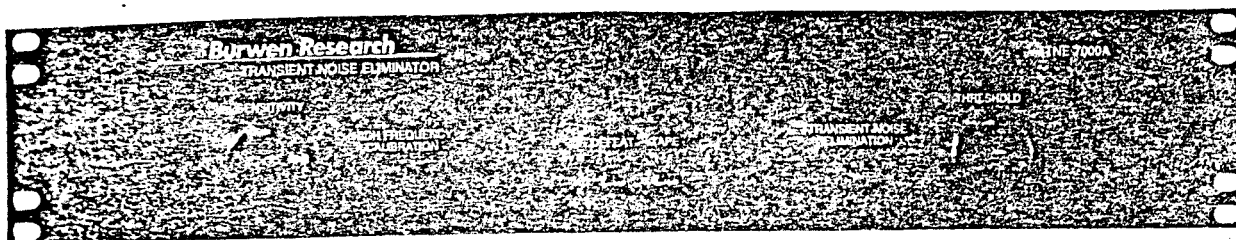


Burwen Research

INSTRUCTION MANUAL

for

TRANSIENT NOISE ELIMINATOR



MODEL TNE 7000A

UNPACKING

Unpack your Model TNE 7000A carefully and check it for possible damage caused by shipping. If the unit is faulty, return it in its original carton to your dealer since the shipping container may show evidence of mishandling.

For your convenience and to help you expedite any service needed on your Model TNE 7000A, please attach your sales slip to this sheet and record the serial number, the date of purchase, and your dealer's name and address for future reference. Please refer to them any time you correspond with Burwen Research. In the event that your Model TNE 7000A is lost or stolen, the availability of this information will be of invaluable help in the filing of an insurance claim and in the report required by your local police.

LINE VOLTAGE INPUT

Your TNE 7000A is designed to operate with a power line input of 105-125 volts, 50 to 60 Hertz. Do not connect it to any other line voltage or frequency, since this can cause damage to the power supply. Conversion to 210-250 volts, 50 to 60 Hertz, may be made by a qualified technician.

INSTALLATION

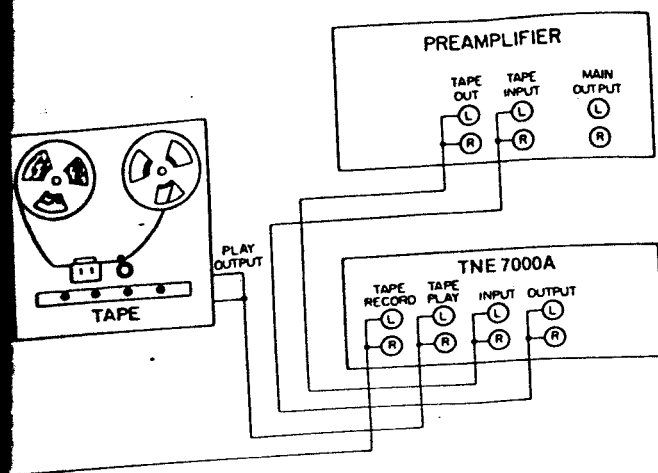
Your TNE 7000A is designed to eliminate large or small ticks and pops from any stereo or quad matrix record. The TNE 7000A can be installed in standard 19 inch wide racks, and requires a 3 1/2" vertical mounting space. The inside pairs of holes are compatible with home hi fi equipment mounting racks. Four screws (not provided with the equipment) should be used for mounting the unit into the vertically adjustable mounting holes located in the rack frame. The four corner slots will mate exactly with the pre-drilled and tapped mounting holes on professional recording and broadcast installations. Connect the TNE 7000A to your system through the external tape circuit of your preamplifier or receiver. Use only the finest quality audio cables for connecting the Model TNE 7000A.

1. Disconnect power from your system.
2. Plug the power cord into a switched outlet on your preamplifier or receiver.
3. Connect the INPUTS of the TNE 7000A to the TAPE OUT jacks of your system.
4. Connect the OUTPUTS of the TNE 7000A to the TAPE INPUT jacks of your system.
5. Connect the RECORD INPUTS of your tape deck to the TAPE RECORD jacks provided on the TNE 7000A.
6. Connect the PLAY OUTPUTS of your tape deck to the TAPE PLAY jacks provided on the TNE 7000A.
7. Operate the TAPE MON switch on your receiver or preamplifier to insert the TNE 7000A between the source and the rest of your system.

WARNING—TO PREVENT FIRE OR SHOCK HAZARD DO NOT EXPOSE THIS DEVICE TO RAIN OR MOISTURE.



7000 - A



CONNECTION DIAGRAM

This method of connecting your TNE 7000A provides:

1. Processing any source selected by your SOURCE selector through the TNE 7000A.
2. Processing any source prior to recording on your tape deck.
3. Simultaneous tape monitoring.

OPERATING PRINCIPLES

Transient noise, sometimes called impulse noise, is probably the most annoying sound that can come through your sound system. Ticks, pops, clicks—any way you describe them, they are heard as short bursts of noise that can ruin your pleasure from even your favorite record. Until the introduction of the Burwen Research Transient Noise Eliminator 7000A, the audio enthusiast has not had a totally satisfactory device to eliminate this aural phenomenon.

Transient noise is an easy phenomenon to understand. As your stylus tracks in the record groove, it moves both laterally and vertically. Sometimes, however, the vertical movement is jarred when the stylus drops into and bounces out of ruts caused by scratches. Sometimes the stylus jolts over obstacles such as dirt or imperfections in the vinyl. These occurrences, and built-up static charges, create short electrical impulses that can be heard as bursts of noise. If the signal level of these bursts is audible above the music, the result is annoying noise and an unhappy listener.

Because it is present at the same time as music, transient noise is a difficult phenomenon to eliminate. However, it has distinctly different characteristics than the music. Music has a natural rhythmic pattern. Musical transients have a typical attack time of 2 thousandths of a second, with a decay time that can last from one tenth of a second to several seconds. Transient noise, on the other hand, has an unnatural, erratic pattern. Its attack time is very fast, varying from 50 to 200 millionths of a second, with a duration of up to 2 thousandths of a second. Transient noise has a high energy content in the ultrasonic region from 20 kHz to 50 kHz, where there is little or no musical content. The Transient Noise Eliminator 7000A uses these three characteristics to eliminate transient noise while maintaining the smoothest possible audio signal.

Transient noise elimination consists of two steps—instantaneous detection and elimination. The TNE 7000A has a sophisticated system that detects ticks and pops by their high energy content at frequencies above the audible range. The detector then switches off the entire signal until the transient noise has passed. During the off time, the TNE 7000A substitutes a smoothly varying signal so that the listener cannot hear any difference in the music. The off time is actually on 80-600 millionths of a second—much shorter than that of any other device on the market. Turning off the signal for millionths of a second minimizes the disturbance to the desired signal and is one of the principle advantages of the Burwen Research system. The Burwen Research Eliminator uses a time delay of 40 millionths of a second to assure that the transient noise impulse is adequately detected and suppressed by the switching circuit. The TNE 7000A uses a shorter time delay system than that of any similar device.

CONTROL CIRCUITRY

The design of the Transient Noise Eliminator 7000A draws on Burwen Research technology for highly advanced state-of-the-art signal processing. The Eliminator uses steep-slope high-pass filtering, precision full-wave rectification, and a high-speed pulse detector. It has manual SENSITIVITY and THRESHOLD controls which optimize the sensitivity to ticks and pops, and minimize the sensitivity to music. Burwen Research uses its own patented system to produce the smoothest possible transition from the musical signal ahead of the tick to the musical signal following the tick. This system involves high frequency pre-emphasis ahead of the switch, complementary de-emphasis afterward, sampling and holding of the low frequency content of the music, phase matching and switch spike cancellation. The short time delay allows the use of a precision linear phase, low-pass filter having extremely low noise and distortion. Through the use of matched and trimmed components, the Burwen Research TNE 7000A is able to maintain a typical frequency response flat within 0.2 dB from 10 Hz to 20kHz. Other devices of this type use wide tolerance components which cause response variations from unit to unit and between channels. Although the phase shift and sharp cutoff of the system changes the wave form of a square wave input, there is not audible effect on either sine waves or music.

When your TNE 7000A is switched out, it becomes a unity gain buffer amplifier having extremely low distortion of all types and excellent square wave response. Its dc coupled output circuitry, having less than 1 ohm output resistance, is unaffected by the load for any value between 5 K ohm and an open circuit.

FRONT PANEL CONTROLS

There are four controls and two light emitting diode (LED) indicators on the front panel of your Transient Noise Eliminator 7000A. When released, the DEFEAT push button allows you to process signals through your TNE 7000A. When depressed, the DEFEAT button switches out the transient noise elimination system and substitutes a unity gain buffer amplifier. To monitor from tape, push the TAPE MONITOR switch. Since your Transient Noise Eliminator is always connected ahead of your tape recorder, it will process all signals fed to the tape unless the DEFEAT button is depressed.

The SENSITIVITY knob adjusts the TNE's sensitivity to high frequency information in the program, such as violins and the upper ranges of brass. It also brings the incoming signal from the receiver to a standard value in the detector by compensating for different incoming signal and noise levels. The SENSITIVITY control affects the brightness of both the HIGH FREQUENCY CALIBRATION and the TRANSIENT NOISE ELIMINATION LEDs. The THRESHOLD knob adjusts the sensitivity of the detector to music and to ticks and pops in the presence of loud high frequency signals. It affects only the TRANSIENT NOISE ELIMINATION LED.

OPERATION

1. BEFORE TURNING YOUR RECEIVER OR PREAMPLIFIER ON OR OFF, TURN YOUR VOLUME CONTROL TO 0 OR SET THE TAPE SOURCE SWITCH AT SOURCE ON YOUR PREAMPLIFIER OR RECEIVER. THIS ELIMINATES A TURN-ON OR TURN-OFF THUMP. If your preamplifier or receiver has a built-in time delay, the thump will automatically be avoided, regardless of the control settings.

2. Make the following initial setting of the controls on your TNE 7000A:

Release DEFEAT

Release TAPE MONITOR

Set SENSITIVITY at maximum counter-clockwise

Set THRESHOLD at maximum counter-clockwise

3. Adjust the SENSITIVITY and THRESHOLD controls in accordance with the following sections:

SENSITIVITY CONTROL

The SENSITIVITY control adjusts the sensitivity of the detector circuit to high frequency program information. When the SENSITIVITY control is set at maximum counter-clockwise, the Transient Noise Eliminator 7000A is at minimum sensitivity to high frequency information. This control should be set during a record passage where there is either no musical content or only low frequency music, such as a bass guitar. With SENSITIVITY at the maximum counter-clockwise position, the HIGH FREQUENCY CALIBRATION LED is brightly lit. Advance the SENSITIVITY control clockwise until the HIGH FREQUENCY CALIBRATION LED is only dimly lit. At this point, the LED is beginning to show the effect on the detector circuit of the high frequency hiss level in the signal. This is the best setting for the control. High frequency hiss is almost always present in the audio signal and your Transient Noise Eliminator 7000A is now tuned for this lowest level high frequency signal. The TNE is ready to be adjusted to eliminate the high frequency transient noise by using the THRESHOLD control. Do not turn the SENSITIVITY control beyond this point except for certain types of program material, as explained under FINE CALIBRATION. When the SENSITIVITY control is set at maximum clockwise, the TNE 7000A is at maximum sensitivity to high frequency information.

THRESHOLD CONTROL

The THRESHOLD control adjusts the sensitivity of the detector circuit to music and to ticks and pops in the presence of loud high frequency program information. When the THRESHOLD control is set at maximum counter-clockwise, the Transient Noise Eliminator 7000A is at minimum sensitivity to transient noise and to music. The control should be set during a record passage where there is medium to loud high frequency musical content, such as violins and the upper ranges of brass. With THRESHOLD at the maximum counter-clockwise position, the TRANSIENT NOISE ELIMINATION LED is not lit. Advance the THRESHOLD control clockwise, and the TNE 7000A will begin to eliminate those noise impulses that are audible above the music. The TRANSIENT NOISE ELIMINATION LED will flash each time the Eliminator removes a tick or pop. The Eliminator distinguishes between transient noise and high frequency music by detecting the sharply erratic signal of the noise, as opposed to the more slowly varying musical patterns. As you advance the control clockwise, the TNE eliminates a higher proportion of ticks and pops. Set the THRESHOLD control by ear at the maximum clockwise setting that does not cause audible distortion. Beyond this point, the TNE will be activated by the music, distorting the signal. When the THRESHOLD control is set at maximum clockwise, the 7000A is at maximum sensitivity to high frequency noise and music. (Note that the TRANSIENT NOISE ELIMINATION LED flashes on for approximately 17 thousandths of a second each time a tick or pop is removed. To make the flash of light appear bright enough, the duration of the light impulse may be more than 200 times the actual time the audio signal is turned off to eliminate the noise impulse.)

FINE CALIBRATION

For certain types of program material, the SENSITIVITY control can be used advantageously when advanced in the presence of high frequency music. On worn records with loud brass instruments, for example, the maximum clockwise setting can be used to prevent false triggering by the distortion components of the brasses. The detector will then saturate on the loud high frequency content and prevent false triggering on loud cymbals and other transient high frequency music.

Use the TRANSIENT NOISE ELIMINATION LED as a guide in setting both the SENSITIVITY and THRESHOLD controls. At the optimum setting, the frequency of flashing caused by the elimination of ticks and pops is about the same during medium volume signals as during the silent portions of a record. You will hear no effect on the music, while noting the elimination of the transient noise. If the two controls are incorrectly set, so the detector operates too frequently and is activated by the music, the music will sound chopped up and distorted.

Occasionally you may notice the TRANSIENT NOISE ELIMINATION LED flashing in synchronism with certain types of percussive musical material such as cymbal beats. Since the Burwen Research Transient Noise Eliminator operates by detecting unusual amounts of ultrasonic frequency content in the vertical component of the phono signal, it cannot always distinguish between the onset of a transient noise and the onset of a musical transient such as a cymbal beat. When the controls are properly set, even if the circuit does trigger on the leading edge of a cymbal beat, the signal is turned off for only 1 to 2 thousandths of a second. There is no audible musical loss.

Very loud high frequency signals may cause the TRANSIENT NOISE ELIMINATION LED to stop flashing altogether. At such high levels there is usually no need to eliminate the ticks and pops, since these are obscured by the music.

The TRANSIENT NOISE ELIMINATION LED may flash very seldom when playing a new high quality record; but even the best record will have imperfections in the vinyl that can cause transient noise. On the other hand, the TRANSIENT NOISE ELIMINATION LED may be on almost continuously on an old worn record. If the LED is on continuously, it indicates that the intervals between transients are less than 17 thousandths of a second. It does not mean the signal is continuously interrupted.

In some sound systems it is possible for the TRANSIENT NOISE ELIMINATION LED to light continuously even when there is no music. This may be an indication of a 60 Hz buzz being picked up in your phono preamplifier system from some noise source such as a light dimmer. If the effect on your program material is audible, reduce the setting on the SENSITIVITY control so the LED flashes only on ticks.

To determine whether there are any remaining audible effects on the music, press the DEFEAT switch and compare the processed signal with the unprocessed signal.

Although the TNE 7000A will substantially eliminate transient noise, resulting in vastly improved record performance, severely damaged records with dirt ground into the surfaces may be beyond the performance restoration capability of any noise suppression technology available today. Signal processing cannot always restore worn vinyl to high performance condition.

Not every tick or pop can be removed, either. It is fundamentally impossible to turn the music off and on in an extremely short period of time without generating some noise that substituted for the impulse that has been removed. Whether any audible noise is generated depends upon the instantaneous amplitudes of the signal immediately before and immediately after the noise impulse. Burwen Research's patented circuitry minimizes the effect of system-generated noises, and the Transient Noise Eliminator 7000A has been designed to perform this function better than any other devices on the market. Audibly, the result is complete elimination of any impulses, and considerable attenuation of others.

PHONO SOURCES

Discrimination between ticks and pops and the desired music can be slightly enhanced by the use of a phono cartridge designed for CD-4 records. The wide frequency response, up to 50 kHz, of a CD-4 cartridge with a Shibata-type stylus delivers a higher ratio of ticks-to-music content to the detector, making it easier to discriminate between noise and music. Such cartridges generally produce excellent results when playing conventional and matrix encoded records. Conventional cartridges are entirely satisfactory, however.

Your TNE 7000A is designed for reproduction of conventional and matrix encoded records. CD-4 records contain an ultrasonic carrier which will desensitize the detector in your TNE 7000A, rendering it much less effective.

Monophonic records can be processed by your TNE 7000A, provided that the blending to mono occurs after the TNE. If the signal is monophonic ahead of the TNE, it is necessary to feed only one input instead of both because your TNE measures the difference between two channels.

FM AND TAPE SOURCES

Your TNE 7000A Transient Noise Eliminator is most effective on records. In some instances the TNE can be used to remove ticks and pops from records played over an FM station or due to auto ignition interference. Most receivers, however, have a substantial amount of 19 kHz and 38 kHz subcarrier signal content which is inadequately filtered out of the FM signal. Such steady ultrasonic signals tend to desensitize the detector circuit in the Transient Noise Eliminator. To counteract the effect, set the SENSITIVITY control further counter-clockwise and be guided by your ears and the flashing of the TRANSIENT NOISE ELIMINATION LED. To increase the sensitivity of the Transient Noise Eliminator to ticks and pops, turn the THRESHOLD control further clockwise. Unless your receiver has a particularly good subcarrier filter, the TNE 7000A will not be as effective on records played over FM as on the same record played directly through your own phono pickup.

On monophonic signals and AM, your TNE normally will not operate since it senses only difference between left and right channels. Single channel signals can be processed by feeding the signal to either the left or right input but not both.

Your Transient Noise Eliminator is normally connected ahead of your tape recorder to remove ticks and pops before recording on tape. If necessary, a tape containing ticks and pops from a record recorded onto it can be played through the Transient Noise Eliminator. Your TNE may not be quite as sensitive because of the loss of high frequencies through the tape recorder and possible presence of high frequency bias in the signal.

AUXILIARY EQUIPMENT

Expanders and equalizers are normally connected after your Dynamic Noise Filter, which comes after your Transient Noise Eliminator. The TNE operates best on conventional unprocessed phono sources.

Your TNE 7000A can be used on matrix encoded phono sources prior to decoding.

No periodic maintenance is needed beyond occasional dusting. CAUTION—avoid using solvents and cleaning fluids, since these may mar the finish.

SERVICE

Your Transient Noise Eliminator 7000A is built to the most rigid control standards possible. Each unit is pre-tested and operated continuously for 168 hours at the factory prior to shipping. If your TNE 7000A does not function as you expect, and you cannot find a solution by following this manual, please follow the instructions outlined below:

Wherever possible, please contact the dealer from whom the system was purchased to arrange for final verification of the defect, replacement if your unit is brand new, or shipping if it requires repairs. If your dealer is not within the immediate area or cannot inspect your unit for any reason, write directly to Burwen Research Customer Service Department, 7930 Deering Avenue, Canoga Park, CA 91304. Describe the trouble and any tests you have made, with as much detail as possible, giving the name of your dealer, date of purchase, and the serial number on the back panel of the TNE 7000A. Alternatively, you may take your TNE 7000A directly to the regional Burwen Research Factory Authorized Service Agency, listed in your local Yellow Pages. Burwen Research will make every effort to remedy any problem within the terms of the Warranty at minimum inconvenience to you.

Do not ship your TNE 7000A or any part thereof to the Burwen Research factory without requesting and receiving a Special Numbered Shipping Label prior to shipment. Any unit arriving at the Burwen Research factory without the Special Numbered Shipping Label will be refused by the Burwen Research Receiving Department.

Freight charges must be prepaid when the TNE 7000A is shipped to Burwen Research for repairs. It is the responsibility of the sender to see that any part of the TNE 7000A returned to Burwen Research for any reason is properly packed. Any TNE 7000A damaged in shipment due to incorrect packing will not be recognized by the carrier as an insurance claim, and the sender will be charged for any parts and labor required to return the unit to proper operating condition. To insure freedom from damage in shipment, the TNE 7000A must be packed as it was when it left the Burwen Research plant. If you no longer have the original factory packing, you may obtain a carton, including the end caps, for a minimal charge from the Burwen Research Customer Service Department simply by making a written request.

Please adhere to the following procedures precisely: