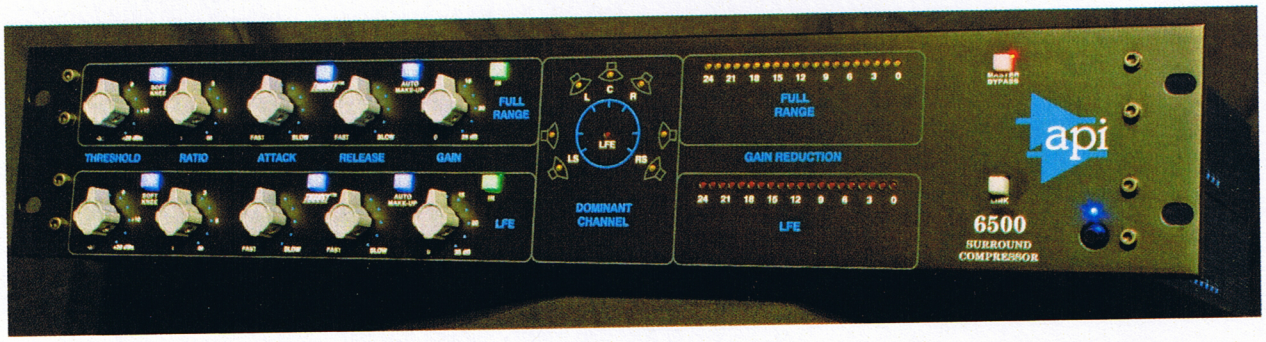
THE API 6500 SURROUND COMPRESSOR



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AN OVERVIEW OF THE 6500 SURROUND COMPRESSOR

Thank you for choosing an API 6500 surround compressor. It represents the most advanced technology available today thoughtfully applied using traditional API circuit techniques. The result is a compressor with powerful capabilities that has a euphonic sonic signature.

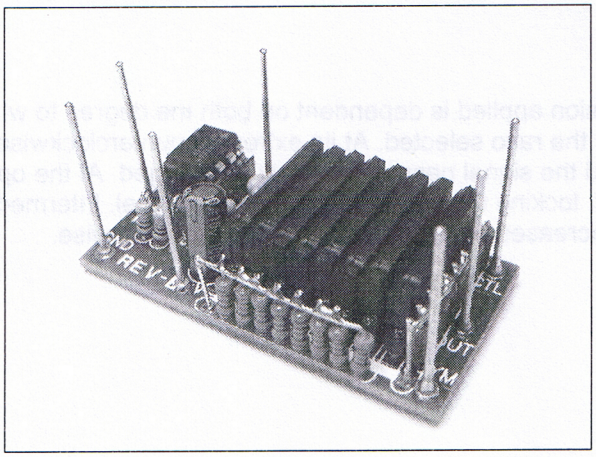
The Analog OR

The 6500 employs a new method of level sensing in its side chain called the "Analog OR". Conventional compressors and limiters develop a control signal that is based on the sum of its inputs. This works well enough for stereo signals that tend to rise and fall in level in both channels simultaneously. In a surround signal, it is common for some channels to become louder while others become quieter as the program switches between dialog and music, or when an effect is moving across the sound-field. A conventional control signal would miss large peaks that occur in these cases. The analog OR circuit looks at the level of each of the channels simultaneously and always uses the loudest one as a basis for forming the control signal.

This is also an advantage when linking or unlinking channels. In the conventional method the sum level rises as more channels are added to the sensing circuitry. This requires the operator to tweak the threshold each time more channels are included. The analog OR merely examines a larger population of channels and applies compression only when the loudest one exceeds the threshold, no matter if it is one or 100 different signals. Gain reduction is applied to all of the signals equally, thus preserving the delicate imaging details of stereo pairs, multi-channel stems, or those single channel signals that are panned between channels.

The 2002 VCA

An important element in the 6500 is the new 2002 VCA gain cell. VCAs are contributors to the most objectionable distortions found in analog circuit design, which are grudgingly accepted as a necessary price to be paid for gain control. In most cases, the distortion contribution is not only sonically distasteful, but also larger in quantity than the more euphonic distortions present elsewhere in the design. The 2002 has lower distortion than any previously available VCA, allowing the typical API sonic signature to shine through, even when the signal is in deep compression.



Smooth Attack and Release

Another novel feature is the linear attack and release characteristic. Most designs control the level in a manner that is linear in decibels, but apply the onset and release of the gain reduction in an exponential manner. This is especially noticeable on a slow release from deep compression where the signal level rises unevenly after it drops below the threshold. The attack and release circuits in the 6500 respond in the same way an engineer would change level when moving a fader by hand, making the compressor's operation less apparent to the listener because the ear naturally responds to linear decibel changes.

Legendary API Sound

As is typical of all API designs, gain is provided by a 2520 discrete operational amplifier driving the legendary 2503 output transformer. A balanced input is provided by the 2510 discrete operational amplifier, which is similar to the 2520, but without the high current output stage. The output is capable of delivering +30 dBu before clipping. This is 6dB higher than typical professional electronics. If clipping is heard, it is most likely due to other elements in the signal path.

Power Mute and Bypass

Also included is a true hard-wire bypass. In this mode the output connector is wired directly to the input. Shortly after power is first applied, or immediately after it is lost, a special circuit forces this mode so signal is never lost and power thumps are never heard. You will notice that the BYP button lights red in bypass mode whenever either the circuit or the operator put it into bypass.

Front Panel Controls

THRESHOLD Control

This control reads in decibels and sets the point where the input level is measured for gain reduction. As long as the input does not exceed the threshold, no compression will be applied.

RATIO Control

The amount of compression applied is dependent on both the degree to which the signal level is above the threshold and the ratio selected. At its extreme counterclockwise position, there is little compression applied and the signal passes relatively unchanged. At the opposite extreme, the unit behaves as a limiter, locking the output to the threshold level. Intermediate settings apply a compression ratio that increases as the control is advanced clockwise.

SOFT KNEE Switch

When out, this switch allows the compressor to operate in a manner that is similar to most compressors. Below the threshold the gain is left unchanged, but above the threshold the output level is adjusted to be a ratio of the degree that the input level has exceeded the threshold. When depressed, there is a smooth transition between these two states, applying a small amount of compression below the threshold and gradually transitioning to the selected ratio above the threshold.

Other compressors with a soft knee function make a very audible change when the control is engaged. This is not so much due to the knee itself, but to the shift in threshold that occurs as a side effect of the knee circuit. The 6500 does not shift the chosen threshold, so the sonic effect is subtle, like it is supposed to be. When depressed, its action is confined to the transition area around the threshold and is inaudible when the signal level is more than a few decibels away from that point.

THRUST Circuit

When this control is engaged, a filter is applied to the side chain that makes the compression more dependent on high frequency content in the signal. This can better approximate the perceived volume of the signal and helps sensitize the compressor to transient components of the channel.

This is especially useful in compressing mixed program. Without thrust, a compressor will tend to base its control on the signal with the most energy. Typically that is a bass instrument like kick drum or bass guitar. The vocals and solos will ride up and down in level as a result. Inserting the THRUST circuitry will focus the compressor's attention to the lead instruments.

No changes to the tonal balance of the audio signal will occur with the application of the THRUST circuit.

ATTACK and RELEASE Controls

These controls are used in the same way as other compressors. They can be set to accommodate a wide range of signals and allow for operation that can range from subtle to aggressive. Their action is totally linear in decibels and therefore will not sound different under differing amounts of gain reduction. This allows these controls to be set without interacting with the threshold and ratio settings.

MAKE-UP Controls

Since the job of a compressor is to reduce the level of loud signals, it is necessary to add an amount of gain afterwards to restore the signal to standard operating level. This can be done automatically by depressing the AUTO MAKE-UP switch. Here, gain is added that is based on the position of the THRESHOLD and RATIO controls. Alternately, when AUTO MAKE-UP is off, up to 25 dB of gain can be added manually using the GAIN control. Typically this is set to make the apparent loudness the same as when the unit is OUT or in BYP mode. This not only optimizes dynamic range, but it provides an excellent method to make an A-B comparison with the uncompressed signal.

GAIN REDUCTION Meter

This meter shows the amount of reduction applied, including the effects of the ATTACK and RELEASE controls. It does not indicate any extra gain applied through the MAKE-UP controls and is inactive when the compressor is switched to the OUT mode or when slaved after the LINK control is activated. It does however read when the unit is in BYP mode, indicating what will happen if the compressor is put into the path.

LINK Switch

When depressed, the LINK switch deactivates the controls for the LFE channel and brings it under the sensing and control of the full range channels.

IN Switch

When IN is selected, the unit is fully operational. When it is out there is no compression applied. It differs from BYP in that the electronics and transformers are still in the signal path.

BYP Switch

When this is selected, the unit enters a true straight-wire bypass, the output is connected directly to the input and there are no electronics in the signal path.

POWER Switch

This power switch has a unique transient bypass capability. When powered down, the unit is automatically in bypass, regardless of the BYP selection. Upon power-up there is a delay, which allows all the electronics to stabilize for a couple of seconds by enforcing bypass mode. Also, if power is removed or lost for any reason, the bypass mode is immediately invoked in order to maintain signal throughput without any interruption. The BYP button's light is red whenever the unit is in bypass, regardless of the BYP button's position.

REAR PANEL CONNECTIONS

Balanced IN and OUT Connections

The input XLR is connected to an active balanced circuit. The output XLR is driven from a transformer and can drive any load from 600 ohms or greater to full output capability. The polarity is such that there is no change from input to output, so it is suitable in studios using either pin 2 or pin 3 as the "hot" connection.

Side Chain Input

Normally the level sensing side chain circuitry is presented the same signal that is on the XLR input. If a signal is applied to the ¼ inch connector, the side chain uses that signal instead. It is balanced and can be driven from either balanced or unbalanced sources.

Traditionally the side chain is either fed a filtered or equalized version of the signal, which forces the compressor to operate on specific frequency ranges of the signal. Another common use is to add automatic "ducking" using an entirely different signal. In order to make the ducking signal work properly, the other inputs need to have their side chains deactivated which will defeat the analog OR circuitry. This is easily done by dead-patching all the other side chain inputs. To do this, you could plug in any quarter inch plug that has no signal input on it.

An interesting new application can be employed with digital workstations. With careful application of a delay of just a few milliseconds to the main inputs while the "earlier" signal is put to the side chain, the compressor can "predict" the signal and react to peaks in the program that have not yet arrived. This allows for a slower attack speed than would be useful under typical configurations. The signal can be compressed without any peaks slipping by untouched or becoming distorted by rapid gain changes. The result can be a high degree of compression without choppy sonic artifacts.

LFE Channel Note

The LFE channel has a separate set of compression controls, but otherwise shares exactly the same functionality as the other channels. It does not have any filtering or signal modifications of any kind.

Voltage Selection and Fuse

For line voltages from 100v to 120v, set the switch to 115v. The 230v position is good for all line voltages from 200-240 volts. When set to the 115v position use a 500mA GMA fuse with Slo-Blo characteristics. At the 230v setting use a 250mA Slo-Blo fuse. **It is important to change the fuse when changing the supply voltage.**

SPECIFICATIONS

Input Impedance:	> 100 kOhm Balanced
Output Impedance:	< 75 Ohm Floating
Maximum output Level:	> +28 dBu with 600 Ohm or greater load
Frequency Response:	Better than ± 1dB from 10 Hz to 30 kHz
Distortion:	< 0.3% at +4 dBu
Noise:	< -70dBu Un-weighted
Power Requirement:	15 watts (130mA at 115v, 65mA at 230v)

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