

AUDIO NOISE SUPPRESSOR MODEL 325



A single-ended noise suppressor designed to eliminate or reduce noises due to imperfections in and damage to sound recordings in all analog audio media and their digital reproduction, including cylinder, disk, film wire and tape recordings, both monophonic and stereophonic

Model 325 contains three processors designed to suppress transient noises (ticks, pops, clicks, crackle, scratch) encountered in some 100 years of phonograph recordings, wherever and however made, as well as the audible hiss familiar in all audio media prior to the development of successful encode/ decode noise suppression systems and, more recently, digital audio.

Model 325 also incorporates a number of necessities and conveniences for the optimum playback of disk and cylinder recordings for best quality of sound.

The Switcher:

The first noise reduction processor in the Audio Noise Suppressor is the Switcher. This is designed specifically for the reduction of noises from monophonic disk and cylinder recordings, taking advantage of the redundancy that exists in these media: the same signal is engraved on each of the two side walls of the groove. However, the distribution of particulate matter in the record material (one cause of noise) is random. Also, dirt, mildew and scratches do not affect each side wall identically.

Prior to the development of the Packburn Switcher, a monophonic disk or cylinder, if played back with a stereophonic reproducing system, was best played by summing (in the appropriate polarity) the signals from the left and right channels. The Switcher does this when in the rest position. However, at any moment when the reproduction from the left or right channel is quieter (more noise-free) than the sum signal, the Switcher can elect to reproduce just the quieter groove wall. The Switcher switches among these three possibilities (left, right, or sum) at a very rapid rate with astonishing results. At lower frequencies (from 300 Hz down) where switching would not accomplish anything, the two channels are mixed to minimize rumble.

The idea of using the Switcher on vertical-cut recordings may seem strange at first since there is only one signal engraved in the bottom of the groove. However, the vertically modulated signal is affected by disturbances in the side walls of the groove. The Switcher is not as effective for

vertical recordings but it has a part to play.

The switching process is *generally* not applicable for noise reduction of stereophonic records or of monophonic tape recordings or broadcast. For these, transient noise suppression must be achieved by the Blanker alone.

The Blanker:

The second noise reduction processor is the Blanker. This is designed to cope with transient noises from any source: whether from the output of the Switcher, where noises remain that were common to both side walls of the groove, or from a stereophonic disk recording. Also, it is applicable to a monophonic tape, a broadcast or a CD record of a disk recording that has transient noises. Note that the Packburn Blanker works from any program source, in contrast to some devices that require the vertical component of a stereophonic disk to trigger their action.

The Blanker clips the amplitude of each individual positive-going or negative-going pulsation of the noise transient whenever it exceeds a threshold value determined by the peak program level in the vicinity of the transient.

The Switcher plus the Blanker comprise the Transient Noise Suppressor of the Audio Noise Suppressor.

The Continuous Noise Suppressor:

The third noise reduction processor reduces audible hiss-or white noise, whatever one prefers to call it. It is a constant annoyance in just about every cylinder, disk, wire, analog tape or film recording made prior to the development of successful encode/ decode systems of noise suppression, followed by digital mastering.

This noise is perceived by the human ear as being of a fairly continuous nature in contrast to the pops, ticks, and clicks of transient noise and therefore, we call our third processor the Continuous Noise Suppressor. This processor comes third because it is expeditious to suppress the transient

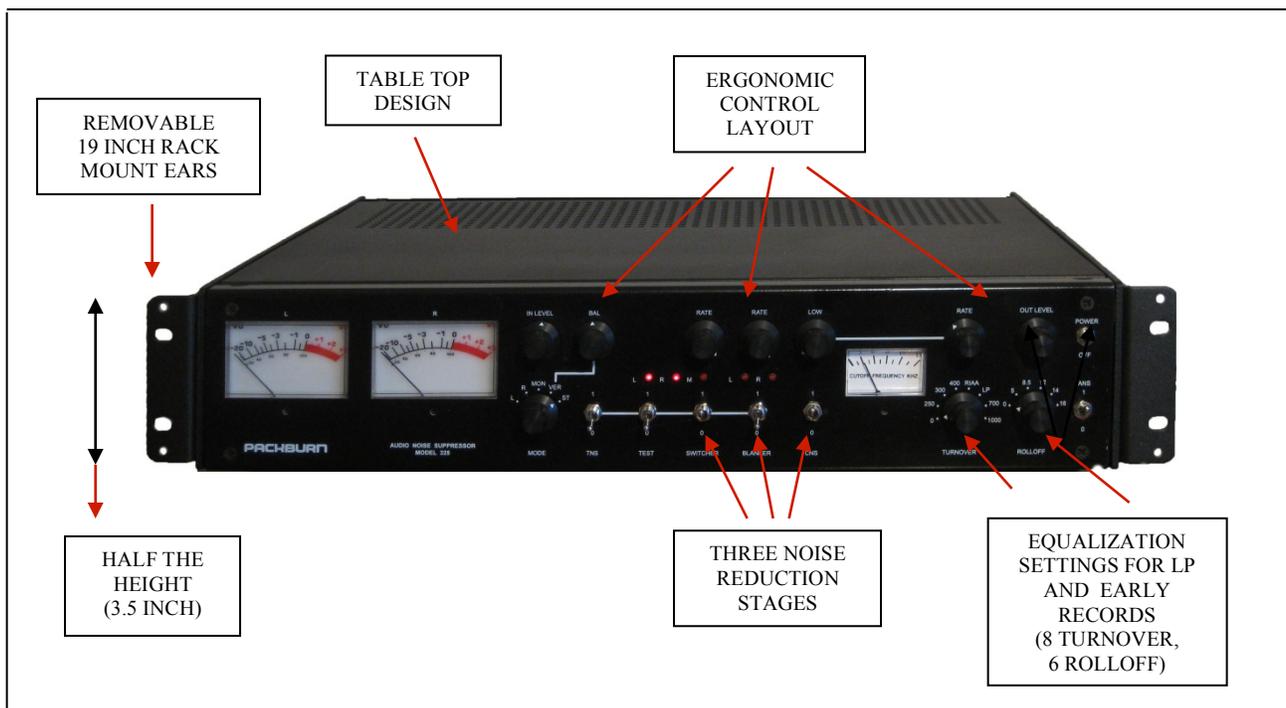
noises first. In the case of recordings containing no transient noise, such as analog master tapes and copies thereof, the Continuous Noise Suppressor will be the only one needed.

The Continuous Noise Suppressor is a variable low-pass filtering circuit that responds in accordance with the nature of the program material. When the program material is quiet and contains little in the way of high frequency energy, the high frequencies that the listener is aware of are almost entirely those in the noise. The cutoff frequency of the filter closes down to its lowest value. In loud and/ or brilliant passages when the signal is effectively making the noise, the cutoff frequency assumes intermediate values. The operator controls the extent to which the filter closes down and opens up, so a substantial reduction of hiss can be achieved without audible degradation of the program material and without the swishes and pumping that have been the undesirable by-product of similar devices.

Metering of the input: The two input channels are metered to assure that the proper signal levels are provided to the Audio Noise Suppressor. Metering takes place after the input level control and before the channel balance control.

Channel balance control and audition of difference signal: the balance control is needed for balancing of signals into the Switcher when playing monophonic disk or cylinder recordings. In reproducing vertical-cut recordings, the balance control also serves as a canting control. Audition of the difference signal as well as of the sum signal allows one to set the channel balance or canting adjustment with accuracy.

Test Switch: This switch enables selection of either the quieter or noisier groove wall by the Switcher. It is useful for demonstration and diagnostic purposes. Also, in the case of a full-width monophonic tape recording in which the oxide is flaking off, one can play it with a two-track head and use the Switcher to choose the momentarily louder channel and thus avoid dropouts.



FACILITIES ADDITIONAL TO AND SUPPORTIVE OF THE NOISE REDUCTION PROCESSORS

A number of necessities and conveniences are included in the Audio Noise Suppressor to assist the user in achieving optimum performance with disk and cylinder playback as well as other signal sources, as follows:

Playback from either channel: There is the ability to play from either channel separately of a monophonic disk or cylinder with the lower frequencies of the two channels mixed so as to eliminate rumble. This is a necessity in reproducing those occasional recordings in which one side wall is consistently noisier than the other. Such a condition can indicate that the optimum stylus is not being used, but some recordings persist in this behavior with any stylus that one may try. For these recordings it is preferable to play from just the quieter side wall of the groove and use just the Blanker for transient noise suppression.

Transient Noise Suppressor can be switched out: The Switcher plus the Blanker, which constitute the Transient Noise Suppressor, can both be switched out by means of a single toggle switch whenever one wishes to process a recording only through the Continuous Noise Suppressor.

Eight position bass equalization switch: This allows selection of the commonly used bass equalization curves for 78s manufactured prior to the recording industry's standardization on the RIAA curve in 1953. Also includes the RIAA curve.

Six position treble equalization switch: This allows selection of the commonly used treble equalization curves for 78s as well as for those long playing records that were manufactured prior to the recording industry's standardization on the RIAA curve in 1953. Also includes the RIAA curve.

Cutoff frequency meter: This meter displays the ever-fluctuating value of the cutoff frequency when the Continuous Noise Suppressor is operating.

Bypassing the Audio Noise Suppressor: The Audio Noise Suppressor is provided with a bypass relay. This connects the output terminals to the input terminals when the power is OFF or when the ANS switch is in the "0" position. Thus, the Audio Noise Suppressor is easily removed from the circuit when it is not needed.

SOME USERS OF THE PACKBURN AUDIO NOISE SUPPRESSOR

Customers are telling us -

“Simple to use...just sit back and listen!”

“Good hiss, pop and click elimination!”

“Improved musical clarity!”

“The controls are easy to operate!”

“Preserves the original sound – serves archival purposes well”

*And for those who have returned their Packburn machines for upgrading to the model 325 performance level * -*

“The blanker and continuous noise suppressor are more effective even on LP records.”

“There is less low frequency rumble on older records including vertical-cut records.”

* Consult factory for details

APPLICATION NOTES

78s: The success of the Audio Noise Suppressor is most spectacularly demonstrated with noisy 78 rpm disks, as these present a continuous stream of ticks, pops, etc. the suppression of which is immediately demonstrable. The same applies to excessively ticky, scratchy or dirty 45s and long play disks. You can instantly hear how the Switcher reduces the crackle. Next you can turn on the Blanker and hear the major role that it plays in eliminating or reducing noise from scratches and cracks. Then you can adjust the Continuous Noise Suppressor for the final improvement. You can even operate the TEST switch and hear the effect of choosing the noisier groove wall.

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Long Play and Stereo Disks: The improvement of these requires more patient observation if they have not been abused, as these have only occasional and pops, some of which, however, can reproduce as loud as a pistol shot. The Blanker reduces the pistol shots to innocuous thumps. Lesser noises are turned into slightly noticeable thuds when they are not totally eliminated. The Continuous Noise Suppressor effectively and unnoticeably reduces the hiss.

45s and polystyrene long play records, with their higher hiss level, are nicely served by the Continuous Noise Suppressor.

Acetates: These can range from worn and deteriorating disks to extremely quiet, mirror-surfaced beauties. The Audio Noise Suppressor handles the difficult ones like bad 78s, the good ones like fine long playing disks.

Vertical-cut Recordings: This includes acoustical disks and

cylinders and electrical broadcast transcriptions. Both the Switcher and Blanker have a major effect in reducing transient noises from broadcast transcriptions. With acoustical disks and cylinders the Blanker plays the major role in reducing the transient noises. The Switcher can be turned up slightly for some assistance in the noise reduction. The Continuous Noise Suppressor can be applied to good effect in reducing the remaining hiss.

78 Transfers to tape or long playing records: Many tape copyists and record producers mistakenly transferred 78s with the RIAA curve, which reduced surface noise but also took much of the life out of the sound of a voice or instrument. In playing back from such a source, one can restore the treble equalization and then use the facilities provided by the Audio Noise Suppressor to suppress the noises in the proper manner.

Analog Master Tapes and Film: The Continuous Noise Suppressor is very successful at unobtrusively reducing the hiss level of analog master tapes or copies thereof.

CDs: We claim no applicability of the Audio Noise Suppressor to CDs mastered from original digital tapes. However, CDs derived from 78s, from old movie sound tracks or from master tapes that antedate the introduction of encode/decode noise reduction devices all are instances where the Audio Noise Suppressor has a role to play, whether on the part of the CD producer or the consumer. If the producer chooses to ignore what the Audio Noise Suppressor can do to improve his product, the consumer can do it on his or her own!

Broadcast reception in general can benefit from use of the Continuous Noise Suppressor if there is audible hiss, whether the source of the hiss is in the program material or in the conditions of the reception. Broadcasts of historical material, if equalized with the RIAA curve (as it often is) can be corrected and transient noises can also be suppressed.

Regarding copies, in general: The Blanker has to be relied on to provide whatever transient noise suppression is to be achieved. However, it must be recognized that recordings processed into long playing disks or into radio broadcasts are subject to equalization, compression and limiting and probably are also several copying generations removed from the original. All of these circumstances can tend to soften the leading edge of a noise transient with the result that the detectability of the noise transient by the Blanker circuit is lowered. Thus, as a general rule, the Transient Noise Suppressor will be at its most effective when it can be applied to the original recording.

The Continuous Noise Suppressor will not be affected in the same way. It will just have more to do.

Carefully made stereo tape transfers of a monophonic disk or cylinder—especially a digital tape—can provide good results, as the Switcher can be employed and there should be no appreciable degradation of the noise transients that would reduce the effectiveness of the Blanker.

Record Restoration: Application of the Continuous Noise Suppressor is best deferred to the final stage of processing by those doing record restoration. In such applications, one would use the Transient Noise Suppressor at the start. After filtering, equalization, volume expansion, adding reverberation, etc., one can then use the Audio Noise Suppressor a second time, this time by-passing the Transient Noise Suppressor and using only the Continuous Noise Suppressor.

Quadraphonics — Surround Sound — Ambience Systems — Electronic Reverberation: The spatial illusion of these systems is seriously degraded when pops and "pistol shots" disclose the presence of the ambience loudspeakers. With the Audio Noise Suppressor one can even play 78s without any loss of the spatial illusion.

Audio Noise Suppressor Model 325 Technical Specifications

Designed for professional installations and for quality home sound systems

Outfitted to interface with 600 ohm balanced line systems or with the more customary single-ended Hi Fi systems; Provided with XLR professional connectors as well as with RCA-type phono connectors for all signal input and output terminations.

Power Line Voltages: U.S./ Canadian 105 volts 120 volts, 50/60 Hz
International: 210 volts-240 volts, 50/60 Hz (consult factory)

Power Consumption: 20 Watts

Size: Width: 19" (483 mm) for rack mount, 17" (432 mm) with mounting ears removed
Depth: 13" (332 mm), Height: 3.5" (89 mm).

Inputs and Outputs: There are two separate electronically balanced input channels. Separation throughout the audio frequency range is maintained in processing stereo signals, in which each signal path is provided with a Blanker, a Treble Equalization network and a Continuous Noise Suppressor and then routed through a dual OUTPUT LEVEL control to the separate output terminations.

In processing lateral-cut or vertical-cut recordings, the signals applied to the two input channels are routed through a balancing circuit to the Switcher. Or, at the operator's choice, with lateral-cut records, the signal of either channel may be individually selected for processing. To reduce the audibility of low frequency disturbances, the bass portion of the two input channels, is mixed in the proper polarity. The output of the Switcher is connected to both of the Blanker + Equalizer + Continuous Noise Suppressor channels, and the fully processed signal may be taken from either or both of the output channels.

Electronically balanced input. Single-ended input impedance is 100k ohms.
Electronically balanced output. Single-ended output impedance is less than 1 ohm.

Sensitivity: With INPUT LEVEL control all the way up, a 0 VU (1.23 v.) reading of the processing level meters will be achieved by an input signal of — 6 VU or less from a 600 ohms line or by 0.4 v. or less from a single-ended source. Range of control of INPUT LEVEL potentiometer is 20 db.
With OUTPUT LEVEL control all the way up, there is unity gain from the metering circuit to the output terminations.

Frequency Response: Bass response is within $\pm 1/2$ db to 10 Hz.
Treble response is determined by the setting of the Treble Equalization switch and the action of the Continuous Noise Suppressor.

Treble Equalization: is provided by the Audio Noise Suppressor by means of a six-position selector switch which enables you to match the treble portion of published equalization curves of records, old and new. Includes FLAT, FFRR, AES, RIM, LP.

Continuous Noise Suppressor Action: The Continuous Noise Suppressor is a low pass filter. Cutoff frequency varies from 2.5 kHz to 18 kHz in accordance with the dynamics of the program material and the nature of the surface noise. Alternatively, a fixed cutoff frequency may be selected. Meter on front panel reads the cutoff frequency. Filter has a slope approaching 12 db per octave.

IM Distortion: 60 Hz and 7 kHz, 4:1 at + 4 vu (1.23v.) input: Less than .05%

S/N Ratio: (Unweighted) – At least 75 dB with reference to + 12 vu (3 v.).

Warranty: A full five year's warranty on both parts and labor.

About your Record Playback Equipment: To take advantage of the Switching process, you must have equipment to play back discs or cylinders stereophonically. The two channels of reproduction must be closely matched in frequency response.

Demonstration CD: Available on request

PACKBURN[®] electronics inc. P.O. Box 226 Syracuse, NY 13215 U.S.A.

Ph 315-476-9121

Covered by one or more of the following US patents: 4,151,471; 4,155,041; 4,259,742; 4,322,641; 7,035,417