

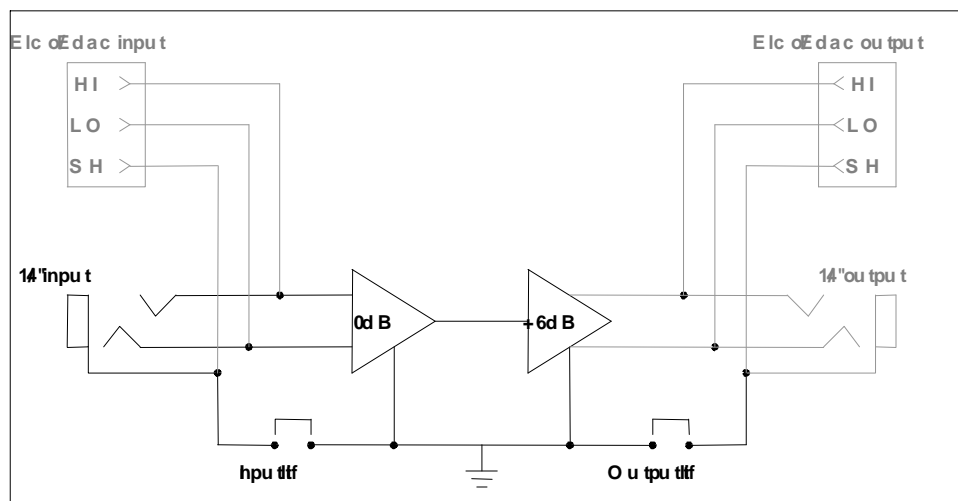
## Tech Notes

### Background

One of the most common problems we encounter when installing Midi Synthesizers is buzz and hum. This occurs even in the best of installations because engineers want to fade up all of their synth voices in the mix simultaneously -- a practice which adds tremendously to the "noise gain" of the system. No matter how hard you try to eliminate hum and buzz voltages in your power and grounding system, there will always be something left. When 48 channels are mixed at unity gain, the noise (hum and buzz) is amplified by more than 30 dB!

People have "cheated" in various ways to try and eliminate this problem. For example, you can throw half of the open channels out of phase, in the hope of canceling the hum. Trouble with this is that each channel has a slightly different frequency content, and it is impossible to get a good null, and of course whenever you adjust the mix level the hum null also drifts. There is also the old standby, the 3-to-2 wire power adapter. By disconnecting the third wire ground to equipment, and providing a ground reference via the signal wire, the problem is sometimes relieved. However it often shows up again in another part of the chain. Furthermore this is a dangerous electrical safety violation and we cannot condone it.

After years of fighting this we finally gave up and designed a solution which corrects the problem at its root. Most professional audio consoles have balanced inputs. However most synthesizers have unbalanced outputs. An unbalanced - to - balanced connection provides some rejection of noise voltages (CMR), but only a balanced - to



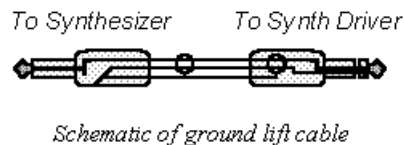
One channel block diagram (configurable components in grey)

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- balanced connection provides the 60 to 90 dB of rejection necessary. What the Signal Transport Synth Driver does is simply to provide balancing for each synth output. But it goes one step further: it provides a balanced input also so that the ground loop which may exist in the short path between the synths and the Synth Driver itself is broken. In other words, we provide an unbalanced - to - balanced connection between the synth and the Synth Driver, and then a Balanced - to Balanced connection from the Synth Driver to the console.

## Installation -- fixed or rack setups

Synth Driver balancing amplifiers are best installed in the rear of synthesizer racks where voice modules can be plugged into Synth Driver inputs with short jumper cables. Each 1/4" input jack is a fully balanced input, with TRS connectors carrying high on the tip, low on the ring, and shield on the sleeve through the internal shield jumper. Input shields are factory set for lifted (shield disconnected) so that the input can "forward reference" from unbalanced sources. This means that if you plug an unbalanced input into the Synth Driver using a standard unbalanced phone plug jumper, the balanced input of the Synth Driver will "break the ground loop" which would exist between the synthesizer, the Synth Driver, and all other synths in the rack.



For the factory setting to work properly, all synthesizers or other gear plugged into the Synth Driver MUST BE GROUNDED. In most rack mount installations this can be done via the rack rail, third wire on the power cord, or if there is not a ground to the gear, by a separate ground wire. If you plug in keyboards or other gear with 2-conductor power cords, the system is guaranteed to buzz as there is no common reference for the signal.

## Installation -- portable or "transient"

When the Synth Driver is to be used for portable or "transient" equipment which may be brought into the studio and plugged in from time to time it may be inconvenient to need an extra ground wire. In fact the perception may be that the hum problem is exaggerated by the Synth Driver. We recommend that in this case you set up the internal jumpers for input shield connected. In this configuration you may find that large setups still hum due to ground loops between synths and the input of the Synth Driver. Remember that if you have the input shield jumper connected, and you plug in with an unbalanced cord, you are defeating the input balancing circuits and for all intents and purposes the unit now has an unbalanced input. This can be avoided by the simple expedient of keeping a supply of 1/4 unbalanced to balanced adapters with the shield lifted on the balanced end. This

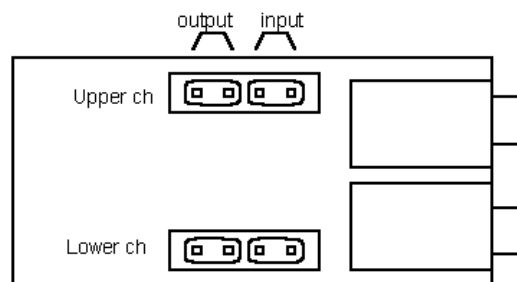
then gives you the option of selecting input grounding by choosing cables without necessitating a removal of the top.

Occasionally you will run into equipment with balanced outputs! In this case we recommend that you maintain the balancing from the Synth to the Synth driver by using a balanced jumper cable. Be aware that the Synth Driver puts 6dB of gain on the signal, and with particularly hot equipment this may lead to clipping the output driver.

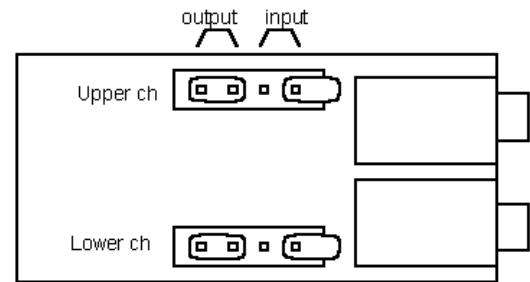
By keeping the input cable lengths short, and the Synth Driver on the same ground reference as the synthesizers (plug it into the same power strip!) the hum and buzz will disappear beneath the noise floor under all conditions. The balanced output of the Synth Driver is low impedance and robust and can be run any distance over multipair cable and through patch bays, without signal degradation.

## Setting Shield jumpers

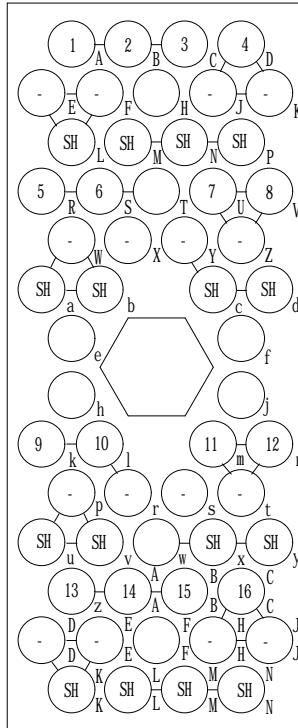
To change the factory settings, remove the cover and look at the printed circuit card on each channel pair. You will need a long, needle nose pliers to move the jumpers. The input jumper is shipped hanging onto only the end pin. To connect the input shield you must move this jumper over one pin, and place it over the first two pins as shown below.



WITH INPUT SHIELD CONNECTED



SYNTH DRIVER CARD AS FACTORY SHIPPED



WIRING SIDE VIEW  
 SEQUENTIAL 16 PAIR  
 CONNECTOR DETAIL 5109  
 LCO 56 PLUG WITH ACTUATING SCRE