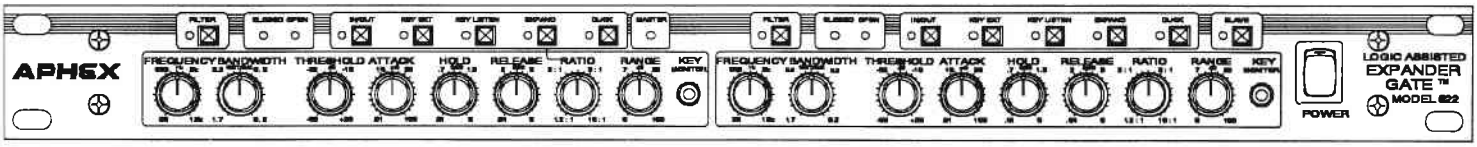
Aphex Model 622

EXPANDER/GATE



OPERATING GUIDE
&
SERVICE MANUAL

APHEX
SYSTEMS

APHEX MODEL 622

LOGIC ASSISTED EXPANDER/GATE

OPERATING GUIDE

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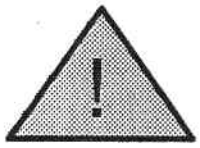

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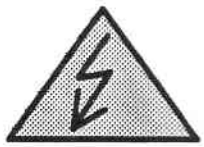


TO REDUCE THE RISK OF FIRE AND ELECTRIC SHOCK, DO NOT EXPOSE THIS APPLIANCE TO RAIN OR MOISTURE

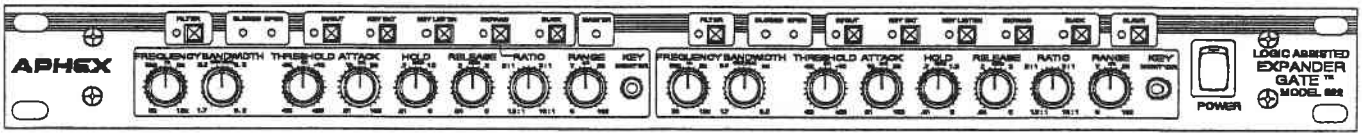
Patent Applied For

Model 622 Operating Guide P/N 10-622

931206RAB

BEFORE STARTING THE QUICK SETUP, PLEASE READ:

Your Model 622 EXPANDER/GATE/DUCKER was carefully packed, and we designed the container to protect the unit from rough handling. Nevertheless, we strongly recommend careful examination of the shipping carton and its contents for any sign of physical damage which may have occurred in transit. If damage is evident, don't destroy the container or packing material. Immediately notify the carrier of a possible claim for damage. Shipping claims must be made by the consignee (that's you).



1.0 QUICK SETUP

1: This quick setup is to acquaint you with the basic operation of the Model 622. We'll discuss how to set up the gate function, but we suggest you read the rest of this manual to find out about the many features available to you.

2: Use one channel only, preferably Channel One.

3: Check that the unit is set to your AC voltage and line frequency. See Section 5.5 on Page 17.

4: Power up the unit. You don't need to watch for smoke, we use an elaborate burn-in procedure.

5: Release all buttons.

6: Feed program material (preferably a drum track or a guitar track) to Channel One.

7: Check that you have an output signal. With all buttons out, you have a wire with no gain.

8: Then press the "**In/Out**" switch.

9: Set the **ATTACK** pot at 10mS, the **HOLD** pot at .01 seconds, the **RELEASE** pot at .04 seconds, the **RATIO** pot at 10:1, and the **RANGE** pot at 100dB.

10: Adjust the **THRESHOLD** control until you see the **CLOSED** LED turn off and the **OPEN** LED turn on, and hear the results of the gating action.

11: Our new **LOGIC ASSISTED GATE** provides you more stability when setting the **THRESHOLD** control. You'll notice that the triggering is very clean, and you won't have to constantly adjust the control to get the right setting.

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APHEX MODEL 622
EXPANDER/GATE
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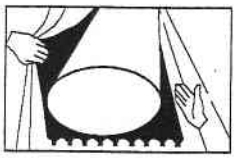
3.0 INTRODUCTION



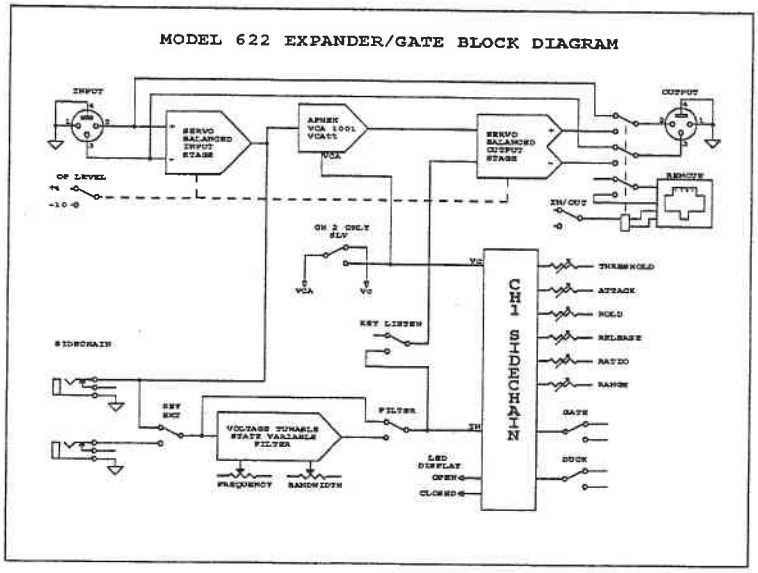
We've created the Aphex Model 622 as the next generation beyond the Model 612. Our latest creation for your audio applications is a versatile expander, gate, and ducker. You may use it for reducing or virtually eliminating noise in recording, effects and sound styles. For sound reinforcement applications, it will automatically mute unused open mikes, increasing the dynamic range of the system, and reducing feedback.

Two channels of downward expansion provide a powerful addition to your studio or personal equipment rack. You've got a comprehensive set of controls which will allow you to adjust the expansion curves to suit a variety of applications, as well as creating useful and dramatic audio effects.

Here's an explanation of the workings of the 622.

3.1 THE BASICS IN PRACTICE

The gain change of an expander is a function of the input signal level, or an external key signal. The signal is routed to two separate circuits in the 622: the Voltage Controlled Attenuator (VCA) circuit, and the sidechain circuit. The VCA circuit is the primary audio path. The signal in the sidechain is the key signal, and the signal path from the input to the sidechain is interrupted by patch points where you may inject an audio key signal from an external source.



The key signal and the result of the front panel control settings are converted in the sidechain circuits to a varying DC control voltage which is used to control the gain of the VCA. You'll be using the key signal quite often.

3.2 THE BASIC IN THEORY

Many professional audio equipment designers are producing devices with as much as 120 dB of dynamic range. Current digital recording techniques typically achieve 85 dB of dynamic range for record and playback. Analog tape recording (without noise reduction processing) can record and reproduce up to about 74 dB of dynamic range. FM broadcasting and analog record cutting processes yield about 65 dB of dynamic range. AM broadcasting yields about 50dB. (We realize these are approximations, not hard numbers.)

3.3 EXPANDERS, GATES

Many audio signals are restricted in dynamic range by their very nature. Voice recordings made outdoors, for example, have a minimum level of ambient background noise (traffic, wind, crowd noise), which sets the minimum noise level of the recording.

Guitar pickups and amplifiers, synthesizer outputs, and electronic special effects devices may generate hisses, hums, and buzzes which restrict the dynamic range of the signal. These noises are masked by the signal when it is significantly louder than the noise, but the noises become noticeable as the signal level decreases to the noise level.

An expander or gate can be used to stretch the effective dynamic range of these noisy signals by adjusting its internal gain to attenuate the signal as the level drops, thereby reducing the level of background noise at the output. Expanders increase the dynamic range of a signal they're controlling. The first widespread use of expanders in audio applications were complementary compression/expansion noise reduction systems.

Expanders are also found useful to reduce or eliminate background noise and leakage on individual tracks in multitrack music recording and post-production work on motion picture films.

An audio gate or noise gate is the simplest form of expander. A signal at or above a chosen level passes unchanged, but signals below this level are cut off. The chosen level is called the threshold level, and is usually adjustable by the user.

A refinement to a gate is the addition of a release time adjustment, which controls the attenuation rate when the signal level falls below the threshold. Some gates have an attack time control, which affects the rate at which the gate opens when the signal exceeds threshold. Further refinements may include a range control, which affects the amount of maximum attenuation.

Still another refinement is the addition of a hold adjustment, which sets a delay time before the release time begins. Another refinement is a ratio control, which sets the ratio of input to output, or the degree of attenuation. With this refinement, the unit works as an expander.

In the Model 622, we've made further refinements, providing circuits which shape the controlling signal, rather than using only the input signal as the controlling signal.

Also, an entirely new circuit, which is patent pending, bypasses the many problems in setting thresholds. We call this a **LOGIC ASSISTED GATE**, You won't have the usual problems in messing with the threshold pot, trying to get the right setting without triggering on false information. Working with the **HOLD** control, you'll have tremendous flexibility in setting the threshold.

3.4 EXPANSION RATIOS

In a true expander the output is adjusted continuously by the input signal over its entire dynamic range. The higher the input level, the higher the gain. The change of output relative to the change of input is called the expansion ratio (e.g. a 1:1 ratio represents no expansion at all, a 2:1 ratio produces a 2dB change in output level for a 1 dB change in input level). The higher the expansion ratio, the greater the dynamic range of the output signal.

3.5 DOWNWARD EXPANSION

For most program material, expansion ratios greater than 4:1 will produce an output dynamic range that exceeds the capabilities of all but the most specialized audio equipment. For example, a signal with a dynamic range of 40dB, when processed by a true expander having a ratio of 4:1, will be expanded to a dynamic range of 160dB which exceeds the dynamic range of human hearing, let alone almost all electronic devices. Therefore, it's necessary to provide a means of limiting the output dynamic range of an expander to match the system capabilities.

This is done in all gates and most expanders by blocking gain control when the input level is above threshold. Therefore, gain control occurs when the input is below threshold, and signals at or above threshold pass without gain change. Because gain is reduced at levels below threshold, this is called DOWNWARD expansion.

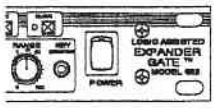
For gating purposes (high expansion ratios), the threshold is often set at the minimum level required to open the gate. All levels above threshold are then passed without gain change.

For expansion over a wide dynamic range, the threshold is set near to the maximum peak level of the input signal. Therefore, all program material is expanded downwards. If the ratio is set too high, the lower levels of program material will be expanded downward to inaudibility, so care should be taken in the selection of expansion ratios and maximum attenuation.

Enough about theory, let's talk about the Model 622 and the practical applications you can use it for.

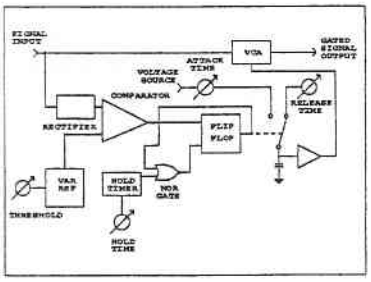
4.0 FEATURES

4.1 LOGIC ASSISTED



You saw that phrase on the front panel, and here's the explanation. We've developed and are patenting a new generation in control systems, and the first implementation is the Model 622.

Conventional gates rely on rectification and filtering for triggering. The filtering loses the transients, frequently necessary to provide the desired trigger. If the signal has very brief peaks, that may cause the gate to "chatter," which is rapid opening and closing of the gate.



If the attack time is set longer than the trigger signal, the gate may not fully open, causing faulty triggering on drum tracks, for example. To get the desired action from the gate, the threshold may be set close to the peak amplitude of the drum track, causing the faulty triggering.

Gating on dialogue or vocal tracks may be difficult, because selecting a workable combination of a high threshold and a long attack time is unlikely.

Logic Assisted doesn't use rectification and filtering. Instead, we use conventional CMOS circuitry in an entirely new manner. In effect, once the gate is triggered, it won't trigger again until the hold time that you've set is past. If you want to use the Model 622 on drum tracks, you can get the drum track you want without compromise.

If you've set a slow attack time to get a desired sound, the Logic Assisted system will hold the gate closed until the attack time is completed, even if the trigger happened early on in the signal.

4.2 QUALITY COMPONENTS AND DESIGN

We use the finest low noise components in the Model 622. We designed it for your use, with audio quality and controls laid out in a logical manner. In addition, each unit is burned in to look for those problems that occur shortly after any piece of electronic equipment is first turned on. Finally, (not to brag too much), we listen to each unit, because even our instrumentation doesn't tell everything. Audio Precision systems are used in production test.

The output noise floor of the 622 at unity gain is -87dBu, and drops to -94dBu at full attenuation. Even with -10dBV nominal operating levels, the signal to noise ratio is 77dB worst case, and with +4dBu systems the signal to noise ratio is 91 dB, with a total dynamic range of 121dB.

The heart of most present-day expanders is a voltage controlled attenuator, or VCA. The Aphex VCA1001 is the latest breakthrough in VCA technology, with very low noise, distortion and control feedthrough, high speed, and stability.

The peak to peak DC shift at the output over the entire range of attenuation is called CONTROL FEEDTHROUGH, and is a critical parameter in

VCA design. Slow changes of the control voltage produce slow changes of DC shift, and are not audible. Fast changes of the control voltage can produce audible clicks or pops at the output. In an expander/gate, the control signal may change very quickly, and that control signal should not appear in the audio output so that clicks or pops aren't heard.

The Aphex VCA1001 has the highest control voltage rejection ratio available today, and consequently delivers superior performance.

4.3 TWO INDEPENDENT CHANNELS

The Model 622 has two identical channels of gain control, which may be used independently, or linked together with the **MASTER/SLAVE** switch, located to the right of the Channel Two controls. When the two channels are linked, Channel One controls both channels.

This is especially useful in stereo material, when you don't want to upset the channel balance and stereo sound. You may notice in the linking mode that the Channel Two indicators are flashing. These may be disregarded, as the Channel One indicators apply to the operation of both channels.

4.4 BALANCED INPUT AND OUTPUT CIRCUITS

We provide transformerless balanced input and output stages for high common mode rejection and excellent maximum output levels. The input and output circuits are servo balanced instrumentation amplifiers. The outputs are short-circuit proof. You may connect the inputs and/or outputs for unbalanced signals, with no change in gain, by grounding Pin 2 or Pin 3 of the input and/or output XLR type connectors. For a more complete discussion on balanced circuits, see Section 5.4.

4.5 FRONT PANEL CONTROLS

The Model 622 is equipped with a full complement of controls so you can adjust attack time, release time, hold time, expansion ratio, range of attenuation, and sophisticated wave shaping of the key signal. Simple gates have little or no control over the attack and release characteristics of the control signal. Many have only a threshold control, which determines the minimum level of input signal required to turn on the gate.

Providing for professional audio or semi-pro systems, on the Rear Panel we've included two 10/4 switches, which set the inputs and outputs for either -10dBV or +4dBu levels. One switch is provided for each channel.

We'll discuss these controls in depth in Section 6, CONTROLS AND INDICATORS.

4.6 INSIDE THE UNIT

Inside the Model 622, we have four PCB's (Printed Circuit Boards). The audio channels are on one board, two boards are the control circuitry, and the last is the power supply board. All the controls and switching on the front panel are logic and DC circuits, which means we don't have to run audio all the way from the back panel to the front panel. Audio inputs and outputs are on the rear panel, near the audio board.

You've heard the expression "a wire with gain" as being the ideal electronic device. By keeping the audio boards and connectors together, we get closer to perfection.

5.0 INSTALLATION and CONNECTIONS

5.1 PHYSICAL MOUNTING

The Model 622 occupies one rack unit (1 3/4 inches), 19 inch nominal panel width, and a depth of 8 1/2 inches. Allow an additional 3 inches behind the unit for connectors and cabling. We recommend at least 1/2 inch of air space around the unit for cooling. Cushioned rack screws are provided with the unit.

5.2 CONNECTORS

Neutrik XLR type connectors are used for the input and output. The audio inputs and outputs are transformerless and balanced, but can be operated unbalanced by using selecting Pin 2 or Pin 3 as the high signal lead, and pin 1 as ground. We recommend using Pin 2 as the high signal lead, as the unbalanced **SIDECHAIN OUT** signal is in phase with Pin 2 of the input XLR connector. Positive polarity is maintained through the device, so you may use either Pin 2 or Pin 3 high to match your balanced system. Also, Pin 2 high is the standard used by most manufacturers.

The sidechain inputs and outputs are 1/4 inch two-conductor phone jacks on the rear panel. These inputs and outputs are unbalanced, and the tip connection of the sidechain output is in phase with pin 2 of the audio input XLR type connector.

Front panel headphone jacks are provided so that you may easily monitor the key signal. Read Section 6.26 for a complete discussion of this neat feature.

5.3 INPUT AND OUTPUT IMPEDANCES

The audio input impedances of the Model 622 are 22kohms, and are easily driven by the output source of any professional audio device. If a transformer feeding the Model 622 requires a 600 ohm termination, any resistor with a value between 560 and 620 ohms may be connected between pins 2 and 3 on the appropriate input connector. This is usually not required. We suggest you try out the system with the Model 622 before adding any resistors, as most contemporary transformers work quite well without terminations. The Model 622 inputs don't require resistors of any sort.

The design of contemporary audio equipment provides for voltage transfer between devices, not power transfer. This means that an output must simply provide a voltage to the following device. The source device will have a low output impedance, and the load device will have a high input impedance. Through testing and experimentation, we have determined that 65 ohms is the optimum source impedance for voltage transfer in the recording and sound reinforcement industry.

The output circuit of the Model 622 is an active servo-balanced transformerless circuit, with an source impedance of 65 ohms between pins 2 and 3. The sidechain input impedances are 50 kohms, unbalanced. The sidechain output impedances are 150 ohms, unbalanced, and are intended for local use, hence the 150 ohm output impedance.

5.4 BALANCED vs. UNBALANCED USE

Electronic noise (unwanted signals) can be picked up by many electronic devices and any system wiring. The trick is to reduce that noise before it degrades the signal. Since external electronic noise is picked up by all wires, it's usually referred to as "Common Mode Noise." The noise appears on all wires at the same time and in the same phase. A balanced circuit rejects almost all Common Mode Noise. By balanced, we mean that both the plus and minus inputs are the same impedance above ground. Since the noise is equal on both wires, the noise is rejected at the input circuit. A balanced input is also referred to as a differential input, as the circuit operates on the difference in signal between the plus and minus inputs.

Because of Common Mode Noise rejection, balanced outputs, either transformer coupled or transformerless, are of great benefit when driving lines of almost any length. If the input circuit of the following device has a balanced input, either transformer coupled or transformerless, the system will be quite insensitive to noise pickup via the connecting cables. To be effective, both the output circuit and the following input circuit must be balanced for Common Mode Noise rejection to be effective.

In an unbalanced input circuit, the center wire is the plus input and the shield wire is both the minus input and ground. This circuit is very poor at rejecting Common Mode Noise, as the noise appearing on the plus input will be introduced into the input circuit. Since the shield wire or minus input is connected to ground, the balanced input doesn't exist.

Care should be taken when using the Model 622 with an input connected for unbalanced operation and the output connected for balanced operation, as your system grounding might be compromised. This is not a fault of the Model 622, but simply that with the input connected for unbalanced operation, the low side of the audio signal is connected to ground.

We've designed the Model 622 to be very insensitive to noise pickup. The input and output circuits are also very insensitive to noise pickup. As you've noticed, both the input and output circuits are balanced. The Model 622 input and output circuits are transformerless as well as balanced. This means lighter weight, greater freedom from pickup of 60Hz magnetic fields, lower cost for you, and a more compact package as good audio transformers take up space.

Although the Model 622 inputs are balanced, they may be driven single-ended (unbalanced) feeding either pin 2 or 3, tying the unused pin to pin 1 ground. We recommend using pin 2 to maintain phase matching with the unbalanced sidechain outputs, where the tip is in phase with pin 2 of the input.

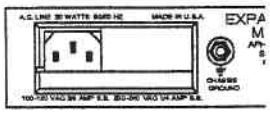
We recommend that the Model 622 be used as a balanced device. Once the noise is in the system, the noise picked up by unbalanced circuits can't be later eliminated by balanced circuits.

5.5 AC LINE CONNECTIONS

AC mains power is supplied to the unit through an integral receptacle/fuse holder/voltage selector on the rear panel which meets all international safety certification requirements. The power receptacle is IEC standard. A power cord is supplied with the unit, the male plug is US standard, two parallel blades, with a round ground pin. Check that the unit is configured to match your AC line or mains voltage by inspecting the voltage programming tag located in the fuse holder.

5.6 LINE VOLTAGE SELECTION

The Model 622 is strapped for the appropriate mains voltage in your country. Before powering, please verify the strapping. The Model 622 can be adapted to any one of several AC line or mains voltage simply by reprogramming the voltage programming card in the fuse holder. This is done as follows:



1. Remove the IEC power cord from the chassis receptacle.
2. Slide the clear plastic cover to the left to uncover the fuse compartment.
3. Remove the fuse by pulling the "FUSE PULL" lever.
4. Pull out the small printed circuit programming tag. The tag has four voltages printed on it; 100, 200 on one side; and 120, 240 on the other side. Orient the tag so the required voltage is readable on the top left side of the tag, and reinsert the tag in the fuse holder. You should now be able to read the correct mains voltage through the fuse holder window. Also refer to the following section on fuse selection.

5.7 FUSE SELECTION

Be sure to use the correctly rated fuse for your AC line or mains voltage. These fuses are:

100-120V, 0.25A Slo-Blo

220-240V, 0.125A Slo-Blo

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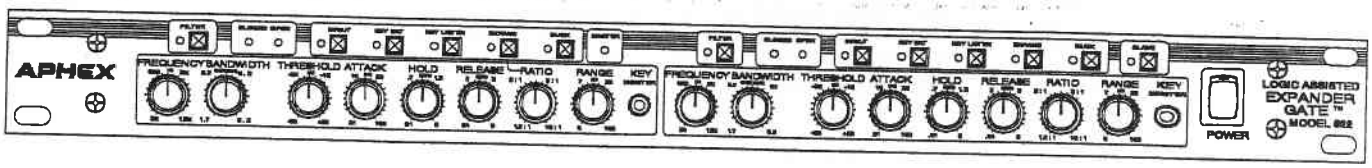
6.0 CONTROLS AND INDICATORS



Each of the two audio channels in the 622 has an identical set of controls, except for the **SLAVE** switch on Channel Two. We'll describe the controls for Channel One (on the left, as viewed from the front). Then we'll discuss the **SLAVE** switch. As you read through the manual, you'll see that various terms are **BOLD** and **CAPS**. These refer to switches and controls on the front and rear panels.

We've located the switches and indicator LEDs across the top of the panel. Below those switches and LEDs is a row of control pots. We'll discuss all the functions on the front panel, than the connectors on the rear panel.

6.1 FILTER LED

This lights when the **FILTER SWITCH** is pressed.

6.2 FILTER SWITCH

This switches the tunable filter section, (**FREQUENCY** and **BANDWIDTH** controls) into or out of the sidechain circuit.

6.3 CLOSED/OPEN LEDs

The traffic light LEDs indicate the operating status of the control circuits. The **CLOSED** light (red) indicates the gate is closed or is closing in the Release mode. The **OPEN** light (green) indicates the gate is within the Attack Time period.

6.4 IN/OUT LEDs

Two LEDs are provided, one for each channel. The LED lights when the control signal is active for that channel, and the 622 is active. This LED is controlled by the bypass relay, so if the relay doesn't operate, the LED won't light.

6.5 IN/OUT

A switch is provided for each channel. When a switch is **IN**, the audio output circuit is relay switched to the output XLR type connectors. When a switch is **OUT**, the input circuit is switched to the output connectors, and the audio input signal is still connected to the primary signal path. The switch has no effect on the sidechain input or output. The circuit is designed so that if the relay doesn't operate, the 622 is in the **OUT** mode.

Since the sidechain is still operating, you can use the Model 622 as an effects device. See Section 7.11, More Special Effects.

This also applies with the input connected for balanced operation and the output connected for unbalanced operation.

6.6 KEY EXT LED

This lights when the **KEY EXT** switch is pressed.

6.7 KEY EXT (Key External)

When pressed, this switch connects the KEY or sidechain signal from the **SIDECHAIN IN KEY** 1/4 inch phone jack on the rear panel to the sidechain circuits instead of the KEY signal from the audio input.

6.8 KEY LISTEN LED

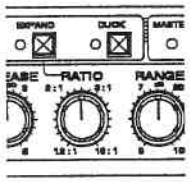
This lights when the **KEY LISTEN** switch is pressed.

6.9 KEY LISTEN

This switch connects the KEY or sidechain signal to the audio output circuits, and simultaneously mutes the normal audio input signal. This permits auditioning of the KEY signal, including the effects of the FREQUENCY and BANDWIDTH controls if the FILTER is switched in, as well as the effects of any external processing of the key signal. When you listen to the sidechain, it's easier for you to adjust filtering or other processing of the key signal to get the desired control effects.

6.10 EXPAND LED

This lights when the EXPAND switch is pressed.



6.11 EXPAND

This switch enables the expander function of the Model 622 to operate. If the DUCK switch is pressed, the EXPAND function won't work.

6.12 DUCK LED

This lights when the **DUCK** switch is pressed.

6.13 DUCK

This switch changes the operation of the 622 from an expander/gate to a ducker. When used as a ducker, an external key signal is normally applied to the **KEY EXTERNAL** jack. The gain of the ducker is unity when the key signal is below threshold, and passes the normal audio input to the output without attenuation.

When the **KEY SIGNAL** exceeds threshold, the gain of the ducker is decreased to a value determined by the **RANGE** control, at a rate determined by the **ATTACK** control (see below). When the **KEY SIGNAL** falls below threshold, the gain of the ducker is restored to unity, at a rate determined by the **RELEASE** control. The **HOLD** control is also active when in the **DUCK** mode.

Since the **KEY SIGNAL** might vary around the threshold, and cause dithering or level fluctuations which would be unsettling to your ears, we've designed and patented a **LOGIC ASSISTED GATE**, a circuit that directs the Model 622 for gain changing. See Section 4.1, Page 14, if you haven't read it already.

6.14 MASTER LED

This LED lights when the **SLAVE** switch on Channel Two is pressed (see SLAVE, below.)

6.15 CHANNEL TWO SWITCHES

The switches and LEDs in Channel Two are the same as Channel One, with the exception of the **SLAVE LED** and the **SLAVE** switch, which are described in the next two paragraphs.

6.16 SLAVE LED

This lights to indicate that the **SLAVE** switch has been pressed, and that Channel Two is slaved to the control signal from Channel One. The **MASTER LED** will light.

6.17 SLAVE

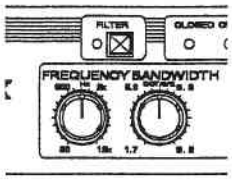
The **SLAVE** switch at the far right of the row of switches on Channel Two selects the control signal from Channel One to control Channel Two. It is important to remember that this control signal is not just the key signal; rather it is derived from the key signal, and includes the effects of the controls in Channel One. The controls on Channel Two are disabled except for the **IN/OUT** and **KEY LISTEN** switches.

The control settings and "traffic light" indicators of Channel One show the action of the control signal operating Channel Two. You may notice that the Channel Two indicators are flashing differently than Channel One. These should be disregarded, as the Channel One indicators apply to the operation of both channels.

6.18 FREQUENCY

This control adjusts the center frequency of the Parametric Key Filter. It is tunable from 30Hz up to 12kHz. Working with the **BANDWIDTH** control, you'll be able to zero in on the sound you want to use to trigger the Expander. If you read Section 7, you'll find more discussion on these two controls, which are entirely new with the Model 622.

6.19 BANDWIDTH

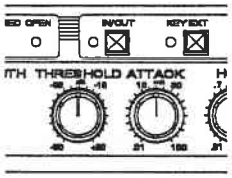


This control adjusts the bandwidth of the Parametric Key Filter. The bandwidth is adjustable from 1.7dB/octave to 9.2dB/octave. The filter slope is 24dB/octave. Working with the **FREQUENCY** control, you'll be able to zero in on the sound you want to use to trigger the Expander.

6.20 THRESHOLD

This control adjusts the threshold level where the Model 622 triggers. In the expander/gate mode, key signals above this threshold level bring the gain to unity. Signals below this level cause attenuation determined by other controls. **HOLD** time begins at the completion of the **ATTACK** time. The **RELEASE** time begins at the end of the **HOLD** time. During the **HOLD** time, the gain of the expander/gate is set to the value determined by the **RANGE** control (see below). When the Model 622 is operating as an expander, the **RATIO** control determines the expansion ratio.

Turning the **THRESHOLD** control CCW reduces the threshold level, so that lower level signals trigger the expander/gate, effectively increasing the sensitivity. Turning the control CW raises the threshold level, reducing sensitivity. The range of control is from -50dBu to +20dBu.



The **LOGIC ASSISTED GATE** is a new circuit which assures reliable triggering, regardless of the signal time above threshold. The length of time the gate stays open is determined by the **HOLD** control (See Section 6.22).

6.21 ATTACK

This control adjusts the time to arrive at unity gain after the key signal exceeds threshold. Full CCW rotation produces an extremely fast attack time, less than 10μS, and fully CW a slow attack of 100mS.

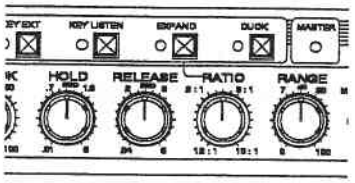
Because of the **LOGIC ASSISTED GATE**, any input signal above the threshold will trigger the expander. Furthermore, the gate will stay open until the full attack time is realized. This means that very slow attack times can be used, even with very brief trigger signals.

When in the **DUCK** mode this control adjusts the rate of attenuation when the key signal exceeds threshold.

6.22 HOLD

This control adjusts the delay period between the end of the **ATTACK** period and the beginning of the **RELEASE** period. The range of adjustment is 10mS at full CCW rotation to 4 seconds at full CW.

6.23 RELEASE



This control adjusts the time for the gain to fall to the value set by the **RANGE** control. The release period begins at the end of the **HOLD** period. The range of release time adjustment is from 40mS at full CCW to 4 seconds at full CW rotation. When in the **DUCK** mode this control adjusts the rate of recovery to unity gain after completion of the **HOLD** period.

6.24 RATIO

This control sets the ratio of downward expansion from 1.2:1 to 10:1. Low ratios accentuate dynamics, with the effect increasing at higher expansion ratios. This control is active when the **EXPAND** switch is **IN**.

6.25 RANGE

This control determines the maximum amount of attenuation. The range of control is from 0dB (no attenuation at all) to 100dB (effectively OFF).

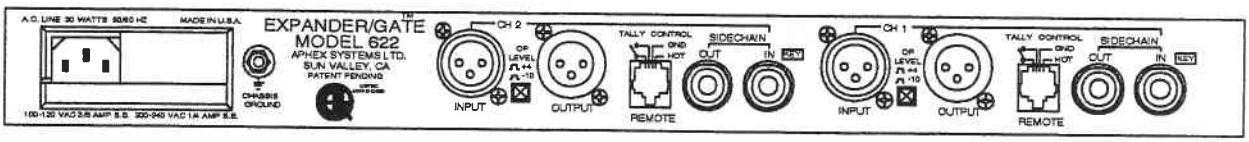
6.26 KEY MONITOR

This jack, which is insulated from chassis ground, allows you to monitor the key signal without using the KEY LISTEN function, which interrupts the normal signal flow through the Model 622.

6.27 POWER SWITCH

The **POWER** switch is located at the right end of the front panel. When the power is off, the unit is **OUT**, automatically in the bypass mode.

6.28 REAR PANEL CONNECTORS



On the rear panel, you'll find the primary signal inputs and outputs, the integrated AC receptacle-fuse holder-voltage selector, the 10/4 switches, and the remote tally control connectors. We'll discuss these in detail.

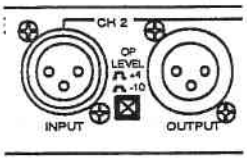
6.29 INPUTS

There are two 3 pin Neutrik XLR type input connectors, one for each channel. Pin 2 is high, pin 3 is low, pin 1 is ground. Each input circuit is balanced, but they may be individually wired for unbalanced operation. See Section 4.3.

6.30 -10/+4 OPERATING LEVEL SWITCHES

There are two switches, one for each channel, which set the operating level for that channel. With the switch pressed, the operating level is -10dBV, and with the switch released, the operating level is +4dBu.

6.31 OUTPUTS



There are two 3 pin Neutrik XLR type balanced output connectors, one for each channel. Pin 2 is high, pin 3 is low, pin 1 is ground. Each output circuit is balanced, but they may be individually wired for unbalanced operation. See Section 4.3.

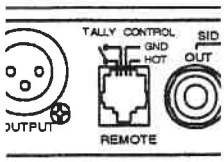
6.32 SIDECHAIN OUT

There are two 1/4 inch two-conductor phone jacks, each tip carries an unbalanced buffered copy of the audio input signal.

6.33 SIDECHAIN IN

There are two 1/4 inch two-conductor phone jacks, one for each channel, which are the unbalanced sidechain or key inputs to the sidechain circuits.

6.34 REMOTE CONTROLS



There are two RJ11 Modular jacks, one for each channel. Pin 1 is Tally contact, pin 2 is Tally contact, pin 3 is ground, pin 4 is Bypass relay closure. When pins 3 & 4 are connected, the Bypass relay will operate. Pins 1 & 2 may be connected to a tally light and power circuit to indicate that the Bypass relay is operated. This relay is operated either by the IN/OUT switch, or by the Remote Control circuit. This controls the bypass circuit discussed in Section 6.5. The IN/OUT switch must be OUT for the remote control to operate.

7.0 TYPICAL USES

The dynamic range of the Model 622 will accommodate all program material with a nominal level of +4dBu without requiring input padding or interior gain adjustments. As you've read, the operating level may be set to -10dBV for semi-pro applications. Here are a number of typical uses for the 622. We suggest you read Section 6, Controls before reading this section. It'll make life easier for you.

Gating is the simplest function of the 622. You'll use it in eliminating background noise and leakage from adjacent instruments on music tracks, auto-muting individual tracks in multitrack mixdowns, automatically turning off open mikes when they are not in use, and for generating special effects. Here are some ideas.

7.1 CONTROLLING LEAKAGE IN THE STUDIO

The 622 is useful in preventing the sound of one instrument from bleeding into the track of another instrument during tracking or mixing. It is commonly used on drum kits, where the mikes are very close to each other. The sounds are loud and there is often considerable leakage into all the mikes. Here's the setup:

Set the **ATTACK**, **RELEASE**, and **HOLD** controls full CCW for minimum attack, release, and hold times. Set the RATIO and **RANGE** controls fully CW for maximum attenuation.

Patch the 622 into a snare drum channel and adjust it so that triggering occurs only on snare hits. If leakage from the hi hat still triggers the unit, use the **FREQUENCY** and **BANDWIDTH** controls to tune out high frequencies from the key signal. With careful tuning, the snare sounds as if it is playing all by itself! Adjustments of the **RELEASE** control can tighten the sound of a loose snare.

7.2 REDUCING STAGE MIKE FEEDBACK

When a performer is using a vocal mike, he effectively blocks the mike from other sounds. When he steps back, the mike is open to pick up the house and monitor speakers, possibly causing feedback in the sound system. The 622 patched in the mike preamp output circuit will shut it off when he steps back, reducing the possibility of feedback. It will also clean up the mix by eliminating pickup of other instruments. This application works well for almost all mikes. Here's the setup:

Set the **ATTACK**, **RELEASE**, and **HOLD** controls full CCW for minimum attack, release, and hold times. Set the **RATIO** and **RANGE** controls fully CW for maximum attenuation.

Adjust the THRESHOLD control until the performer's lowest level voice level triggers the gate (indicated visually by a flash of the **THRESHOLD** LED) and passes their voice at full volume. You may want to adjust the **HOLD** control, if the performer's pauses between words or phrases cause the gate to trigger when unwanted. The result is a clean vocal, surrounded by silence. This is gating at its most basic.

7.3 PERCUSSION GATING

Percussion instruments are characterized by a fast attack. The space between percussion strikes may be "contaminated" with leakage from other adjacent instruments or excessive room reverberation. This leakage may be reduced or possibly removed with the 622. We suggest you set the controls as follows:

Set the **ATTACK, RELEASE,** and **HOLD** controls full CCW for minimum attack, release, and hold times. For kick drums and similar instruments, you may want to set a slower **ATTACK** time to avoid clicks when the unit operates. Set the **RATIO** and **RANGE** controls fully CW for maximum attenuation.

Adjust the **THRESHOLD** control until the softest strike of the percussion instrument triggers the gate (indicated visually by a flash of the **THRESHOLD** LED) and passes the signal at full volume. The result is a clean, dry percussion sound, surrounded by silence. This is also gating at its most basic.

7.4 CONFERENCE ROOM MIKE CONTROL

The duck mode can be used to advantage in a conference room multiple mike P.A. system. The mike channel used by the conference director can be used as a key signal to attenuate a submix of the mikes used by the other members of the conference, thereby giving the conference director priority. Here's the setup:

Patch Channel One of the 622 in the submix channel of the microphones to be ducked. Using an isolation transformer to avoid ground loops, patch a mult of the conference director's mike channel into **SIDECHAIN IN (KEY)** of Channel One. Press the **KEY EXT** switch. Press the **DUCK** switch. Set the **ATTACK** control about halfway. Adjust the **THRESHOLD** control according to the submix level for the desired point where you want ducking to take place.

Adjust the **RANGE** control if you want the submix level to be lower in level rather than fully attenuated. Adjust the **FREQUENCY** and **BANDWIDTH** controls according to the spectrum of the submix channel. Setting the **FREQUENCY** around 2kHz, and the **BANDWIDTH** fully CW would be a good starting point.

7.5 PAINLESS DE-ESSING

You've got sibilants in program material giving you problems? Here's the cure:

Patch the 622 in the channel to be repaired. Press the **DUCK** switch. Press the **FILTER** switch, adjust the **FREQUENCY** and **BANDWIDTH** controls to roll off the low frequencies in the sidechain. Adjust the **THRESHOLD** so that ducking occurs only on the high frequency sibilant content of the voice material, and adjust the **RATIO, ATTACK, RELEASE,** and **RANGE** controls until you've reduced the sibilants as desired.

7.6 KEYING SOUNDS TO PERCUSSION TRACKS

This technique can be used to "tighten up' a rhythm track. Here's the setup:

Patch the 622 in a bass guitar track, and feed the bass drum signal to the **EXTERNAL KEY** input. Now the bass guitar is keyed in sync with the bass drum. A bass drum sound may be fattened or tuned to a given note by using the drum sound to key one or more low frequency oscillators or synth tones, and mixing these tones with the bass drum track.

7.7 DUCKING FOR VOICE-OVERS AND PAGING

Instead of opening up when the key signal exceeds threshold, ducking attenuates the output. Here's the setup:

Patch Channel One of the 622 to the music channel, and patch the voice channel to the **KEY INPUT** jack. Press the **DUCK** mode and **EXTERNAL KEY** switches, and set the desired amount of attenuation on the **RANGE** control.

Adjust the **THRESHOLD** control so that the **OPEN** LED illuminates when the music signal is at the desired level. Adjust the **RATIO** control to about mid position. Low ratios inhibit the ducking sensitivity for a given **THRESHOLD** setting. Adjust the **RANGE** control to about mid position. This adjusts the depth of ducking, a good starting point is about 10dB. When the key (voice) channel exceeds threshold, the music channel will be attenuated.

If you want to independently control the voice channel, then patch Channel Two to the voice channel, patch the **SIDECHAIN OUT** of Channel Two to the **SIDECHAIN IN (KEY)** input of Channel One. This permits expanding or gating the voice channel (if desired) while using the voice channel as a keying source to duck the music channel.

For ducking a stereo music program, patch the music channels to the 622. In this case the mike signal must be split from the main mike channel and patched to the **SIDECHAIN IN (KEY)** input of Channel One. Activate the **SLAVE** switch on Channel Two. Be sure that the **IN/OUT** switches for both channels is **IN**.

Both channels of the 622 are now using the ducking parameters set up on Channel One, and all the controls (except for the **IN/OUT** switch) of Channel Two are inoperative.

7.8 ADDING DYNAMICS

With the variable ratio control, the 622 can be used to "spice up' the dynamics of a sound track. Low ratios (1.2:1 to 3:1) will multiply the existing dynamics, adding punch to a lifeless track. Here's the setup:

Patch the 622 to the track or tracks you want to "spice up." Set the **RATIO** control to about 1.5:1 as a start. Adjust the **THRESHOLD** control so that only the loudest peaks of the recorded material cause the **OPEN** LED to flash. Then adjust the **RANGE** control to set the expansion range that sounds best. Further adjustment or twiddling of these controls will even up the track. As you adjust the **THRESHOLD** , this will affect the level at which expansion takes place.

7.9 RESHAPING SAMPLED SOUND ENVELOPES

Once you've captured a sound in a sampler, you can use the 622 to change the envelope, creating new sounds. You can slow the attacks, expand the dynamics, or even reverse them. Here's the setup:

Patch the 622 in the sampled sound channel. Press the **FILTER** switch. Release the **KEY EXT** switch. Press the **EXPAND** switch. Release the **DUCK** switch. Then adjust the **FREQUENCY** and **BANDWIDTH** controls to get the desired triggering of the sampled sound.

Using the **HOLD, RANGE, ATTACK,** and **RELEASE** controls will give you tremendous control of the sampled sound.

7.10 SPECIAL EFFECTS

We suggest you try creating new sounds by crossfading the attack portion of a piano with the decay portion of a flute for example. Here's a setup to accomplish it:

1. First, record a single line piano figure, and on another track record a flute in unison with the piano.

2. Connect those tracks to the two input channels of the 622.

3. Adjust the piano channel controls as follows:

   A. **THRESHOLD,** set high so that triggering occurs only on the attack portion of each piano note.

   B. **ATTACK,** set at full CCW for shortest attack time.

   C. **HOLD,** set at full CCW for shortest hold time.

   D. **RELEASE,** set at about 1/2 second as a start.

   E. **RATIO,** turn to full CW for gate action.

F. **RANGE**, turn to full CW for complete fadeout of piano sound.

4. Patch the **SIDECHAIN OUT** of the piano channel to the **KEY IN** of the flute channel.

5. Press the **KEY EXT** and **DUCK** switches on the flute channel. Then adjust the controls of the flute channel as follows:

   A. **THRESHOLD**, set the same as for the piano channel.

   B. **ATTACK**, set at full CCW.

   C. **HOLD**, set at full CCW.

   D. **RELEASE**, set the same as for the piano channel.

   E. **RATIO**, set high.

   F. **RANGE**, set at 20dB or greater.

This setup passes the transient attack of the piano, then quickly attenuates the piano sound. At the same time the piano attack ducks the flute channel, and as the piano sound fades out, the flute channel fades in. These suggested settings are rough approximations, mainly to show what you can do with the Model 622. We suggest you try your own combinations.

7.11 MORE SPECIAL EFFECTS

The Model 622 may be used as an effects filter. If the 622 isn't being used as an Expander or Gate, the sidechain circuit is independently available. The filter section is used. Here's the setup:

Use Channel One. Release the **IN/OUT** switch. Patch Channel One input to the desired material. Using a 1/4 inch two-circuit phone plug, connect to the **KEY MONITOR** jack for Channel One on the front panel. This is an unbalanced output, the level will be around . Feed this to a line input on the console. Be sure the **KEY EXTERNAL** switch is released. Press the **FILTER** switch. By adjustments of the **FREQUENCY** and **BANDWIDTH** controls, you have easy access to a versatile bandpass filter.

If you want to use this in a stereo configuration, simply repeat the setup for Channel Two. Be sure that the **SLAVE** switch is released

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8.0 LIMITED WARRANTY

8.1 PERIOD

Five years from date of purchase from Aphex Systems, or an authorized dealer.

8.2 SCOPE

All defects in workmanship and materials. The following are not covered:

A. Voltage conversions.

B. Units on which the serial number has been defaced, modified, or removed.

C. Damage or deterioration:

1. Resulting from installation and/or removal of the unit.

2. Resulting from accident, misuse, abuse, neglect, unauthorized product modification or failure to follow instructions contained in the Operating Guide.

3. Resulting from repair or attempted repair by anyone not authorized by Aphex Systems.

4. Occurring from shipment (claims must be presented to shipper).

8.3 WHO IS PROTECTED

This warranty will be enforceable by the original purchaser and by any subsequent owner(s) during the warranty period, so long as a copy of the original Bill of Sale is submitted whenever warranty service is required.

8.4 WHAT WE WILL PAY FOR

We will pay all labor and material expenses for covered items. We will pay return shipping charges if the repairs are covered by the warranty.

8.5 LIMITATION OF WARRANTY

No warranty is made, either expressed or implied, as to the merchantability and fitness for any particular purpose. Any and all warranties are limited to the duration of the warranty stated above.

8.6 EXCLUSION OF CERTAIN DAMAGES

Aphex Systems Ltd. liability for any defective unit is limited to the repair or replacement of said unit, at our option, and shall not include damages of any kind, whether incidental, consequential, or otherwise.

Some states do not allow limitations on how long an implied warranty lasts and/or do not allow the exclusion or limitation of incidental or consequential damages, so the above limitations and exclusions 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.

Aphex Systems is constantly striving to maintain the highest professional standards. As a result of these efforts, modifications may be made from time to time to existing products without prior notice. Aphex is under no obligation to modify existing products. Specifications and appearance may differ from those listed or shown.

9.0 SERVICE INFORMATION

As stated in Section 8, we provide a limited warranty for one year. Because of the complexity of the Model 622 circuitry, service information isn't provided. If service is required, the unit should be returned to your local dealer or to Aphex Systems, Ltd.

10.0 TEST AND NULLING PROCEDURES

Test procedures for the Model 622 require the following test equipment:

1. Dual trace oscilloscope, 10MHz or better.
2. Fluke digital multimeter, Model 75, or equivalent.
3. Audio Precision System One.

Because of the sophistication of the test equipment required, and that not all users will possess the required equipment, we do not include the Test Procedures in this manual.

10.1 NULLING PROCEDURE

The nulling procedure is included, as these adjustments may be necessary from time to time.
The following test equipment is required:

1. Function Generator.
2. Fluke digital multimeter, Model 75, or equivalent.
3. Oscilloscope.

PROCEDURE:

1. Remove the top cover. Release all switches.

2. Set these controls fully counter-clockwise:

   FREQUENCY, THRESHOLD, ATTACK, HOLD, RELEASE, RANGE.

3. Set these controls fully clockwise:

   BANDWIDTH, RATIO.

4. Place a 10k resistor in series with the output of the function generator. Feed a 0-10V, 1kHz triangular wave to R68 (the end nearest to U16) on the Control PCB and ground. Also feed the triangular wave to the X input of the oscilloscope. Set the scope to X-Y display. Set both inputs to DC, the range switches to 20mV/div.

5. Connect TP101 on the Audio PCB to the Y input of the oscilloscope. Turn on power to the Model 622.

6. Adjust VR102 and VR103 on the Audio PCB for DC shift null. Adjust the scope sensitivities as necessary.

7. Place a temporary short between pins 1 & 2 on U104 on the Audio PCB. Note the offset voltage.

8. Leave the scope connected as in Step #5. Leave the temporary short in position that was placed in Step 5. Set SW101 (-10/+4 level) to -10 position. Adjust VR105 on the Audio PCB so that the offset voltage is 0VDC, ± 4mV.

9. Repeat Steps 2 through 8 for Channel Two, using the equivalent components to Channel One. Do not change the connection to R68, as the Control PCB is common to both Audio PCB's.

10. Turn off power. Remove temporary short. Replace cover.

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11.0 MODEL 622 SPECIFICATIONS

11.1 INPUTS

Type	RF filtered, true instrumentation differential balanced
Input Impedance	22 kohms, balanced
Nominal Operating Level	+4dBu, switchable to -10dBV
Maximum Input Level	+27 dBu, +15dBv in -10 mode
CMRR	Better than 60dB at 10kHz

11.2 SIDECHAIN

Gain Reduction Element	APHEX VCA1001
Key Input Impedance	50kohms unbalanced
Key Output Impedance	150 Ohms, unbalanced
Maximum Key Level	+21 dBu

11.3 OUTPUTS

Type	Electronically servo-balanced, transformerless May be operated single- ended or balanced
Output Impedance	65 Ohms balanced or unbalanced
Maximum Output Level	At +4 mode, +27dBu balanced, +21 dBu unbalanced
Bandwidth	5 Hz to 100kHz, +0, -0.2dB
THD @ +20dBu	0.006%
THD @ +4dBu	0.003%
IMD (SMPTE} @ +10dBu	0.006%

11.3 OUTPUTS (cont'd)

Noise & Hum, unity gain	-87dBu
Noise & Hum, fully off	-94dBu
Crosstalk @ 20kHz	-76dBu worst case

11.4 CONTROLS

Threshold	-50dBu to +20dBu
Attack time	FAST (10μS) to SLOW (100mS)
Hold	10mS to 4 seconds
Release	40mS to 4 seconds
Ratio	1.2:1 to 10:1
Range	0 to 100dB
Frequency	30Hz to 12kHz
Bandwidth	1.7 to 9.2dB/octave at 24dB/octave

11.5 FUNCTION SWITCHES

Filter IN/OUT

Channel IN/OUT

Duck

Expand

Key Listen

Key External

Master/Slave Link

11.6 INDICATORS

Status is 2 LED "traffic light" display showing:

Closed (below threshold)

Open (above threshold)

One LED indicator for each function switch.

11.7 POWER REQUIREMENTS AND CONNECTIONS

90-250 VAC 50-60Hz, 25 Watts

AC power connection: IEC standard, with integral fuse, voltage select and RF filter.

11.8 PHYSICAL SPECIFICATIONS

Size:	1 3/4 inches (44.5mm) high
	19 inches (482.6mm) wide
	9 inches (228.6mm) deep
Weight:	7 lb. (3.17kG)
Shipping Weight	8.5 lb. (3.85kG)

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12.0 PARTS LISTS

NOTE: When a part designation is preceded by a number in parentheses, this indicates that the part designator applies to both PCBs. The part designator is to be read as: C101, C201, for example.

PART #	DESCRIPTION	STOCK#
AUDIO PCB CAPACITORS:		
(2) C101	470pF CERAMIC	80-015
(2) C102	470pF CERAMIC	80-015
(2) C103	470pF CERAMIC	80-015
(2) C104	470pF CERAMIC	80-015
(2) C105	22uf/NP NONPOLAR	89-001
(2) C106	.1uf POLY	84-084
(2) C107	22uf/NP NONPOLAR	89-001
(2) C108	.1uF POLY	84-084
(2) C109	10pF MICA	85-001
(2) C110	10pF MICA	85-001
(2) C111	10pF MICA	85-001
(2) C112	.33uF POLY	84-022
(2) C113	10pF MICA	85-001
(2) C114	10pF MICA	85-001
(2) C115	100uF/NP NONPOLAR	89-002
(2) C116	100uF/NP NONPOLAR	89-002
(2) C117	.33uF POL	84-022
(2) C118	20pF MICA	85-003
(2) C119	20pF MICA	85-003
(2) C120	.33uF POLY	84-022
(2) C121	20pF MICA	85-003
(2) C122	20pF MICA	85-003
(2) C123	100uF ELECT	82-014
(2) C124	22uF NP NONPOLAR	89-001
(2) C125	22uF NP NONPOLAR	89-001
(2) C126	.1uF MONO	88-001
(2) C127	.1uF MONO	88-001
(2) C128	.1uF MONO	88-001
(2) C129	.1uF MONO	88-001
(2) C130	.1uF MONO	88-001
(2) C131	.1uF MONO	88-001
(2) C132	100uF ELECT	82-014
(2) C133	100uF ELECT	82-014
(2) C134	20pF MICA	85-003
AUDIO PCB SEMICONDUCTORS		
(2) K101	DS4E-M-DC12V RELAY	73-012
(2) D102	1N4003 POWER DIODE	30-009
(2) Q101	2N3904 NPN	31-015
(2) U101	NE5532 DUAL OP-AMP	32-028
(2) U102	VCA1001 APHEX VCA	33-052
(2) U103	NE5532 DUAL OP-AMP	32-028
(2) U104	LF353N DUAL OP-AMP	32-007
(2) U105	LF353N DUAL OP-AMP	32-007
(2) U106	NE5532 DUAL OP-AMP	32-028
(2) U107	LF353N DUAL OP-AMP	32-007
(2) U108	CD4016 QUAD SWITCH	38-003
(2) U109	LF353N DUAL OP-AMP	32-007
U301	NE5532 DUAL OP-AMP	32-028
(2)U110	TDA7052A OP-AMP	33-082
AUDIO PCB CONNECTORS		
(2) H101	HDR 7 PIN MOLEX STRAIGHT	43-062
	7 PIN HOUSING	43-059
(2) H102	HDR 2 PIN MOLEX STRAIGHT	
	2 PIN HOUSING	43-099
H301	HDR 5 PIN MOLEX STRAIGHT	43-101
	5 PIN HOUSING	43-080
(2) J101	XLR-3F NC3-FGC	43-160
(2) J102	XLR-3M NC3-MGC	43-159
(2) J103	PHONEJACK	43-191
(2) J104	PHONEJACK	43-191
(2) J105	RJ11 4 PIN JACK	42-020
AUDIO PCB SWITCHES		
(2) SW101	4PDT MTK4UEE	20-030
AUDIO PCB INDUCTORS		
(2) L101	220uH INDUCTOR	72-016
(2) L102	220uH INDUCTOR	72-016
(2) L103	1000uH INDUCTOR	72-013
(2) L104	1000uH INDUCTOR	72-013
(2) L105	47uH INDUCTOR	72-018
(2) L106	47uH INDUCTOR	72-018
AUDIO PCB RESISTORS		
(2) R101	100K 1/4W 1% MTL FILM	92-1003
(2) R102	100K 1/4W 1% MTL FILM	92-1003
(2) R103	1K0 1/4W 1% MTL FILM	92-1001
(2) R104	1K0 1/4W 1% MTL FILM	92-1001
(2) R105	1M0 1/4W 1% MTL FILM	92-1004
(2) R106	8K25 1/4W 1% MTL FILM	92-8251
(2) R107	2K80 1/4W 1% MTL FILM	92-2801
(2) R108	2K80 1/4W 1% MTL FILM	92-2801
(2) R109	8K25 1/4W 1% MTL FILM	92-8251
(2) R110	10K0 1/4W 1% MTL FILM	92-1002
(2) R111	10K0 1/4W 1% MTL FILM	92-1002
(2) R112	200K 1/4W 1% MTL FILM	92-2003
(2) R113	1K0 1/4W 1% MTL FILM	92-1001
(2) R114	49R9 1/4W 1% MTL FILM	92-0499
(2) R115	49R9 1/4W 1% MTL FILM	92-0499
(2) R116	49R9 1/4W 1% MTL FILM	92-0499
(2) R117	22K6 1/4W 1% MTL FILM	92-2262
(2) R118	7K87 1/4W 1% MTL FILM	92-7871
(R) R119	10K0 1/4W 1% MTL FILM	92-1002
(2) R120	22K1 1/4W 1% MTL FILM	92-2212
(2) R121	7K87 1/4W 1% MTL FILM	92-7871
(2) R122	10K0 1/4W 1% MTL FILM	92-1002
(2) R123	10M0 1/4W 1% MTL FILM	92-1005
(2) R124	100K 1/4W 1% MTL FILM	92-1003
(2) R125	20K0 1/4W 1% MTL FILM	92-2002
(2) R126	20K0 1/4W 1% MTL FILM	92-2002
(2) R127	20K0 1/4W 1% MTL FILM	92-2002
(2) R128	10K0 1/4W 1% MTL FILM	92-1002
(2) R129	10K2 1/4W 1% MTL FILM	92-1022
(2) R130	10K0 1/4W 1% MTL FILM	92-1002
(2) R131	10K0 1/4W 1% MTL FILM	92-1002
(2) R132	499K 1/4W 1% MTL FILM	92-4993

(2) R133	10M0 1/4W 1% MTL FILM	92-1005
(2) R134	332K 1/4W 1% MTL FILM	92-3323
(2) R135	56R2 1/4W 1% MTL FILM	92-0562
(2) R136	20K0 1/4W 1% MTL FILM	92-2002
(2) R137	150R 1/4W 1% MTL FILM	92-1500
(2) R138	10M0 1/4W 1% MTL FILM	92-1005
(2) R139	332K 1/4W 1% MTL FILM	92-3323
(2) R140	56R2 1/4W 1% MTL FILM	92-0562
(2) R141	20K0 1/4W 1% MTL FILM	92-2002
(2) R142	150R 1/4W 1% MTL FILM	92-1500
(2) R143	10K0 1/4W 1% MTL FILM	92-1002
(2) R144	39K2 1/4W 1% MTL FILM	92-3922
(2) R145	100K 1/4W 1% MTL FILM	92-1003
(2) R146	150R 1/4W 1% MTL FILM	92-1500
(2) R147	100K 1/4W 1% MTL FILM	92-1003
(2) R148	100K 1/4W 1% MTL FILM	92-1003
(2) R149	100R 1/4W 1% MTL FILM	92-1000
(2) R150	20K0 1/4W 1% MTL FILM	92-2002
(2) R151	18K2 1/4W 1% MTL FILM	92-1822
(2)R152	1K00 1/4W 1% MTL FILM	92-1001
(2)R153	49R9 1/4W 1% MTL FILM	92-0499
(2) RN101	10K0 R/N 8PIN ISOLATED	97-023-I8
(2) RN102	10K0 R/N 8PIN ISOLATED	97-023-I8
(2) RN102	10K0 R/N 8PIN ISOLATED	97-023-I8

AUDIO PCB VARIABLE RESISTORS

(2) VR101	50K/1T PIHER LAYDOWN	22-008
(2) VR102	100/1T PIHER LAYDOWN	22-009
(2) VR103	1K/1T PIHER LAYDOWN	22-011
(2) VR104	10K/1T PIHER LAYDOWN	22-003
(2) VR105	1K/1T PIHER LAYDOWN	22-011

PART #	VALUE	STOCK #
CONTROL BOARD CAPACITORS		
C1	.0022uF/25V POLY	84-085
C2	.0022uF/25V POLY	84-085
C3	.1uF POLY	84-086
C4	22uF/NP NONPOLAR	89-001
C5	.0022uF/25V POLY	84-085
C6	.0022uF/25V POLY	84-085
C7	.1uF POLY	84-086
C8	22uF/NP NONPOLAR	89-001
C9	.0015uF POLY	84-073
C10	.0015uF POLY	84-073
C11	.1uF POLY	84-086
C12	22uF/NP NONPOLAR	89-001
C13	.0015uF POLY	84-073
C14	.0015uF POLY	84-073
C15	.1uF POLY	84-086
C16	22uF/NP NONPOLAR	89-001
C17	100uF/NP NONPOLAR	89-002
C18	270pF MICA	85-020
C19	20pF MICA	85-003
C20	470pF CERAMIC	80-015
C21	20pF MICA	85-003
C22	10uF/25V TANT	83-014
C23	.33uF POLY	84-022
C24	20pF MICA	85-003
C25	.1uF MONO	88-001
C26	.1uF MONO	88-001
C27	.1uF MONO	88-001
C28	.1uF MONO	88-001
C29	.1uF MONO	88-001
C30	.1uF MONO	88-001
C31	.1uF MONO	88-001
C32	.1uF MONO	88-001
C33	.1uF MONO	88-001
C34	.1uF MONO	88-001
C35	.1uF MONO	88-001

CONTROL BOARD SEMICONDUCTORS		
D1	1N914B LOW SIGNAL DIODE	30-002
D2	1N914B LOW SIGNAL DIODE	30-002
D3	1N914B LOW SIGNAL DIODE	30-002
D4	1N914B LOW SIGNAL DIODE	30-002
D5	1N914B LOW SIGNAL DIODE	30-002
D6	1N914B LOW SIGNAL DIODE	30-002
D7	1N914B LOW SIGNAL DIODE	30-002
D8	1N914B LOW SIGNAL DIODE	30-002
D9	1N914B LOW SIGNAL DIODE	30-002
D10	1N914B LOW SIGNAL DIODE	30-002
D11	1N914B LOW SIGNAL DIODE	30-002
D12	1N914B LOW SIGNAL DIODE	30-002
D13	1N914B LOW SIGNAL DIODE	30-002
LD1	LTL-1234 GRN LED	27-034
LD2	LTL-1204 RED LED	27-035
LD4	LTL-1234 GRN LED	27-034
LD5	LTL-1204 RED LED	27-035
D6	LTL-1234 GRN LED	27-034
D7	LTL-1234 GRN LED	27-034
D8	LTL-1234 GRN LED	27-034
D9	LTL-1234 GRN LED	27-034
D10	LTL-1254 YEL LED	27-037
D11	LTL-1234 GRN LED	27-034
Q1	2N3906 PNP TRANS	31-011
Q2	2N3906 PNP TRANS	31-011
Q3	2N3906 PNP TRANS	31-011
Q4	2N3906 PNP TRANS	31-011
Q5	LM334Z PROG. CUR.SOURCE	36-025
Q6	J113 N CH FET	31-010
Q7	D631 PNP POWER TRANS	31-021
Q8	LM334Z PROG. CUR. SOURCE	36-025
U1	LF347N QUAD OP-AMP	32-048
U2	LM13700 DUAL OTA	33-036
U3	LF347N QUAD OP-AMP	32-048
U4	LM13700 DUAL OTA	33-036
U5	LF347N QUAD OP-AMP	32-048
U6	LM13700 DUAL OTA	33-036
U7	LF347N QUAD OP-AMP	32-048
U8	LM13700 DUAL OTA	33-036
U9	LF347N QUAD OP-AMP	32-048
U10	LF347N QUAD OP-AMP	32-048
U11	LF347N QUAD OP-AMP	32-048
U12	LF347N QUAD OP-AMP	32-048
U13	CD4001B CMOS	38-005
U14	LMC555N TIMER	33-011
U15	LF347N QUAD OP-AMP	32-048
U16	NE5532 DUAL OP-AMP	32-028

CONTROL BOARD CONNECTORS		
H1	5 PIN MOLEX RT ANGLE	43-164
	5 PIN HOUSING	43-080
H2	7 PIN MOLEX RT ANGLE	43-103
	7 PIN HOUSING	43-059
H3	2 PIN MOLEX RT ANGLE	43-101
	2 PIN HOUSING	43-099
JP	.4" JUMPER	67-069
TP1	TEST POINT	67-046

CONTROL BOARD RESISTORS		
R1	33K2 1/4W 1% MTL FILM	92-3322
R2	6K34 1/4W 1% MTL FILM	92-6341
R3	33K2 1/4W 1% MTL FILM	92-3322
R4	1M0 1/4W 1% MTL FILM	92-1004

R5	33K2 1/4W 1% MTL FILM	92-3322
R6	6K34 1/4W 1% MTL FILM	92-6341
R7	33K2 1/4W 1% MTL FILM	92-3322
R8	1M0 1/4W 1% MTL FILM	92-1004
R9	33K2 1/4W 1% MTL FILM	92-3322
R10	6K34 1/4W 1% MTL FILM	92-6341
R11	33K2 1/4W 1% MTL FILM	92-3322
R12	1M0 1/4W 1% MTL FILM	92-1004
R13	33K2 1/4W 1% MTL FILM	92-3322
R14	6K34 1/4W 1% MTL FILM	92-6341
R15	33K2 1/4W 1% MTL FILM	92-3322
R16	1M0 1/4W 1% MTL FILM	92-1004
R17	4K75 1/4W 1% MTL FILM	92-4751
R18	4K99 1/4W 1% MTL FILM	92-4991
R19	4K99 1/4W 1% MTL FILM	92-4991
R20	2K43 1/4W 1% MTL FILM	92-2431
R21	49R9 1/4W 1% MTL FILM	92-0499G
R22	1K74 1/4W 1% MTL FILM	92-1741
R23	2K43 1/4W 1% MTL FILM	92-2431
R24	49R9 1/4W 1% MTL FILM	92-0499G
R25	1K74 1/4W 1% MTL FILM	92-1741
R26	1KO 1/4W 1% MTL FILM	92-1001
R27	100R 1/4W 1% MTL FILM	92-0100
R28	100R 1/4W 1% MTL FILM	92-0100
R29	1K0 1/4W 1% MTL FILM	92-1001
R30	10K0 1/4W 1% MTL FILM	92-1002
R31	20K0 1/4W 1% MTL FILM	92-2002
R32	10K0 1/4W 1% MTL FILM	92-1002
R33	10K0 1/4W 1% MTL FILM	92-1002
R34	221K 1/4W 1% MTL FILM	92-2213
R35	4K99 1/4W 1% MTL FILM	92-4991
R36	5M6 1/4W 5% CARB FILM	90-656
R37	3K93 1/4W 1% MTL FILM	92-3931
R38	10K0 1/4W 1% MTL FILM	92-1002
R39	15K0 1/4W 1% MTL FILM	92-1502
R40	100K 1/4W 1% MTL FILM	92-1003
R41	100K 1/4W 1% MTL FILM	92-1003
R42	270R 1/4W 5% CARB FILM	90-227
R43	200K 1/4W 1% MTL FILM	92-2003
R44	150R 1/4W 1% MTL FILM	92-0150
R45	8K25 1/4W 1% MTL FILM	92-8251
R46	8K25 1/4W 1% MTL FILM	92-8251
R47	4K99 1/4W 1% MTL FILM	92-4991
R48	10K0 1/4W 1% MTL FILM	92-1002
R49	20K0 1/4W 1% MTL FILM	92-2002
R50	20K0 1/4W 1% MTL FILM	92-2002
R51	1K0 1/4W 1% MTL FILM	92-1001
R52	100K 1/4W 1% MTL FILM	92-1003
R53	100K 1/4W 1% MTL FILM	92-1003
R54	200K 1/4W 1% MTL FILM	92-2003
R55	825R 1/4W 1% MTL FILM	92-0825
R56	1M0 1/4W 1% MTL FILM	92-1004
R57	10K0 1/4W 1% MTL FILM	92-1002
R58	1K0 1/4W 1% MTL FILM	92-1001
R59	1K0 1/4W 1% MTL FILM	92-1001
R60	100K 1/4W 1% MTL FILM	92-1003
R61	30K1 1/4W 1% MTL FILM	92-3012
R62	20K0 1/4W 1% MTL FILM	92-2002
R63	20K0 1/4W 1% MTL FILM	92-2002
R64	20K0 1/4W 1% MTL FILM	92-2002
R65	33K2 1/4W 1% MTL FILM	92-3322
R66	20K0 1/4W 1% MTL FILM	92-2001
R67	20K0 1/4W 1% MTL FILM	92-2001
R68	20K0 1/4W 1% MTL FILM	92-2002
R69	1K0 1/4W 1% MTL FILM	92-1001
R70	1K0 1/4W 1% MTL FILM	92-1001
R71	1K0 1/4W 1% MTL FILM	92-1001
R72	1K0 1/4W 1% MTL FILM	92-1001
R73	1K0 1/4W 1% MTL FILM	92-1001
R74	6R81 1/4W 1% MTL FILM	92-0681
RN1	10K0 R/N ISO	97-004-I8
RN2	220R R/N ISO	97-023-I8
RN3	10K0 R/N ISO	97-004-I8
RN4	220R R/N ISO	97-023-I8
RN5	10K0 R/N ISO	97-004-I8
RN6	220R R/N ISO	97-023-I8
RN7	10K0 R/N ISO	97-004-I8
RN8	220R R/N ISO	97-023-I8
RN9	20K0 R/N ISO	97-005-I8
RN10	20K0 R/N ISO	97-005-I8
RN11	20K0 R/N ISO	97-005-I8

CONTROL BOARD SWITCHES

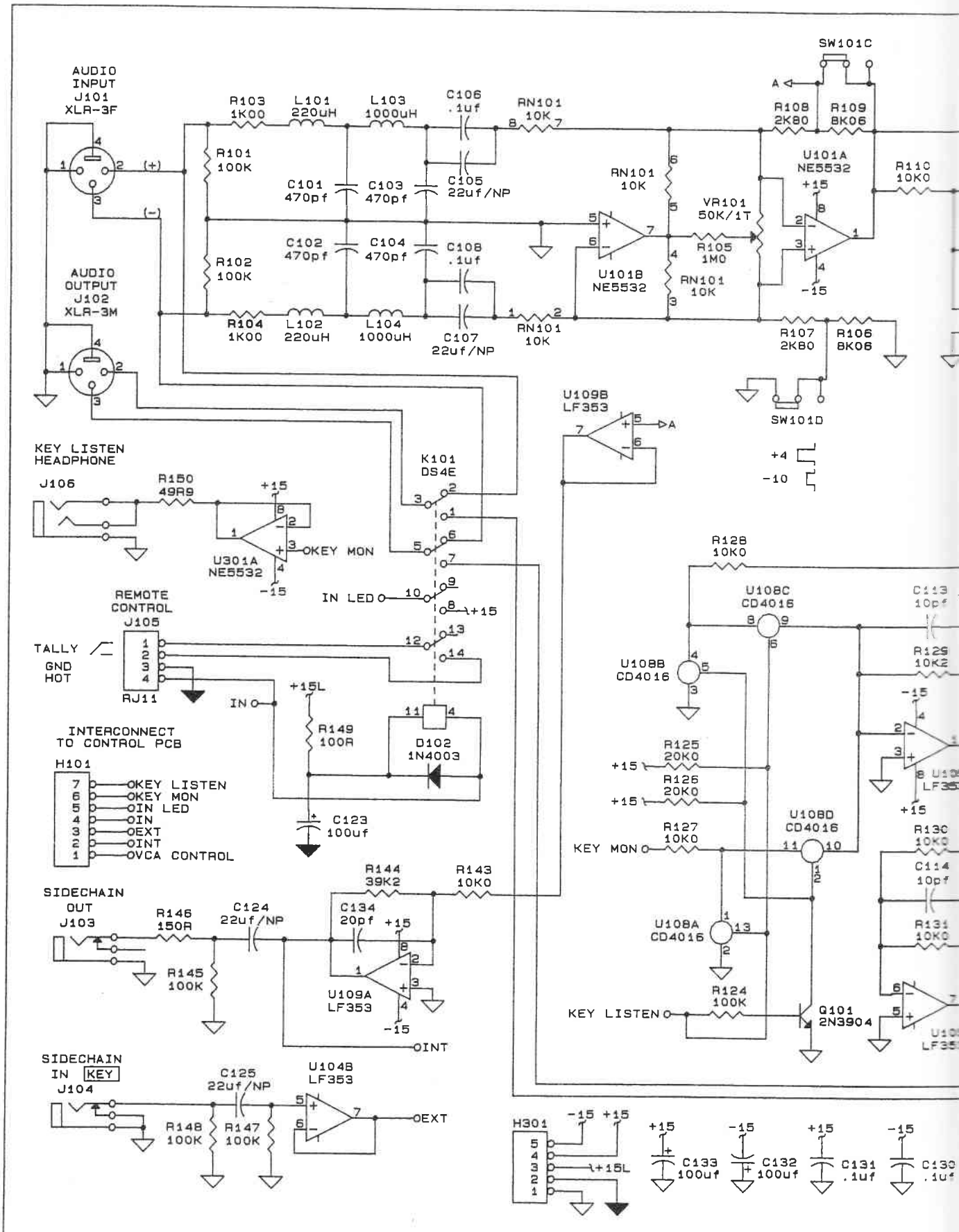
SW1	2PDT MTK2UEE NON-SHORT	20-031
SW2	2PDT MTK2UEE NON/SHORT	20-031
SW3	2PDT MTK2UEE NON/SHORT	20-031
SW4	2PDT MTK2UEE NON/SHORT	20-031
SW5	2PDT MTK2UEE NON/SHORT	20-031
SW6	4PDT MTK4UEE NON/SHORT	20-030
SW7	2PDT MTK2UEE NON/SHORT	20-031

CONTROL BOARD VARIABLE RESISTORS

VR1	B100K	23-094
VR2	B100K	23-094
VR3	B100K	23-094
VR4	15A10K/100K	23-097
VR5	15A500K	23-095
VR6	15A500K	23-095
VR7	15A100K	23-096
VR8	15A100K	23-096
VR9	10K/1T PIHER LAYDOWN	22-003

PART #	VALUE	STOCK #
POWER SUPPLY CAPACITORS		
C1	3300uF/35V ELECT	82-054
C2	3300uF/35V ELECT	82-054
C3	1uF/35V TANT	83-001
C4	1uF/35V TANT	83-001
POWER SUPPLY SEMICONDUCTORS		
D1	1N4003 POWER DIODE	30-009
D2	1N4003 POWER DIODE	30-009
D3	1N4003 POWER DIODE	30-009
D4	1N4003 POWER DIODE	30-009
U1	LM7815 POS REG	36-009
U2	LM7915 NEG REG	36-010
BR1	BRIDGE RECTIFIER	30-004
POWER SUPPLY CONNECTORS		
H1	7PIN MOLEX STRAIGHT	43-062
	7PIN HOUSING	43-059
H2	5PIN MOLEX STRAIGHT	43-101
	5PIN HOUSING	43-080
H3	5PIN MOLEX STRAIGHT	43-101
	5PIN HOUSING	43-080
H4	5PIN MOLEX STRAIGHT	43-101
	5PIN HOUSING	43-080

13.0 SCHEMATICS


AUDIO INPUT J101 XLR-3F
AUDIO OUTPUT J102 XLR-3M
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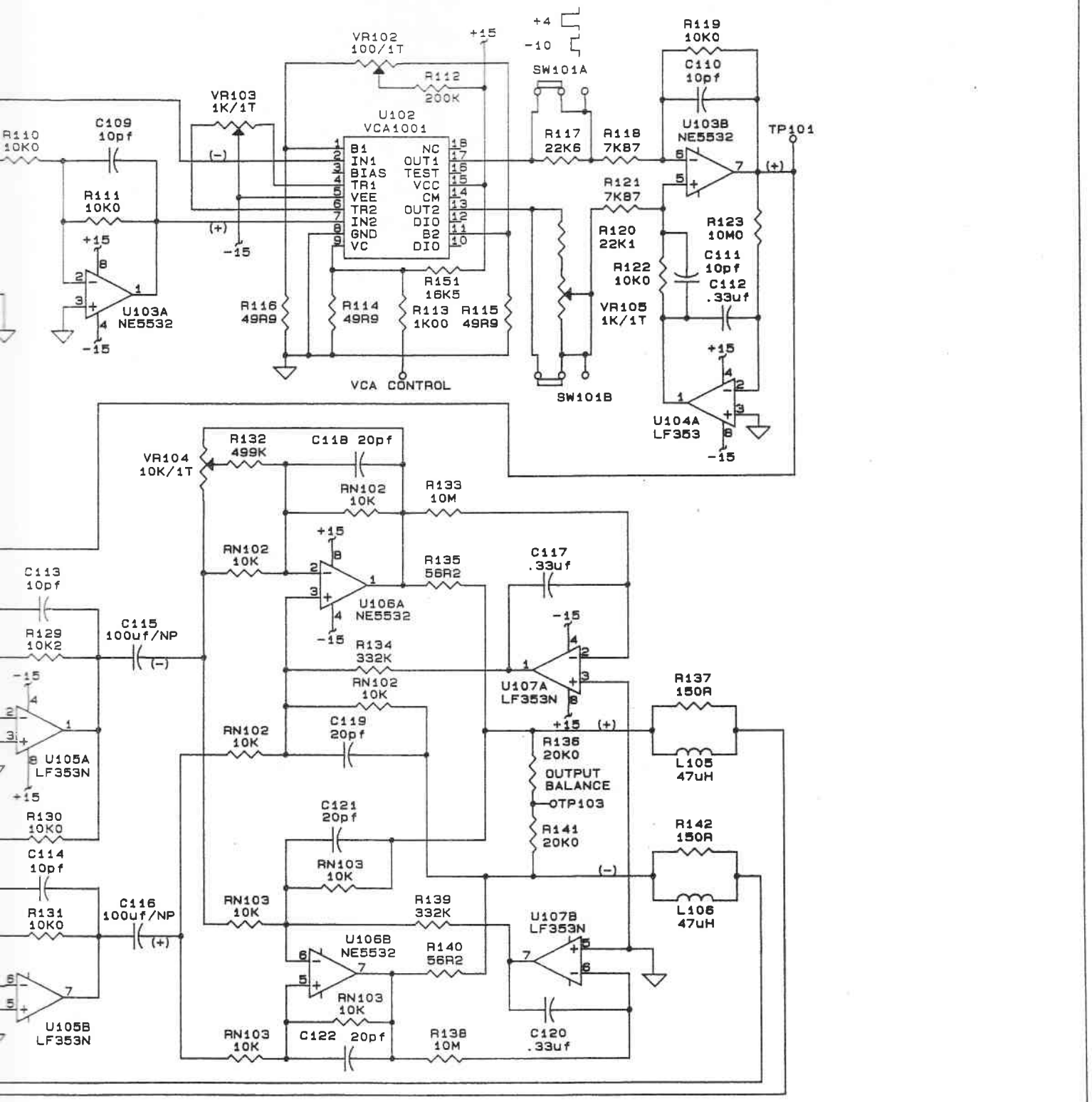
L101 220uH
L103 1000uH
C106 .1uf
RN101 10K
R101 100K
C101 470pf
C103 470pf
C105 22uf/NP
R102 100K
C102 470pf
C104 470pf
C108 .1uf
R104 1K00
L102 220uH
L104 1000uH
C107 22uf/NP
SW101C
R108 2K80
R109 8K06
U101A NE5532
R110 10K0
VR101 50K/1T
R105 1M0
U101B NE5532
R107 2K80
R106 8K06
SW101D
U109B LF353
+4
-10
KEY LISTEN HEADPHONE
J106
R150 49R9
U301A NE5532
OKEY MON
K101 DS4E
IN LED
REMOTE CONTROL J105
TALLY
GND
HOT
RJ11
IN
R149 100R
D102 1N4003
C123 100uf
INTERCONNECT TO CONTROL PCB
H101
OKEY LISTEN
OKEY MON
OIN LED
OIN
OEXT
OINT
OVCA CONTROL
SIDECHAIN OUT J103
R146 150R
C124 22uf/NP
R145 100K
R144 39K2
R143 10K0
C134 20pf
U109A LF353
OINT
SIDECHAIN IN KEY J104
C125 22uf/NP
U104B LF353
R148 100K
R147 100K
OEXT
R128 10K0
U108C CD4016
C113 10pf
U108B CD4016
R129 10K2
R125 20K0
R126 20K0
U108D CD4016
R127 10K0
KEY MON
R130 10K0
C114 10pf
U108A CD4016
R131 10K0
R124 100K
KEY LISTEN
Q101 2N3904
H301
C133 100uf
C132 100uf
C131 .1uf
C130 .1uf



APHEX SYSTEMS LTD.		
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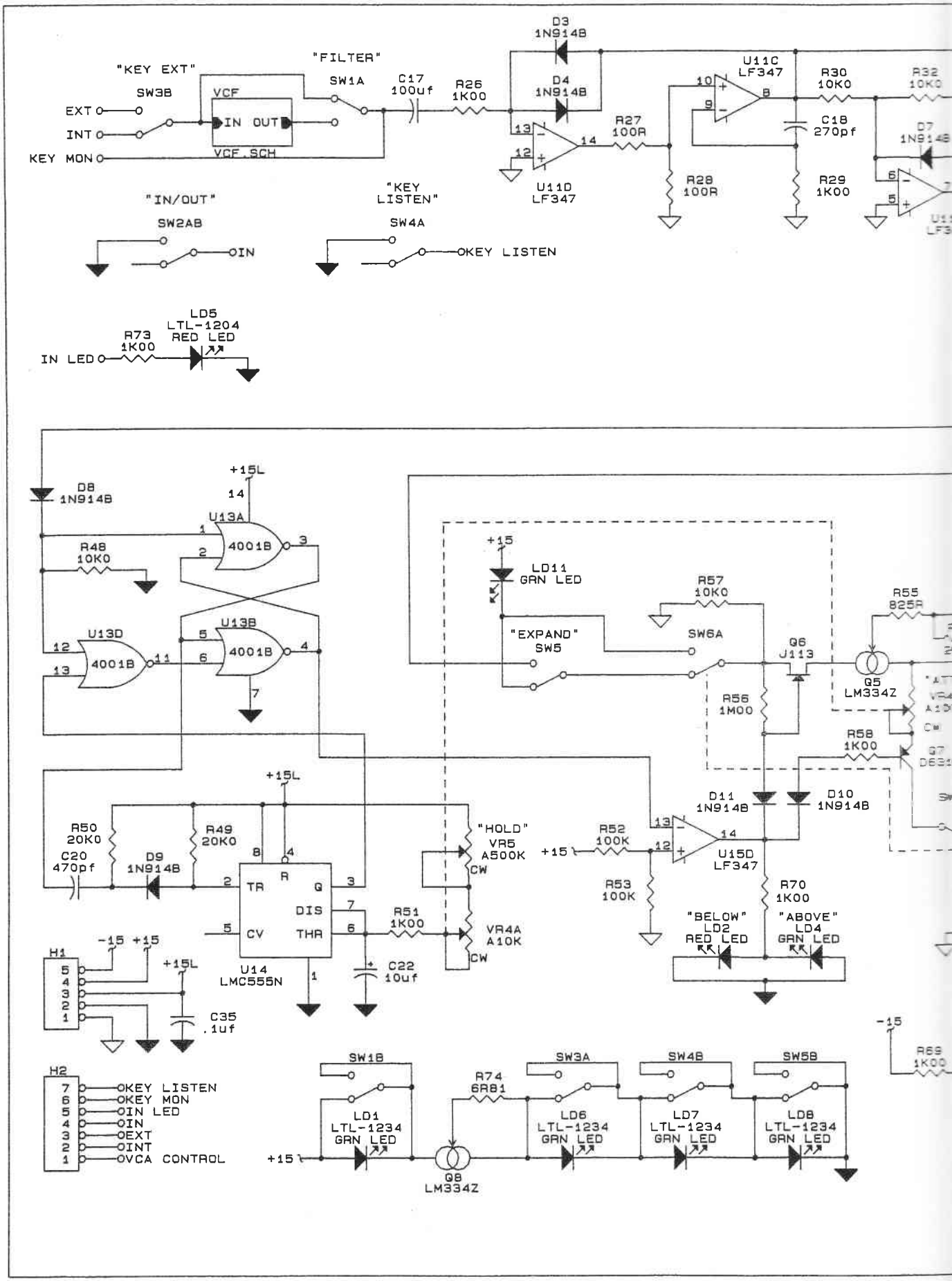
Size: B	Document Number: 68-234A.SCH	REV: A
Date: November 28, 1993	Sheet 1 of 1	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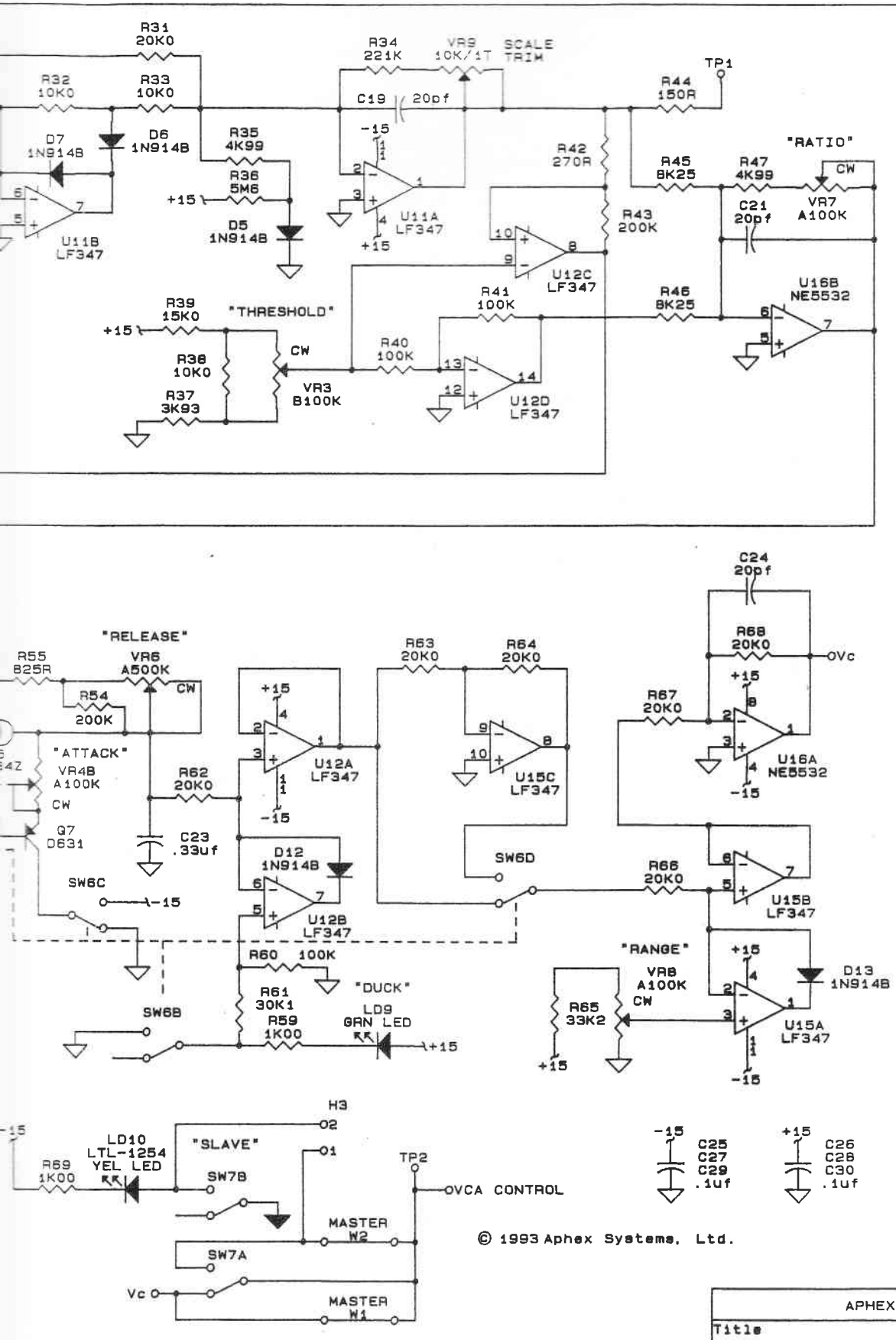
SW3B
EXT
INT
KEY MON
VCF
IN OUT
VCF.SCH
"FILTER"
SW1A
C17
100uf
R26
1K00
D3
1N914B
D4
1N914B
U11C
LF347
U11D
LF347
R27
100R
R28
100R
R29
1K00
R30
10K0
C18
270pf
R32
10K0
D7
1N914B
"IN/OUT"
SW2AB
IN
"KEY
LISTEN"
SW4A
KEY LISTEN
LD5
LTL-1204
RED LED
R73
1K00
IN LED
D8
1N914B
+15L
U13A
4001B
R48
10K0
U13D
4001B
U13B
4001B
+15
LD11
GRN LED
"EXPAND"
SW5
SW6A
R57
10K0
R55
825R
Q6
J113
Q5
LM334Z
R56
1M00
R58
1K00
D11
1N914B
D10
1N914B
R50
20K0
C20
470pf
D9
1N914B
R49
20K0
"HOLD"
VR5
A500K
CW
R51
1K00
VR4A
A10K
CW
U14
LMC555N
C22
10uf
C35
.1uf
R52
100K
R53
100K
U15D
LF347
R70
1K00
"BELOW"
LD2
RED LED
"ABOVE"
LD4
GRN LED
H1
-15 +15
+15L
H2
OKEY LISTEN
OKEY MON
OIN LED
OIN
OEXT
OINT
OVCA CONTROL
SW1B
SW3A
SW4B
SW5B
R74
6R81
LD1
LTL-1234
GRN LED
LD6
LTL-1234
GRN LED
LD7
LTL-1234
GRN LED
LD8
LTL-1234
GRN LED
Q8
LM334Z
-15
R69
1K00



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Title: MODEL 622 EXPANDER/GATE SIDECHAIN		
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