

FBX™

FEEDBACK EXTERMINATOR

MODEL NO. R 1.0
PATENT PENDING • MADE IN U.S.A.

WHAT IS THE FBX FEEDBACK EXTERMINATOR?

The Sabine **FBX** Automatic Feedback Controller (AFC) is a microprocessor controlled filtering device which automatically finds and eliminates feedback in sound systems. And it does it quicker and with less tonal degradation than any other method.

WHAT DOES IT DO?

The **FBX** AFC microprocessor quickly senses if a sound system is experiencing feedback and determines its pitch. Once feedback occurs, the **FBX** AFC microprocessor assigns one of six very narrow notch filters to the resonating frequency and quickly eliminates the feedback. In almost every case, the **FBX** AFC automatically controls feedback faster, and with less sound degradation, than a competent sound man using the best graphic equalizer.

HOW DOES IT WORK?

The **FBX** AFC utilizes six narrow-band, independent, parametric notch filters that operate in two stages — three Fixed filters and three Dynamic filters. The **FBX** AFC sets the three Fixed filters to control the strongest feedback frequencies. The Fixed filters remain set on the strongest resonating frequencies until the **FBX** AFC is turned off. The three Dynamic filters control intermittent feedback that may develop during a program. They are automatically reassigned new frequencies as feedback occurs. Total feedback control is now achieved with fewer filters and less program degradation than with any other method.

PROBLEMS WITH GRAPHIC EQUALIZERS

Until now, graphic equalizers were the only devices available for controlling feedback even though they have several problems. The most obvious disadvantage is that they are not automatic and require a competent sound man on duty during the entire program, ready to jump at the first sign of feedback.

Once feedback occurs, the sound man must guess which slider controls the feedback frequency. While he searches for the correct sliders and the correct amount of adjustment, feedback spoils the program.

OPERATING GUIDE

The center frequencies of graphic EQ filters are fixed, so it may require two sliders to control a single feedback frequency. In contrast, a single movable **FBX** AFC filter can always control any feedback frequency with much less program degradation.

Once an EQ's slider is set, it is safer to leave that frequency attenuated rather than to chance allowing feedback to return. The result is that too many frequencies are attenuated and the program's sound is unnecessarily distorted. The **FBX** AFC never requires more than six filters to control feedback throughout the entire audio spectrum.

WHO NEEDS THE FBX?

Virtually every sound system will be improved with the **FBX** AFC. Small bands that do not have sound men can now increase their monitor volumes so they can hear themselves without worrying if the gig is going to be ruined by feedback.

Auditoriums and churches of all sizes will be able to enjoy quality sound control. Ministers will no longer wonder if the guy who installed his sound system is really a demon from the dark side.

Hotels that cater to business clients and conference groups can now offer meeting rooms with sound systems that don't squeal throughout the program.

Professionals mixing sound for large bands are often simultaneously responsible for a number of performers — each of whom have separate monitor mixes. If feedback occurs, it is very difficult to tell which of the many monitor mixes is resonating. If **FBX** AFCs are substituted for graphic EQs, the feedback will be automatically eliminated, without any effort on the part of the sound man.

WHY THE FBX?

The simple beauty of the **FBX** AFC is its ability to quickly and effectively eliminate feedback with fewer and narrower filters than ever possible before. The **FBX** AFC delivers superior sound quality automatically.



HOW TO USE THE FBX FEEDBACK EXTERMINATOR AUTOMATIC FEEDBACK CONTROLLER

The **FBX** automatic feedback controller (AFC) will improve any sound reinforcement system even if it is used incorrectly, but by following these suggestions, you will be assured that you get the most benefit from your **FBX** AFC and sound system.

WHERE TO PLACE THE FBX IN YOUR SOUND SYSTEM

1. Placement in the Sound System: Place the **FBX** AFC anywhere in the sound system that a graphic equalizer might be used. Some sample configurations are shown in Figure-1, with the most common configuration shown in Setup A. In this setup, the **FBX** AFC is installed between the output of the mixer and the input of the power amp. The main advantage of this configuration is that a single **FBX** AFC can sense and eliminate feedback occurring in any channel of the mixer.

Setup B is most useful when a single microphone is being used (e.g., an auditorium with a single speaker) or when an automatic feedback control is desired in certain mixer channels but not in others. (Feedback is sometimes a desired effect for lead guitarists). The unbalanced mic inputs and outputs are suitable for High Impedance microphones. Low Impedance microphones will require a Low-To-High Impedance transformer. One advantage of this configuration is that changes in the master volume of the system will not affect the SENSITIVITY LEVEL settings (more on sensitivity below).

Setup C is used in larger sound installations that require balanced line levels, such as when a long snake is required to connect a number of separate monitor amps to a single mixing console.

USING GRAPHIC EQUALIZERS: In almost all situations, the **FBX** automatic feedback controller replaces the graphic equalizer's function for eliminating feedback. In many applications, such as churches, auditoriums or small acoustic ensembles, the mixing board provides all the tonal control that is necessary and the **FBX** AFC can replace the graphic EQ altogether.

If a graphic equalizer is desired, place it in series with the **FBX** AFC, preceding the **FBX** AFC in the signal path. Use the EQ's controls to shape the tonal response of the sound system but **DO NOT NOTCH FOR FEEDBACK**. EQs just will not do as good a job at controlling feedback as the **FBX** AFC and EQ notches will degrade the response of the sound system. **IF YOU ARE USING THE FBX AFC AND YOUR SYSTEM SOUNDS THIN, CHECK THE EQUALIZATION.**

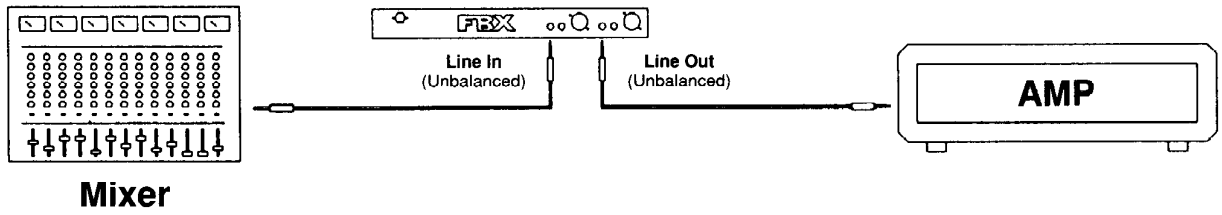
The following instructions presume that you are familiar with the fundamentals of sound reinforcement. If any of the following terms are not clear, or if the system does not perform as expected, contact your **SABINE** dealer for further information.

Now you are ready to continue to the next steps.

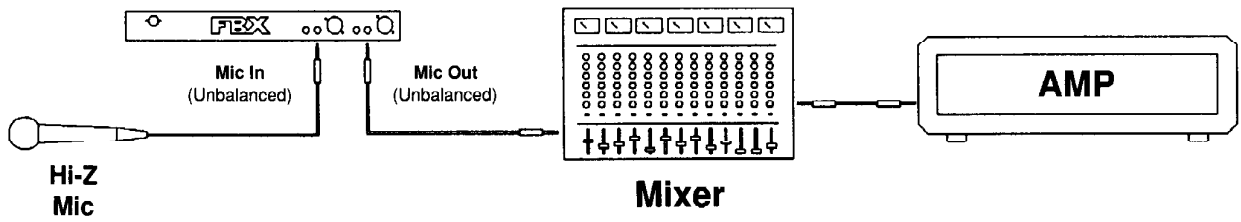
2. Place the speakers and microphones in the positions they will be used during the program. Avoid placing microphones directly in front of speakers.
3. Set all master volumes to the lowest position. Turn on the mixer, then the **FBX** AFC, then any other accessories, and finally, the power amp.
4. Place the **FBX** AFC in BYPASS MODE.
5. If you are using a graphic EQ, adjust only for the desired tonal qualities, but **DO NOT NOTCH FOR FEEDBACK**. The EQ sliders should form a smooth curve.
6. Set the approximate volume and balance for each mixer channel.
7. Adjust the sound system's master volume to minimum.
8. Place the **FBX** AFC in ACTIVE mode.
9. Set the SENSITIVITY LEVEL to MAX.
10. Slowly raise the sound system master volume until feedback occurs. The **FBX** AFC should quickly remove the feedback.
11. Continue to raise the master volume until the second and third feedback frequencies are filtered.
12. Now lower the master volume slightly so that you are not on the verge of another feedback point.
13. Finally, during sound check, adjust the SENSITIVITY LEVEL so that the red OdB SENSITIVITY LEVEL light blinks intermittently, as you would adjust the recording level of a tape recorder.
14. The **FBX** AFC is now ready for use. Any feedback that occurs during the program will be quickly and automatically eliminated. Occasionally, check the SENSITIVITY LEVEL display during the program. SENSITIVITY must be readjusted if the overall program volume level changes significantly (except if you are using setup B).

CAUTION: You may be able to increase the sound system volume so much that all six **FBX** AFC filters will be overloaded and it will not be able to control the feedback. In this case you should turn down the sound system's master volume, rearrange the positions of the speakers and microphones and repeat the **FBX** AFC setup procedure, or notch the remaining feedback frequencies with the graphic EQ. It is not recommended that you permit your sound system to be excessively loud since high volumes will almost certainly lead to hearing loss and possibly damage your system. **DO NOT USE THE FBX AFC IN A MANNER THAT WILL CAUSE HEARING LOSS.** Read and follow the precautions on the reverse side of this booklet.

Setup A



Setup B



Setup C

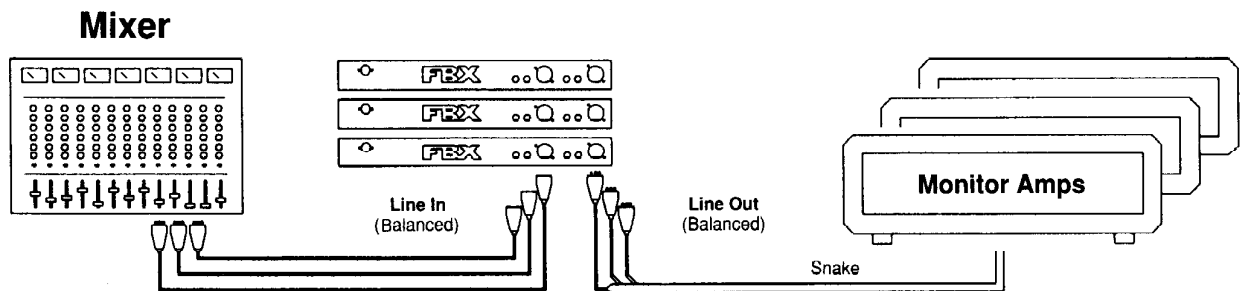
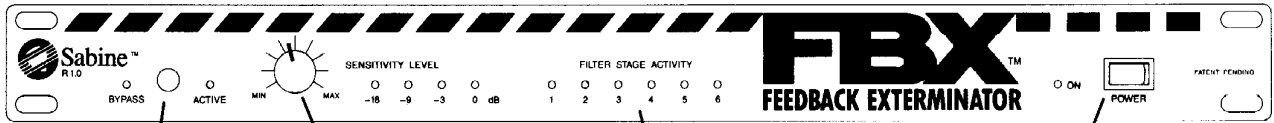


FIGURE 1 - TYPICAL SETUPS

FRONT PANEL



ACTIVE/BYPASS

Bypass mode takes the unit out of the signal path so that it will have no effect on the program. In Active mode, the unit controls feedback automatically. LEDs indicate whether the unit is in Active or Bypass mode.

SENSITIVITY LEVEL

Sensitivity level is adjusted so that the device can distinguish between sounds that are part of the program and sounds caused by feedback. The microprocessor presumes that tones louder than the SENSITIVITY LEVEL threshold are feedback. If your power amp is set to its maximum volume and there is no head room, then feedback will not be louder than the program. Under these conditions, it will take much longer for the FBX AFC to eliminate the feedback.

FILTER STAGE ACTIVITY

When one of the unit's filters is activated, the corresponding LED is lit. A blinking LED indicates the filter that was most recently activated.

ON/OFF SWITCH

The ON/OFF switch is a two-position rocker-type switch. The LED marked ON will light when the unit is turned on.

BACK PANEL



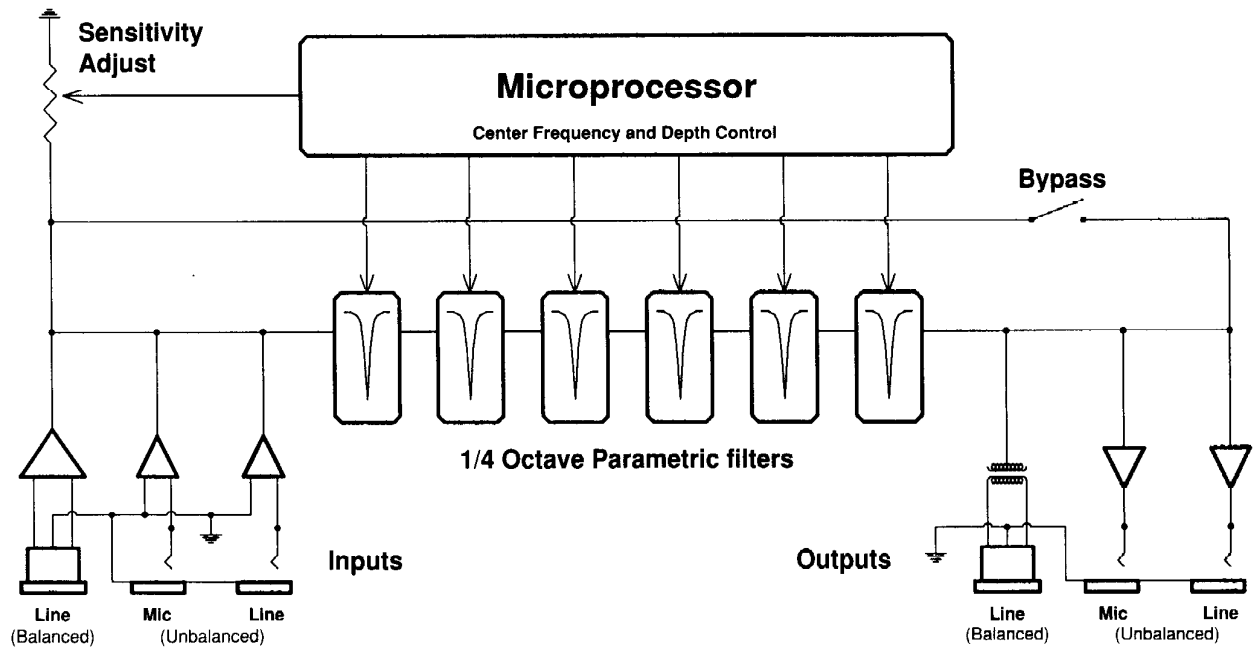
A/C ADAPTOR

The FBX AC-1 external power supply is included with the unit. Use of any other power supply may cause permanent damage to the unit and **WILL VOID THE WARRANTY. DO NOT, UNDER ANY CIRCUMSTANCES, REMOVE OR DEFEAT THE GROUND PIN.**

THE INPUTS AND OUTPUTS

See the discussion about **PLACEMENT IN THE SOUND SYSTEM** for details concerning the inputs and outputs.

BLOCK DIAGRAM



ENGINEERING SPECIFICATIONS

FILTERS:

Six independent, microprocessor controlled parametric notch
 Filter center point range: 100Hz-7000Hz
 Filter width: 1/4 octave
 Filter Depth (Microprocessor controlled): up to -30dB as needed
 Typical time to eliminate feedback: .5 sec at 1000 Hz
 Resolution: Identifies feedback frequency to within 1/10 octave

Spectral Variation: +/- 3dB from 20Hz to 20,000Hz

Physical Dimensions: 19" x 1 1/4" x 7 1/4" in rackmount case

Weight: 5.6 lbs

Power Supply: 9VA, external

INPUT/OUTPUT

Unbalanced Line In: 10K Ohm impedance, 1V peak to peak

Unbalanced Line Out: 10K Ohm impedance, 1V peak to peak

Unbalanced Mic In: 10K Ohm impedance, 10 mV peak to peak

Unbalanced Mic Out: 10K Ohm impedance, 10mV peak to peak

Balanced Line In: 600 Ohm impedance, 1V peak to peak

Balanced Line Out: 600 Ohm impedance, 1V peak to peak

Signal to noise ratio: 70dB

Total harmonic distortion: Down 70dB from peak response

(SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE)

CAUTION

EXPOSURE TO EXTREMELY HIGH NOISE LEVELS MAY CAUSE A PERMANENT HEARING LOSS. INDIVIDUALS VARY CONSIDERABLY IN SUSCEPTIBILITY TO NOISE INDUCED HEARING LOSS, BUT NEARLY EVERYONE WILL LOSE SOME HEARING IF EXPOSED TO SUFFICIENTLY INTENSE NOISE FOR A SUFFICIENT TIME. THE U.S. GOVERNMENT'S OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (OSHA) HAS SPECIFIED THE FOLLOWING PERMISSIBLE NOISE LEVEL EXPOSURES:

DURATION PER DAY IN HOURS	SOUND LEVEL dBA, SLOW RESPONSE
8	90
6	92
4	95
3	97
2	100
1 1/2	102
1	105
1/2	110
1/4 or less	115

ACCORDING TO OSHA ANY EXPOSURE IN EXCESS OF THE ABOVE PERMISSIBLE LIMITS COULD RESULT IN SOME HEARING LOSS. EAR PLUGS OR PROTECTORS IN THE EAR CANALS OR OVER THE EARS MUST BE WORN WHEN OPERATING THIS DEVICE IN ORDER TO PREVENT A PERMANENT HEARING LOSS IF EXPOSURE IS IN EXCESS OF THE LIMITS AS SET FORTH ABOVE. TO ENSURE AGAINST POTENTIALLY DANGEROUS EXPOSURE TO HIGH SOUND PRESSURE LEVELS, IT IS RECOMMENDED THAT ALL PERSONS EXPOSED TO EQUIPMENT CAPABLE OF PRODUCING HIGH SOUND PRESSURE LEVELS SUCH AS THIS DEVICE BE PROTECTED BY HEARING PROTECTORS WHILE THIS UNIT IS IN OPERATION.

1. Read all safety and operating instructions before using this product.
2. All safety and operating instructions should be retained for future reference.
3. Obey all cautions in the operating instructions and on the unit.

4. All operating instructions should be followed.
5. This product should not be used near water, i.e. a bathtub, sink, swimming pool, wet basement, etc.
6. This product should be located so that its position does not interfere with its proper ventilation. It should not be placed flat against a wall or placed in a built-in enclosure that will impede the flow of cooling air.
7. This product should not be placed near a source of heat such as a stove or radiator.
8. Connect only to a power supply of the type marked on the unit adjacent to the power supply cord.
9. Never break off the ground pin on the power supply cord.
10. Power supply cords should always be handled carefully. Never walk or place equipment on power supply cords. Periodically check cords for cuts or signs of stress, especially at the plug and the point where the cord exits the unit.
11. The power supply cord should be unplugged when the unit is to be unused for long periods of time.
12. Care should be taken so that objects do not fall and liquids are not spilled into the unit through the ventilation holes or any other openings.
13. This unit should be checked by a qualified service technician if:
 - A. The power supply cord or plug has been damaged.
 - B. Anything has fallen or been spilled into the unit.
 - C. The unit does not operate correctly.
 - D. The unit has been dropped or the enclosure damaged.
14. The user should not attempt to service this equipment. All service work should be done by a qualified service technician.

ONE-YEAR LIMITED WARRANTY

THIS LIMITED WARRANTY VALID ONLY WHEN PURCHASED AND REGISTERED IN THE UNITED STATES OR CANADA. ALL EXPORTED PRODUCTS ARE SUBJECT TO WARRANTY AND SERVICES TO BE SPECIFIED AND PROVIDED BY THE AUTHORIZED DISTRIBUTOR FOR EACH COUNTRY.

Ces clauses de garantie ne sont valables qu'aux Etats-Unis et au Canada. Dans tous les autres pays, les clauses de garantie et de maintenance sont fixées par le distributeur national et assurées par lui selon la législation en vigueur.

Diese Garantie ist nur in den USA und Kanada gültig. Alle Export-Produkte sind der Garantie und dem Service des Importeurs des jeweiligen Landes unterworfen.

Esta garantía es válida solamente cuando el producto es comprado en E.U. continentales o en Canadá. Todos los productos que sean comprados en el extranjero, están sujetos a las garantías y servicio que cada distribuidor autorizado determine y otorgue en los diferentes países.

ONE-YEAR LIMITED WARRANTY/REMEDY

SABINE, INC. ("SABINE") warrants this product to be free from defects in material and workmanship for a period of one (1) year from date of purchase PROVIDED, however, that this limited warranty is extended only to the original retail purchaser and is subject to the conditions, exclusions and limitations hereinafter set forth:

CONDITIONS, EXCLUSIONS & LIMITATIONS OF LIMITED WARRANTIES

These limited warranties shall be void and of no effect if:

- a. The first purchase of the product is for the purpose of resale; or
- b. The original retail purchase is not made from an AUTHORIZED SABINE DEALER; or
- c. The product has been damaged by accident or unreasonable use, neglect, improper service or maintenance, or other causes not arising out of defects in material or workmanship; or
- d. The serial number affixed to the product is altered, defaced or removed; or
- e. The power supply grounding pin is removed or otherwise defeated. In the event of a defect in material and/or workmanship covered by this limited warranty, Sabine will repair the defect in material or workmanship or replace the product, at Sabine's option; and provided, however, that, in any case, all costs of shipping, if necessary, are paid by you, the purchaser.

THE WARRANTY REGISTRATION CARD SHOULD BE ACCURATELY COMPLETED, MAILED TO AND RECEIVED BY SABINE WITHIN FOURTEEN (14) DAYS FROM THE DATE OF YOUR PURCHASE.

In order to obtain service under these warranties, you must:

- a. Bring the defective item to any AUTHORIZED SABINE DEALER and present therewith the ORIGINAL PROOF OF PURCHASE supplied to you by the AUTHORIZED SABINE DEALER in connection with your purchase from him of this product. If the DEALER is unable to provide the necessary warranty service, you will be directed to the nearest other SABINE AUTHORIZED DEALER which can provide such service. **-OR-**
- b. Ship the defective item, prepaid, to:

SABINE, INC.
13301 HIGHWAY 441
ALACHUA, FL 32615-8544

including therewith a complete, detailed description of the problem, together with a legible copy of the original PROOF OF PURCHASE and a complete return address. Upon Sabine's receipt of these items:

If the defect is remedial under the limited warranties and the other terms and conditions expressed have been complied with, Sabine will provide the necessary warranty service to repair or replace the product and will return it, FREIGHT COLLECT, to you, the purchaser.

Sabine's liability to the purchaser for damages from any cause whatsoever and regardless of the form of action, including negligence, is limited to the actual damages up to the greater of \$500.00 or an amount equal to the purchase price of the product that caused the damage or that is the subject of or is directly related to the cause of action. Such purchase price will be that in effect for the specific

product when the cause of action arose. This limitation of liability will not apply to claims for personal injury or damage to real property or tangible personal property allegedly caused by Sabine's negligence. Sabine does not assume liability for personal injury or property damage arising out of or caused by a non-Sabine alteration or attachment, nor does Sabine assume any responsibility for damage to interconnected non-Sabine equipment that may result from the normal functioning and maintenance of the Sabine equipment.

UNDER NO CIRCUMSTANCES WILL SABINE BE LIABLE FOR ANY LOST PROFITS, LOST SAVINGS, ANY INCIDENTAL DAMAGES OR ANY CONSEQUENTIAL DAMAGES ARISING OUT OF THE USE OR INABILITY TO USE THE PRODUCT, EVEN IF SABINE HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES.

THESE LIMITED WARRANTIES ARE IN LIEU OF ANY AND ALL WARRANTIES, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR USE; PROVIDED, HOWEVER, THAT IF THE OTHER TERMS AND CONDITIONS NECESSARY TO THE EXISTENCE OF THE EXPRESS LIMITED WARRANTIES, AS HEREINABOVE STATED, HAVE BEEN COMPLIED WITH, IMPLIED WARRANTIES ARE NOT DISCLAIMED DURING THE APPLICABLE ONE-YEAR PERIOD FROM DATE OF PURCHASE OF THIS PRODUCT.

SOME STATES DO NOT ALLOW LIMITATION ON HOW LONG AN IMPLIED WARRANTY LASTS, OR THE EXCLUSION OR LIMITATION OF INCIDENTAL OR CONSEQUENTIAL DAMAGES, SO THE ABOVE LIMITATIONS OR EXCLUSIONS MAY NOT APPLY TO YOU. THESE LIMITED WARRANTIES GIVE YOU SPECIFIC LEGAL RIGHTS, AND YOU MAY ALSO HAVE OTHER RIGHTS WHICH MAY VARY FROM STATE TO STATE.

THESE LIMITED WARRANTIES ARE THE ONLY EXPRESS WARRANTIES ON THIS PRODUCT, AND NO OTHER STATEMENT, REPRESENTATION, WARRANTY OR AGREEMENT BY ANY PERSON SHALL BE VALID OR BINDING UPON SABINE.

In the event of any modification or disclaimer of express or implied warranties, or any limitation of remedies, contained herein conflicts with applicable law, then such modification, disclaimer or limitation, as the case may be, shall be deemed to be modified to the extent necessary to comply with such law.

Your remedies for breach of these warranties are limited to those remedies provided herein, and Sabine gives this limited warranty only with respect to equipment purchased in the United States of America.

INSTRUCTIONS-WARRANTY REGISTRATION CARD

1. Mail the completed WARRANTY REGISTRATION CARD to:

SABINE, INC.
13301 HIGHWAY 441
ALACHUA, FL 32615-8544

- a. Keep the PROOF OF PURCHASE. In the event warranty service is required during the warranty period, you will need this document. **There will be no identification card issued by Sabine, Inc.**

2. IMPORTANCE OF WARRANTY REGISTRATION CARDS AND NOTIFICATION OF CHANGES OF ADDRESS:

- a. Completion and mailing of WARRANTY REGISTRATION CARDS - Should notification become necessary for any condition that may require correction, the REGISTRATION CARD will help ensure that you are contacted and properly notified.

- b. Notice of address changes - If you move from the address shown on the WARRANTY REGISTRATION CARD, you should notify Sabine of the change of address so as to facilitate your receipt of any bulletins or other forms of notification which may become necessary in connection with any condition that may require dissemination of information or correction.

3. You may contact Sabine directly by telephoning (904) 418-2000.

4. Please have the Sabine product name and serial number available when communicating with Sabine Customer Service.

Register your Sabine Products online at Sabine.com

MADE IN USA

Manufactured by: Sabine, Inc. • 13301 Highway 441 • Alachua, FL 32615-8544 USA • Phone: (386) 418-2000 • Fax: (386) 418-2001

Sabine.com

SABINE
ADAPTIVE AUDIO

ADDENDUM

FBX Setup Procedure

CAUTION: TO AVOID DAMAGE TO SPEAKERS AND AMPLIFIERS be sure to **SLOWLY** bring the system to feedback level. When setting the FBX AFC filters, ensure that the sensitivity level is set **FULLY** clockwise to the **MAXIMUM** position. Start with the master volume control at its minimum setting and **SLOWLY** raise the volume level to the point where feedback begins. If the volume is raised too rapidly, several feedback frequencies can be generated at extremely high sound levels, which can damage speakers and possibly amplifiers. Continue to **SLOWLY** raise the volume level until the first three filter activity indicators are lit. In most situations, it is possible to generate the required signal levels for filtering without raising the volume of feedback beyond the level of a normal conversation.

FBX with MEMORY OPTION

Some models have memory backup that remembers the positions and depths of the filters when the unit is turned off and automatically returns the filters to their last settings when the unit is turned on. This eliminates the need to go through the setup procedure every time the unit is turned on. This is convenient for fixed installations where the settings are not likely to change from program to program, as in a church or auditorium. However, for best results, the unit should be reset if there are any significant changes in the room, or any parameters of the sound system that might change the feedback characteristics.

To reset the filters, depress the reset button. The filter activity lights will flash eight times, and on the ninth flash, all LED's will stay illuminated and the filters will be reset. If the reset button is released any time before the ninth flash, the filters will be returned to their original settings.

SPECIFICATIONS UPDATE

Filter Center Point Range:	160Hz - 7000Hz
Filter Width:	1/4 Octave
Filter Depth:	Up to -20dB
Resolution:	Max filter placement error of 1/20 Octave
Spectral Variation:	< +/- 1.5dB from 20Hz to 20000Hz
Signal to Noise	
Unbalanced Line:	88dB typical
Balanced Line:	78dB typical
Unbalanced Mic:	76dB typical
Total Harmonic Distortion:	0.02%
Input/Output	
Unbalanced Line In:	100K Ohm Impedance, +4dBV
Unbalanced Line Out:	20 Ohm Impedance, +4dBV
Unbalanced Mic In:	10K Ohm Impedance, 100mV peak- to-peak
Unbalanced Mic Out:	20 Ohm Impedance, 100mV peak- to-peak
Balanced Line In:	10K Ohm Impedance, +4dBV Pin 2 Hi
Balanced Line Out:	150 Ohm (75 Ohm per leg) Impedance +4dBV Pin 2 Hi
Option:	Memory Backup - battery life 11 years