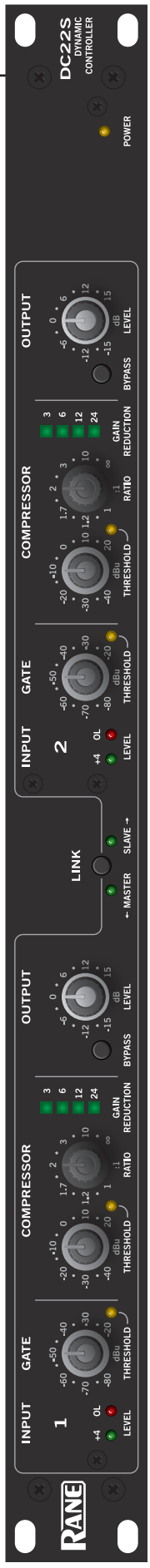
DC22S

DYNAMICS CONTROLLER



CONTENTS *(in order of appearance)*

22320

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.

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

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 3è 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 utlisez 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 abimé : 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 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 detecté en mettant l'équipement sous/hors tension, l'utilisateur est encouragé à essayer de corriger cette interférence par une ou plusieurs des mesures suivantes:

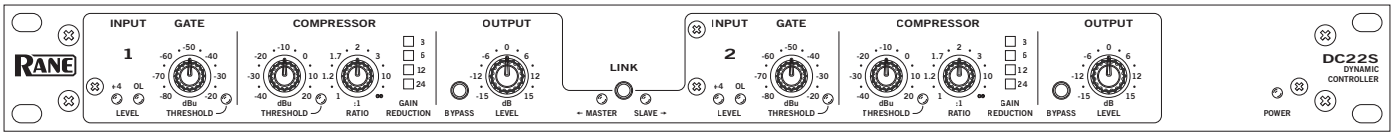
- Réorienter ou déplacer l'antenne de réception.
- Augmenter la distance entre l'équipement et le récepteur.
- Connecter l'équipement à une sortie sur un circuit différent de celui sur lequel le récepteur est branché.
- Consulter un revendeur ou un technicien radio / TV expérimenté.

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

Shredded, this document makes excellent packing material. In its present form, it makes interesting and useful reading. If you run out of patience quickly, at least read this part to make sure you don't exterminate everything within a two mile radius by doing something wrong.

First, be sure the **POWER** switch is off. Attach one or two channels of Inputs and Outputs to the respective connectors on the rear. *This device uses low impedance balanced line drivers.* ***Do not*** *connect the XLR "+" or "–" output pins to ground, as this may cause the power supply to shut down. For unbalanced use, leave the unused output pin ("+" or "–") unterminated.* OK, now you can power up your sound system, volumes down, amp turned on *last*.

With the **GATE THRESHOLD** turned all the way *down* to **-80 dBu**, **COMPRESSOR THRESHOLD** turned all the way *up* to **20 dBu, COMPRESSOR RATIO** turned all the way *down* to **1**, and the **OUTPUT LEVEL** control in the *center* at **0 dB,** you have an expensive patch cord.

While sending a signal to the DC22S, adjust the output level of the previous device so the **+4 dBu** LED lights occasionally, but the **OL** LED does not light. If you are driving the ¼" INPUTS with a balanced signal (tip-ring-sleeve), set the Input Gain switch to +4 dBu (*in*). When driving this input with an unbalanced signal (tip-sleeve), set this switch to –10 dBv (*out*). Regardless of the type of Input, you might need to set this switch so the **INPUT LEVEL** LEDs light correctly.

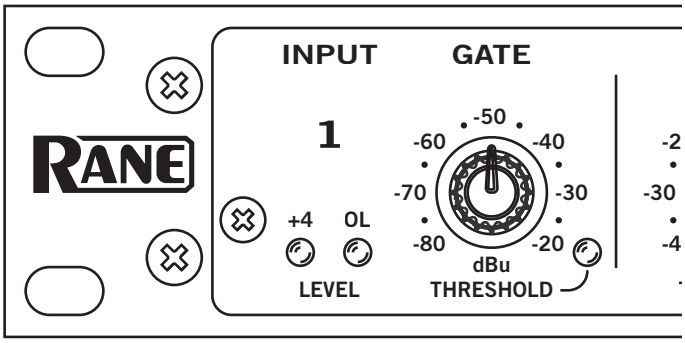
Now increase the **COMPRESSOR RATIO** to something useful, like **2:1** (with the control set at 2, the Ratio is 2:1; at 5, it is 5:1.) Adjust the **COMPRESSOR THRESHOLD** to the point you want the Compressor to kick in. The **GAIN REDUCTION** meter reads the amount of signal compression.

If you want the quiet parts to be even quieter, increase the **GATE THRESHOLD** so only higher levels make it through the Gate.

Both Gates and Compressors will activate by the source material applied to either channel if the **LINK** switch is on. This is the preferred setting for stereo program material. The channel 1 controls set both channels to the same adjustments, as the channel 2 controls go dormant and the LEDs extinguish. If the **LINK** switch is off, then both channels are independently controllable.

WEAR PARTS: This product contains no wear parts.

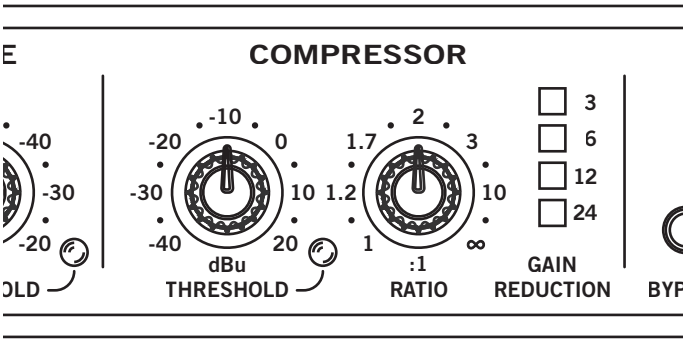
Front Panel Description



INPUT LEVEL indicators: With signal applied, the +4 dBu LED may light occasionally. If the OL (overload) LED flashes, turn the output level down on the previous device.

GATE THRESHOLD control sets the point at which the Input signal level causes the Gate to become active.

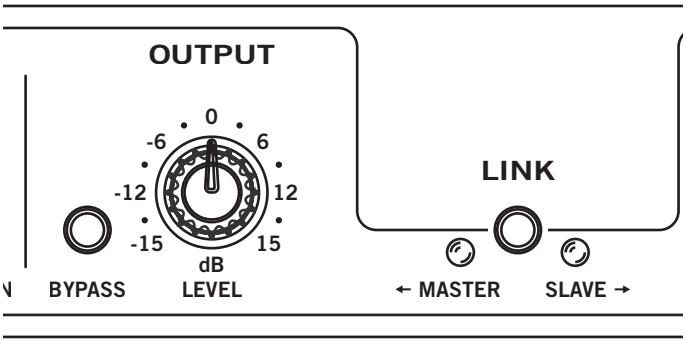
COMPRESSOR THRESHOLD control sets the point at which the Input signal level causes the Compressor to become active. See Figure 1 on page Manual-4.



COMPRESSOR RATIO control: Once the Threshold is exceeded, the Ratio of input change to output change is determined by this control. The compressor has no effect when set at 1:1. But at 10:1, it takes a 10 dB input signal increase above the Threshold to produce a 1 dB increase in Output Gain. See Figure 2 on page Manual-4.

GAIN REDUCTION LEDs show the amount of average signal reduction in dB. This aids in setting the THRESHOLD and RATIO controls by showing how much compression is occurring.

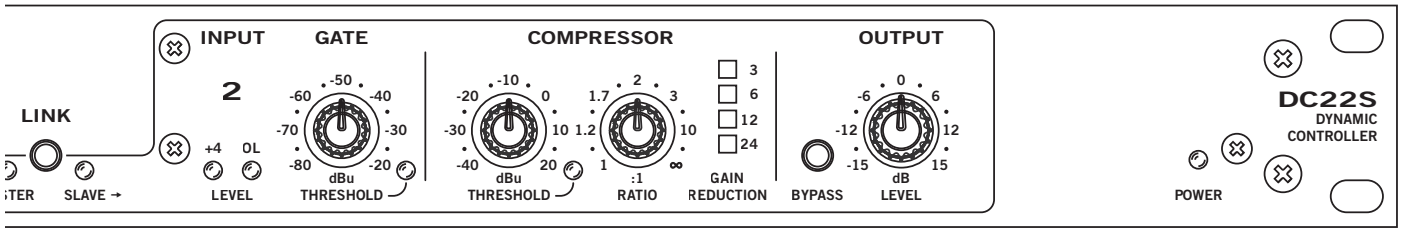
BYPASS switch compares the compressed and non-compressed signal. There is one for each channel. The INPUT LEVEL indicators remain active regardless of switch position.



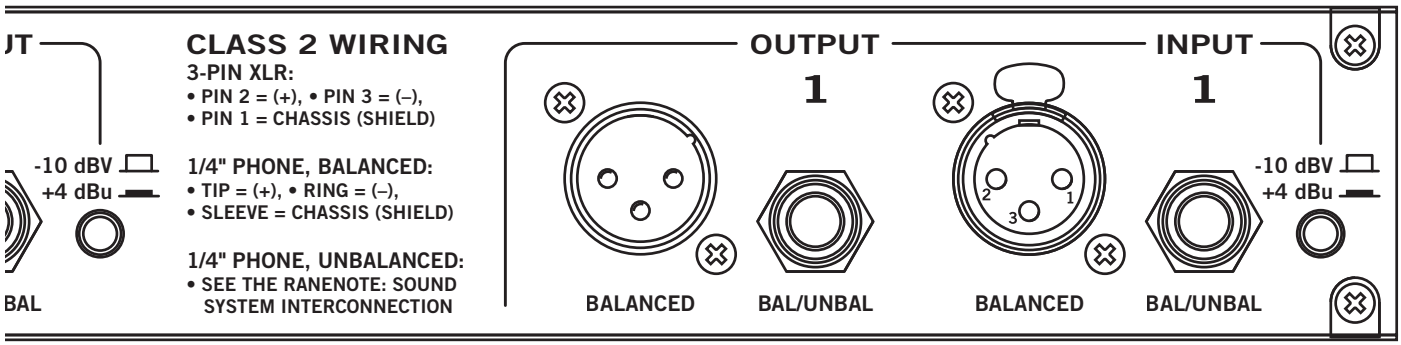
OUTPUT LEVEL control increases or decreases the output gain of each Channel by 15 dB. In the center detent, gain will be unity.

LINK switch activates both Compressors when either channel's signal exceeds the set Threshold, preserving stereo imaging. Switch this ON when using stereo material. The channel 1 controls become the Master when this switch is active, rendering the channel 2 controls and indicators dead.

Channel 2 controls duplicate the controls in channel 1. These are not active if the LINK switch is engaged.



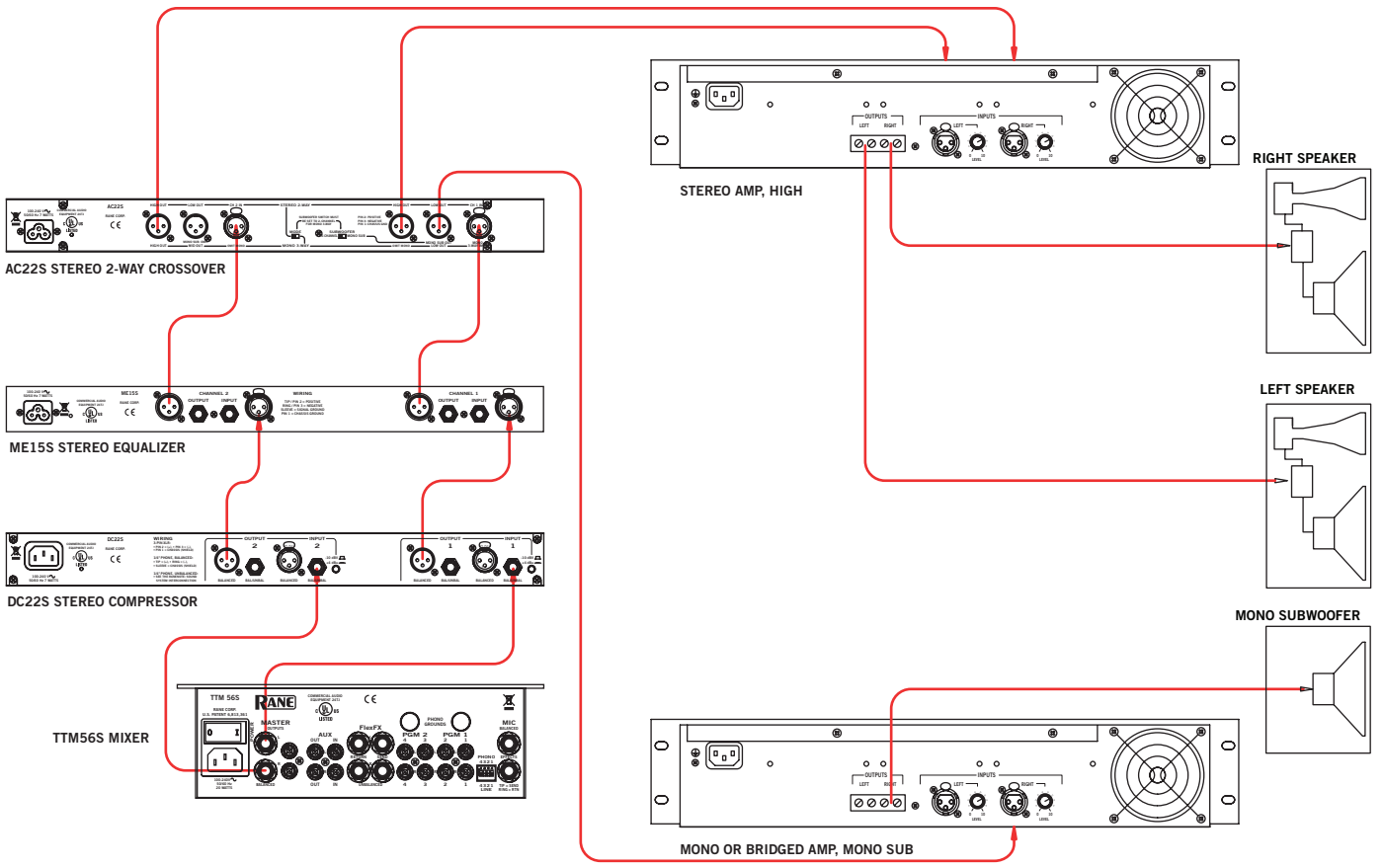
When the POWER LED is lit, the DC22S is connected to a 100-240 VAC source and ready to rock.



INPUTS 1 and 2: Choose between the balanced XLR or the balanced/unbalanced ¼" TRS jacks, but only use one. Inserting a ¼" TS jack will work—however—we recommend using balanced lines, especially when connecting any cable over 10 feet (3 meters) in length. Consult the Sound System Interconnection RaneNote provided with this manual.

INPUTS 1 and 2 Gain Trim Switch: In its +4 dBu position, the Input gain of the respective channel is unity. In the -10 dBV position, the input gain is increased by 12 dB (although mathematically suspicious, it really is 12 dB, not 14 dB) to compensate for certain recording devices. This switch must be in the +4 dBu position for front panel calibration accuracy.

OUTPUTS 1 and 2 are delivered by the balanced XLR or the unbalanced ¼" TS jacks. Using both types of Outputs are permissible to drive two devices, such as an amplifier and a recorder. *This device uses low impedance balanced line drivers.* ***Do not*** *connect the XLR "+" or "–" output pins to ground, as this may cause the power supply to shut down. For unbalanced use, leave the unused output pin ("+" or "–") unterminated.*



System wiring example for a DJ system

OPERATING INSTRUCTIONS

A PRIMER

Let's start with what a compressor actually does. No matter how you cut it, this is an automatic volume control. It is a hand on a knob, turning the volume down and turning it up again. The hand is really quick and really accurate, but it's just turning a volume control.

When the input signal reaches a level set by the COMPRESSOR THRESHOLD control, the compressor begins turning down the signal by an amount determined by the RATIO control. The DC22S, like most compressors, operates by making the loud signals quieter, but does not make the quiet parts louder. However, by keeping the loud signals under control, the entire system may be turned up when necessary to make the quiet parts louder.

PRE-FLIGHT CHECKLIST

Before proceeding, it's a good idea to turn the control knobs to the following positions:

1. GATE THRESHOLD control .....fully counterclockwise
2. COMPRESSOR THRESHOLD ...fully clockwise
3. COMPRESSOR RATIO .....fully counterclockwise
4. BYPASS switches.....ACTIVE (out)
5. OUTPUT LEVEL.....0 dB

This renders the DC22S with no compression, allowing signal through at unity gain. No change occurs with the BYPASS switch *in* or *out*.

INPUT LEVEL

Before making any Threshold adjustments, set the ouput level of the previous device so the +4 dBu LED lights occasionally, and the OL LED does not light. Be aware that changes to the Input Level will affect the Thresholds.

GATE THRESHOLD

The threshold is the point at which gain adjustment begins. When the input signal is below the threshold, the DC22S attenuates the signal at a 2:1 ratio, making the quiet parts twice as quiet. When the signal is above the Gate Threshold, the Gate is open, like a straight wire.

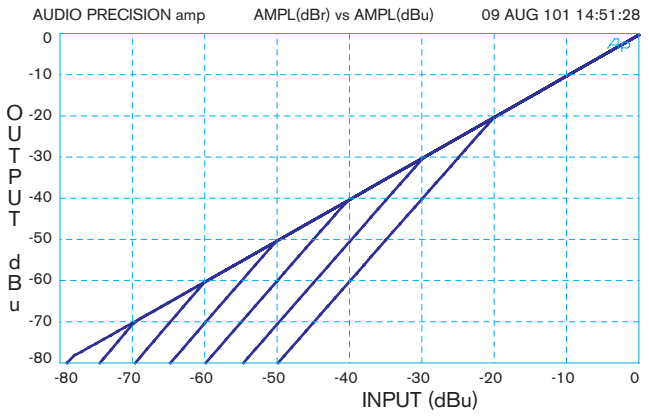


Figure 1. With a fixed Ratio set to 2:1, this graph shows gain reduction below various Gate Thresholds at -20 dBu, -30 dBu, -40 dBu, etc.

COMPRESSOR THRESHOLD

The threshold is the point at which gain adjustment begins. When the input signal is below the threshold, the Compressor section acts like a straight wire. When the signal is loud enough to cross the Compressor Threshold, the compressor is active and turns the volume down. Various Threshold points are illustrated in Figure 1. How *much* it gets turned down is determined by the RATIO control (Figure 1 shows a Ratio set at 2:1).

RATIO

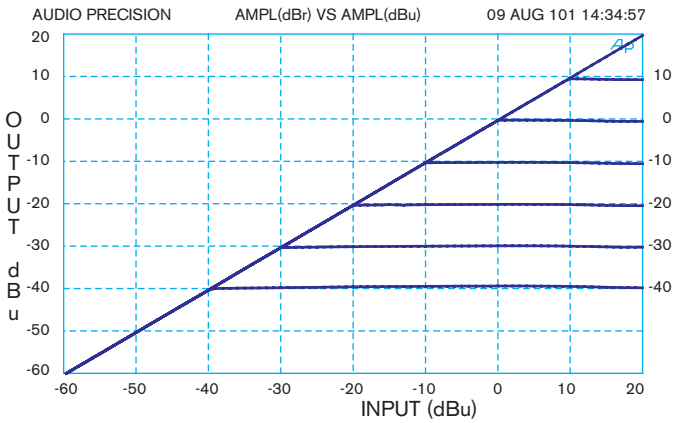


Figure 2. With the Ratio set to ∞, the DC22S acts as a Limiter. This graph shows Limiter gain reduction above various Compressor Thresholds at 10 dBu, 0 dBu, -10 dBu, etc.

Once the Threshold is exceeded, the increase in output compared to the input signal increase depends on the RATIO setting. An ordinary preamp set for unity gain or a straight wire has a ratio of 1:1, that is, the output level tracks the input level perfectly. A 2 dB change at the input produces a 2 dB change at the output.

For a 10:1 Ratio, a 10 dB blast at the input would rise only 1 dB at the output – *heavy* compression. Kinder, gentler ratios are in the 2:1 to 3:1 range. Limiting, with no increase in signal above the Threshold, occurs at ∞:1. Figure 3 illustrates various Ratios.

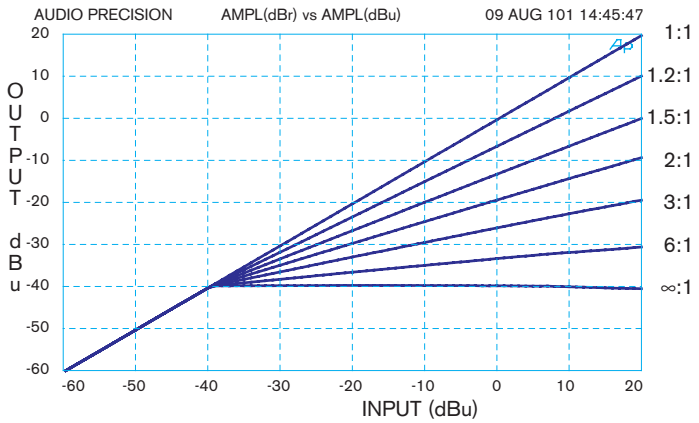


FIgure 3. Threshold at -40 dBu. Ratios of 1:1, 1.2:1, 1.5:1, etc. Vertical axis = output level, horizontal axis = input level.

LIMITING

A limiter is a special form of compressor set up especially to reduce peaks for overload protection. In other words, it's a compressor with a maximum ratio. A compressor is used to change the dynamics for purposes of aesthetics, intelligibility, recording or broadcast limitations. Once the threshold of a limiter is reached, no more signal increase is allowed. The DC22S acts as a limiter when set at a very high ratio of 10:1.

LINKING IN STEREO

When using the DC22S as a true stereo processor, with left signal in Channel 1 and right signal in Channel 2, it is recommended to turn the LINK switch *on* to prevent large balance and image shifts. While LINKed, both Channels attenuate by exactly the same amount when either Compressor works, maintaining correct stereo imaging. Only Channel 1's controls are active, Channel 2 becomes the slave.

DC22S APPLICATIONS

TWO CHANNEL COMPRESSOR/LIMITER

In this case, the audio path on Channel 1 is completely separate from Channel 2, allowing you to use it as a stereo unit *or* for doing two completely different processes to two completely different signals. For stereo use, the front panel LINK switch allows you to link Channels. When either Channel's Threshold is reached, both channels compress equally, preserving the stereo image. Channel 1's Threshold and Ratio settings will affect both Channels.

GUITAR & BASS

Where does the unit go in the signal chain? Well, that depends on how you want it to function. If it's a comp/limiter for the input signal, it would go after the guitar (if the guitar has a line-level output) and before the preamp. If it's to function as a limiter to protect the speakers in the rig, it would go after the preamp and before the power amp. Another method is to insert the unit in the effect loop of the preamp. This allows the bass signal to be affected by the pre-amp first, then the comp/limiter, and then sent to the power amp. This can be desirable with tube pre-amps.

RECORDING

Use it on bass guitar, piano, drums, or vocals—as an effect or to tailor dynamic range for a particular recording medium. Patch it between line-level devices or in your mixer inserts or "loops". The DC22S gives you more control and a less tortured sound, and keeps instruments sounding "up-front." In digital recording, compress an extremely wide dynamic range into a signal that won't go into digital overload, i.e. severe clipping. This is really valuable during a live digital recording when you just don't know how loud it may get, and digital distortion can ruin an otherwise good take. Set both the COMPRESSOR THRESHOLD and RATIO relatively high, just enough to limit the peaks. Set the GATE THRESHOLD very low, though you might want to raise it just above the noise floor to get rid of tape hiss or processor noise.

Of special interest are instruments which have large level differences in their tonal ranges. String pops on a bass are one example, shrill peaks on a flute are yet another. The higher tones require more breath and can seem much louder than lower pitches. Another good application would be a drum mix or vocal submix.

LONG DISTANCE LINE DRIVER

The DC22S is excellent as a line level amp for driving long lines (from the mixer to the stage for instance). With the COMPRESSOR switch in the BYPASS position, the INPUT LEVEL control and the output amplifiers remain in the circuit. This provides a very low distortion, low noise line driver. Balanced XLR connections are recommended for the long run from the DC22S's outputs (anything over 10 feet [3 meters]). A balanced piece of equipment (equalizer or amplifier) must be used at the receiving end of this long line.

For unbalanced systems, use the ¼" inputs on the DC22S and use the balanced XLR outputs to run the long distance. See the RaneNote "Sound System Interconnection" included with this manual for proper cable wiring.

SOUND SYSTEM WITH COMPRESSION

Let's run a stereo system with compression. See the wiring diagram on page Manual-3.

Patch the DC22S Compressor Inputs from the program source or mixer outputs, and send the DC22S Outputs to the system equalizer (if you have one), and then on to the crossover inputs (if you have one). Set the equalizer and crossover Inputs to unity gain. Set the LINK switch to ON, and adjust the CHANNEL 1 COMPRESSOR THRESHOLD and RATIO controls to keep the entire system dynamic range under control. Locating the compressor before the equalizer results in correct spectral balance during compression.

DRIVER PROTECTION

To individually limit Low and High drivers in a biamped system, connect the Crossover Low Output into one DC22S Input, and the High Output into the other DC22S Input. The DC22S Outputs go right to the respective low and high frequency power amplifier inputs. For a stereo configuration use two DC22S Stereo Compressors. Be sure the LINK switch is OFF. Set the RATIO controls to 10:1.

Assuming your input signal has peaks in excess of -20 dBu, you should be able to rotate the COMPRESSOR THRESHOLD controls and see some GAIN REDUCTION meter action. You should begin to hear the difference. Leave these controls at whatever level is appropriate for your application. For the most precise settings, see the section on the next page.

DRIVER PROTECTION FINE TUNING

1. Determine the driver's maximum continuous average power rating in watts (W) (specified by the manufacturer).

2. Determine the driver impedance "z" in ohms (specified by the manufacturer).

3. Using the data in steps (1) and (2) above, calculate the maximum signal level in dBu that the driver can handle.
   Max dBu = 20*log($\sqrt{(w*z)}$/.775).

4. Determine the gain of the amplifier in dB (if the amplifier has a level control , you may wish to measure the gain). If, i.e., you put 1V in, how many volts come out? Then convert to dB (20 log gain).

5. Subtract the gain of the amplifier in dB from the answer in step (3) to obtain the correct COMPRESSOR THRESHOLD.

6. Set the RATIO to 10:1.

NOTES

Any change in amplifier sensitivity setting will effect the power limit to the driver.
If the DC22S is placed just before the amplifier, no other system levels will effect the power limit setting.

EXAMPLE

1. Driver power rating: w = 100 watts.

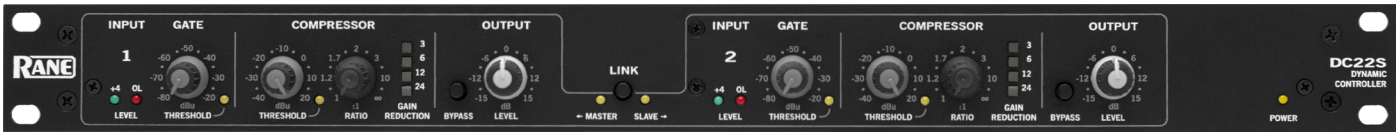
2. Driver impedance: z = 4 ohms.

3. 20*log($\sqrt{(w*z)}$/.775) = 28.2 dBu.

4. Amplifier gain is 30 dB (1V in equals 31.6 V out).

5. Set the COMPRESSOR THRESHOLD control to 28.2 dBu-30 dB = -1.8 dBu.

6. Set the RATIO control to 10:1.



General Description

A cure for compression confusion is here. Quit guessing and anguishing over proper compressor and gate settings. Get on with what is important, your work. Rane has created a compressor gate using high quality log rms detectors and Voltage Controlled Amplifiers (VCAs). The DC22S combines quality compression and gate functions with simplicity. No more compression headache!

Lets start with what a compressor actually does. No matter how you cut it, this is an automatic volume control... a hand on a control, turning it down and turning it up again. The hand is fast and accurate, but it is just turning a volume control.

When the input signal reaches a level set by the Threshold control, the compressor begins to turn the signal down by an amount determined by the Ratio control. The DC22S, like most compressors, operates by making the loud signals quieter, but does not make the quiet parts louder. However, by keeping the loud signals under control, the entire system may be turned up when necessary to make the quiet parts louder.

There is more than just a stereo compressor working here. The adjustable Gate is a downward expander, acting like a compressor running in reverse, making the quiet parts quieter. This is valuable in reducing system background noise. The Ratio is fixed at 2:1. When the signal drops below the set Threshold, the Gate Threshold indicator lights and the output level is reduced by 2 dB for every 1 dB the input signal level drops.

When using the DC22S as a true stereo processor with left and right signals, activate the Link switch. In Link mode, channel 1 becomes the Master and channel 2 the Slave. Gate Threshold, Compression Threshold, Compression Ratio and Output Level are all controlled by channel 1. This ensures that both channels track perfectly, maintaining perfect balance and image. The channels are totally independent with the Link switch off.

The DC22S offers performance and simplicity not found (until now) in this price range. Designed for the working musician or club system, The DC22S provides reduced complexity without compromise in audio quality or dependability.

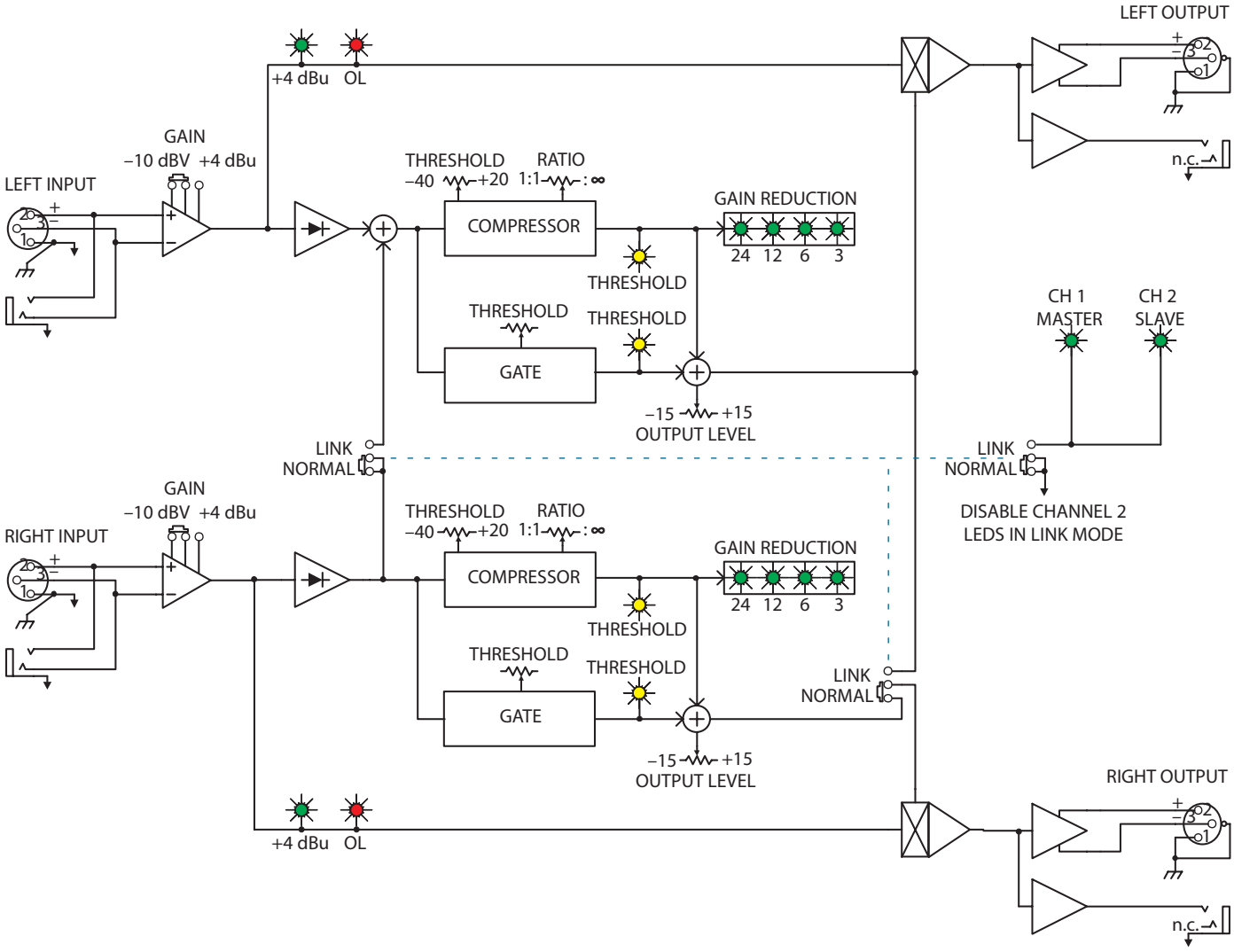
Features

- Two Independent Gates
- Two Independent Compressors
- Two Independent Output Level controls
- True Master / Slave operation in Link Mode
- -10 dBV / +4 dBu Input Sensitivity Switch
- +4 dBu and Overload Indicators
- Balanced XLR & ¼" TRS Connectors
- Internal Universal Power Supply (100-240 VAC)

Features and Specifications

Parameter	Specification	Limit	Units	Conditions/Comments
Gain	0 / +12	±0.2	dB	+4 dBu / -10 dBV sensitivity
Detector: Type	Log rms			
.....Response	80 dB per second			Fixed
Compressor:				
.....Threshold Range	+20 to -40	±2	dBu	
.....Ratio	1:1 to infinity:1	10%		
Gate:				
.....Threshold	-20 to -80	±2	dBu	
.....Ratio	2:1	10%		Fixed
Inputs:				
.....XLR	Active Balanced			Pin 2 “hot” per AES standards
.....¼" TRS	Active Balanced/Unbalanced			
.....Impedance	20k	1%	Ω	Common mode each leg to ground
.....Maximum Level	+22	1	dBu	
Outputs:				
.....XLR	Active Balanced			100 Ω impedance each leg
.....¼" TS	Active Unbalanced			300 Ω impedance
.....Maximum Level	+20	1	dBu	2k Ω
.....Gain Range	±15	±1.5	dB	
Frequency Response	20 Hz - 40 kHz	+0/-.5	dB	R load > 2 kHz
THD+Noise	0.02	typ.	%	1 kHz @ +4 dBu
.....vs Amplitude	0.05	max.	%	0 to +20 dBu @ 1 kHz
.....vs Frequency	0.02	max.	%	+4 dBu, 20 Hz to 20 kHz
Signal-to-Noise Ratio	100	typ.	dBr	Unity gain, re +4 dBu, 20 kHz BW
Common Mode Rejection Ratio	40	min.	dB	
Universal Line Voltage	100-240 VAC, 50/60 Hz		VAC	7W
Unit: Conformity	CE, FCC, cULus			
Unit: Construction	All Steel			
.....Size	1.75"H x 19"W x 5.3"D (1U)			(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)
Note: 0 dBu = 0.775 Vrms				

DC22S Block Diagram



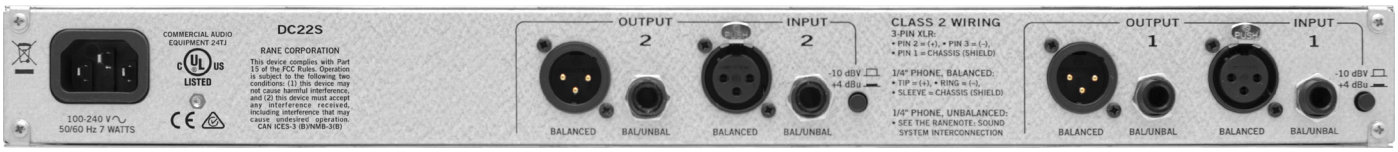
DC22S Applications

- Two-Channel Compressor/Limiter and Gate
- Guitar & Bass Compression with Gate
- Post Production Dynamics Control
- Sound System with Compression and Gate
- Driver Protection
- Long Distance Line Driver

Reference

For details on what the DC22S can do for your sound, see the RaneNote *Dynamics Processors — Technology & Application Tips* available at the Rane website.

Rear Panel



Architectural Specifications

The Dynamic Processor shall be a two-channel unit with separate Gate Threshold, Compression Threshold, Compression Ratio and Output Level controls. A Link switch shall provide true Master / Slave operation of Gate, Compression and Output Level functions. Gate and compression threshold indicators shall be provided. A four-segment meter shall indicate compression gain-reduction for each channel.

The Compressors shall provide a threshold range of +20 dBu to –40 dBu and a ratio range of 1:1 to ∞:1. The Gates shall operate with a threshold range of –20 dBu to –80 dBu with a fixed ratio of 2:1. The response time of the detector shall be 80 dB/second.

Each Input shall feature XLR and TRS connectors, active balanced input buffer, RFI filtering and –10 dBV / +4 dBu sensitivity switch. Input levels shall be monitored by +4 dBu and overload indicators. Each channel shall feature a bypass switch that disconnects the dynamics processing and connects the buffered input to the output amplifiers.

Each output shall feature XLR and TRS connectors, active balanced line drivers and RFI filtering.

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 entirely constructed from cold-rolled steel. The unit shall occupy one rack space in height.

The unit shall be a Rane Corporation Model DC22S.

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

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.

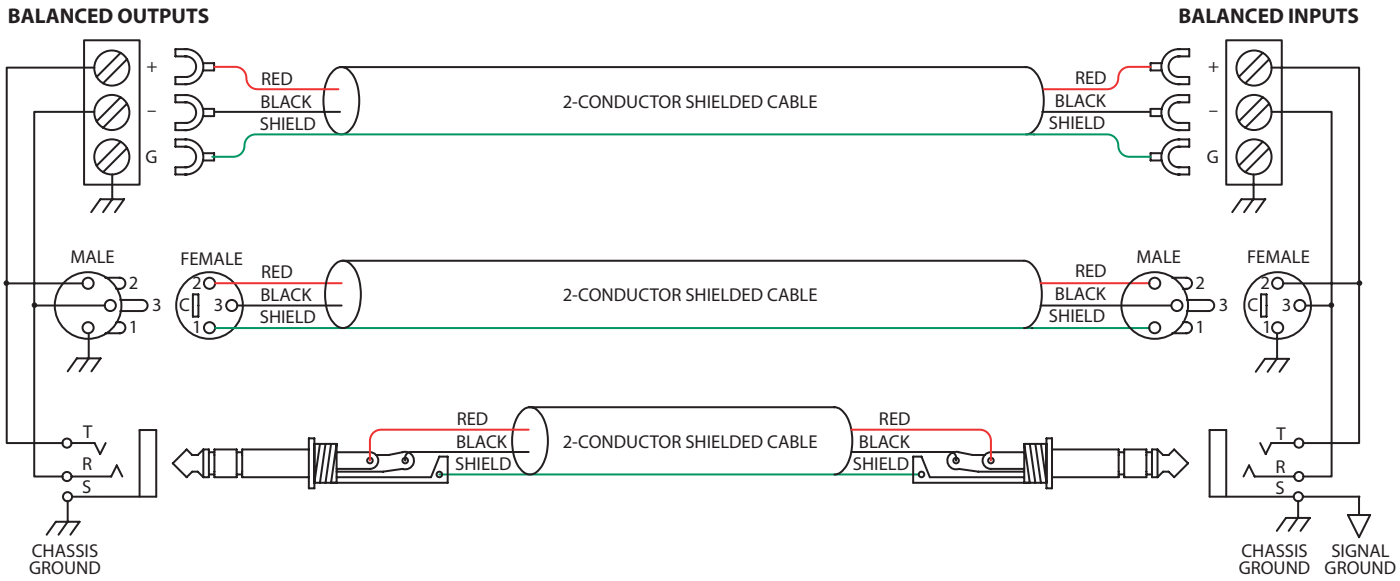


Figure 1a. The right way to do it.

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[1], 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[2]. 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.

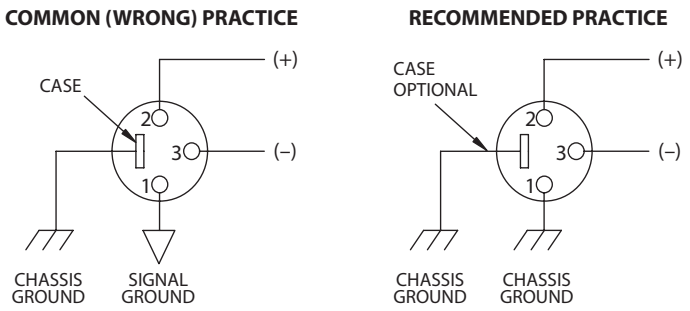


Figure 1b. Recommmended practice.

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 everwhere, easily available and inexpensive. All those RCA and ¼" 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.

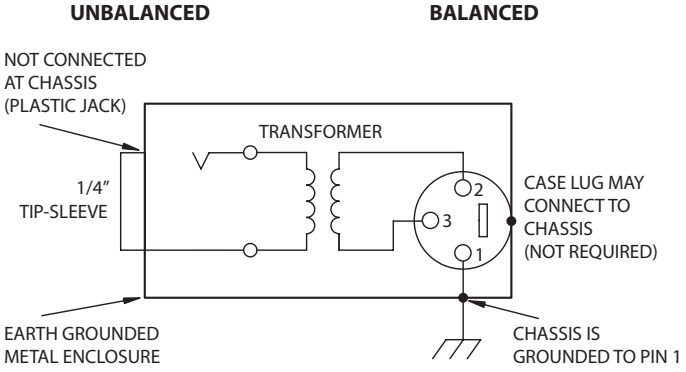


Figure 2. Transformer Isolation

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

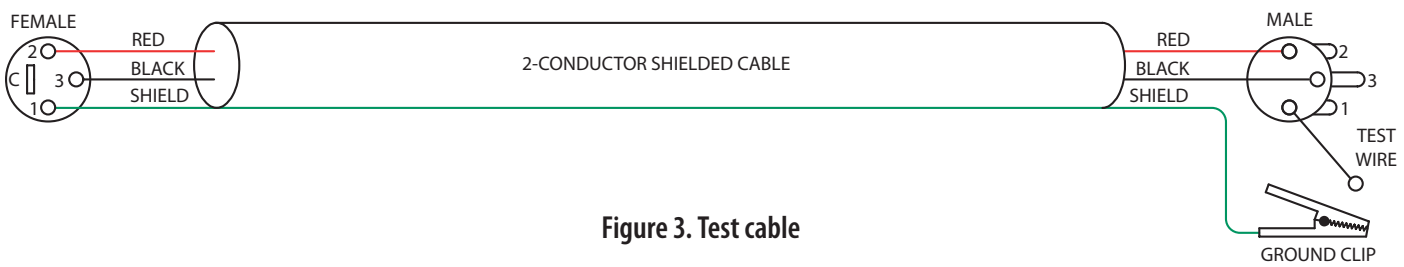


Figure 3. Test cable

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 psuedo-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).

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To Input

From Output

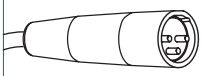
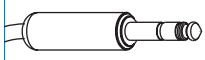
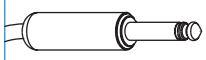
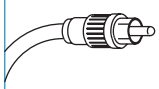
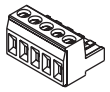
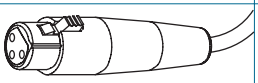
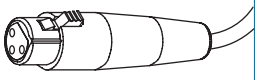
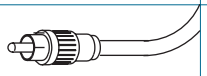
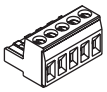
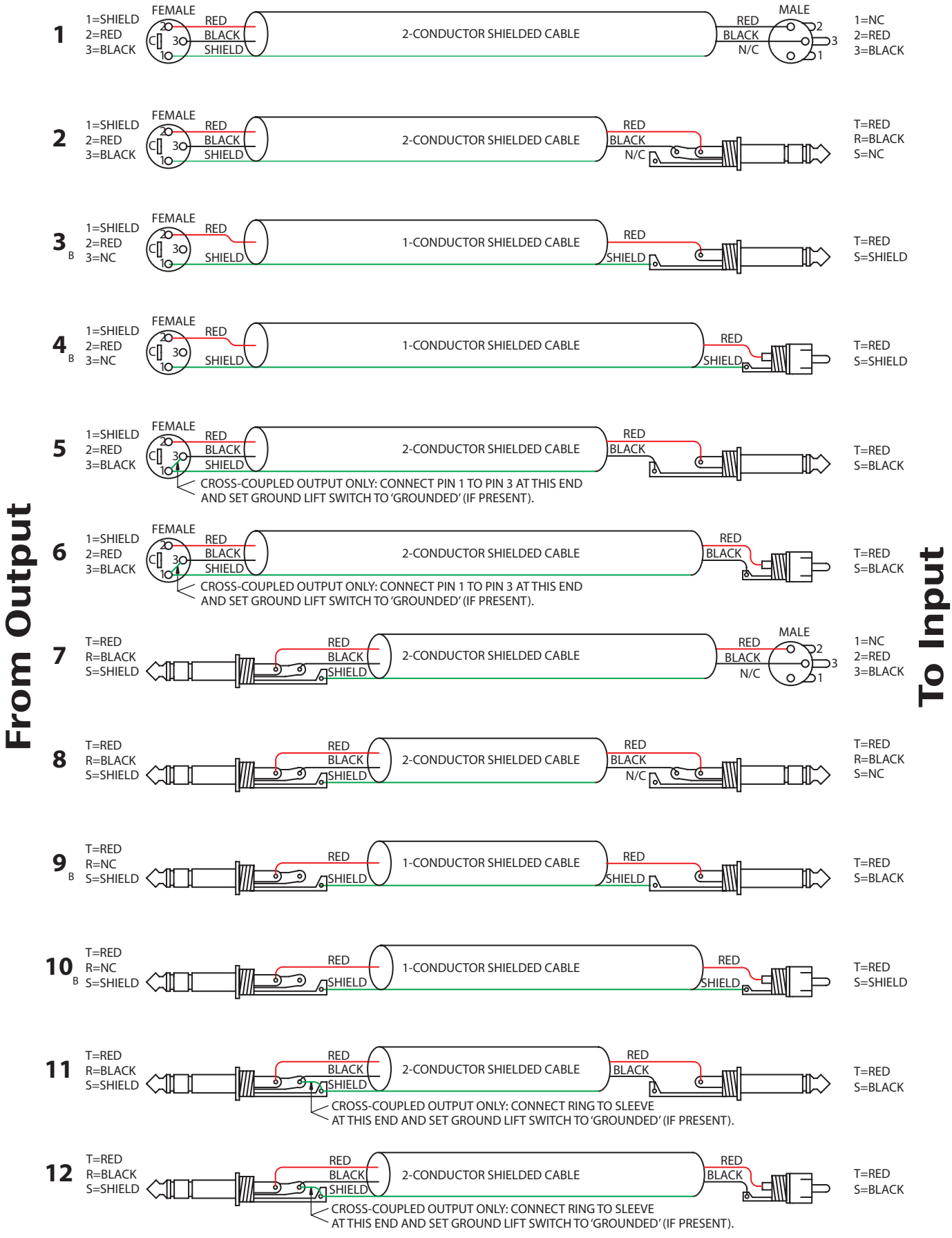
CABLE CONNECTORS	 MALE BALANCED XLR	 ¼" BALANCED TRS (TIP-RING-SLEEVE)	 ¼" OR 3.5mm UNBALANCED TS (TIP-SLEEVE)	 UNBALANCED RCA	 BALANCED EUROBLOCK
 FEMALE BALANCED XLR (NOT A TRANSFORMER, NOR A CROSS-COUPLED OUTPUT STAGE)	1	2	3 B	4 B	+ to + − to − SHIELD NC
 FEMALE BALANCED XLR (EITHER A TRANSFORMER OR A CROSS-COUPLED OUTPUT STAGE)	1	2	5	6	+ to + − to − SHIELD NC
 ¼" BALANCED TRS (NOT A TRANSFORMER, NOR A CROSS-COUPLED OUTPUT STAGE)	7	8	9 B	10 B	+ to + − to − SHIELD ONLY TO EUROBLOCK
 ¼" BALANCED TRS (EITHER A TRANSFORMER OR A CROSS-COUPLED OUTPUT STAGE)	7	8	11	12	+ to + − to − SHIELD NC
 ¼" FLOATING UNBALANCED TRS (TIP-RING-SLEEVE) (SLEEVE IN UNIT = NC)	21 A	22 A	11	12	+ to + − to − GROUND to GROUND
 ¼" 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

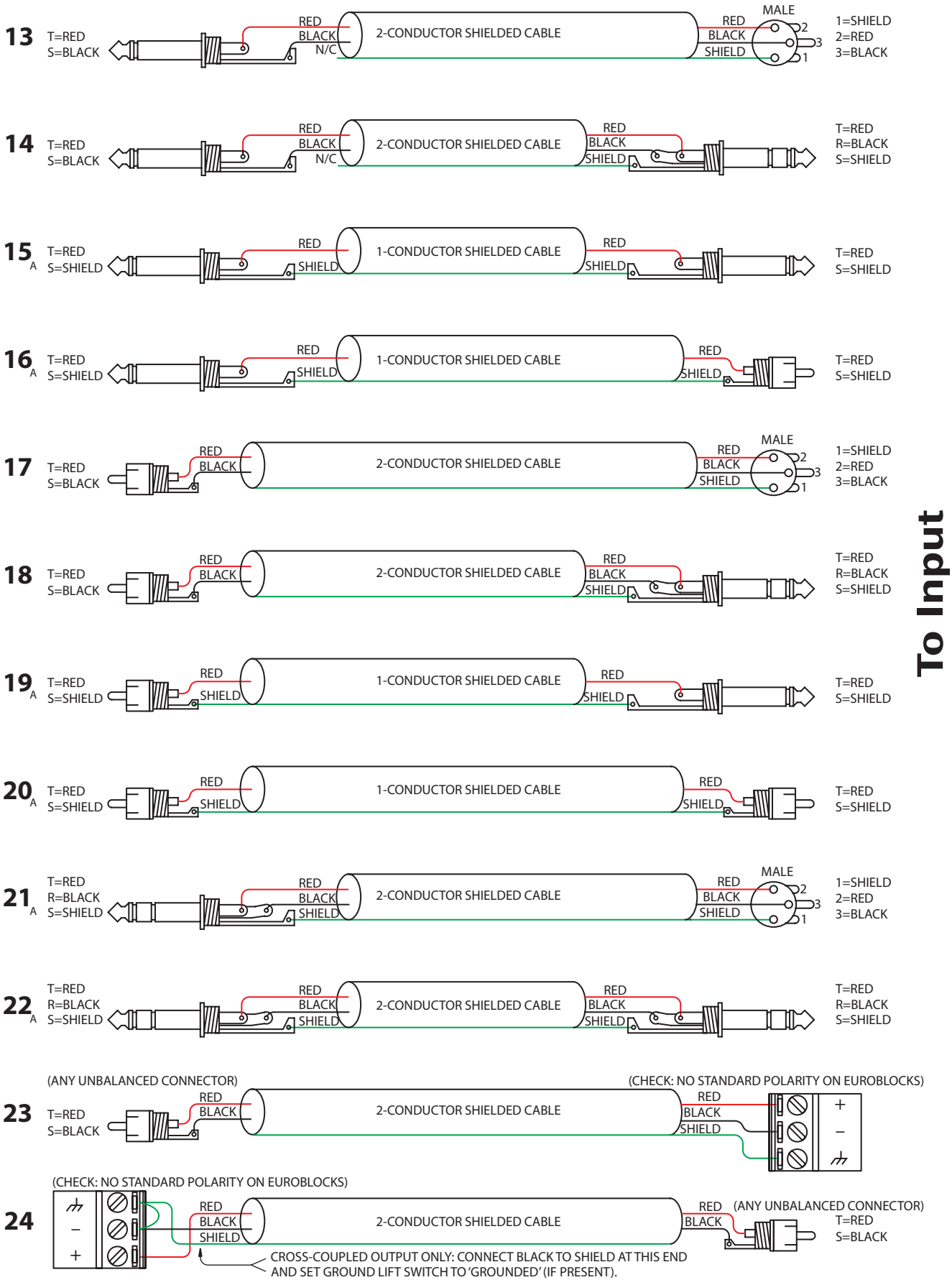
Figure 4. Interconnect chart for locating correct cable assemblies on the following pages.

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

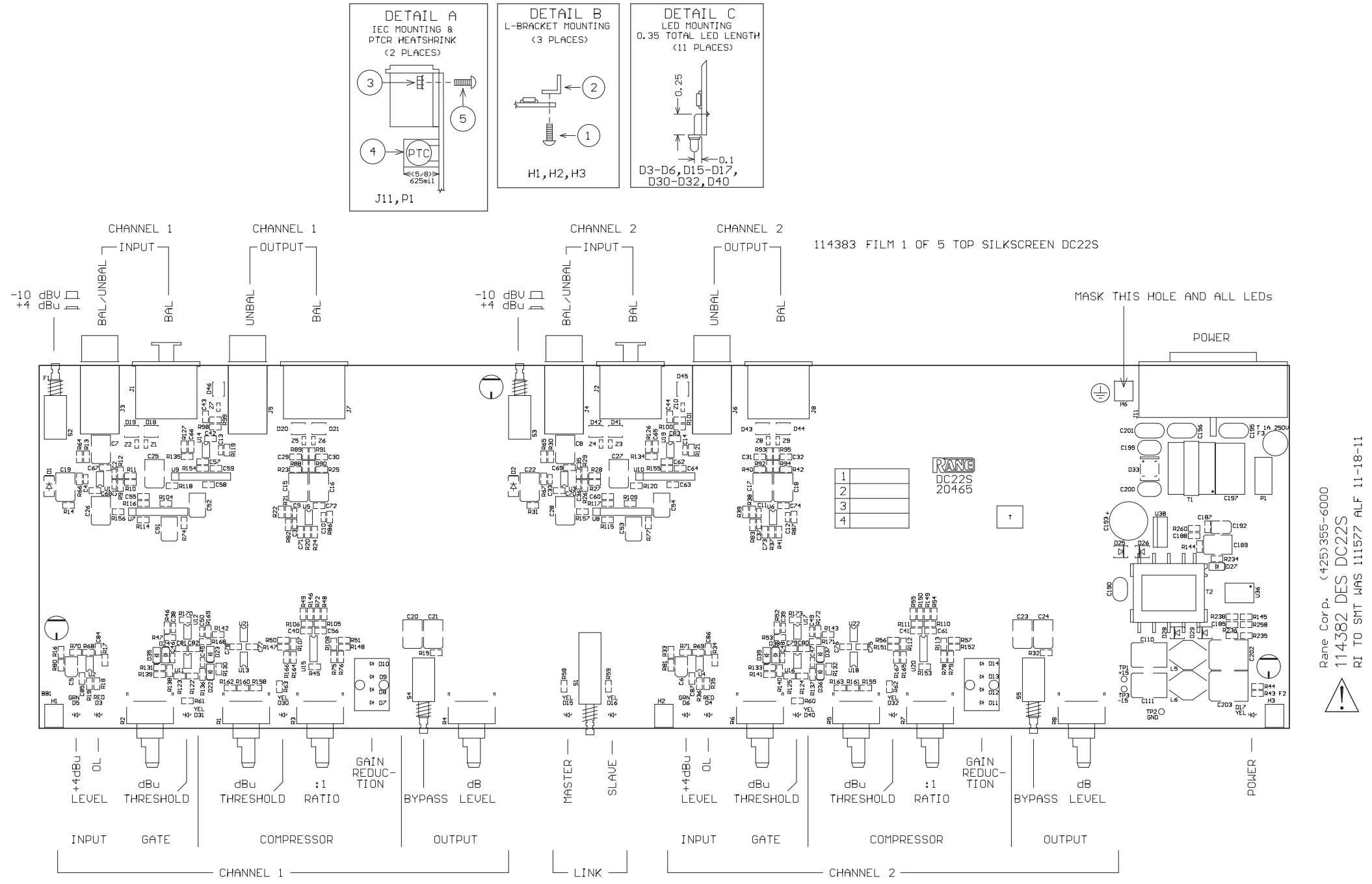
Note: (B) This configuration causes a 6 dB signal loss. Compensate by "turning the system up" 6 dB.


From Output
To Input
1
1=SHIELD
2=RED
3=BLACK
FEMALE
RED
BLACK
SHIELD
2-CONDUCTOR SHIELDED CABLE
RED
BLACK
N/C
MALE
1=NC
2=RED
3=BLACK
2
1=SHIELD
2=RED
3=BLACK
FEMALE
RED
BLACK
SHIELD
2-CONDUCTOR SHIELDED CABLE
RED
BLACK
N/C
T=RED
R=BLACK
S=NC
3 B
1=SHIELD
2=RED
3=NC
FEMALE
RED
SHIELD
1-CONDUCTOR SHIELDED CABLE
RED
SHIELD
T=RED
S=SHIELD
4 B
1=SHIELD
2=RED
3=NC
FEMALE
RED
SHIELD
1-CONDUCTOR SHIELDED CABLE
RED
SHIELD
T=RED
S=SHIELD
5
1=SHIELD
2=RED
3=BLACK
FEMALE
RED
BLACK
SHIELD
2-CONDUCTOR SHIELDED CABLE
RED
BLACK
T=RED
S=BLACK
CROSS-COUPLED OUTPUT ONLY: CONNECT PIN 1 TO PIN 3 AT THIS END
AND SET GROUND LIFT SWITCH TO 'GROUNDED' (IF PRESENT).
6
1=SHIELD
2=RED
3=BLACK
FEMALE
RED
BLACK
SHIELD
2-CONDUCTOR SHIELDED CABLE
RED
BLACK
T=RED
S=BLACK
CROSS-COUPLED OUTPUT ONLY: CONNECT PIN 1 TO PIN 3 AT THIS END
AND SET GROUND LIFT SWITCH TO 'GROUNDED' (IF PRESENT).
7
T=RED
R=BLACK
S=SHIELD
RED
BLACK
SHIELD
2-CONDUCTOR SHIELDED CABLE
RED
BLACK
N/C
MALE
1=NC
2=RED
3=BLACK
8
T=RED
R=BLACK
S=SHIELD
RED
BLACK
SHIELD
2-CONDUCTOR SHIELDED CABLE
RED
BLACK
N/C
T=RED
R=BLACK
S=NC
9 B
T=RED
R=NC
S=SHIELD
RED
SHIELD
1-CONDUCTOR SHIELDED CABLE
RED
SHIELD
T=RED
S=BLACK
10 B
T=RED
R=NC
S=SHIELD
RED
SHIELD
1-CONDUCTOR SHIELDED CABLE
RED
SHIELD
T=RED
S=SHIELD
11
T=RED
R=BLACK
S=SHIELD
RED
BLACK
SHIELD
2-CONDUCTOR SHIELDED CABLE
RED
BLACK
T=RED
S=BLACK
CROSS-COUPLED OUTPUT ONLY: CONNECT RING TO SLEEVE
AT THIS END AND SET GROUND LIFT SWITCH TO 'GROUNDED' (IF PRESENT).
12
T=RED
R=BLACK
S=SHIELD
RED
BLACK
SHIELD
2-CONDUCTOR SHIELDED CABLE
RED
BLACK
T=RED
S=BLACK
CROSS-COUPLED OUTPUT ONLY: CONNECT RING TO SLEEVE
AT THIS END AND SET GROUND LIFT SWITCH TO 'GROUNDED' (IF PRESENT).

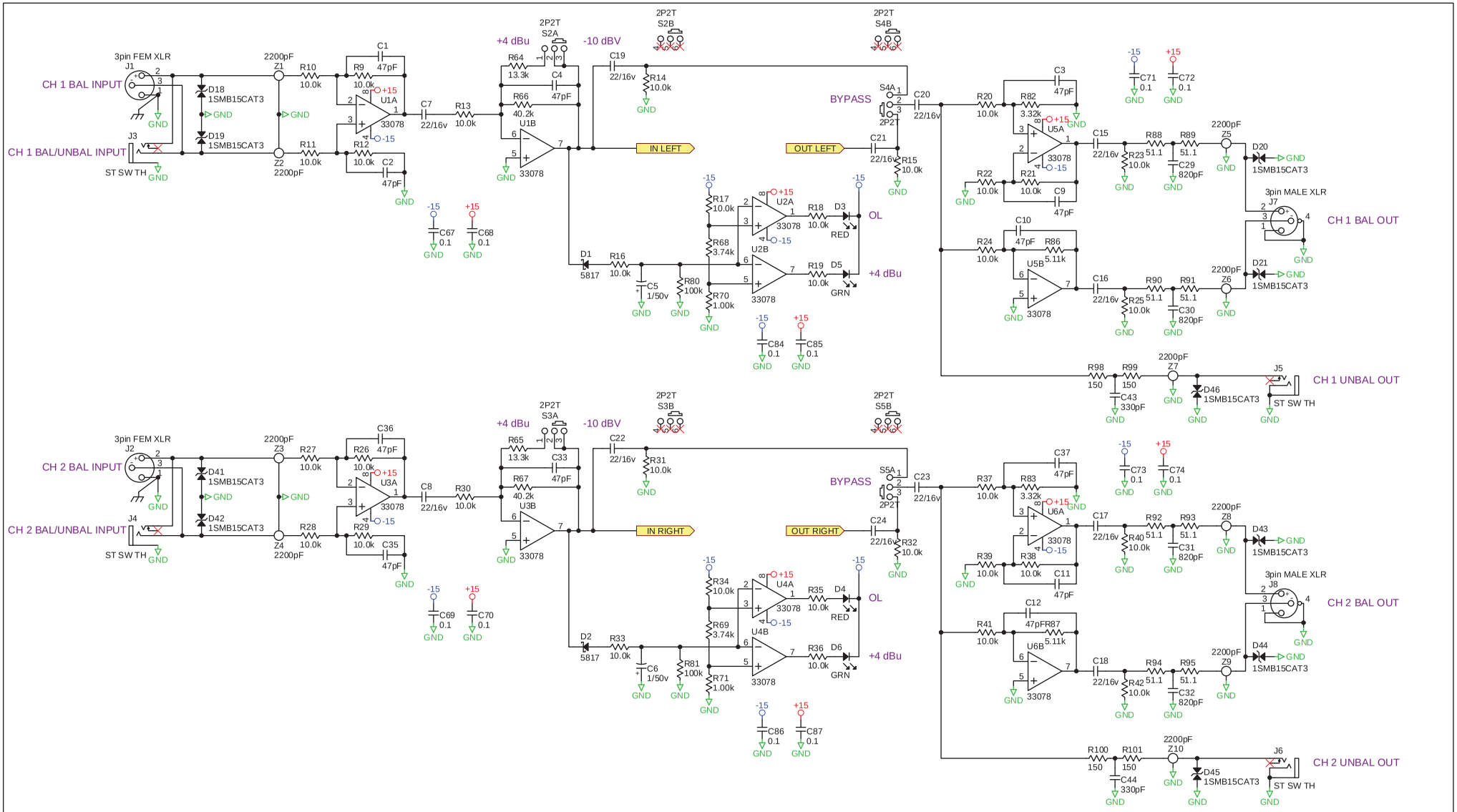
From Output



To Input



Rane Corp. (425)355-6000
114382 DES DC22S
RI TO SMT WAS 111577 ALF 11-18-11



11/17/2011
C:\CAD Projects\DC22S\DC22S-1.SCHDOC

Main

ACTION: RI TO SMT CONVERSION WAS 111576

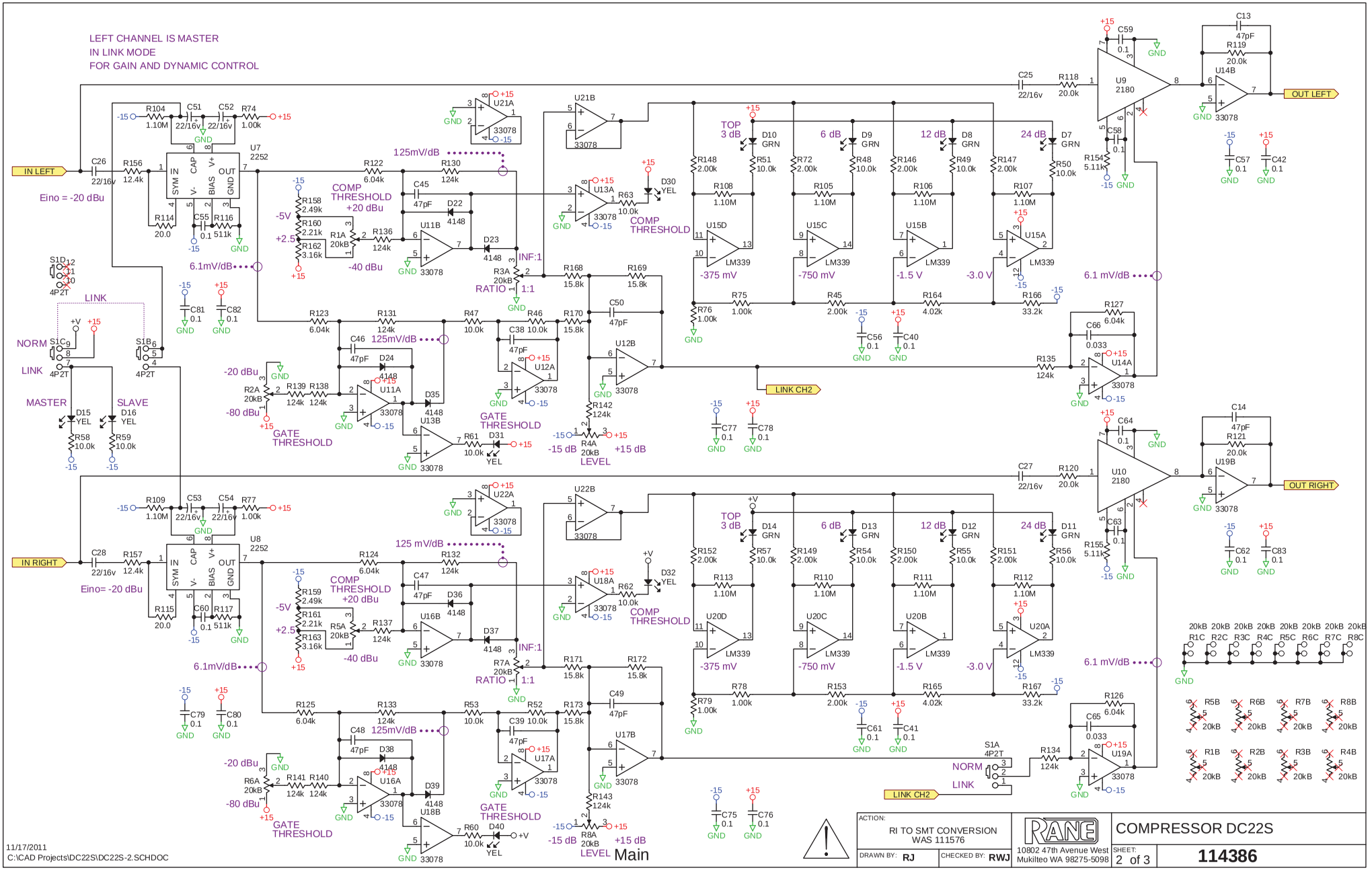
DRAWN BY: RJ | CHECKED BY: RWJ

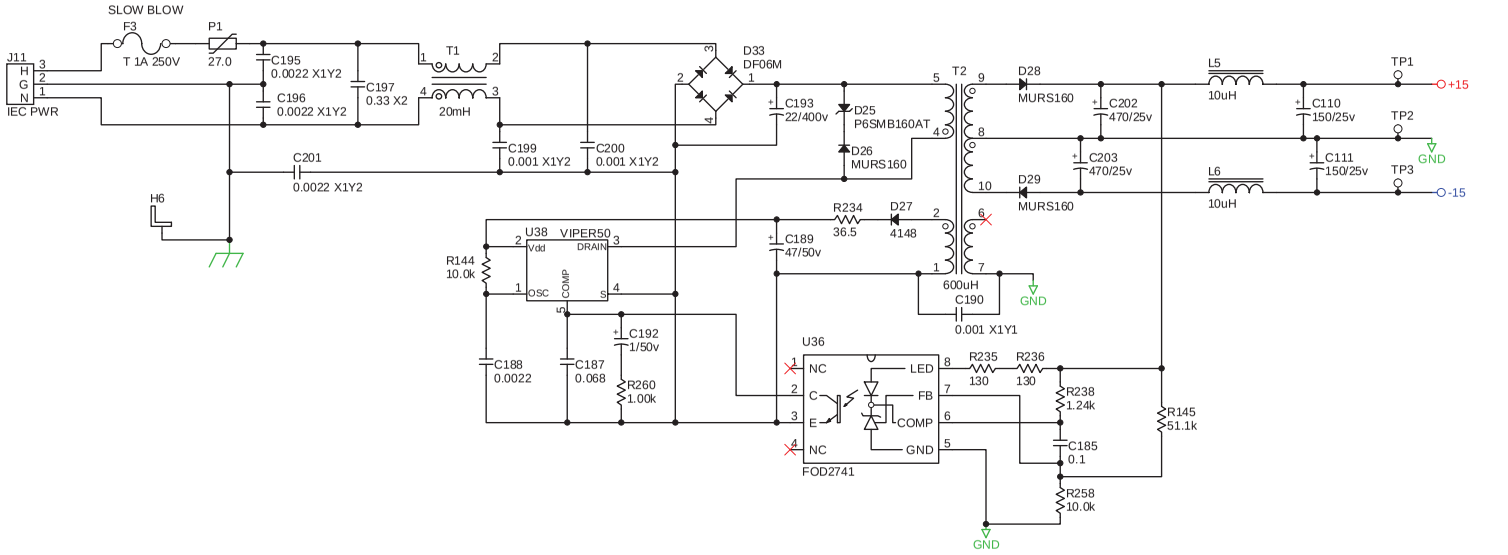
RANE
10802 47th Avenue West
Mukilteo WA 98275-5098

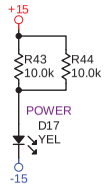
IN/OUT DC22S

SHEET: 1 of 3

114386


LEFT CHANNEL IS MASTER
IN LINK MODE
FOR GAIN AND DYNAMIC CONTROL
IN LEFT
Eino = -20 dBu
IN RIGHT
Eino= -20 dBu
LINK
NORM
MASTER
SLAVE
COMP THRESHOLD +20 dBu
GATE THRESHOLD
LEVEL
RATIO 1:1
INF:1
125mV/dB
125 mV/dB
6.1mV/dB
-40 dBu
-20 dBu
-80 dBu
-5V
+2.5
TOP 3 dB
6 dB
12 dB
24 dB
-375 mV
-750 mV
-1.5 V
-3.0 V
-15 dB
+15 dB
LINK CH2
OUT LEFT
OUT RIGHT
Main
ACTION:
RI TO SMT CONVERSION
WAS 111576
DRAWN BY: RJ
CHECKED BY: RWJ
RANE
10802 47th Avenue West
Mukilteo WA 98275-5098
COMPRESSOR DC22S
SHEET: 2 of 3
114386
11/17/2011
C:\CAD Projects\DC22S\DC22S-2.SCHDOC





11/17/2011
C:\CAD Projects\DC22S\DC22S-3.SCHDOC

Main

ACTION: RI TO SMT CONVERSION WAS 111576

DRAWN BY: RJ

CHECKED BY: RWJ

RANE
10802 47th Avenue West
Mukilteo WA 98275-5098

POWER SUPPLY DC22S

SHEET: 3 of 3

114386

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.

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* 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 2009
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 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: DC22S

Immunity Results:

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

Test Description	Specification	Conditions
RF Electromagnetic Fields Immunity		
80 MHz -1000 MHz, 1 kHz AM, 80% depth, 3V/m	< -80 dB	80 MHz - 120 MHz
	<-76 dB	120 MHz - 155 MHz
	<-70 dB	155 MHz - 421 MHz
	<-52 dB	421 MHz - 487 MHz
	<-64 dB	487 MHz - 736 MHz
	<-54 dB	736 MHz - 854 MHz
	<-75 dB	854 MHz - 1000 MHz
Conducted RF Disturbances Immunity		
150 kHz - 80 MHz, 1 kHz AM, 80% depth, 3V RMS	< -89 dB	Power Lines
	< -88 dB	Signal Lines
Magnetic Fields Immunity		
50 Hz - 10 kHz, 3.0 - 0.3 A/m	< -81 dB	
Common Mode Immunity:		Bandpass re: 4 dBu, 1/3-octave
50 Hz - 10 kHz, -20 dBu	< -78 dB	

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

(Signature)

Greg Frederick (Full Name)

Compliance Engineer (Position)

January 15, 2009 (Date)

Mukilteo WA, USA (Place)

DC22S

DYNAMICS CONTROLLER