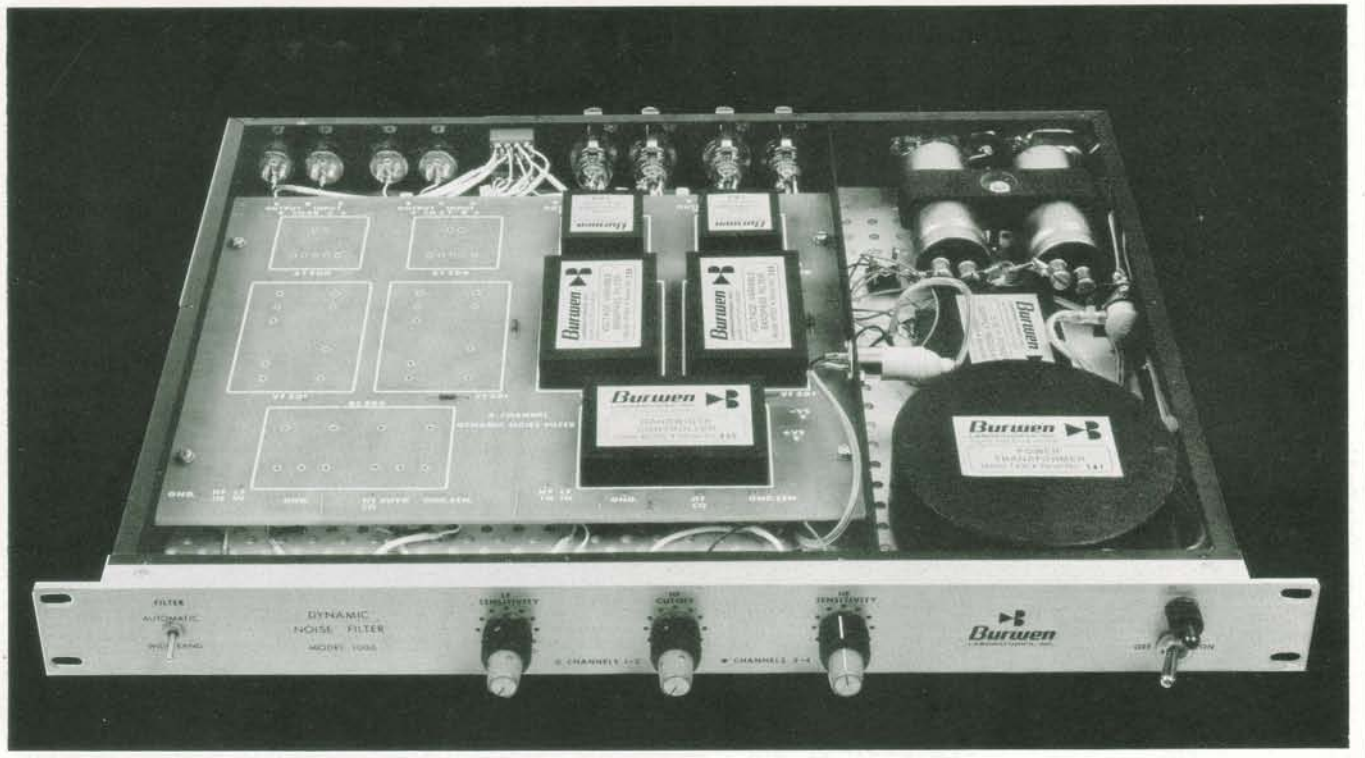
Dynamic Noise Filter
Model 1000



1, 2, 3, or 4 Channels Use Epoxy Plug-in Modules

FEATURES

Bandwidth Dynamically Controlled By the Music
Noise Attenuation Up To 25 dB @ 30 cps and 22 dB @ 10 kc
Response To Musical Content Flat ±.2 dB
A Transient Extends the Bandwidth to 32 kc in 1 ms
Attenuates Noise Above and Below the Audio Range
Less Than .1% Total Harmonic Distortion
Dynamic Range 100 dB
±.1 dB Insertion Gain
10 dB Unweighted Tape Noise Reduction
Output dc Coupled, ±11 V Open Circuit
Delivers 18 dBm into 600 ohms or 16 dBm into 150 ohms
1, 2, 3 or 4 Channels Available on 1-3/4" Rack Panel
Stereo Channels Ganged in Pairs or Independently
Plug-in Epoxy Encapsulated Modules for Ease of Servicing
Active Transformer Input, 100k or 600 ohms
Highest Quality Materials and Components Guaranteed for Two Years

A Signal Controlled Automatically Variable Bandpass Filter Which Reduces Noise When Playing Any:

Master Tape
Multitrack Mix
Prerecorded Tape
Cartridge
Cassette
Record
FM Program
Video Tape Sound
with no audible effect on either music or speech

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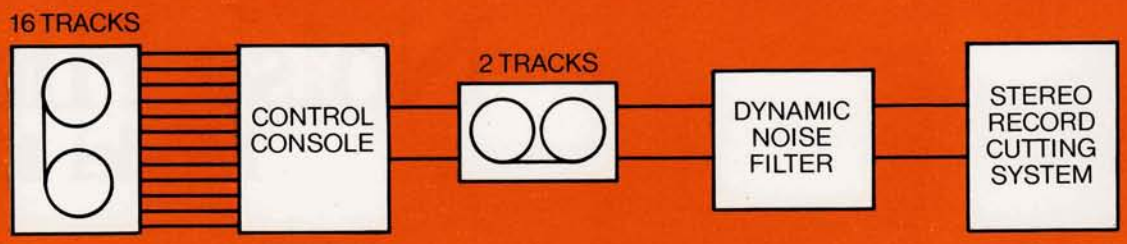

FIGURE 1. TWO CHANNEL DYNAMIC NOISE FILTER PERFORMS 18 CHANNEL NOISE REDUCTION.

Dynamic Noise Filter* Model 1000

Operating principle

The Dynamic Noise Filter reduces noise by attenuating the high and low frequencies when there is no music present. As the high frequency content of the music increases the upper cutoff frequency gradually increases from 1100 cps to 32 kc. Similarly, low frequency musical content causes an increase in the low frequency bandwidth from 350 cps down to 13 cps. The variable filter action (Figure 2) is distortionless and the wideband response is extremely flat. Bandwidth increases are so rapid that there is no audible loss of high frequency transients in the program material and the net effect is a reduction of background noise without degradation of the program material such as would occur with a fixed filter.

No signal encoding

Any conventional audio source can be improved by passing the signal through the Dynamic Noise Filter. Because no special signal preprocessing is needed it is unnecessary to use a Dynamic Noise Filter channel for every signal channel. Instead a multitrack recording system (Figure 1) can use a two channel Dynamic Noise Filter to remove the cumulative noise from all sources ahead of the filter. Tapes thus remain conventional and interchangeable among standard tape machines.

Low level operation

It is the extremely low level operation of the Dynamic Noise Filter (Figures 3 and 4) that makes possible a 10 dB noise reduction with no audible loss of the high or low frequencies when playing a normal two track tape master. For a wide range of input levels the frequency response is flat within .2 dB from 20 cps to 20 kc. Signal energy in the region of 6.6 kc dynamically controls the high frequency bandwidth. Signal energy in the region of 85 cps controls the low frequency bandwidth. Although the bandwidth controller responds to other frequencies it has considerably less sensitivity thereby assuring that the signal level is sufficient to mask the noise.

Fast attack

A sharp transient can extend the high cutoff frequency to 32 kc in only 1 ms. This rapid attack was chosen to be so fast that the ear cannot detect any loss of impact yet slow enough to prevent actuation by microsecond noise impulses from a phonograph record. At low frequencies the bandwidth can extend to 13 cps in 10 ms.

The decay times must be slow enough to prevent modulation of the signal at audio frequencies yet fast enough to follow the normal decay of the signal in order to prevent noise from being heard for a moment following each note. A decay to within 10% of the final bandwidth occurs in 50 ms at high frequencies and in 500 ms at low frequencies. Smooth action is produced by a newly developed multistage nonlinear feedback filter.

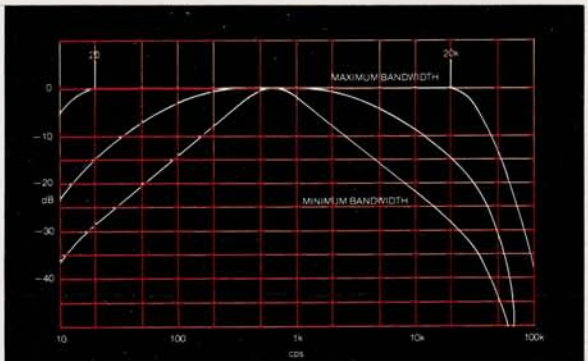

FIGURE 2. FREQUENCY RESPONSE

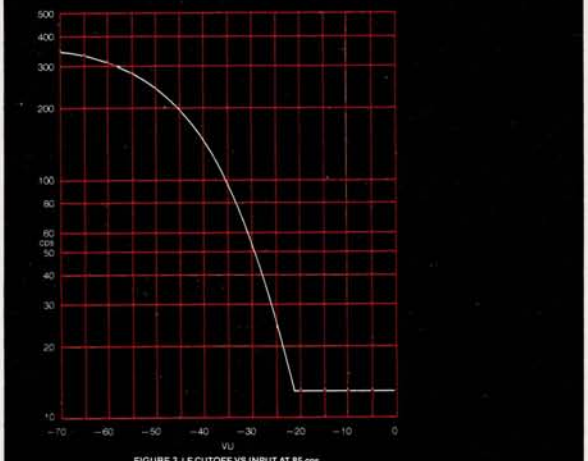

FIGURE 3. LF CUTOFF VS INPUT AT 85 cps

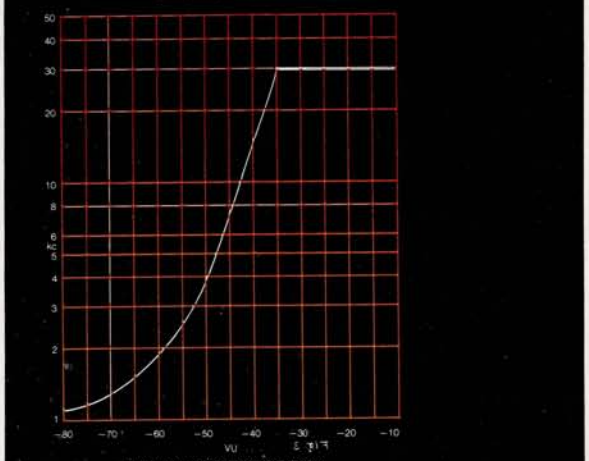

FIGURE 4. HF CUTOFF VS INPUT AT 6.6 kc

*Patent applied for

MODULAR COMPONENTS

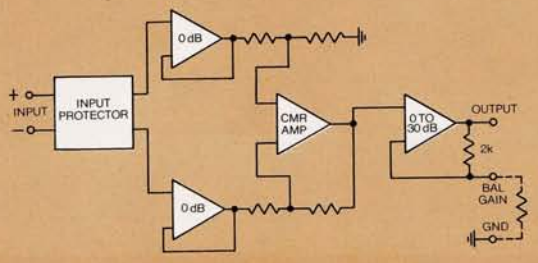

FIGURE 5

AT200 ACTIVE TRANSFORMER

The passive audio input transformer is obsolete. Burwen Laboratories uses the Active Transformer—a differential input dc amplifier that overcomes the frequency response, distortion, and hum pickup limitations of the common audio transformer. The AT200 consists of an input over-voltage protector that feeds a pair of unity gain followers and then a bridge connected amplifier for common mode rejection. An output buffer amplifier provides 0 to 30 dB voltage gain selected by an external resistor.

Brief specifications: Input impedance 100k, output impedance .1 ohms, distortion .01%, output ±11 V into 10k, +18 dBm into 600 ohms, and CMRR 85 dB min.

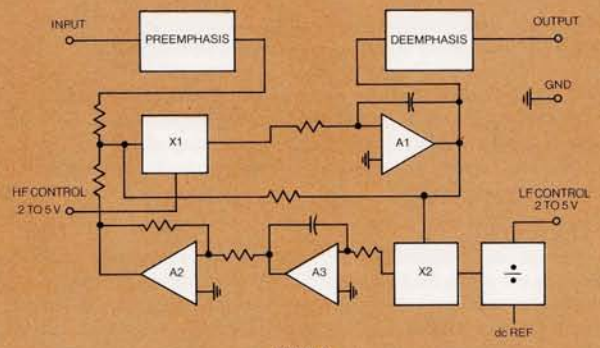

FIGURE 6

VF301 VOLTAGE VARIABLE BANDPASS FILTER

The VF301 uses precision multipliers and integrators to form a bandpass filter having dc controlled high and low cutoff frequencies. As the high frequency dc control voltage increases from +.2 V to +5.0 V the multiplier X1 reduces the effective time constant of the integrator A1 and increases the upper cutoff frequency in direct proportion to the dc control voltage. Similarly, an increase in low frequency control voltage from +.2 to +5.0 V, inverted by the divider, increases the effective time constant of A3 to reduce the low frequency feedback and thereby lower the low cutoff frequency in inverse proportion to the control voltage. Attenuation beyond the audio band eliminates extraneous noises and internal noise is minimized by the use of high frequency preemphasis before the filter and deemphasis afterward. The frequency response is shown in Figure 2 for control voltages of .2 V, 1 V, and 5 V each.

Brief specifications: Output 11 V peak into 10k, 18 dBm into 600 ohms, 1 kc harmonic distortion .01% wideband, input impedance 200k, voltage gain 0 dB or 10 dB, and dynamic range 100 dB.

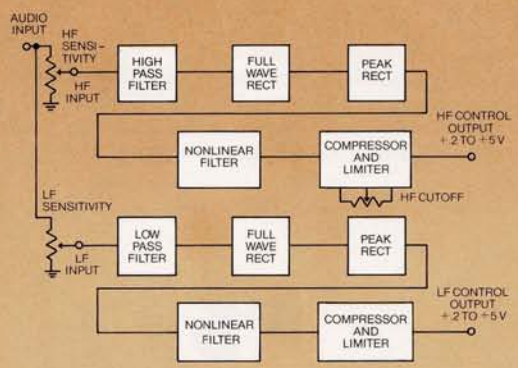

FIGURE 7

BC302 BANDWIDTH CONTROLLER

The BC302 produces the high and low frequency +.2 to +5 V dc control voltages to actuate the VF301. The high frequency control voltage is derived from the incoming signal by selecting frequencies in the region of 6.6 kc and then full wave peak rectifying. Nonlinear multistage filtering provides fast step response together with a medium speed decay free from audio modulation. Similarly, the low frequency dc control voltage is derived from frequencies in the region of 85 cps. Separate high frequency and low frequency sensitivity controls and a high frequency cutoff control optimize the performance for signals having different noise levels. A single BC302 controls two VF301s.

Brief specifications: Low frequency sensitivity 3.5 mV at 85 cps, 250 mV at 1 kc; high frequency sensitivity .9 mV at 6.6 kc, 220 mV at 1 kc.

Dynamic Noise Filter Model 1000

SPECIFICATIONS

Typical @ 25° C with 10k load unless otherwise specified.

CHANNELS—Prewired for 1, 2, 3, or 4. For stereo operation, channels 1 and 2 use common bandwidth control and channels 3 and 4 use common bandwidth control. Modules may be plugged into any channels and operated without modification or adjustment.

INPUT—Level: 0 to +20 dBm, 1.1 to 11 V instantaneous peak +10 dBm, 3.4 V instantaneous peak optimum

Impedance: 100k bridging • 600 ohms ±1% termination available via rear panel switch

Common Mode Rejection: 85 dB minimum, dc to 1 kc • 65 dB minimum with 600 ohm source unbalance • 70 dB minimum at 10 kc

Common Mode Impedance: 2 Mohm each input to ground

Overload Input: ±25 V dc or rms

OUTPUT—Open Circuit: +20 dB, 11 V instantaneous peak

600 ohm Load: +18 dBm, 9 V instantaneous peak

150 ohm Load: +16 dBm, 3.4 V instantaneous peak

Output Impedance: <.5 ohm dc to 100 cps • 10 ohms @ 20 kc • 604 ohms ±1% series resistance available via rear panel 4-channel switch

Short Circuit Protection: included

Connections: Single ended, common grounded to chassis

FREQUENCY RESPONSE—Minimum Bandwidth: —25 dB @ 30 cps • —22 dB @ 10 kc

Maximum Bandwidth: ±.2 dB max, 20 cps to 20 kc • —37 dB @ 100 kc

HARMONIC DISTORTION—Worst Case: .1% max. 20 cps to 2 kc @ +10 dBm input • .1% @ 10 kc @ 0 dBm input

Wideband: .01% @ 1 kc @ 18 dBm into 600 ohms

GAIN—Wideband: 0 dB ±.1 dB at any load from 150 ohms to open circuit

With 600 ohm series resistance and 600 ohm load: —6 dB

INTERNAL NOISE—Narrowband: —80 dBm, 77 uV rms, 20 cps to 20 kc

Wideband: —77 dBm, 110 uV rms, 20 cps to 20 kc

CONTROLS—LOW FREQUENCY SENSITIVITY, HIGH FREQUENCY SENSITIVITY, HIGH FREQUENCY CUTOFF. These are friction ganged coaxial potentiometers. Outer knob channels 1-2, inner knob channels 3-4. • **AUTOMATIC-WIDEBAND**, 4 channels ganged. • Power, **ON-OFF**

FILTER-AUTOMATIC WIDEBAND 4 channels ganged—Power, ON-OFF

POWER INPUT—115V or 230V ±10%, 50 to 60 cps, 20 VA per 4 channels

MECHANICAL—Single 19" x 1-3/4" rack panel for 1 to 4 channels. Depth behind panel 14". Panel gold anodized.

Input Connectors: D3F Switchcraft • Mating connectors required (1 per channel) A3M Switchcraft or XLR3-12C Cannon

Output Connectors: D3M Switchcraft • Mating connectors required (1 per channel) A3F Switchcraft or XLR3-11C Cannon

Pin Connections: 1, shield and shell • 2, common • 3, high

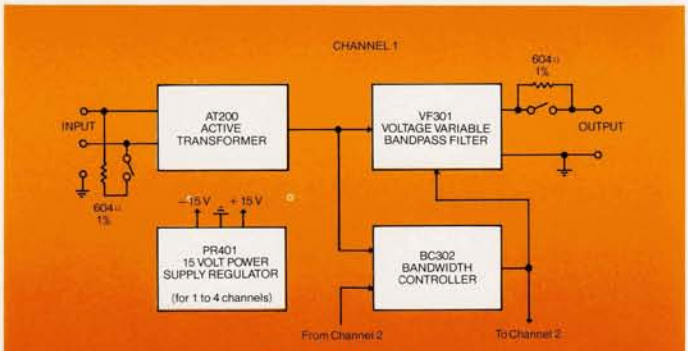

FIGURE 8. SYSTEM DIAGRAM

SYSTEM DIAGRAM

A single channel consists of an AT200 Active Transformer feeding a VF301 Voltage Variable Bandpass Filter module. A single BC302 Bandwidth Controller receives as inputs via the sensitivity controls the sum of the AT200 output signals for channels 1 and 2. The Bandwidth Controller produces high and low frequency dc control voltages used to vary the bandwidth simultaneously for both channels in stereo operation. Channels 3 and 4 are similar and all four use a common power supply. Independent operation can be attained by utilizing channels 1 and 3 or 2 and 4 each having its own Bandwidth Controller.

POWER SUPPLY

The power supply consists of a large toroidal power transformer designed to eliminate magnetic interference with adjacent equipment, oversized rectifiers and computer grade filter capacitors, and a precision regulator module Model PR401. The supply delivers ±15 V ±5%, ±500 mA regulated to .01%. All components are highly derated, and interlocking and overvoltage protection prevents damage to other modules in the event of a power supply failure.

OPERATION

In normal use the individual high and low frequency sensitivity controls are set so the hiss just begins to raise the upper cutoff frequency and the rumble just begins to reduce the lower cutoff frequency. The bandwidth then increases to maximum for most of the range of signal levels. For poorer material a limit can be placed on the upper cutoff frequency between 1 kc and 30 kc and for special effects the bass can be attenuated at a fixed 6 dB/octave below 400 cps or the treble can be attenuated above 800 cps.

REVIVING OLD RECORDS

Program material such as old 78 rpm records which may have more distortion and noise than useful signal in the 6.6 kc region can be substantially improved. First the signal is passed through a 12 dB octave, 4 to 6 kc fixed low pass filter and then through the Dynamic Noise Filter followed by a flexible equalizer to adjust the tonal balance.

T1000 DEMONSTRATION TAPE

A 7-1/2 ips Dynamic Noise Filter demonstration tape recorded in four tracks compatible with 1/4 and 1/2 track two channel stereo machines is available for a $10.00 deposit which will be refunded upon return of the tape, postage prepaid, within 15 days.

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