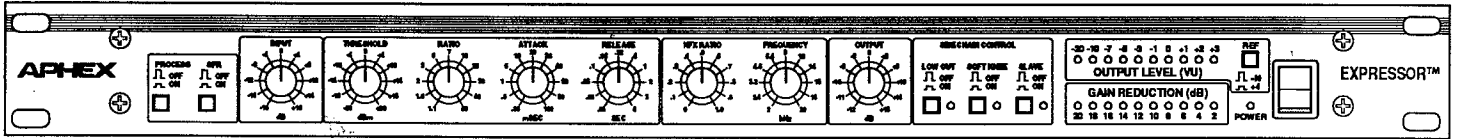


# EXPRESSOR™ MODEL 651



## OPERATING GUIDE

**APHEX**  
SYSTEMS

**WARNING**

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

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# 1.0 INTRODUCTION

## *We've got the "sound"...*

The Aphex EXPRESSOR™, Model 651, is the "sound" you've been looking for but, until now, could not find in any other compressor/limiter devices. Now you can get it *fast* and get it *clean* with fully adjustable controls and unparalleled audio performance.

In addition to the standard controls (i.e., INPUT, THRESHOLD, RATIO, ATTACK, RELEASE, and OUTPUT) you'd expect to find on a professional device like this, we've included several unique features that give you more value for your money.

## *Unique features...*

With our exclusive High Frequency Expander (patent pending), you can use higher compression ratios, even up to 50 to 1, without worrying about "dullness" artifacts, typically found in other wide-band devices. The Spectral Phase Refractor feature restores bass clarity and punch without any increase in amplitude. Sidechain Controls let you choose whether you want to cut low frequencies, employ a soft-knee threshold, or link two EXPRESSORs for stereo or master/slave operation. Servo-balanced XLR input and output connections allow you to use your EXPRESSOR in any audio environment such as:

- Tracking, Mixing, Mastering
- Fixed Installations
- Tape Duplication
- P.A. Systems
- Voice Processing
- Post-Production

## *About this manual...*

In the following sections, you will find information on Installation, Gain Reduction, and Front Panel Controls. The last section, Applications, presents a number of templates that illustrate how to use your EXPRESSOR on Drums, Percussion, Guitars, Vocals, and as a Peak Limiter. Several blank templates are also provided for your own use in noting any custom settings.

## 2.0 INSTALLATION

Follow the instructions listed here to install and initially set up your new EXPRESSOR. Once you've completed this section, read the next section on Gain Reduction principles to gain a better understanding of how Gain Reduction works. Then read the Front Panel Controls and Applications sections for ideas on how to use the EXPRESSOR on your next audio date..

### 2.1 Unpacking and Mounting

Your EXPRESSOR, Model 651, was carefully packed at the factory, and the container was designed to protect it. Nevertheless, we recommend careful inspection of the box to determine if any damage occurred in transit. Save the box, so you can properly repack the EXPRESSOR for transport, in case it should ever need repair.

### 2.2 Rear Panel Connections

The EXPRESSOR's rear panel provides audio connections for AUDIO INPUT and AUDIO OUTPUT, and Sidechain Access for SEND, RETURN, and LINK, as shown in Fig. 2-1. AUDIO INPUT and AUDIO OUTPUT use standard 3-pin XLR's, while SEND, RETURN, and LINK use standard 1/4" phone jacks.

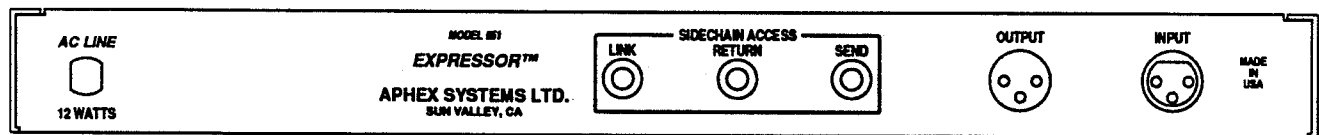


Fig. 2-1. Rear panel layout of EXPRESSOR Model 651.

#### 2.2.1 Audio I/O (Input/Output) Wiring Considerations

Equal polarity is maintained from input to output, so that you may elect to use either pin 2 or pin 3 as the high side to match your wiring standard. Be sure to use proper grounding techniques. In a balanced system, the shield should only be connected to the receiving end of the line (i.e., pin 1 of input jack) and at the opposite end of the output line. Avoid connecting the shield to ground at both ends of the cable. For an unbalanced system, use shielded twisted-pair cable as a "pseudo-balanced" technique.

##### 2.2.1.1 Balance vs. Unbalanced Use

The EXPRESSOR can easily be used with Unbalanced Audio Equipment. For Unbalanced Input or Output, connect the audio "High" lead to either the + or - terminal. Connect the audio "Low" lead to the unused audio terminal. Use a jumper wire to connect together the GND terminal to audio "Low" and "Shield" leads.

### **2.2.1.2 Impedances**

The EXPRESSOR features a high input impedance (22 k $\Omega$  balanced), allowing it to be easily driven by any other piece of audio equipment, including consumer gear. However, a piece of equipment designed to work into a 600  $\Omega$  load may show unusually low output meter readings, even though the unit is driving the EXPRESSOR properly. Or the unit may considerably overdrive the EXPRESSOR's input, while still indicating 0 VU.

In either case, you will observe a large disparity between indicated drive levels, with the EXPRESSOR's meter reading a much higher level than the output meter of the driving unit. If this occurs, install a 600  $\Omega$  resistor across each EXPRESSOR input to lower the input impedance to 600  $\Omega$ .

The output impedance of the EXPRESSOR is very low (65  $\Omega$  balanced), allowing it to easily drive almost any load. However, there are some types of inputs, especially transformer types, that are designed to see a 600  $\Omega$  source impedance. An indication of this mismatch would be a non-linear frequency response, emphasizing the low frequencies.

In this case, install two 300  $\Omega$ , 1/4 watt, 1% resistors (at each output) in a series bridge with pins 2 and 3 to create a 600  $\Omega$  source impedance.

### **2.2.2 Sidechain Access Wiring Considerations**

Sidechain Access is provided via three phone jacks, labelled SEND, RETURN, and LINK. The jacks are standard 1/4" mono phone connectors, with pin 1 as an unbalanced high audio signal (at nominal 0 dBv) and pin 2 as audio ground.

You can use the LINK jack to either link two EXPRESSOR's for Stereo operation (SLAVE OFF/ON Switch is OFF) or Master/Slave operation (SLAVE OFF/ON Switch is ON). Refer to Section 4.11.3 in Front Panel Controls for more information.

Use the SEND jack to send the EXPRESSOR's internal audio control signal to an outside device for creative processing. Use the RETURN jack to feed an external audio control signal back into the EXPRESSOR's sidechain.

NOTE...



The signal at the SEND jack is normalised to the RETURN jack (refer to the block diagram in Fig. 4-2). Placing a phone plug into the SEND jack breaks the signal path, so be sure to insert an audio control signal via another phone plug into the RETURN jack for proper EXPRESSOR operation.

## **2.3 AC Line Voltage and Fuse**

The AC line operating voltage on the Model 651 is NOT user-selectable. A desired voltage (100, 120, 220 or 240 VAC) must be specified at time of purchase. Due to the low current draw, the Model 651 uses a thermal fuse built into the power transformer. This should only fail due to a catastrophic problem in the PCB or transformer itself. If failure occurs, the unit must be returned to Aphex or an authorized distributor for repair.

## **2.4 Installing the EXPRESSOR in an Equipment Rack**

The EXPRESSOR occupies one standard rack unit of space (1.75") at a width of 19" and a depth of 8.6". Allow at least an additional 3" of depth for connectors and at least 1/2" of air space around the unit for cooling. Mount the unit in the desired space by using the cushioned rack screws provided with the package.

## **2.5 Applying Power and Initial Checkout**

Apply power to the unit by depressing the POWER switch. The POWER indicator LED should become lit, confirming that AC power is reaching the unit. If the POWER indicator does not light, check whether the line cord is plugged in and the AC receptacle is "hot" (also refer to Section 2.3).

Position all rotary knobs at 12 o'clock, send a test signal of your choice to the input, and verify that the signal is passing through the unit by auditioning or measuring the signal at the output.

## 3.0 GAIN REDUCTION PRINCIPLES

In order to fully understand the features found in your EXPRESSOR, we need to first explain several Gain Reduction principles that are basic to the design of the Aphex family of Gain Reduction devices.

Gain Reduction is the process of proportionally reducing the dynamic range of audio signal into a smaller, more compact range so it "fits" the recording or transmission medium at hand. Ideally, the output signal should be a scaled replica of the original signal, without any undesired artifacts created by the Gain Reduction system.

How well this procedure is executed is subject to a number of factors including: design of the device, understanding Gain Reduction applications, and correctly setting the controls.

### 3.1 Design of the Device

*Audio performance...*

All our Gain Reduction devices (EXPRESSOR, COMPELLOR, and DOMINATOR) use the latest circuit techniques, incorporating our own Aphex VCA 1001, to produce the industry's lowest noise and distortion specifications.

We include transformerless servo-balanced instrumentation input stages on all three product lines to provide high headroom, superb common-mode rejection, transparent audio interface, and high input impedance.

The output stages also use a transformerless servo-balanced design to drive balanced or unbalanced lines without loss of level or increase in distortion. The outputs can actually sense short circuits to ground on either leg (pin 2 or 3). When this occurs, they immediately throw full audio to the other (ungrounded) pin, while turning off the grounded amplifier.

These features translate into unparalleled audio performance in any environment.

### 3.2 Understanding Gain Reduction Applications

*What is Gain Reduction...*

In its simplest form, Gain Reduction is the level difference between Input and Output audio signals. As Input level increases above the (Gain Reduction) Threshold, the amount of Gain Reduction increases. As Input level decreases (still above the Threshold), the amount of Gain Reduction decreases. This relationship can be expressed as the following formula:

$$\text{Input (dB)} - \text{Gain Reduction (dB)} = \text{Output (dB)}$$

#### 3.2.1 Gain Reduction Parameters

*Threshold...*

The level at which Gain Reduction starts is the Threshold setting. Above Threshold, Gain Reduction takes place as the audio level rises above the setting.

When the audio level falls below the Threshold setting, Gain Reduction ceases. Knowing this, we may choose to gain-reduce all or only the highest peaks of the audio signal.

*Ratio...* Ratio is the mathematical relationship that provides a convenient measurement of how much an increase in Input signal level will be reduced. For example, a Ratio of 5:1 means the increase in Input signal is five times larger than the increase in Output signal.

*Attack Time...* Attack Time is defined as the time it takes the Gain Reduction circuit, set at its highest Ratio, to attenuate by 10 dB an increase in the Input signal above Threshold. With a fast Attack Time (e.g., 50  $\mu$ s), the Gain Reduction circuit would react almost immediately to any signal increase above Threshold, whereas a slow Attack Time (e.g., 60 ms) would create a slower reaction time. A lower Ratio setting also influences the Attack Time by proportionally slowing the reaction time.

Overshoot is defined as the signal above the Output signal eventually achieved through Gain Reduction. The slower the Attack Time, the greater the Overshoot. This relationship may be used to create greater "slap", "punch", or "bite", depending upon the particular Input signal.

*Release Time...* Release Time is defined as the time it takes to "undo" or un-attenuate the Gain Reduction by 10 dB when the Input level drops (based on the highest Ratio setting). A very fast Release Time (e.g., 0.4 seconds) quickly "brings up" the Output level as the Input decreases. A slow Release Time (e.g., 2 seconds or longer) creates a gradual release of Gain Reduction.

A faster Release Time will generally keep the Output level more constant and make low level signals louder. A slower Release Time will allow the Output dynamics to more closely resemble the Input dynamics, resulting in a more natural sound.

*Make-Up Gain...* Make-Up Gain is the amount of additional gain needed to bring the gain-reduced signal up to a desired Output level.

### **3.2.2 Different Types of Gain Reduction and Applications**

*Five different types...* There are five different types of Gain Reduction: Leveling, Compression, Program Limiting, Peak Limiting, and Clipping. Depending on the application, you must choose which type or which combination of types of Gain Reduction are appropriate to achieve a desired effect.


*Leveling...* Leveling maintains a consistent output level over the long term, without affecting the short-term dynamics. The Ratio is set for a high value, while Attack and Release Times are adjusted for slow response.

**Compression...** Compression is a low Ratio setting with faster Attack and Release times. It is used to "fit" a wide dynamic range signal into a smaller range. Compression is typically used to bring low level signals "up."

**Program Limiting...** Program Limiting is a high Ratio setting with fast Attack and Release times. It is used to set a maximum level for an "average" (i.e., VU) Output.

**Peak Limiting...** Peak Limiting is high Ratio setting with extremely fast Attack and Release times. It is used to set a maximum level for peak Output. Most peak limiters will produce Overshoot even though the Attack Time is very fast.

**Clipping...** Clipping is an infinite Ratio setting with nearly instantaneous Attack and Release times. It provides an absolute, zero overshoot, "brick wall" at which peak levels will be capped.


**NOTE...**  Typically, higher Ratio settings and faster Attack/Release times produce greater Gain Reduction effects. The EXPRESSOR allows you to use these effects for creative purposes. If these effects are not desired, then use more sophisticated gain control devices like the COMPELLOR on average levels and the DOMINATOR on peak levels.

### 3.3 Setting the EXPRESSOR Controls

When using any Gain Reduction device, you need to know your system's nominal operating level. Even if your console operates at +4 dBm, the patch insert points may be 0 dBm or -10 dBv. The next step is to use a consistent set-up method like the one discussed below.

A suggested Set-up Method for the EXPRESSOR:

1. On the EXPRESSOR, initially set the RATIO Control to its minimum setting (i.e., 1.1:1) and adjust THRESHOLD for a maximum value (e.g., +20 dBm). These settings effectively make the EXPRESSOR inactive on most audio programs.
2. Next, adjust the INPUT and OUTPUT Controls for unity gain, so that average levels at the Input match the Output. Use the OUTPUT VU Meter to set the Output Level at your system's reference level (also refer to Section 4 - Front Panel Controls).

**NOTE...**  Make sure PROCESS is ON and SPR, LOW CUT, SOFT KNEE, and SLAVE are all OFF. Also adjust the HFX RATIO to 0 and (HFX) FREQUENCY to 20 kHz.

3. Adjust the ATTACK and RELEASE Controls for average values (approximately 12 o'clock position).

4. While listening to the audio program, increase the **RATIO** Control to an average value (approximately 12 o'clock position) and then start lowering the **THRESHOLD** Control. Observe the **GAIN REDUCTION** Meter to see how much Gain Reduction is taking place for the sound you're hearing.
5. Once you've set an approximate **THRESHOLD**, adjust the **RATIO**, **ATTACK** and **RELEASE** Controls and judge the effect of each adjustment.
6. After you've set the controls in step 5, adjust the **OUTPUT** Control to make up any desired gain.

At this point, you've correctly adjusted the **EXPRESSOR** for its basic Compression application. The remaining controls add additional refinements to the sound you've created. Until you become more proficient in its use, follow this basic set-up each time you use the **EXPRESSOR** on an audio date.

Read the next section for further details on the **Front Panel Control**. After that, look at the **Application templates** to help you "express" your own creative ideas.

## 4.0 FRONT PANEL CONTROLS

The Aphex EXPRESSOR provides you with a number of fully adjustable controls, located on the front panel, as shown in Fig. 4-1.

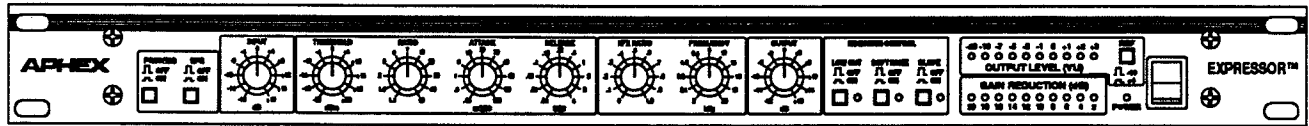


Fig. 4-1. Front Panel layout of EXPRESSOR Model 651.

The first two controls (from left to right) are pushbutton switches for selection of PROCESS ON/OFF and SPR ON/OFF. Next, are six rotary controls, for setting INPUT, THRESHOLD, RATIO, ATTACK, RELEASE, HFX RATIO and OUTPUT parameters. Three pushbutton switches provide Sidechain Control of LOW CUT ON/OFF, SOFT KNEE ON/OFF and SLAVE ON/OFF. Located on the right are two meters for monitoring OUTPUT LEVEL (VU) and GAIN REDUCTION (dB), and a unit POWER on/off switch.

The following sections contain details on the function and use of each control and switch. A block diagram, shown in Fig. 4-2, illustrates a simplified signal path to help you understand the effect of each adjustment or selection.

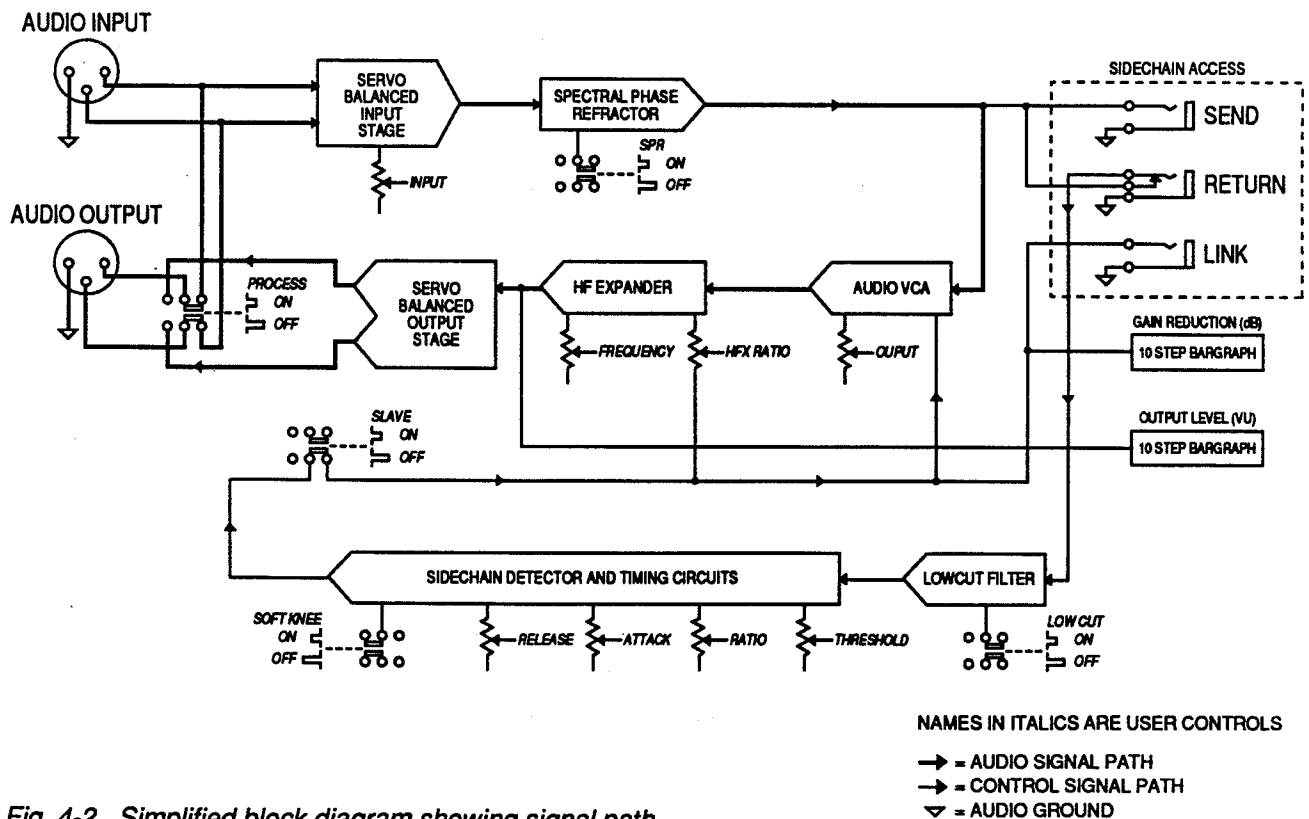


Fig. 4-2. Simplified block diagram showing signal path in the EXPRESSOR Model 651.

Notice that the signal coming from the input is divided into two paths, known as the "Audio Signal Path" and "Control Signal Path". The "Audio Signal Path" basically serves as a signal tap and summing point for the EXPRESSOR circuits. The "Control Signal Path" provides a signal tap for the EXPRESSOR Sidechain Detector and Timing Circuits. Here the control signal is altered and enhanced via the rotary controls, and then is fed to the Voltage Controlled Attenuator to control the audio signal on the way to the output connector.

As a suggestion, periodically refer to the block diagram as you become familiar with the controls and switches described below. When you have completed this section, move on to APPLICATIONS for details on typical settings.

PROCESS  
 OFF  
 ON



#### 4.1 PROCESS OFF/ON Switch

When the PROCESS OFF/ON Switch is ON, audio is routed through the EXPRESSOR. In the OFF position, this switch provides a hardwire audio bypass.

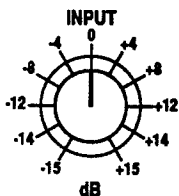
SPR  
 OFF  
 ON



#### 4.2 SPR OFF/ON Switch

First introduced on the AURAL EXCITER TYPE III, the SPR OFF/ON Switch controls a Spectral Phase Refractor effect that is independent of other controls or switches. When the SPR OFF/ON Switch is ON, the main audio signal is processed in such a way that bass frequencies (up to 150 Hz) lead phase in relation to the rest of the spectrum. Through the many steps of recording, duplicating, distributing and reproducing sound, the phase of the low frequency audio spectrum becomes delayed compared to mid and high frequencies.

SPR corrects the bass delay anomaly to restore clarity and openness. This effect significantly increases the apparent bass energy level, without adding any amplitude equalization or bass boost. In certain situations, there may be an opposite effect, so use your ears to judge the sound!



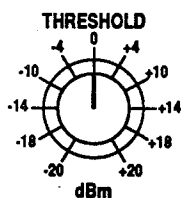
#### 4.3 INPUT Control

The INPUT Control provides a variable audio input gain control that drives the EXPRESSOR circuits. You can adjust this control from -15 to +15 dB with 0 dB representing unity gain, at your system's nominal operating level (e.g., +4, 0, -10, etc.). The servo balanced input stage uses a transformerless circuit that accepts balanced or unbalanced audio signals (see Installation). This design also provides a high degree of common-mode signal rejection, to get rid of unwanted signals generated in long cable runs.

NOTE...




The EXPRESSOR is designed to accept a maximum audio signal of +27 dBm. To maximize signal-to-noise performance, use a high INPUT Control setting when the nominal Input level is low (e.g., -10 dBv).

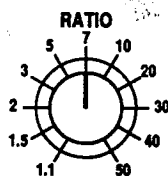


## 4.4 THRESHOLD Control

The THRESHOLD Control allows you to set the threshold level where gain reduction begins, regardless of INPUT Control position. This control is adjustable from -20 to +20 dBm.

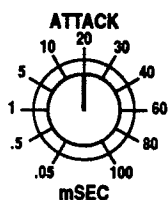
**NOTE...** 

If the SOFT KNEE Switch is ON, the threshold level is automatically lowered by 10 dB to accommodate the lower "soft" compression ratio and keep the same Output level.



## 4.5 RATIO Control

The RATIO Control allows you to compress the incoming audio signal according to the ratio of input versus output signal. The control can be varied from a ratio of 1.1 (to 1) to 50 (to 1). For example, a RATIO setting of 5:1 means the input audio signal above Threshold is compressed to one-fifth of its original level.



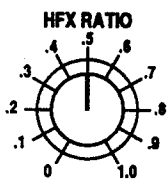
## 4.6 ATTACK Control

The ATTACK Control allows you to control how fast an audio signal is going to be compressed. The control can be varied from .05 to 100 ms, with attack time being defined as the time it takes to fully attenuate a signal by 10 dB with the highest Ratio setting.



## 4.7 RELEASE Control

The RELEASE Control allows you to control how long an audio signal is going to be compressed. The control can be varied from .04 to 4s, with release time being defined as the time it takes to "undo" or un-attenuate a signal by 10 dB with the highest Ratio setting.



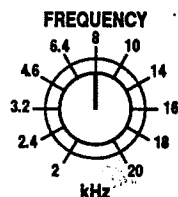
## 4.8 HFX RATIO Control

Fixed equalization is the traditional method of retrieving brightness lost due to high Ratio compression/limiting. The problem with this technique occurs when equalization is no longer needed (i.e., signal is out of limiting) and creates an undesirable audible increase in background noise. The EXPRESSOR provides a unique feature that automatically adds equalization only when necessary. The HFX Control allows you to set the amount of equalization (6 dB per octave shelving) for the amount of Gain Reduction. At a minimum ratio of 0:1, there is no HFX effect. At 1.0:1, there is 1 dB of High Frequency Expansion (or boost) for

every 1 dB of Gain Reduction. The maximum amount of High Frequency Expansion is 6 dB, regardless of the amount of Gain Reduction. With this unique High Frequency Expander, you can add "life" or "air" to a compressed signal, without fear of hearing "background noise pumping" that usually results from standard attempts at post-equalization of a compressed signal.

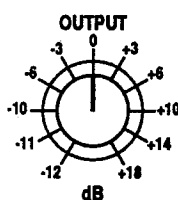
## 4.9 FREQUENCY Control

The FREQUENCY Control lets you set the high pass corner frequency of the HFX expander. The control can be varied from 2 kHz to 20 KHz.



## 4.10 OUTPUT Control

The OUTPUT Control provides a variable audio "make-up" gain control that feeds the EXPRESSOR servo balanced output circuits. You can adjust this control from -12 to +18 dB, with 0 dB representing unity gain at your system's nominal operating level. The servo balanced output stage uses a transformerless circuit that is virtually short-circuit proof and can drive either balanced or unbalanced audio systems (see Installation).

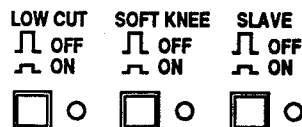


NOTE...



The EXPRESSOR is designed to output a maximum audio signal of +25 dBm.

### SIDECHAIN CONTROL



## 4.11 SIDECHAIN CONTROL

The EXPRESSOR has three SIDECHAIN CONTROLS to provide you with several unique functions to enhance the overall signal. The controls are: LOW CUT OFF/ON Switch, SOFT KNEE OFF/ON Switch, and SLAVE OFF/ON Switch.

### 4.11.1 LOW CUT OFF/ON Switch

When the LOW CUT OFF/ON Switch is ON, a low cut filter (6 dB per octave) is inserted into the sidechain signal to attenuate all frequencies below 80 Hz. With this feature, you can remove unwanted low frequencies (e.g., proximity effect) that can produce unnatural Gain Reduction.

### 4.11.2 SOFT KNEE OFF/ON Switch

When the SOFT KNEE OFF/ON Switch is ON, the THRESHOLD setting is lowered 10 dB, and Gain Reduction becomes more gradual, to produce a less perceived sound change at Threshold. When the RATIO Control is set for a high value, the EXPRESSOR becomes a compressor/limiter.

When SOFT KNEE is OFF, Gain Reduction begins at the RATIO setting. This may produce a noticeable change in signal quality at the Threshold level.

### 4.11.3 SLAVE OFF/ON Switch

When the SLAVE OFF/ON Switch is ON, an audio control signal from another EXPRESSOR can be used to control your EXPRESSOR through respective rear panel LINK jacks. There are two modes of operation: Stereo Link and Slave Link.

#### **Stereo Link:**

Normally, two EXPRESSORs can be linked for stereo operation by connecting a 1/4" phone cable between the two units and leaving the SLAVE OFF/ON Switch in the OFF position (refer to Rear Panel drawing in Fig. 3-1). The EXPRESSOR exhibiting the greatest GAIN REDUCTION will control the pair.

NOTE...



Set all other controls on both EXPRESSOR units to the same respective positions.

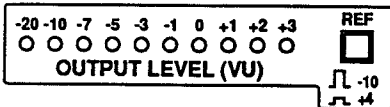
#### **Slave Link:**

When you set SLAVE OFF/ON to ON on one EXPRESSOR, then it will be controlled by the other (master) EXPRESSOR's setting, regardless of the GAIN REDUCTION setting.

NOTE...

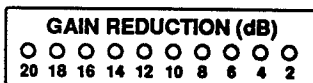


Up to three EXPRESSORs (one master/two slaves) can be linked for master/slave operation. To achieve the same Output from the Slave Units, make sure the INPUT, OUTPUT, and HFX Controls match the Master's settings.



### 4.12 OUTPUT LEVEL (VU) Meter

This VU meter lets you monitor the output level of the EXPRESSOR over a range from -20 to +3 VU. An adjacent REF switch lets you set the 0 VU reading to match either -10 or +4 dB system. The meter shows Output level, regardless of whether the PROCESS ON/OFF Switch is ON or OFF.

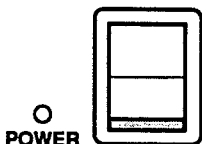


### 4.13 GAIN REDUCTION (dB) Meter

The GAIN REDUCTION meter shows you how much the audio signal is being compressed at any moment for a given THRESHOLD setting. The meter is calibrated in 2 dB steps over a 20 dB range. The meter shows the amount of Gain Reduction generated as if the PROCESS ON/OFF Switch is ON, whether the PROCESS ON/OFF Switch is ON or OFF.

### 4.14 POWER Switch

The POWER on/off switch routes incoming AC power to the internal power supply circuits. A POWER indicator confirms power is reaching the EXPRESSOR.



## 5.0 APPLICATIONS

This section presents a series of application templates to help you begin using your EXPRESSOR immediately. With help from our friend and world-famous producer/recording engineer David J. Holman, we've put together several applications for recording drums, percussion, guitars, and vocals. These ideas have been achieved with the EXPRESSOR inserted into the signal path of console I/O module, after the mic pre-amp or line input, and before the equalizer.

After you've tried a particular application, be sure to experiment with the controls, to come up with your own variations. At the end of this section, we've also included a peak limiter application and several blank user templates to note your own settings.

NOTE...



In the interest of clarity, the application templates do not show the following controls and switches: PROCESS, SPR, INPUT, SIDECHAIN CONTROLS (LOW CUT, SOFT KNEE, SLAVE), OUTPUT, and OUTPUT LEVEL VU. However, the figure caption under each template lists the switches and their ON/OFF status.

Settings for INPUT and OUTPUT Controls depend on desired system and program levels. When using a template application, adjust the THRESHOLD CONTROL until the illustrated GAIN REDUCTION setting is achieved. A lit LED is denoted as a black-filled circle.

IMPORTANT... Make sure that PROCESS is ON for all applications.

### 5.1 Using the EXPRESSOR on Drums and Percussion

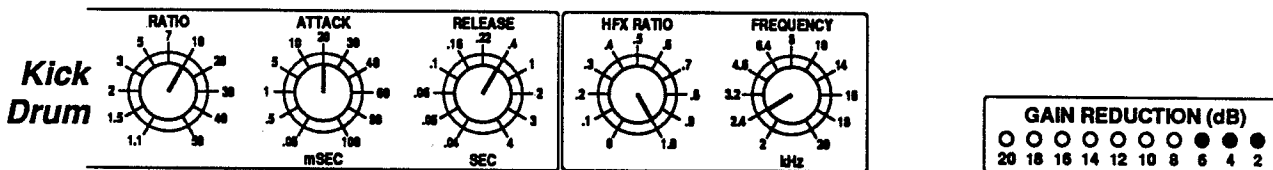


Fig. 5-1. EXPRESSOR on a Kick Drum. PROCESS, SPR, LO CUT, and SOFT KNEE are ON. SLAVE is OFF. The settings provide a "steady, unaffected" sound.

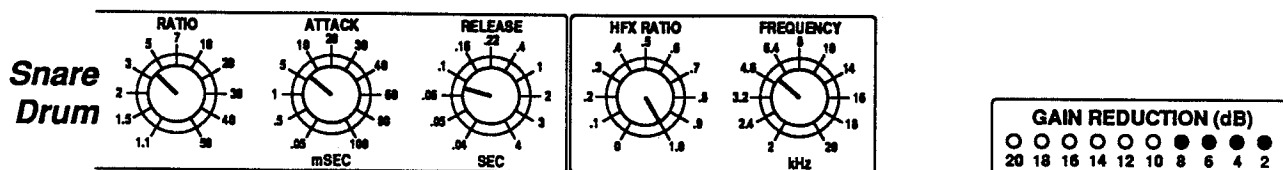


Fig. 5-2. EXPRESSOR on a Snare Drum. PROCESS, SPR, LO CUT, and SOFT KNEE are ON. SLAVE is OFF. Use these settings to provide a "power, pop" sound that is dependent on the size and tuning of the snare drum. Adjust ATTACK for a slower setting to get more stick hit. Adjust RELEASE for desired amount of sustain.

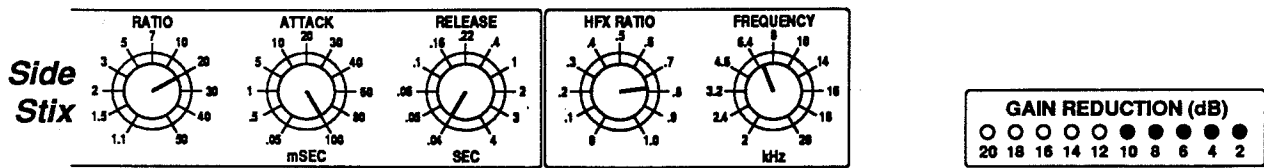


Fig. 5-3. EXPRESSOR on Side Stix. PROCESS and SPR are ON. LO CUT, SOFT KNEE, and SLAVE are OFF. The signal coming into the EXPRESSOR is heavily gated to control any unwanted sounds in the room. More GAIN REDUCTION allows you to hear more of the side stix sound. Use long ATTACK for more of the "hit" sound. Use fastest RELEASE to maintain level.

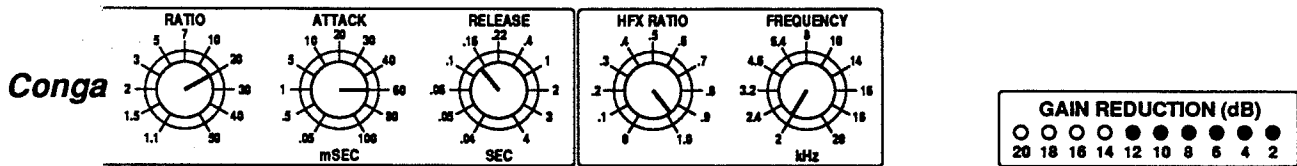


Fig. 5-4. EXPRESSOR on a Conga. PROCESS, SPR, LO CUT, and SOFT KNEE are ON. SLAVE is OFF. These settings help control the low notes of the conga, while bringing out more of the "finger slide" sound. Notice the high amount of GAIN REDUCTION.

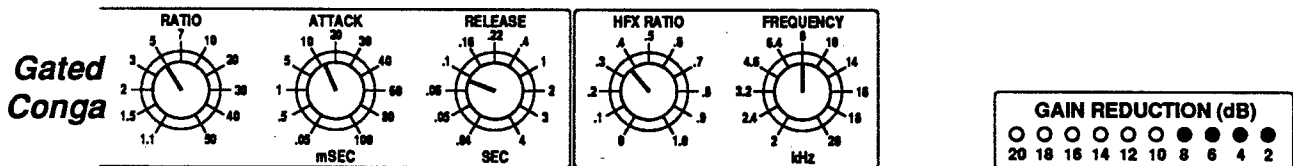


Fig. 5-5. EXPRESSOR on a Gated Conga with Gated Reverb. PROCESS, SPR, LO CUT, and SOFT KNEE are ON. SLAVE is OFF. To produce this unusual sound, the conga signal is gated first to control unwanted room sounds. Reverb is added and also gated, to control the decay sound. The composite signal is fed into the EXPRESSOR to produce a "shorter" conga with pronounced slap and rising reverb.

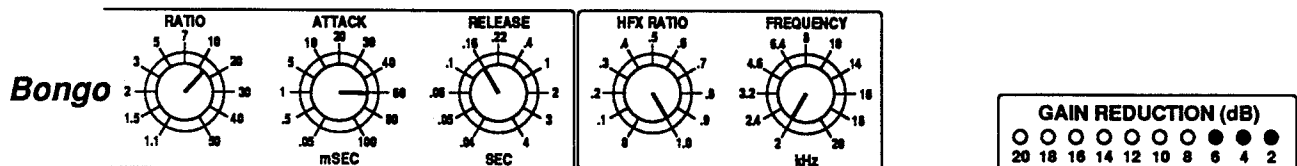
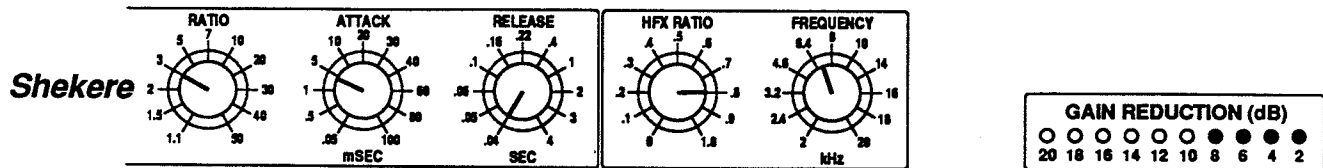
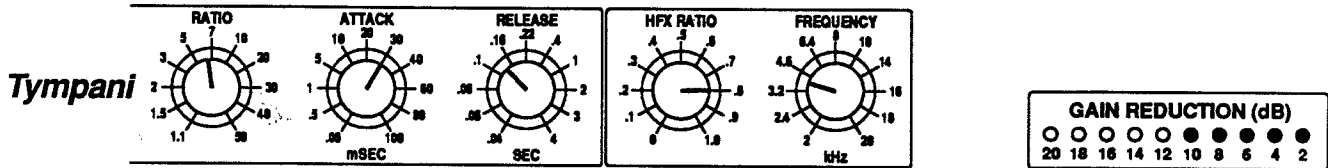


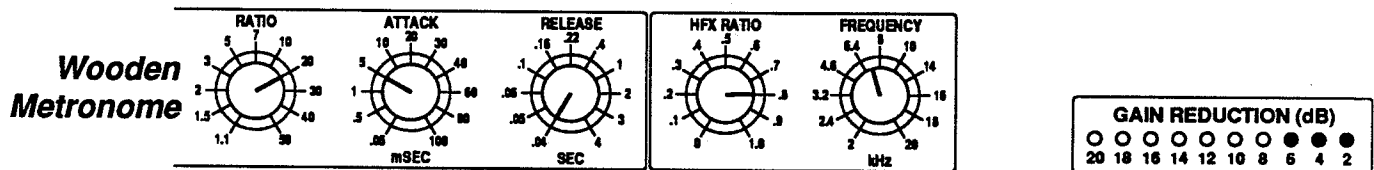
Fig. 5-6. EXPRESSOR on a Bongo. PROCESS, SPR, LO CUT, and SOFT KNEE are ON. SLAVE is OFF. These settings give you "more slap for the buck."



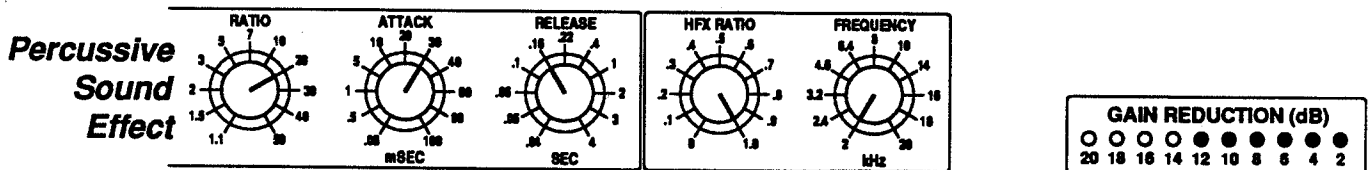
*Fig. 5-7. EXPRESSOR on a Shekere. PROCESS, SPR, LO CUT, and SOFT KNEE are ON. SLAVE is OFF. A fast ATTACK gives you less slap. A fast RELEASE accentuates the "beads" in the instrument.*



*Fig. 5-8. EXPRESSOR on a (poorly sampled) Tympani. PROCESS, SPR, LO CUT, and SOFT KNEE are ON. SLAVE is OFF. Use these settings to build the attack and lengthen the sustain. Makes the sample sound real.*



*Fig. 5-9. EXPRESSOR on a Wooden Metronome. PROCESS and SOFT KNEE are ON. SPR, LOW CUT, and SLAVE are OFF. These settings reduce the dynamics without changing the "wooden" sound. Brings out the "tick-tock" sound to "sit" better in the overall music track.*



*Fig. 5-10. EXPRESSOR on a Percussive Sound Effect. PROCESS, SPR, and SOFT KNEE are ON. LOW CUT and SLAVE are OFF. Try these settings to lengthen and enlarge a sampled sound effect explosion or factory garage door closing. Works well on other percussive-type sound effects.*

## 5.2 Using the EXPRESSOR on Guitar

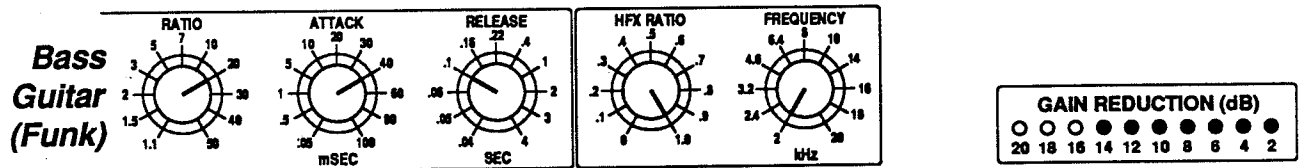


Fig. 5-11. EXPRESSOR on an Electric (Funk) Bass Guitar. PROCESS and SPR are ON. LOW CUT, SOFT KNEE, and SLAVE are OFF. Use these settings on a "funk" bass performance.

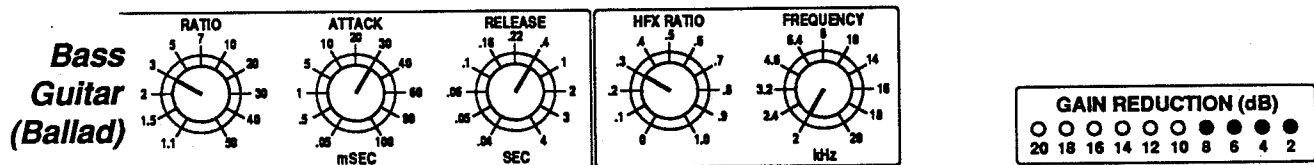


Fig. 5-12. EXPRESSOR on an Electric (Ballad) Bass Guitar. PROCESS, SPR and SOFT KNEE are ON. LOW CUT and SLAVE are OFF. Use these settings on a "ballad" bass performance.

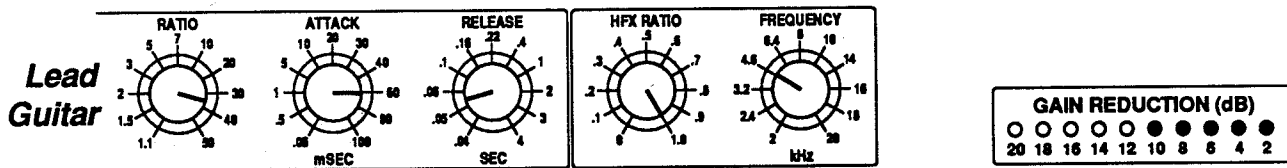


Fig. 5-13. EXPRESSOR on a Lead Guitar. PROCESS and SPR are ON. LOW CUT, SOFT KNEE, and SLAVE are OFF. Adjust ATTACK to build-up "bang" and RELEASE to maintain the overall level.

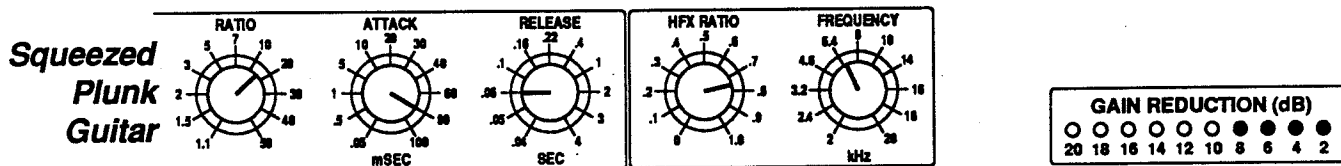
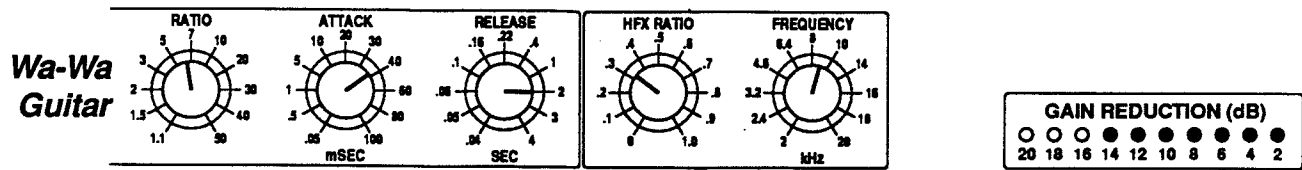
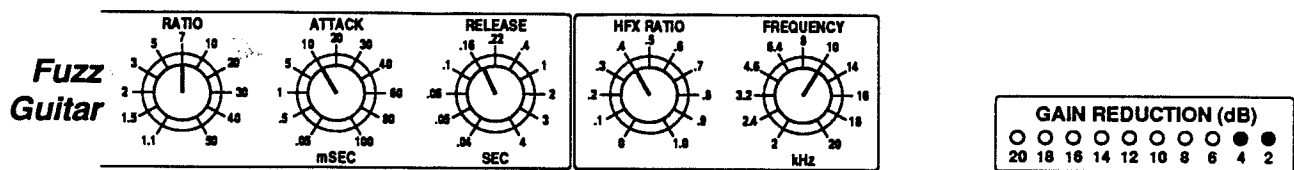


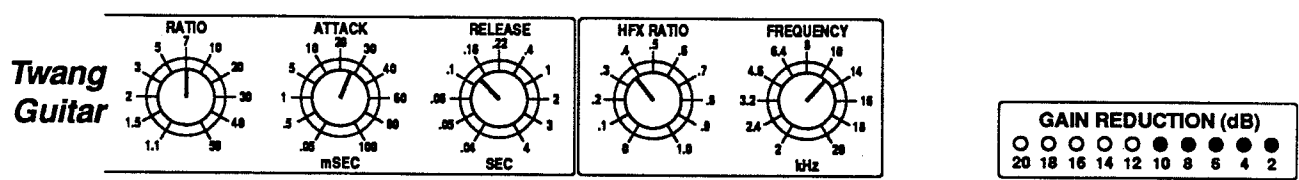
Fig. 5-14. EXPRESSOR on a (Squeezed) Plunk Guitar. PROCESS and SPR are ON. LOW CUT, SOFT KNEE, and SLAVE are OFF. The signal is "squeezed" first via a tube limiter enroute to the EXPRESSOR. For more of the "plunk" sound, adjust ATTACK for a faster time. Adjust RELEASE to maintain the overall level.



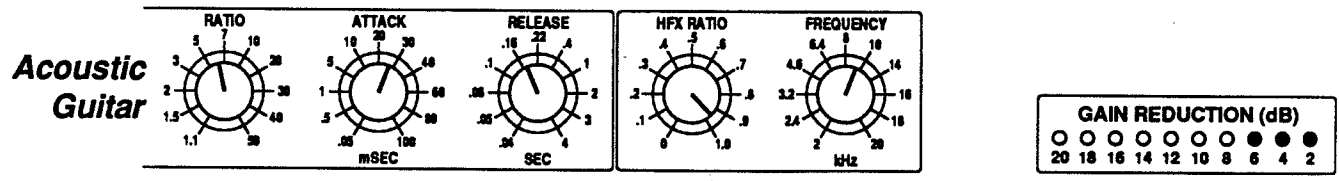
*Fig. 5-15. EXPRESSOR on a "Wa-Wa" Guitar. PROCESS, SPR and SOFT KNEE are ON. LOW CUT and SLAVE are OFF. These settings control the "Wa-Wa" levels without changing the sound. Notice the large amount of GAIN REDUCTION.*



*Fig. 5-16. EXPRESSOR on a "Fuzz" Guitar. PROCESS and SOFT KNEE are ON. SPR, LOW CUT, and SLAVE are OFF. Try these settings on a "soft and warm" fuzz guitar performance.*



*Fig. 5-17. EXPRESSOR on a "Twang" Guitar. PROCESS, SPR, and SOFT KNEE are ON. LOW CUT, and SLAVE are OFF. This "Telecaster" type of guitar sound is already bright, so keep the HFX RATIO low. Remaining settings bring out the "twang" sound in the mix.*



*Fig. 5-18. EXPRESSOR on a Acoustic Guitar. PROCESS and SOFT KNEE are ON. SPR, LOW CUT, and SLAVE are OFF. Adjust ATTACK, RELEASE, and FREQUENCY for the best sound, depending on type and brand of acoustic guitar and the performer's playing style (e.g., strum, finger pick, slide, etc.).*

### 5.3 Using the EXPRESSOR on Vocals

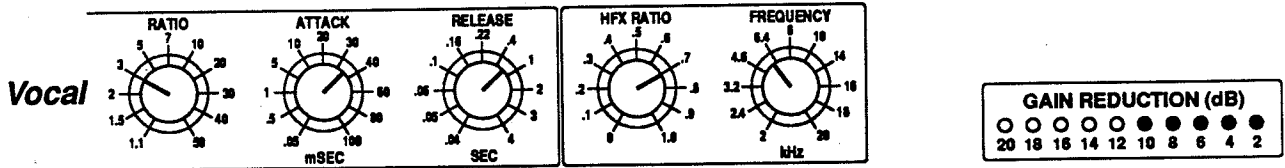


Fig. 5-19. EXPRESSOR on a Vocal. PROCESS, SPR, SOFT KNEE, and LOW CUT are ON. SLAVE is OFF. Depending on the singer's dynamic range, try keeping the RATIO between 2 and 5:1.

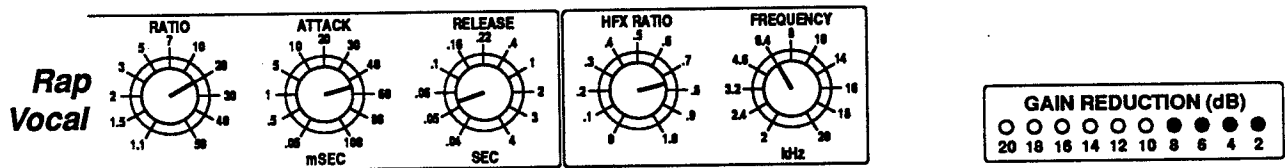


Fig. 5-20. EXPRESSOR on a Rap Vocal. PROCESS, SPR, and LOW CUT are ON. SOFT KNEE and SLAVE are OFF. For rap vocals, a 20:1 RATIO and a fast RELEASE keeps "the pump" in time with the track by bringing up the low-level words and breathes.

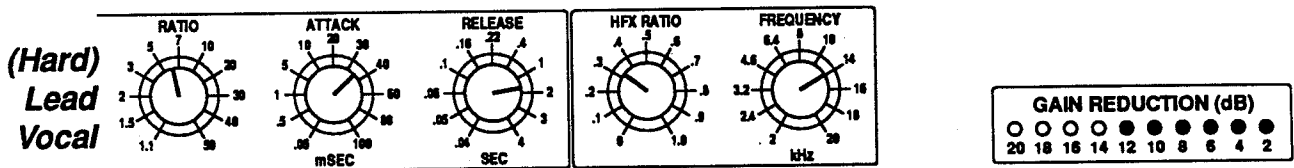


Fig. 5-21. EXPRESSOR on a (Hard) Lead Vocal. PROCESS, SPR, SOFT KNEE, and are ON. LOW CUT and SLAVE are OFF. Pre-compress the lead vocal enroute to the EXPRESSOR. Use a fair amount of GAIN REDUCTION to control overall level.

### 5.4 Using the EXPRESSOR as a Peak Limiter

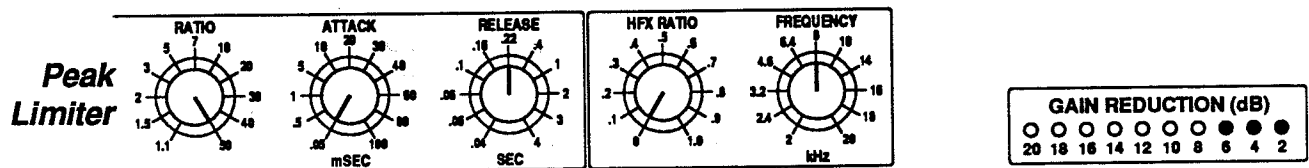


Fig. 5-22. EXPRESSOR as a Peak Limiter. PROCESS is ON. SPR, LOW CUT, SOFT KNEE, and SLAVE are OFF. Use a high RATIO, fast ATTACK, and adjust the THRESHOLD to approximately 6 dB below maximum peak output. Adjust the INPUT and OUTPUT Controls for unity gain through the EXPRESSOR.

## 5.5 User Templates

<b>RATIO</b> 	<b>ATTACK</b> 	<b>RELEASE</b> 	<b>HFX RATIO</b> 	<b>FREQUENCY</b> 
------------------	-------------------	--------------------	----------------------	----------------------

SPR  ON  OFF  
 LOW CUT    
 SOFT KNEE

**GAIN REDUCTION (dB)**

20 18 16 14 12 10 8 6 4 2

<b>RATIO</b> 	<b>ATTACK</b> 	<b>RELEASE</b> 	<b>HFX RATIO</b> 	<b>FREQUENCY</b> 
------------------	-------------------	--------------------	----------------------	----------------------

SPR  ON  OFF  
 LOW CUT    
 SOFT KNEE

**GAIN REDUCTION (dB)**

20 18 16 14 12 10 8 6 4 2

<b>RATIO</b> 	<b>ATTACK</b> 	<b>RELEASE</b> 	<b>HFX RATIO</b> 	<b>FREQUENCY</b> 
------------------	-------------------	--------------------	----------------------	----------------------

SPR  ON  OFF  
 LOW CUT    
 SOFT KNEE

**GAIN REDUCTION (dB)**

20 18 16 14 12 10 8 6 4 2

<b>RATIO</b> 	<b>ATTACK</b> 	<b>RELEASE</b> 	<b>HFX RATIO</b> 	<b>FREQUENCY</b> 
------------------	-------------------	--------------------	----------------------	----------------------

SPR  ON  OFF  
 LOW CUT    
 SOFT KNEE

**GAIN REDUCTION (dB)**

20 18 16 14 12 10 8 6 4 2

## 6.0 SPECIFICATIONS AND WARRANTY

### 6.1 Specifications

#### *Input*

Type	Electronically Servo-Balanced Input
Impedance	22 kOhms
Maximum Input Level	+27 dBm

#### *Output*

Type	Electronically Servo-Balanced
Output Impedance	65 Ohms
Maximum Output Level (600 Ohm Load)	+25 dBm
Dynamic Range	112 dB
Bandwidth	5 Hz to 100 kHz; +0, -0.2 dB
Noise and Hum @ Unity Gain	-85 dBm
THD @ +4 dBm	0.006 %
IMD (SMPTE) @ +10 dBm	0.006 %

#### *Controls*

Input	-15 to +15 dB
Threshold	-20 to +20 dBm
Attack Time	0.5 to 100 ms
Release	0.4 to 4 s
Ratio	1.1:1 to 50:1
HF Expander:	
Ratio	0:1 to 1:1
Frequency	2 kHz to 20 kHz

#### *Power*

Line Voltage Range (120 VAC)	97 to 132 VAC
Line Voltage Range (220 VAC)	194 to 264 VAC
Power Consumption	12 Watts

#### *Dimensions*

1.75" H (44.9 mm) x 19" W  
(487.2 mm) x 8.6" D (220.5 mm)

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. Specifications and appearance may differ from those listed or shown.

## **6.2 Warranty**

Aphex Systems warrants parts and labor for the EXPRESSOR Model 651 for a period of one year from the date of purchase. If you need to return a unit for repair, repack it in the original carton and packing material, if possible. Please include a letter with a complete description of the problem. For warranty repair, also enclose a copy of the proof of purchase. Prior to shipping, contact us for a Return Authorization Number.

Aphex Systems Limited  
11068 Randall Street, Sun Valley, CA 91352  
PH: (818) 767-2929 • FAX: (818) 767-2641

## SPARE PARTS LIST

ITEM	DESCRIPTION	APHEX PN
BUTTON CAPS		11-009
KNOBS		12-004
KNOB CAPS		14-003
SWITCH DPDT	ROCKER	20-015
SWITCH DPDT	PUSHBUTTON	20-031
SWITCH 4PDT	PUSHBUTTON	20-030
SWITCH 4PDT	PUSHBUTTON SHORTING	20-029
POT 15A10K		23-037
POT 15C10K		23-035
POT 15A500K		23-057
POT B10K		23-056
POT 15A100K		23-037
DIODE	1N914B	30-002
DIODE BRIDGE		30-004
DIODE	1N4003	30-009
RED LED		27-035
GREEN LED		27-034
YELLOW LED		27-037
NPN TRANSISTOR	2N3904	31-015
PNP TRANSISTOR	2N3906	31-011
DUAL OPAMP	LF353N	32-007
DUAL LN OPAMP	NE5532N	32-028
VCA	VCA1001	33-052
BARGRAPH DRIVER	LM3915	33-035
BARGRAPH DRIVER	LM3916	33-030
VOLT REG	7815	36-009
VOLT REG	7915	36-010
XLR MALE		43-073
XLR FEMALE		43-074
1/4" PHONE		43-129

## MAIN BOARD

68-173SA

## RESISTORS

PART#	VALUE	TOL	STYLE	STOCK#
R203,R209	10R0	1%	FILM	92-0100
R214,R213,	21R5	1%	FILM	92-0215
R122,R119,R123,R140,	56R2	1%	FILM	92-0562
R141,R142,R159,R168,				
R174,R175,R176,R190,				
R191,R193				
RI83,R106	100R	1%	FILM	92-1000
R113,R161,R170	150R	1%	FILM	92-1500
R196,R107	402R	1%	FILM	92-4020
R192,R120,R172	536R	1%	FILM	92-5360
R116,R121,R131,R139,	1K00	1%	FILM	92-1001
R171,R104,R102				
R212	1K18	1%	FILM	92-1181
R137	2K00	1%	FILM	92-2001
R199,R194,R195,R200,	2K49	1%	FILM	92-2491
R219				
R108,R109	4K75	1%	FILM	92-4751
R129	5K11	1%	FILM	92-5111
R202	5K36	1%	FILM	92-5361
R130	6K65	1%	FILM	92-6651
R178,R180	7K50	1%	FILM	92-7501
R117,R118,R132,R133,	10K0	1%	FILM	92-1002
R145,R147,R148,R149,				
R150,R151,R152,R153,				
R154,R158,R163,R165,				
R166,R176,R179,R181,				
R184,R188,R204,R206,				
R207,R208,R210,R211				
R197	11K0	1%	FILM	92-1102
R146,R143	15K0	1%	FILM	92-1502
R125,R126,R127,R128	18K2	1%	FILM	92-1822
R160,R138,R169,R173,	20K0	1%	FILM	92-2002
R299				
R134	24K3	1%	FILM	92-2432
R115	39K2	1%	FILM	92-3922
R198	49K9	1%	FILM	92-4992
R101,R103,R112,R189	100K	1%	FILM	92-1003
R185	121K	1%	FILM	92-1213
R124,R144,R177	200K	1%	FILM	92-2003
R157,R162,R201	332K	1%	FILM	92-3323
RI86	365K	1%	FILM	92-3653
R136	392K	1%	FILM	92-3923
R155	499K	1%	FILM	92-4993
R105,R135,R218	1M00	1%	FILM	92-1004
R205	1M21	1%	FILM	92-1214
R156,R164,R182,R187,R127,	10M	1%	FILM	92-1005

## RESISTOR NET WORK

PART#	VALUE	STOCK#
RN101, RN102	10K	97-004-I8

## CAPACITORS

PART#	VALUE	STYLE	STOCK#
C102, C101	470pf	CERAMIC	80-015
C119	.0047uf	GREEN	81-012
C116	.047uf	GREEN	81-014
C103, C103, C114, C115, C135	22uf/25v	ELEC	89-001
C139, C124, C125	100uf/25V	ELEC	82-014
C150, C151	2200UF/35V	ELEC	82-040
C152, C153	1uf	TANTALUM	83-001
C140	2.2uf	TANTALUM	83-007
C105, C106	.1uf	FOIL WIMA MKS-3	84-036
C144, C127, C130, C134, C137	.33uf	FOIL WIMA MKS-3	84-039
C109, C111	.47uf	FOIL WIMA MKS-2	84-070
C107, C110, C112, C117	10pf	MICA	85-001
C121, C123, C132, C133			
C118, C120, C122, C126, C128, C129, C131	20pf	MICA	85-003
C136, C138	5pf	MICA	85-017
C141, C142, C154, C155, C156, C157, C157, C159, C160, C161	.1uf	MONO	88-001

## VARIABLE RESISTORS

PART#	VALUE	STYLE	STOCK#
VR102, VR103, VR105, VR107	15C10K		23-035
VR106	B10K		23-038
VR101	15A10K		23-037
VR108	15A100K		23-056
VR104	15A500K		23-057
VR113, VR118	10K/1T		22-003
VR109	50K/1T		22-008
VR112, VR115, VR117	100/1T		22-009
VR111, VR114, VR116	1K/1T		22-011
VR110	2K5/1T		22-027

HARDWARE

PART#	DESCRIPTION	FUNCTION	STOCK#
SW104	PB4PDT	SHORTING	20-029
SW101,SW102	PB4PDT		20-030
SW103,SW105	PB2PDT		20-031
H101	4 PIN MOLEX .156		43-025
J102	XLR3M		43-073
J101	XLR3F		43-074
J103,J104,J105	PHONEJACK STEREO SW		43-129
	HEATSINK		65-003
	POT BRACKET		67-092B
	PCB		68-173B

INDUCTORS

PART#	DESCRIPTION	STOCK#
L101,L102	47uh	72-018
TP101-TP109	TEST POINT	67-046
W101	4 COND WIRE JUMPER	

SEMICONDUCTORS

PART#	DESCRIPTION	FUNCTION	STOCK#
LED101,LED102, LED103,LED104, LED105	RED LED	LITE-ON	27-035
D101,D102,D103,D104, D105,D106,D107	1N914B		30-002
BR101,BR102	BRIDGE	RECTIFIER	30-004
D122,D120,D121,D123	1N4003		30-009
Q101,Q102,Q106,Q107, Q108,Q109-Q113	2N3906		31-011
Q103,Q104,Q105,Q116	2N3904		31-015
U107,U108,U113,U115, U116,U117,U120	LF353		32-007
U101-U106,U110,U111 U114	NE5532		32-028
U109,U104,U112	VCA1001		33-052
U118	7815 POS	REGULATOR	36-009
U119	7915 NEG	REGULATOR	36-010

GAIN REDUCTION DISPLAY BOARD

68-174SA

RESISTORS

PART#	VALUE	TOL	STYLE	STOCK#
R103	150R	1%	FILM	92-1500
R104	1K00	1%	FILM	92-1001
R102	2K49	1%	FILM	92-2491
R101	10K0	1%	FILM	92-1002

SEMICONDUCTORS

PART#	DESCRIPTION	STOCK#
LD1-LD10	LTL-1234A	27-034
LD11	LTL-1204A	27-035
U101	LM3914	33-023

HARDWARE

PART#	DESCRIPTION	STOCK#
PCB	PCB	68-174A

CAPACITOR

PART#	VALUE	STYLE	STOCK#
C101, C102	22UF		82-003

OUTPUT DISPLAY BOARD

68-175SA

RESISTORS

PART#	VALUE	TOL	STYLE	STOCK#
R111	150R	1%	FILM	92-1500
R110	2K49	1%	FILM	92-2491
R105,R109	10K0	1%	FILM	92-1002
R101,R103	20K0	1%	FILM	92-2002
R104,R106				
R102,R108	23K7	1%	FILM	92-2372
R107	499K	1%	FILM	92-4993

CAPACITORS

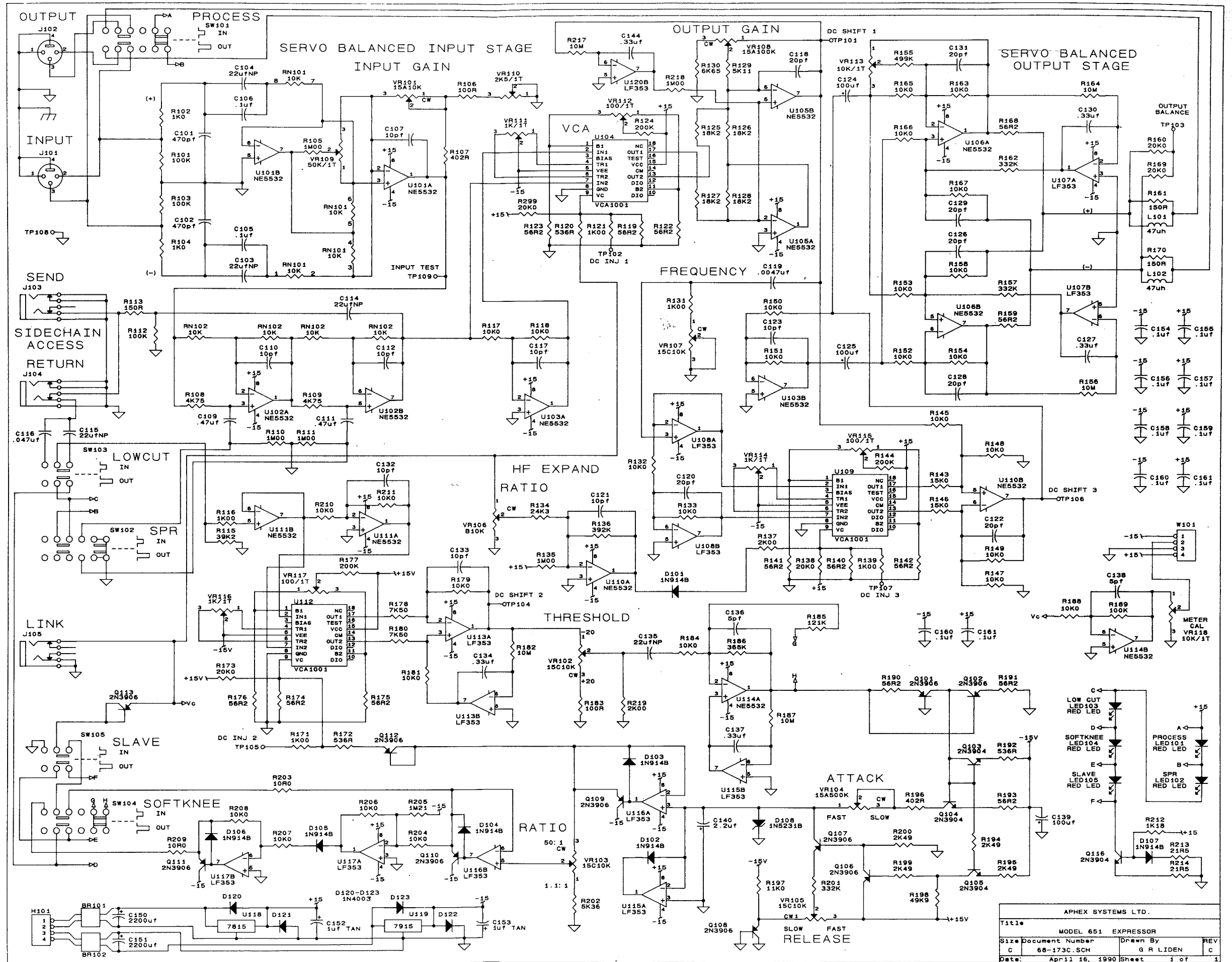
PART#	VALUE	STYLE	STOCK#
C101,C103,C104	22UF	ELECTROLYTIC	82-003
C102	.33UF	FOIL	84-039

HARDWARE

PART#	DESCRIPTION	FUNCTION	STOCK#
PCB	PCB		68-175A

SEMICONDUCTORS

PART#	DESCRIPTION	FUNCTION	STOCK#
SW101		PB2PDT	20-031
LD5-LD10	GREEN LED	LTL-1234A	27-034
LD1-LD3	RED LED	LTL-1204A	27-035
LD4	YELLOW LED	LTL-1254A	27-037
D101-D104		1N914B30-002	
U101		LF353	32-007
U102		LM3916	33-030



APHEX SYSTEMS LTD.		
Title	MODEL 651 EXPRESSOR	
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