

HUSH IICXTM

STEREO SINGLE-ENDED NOISE REDUCTION SYSTEM

OWNER'S MANUAL

May be covered by one or more of the
following: U.S. Patents #4538297,
4647876, 4696044, 4745309,
4881047, 4893099.
Other patents pending.
Foreign patents pending.

HUSH
SYSTEMS

INTRODUCTION:

The Hush Systems HUSH IICX™ is a rackmount single-ended noise reduction unit, providing the versatility of a two channel package of Hush Systems' HUSH II™. Single-ended noise reduction requires that the audio signal pass through the system only once to eliminate noise. The HUSH IICX™ will solve virtually ANY noise problem.

This operating manual will introduce you to the HUSH IICX™ and its various functions. After reading this manual carefully, keep it for future reference.

PRECAUTIONS:

NOTE: IT IS VERY IMPORTANT THAT YOU READ THIS SECTION TO PROVIDE YEARS OF TROUBLE FREE USE. THIS UNIT REQUIRE CAREFUL HANDLING.

All warnings on the equipment and in the operating instructions should be adhered to and all operating instructions should be followed.

Do not use this equipment near water. Care should be taken so that objects do not fall and liquids are not spilled into the unit through any openings.

The power cord should be unplugged from the outlet when left unused for a long period of time.

DO NOT ATTEMPT TO SERVICE THE EQUIPMENT. THIS EQUIPMENT SHOULD BE SERVICED BY QUALIFIED SERVICE PERSONNEL ONLY. DO NOT REMOVE THE COVER FROM THIS EQUIPMENT AT ANY TIME. DO NOT MAKE ANY INTERNAL ADJUSTMENTS OR ADDITIONS TO THIS EQUIPMENT AT ANY TIME. DO NOT TAMPER WITH INTERNAL ELECTRONIC COMPONENTS AT ANY TIME. FAILURE TO FOLLOW THESE INSTRUCTIONS MAY VOID THE WARRANTY OF THIS EQUIPMENT AS WELL AS CAUSING SHOCK HAZARD.

POWER REQUIREMENTS:

This unit accepts power from the 9V AC/1500mA adaptor supplied with the unit. This 9V RMS AC voltage is internally processed by a voltage doubler, thus generating a bi-polar + & - 15V to maintain the headroom and sound quality of professional, studio quality equipment. Using an external power source such as this minimizes excessive noise and hum problems often associated with internal transformers, giving the user optimal performance.

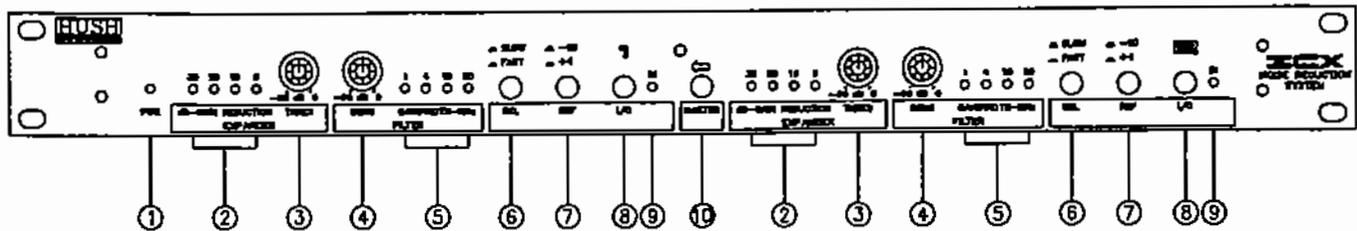
OPERATING TEMPERATURE:

Do not expose the unit to excessive heat. This unit is designed to operate between 32 F and 104 F (0 C and 40 C). This unit may not function properly under extreme temperatures.

CLEANING INSTRUCTIONS:

Do not use cleaners such as Benzine to clean the exterior. Use a soft dry cloth to remove dust, dirt or fingermarks. Internal cleaning should only be performed by authorized technicians.

FRONT PANEL DESCRIPTION



The HUSH IICX™ has two identical channels. Each channel has the following controls, as well as individual channel in/out switches and a stereo master switch.

(1)...POWER ON/OFF LED:

This LED indicates power On/Off.

(CHANNELS ONE AND TWO)

(2)...EXPANDER GAIN REDUCTION METER:

Indicates (in dB) amount of gain reduction taking place.

(3)...EXPANDER THRESHOLD CONTROL:

Variable between -60 and 0dB.

This control sets the threshold point at which low level downward expansion begins once the input signal drops below the level at which this control is set.

(4)...FILTER SENSITIVITY CONTROL:

Variable between -60 and 0dB.

The Filter Sensitivity control allows the user to set the maximum sensitivity point (or minimum input level) at which the filter of the HUSH™ will begin to operate.

(5)...FILTER BANDWIDTH METER:

Indicates (in KHz) the bandwidth of the filter.

(6)...RELEASE SWITCH:

This switch allows for a fast or slow expander release rate.

(7)...REFERENCE SWITCH:

This switch adjusts the sensitivity of the unit, optimizing it for either -10dB or +4dB operation.

(8)...CHANNEL IN/OUT SWITCH:

This switches the channel in for HUSH™ operation or out for bypass.

(9)...CHANNEL IN/OUT LED:

When lit, the LED indicates the channel is in.

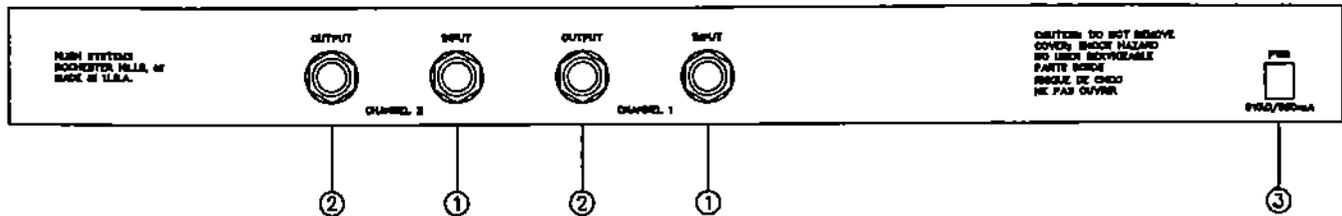
(10)...STEREO MASTER SWITCH:

The Stereo/Master switch ties the expander and filter detection circuits of channel 1 and channel

2 together for stereo applications. This switch allows the user to select for either stereo or mono applications. When the Stereo Master switch is in, channel 1's controls are master and channel 2's are inoperable.

NOTE: To avoid mis-tracking when using the stereo master mode, make sure that both channel's reference switches are set in the same positions.

REAR PANEL DESCRIPTION



(CHANNELS ONE AND TWO)

(1)...INPUT JACKS:

These two standard unbalanced 1/4" mono jacks are used to provide input to the unit.

(2)...OUTPUT JACKS:

These two standard unbalanced 1/4" mono jacks are used to provide the outputs of the unit.

NOTE: HUSH IICX™ has a 470K input impedance which allows direct use with instruments, such as guitars, with no loss of frequency response.

PRECAUTION: READ OUTPUT SPECIFICATIONS AND BASIC OPERATIONS FOR PROPER USE.

(3)...POWER JACK:

This unit accepts power from the 9V AC/1500mA adaptor supplied with the unit.

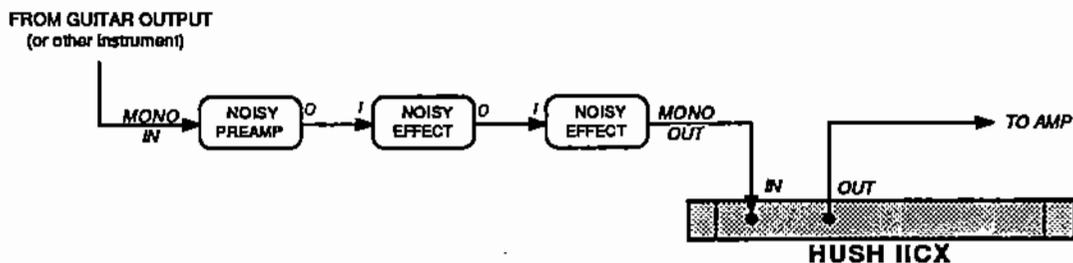
CONNECTIONS AND APPLICATIONS

There are many possible applications for the HUSH IICX™. Make the appropriate connections as shown below.

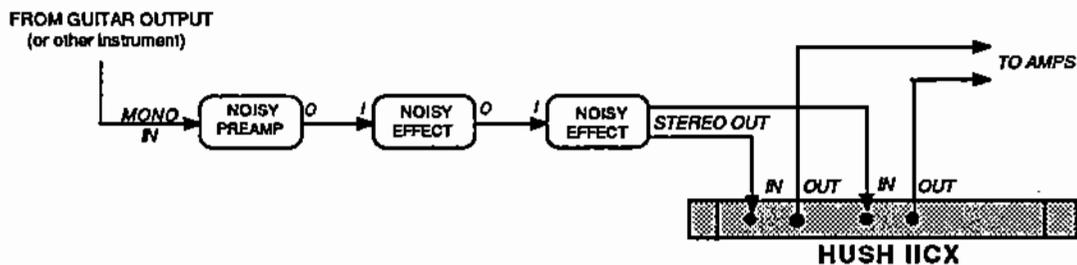
Guitar Applications

Guitar with effects and amplifiers. The HUSH™ helps to quiet effects.

MONO APPLICATION



STEREO APPLICATION

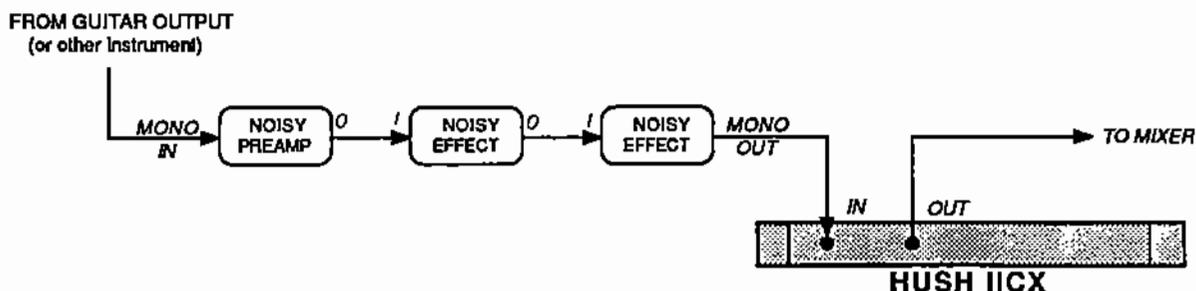


Note: It is possible to connect from effects, into the IICX, while utilizing the effects loop of your amplifier. This will help quiet the preamp section of the amplifier.

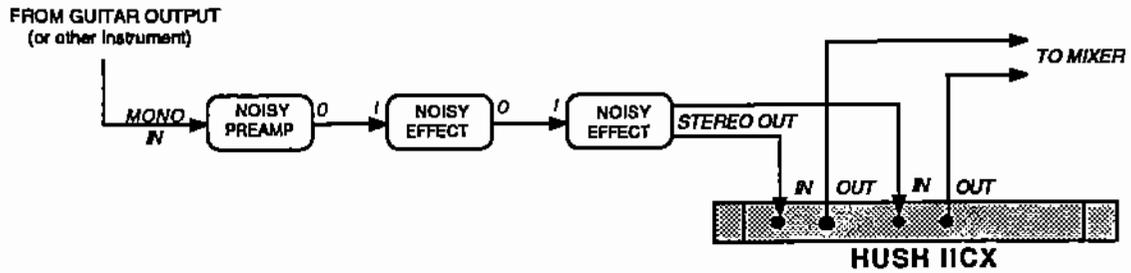
WARNING: Do not connect the "speaker out" of your amplifier into the HUSH IICX™. This may result in severe damage to your IICX unit.

Recording Applications

MONO APPLICATION

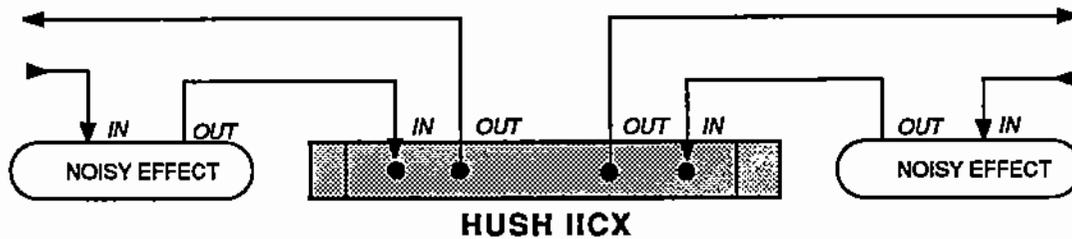


STEREO APPLICATION



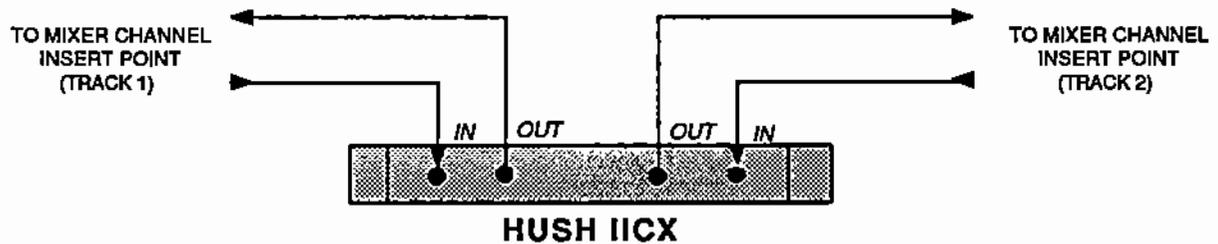
In the Studio

The HUSH™ has numerous applications for noise problems in the studio, from multi-channel mixdown and two channel mastering to reducing the noise in the recording of individual tracks. The HUSH IICX™ provides excellent results when copying previously recorded tapes and can also be used to quiet outboard signal processing gear in the studio such as digital delay lines, reverb units and drum machines.



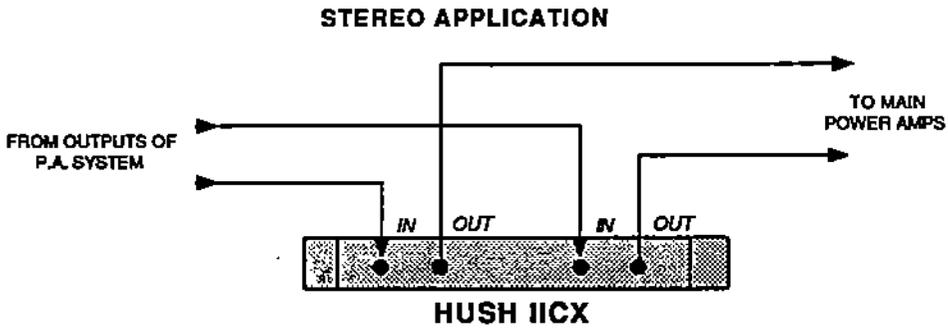
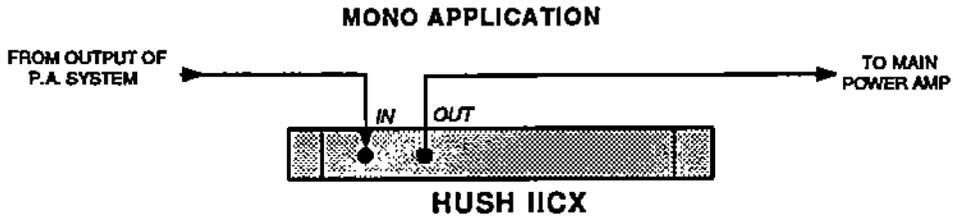
Two track recording

Patched in a channel of a mixing console for separate uses (vocals, guitar, etc.).



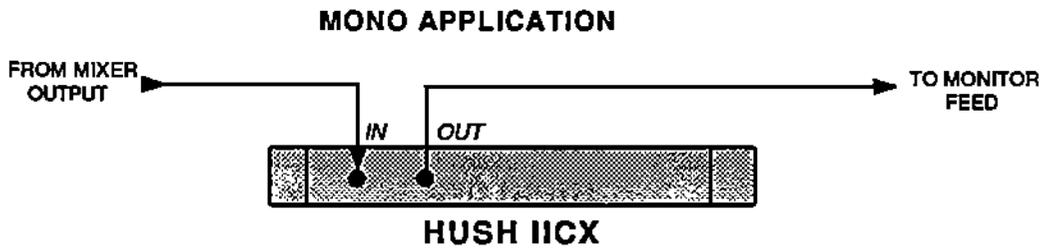
PA Applications

The HUSH™ can be used on the output feed to the mains to quiet both ambient stage noise and to reduce to inaudible levels the noise of mixing consoles and any other signal processing devices used.



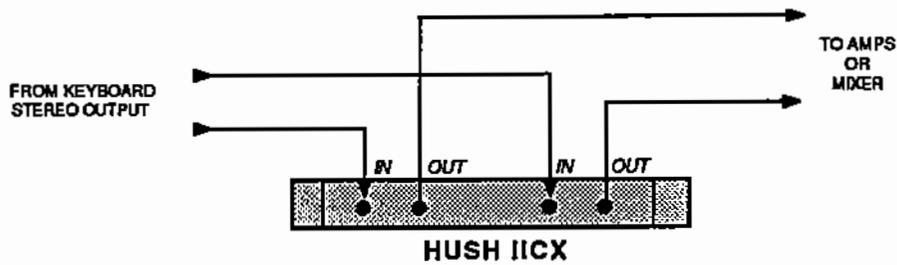
Live Monitor Applications

The IICX can be used to quiet monitor feed from the mixing console in a live application. This will help quiet the stage mix and also greatly reduce the possibility of feedback from vocal microphones.



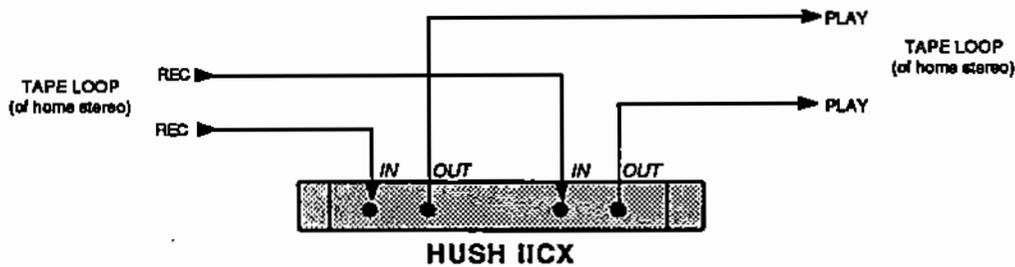
Keyboard Applications

The IICX can be used to quiet an entire keyboard mix before being fed to the power amplifier and speakers.



In the Home

The HUSH™ may be used to reduce noise when making tapes (or copies) at home. By inserting the HUSH IICX™ into the tape loop of a home stereo system, the HUSH™ can also be used to quiet albums, compact discs, and FM broadcasts. The HUSH™ is also excellent for eliminating noise in the home entertainment system present when processing audio signals from VCRs.



OPERATION

The HUSH™ system incorporates the principles of dynamic filtering and low level expansion. The dynamically controlled low pass filter is designed to open and close the bandwidth dependant upon the amount of mid and high frequency information present in the audio signal. The filter bandwidth will open to pass the high frequency information in the input signal while reducing the high frequency noise above the highest input signal. For example, if the highest frequency present is 8KHz, the filter will open to pass up to 8KHz while the noise from 8KHz to 20KHz would be reduced.

The Filter Sensitivity control on the front panel will determine the minimum input level at which the filter will begin to operate.

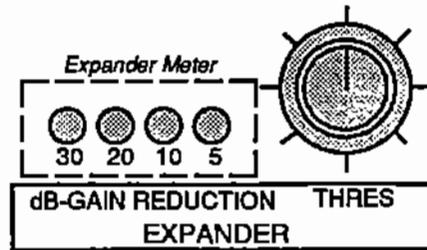
When no mid or high frequency information is present, the filter will close down to a pre-set cut-off point of 700Hz, allowing only frequencies below 700Hz to pass. The cut-off slope employs a 12dB per octave filter.

The second half of the process incorporates downward expansion. Low level downward expansion takes place when the input signal level drops below the threshold point, set via the Threshold control on the front panel. This means that as the signal drops a certain level below the threshold point, the output will be attenuated to an even greater degree, thus reducing noise. As the signal falls further below this point, the ratio at which this occurs increases.

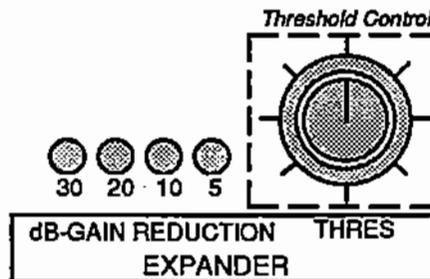
The basic operation of the HUSH IICX™ has been divided into the functions of the separate controls and switches. In order to obtain the best performance from your unit, read and understand how each works.

EXPANDER METER:

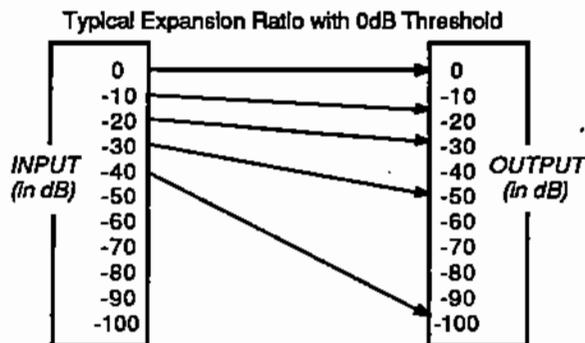
The expander meter indicates the amount of expansion taking place. The meter reads the level of gain reduction in decibels. For example, if both the 5dB and 10dB LEDs are lit, this indicates that at least 10dB of gain reduction is taking place.



THRESHOLD CONTROL:

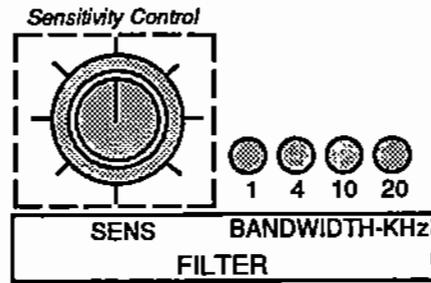


The threshold control sets the level at which broad band downward expansion begins. With the control full counterclockwise, downward expansion begins at an input level of approximately -60dBv. As the signal level drops below -60, the expansion ratio will increase, thereby providing more gain reduction of the signal across the entire audio spectrum. The further the signal level decreases below this pre-set threshold point, the more the ratio of expansion and resulting gain reduction increases.



With control full clockwise, the maximum gain reduction is provided. Downward expansion will begin at approximately 0dBv and increase as previously described as the signal level decreases.

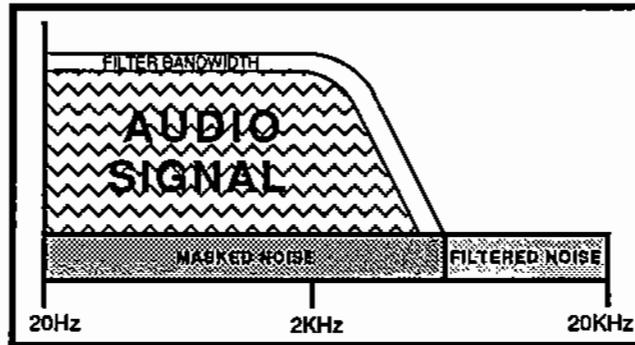
SENSITIVITY CONTROL:



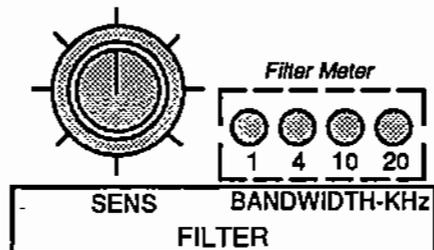
To facilitate a better understanding of the sensitivity control, a more detailed description of the dynamically controlled filter section of the HUSH™ will be given.

The dynamic filter circuit incorporates a frequency weighted detection circuit. This circuit senses both the mid and high frequency content and the amplitude of the input signal and produces an output DC signal which controls a voltage controlled low pass filter. If a large amount of high frequency information is present in the input signal, the filter will open to its full bandwidth (40KHz). If the highest input frequency is only 2KHz the filter will open to pass the 2KHz signal and its harmonic information while reducing any noise present above this frequency.

The sensitivity control is used to set the level at which the filter will open to pass the frequencies contained within the input signal. Setting this control at a level too high for a particular application will cause the filter to remain closed when a signal is present. When set too low, the filter will stay open when a signal is not present, allowing all high frequency noise to pass.



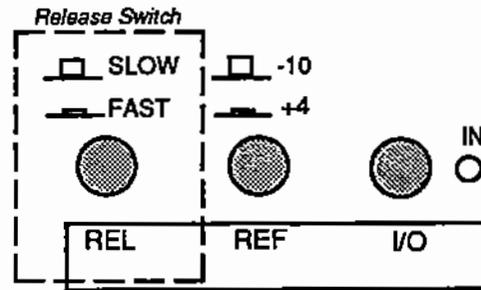
FILTER METER:



The filter meter indicates the bandwidth that the dynamic filter is open to, as well as showing the filter cut-off frequency when no input signal is present. The filter is always open to at least 0.7KHz (400HZ).

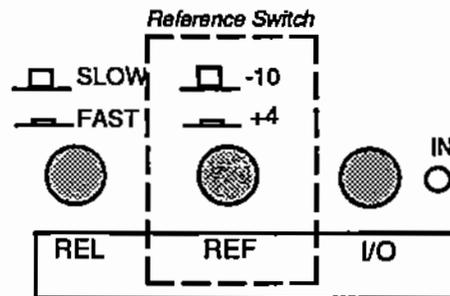
Note: When an input signal's frequency component exceeds 700HZ, the filter meter will indicate an increase in bandwidth.

RELEASE:



The release switch selects a fast or slow release time for the low level downward expander. In the fast release mode, the release time is approximately 200ms for 20dB of expansion. The fast release is recommended when the HUSH™ is used on individual tracks or instruments, or when used to quiet effects which are used on a single audio source like individual instruments or vocals. The slow release provides a release time of approximately 800ms for 20dB of expansion. The slow release mode is best used for composite music or multiple audio signal applications.

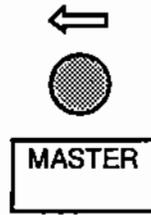
REFERENCE SWITCH:



The reference switch adjusts the sensitivity of the unit. When using the HUSH IICX™ with professional audio equipment providing a nominal output level of +4dB, it is recommended using the +4 setting on the unit as the threshold adjustment will allow you to optimize noise reduction for this reference level.

When using the unit with an instrument such as guitar or keyboards and their related equipment, a setting of -10dB should be used unless the other equipment being used also incorporates a reference level switch and is in a +4 position. Also, if a setting of -10 is used and the unit is overdriven, the +4 setting should be used.

STEREO MASTER:



When the stereo master switch is switched in, this ties the expander detection and filter detection circuits of both channel 1 and channel 2 together. When using the stereo master, a high level, high frequency signal present in one channel will cause the expander and filter of both channels 1 and 2 to open to the exact same point.

Note: To avoid mis-tracking when using the stereo master mode, make sure that both channels' line/inst switches are set in the same positions, (i.e., both set to line or both set to inst.).

SPECIFICATIONS

INPUT

Input Impedance 470K ohms
Maximum Input Level +18dBu (+4 Ref) +5dBu (-10 Ref)
Input Jack 1/4" Mono

FREQUENCY RESPONSE

+/-0.5dB 30Hz to 20KHz

TOTAL HARMONIC DISTORTION

Less than 0.03% at 0dBu 1KHz
+4 Ref level
(threshold at minimum)

DYNAMIC RANGE

114dB Peak signal to A-weighted
noise floor

EFFECTIVE NOISE REDUCTION

Greater than 60dB

FILTER

Two pole Class A, 12dB per
octave slope
Quiescent cut-off 700Hz
Maximum Bandwidth 50KHz

EXPANDER VCA

Class A

OUTPUT

Maximum +4 Ref Output Level +18dBu
Maximum -10 Ref Output Level +5dBu
Output Impedance Less than 100 ohms
Output Jack 1/4" Mono

POWER REQUIREMENTS

9VAC RMS 750mA

DIMENSIONS

19" X 6" X 1 3/4"

Note: 0dBu = .775V RMS

