Dynamic Noise Filter

Model 1000

SERIAL NO. 179

OPERATING AND SERVICE MANUAL

Burwen
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MODEL 1000 DYNAMIC NOISE FILTER OPERATING INSTRUCTIONS

The Dynamic Noise Filter reduces noise by attenuating the high and low frequencies when there is no music or speech present. The upper cutoff frequency increases gradually and automatically from 1100 cps toward 32 kc with an increase in the high frequency content of the program material. Similarly, the low cutoff frequency is gradually lowered from 350 cps toward 13 cps with increasing low frequency content in the program material. Separate sensitivity controls are provided for the high and low frequency sections of the Bandwidth Controller and a cutoff control limits the maximum high frequency response. Operation normally begins to take place just above the noise level of the program material at both high and low frequencies.

PATCHING INTO YOUR SYSTEM

Since the Dynamic Noise Filter reduces the noise from all sources ahead of it the best place to use it is as the last instrument in the signal chain. It can be connected at the output of the studio console working on the mixed down signal ahead of a 2 or 4 track mastering recorder. In this case the Filter reduces the noise to that of one generation of tape; or it can be connected just ahead of the disc cutting system, in which case all tape noise ahead of the Filter is reduced. The Dynamic Noise Filter can be used more than once such as before and after a 2 track tape master.

EQUALIZATION

The Bandwidth Controller, which determines the upper and lower cutoff frequencies, measures the signal energy content at the high and low frequencies and is most sensitive at 6.6 kc and 85 cps. With most program material it performs best on a flat response signal but works quite satisfactorily with the individual channel equalization used in multitrack recording. For use with extremely noisy program material, such as old 78 rpm records which may have more distortion and noise than useful signal in the 6.6 kc region, it is frequently advantageous to cut off the high frequencies at 12 dB/octave ahead of the Dynamic Noise Filter in the region of 4 - 6 kc. Alternatively, the high frequencies can be depressed or rolled off by means of tone controls so the upper cutoff frequency of the Dynamic Noise Filter will respond more to the middle frequency content of the program material than to the high frequency content. Equalization for pleasing response in this case should follow the Dynamic Noise Filter. In using the Dynamic Noise Filter bear in mind that channels 1 and 2 use a common bandwidth controller as do channels 3 and 4.

INPUT AND OUTPUT CONNECTIONS

The input to the Active Transformer in the Dynamic Noise Filter is differential the same as when a conventional transformer is used. However, the output is a single ended dc coupled amplifier whose common is connected to the chassis. The input will withstand 25 V rms input overvoltage and the output will withstand a short-circuit, but do not test these features first. Also, avoid feeding any voltage into the output terminals from another piece of equipment.

The pin connections on the Dynamic Noise Filter chassis are as follows:

Input, female
- Pin 1, ground
- Pin 2, inverting input (may be grounded)
- Pin 3, non-inverting input (high)

Output, male
- Pin 1, ground
- Pin 2, ground
- Pin 3, high

Plug the power cord into 115 V, 60 cps. For 230 V operation use a screwdriver to set the slide switch on the rear of the chassis before connecting the power cord. Note that only one power line ground is permissible in an audio system. Otherwise circulating ground currents may cause hum. Therefore, in many cases it is necessary to use the 3 to 2 prong adapter plug which eliminates the chassis connection to the power line ground. Set the rear panel switches for the proper terminating impedances. The input impedance can be set at either 100k or 600 ohms. The output is designed to feed anything from 150 ohms to an open circuit and there is no advantage in terminating the output. If the output switch is set at 600 ohms a 600 ohm resistor is added in series with the output and there will be a 6 dB loss when feeding a 600 ohm load. This switch is occasionally used when the outputs of two units are to be mixed together in parallel but in most cases the output switch should be set at low Z which provides an internal impedance of less than .5 ohms.

CHANNELS

Each Model 1000 Dynamic Noise Filter chassis is wired for four channels. Modules are plugged in in accordance with each individual customer's order. Normally the channel connectors on the rear of the chassis that are operational are as follows:

Number of channels	Connector numbers
1	1
2	1,2
3	1,2,3
4	1,2,3,4
2 independent	1,3

Additional modules for more channels can be inserted at any time and no adjustments are required. Due to the high accuracy of Burwen Laboratories modules, they are completely interchangeable with negligible stereo tracking errors.

OPERATING CONTROLS

The controls for all four channels are ganged together. The outer black knobs control channels 1 and 2 and these are friction ganged to the inner red knobs which control channels 3 and 4. Start with the LF SENSITIVITY and HF SENSITIVITY controls at their maximum counterclockwise position. Set the FILTER switch at WIDEBAND. This is an A-B switch and in the WIDEBAND position the Dynamic Noise Filter behaves as a flat unity gain amplifier. Adjust the input signal level (normally +4 dBm @ 0 vu) and equalize the signal for most pleasing results.

Now set the FILTER switch at AUTOMATIC. This brings the Dynamic Noise Filter into operation and you will note an attenuation of the bass and treble. Using a quiet section of the program material, advance the LF SENSITIVITY control clockwise until the low frequency rumble just begins to come through. Next advance the HF SENSITIVITY control clockwise until the hiss just begins to increase. The program material will now automatically increase the bandwidth. If necessary, the controls can be readjusted for best compromise between noise reduction and some loss of the high or low frequencies in the program material.

Program material having excessive extreme high frequency content or excessive noise and distortion in the high frequency region can be improved by rotating the CUTOFF control counterclockwise. This control places a limit on the maximum high frequency bandwidth beyond which the response rolls off at 6 dB/octave.

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MODEL 1000 DYNAMIC NOISE FILTER SERVICING INSTRUCTIONS

WARRANTY OF QUALITY

Burwen Laboratories warrants its products to be free from defects in material and workmanship. For a period of two years from the date of shipment to the original purchaser, we will service at the factory, or at our option, ship a replacement for any device which fails in normal use to meet its published specifications. Burwen Laboratories normally maintains a stock of modules and critical components reserved for rapid field replacement.

INSTALLATION PROBLEMS

Be sure the unit is connected in accordance with the operating instructions. If the neon pilot lamp lights and no signal passes through the Dynamic Noise Filter recheck the input and output connections to see that they conform with the instructions. Connect the input and output cables together to see that a signal passes directly from one cable to the other. Be sure your cables are plugged into operating channels and not into empty channels.

If you are certain the input and output connections are correct and there is signal at the input but still no signal at the output, then it is suggested you remove the top cover to see if any of the modules have worked their way out of their sockets or any of the internal power supply plugs have loosened. Do not remove the bottom cover as the power supply is attached to this cover.

If the unit still does not work, please contact the factory immediately. Frequently we can diagnose problems by telephone from an adequate description of the symptoms. Factory authorization is required before returning the unit for repair. Follow the instructions for return of the unit to the factory.

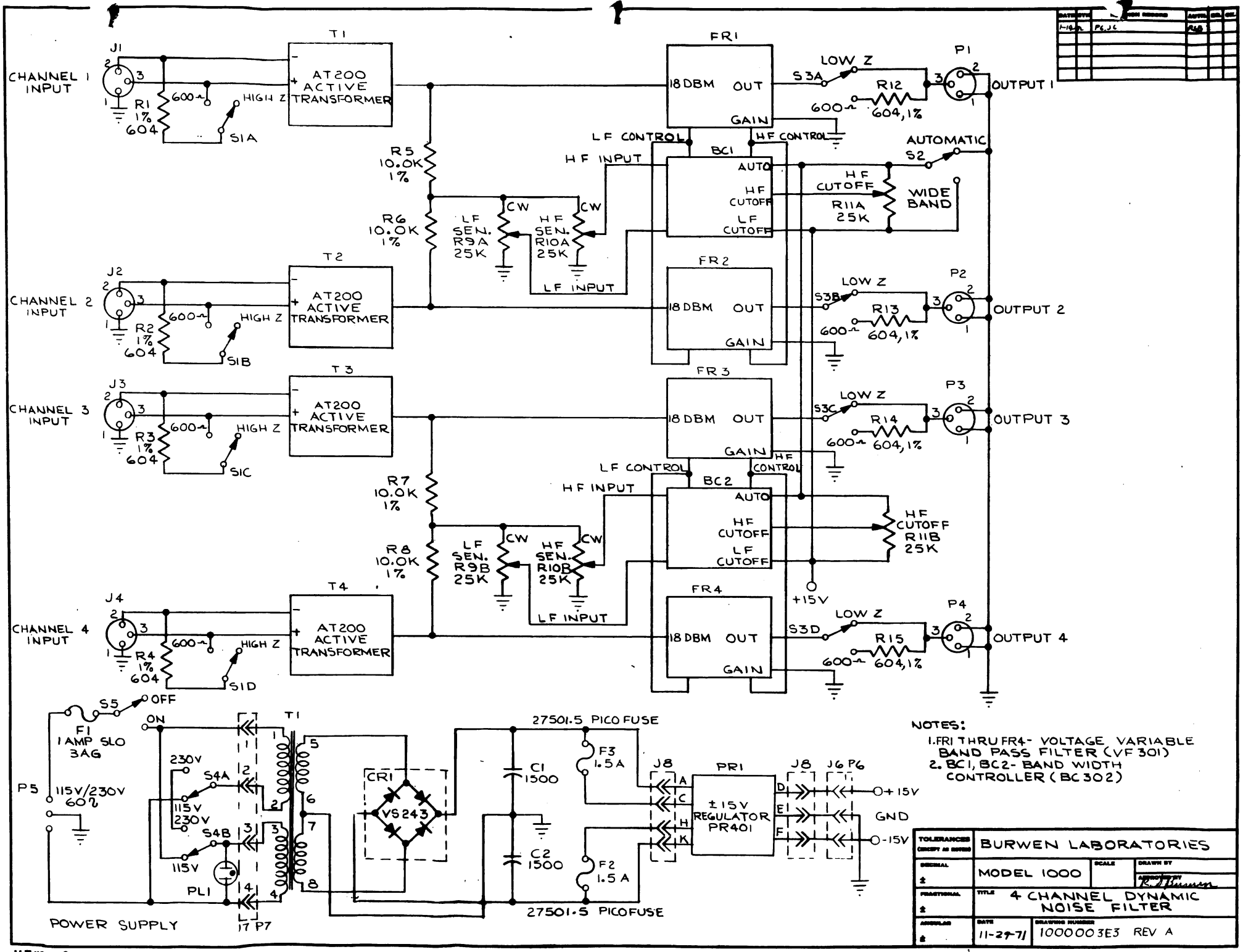
FIELD SERVICE

Because of its modular construction, field servicing is generally quite simple. Customers are encouraged to make the simpler repairs such as replacement of modules in the field. If you are unable to solve the problem, write or phone us an adequate description of the symptoms. We may be able to solve the problem over the telephone or rapidly ship you a replacement part. If you prefer, your instrument may be returned to the factory for repair after receiving our authorization.

SERVICING PROCEDURE

Symptoms	Check
Pilot lamp out, operation on signals	If signals pass normally and the line voltage switch at the rear of the unit is set for the proper voltage, replace the pilot lamp.
Pilot lamp out, no signals	Disconnect the input and output cables and connect them together to be sure that signals pass through each cable. Inspect the power line fuse at the rear of the chassis. Fuses occasionally wear out but more often the cause of a fuse failure is some internal component failure. If the fuse has failed, remove the top cover and make an ohmmeter check across C1 and C2 for shorts. Check for a circuit through the picofuses F2 and F3 mounted on the regulator connector. Check for shorts across each diode of CR1. Try reversing the ohmmeter leads if the resistance appears low. If the fuses CR1, C1, and C2 appear to be normal then replace the power line fuse and reapply power.
Power fuse blows again	If after following the above procedure the fuse blows again, remove J8 from the power supply regulator PR1 and check CR1, C1, C2, F1, and F2 again. Replace the power line fuse and check for +28 V to ground across C1 and -28 V to ground across C2. If the fuse blows again the trouble can be a shorted resistor in the pilot lamp or a short inside the power transformer T1.
Pilot lamp lights, no signal	If a signal will pass through the input and output cables try replacing the Voltage Variable Bandpass Filter in the inoperative channel with the Filter from the operative channel. If this change does not solve the problem, replace the Active Transformer. If replacing a module solves the problem, contact Burwen Laboratories for a replacement.
Pilot lamp light on, no signal all channels	Check the positive and negative 15 V supply voltages on the master circuit board. If either voltage is 0, this will cause a near 0 voltage on the other side. Check the voltages on each side of the picofuses F2 and F3, normally +26 V and -26 V. Check for shorts from each side of each fuse to ground with and without J8 plugged onto the power supply regulator.
	Caution Be careful to replace J8 on the power supply regulator so that all pins mate. Replacement on the wrong pins will damage the Model PR401 Power Supply Regulator.

Symptoms (continued)	Check
Abnormal filterting action, channels 1 and 2 or channels 3 and 4	Replace the Bandwidth Controller and check for normal operation. If no spare is available, remove a Voltage Variable Bandpass Filter and check the high frequency and low frequency dc control voltages. In the wideband position each voltage is +5.0 V. In automatic each voltage varies from .2 V to +5 V with the signal. Vary the high frequency and low frequency controls to see that each control voltage follows the signal level.
FACTORY REPAIRS	If authorization for return to the factory for repair has been received repack the Model 1000 with its power cord using the original packing material. Ship via air or via United Parcel Service and insure for the full purchase value.



NOTES:

1. FR1 THRU FR4 - VOLTAGE VARIABLE BAND PASS FILTER (VF 301)
2. BC1, BC2 - BAND WIDTH CONTROLLER (BC 302)

BURWEN LABORATORIES	
MODEL 1000	
4 CHANNEL DYNAMIC NOISE FILTER	
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DYNAMIC NOISE FILTER

MODEL 1000
CHASSIS PARTS LIST

Drawing No. 10000010L1-B
5/8/72

ITEM	DESCRIPTION
C1	1500, 50 V, CG152U50B1, Mallory
C2	1500, 50 V, CG152U50B1, Mallory
CR1	Bridge rectifier, VS243, Varo
F1	1 amp, slo-blo, 3AG, Littelfuse Fuseholder, 342014A, Littelfuse
F2	1.5 amp, pico fuse, 2750l.5, Littelfuse
F3	1.5 amp, pico fuse, 2750l.5, Littelfuse
J1	D3F, Switchcraft
J2	D3F, Switchcraft
J3	D3F, Switchcraft
J4	D3F, Switchcraft
J6	07QK3F, Switchcraft
J7	57GB5F, Switchcraft
J8	EC5108, Burndy

ITEM	DESCRIPTION
P1	D3M, Switchcraft
P2	D3M, Switchcraft
P3	D3M, Switchcraft
P4	D3M, Switchcraft
P5	AC3G, Switchcraft Power cord 8', 18-3, Type SVT, 17258-S, Belden 3 - 2 prong adapter, Leviton
P6	57KD3M, Switchcraft
P7	05UK5M, Switchcraft
PL1	5-703 with 22k resistor built in, Drake (amber) Holder, 508-7538-504, Dialco
R1	RN55D6040F, Mepco
R2	RN55D6040F, Mepco
R3	RN55D6040F, Mepco
R4	RN55D6040F, Mepco
R5	RN55D1002F, Mepco
R6	RN55D1002F, Mepco
R7	RN55D1002F, Mepco
R8	RN55D1002F, Mepco

ITEM	DESCRIPTION
R9	Dual potentiometer, 25k ±10%, 15% clockwise log taper, WA1433, CTS
R10	Dual potentiometer, 25k ±10%, 15% clockwise log taper, WA1433, CTS
R11	Dual potentiometer, 25k ±10%, 15% clockwise log taper, WA1433, CTS
R12	RN55D6040F, Mepco
R13	RN55D6040F, Mepco
R14	RN55D6040F, Mepco
R15	RN55D6040F, Mepco
S1	4PDT, sub-miniature toggle, 7401G, C & K
S2	SPDT, sub-miniature toggle, 7101G, C & K
S3	4PDT, sub-miniature toggle, 7401G, C & K
S4	DPDT, slide switch, screwdriver slot, 115 - 230, Continental Wirt
S5	SPST, toggle, A H & H, 82601
T1	Power transformer, Burwen Laboratories Spec. No. T402-2

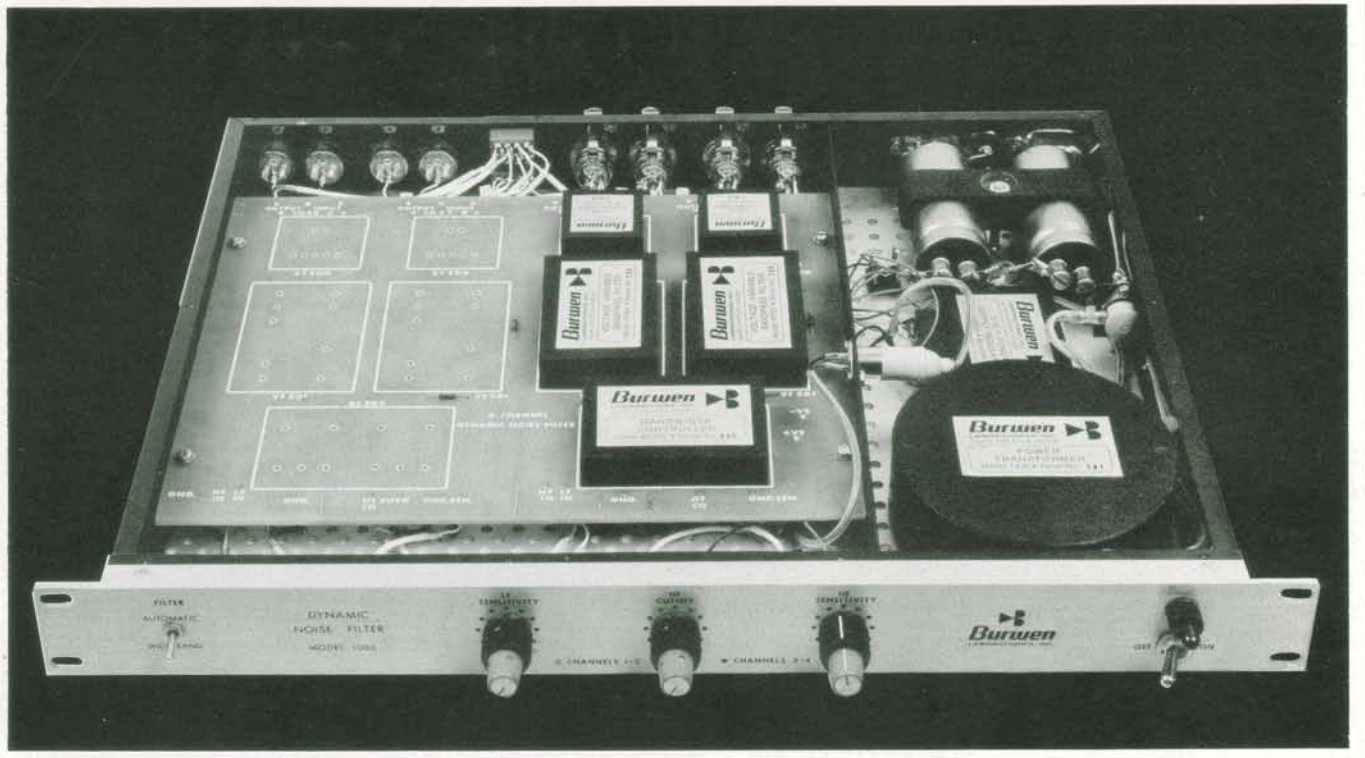
MODULES

ITEM	DESCRIPTION
BC1	BC302 Bandwidth Controller
BC2	BC302 Bandwidth Controller
FR1	VF301 Voltage Variable Bandpass Filter
FR2	VF301 Voltage Variable Bandpass Filter
FR3	VF301 Voltage Variable Bandpass Filter
FR4	VF301 Voltage Variable Bandpass Filter
T1	AT200 Active Transformer
T2	AT200 Active Transformer
T3	AT200 Active Transformer
T4	AT200 Active Transformer

Note: The above modules are required for four channels. For a lesser number of channels the modules required are as follows:

One Channel	BC1, F1, and T1
Two Channels	BC1, F1, F2, T1, and T2
Three Channels	BC1, BC2, F1, F2, F3, T1, T2, and T3
Two Independent Channels	BC1, F1, and T1 BC2, F3, and T3

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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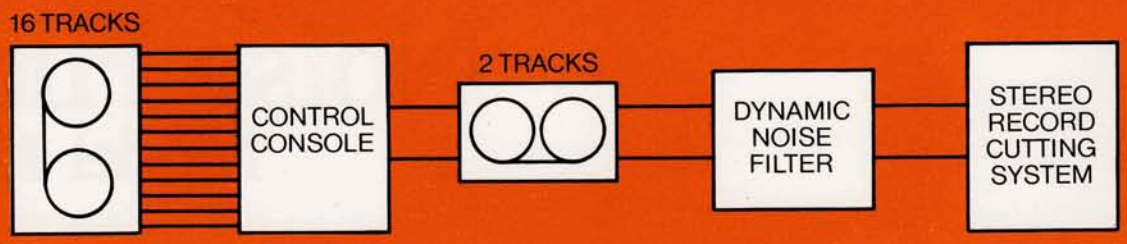

FIGURE 1. TWO CHANNEL DYNAMIC NOISE FILTER PERFORMS 18 CHANNEL NOISE REDUCTION.

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.

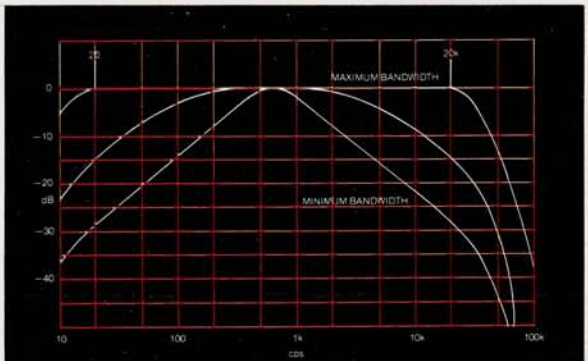

FIGURE 2. FREQUENCY RESPONSE

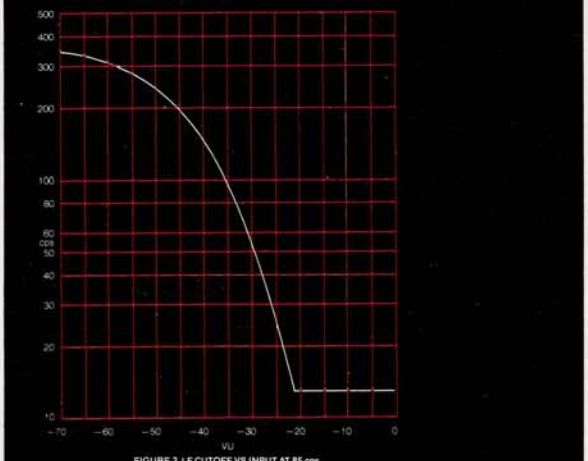

FIGURE 3. LF CUTOFF VS INPUT AT 85 cps

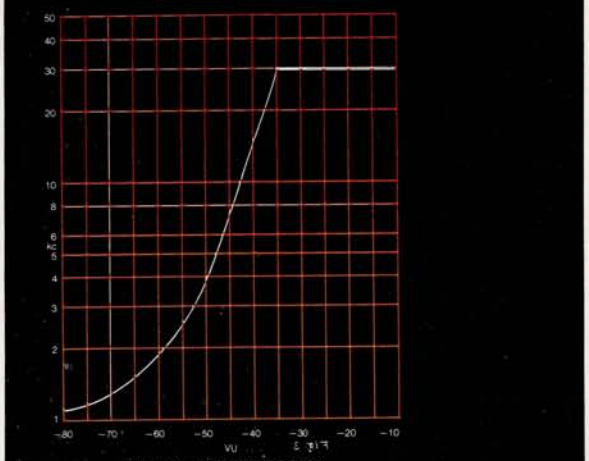

FIGURE 4. HF CUTOFF VS INPUT AT 6.6 kc

*Patent applied for

MODULAR COMPONENTS

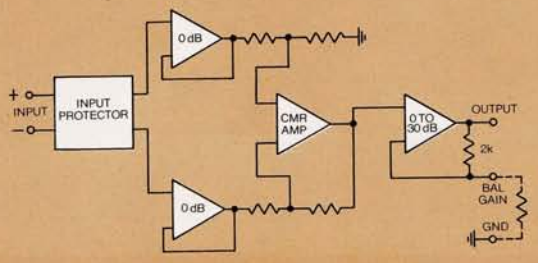

FIGURE 5

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.

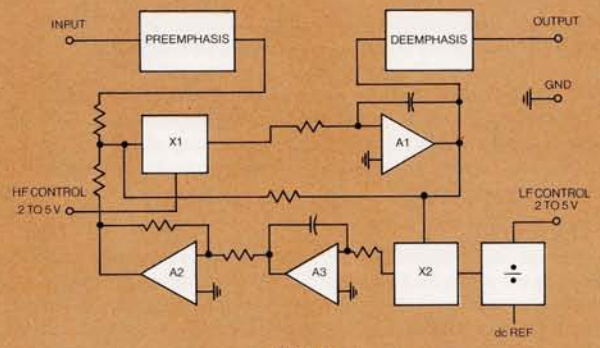

FIGURE 6

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.

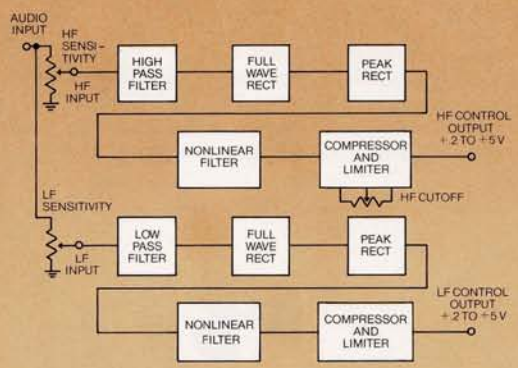

FIGURE 7

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

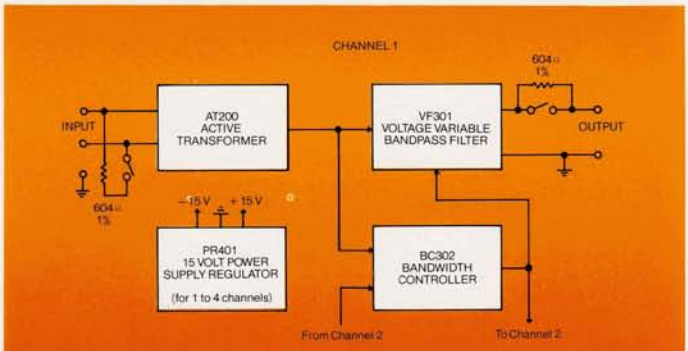

FIGURE 8. SYSTEM DIAGRAM

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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