unity gain position of this control is located at “7.5.”
- ⑥ **RETURN OverLoad indicator:** glows red whenever the return levels exceed a level of 4 dB below clipping.
- ⑦ **RETURN PAN control:** is a vertical slider that controls the effect or source connected to the LOOP RETURN in the same way the Input PAN controls work (see ③ above).
- ⑧ **OUTPUT LEVEL control:** is a rotary stereo attenuator that controls the final signal Level at the main OUTPUT jacks. The unity gain position of this control is located at “7.5.”
- ⑨ **OUTPUT OverLoad indicator:** glows red any time the output level exceeds 4 dB below clipping.
- ⑩ **OUTPUT PAN control:** is a vertical slider that operates in the same fashion as the PAN control described in item ③ above. It however, determines the relative levels of the LEFT and RIGHT MAIN OUTPUTS only.

# REAR PANEL DESCRIPTION



- ① **Channel Input jacks:** consist of eight pairs of unbalanced ¼" tip-sleeve jacks, used to connect any line-level signal source to the SM82S. As indicated, only the LEFT is to be used if the Input is mono and should therefore appear in both Left and Right channels, depending on the position of the front panel PAN control.
- ② **MAIN EXPAND INPUT:** A ¼" TRS stereo Input jack may link two or more SM82Ss together, or accept the output from another mixer. This may also be used to sum any fixed-level stereo signal into the Main Outputs, producing a *ninth* stereo Input when added with ①. A stereo Tip-Ring-Sleeve cable must be used here. The Left input is on the Tip, Right is on the Ring and the Sleeve is ground.
- ③ **LOOP EXPAND INPUT:** Another ¼" TRS stereo Input, expands the stereo Loop buses of two SM82Ss so they share the same effects loop. A stereo Tip-Ring-Sleeve cable must be used here. Connect the LEFT and RIGHT LOOP SENDS (④) of the first unit to the LOOP EXPAND INPUT of the second SM82S. (Tip = left; Ring = right.)
- ④ **LOOP SEND:** This pair of ¼" jacks may drive an effect or similar device which is to be returned to item ⑤ below. If a mono device is used, both the Left and Right Send channels of the SM82S are summed together and presented at the LEFT Output if nothing is inserted in the RIGHT Output.
- ⑤ **LOOP RETURN:** These ¼" aux returns may connect the output of a reverb or other effect unit to the Loop bus of the SM82S. If no effect is used, they can be used as a *tenth* stereo Input to the mixer in addition to those described in ① and ②. As with the other stereo Inputs, mono signal may be connected to the LEFT input to obtain two-channel mono operation.
- ⑥ **MAIN EXPAND OUTPUT:** This ¼" TRS stereo (Tip = left, Ring = right) Output jack connects one SM82S to another for the purpose of expanding the number of Inputs available. Use only a stereo plug in this jack — a mono jack or cable will cause loss of Right channel signal and possibly distortion to the Left channel. This Output also serves as a fixed pre-fader level useful as record outputs or other applications. A send/return cable can be ideal for this output to drive a second amplifier or recorder. See the diagram below.
- ⑦ **Main BALANCED OUTPUT:** These balanced Tip-Ring-Sleeve jacks connect the main Outputs of the SM82S to a power amplifier or to additional signal processing. As is the AES standard with all Rane balanced outputs using ¼" TRS jacks, the Tip is (+), the Ring is (-) and the Sleeve is ground.
- ⑧ **Power connector:** The internal universal switching power supply operates on any AC mains 100 to 240 VAC, 50 or 60 Hz (most places in the world). All that is required when traveling is the appropriate IEC line cord.



A Send-Return cable works well to connect other equipment to any of the Expand Inputs or Outputs.

# OPERATING INSTRUCTIONS

## CIRCUIT DESCRIPTION

Learning to operate the SM82S might be a bit easier if you glance at the Block Diagram below. All eight stereo Inputs operate in exactly the same way. Signal applied to the Inputs is acted on by a radio interference filter (we have assumed that local broadcasts should not be a part of your music) and is then routed to a stereo LEVEL control. If you are using a mono source, connect it only to the LEFT Input to send this mono signal to both the Left and Right sides of the input circuitry. The output of the Level control sections is applied to a unity gain buffer to prevent the LEVEL control from adversely interacting with downstream circuitry. The Input overload sensor monitors here to alert the user via LED to any possible Input overload conditions. Left and Right audio is then subjected to the channel PAN control to allow the user to place the stereo image of the source as desired to the Left and Right Outputs. A stereo SEND control adjusts the amount of each Input routed to the Loop Output.

All eight stereo Inputs are simultaneously adjusted for stereo placement by the OUTPUT PAN control. The resultant signal is added together and fed to the OUTPUT LEVEL control, which has its own Overload indicator. The main Outputs are fully actively balanced, allowing the use of correctly wired long cables.

## EFFECTS LOOP

The LOOP SENDS receive their audio from the Send bus which is the sum of all the Inputs as determined by the Input SEND controls. This Output may be used to drive a stereo effects processor. The output of the effect device is returned to the SM82S through the LOOP RETURNS. The level of the returned effect is determined by the RETURN LEVEL control on the front panel. The return section also provides a BALANCE control for image placement.

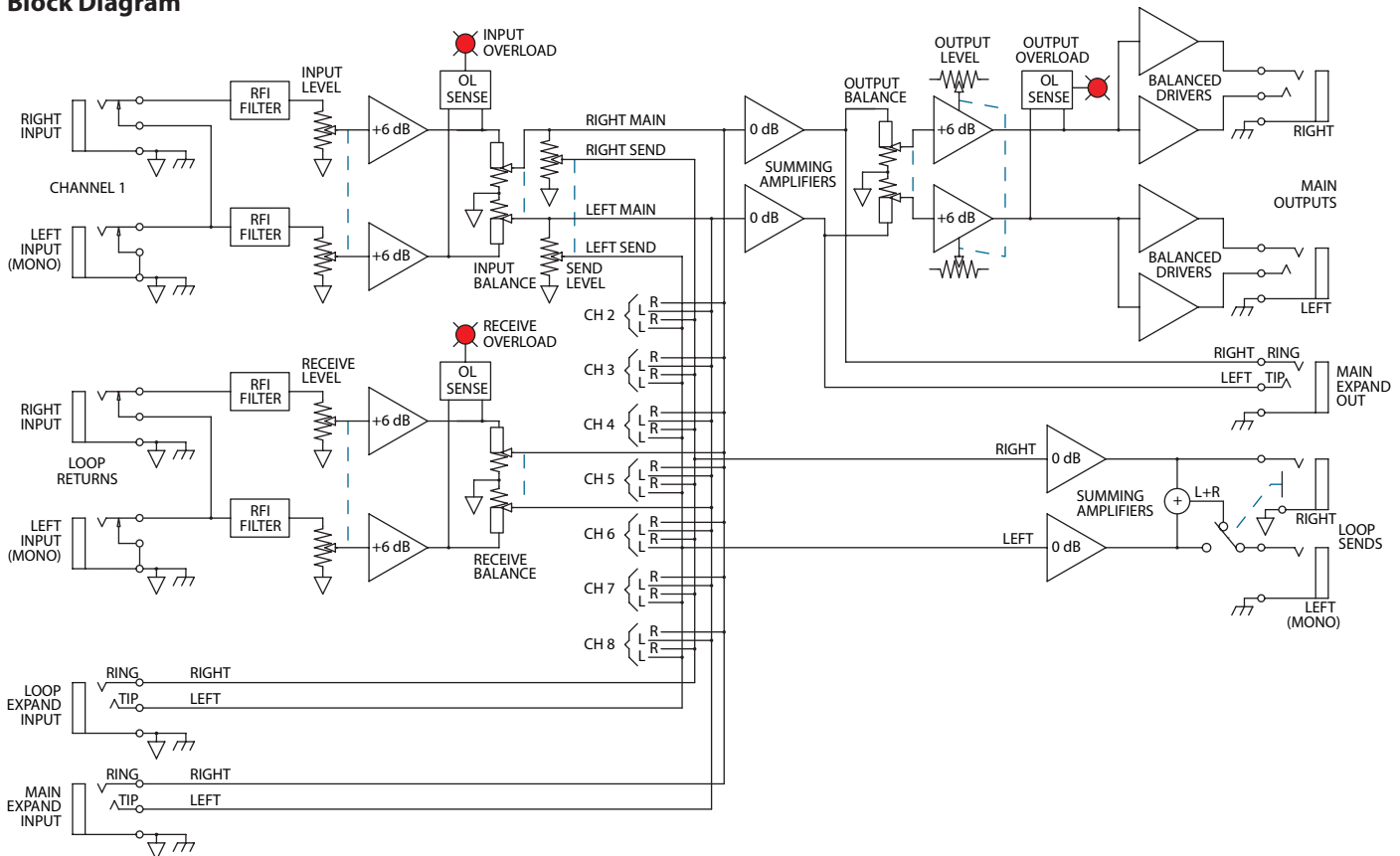
## PAN / BALANCE CONTROLS

These operate as 'PAN' with a mono signal plugged in the LEFT input only, and 'BALANCE' with a stereo signal (both jacks plugged in). These do not increase the level of either Left or Right signal. As the controls are moved toward one channel, the level of the other channel is only reduced.

## HIGH NOISE IMMUNITY

One of the most unusual features of the SM82S is its inherent immunity from noise. All eight of the stereo inputs may be turned all the way up without increasing the internal noise of the mixer. This is critical due to the wide variation in output levels found in musical instruments and tape devices. A fairly low-level guitar may be combined in the same system with a high level synthesizer without any undesirable side-effects. The SM82S eliminates the concerns normally associated with mixing so-called -10 dBV units with +4 dBu types.

## Block Diagram







## General Description

The Rane SM82S is a product offering incredible power and versatility. It is the equivalent of a *sixteen* channel mixer in one rack space. Measuring only 5.25 inches deep, it can do the job of mixers costing several times as much while only occupying a fraction of the rack space. It is ideally suited for keyboards, synthesizer expander modules and drum machines, as well as such things as effects mixing in guitar racks. It also functions as an excellent submixer for stereo line inputs and effects to a larger console. Because of shorter internal signal paths, it is much cleaner than many mixers ten times the cost and size.

Each of the eight Stereo (two channel) input channels feature a stereo rotary input Level control, a stereo aux Send level control slider and a left to right Balance control slider. When a single mono input is used, the Balance control acts as a pan pot. The aux return section provides a rotary Return Level control and a

slide control for left to right Balance. The output stage includes a rotary Output Level control and a slide control for left to right Balance.

The human engineering applied to the SM82S makes it extremely easy to operate. The segregation of function between rotary and slide controls (rotary for all input and output Levels and slide for Balance and Send) makes it simple to use, even in the dark.

The SM82S is fully expandable using the ¼" TRS Main Expand Input and Output jacks. Expansion is as simple as connecting a stereo ¼" jumper cable from the first unit's Expand Output jack to the second unit's Expand Input jack. Now, two SM82S units create a 16 channel stereo (32 input) line level Mixer in just two rack spaces. Or, 24 channel stereo (48 input) Mixer in just three rack spaces. You get the idea!

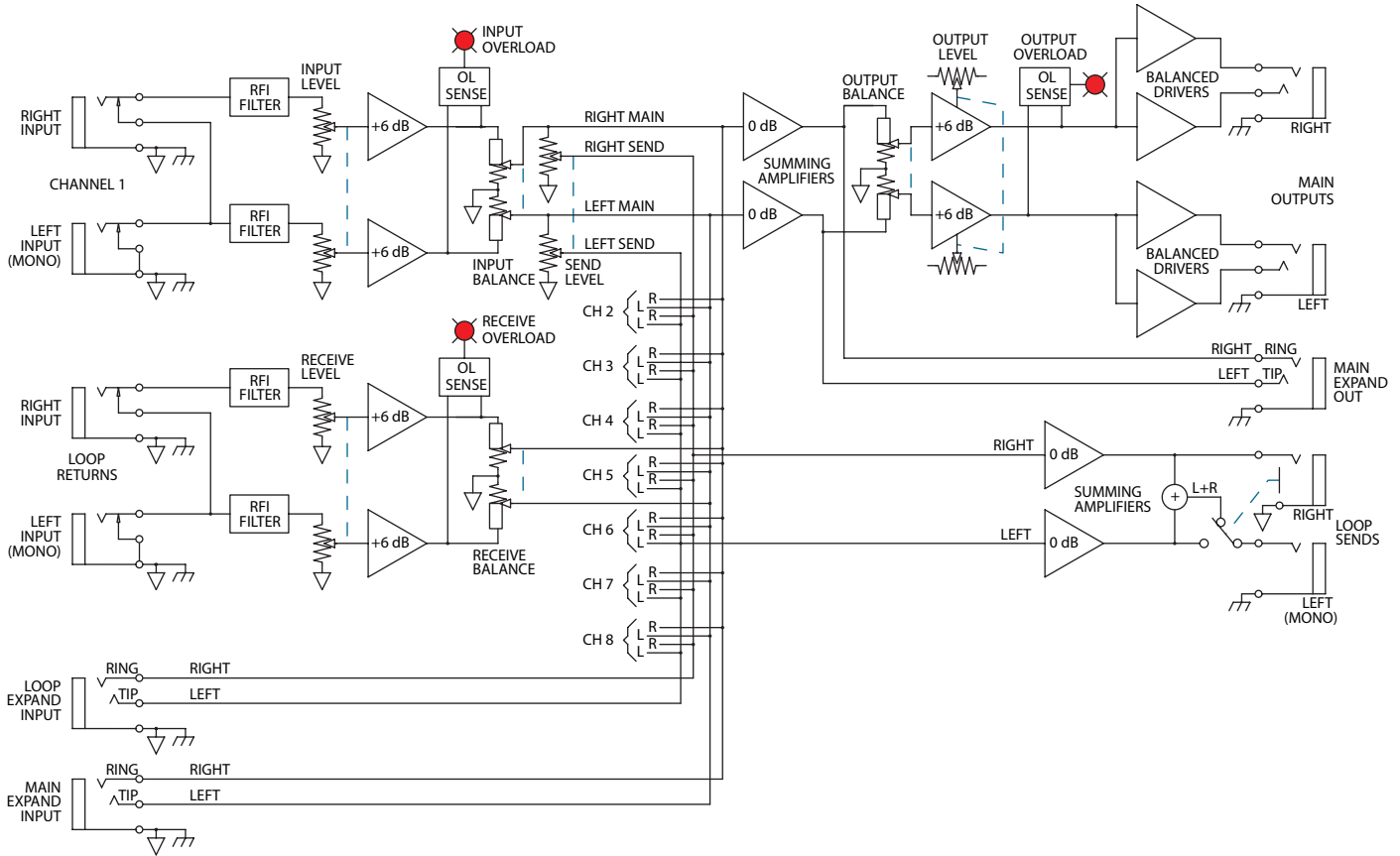
## Features

- 8 Stereo Input Channels
- 1 Stereo Auxiliary Send
- 1 Stereo Auxiliary Return
- Stereo Balance / Mono Pan Controls
- Balanced Stereo Output
- Expandable to / from other Mixers
- Internal Universal Voltage Power Supply (100-240 VAC)



Parameter	Specification	Limit	Units	Conditions/Comments
Input Impedance: Ch's 1-8	100k	20%	Ω	
.....Receive	100k	20%	Ω	
.....Expand	20k	1%	Ω	
Input Level: Nominal	+4	1	dBu	
.....Minimum	-10	1	dBV	
.....Maximum	+26	1	dBu	
Input Design	Unbalanced			
Input Connectors: Ch's 1-8	¼" mono TS (tip-sleeve)			
.....Receive	¼" mono TS			
.....Expand	¼" stereo TRS (tip-ring-sleeve)			Tip=Left; Ring=Right
Input Gain Range	Off to +6	1	dB	
RFI Input Filters	Yes			
Max Output Level: Main	+26 (+20)	1	dBu	Balanced (Unbalanced)
.....Loop Send	+20	1	dBu	Unbalanced
.....Expand	+20	1	dBu	Unbalanced
Output Impedance: Main	100	1%	Ω	Each Output
.....Loop Send	100	1%	Ω	
.....Expand	100	1%	Ω	
Output Design: Main	Active Balanced/Unbalanced			Differential line drivers
.....Loop Send	Unbalanced			
.....Expand	Unbalanced			
Output Connectors	¼" TRS			
Output Gain Range	Off to +6	2	dB	Unbalanced
Frequency Response	20 Hz-20 kHz	3	dB	
THD + Noise	.015	.005	%	+4 dBu, 20-20 kHz
IM Distortion (SMPTE)	.01	.005	%	60 Hz/7 kHz, 4:1, +4 dBu
Input Referred Noise	-112	1	dBu	
Signal-to-Noise Ratio	98 (re +4 dBu, 20 kHz BW)	2	dB	All inputs max, 50% out level, balanced
Crosstalk	76 (1 kHz)	2	dB	Left-Right
	85 (1 kHz)	2	dB	Channel to channel
Overload LED Thresholds	+16	1	dBu	All critical nodes monitored
Power Supply Requirement	100 to 240	10%	VAC	50/60 Hz, 7W
Unit: Conformity	CE, FCC, cULus			
.....Construction	All Steel			
.....Size	1.75"H x 19"W x 5.3"D			(4.4 cm x 48.3 cm x 13.5 cm)
.....Weight	5 lb			(2.3 kg)
Shipping: Size	4.25" x 20.3" x 13.75"			(11 cm x 52 cm x 35 cm)
.....Weight	8 lb			(3.6 kg)
<i>Note: 0 dBu=0.775 Vrms</i>				

### Block Diagram



### Architectural Specifications

The line level stereo mixer unit shall have eight (8) stereo (total of 16) inputs, one main stereo output pair, one stereo loop send pair, one stereo loop receive pair, loop and main stereo expand inputs, and one stereo main expand output. All inputs, as well as the loop send output, shall be configured such that plugging only into the left input (or output) will mono the system. Each stereo input shall have a rotary ganged level control with a range of off to +6 dB gain and a separate input overload LED. Separate +6 dB gain master rotary ganged stereo output level control shall be provided. In addition, stereo slider-type balance controls shall be provided for all inputs and outputs, along with stereo slider-type send level controls on all inputs.

Complete stereo expansion capabilities shall be provided to allow any number of similar units to be coupled together. The inputs shall be high impedance (100 kΩ) unbalanced designs terminated with ¼" TS (tip-sleeve) connectors. The outputs shall be active differentially balanced with balanced output impedance equal to 200 Ω terminated with ¼" TRS (tip-ring-sleeve) connectors. RFI filters shall be provided. The unit shall be capable of operation by means of its own built-in universal power supply operating at 100-240 VAC and meet CE requirements. The unit shall be UL and cUL listed. The unit shall be constructed entirely from cold-rolled steel, and mount into a standard EIA relay rack occupying 1 rack-space.

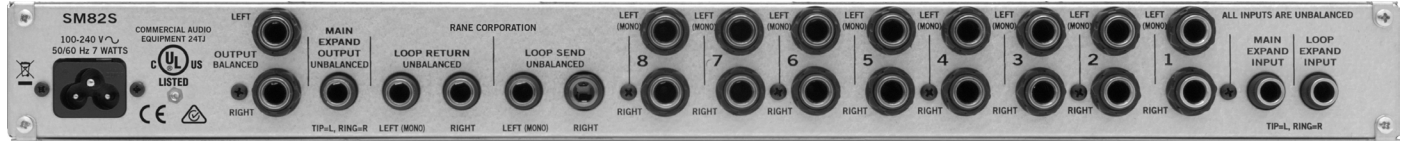
*The unit shall be a Rane Corporation Model SM82S.*

# SM82S

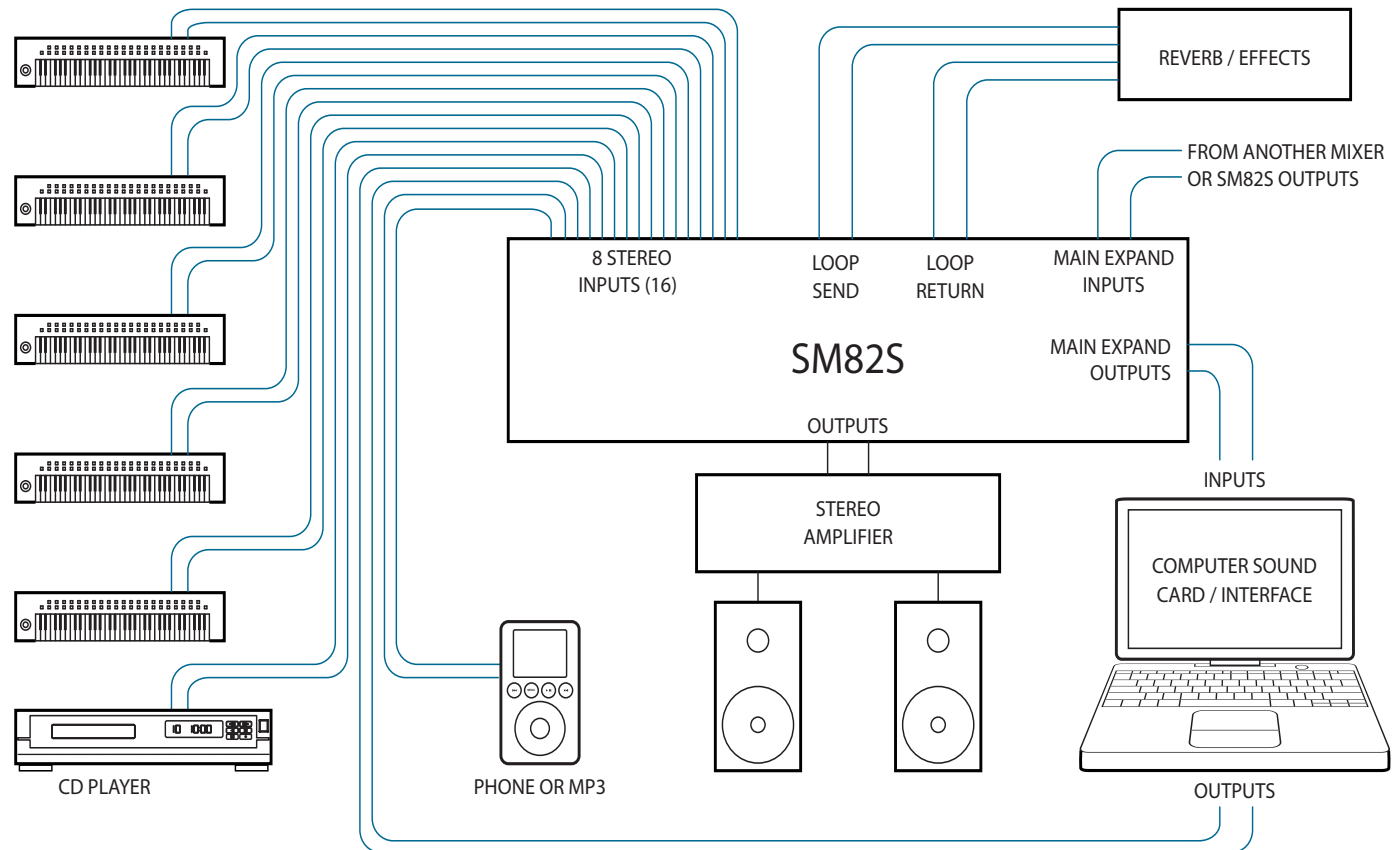
## STEREO LINE MIXER



### Rear Panel



### Studio Example



### Application Information

The SM82S allows you to mix eight Stereo line level Inputs down to a main Stereo Output. Additionally you can create a separate Stereo Loop Send mix for driving any stereo, or mono, external processor, and then return from this processor into the Stereo Loop Return Inputs. The stereo Return Level control is used to set the desired mix of wet and dry signals.

For applications not requiring the looping facilities, the Loop Return Inputs double as a fully functional 9th Stereo Input, creating a 9-Input Stereo Mixer! When used this way, the Loop Send Outputs become a separate Stereo Output pair, useful for monitor sends, tape outputs, or any other application.

When not used for expansion, the Main Expand Output pair double as a pre-fader stereo mix, again useful as tape outputs, or any other fixed-level application.

Mono sources and external processors are handled easily by the SM82S. Connecting only to any Left Input Jack automatically routes this signal to the Right channel so an equal Left/Right signal is summed into the mains. Similarly, connecting only to the Left Loop Send output gives you an equal mono L+R output send for mono input processors.

## 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**

© 1985, 1995, 2006, 2007, 2011 Rane Corporation

## 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.

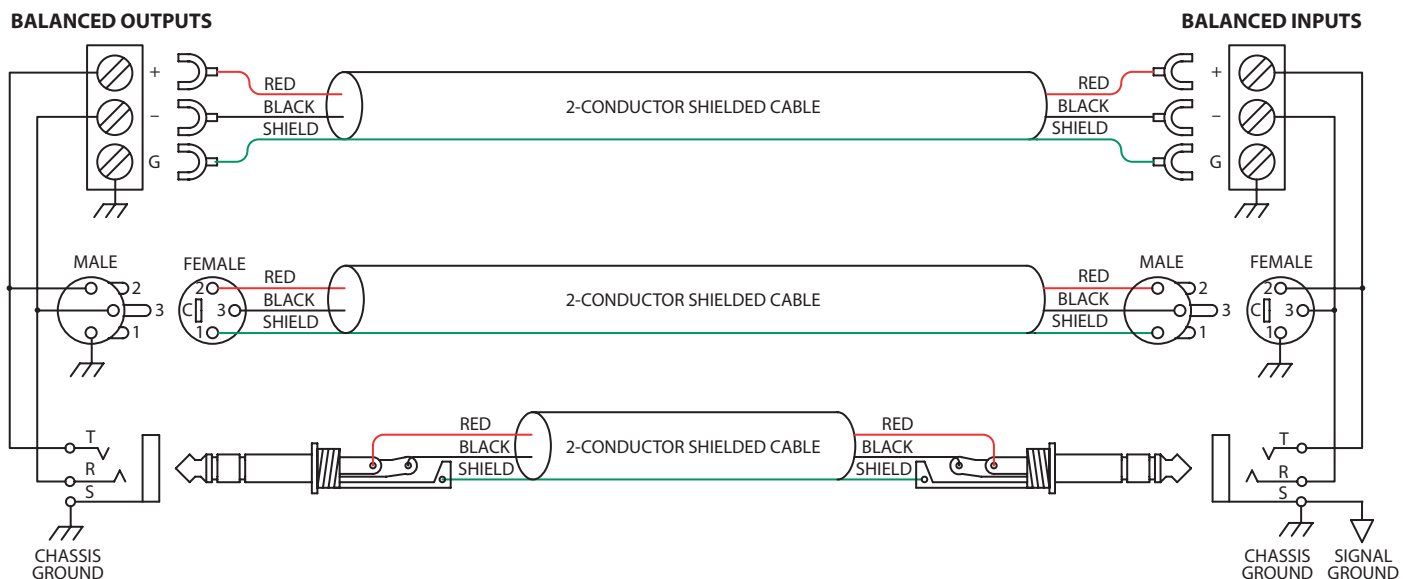


Figure 1a. The right way to do it.

## 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.*

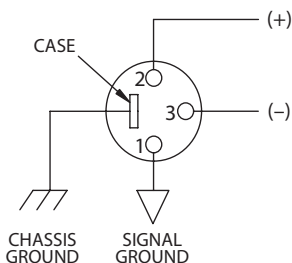
A balanced line requires three separate conductors, two of which are signal (+ and -) and one shield (see Figure 1a). The shield serves to guard the sensitive audio lines from interference. Only by using balanced line interconnects can you *guarantee* (yes, *guarantee*) hum-free results. Always use twisted 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 Muncy<sup>1</sup>, 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 equipment<sup>2</sup>. 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

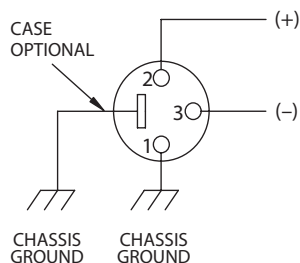


Figure 1b. Recommended practice.

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.

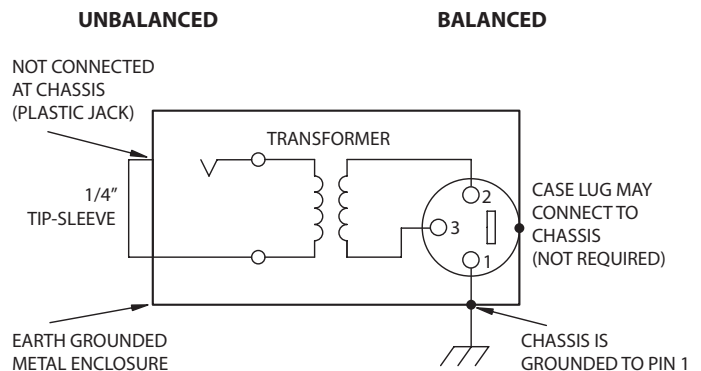


Figure 2. Transformer Isolation

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

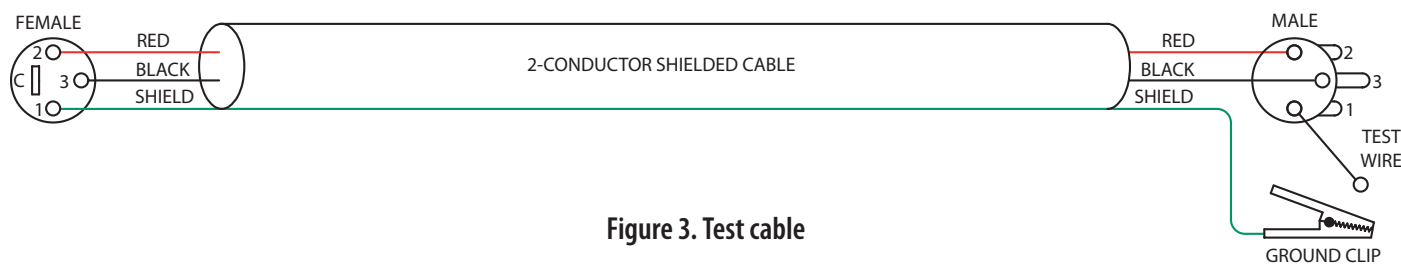


Figure 3. Test cable



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

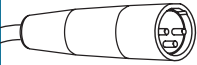
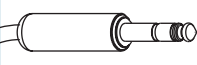
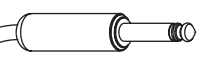
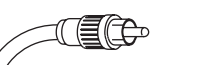

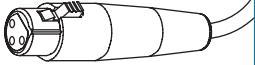
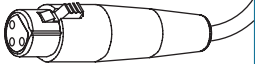

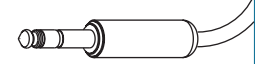
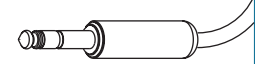

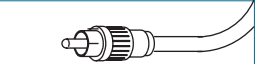

If you are unable to do things correctly (i.e. use fully balanced wiring with shields tied to the *chassis* at both ends, or transformer isolate all unbalanced signals from balanced signals) then there is no guarantee that a hum-free interconnect can be achieved, nor is there a definite scheme that will 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," *S&VC*, 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	<b>CABLE CONNECTORS</b>					
		MALE BALANCED XLR	¼" BALANCED TRS (TIP-RING-SLEEVE)	¼" OR 3.5mm UNBALANCED TS (TIP-SLEEVE)	UNBALANCED RCA	BALANCED EUROBLOCK
		<b>1</b>	<b>2</b>	<b>3<sub>B</sub></b>	<b>4<sub>B</sub></b>	+ to + - to - SHIELD NC
		<b>1</b>	<b>2</b>	<b>5</b>	<b>6</b>	+ to + - to - SHIELD NC
		<b>7</b>	<b>8</b>	<b>9<sub>B</sub></b>	<b>10<sub>B</sub></b>	+ to + - to - SHIELD ONLY TO EUROBLOCK
		<b>7</b>	<b>8</b>	<b>11</b>	<b>12</b>	+ to + - to - SHIELD NC
		<b>21<sub>A</sub></b>	<b>22<sub>A</sub></b>	<b>11</b>	<b>12</b>	+ to + - to - GROUND to GROUND
		<b>13</b>	<b>14</b>	<b>15<sub>A</sub></b>	<b>16<sub>A</sub></b>	<b>23</b>
		<b>17</b>	<b>18</b>	<b>19<sub>A</sub></b>	<b>20<sub>A</sub></b>	<b>23</b>
		+ to + - to - SHIELD ONLY TO XLR PIN 1	+ to + - to - SHIELD ONLY TO TRS SLEEVE	<b>24</b>	<b>24</b>	+ to + - to - GROUND to GROUND

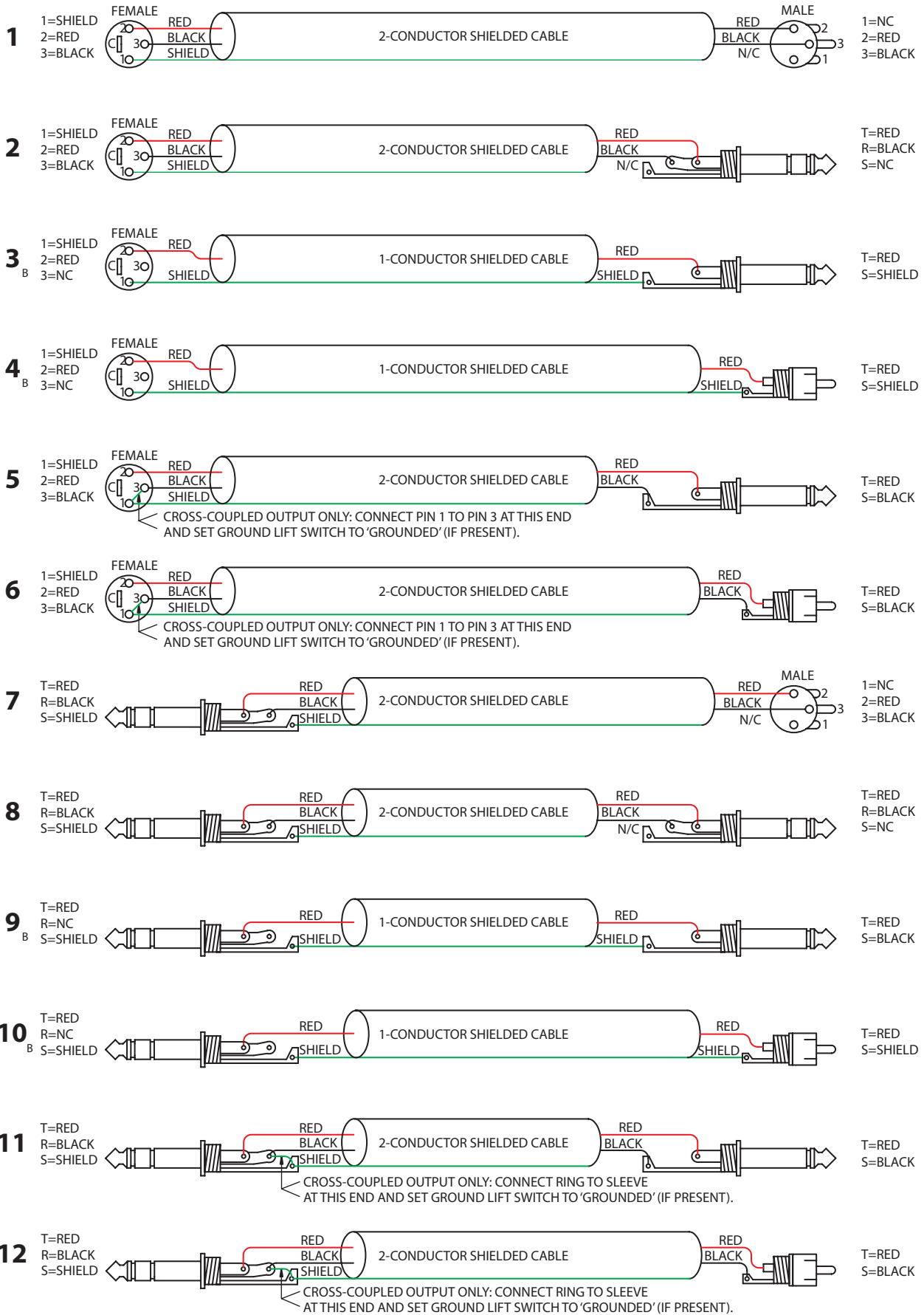
**Figure 4. Interconnect chart for locating correct cable assemblies on the following pages.**

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.

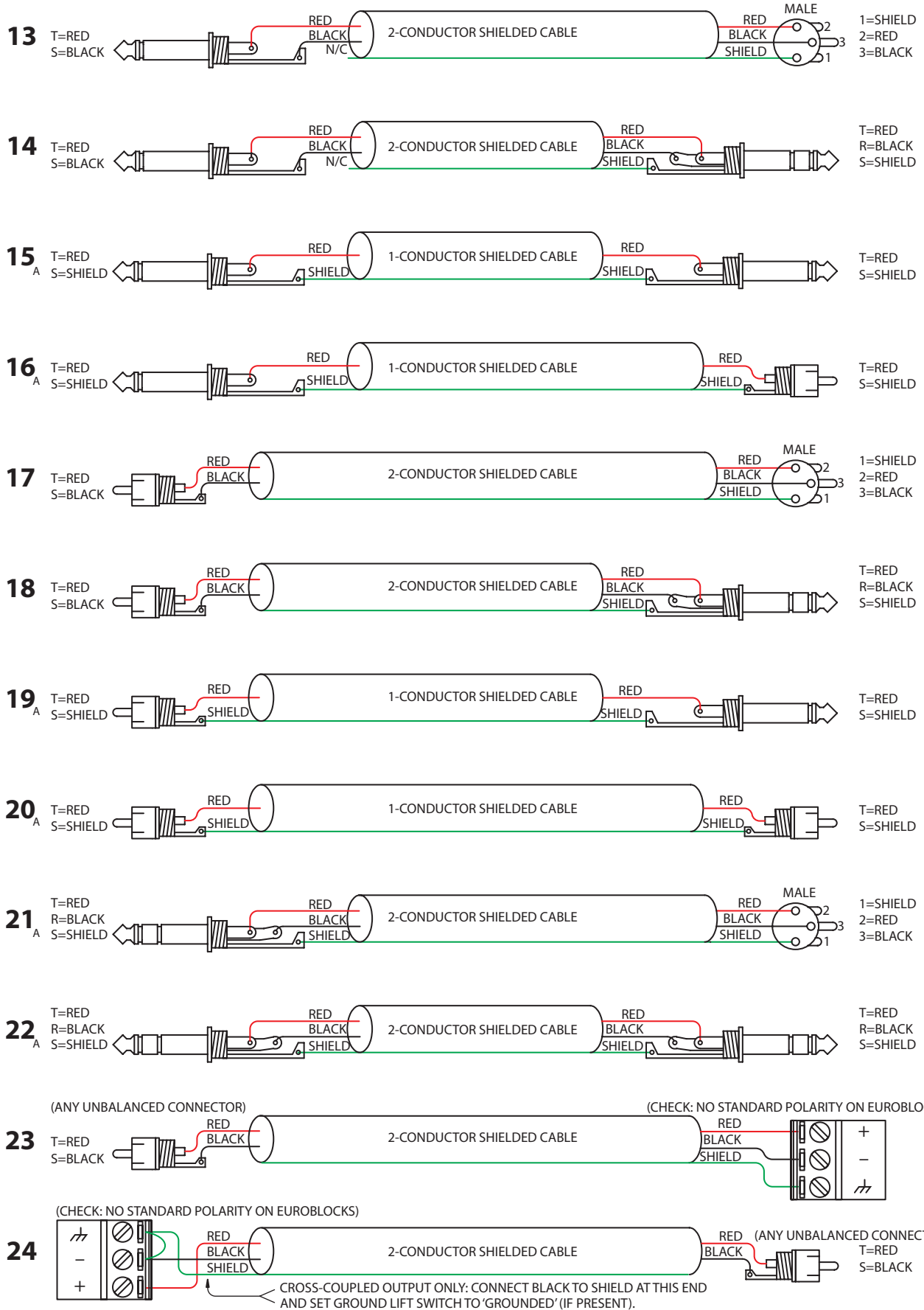
From Output

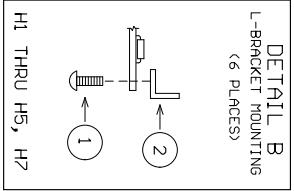
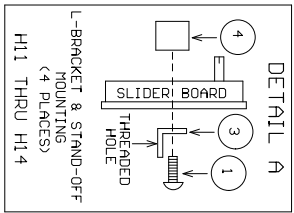
To Input



From Output

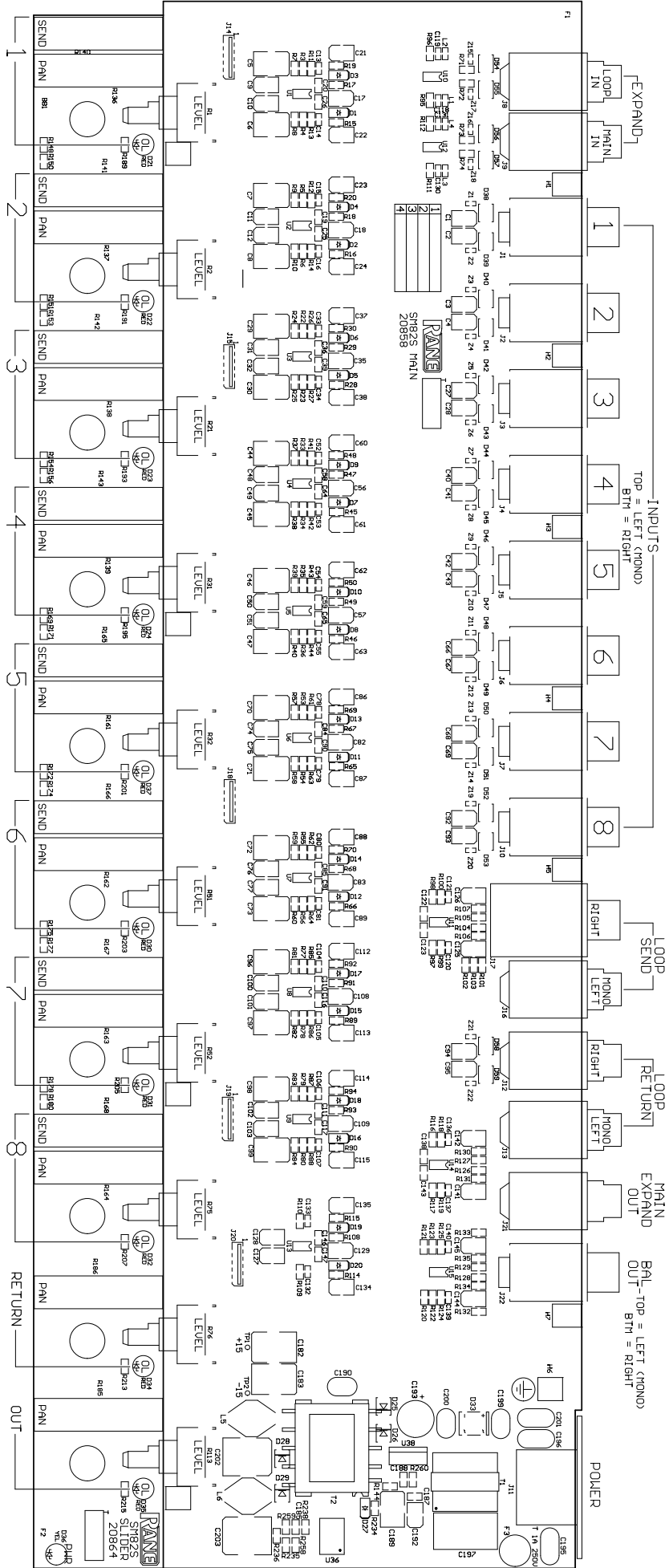
To Input





PREP NOTE:  
 CLIP OFF TAB ON STACKED JACKS  
 MASK OFF H1 THRU H5 AND H7 SCREW HEADS.

114842 FILM 1 OF 6 TOP SILKSCREEN SM82S



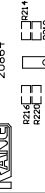
11-4942 FILM 6 OF 6 BOTTOM SILKSCREEN SM82S

F4

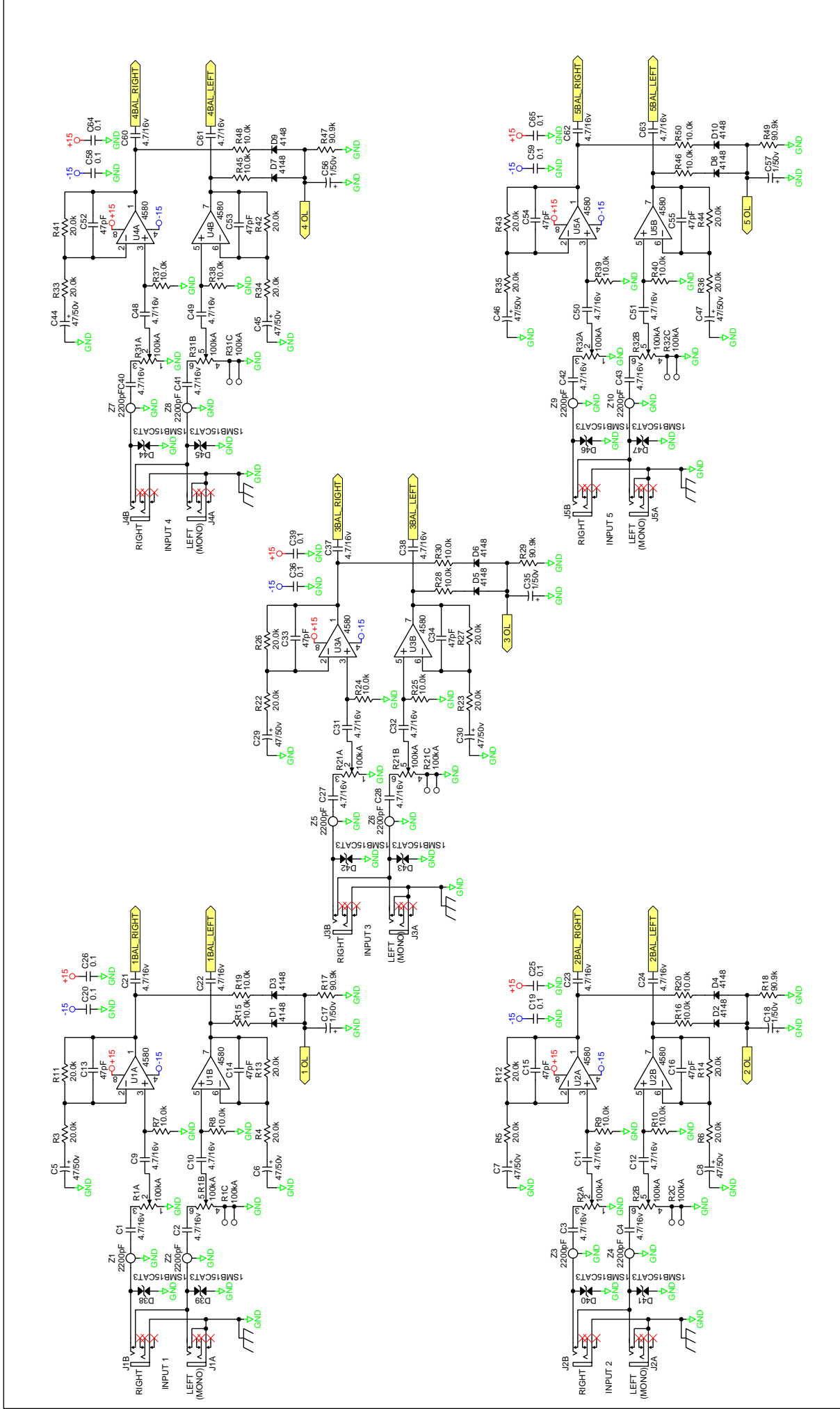
RUBBER  
FOOT

RUBBER  
FOOT

RANE SM82S SILVER  
20845



BR2



ACTION: ADD DSB THRU DAT.  
 UPDATED TO SMT PARTS.  
 WAS 109263, SKH 25JANI 2

DRAWN BY: RWJ    CHECKED BY: MR

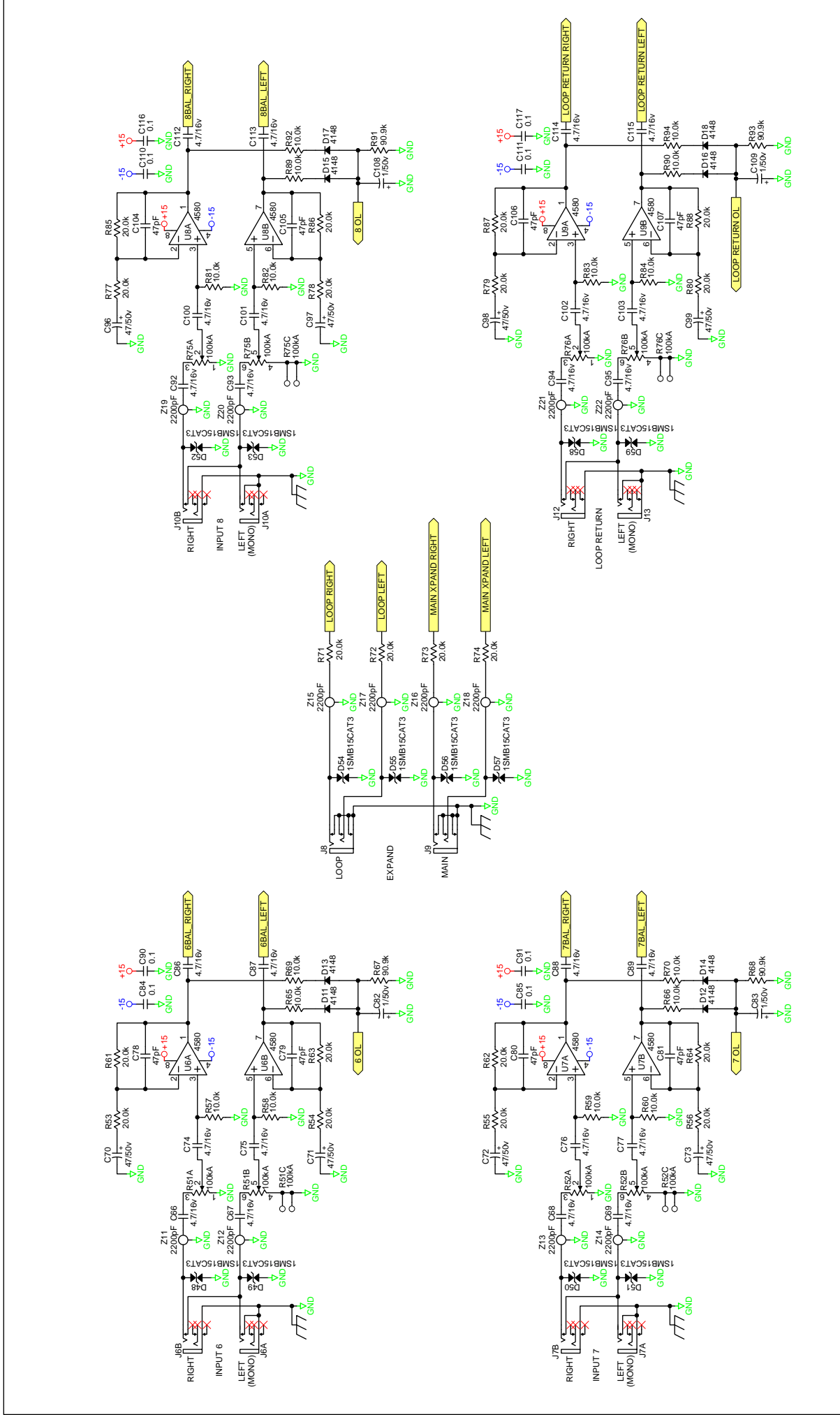
SM82 INPUTS 1-5

10802 47th Avenue West  
 Mukilteo WA 98275-5098

SHEET: 1 of 5    114666

Main

3/23/2012  
 C:\CAD Projects\sm82s\SM82s-1\_Sch.Doc



ACTION: ADD D48 THRU D68.  
 UPDATED TO SMT PARTS.  
 WAS 109263, SKH 25JAN12



DRAWN BY: **RWJ**  
 CHECKED BY: **MR**

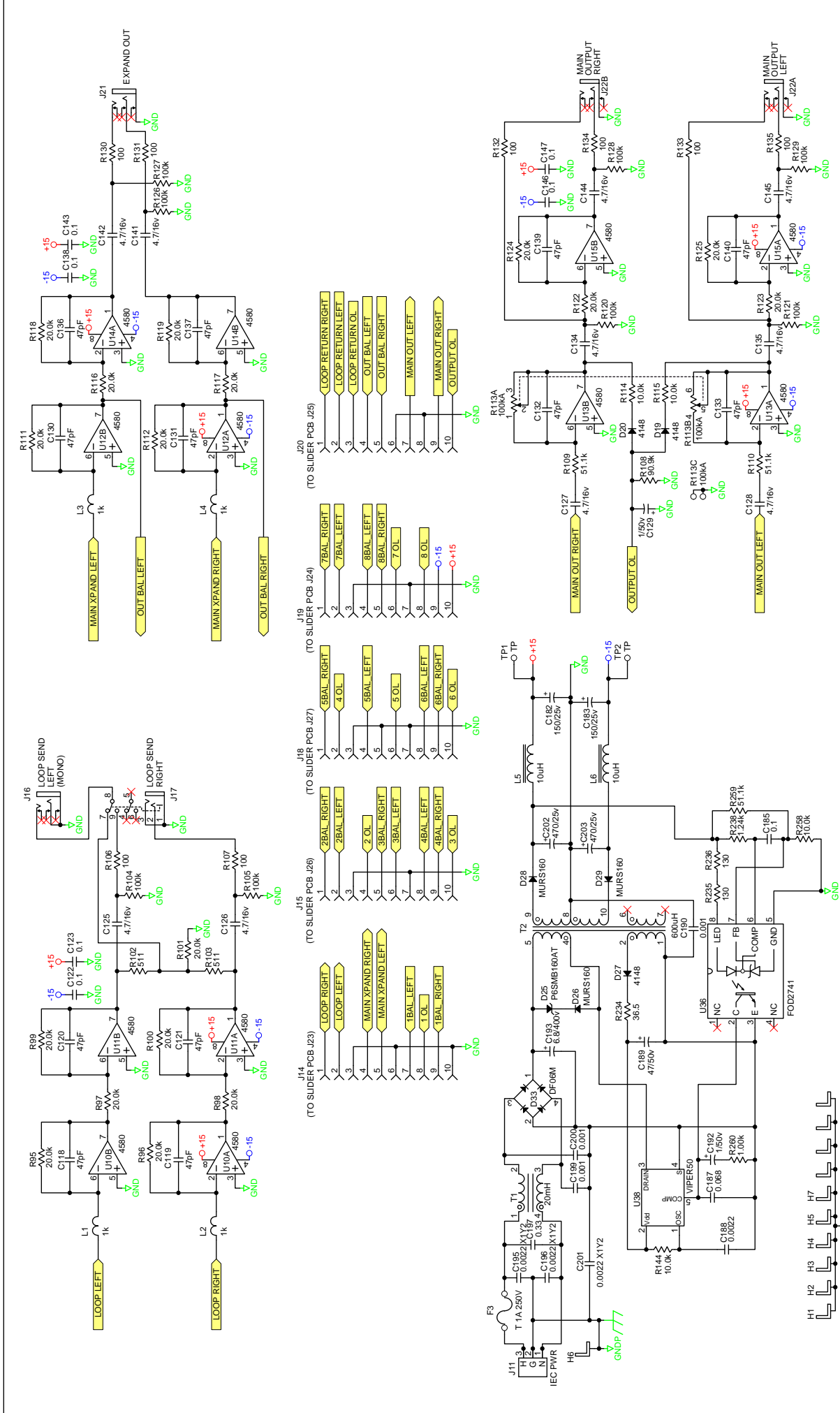
**SM82 IN 6-8, LOOP RETURN & EXP**  
 10802 47th Avenue West  
 Mukilteo WA 98275-5398

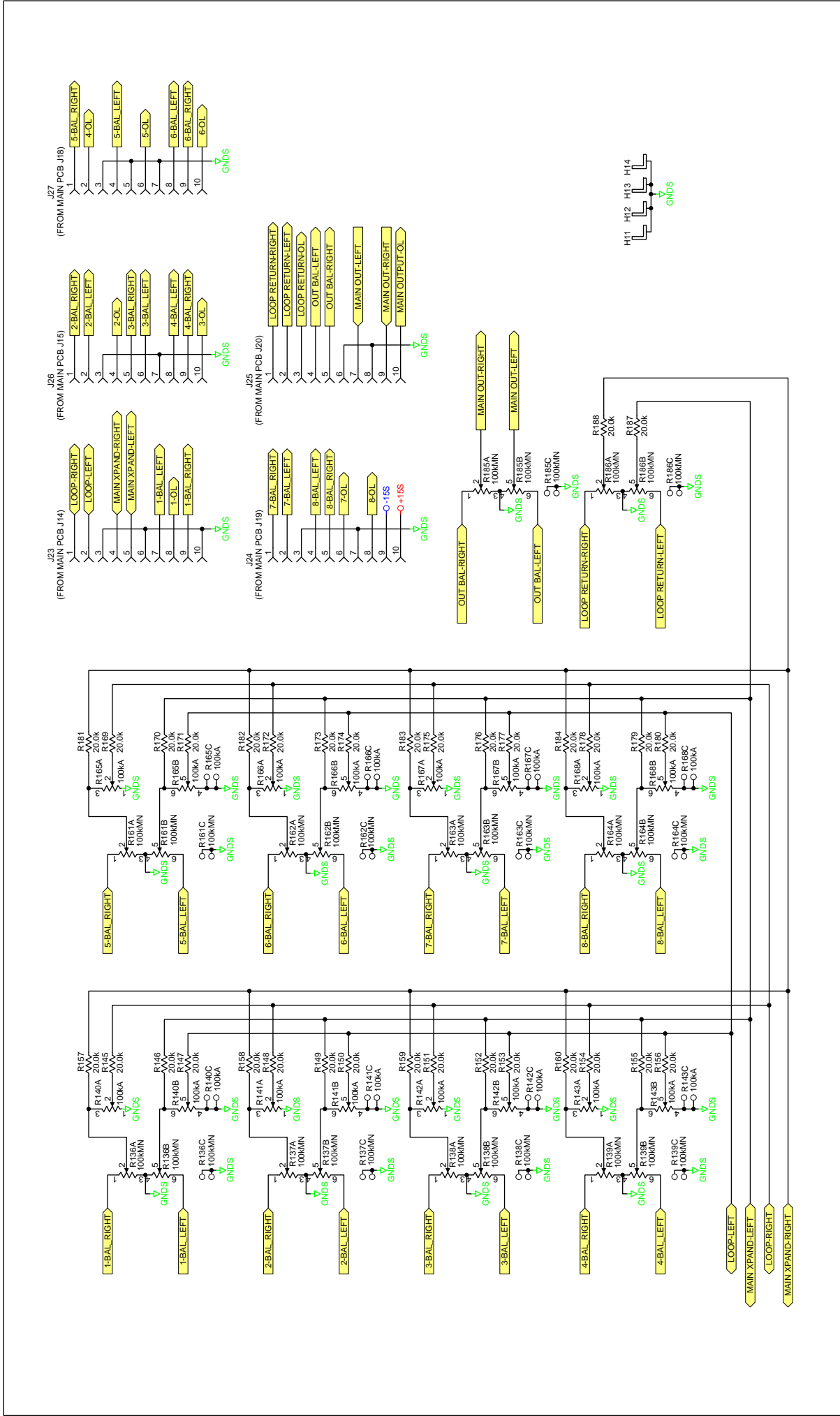
SHEET: **2** of **5**  
**114666**

Main

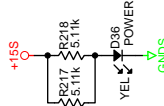
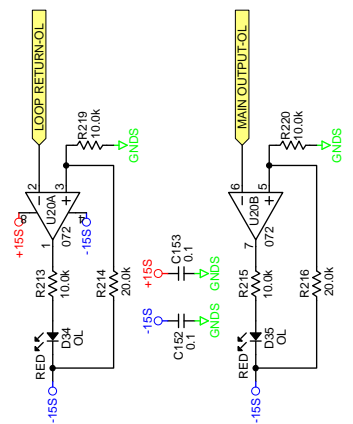
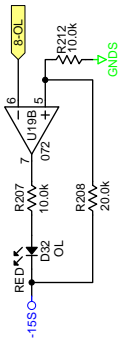
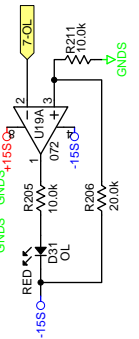
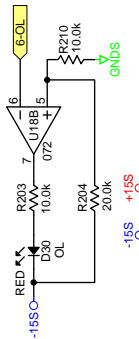
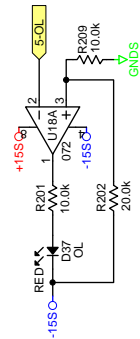
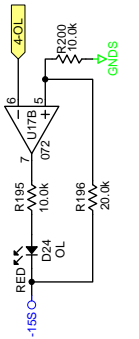
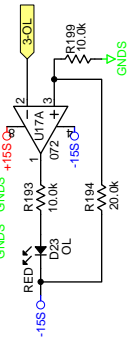
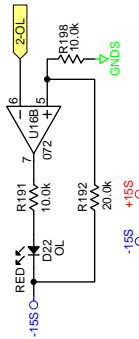
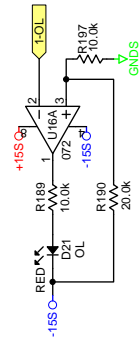
3/23/2012  
 C:\CAD Projects\sm82\sm82s-2\SchDoc







SLIDER



ACTION: NO CHG THIS PAGE  
 WAS:10/26/12, SKH:25/JAM12  
 DRAWN BY: RWJ CHECKED BY: MR

RANGE  
 10802 47th Avenue West  
 Mukilteo WA 98275-5098

SM82 OVERLOADS  
 SHEET: 5 of 5  
 114666

**RANE**



## 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](http://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.

### LIMITED WARRANTY OUTSIDE THE U.S.A.

RANE PRODUCTS ARE WARRANTED ONLY IN THE COUNTRY WHERE PURCHASED, THROUGH THE AUTHORIZED RANE DISTRIBUTOR IN THAT COUNTRY, AGAINST DEFECTS IN MATERIAL OR WORKMANSHIP, THE SPECIFIC PERIOD OF THIS LIMITED WARRANTY SHALL BE THAT WHICH IS DESCRIBED TO THE ORIGINAL RETAIL PURCHASER BY THE AUTHORIZED RANE DEALER OR DISTRIBUTOR AT THE TIME OF PURCHASE. Rane Corporation does not, however, warrant its products against any and all defects: 1) arising out of materials 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, through the applicable authorized distributor, 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 the designated authorized Rane warranty repair facility in the country where purchased, or to the Rane factory in the U.S., 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.

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](http://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):

2001/95/EC  
2002/96/EC  
2004/108/EC  
2006/95/EC  
2011/65/EU

## Standard(s) to which conformity is declared:

EN60065: 2002/A1:2006/A11:2008/A2:2010/A12:2011  
EN55103-1:2009  
EN55103-2:2009  
EN50581:2012  
ENVIRONMENT E2  
CE MARK FIRST AFFIXED IN 2006  
SERIAL NUMBERS 850000 - 950000

## 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 EU's Low Voltage (LV) directive 2006/95/EC, and 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 LV directive and 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:** SM82S

## Immunity Results:

THD+N re: 4 dBu, 400 Hz, BW=20-20kHz

### Test Description

### Results

### Conditions

#### RF Electromagnetic Fields Immunity

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

< -46 dB

80 MHz - 100 MHz

< -59 dB

100 MHz - 200 MHz

< -53 dB

200 MHz - 350 MHz

< -42 dB

350 MHz - 550 MHz

< -52 dB

550 MHz - 1000 MHz

#### Conducted RF Disturbances Immunity

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

< -61 dB

Power Lines

< -57 dB

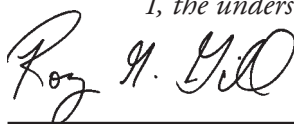
Signal Lines

#### Magnetic Fields Immunity

50 Hz - 10 kHz, 4.0 - 0.4 A/m

< -61 dB

*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)

**November 8, 2006**

(Date)

**Mukilteo WA USA**

(Place)

# SM82S

## STEREO LINE MIXER

