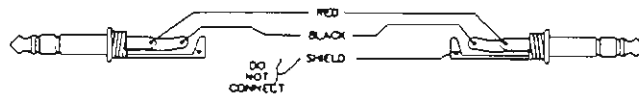
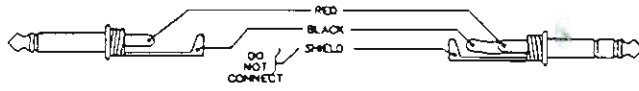


# WIRING DIAGRAMS

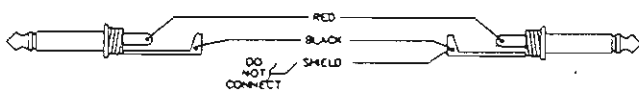
RANE 1/4" OUTPUT (TRS)      RANE 1/4" IN (BAL)



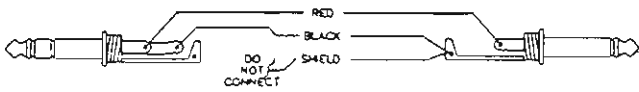
OTHER 1/4" OUT (TS)      RANE 1/4" IN (BAL)



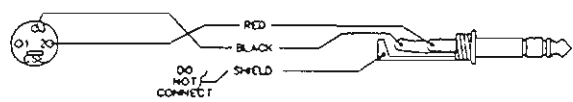
OTHER 1/4" OUT (TS)      OTHER 1/4" IN (TS)



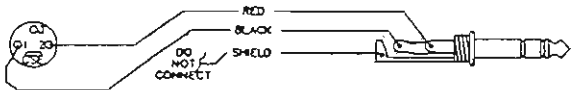
RANE 1/4" OUT (TRS)      OTHER 1/4" IN (TS)



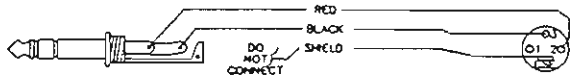
3-PIN BALANCED      RANE 1/4" IN (BAL)



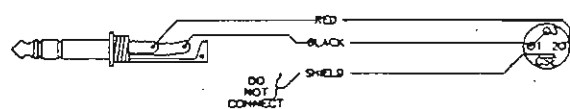
3-PIN UNBALANCED      RANE 1/4" IN (BAL)



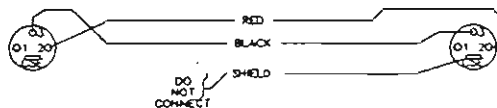
RANE 1/4" OUT      3-PIN BALANCED IN



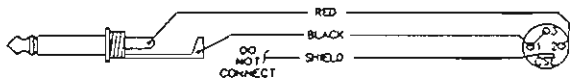
RANE 1/4" OUT      3-PIN UNBALANCED IN



RANE 3-PIN BALANCED      RANE 3-PIN BALANCED



OTHER UNBALANCED      RANE 3-PIN BALANCED



RANE EFFECTS LOOP STANDARD

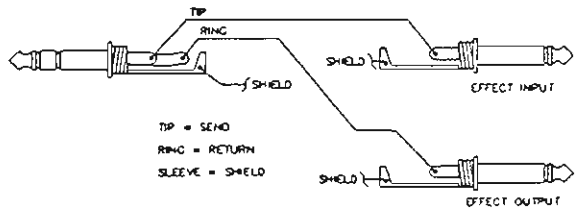


Figure 1. Interconnection wiring cable

## INTRODUCTION

There is nothing more disconcerting than connecting brand new, fresh out of the box equipment for which you have paid good money, turning it on for the first time and finding out that it hums, buzzes, whistles, groans, farts, etc. Ground lifts don't help, praying doesn't work, twisting the knobs make it worse, what will you do?

The best insurance policy available is proper interconnect procedures right from the very start. Many believe that only fully balanced ins and outs along with a garlic necklace and voodoo beads is the way to go. Not necessarily. Balanced lines certainly do have their place in society. They do a good job of preserving a clean signal over great distances and have the added benefit of rejecting noise induced in the lines. The majority of system noise, however, is not induced noise, rather it is caused by ground loops. Almost all cases of excessive noise can be traced directly to grounding or lack thereof.

## THE PROBLEM

It is important to understand the mechanism that causes grounding noise in order to be able to effectively eliminate it. Each component of a sound system produces its own ground internally. Connecting devices together with interconnect wires can tie the grounds of the two units together in one place through the ground in the cable. The problem of "ground looping" occurs when the grounds of these two units are also tied in another place: via the third wire in the line cord, by tying the chassis together through the rails in a rack, etc. These situations create a circuit through which current may flow in a closed "loop" from one unit's ground out to the second unit and back to the first. The potential or voltage which pushes the current through the circuit is developed between the independent grounds of the two or more units in the system. The impedances of this circuit are low, and even though the voltages are relatively low, currents will be high, thanks to Mr. Ohm, without whose help we wouldn't have this problem. (It would take a very high resolution ohm meter to measure the impedance of a steel chassis or a rack mounting rail. We're talking thousandths of ohms here.)

The diagrams on the back of this guide show numerous combinations of interconnects which may be required when using different types of equipment. Please read on before looking too closely at the diagrams. The descriptions which follow will assist you in gaining a good understanding of why the diagrams are as they are.

Wiring a balanced line requires the use of three conductors, two of which are signal (+ and -) and one shield. Signal ground should never be connected between two units in the balanced mode. Signal ground is not required to make the system work properly, and only raises the odds that hum and buzz will occur. Shield ground should only be connected on the receiving end to further minimize the possibility of noise generation. Following this procedure eliminates the possibility that grounding problems will destroy the advantages of balanced lines.

At RANE, chassis ground and signal ground are never the same. That is, they are never the same unless the interconnection wiring makes them the same. By separating these grounds, connecting units together through rack mounting won't cause problems, and third-wire grounds in AC line cords won't cause difficulties either. That's what this treatise is all about. We wish to make it clear that all of the sound products manufactured by RANE have been designed to make all of these silly little ground problems disappear. And they will disappear if the wiring allows the products to function as they were designed. Once this paper is fully read and digested, hum and buzz will be a long forgotten experience.

## INPUT WIRING

We should start out by wiring the input plugs. Without input there would be no output, and without output where would we be? The inputs are also the easiest, and most straightforward. Are you running balanced? If so, and you are driving the 1/4" TRS input on a RANE device, simply connect the positive signal line to the TIP of the plug, the negative signal line to the plug's RING, and the shield or drain wire of the incoming cable to the SLEEVE.

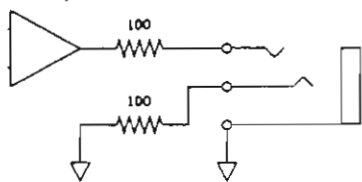
In unbalanced situations, always use shielded two conductor wire. Using a single conductor inside a shield mandates that all signal grounding and shielding must take place in the same wire. This is definitely a mistake. The only way to insure you will not have a problem is to keep these two paths isolated wherever possible. They are not the same ground. Connecting this cable to a RANE 1/4" TRS input is much the same as the balanced situation: connect signal to the TIP, signal ground from the preceding device to the RING, and shield ground to the SLEEVE. Shield ground should not be connected on the source end of the line. More about this in a minute. . . .

3-pin (Canon, XLR etc.) connectors may also be used in an unbalanced configuration, and the connection requirements remain the same. Rane follows the IEC 268 standard, which means signal goes to pin 2, signal ground to pins 1 & 3, and shield ground to case. Isn't this easy?

A 3-pin balanced input should be wired such that pin 2 is positive, pin 3 is negative, pin 1 is ground. If pin 1 on the device is signal ground, use the case connection for input shielding, which will be chassis ground. There is no sense in running the unit's signal ground all over the place as a shield since it could be induced with some sort of nastiness which may cause unnecessary buzzes and RFI problems.

#### OUTPUT WIRING

Now that we have input, lets get the output going so that we can see how quiet this is. The 1/4" output connectors on all Rane unbalanced products are 3 conductor, TRS types. The TIP is signal (through 100 ohms), the RING is signal ground (through 100 ohms), and the SLEEVE is tied directly to signal ground (see diagram below). What this creates is a sort of quasi-balanced output for noise rejection purposes. When used to drive a balanced input, it presents equal common-mode source impedances (100 ohms). This helps guarantee any common-mode noise is induced equally into each leg. The balanced input stage then rejects this common-mode noise.



RANE 1/4" UNBALANCED  
OUTPUT STANDARD

As with the input cable, the output cable must be two conductor with shield, and only three conductor (TRS, stereo, etc.) plugs should be used. Connect the TIP to the signal line, the RING to the signal ground line, and leave the SLEEVE unconnected. At the receiving end, if you are driving an unbalanced input, and the receiver happens to be another Rane product, configure the plug exactly the same as the output plug at the other end of the line. If you are driving a piece of equipment that is unbalanced only, chances are that it has a two conductor connector on its input. If this is the case, connect the signal line to the appropriate pin, and tie the signal ground line and the shield ground line together inside the plug.

Should you wish to terminate this cable with a 3-pin connector, and the piece of equipment is not of Rane manufacture, consult the manual for that product concerning the exact pin-out of the input jack. Not everyone has the good sense to follow the IEC standard which creates a great deal of confusion. (Some folks use pin 3 as hot (+) pin 2 as common or (-)). This confusion will slowly decay over the next few years as more designers give up their old ways of doing things, but until then, consult the packing material (usually marked "Owners Manual") for the details.

When wiring up the cable to connect the output of a Rane product employing a 3-pin connector, and your wish to drive the line in a balanced mode, connect the signal positive output to pin 2, the signal negative to pin 3, and signal ground to pin 1. Shield ground should not be connected to the case of the connector at this end. At the other end, follow the wiring directions supplied by the manufacturer of the device and be sure to connect the shield to ground.

Once the preceding has been properly accomplished, hum caused by circulating ground currents will become a thing of the past. In the extremely rare case where hum and buzz is still a problem, the chances are good that the wiring is not the problem. Enlist the aid of a second pair of eyes to look at the problem if you can find no solution, or call us at the factory and we will try to help.