

# Grove Hill Audio - LIVERPOOL

## *OPERATING INSTRUCTIONS TUBE COMPRESSOR*



***Rev. 3.0***

## Contents

<b>Section</b>	<b>Page</b>
INTRODUCTION	3
MAINS CONNECTIONS / INSTALLATION	6
FRONT PANEL / OPERATIONAL NOTES	8
TECHNICAL NOTES	14
SERVICE ADJUSTMENTS	16
SPECIFICATIONS	17
TUBE SUBSTITUTIONS	18
WARRANTY AND SERVICE	19
WARRANTY REGISTRATION	21

## **Introduction**

**THANK YOU** for choosing the Grove Hill Audio Mono, Tube, Compressor. Please take a few moments to read through this manual, there may be features and information about this unit that are unfamiliar to you.

Thank you again, and enjoy!

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## **Introduction** (continued)

The LIVERPOOL is an all-tube feedback style compressor. The Mu tube design was made famous by its use on the early rock and roll albums recorded during the early 60's in England. The LIVERPOOL is based upon an American commercial sound compressor. With minor electronic changes and the addition of key performance features, the LIVERPOOL is a compressor that is smooth and creamy but most importantly reliable.

The Grove Hill PCB, with its excellent transformer design and component layout, has been used to make a compressor which improved upon the original audio circuit with added features that make LIVERPOOL usable on many types of program sources from vocals, drums and bass to mastering.

The heart of LIVERPOOL is the dual triode remote cut-off Mu tube. This is the gain reduction tube. This tube is re-biased by the 6AL5 vacuum tube rectified side-chain control voltage which causes the Mu tube to smoothly change its mutual conductance or amplification. The faithfully recreated solid state power supply provides low noise and stability even at 30dB of gain reduction.

## **GENERAL NOTES**

### **LOCATION & VENTILATION**

The Compressor unit must be installed in a stable location with ample ventilation. It is recommended, if this unit is rack mounted, that you allow enough clearance on the top and bottom of the unit so that there is a constant movement of air that can flow around the ventilation unit. There are 3 tubes inside this unit so it does run hot. Good ventilation is encouraged to promote long life of the internal components and consistent performance.

### **WATER & MOISTURE**

This unit should not be used near water or moisture.

### **SPECIAL NOTES**

Even though the tubes have metal shields around them, tubes may become loose during transit. Straighten and press down each tube before you plug the unit into the mains socket. Do not touch the tubes after the unit has been switched on, as the tubes become very hot during operation and should be handled after the power has been turned off and the tubes are cool.

### **WARNING!**

**TO PREVENT THE RISK OF ELECTRIC SHOCK, DO NOT OPEN THE CHASSIS.**

**REFER SERVICING ONLY TO QUALIFIED PERSONNEL.**

## **MAINS CONNECTIONS**

Your unit has been factory set to 115 Volts AC to comply with United States standards. There is a selector switch to set the unit for the correct mains voltage for your country. The voltage settings are either 115 VAC or 230 VAC at 50-60Hz. This selector switch is located on the rear panel, above the standard IEC mains cable. The fuse is also located within the same assembly and should be changed if the voltage is changed to 230 VAC.

## **INSTALLATION**

1. Set the voltage change-over switch on the back of the unit to the voltage you are using. Units are shipped set for U.S.A. standard voltage.
2. Be certain that the correct fuse is installed.
3. Connect the input signal to the 3 pin female XLR on the rear panel. The input XLR are balanced and wired as follows:

*PIN 1: GROUND*

*PIN 2: (+) POSITIVE GOING PHASE*

*PIN 3: (-) NEGATIVE GOING PHASE*

**The input impedance is 15,000 Ohms.**

4. Connect a 3 pin XLR cable to the male output XLR on the rear panel. The output XLR is balanced and the pinout is wired as follows:

*PIN 1: GROUND*

*PIN 2: (+) POSITIVE GOING PHASE*

*PIN 3: (-) NEGATIVE GOING PHASE*

**The output impedance is 600 Ohms.**

5. Check that the power is switched off on the unit.

6. Connect a standard IEC mains cable to the IEC mains socket on the rear panel.

7. Connect the IEC mains cable to a 50/60 Hz AC source of the proper selected voltage.

8. Power up the unit and allow approximately 15-30 minutes for the unit to stabilize before using.

9. There is a LINK connector on the rear panel. This is used to connect two units for stereo operation. Set all controls on both units exactly the same. Connection is made by a standard, mono, Tip-Sleeve cable.

## FRONT PANEL / OPERATIONAL NOTES



### Operation and Use of Controls

The LIVERPOOL compressor has nine controls. Seven mounted on the front panel, two located inside the chassis.

1. Input gain control
2. Threshold control
3. Attack control
4. Recovery control
5. Output attenuator
6. Mains Power switch
7. Cathode balance trim
8. Anode balance trim
9. GR zero trim



## **1. Input Gain Control:**

The input control has a dual function. This control is used to adjust the input level and to provide the desired average compression as indicated on the compression meter. The input control on the LIVERPOOL is located ahead of the tubes and directly after the input transformer. So as you advance the input control, you're hitting the input tube, which is the gain reduction stage, with more and more signal. The signal is then amplified by the second stage. The control signal is taken from the output of the second stage then rectified into a negative control voltage (CV). Gain reduction is done by making the DC bias on the first stage tube more negative. So as the input is increased so does the CV and therefore the amount of compression. The onset of compression is determined by the threshold and how far the input control is advanced. The input tube has a limit as to how far it can be biased negative to reduce gain before it goes non-linear, and since your audio signal is obviously swinging both positive and negative, the big swings of the audio signal plus the negative gain control voltage will eventually push the tube into cut off. The limiting characteristics shouldn't change much, but the distortion characteristics will. Distortion can be creatively used by turning up the Input and turning down the Output while using very little or no compression.

## **2. Threshold Control:**

The threshold control determines how much compression takes place and the output level at which compression commences. The threshold also adjusts the ratio.

## **3. Attack Control:**

The attack controls how much of the signal transient is allowed through before compression starts. There are 6 different speeds labelled 1 (Fast) to 6 (Slow) with every second selection, labeled 'C', turning off the compression action. In these positions, the unit can be used as a line amplifier.

### Attack times

- 1 – 3 milliseconds
- 2 – 19 milliseconds
- 3 – 48 milliseconds
- 4 – 77 milliseconds
- 5 – 109 milliseconds
- 6 – 138 milliseconds

## **4. Recovery Control:**

The recovery control determines how quickly the signal rebounds after the input signal has fallen below the threshold. There are six Recovery positions labelled 1 (Fast) to 6 (Slow) with every second selection turning on the 'H' HOLD function.

## Recovery times

- 1 – 127 milliseconds
- 2 – 447 milliseconds
- 3 – 917 milliseconds
- 4 – 1.9 seconds
- 5 – 3.4 second
- 6 – 6 seconds

The Hold function is a unique feature of the compressor. It was added as a modification on the original compressor in response to two scenarios faced by engineers when large amounts of gain reduction are being applied:

1. When trying to process the initial attack of an audio track, the slow attack of the compressor will cause an audible thump to be produced. The Hold control would be used in these cases to “prime” the compressor with the required amount of gain reduction and prevent the thump from occurring. This was done by playing a track into the compressor, setting the controls as required and then moving the Recovery control to one of the adjacent Hold positions. This would prevent the compressor release taking place and maintain the amount of gain reduction.

The track can then be stopped, moved back to the beginning of the track and playback started again. Once the initial attack of the first note has been processed, the compressor can be switched out of Hold and put back to the desired Recovery setting.

**2.** If the unit is compressing a track with room ambience, the ambient noise from the recording would swell up in volume at the end of the performance as the gain reduction returned from the compressed level to zero. This can be avoided by switching the Recovery control to an adjacent Hold position after the last note has finished, which would stop the compressor release from taking place.

### **5. Output Attenuator:**

The output attenuator is a six position rotary switch. This method of attenuation allows for constant impedance on the output transformer as well as the load. The attenuator gives you output gain control of your signal output into the next device in the chain. The selections are: 0dB, 5 dB, 10dB, 15dB, 20dB and 30dB of precise output signal attenuation.

### **6. Mains Power Switch**

The power switch is used to turn the compressor on or off.

## **7. Cathode Balance**

The cathode balance pot is used to balance the cathodes of the Mu tube. This helps to reduce thumps and instability. To adjust the cathode balance turn the pot fully CW and then fully CCW then to the middle position. Connect the negative lead of a digital multi meter to ground and the other one to test pin 3 of the tube socket and note the voltage, then measure the voltage at test pin 8 of the same socket. Adjust the pot until the voltage at pin 3 and 8 are equal. You should not have to perform this calibration again unless this tube is changed.

## **8. Anode Balance**

The anode balance pot is used to balance the anodes of the Mu tube. This helps to reduce thumps and instability. To adjust the anodes balance turn the pot fully CW and then fully CCW and then to the middle position. Connect the negative lead of a digital multi meter to ground and the other one to test pin 1 of the 6BC8 tube socket and note the voltage, then measure the voltage at test pin 6 of the same socket. Adjust the pot until the voltage at pin 1 and 6 are equal. You should not have to perform this calibration again unless the tube is changed.

## **9. G.R. Zero Adjust**

The GR zero is used to adjust the meter to show zero gain reduction when the unit is at rest. Allow the unit to warm up for 15 - 20 minutes, and then adjust the pot until the meter reads zero. This adjustment need only be done when replacing the Mu tube.

## **TECHNICAL NOTES**

### **SWITCHING ON**

The power switch is located on the right side of the front panel. Flip the switch up to turn on the LIVERPOOL compressor and down to turn it off. Do not operate this switch up and down rapidly, as it may cause damage.

### **TUBE LIFE**

As with all tubes, their quality degrades with age. This is due to cathode emission, a natural process found in all tubes. We recommend that you have your unit checked every 4-5 years, depending on usage. One symptom of failing tubes is increased noise floor and performance changes.

### **NOTE**

Allow the LIVERPOOL to warm up before operating. This unit employs high voltage tubes and reaches optimum operation within approximately twenty minutes. Any adjustments such as meter calibration should be performed when the unit had time to warm up to operating temperature.

### **OPERATION**

The principle of operation of this unit is based around a Mu tube, an all glass miniature VHF dual triode, remote cut-off tube. This is the gain reduction tube. This tube is re-biased by the 6AL5 vacuum tube rectified side-chain control voltage which causes the Mu tube to smoothly change its mutual conductance. The benefits of utilizing a variable mutual conductance vacuum tube as the 'heart' of the compression function is that a widely varying range of input signals can be handled quickly without introducing harmonic distortion.

As with all compressors there will be little change of gain reduction with various settings of ATTACK and RECOVERY controls using a sine wave source. With music there will be changes in the amount of gain reduction with changes of these controls.

## **HUM**

This unit is meant to use the third pin of the mains as the ground reference. The GROUND TERMINAL is one method to reduce hum. Verify that the terminal is connected with the ground strap or that the hum is less with the strap off of the terminal. If that does not work, try a three pin to two pin AC adapter for the AC plug.

The most common problem is the input/output cabling. Transformer isolated balanced inputs and outputs are most immune to ground problems. These balanced inputs and outputs will interface to unbalanced inputs and outputs automatically. This is a prime benefit with transformers.

Alternative ground schemes are common in studios. The two most used are cutting shields at either inputs or outputs to prevent ground loops and star grounding style. This method does not use any AC grounds but supplies a separate ground wire from a central ground to each piece of gear.

CHASSIS GROUND may be connected to the rack rails or not. Always try to use pro gear that is designed to drive 600 ohms for this unit.

Another source of hum can be equipment mounted on top of one another. This is not a good for hum or ventilation and should be avoided.

## **SERVICE ADJUSTMENTS**

The internal chassis has high voltage present which can cause harm or even death.

Do not attempt to make these service adjustments.

Have a qualified technician perform these tasks.

These are factory presets and need only be altered after a re-tube or if a change in performance is suspected.

1. Cathode Balance – Refer to item number 7 in the “Operation and Use of Controls” section.
2. Anode Balance - Refer to item number 8 in the “Operation and Use of Controls” section.
3. Gain Reduction Zero Adjust - Refer to item number 9 in the “Operation and Use of Controls” section.



## ***Specifications:***

Type:	<i>Tube Compressor Amplifier</i>
Frequency Response:	<i>+/- 1.5dB, 10 Hz to 40,000Hz</i>
Frequency Response (vintage):	<i>+/- 1.5dB, 300 Hz to 15,000Hz</i>
Power Output:	<i>+20 dBm</i>
Total Harmonic Distortion:	<i>0.08% at 1 KHz with output at 0dB</i>
Noise Level:	<i>82 dBu below rated output</i>
Source Impedance:	<i>Any up to 15,000 Ohms</i>
Load Impedance:	<i>600 Ohms</i>
Attenuation:	<i>30 dB in 5 dB steps - Constant impedance.</i>
Maximum Compression:	<i>30dB</i>
Attack Times (*msec):	<i>3*, 19*, 48*, 77*, 109*, 138*.</i>
Recovery Times (*msec):	<i>127*, 447*, 917*, 1.9 sec., 3.4 sec., 6 sec.</i>
Threshold:	<i>0dBm to +16dBm Output</i>
Compression Ratios:	<i>2:1 at 0dBm Threshold, 4:1 at +16dBm Threshold</i>
Tube Complement:	<i>6BC8/6BZ8 or approved equivalent, 6CG7, 6AL5</i>

***Specifications are subject to change without notice.***

### ***Tube Substitution\*:***

The following tubes can be substituted by a qualified technician.

The 6BC8 can be substituted with a 6BC8, 6BZ8, ECC189, 6N1-P or PCC189.

The 6AL5 can be substituted with an EAA901S, D77, EB91, 5726 or 6058.

Substitution of the 6CG7 is not recommended.

**\*Although substitute tubes will perform well, for optimum results use the same model tubes as supplied.**

## **Warranty**

All Grove Hill Audio equipment is covered by a limited warranty against defects in materials and workmanship for a period of 90 days from date of purchase to the original purchaser only. A further 270 day warranty is available to the original purchaser upon proper registration of ownership within 30 days of date of first purchase.

Proper registration is made by filling out and returning to the factory the warranty registration sheet, attached to this general warranty statement, along with a copy of the original sales receipt as proof of the original date of purchase. Only one sheet is issued with each unit, and copies will not be accepted.

If the warranty registration sheet has already been removed then this is not a new unit, and is therefore not warranted by the factory. If you believe this to be a new unit then please contact the factory with the details of purchase.

This warranty is provided by the dealer where the unit was purchased, and by Grove Hill Audio, LLC. Under the terms of the warranty defective parts will be repaired or replaced without charge, excepting the cost of tubes. No warranty is offered on tubes, unless the warranty registration sheet is completed.

If a Grove Hill Audio product fails to meet the above warranty, then the purchaser's sole remedy shall be to return the product to Grove Hill Audio, where the defect will be repaired without charge for parts and labor. The product will then be returned via prepaid, insured freight, method and carrier to be determined by Grove Hill Audio. All returns to the factory must be in the original packing, (new packing will be supplied at a nominal cost if needed), accompanied by a written description of the defect, and must be shipped to Grove Hill Audio via insured freight at the customer's own expense.

Charges for unauthorized service and transportation costs are not reimbursable under this warranty, and all warranties, express or implied become null and void where the product has been damaged by misuse, accident, neglect, modification, tampering or unauthorized alteration by anyone other than Grove Hill Audio.

The warrantor assumes no liability for property damage or any other incidental or consequential damage whatsoever which may result from failure of this product. Any and all warranties of merchantability and fitness implied by law are limited to the duration of the expressed warranty. All warranties apply only to Grove Hill Audio products purchased and used in the United States of America.

Some states do not allow limitations on how long an implied warranty lasts, so the above limitations may not apply to you. Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above exclusion may not apply to you.

This warranty gives you specific legal rights and you may also have other rights which vary from state to state.

## **WARRANTY REGISTRATION**

We ask that you please fill out this registration form and send it to:

**Grove Hill Audio, LLC**  
**REGISTRATION DEPARTMENT**  
**1533 Ilwaco Ave. NE**  
**Renton, Washington 98059**

Registration entitles you to product support, full warranty benefits, and notice of product enhancements and upgrades.

You need to complete and return the following to validate your warranty and registration.

MODEL : \_\_LIVERPOOL\_\_      SERIAL No. : \_\_\_\_\_

PURCHASE DATE : \_\_\_\_\_ SUPPLIER : \_\_\_\_\_

**Please copy this portion and send it to Grove Hill Audio.**

MODEL : LIVERPOOL SERIAL No. \_\_\_\_\_

PURCHASE DATE \_\_\_\_\_ SUPPLIER \_\_\_\_\_

NAME OF OWNER \_\_\_\_\_

ADDRESS \_\_\_\_\_

CITY, STATE, ZIP \_\_\_\_\_

TELEPHONE NUMBER \_\_ (         ) \_\_\_\_\_

EMAIL \_\_\_\_\_

ANY SUGGESTIONS TO IMPROVE THIS PRODUCT?

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