

dbx[®]
by HARMAN

AFS[™] 224

Dual Channel Advanced Feedback Suppression Processor



→ *User Manual*

IMPORTANT SAFETY INSTRUCTIONS



ATTENTION: RISQUE DE CHOQUE ELECTRIQUE - NE PAS OUVRIR

WARNING: TO REDUCE THE RISK OF FIRE OR ELECTRIC SHOCK DO NOT EXPOSE THIS EQUIPMENT TO RAIN OR MOISTURE

The symbols shown above are internationally accepted symbols that warn of potential hazards with electrical products. The lightning flash with arrowpoint in an equilateral triangle means that there are dangerous voltages present within the unit. The exclamation point in an equilateral triangle indicates that it is necessary for the user to refer to the owner's manual.

These symbols warn that there are no user serviceable parts inside the unit. Do not open the unit. Do not attempt to service the unit yourself. Refer all servicing to qualified personnel. Opening the chassis for any reason will void the manufacturer's warranty. Do not get the unit wet. If liquid is spilled on the unit, shut it off immediately and take it to a dealer for service. Disconnect the unit during storms to prevent damage.

SAFETY INSTRUCTIONS

NOTICE FOR CUSTOMERS IF YOUR UNIT IS EQUIPPED WITH A POWER CORD.

WARNING: THIS APPLIANCE SHALL BE CONNECTED TO A MAINS SOCKET OUTLET WITH A PROTECTIVE EARTHING CONNECTION.

THE CORES IN THE MAINS LEAD ARE COLOURED IN ACCORDANCE WITH THE FOLLOWING CODE:

GREEN AND YELLOW - EARTH BLUE - NEUTRAL BROWN - LIVE

AS COLOURS OF THE CORES IN THE MAINS LEAD OF THIS APPLIANCE MAY NOT CORRESPOND WITH THE COLOURED MARKINGS IDENTIFYING THE TERMINALS IN YOUR PLUG, PROCEED AS FOLLOWS:

- THE CORE WHICH IS COLOURED GREEN AND YELLOW MUST BE CONNECTED TO THE TERMINAL IN THE PLUG MARKED WITH THE LETTER E, OR WITH THE EARTH SYMBOL, OR COLOURED GREEN, OR GREEN AND YELLOW.
- THE CORE WHICH IS COLOURED BLUE MUST BE CONNECTED TO THE TERMINAL MARKED N OR COLOURED BLACK.
- THE CORE WHICH IS COLOURED BROWN MUST BE CONNECTED TO THE TERMINAL MARKED L OR COLOURED RED.

THIS EQUIPMENT MAY REQUIRE THE USE OF A DIFFERENT LINE CORD, ATTACHMENT PLUG, OR BOTH, DEPENDING ON THE AVAILABLE POWER SOURCE AT INSTALLATION. IF THE ATTACHMENT PLUG NEEDS TO BE CHANGED, REFER SERVICING TO QUALIFIED SERVICE PERSONNEL WHO SHOULD REFER TO THE TABLE BELOW. THE GREEN/YELLOW WIRE SHALL BE CONNECTED DIRECTLY TO THE UNITS CHASSIS.

| CONDUCTOR | | WIRE COLOR | |
|-----------|-----------|------------|-------|
| | | Normal | Alt |
| L | LIVE | BROWN | BLACK |
| N | NEUTRAL | BLUE | WHITE |
| E | EARTH GND | GREEN/YEL | GREEN |

WARNING: IF THE GROUND IS DEFEATED, CERTAIN FAULT CONDITIONS IN THE UNIT OR IN THE SYSTEM TO WHICH IT IS CONNECTED CAN RESULT IN FULL LINE VOLTAGE BETWEEN CHASSIS AND EARTH GROUND. SEVERE INJURY OR DEATH CAN THEN RESULT IF THE CHASSIS AND EARTH GROUND ARE TOUCHED SIMULTANEOUSLY.

WARNING FOR YOUR PROTECTION READ THE FOLLOWING:

KEEP THESE INSTRUCTIONS

HEED ALL WARNINGS

FOLLOW ALL INSTRUCTIONS

the apparatus shall not be exposed to dripping or splashing liquid and no object filled with liquid, such as vases, shall be placed on the apparatus.

CLEAN ONLY WITH A DRY CLOTH.

DO NOT BLOCK ANY OF THE VENTILATION OPENINGS. INSTALL IN ACCORDANCE WITH THE MANUFACTURER'S INSTRUCTIONS.

DO NOT INSTALL NEAR ANY HEAT SOURCES SUCH AS RADIATORS, HEAT REGISTERS, STOVES, OR OTHER APPARATUS (INCLUDING AMPLIFIERS) THAT PRODUCE HEAT.

ONLY USE ATTACHMENTS/ACCESSORIES SPECIFIED BY THE MANUFACTURER.

UNPLUG THIS APPARATUS DURING LIGHTNING STORMS OR WHEN UNUSED FOR LONG PERIODS OF TIME.

Do not defeat the safety purpose of the polarized or grounding-type plug. A polarized plug has two blades with one wider than the other. A grounding type plug has two blades and a third grounding prong. The wide blade or third prong are provided for your safety. If the provided plug does not fit your outlet, consult an electrician for replacement of the obsolete outlet.

Protect the power cord from being walked on or pinched particularly at plugs, convenience receptacles, and the point where they exit from the apparatus.

Use only with the cart stand, tripod bracket, or table specified by the manufacture, or sold with the apparatus. When a cart is used, use caution when moving the cart/apparatus combination to avoid injury from tip-over.



Refer all servicing to qualified service personnel. Servicing is required when the apparatus has been damaged in any way, such as power-supply cord or plug is damaged, liquid has been spilled or objects have fallen into the apparatus, the apparatus has been exposed to rain or moisture, does not operate normally, or has been dropped.

POWER ON/OFF SWITCH: The Power switch used in this piece of equipment DOES NOT break the connection from the mains.

MAINS DISCONNECT: The plug shall remain readily operable. For rack-mount or installation where plug is not accessible, an all-pole mains switch with a contact separation of at least 3 mm in each pole shall be incorporated into the electrical installation of the rack or building.

If connected to 240V supply, a suitable CSA/UL certified power cord shall be used for this supply.

This Equipment is intended for rack mount use only.

IMPORTANT SAFETY INSTRUCTIONS

ELECTROMAGNETIC COMPATIBILITY

This device complies with part 15 of the FCC Rules and the Product Specifications noted on the **Declaration of Conformity**. Operation is subject to the following two conditions:

- this device may not cause harmful interference, and
- this device must accept any interference received, including interference that may cause undesired operation.

Operation of this unit within significant electromagnetic fields should be avoided.

- use only shielded interconnecting cables.

U.K. MAINS PLUG WARNING

A molded mains plug that has been cut off from the cord is unsafe. Discard the mains plug at a suitable disposal facility.

NEVER UNDER ANY CIRCUMSTANCES SHOULD YOU INSERT A DAMAGED OR CUT MAINS PLUG INTO A 13 AMP POWER SOCKET.

Do not use the mains plug without the fuse cover in place. Replacement fuse covers can be obtained from your local retailer. Replacement fuses are 13 amps and **MUST** be ASTA approved to BS1362.



If you want to dispose this product, do not mix it with general household waste. There is a separate collection system for used electronic products in accordance with legislation that requires proper treatment, recovery and recycling.

Private household in the 25 member states of the EU, in Switzerland and Norway may return their used electronic products free of charge to designated collection facilities or to a retailer (if you purchase a similar new one).

For Countries not mentioned above, please contact your local authorities for a correct method of disposal. By doing so you will ensure that your disposed product undergoes the necessary treatment, recovery and recycling and thus prevent potential negative effects on the environment and human health.

DECLARATION OF CONFORMITY

Manufacturer's Name: dbx Professional Products
Manufacturer's Address: 8760 S. Sandy Parkway
Sandy, Utah 84070, USA

declares that the product:

Product name: dbx AFS224
Note: Product name may be suffixed by the EU.

Product option: None

conforms to the following Product Specifications:

Safety: IEC 60065 -01+Amd 1

EMC: EN 55022:2006
EN 55024:1998
FCC Part 15

Supplementary Information:

The product herewith complies with the requirements of the:
Low Voltage Directive 2006/95/EC
EMC Directive 2004/108/EC.
RoHS Directive 2002/95/EC
WEEE Directive 2002/96/EC

With regard to Directive 2005/32/EC and EC Regulation 1275/2008 of 17 December 2008, this product is designed, produced, and classified as Professional Audio Equipment and thus is exempt from this Directive.

Roger Johnsen
Director, Engineering
Signal Processing
8760 S. Sandy Parkway
Sandy, Utah 84070, USA
Date: May 31, 2012

European Contact: Your local dbx Sales and Service Office or

Harman Signal Processing
8760 South Sandy Parkway
Sandy, Utah
84070 USA
Ph: (801) 566-8800
Fax: (801) 568-7583

Service Contact Info

If you require technical support, contact dbx Technical Support. Be prepared to accurately describe the problem. Know the serial number of your device - this is printed on a sticker attached to the chassis. If you have not already taken the time to fill out your warranty registration card and send it in, please do so now. You may also register online at www.dbxpro.com.

Before you return a product to the factory for service, we recommend you refer to the manual. Make sure you have correctly followed installation steps and operation procedures. For further technical assistance or service, please contact our Technical Support Department at (801) 568-7660 or visit www.dbxpro.com. If you need to return a product to the factory for service, you **MUST** first contact Technical Support to obtain a Return Authorization Number.

No returned products will be accepted at the factory without a Return Authorization Number.

Please refer to the Warranty information on the following page, which extends to the first end-user. After expiration of the warranty, a reasonable charge will be made for parts, labor, and packing if you choose to use the factory service facility. In all cases, you are responsible for transportation charges to the factory. dbx will pay return shipping if the unit is still under warranty.

Use the original packing material if it is available. Mark the package with the name of the shipper and with these words in red: DELICATE INSTRUMENT, FRAGILE! Insure the package properly. Ship prepaid, not collect. Do not ship parcel post.

Warranty

1. The warranty registration card that accompanies this product must be mailed within 30 days after purchase date to validate this warranty. You can also register online at www.dbxpro.com. Proof-of-purchase is considered to be the responsibility of the consumer. A copy of the original purchase receipt must be provided for any warranty service.
2. dbx warrants this product, when purchased new from an authorized U.S. dbx dealer and used solely within the U.S., to be free from defects in materials and workmanship under normal use and service. This warranty is valid to the original purchaser only and is non-transferable.
3. dbx liability under this warranty is limited to repairing or, at our discretion, replacing defective materials that show evidence of defect, provided the product is returned to dbx **WITH RETURN AUTHORIZATION** from the factory, where all parts and labor will be covered up to a period of two years. A Return Authorization number must first be obtained from dbx. The company shall not be liable for any consequential damage as a result of the product's use in any circuit or assembly.
4. dbx reserves the right to make changes in design or make additions to or improvements upon this product without incurring any obligation to install the same additions or improvements on products previously manufactured.
5. The foregoing is in lieu of all other warranties, expressed or implied, and dbx neither assumes nor authorizes any person to assume on its behalf any obligation or liability in connection with the sale of this product. In no event shall dbx or its dealers be liable for special or consequential damages or from any delay in the performance of this warranty due to causes beyond their control.

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Congratulations on your purchase of the dbx AFS™ 224. The AFS 224 Advanced Feedback Suppression processor was designed to provide state-of-the-art feedback elimination processing, while maintaining a simple and intuitive control interface. From the powerful DSP module to the no-nonsense user interface, the AFS 224 provides all the processing and control necessary for both installation and live use. The AFS 224 is an absolute must for any live sound application.

Ten and twelve filter feedback elimination processors have become the de facto standard, but the engineering staff at dbx have never been content residing in the neighborhood of the status quo. So, to raise the bar once again, we went out and developed a dedicated feedback suppression processor that offers up to 24 filters per channel with widths as narrow as 1/80 of an octave. To achieve these staggering numbers, we utilized our patent-pending AFS™ technology, which had previously only been available in the upper echelon line of products. In addition to the plethora of feedback suppression filters available, the AFS 224 also offers selectable filter widths, “Fixed” and “Live” filter types for static and dynamic filtering, Live Filter Lift with selectable lift times, and dual mono or stereo operation, all readily available via the front panel’s intuitive user interface. This manual will be your guide to understanding the full functionality of the powerful AFS 224 processor.

Defining the AFS 224

The dbx AFS 224 provides the following features:

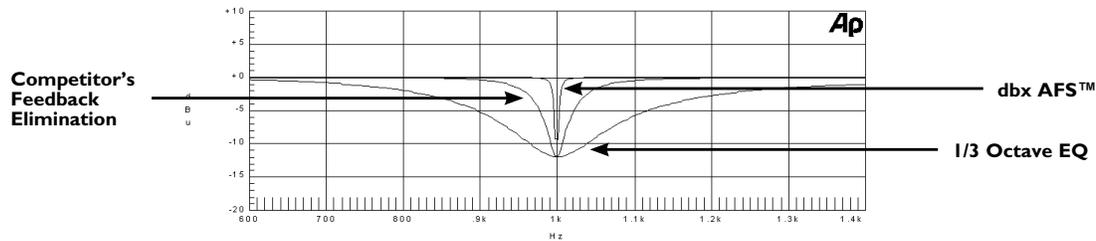
- ***dbx’s Patent-Pending Advanced Feedback Suppression (AFS™) Technology***
- ***24 Programmable Filters per Channel***
- ***Stereo or Dual Mono Processing***
- ***Live and Fixed Filter Modes***
- ***Selectable Filter Lift Times***
- ***Application-Specific Filter Types Include: Speech; Music Low, Music Med, and Music High***
- ***Input Channel Metering***
- ***24 Segment Filter Metering per Channel***
- ***XLR and TRS Electronically Balanced Input and Outputs***
- ***+4dBu / -10dBV Operating Level Switch per Channel***

The AFS 224 Advantage

Key features that make the AFS 224 are its Fixed and Live Modes of operation, as well as the units Filter Lift capabilities. The Live Mode of operation continuously updates filter placement which provides flexibility during a performance. The Filter Lift feature automatically removes filter assignments that are no longer necessary, which in turn, maximizes sonic integrity.

The AFS 224 allows the user to optimize the elimination of feedback. In the past, graphic equalizers were used to eliminate feedback from a system. This was an acceptable method for eliminating feedback, but when this method was precision tested, the result clearly showed that a single 1/3 octave EQ slider was removing approximately half of the signal power. With AFS™, the feedback is removed automatically

and the proprietary, precision AFS filters remove only a fraction of the frequency spectrum. The following graph shows a comparison between AFS filters, the filters available in other feedback eliminators, and conventional graphic EQ filters:



For more information regarding dbx Advanced Feedback Suppression (AFS™) technology, please refer to the white paper available online at: www.dbxpro.com.

Installation Recommendations

FOR RACK MOUNT USE ONLY – Install the AFS 224 in a standard-width rack with the provided rack screws. When installed in a rack, the unit should be positioned with enough room (at least 1U above the unit and 1U below the unit) to allow proper ventilation. The AFS 224 should not be mounted above or below anything that generates excessive heat. Ambient temperatures should not exceed 113°F (45°C) when equipment is in use. Although the unit is shielded against radio frequency and electromagnetic interference, extremely high fields of RF and EMI should be avoided where possible.

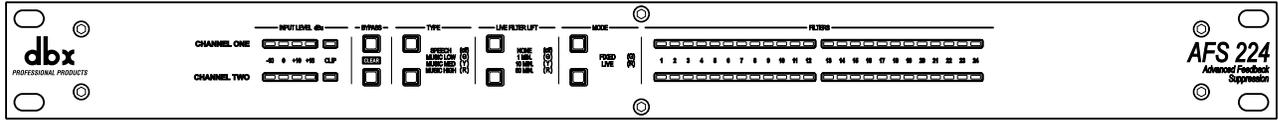
Connection Recommendations

The AFS 224 has balanced inputs and outputs that can be used with any balanced or unbalanced line-level device.

To connect the AFS 224 to your sound system, refer to the following steps:

- Turn off all equipment before making connections.
- Make audio connections via XLR or 1/4" TRS connectors according to application needs. Both types of connectors for the inputs and outputs can be used for balanced or unbalanced connections. The use of more than one connector at a time for the inputs could unbalance balanced lines, cause phase cancellation, short a conductor to ground, or cause damage to other equipment connected to the AFS 224. More than one output may be used simultaneously as long as the combined parallel load is greater than 600Ω.
- Apply power to the AFS 224. Connect the AC power cord to the AC power receptacle on the back of the AFS 224. Route the AC power cord to a convenient power outlet away from audio lines. The unit may be turned on and off from a master equipment power switch. Since the AFS 224 consumes a relatively small amount of power, the unit may be left on continuously.

Front Panel



Input Level Bar Graph

These four LEDs indicate the input signal level of the AFS 224. Input level LEDs range from -10dBu to +18dBu.

NOTE: For maximum performance and proper operation, the average input signal level should consistently light the 0dBu LED, with the +10dBu LED lighting occasionally.

Clip LED

This LED indicates that there is signal clipping at the input.

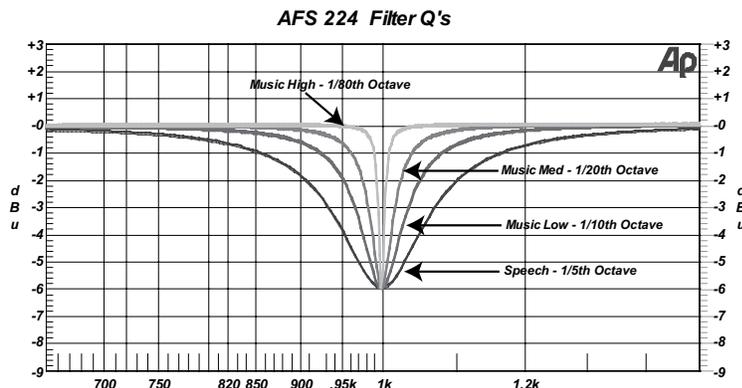
Bypass Button

Pressing and releasing this button will bypass the processing in the AFS 224 (LED on) and engage the AFS processing (LED off). Pressing and holding the Bypass button will clear the filters on that channel. For more information regarding clearing filters, see the “Clearing Filters” section of this manual.

Type Button

Pressing and holding this button allows you to link and unlink channels (see “Linking Channels”). Pressing and releasing this button allows you to select the AFS Type. The AFS 224 offers several feedback suppression types, which are: SPEECH, MUSIC LOW, MUSIC MED, and MUSIC HIGH. Each selected type controls the width of the notch filter used to remove the feedback. MUSIC HIGH uses very narrow notch filters, minimizing audible artifacts within the music. The SPEECH type uses much wider notch filters, allowing the AFS 224 to work faster. The below table and graph further demonstrate the differences between these filter types.

| Description of AFS Types | | | |
|--------------------------|---|---------|---------------|
| Type | Description | LED | Q |
| SPEECH | Optimized for systems reproducing only speech. | Not Lit | 1/5th Octave |
| MUSIC LOW | Faster response time, lower fidelity. | Green | 1/10th Octave |
| MUSIC MED | Good combination of response time and fidelity. | Yellow | 1/20th Octave |
| MUSIC HIGH | Slightly slower response time, high fidelity. | Red | 1/80th Octave |



Live Filter Lift Button

Live Filter Lift provides maximum sonic integrity by removing unnecessary feedback filters. This button is used to select the live filter lift times and are indicated as follows:

| LED | Lift Time |
|---------|------------|
| Not Lit | Lift Off |
| Green | 1 Minute |
| Yellow | 10 Minutes |
| Red | 60 Minutes |

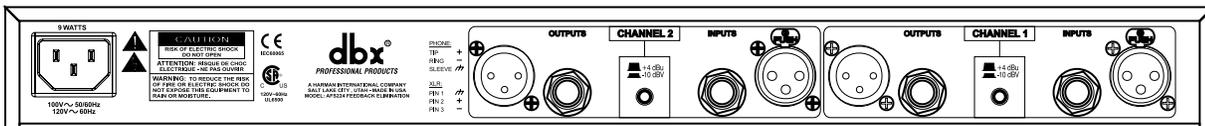
Mode Button

This button is used to select between FIXED MODE (button is green) or LIVE MODE (button is red). The Mode button is also used to enter and exit Setup Mode when pressed and held (see “Setup Mode”).

AFS Filter LEDs

The AFS 224 offers 24 filter LEDs per channel, which provide visual indicators when AFS filters are set. When in Setup Mode, these LEDs are used for setting up the total number of available filters and the number of Fixed filters versus Live filters (see “Setup Mode”).

Rear Panel



Power Cord Receptacle

Connects AC power to the AFS 224.

Input Connectors

Two types of input connectors are provided for input connections: female locking XLR type connectors, and 1/4” tip-ring-sleeve phone jack connectors. The maximum input level that the processor can accept is +20dBu (ref: 0.775Vrms).

Operating Level Switch

This switch allows you to select between a nominal operating level of either +4dBu or -10dBV. Use this switch to match the operating level of the AFS 224 to the equipment you are connecting it to.

Output Connectors

Two types of output connectors are provided for output connections: male XLR type connectors, and 1/4” tip-ring-sleeve phone jack connectors.

System Connection & Gain Structure

The four basic ways to hookup the AFS 224 to your system are as follows:

1. Connected to the insert jack(s) on a microphone channel of a mixer.
2. Connected to the subgroup insert jack(s) of a mixer.
3. Connected to the insert jack(s) on the master outputs of a mixer.
4. Connected inline w/outputs of a mixer (output of mixer to input of 224, output of 224 to amplifiers).

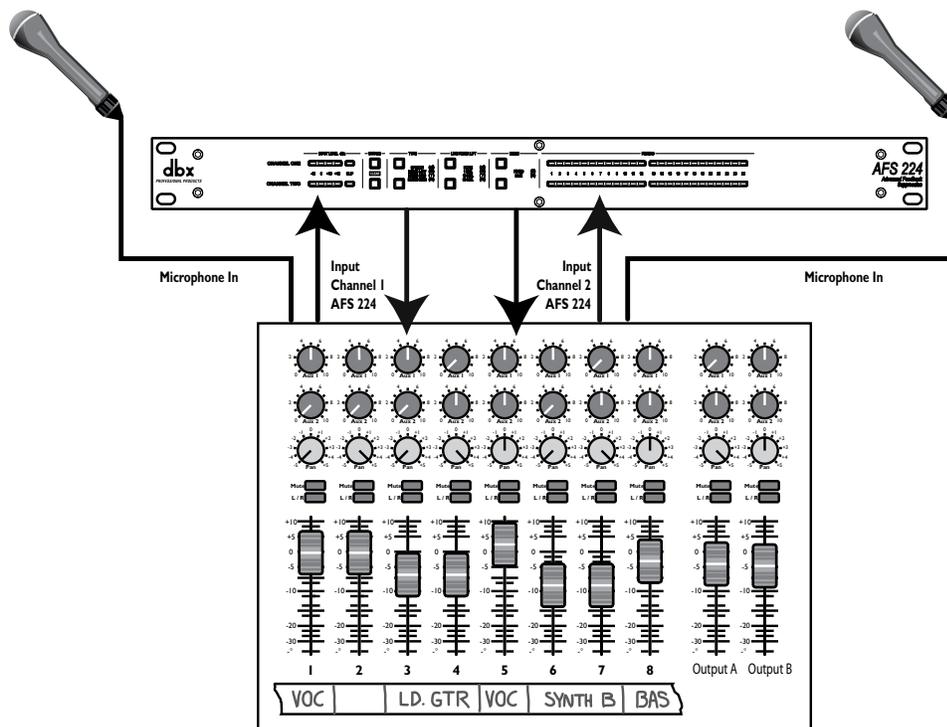
For maximum performance and proper operation, the average input signal to the AFS 224 should consistently light the 0dBu LED, with the +10dBu LED occasionally lighting. Hookup methods 1, 2, and 3 above are the preferred way to connect the AFS 224 since the insert points on most mixers are pre output fader. This allows the proper signal level to be fed to the AFS 224 without the channel or output fader affecting the level as the fader is moved up or down. Be sure to check the mixer's manual for the nominal operating level of the insert jacks, and then select the +4dBu or -10dBV switch on the back of the AFS 224 accordingly.

If no insert points are available, then method 4 would be utilized. In this situation, be sure that the AFS 224 input level allows the 0 and +10dBu LEDs to light as indicated above. The input level to the amplifiers may have to be reduced in this situation so that they are not overdriven by the signal from the AFS 224.

Application 1 – Mixer Channel Inserts

This application provides dedicated feedback suppression directly on the microphone channels of a mixing console, thereby leaving other channels unaffected. This application provides two individual channels of feedback suppression with up to 24 filters per microphone channel.

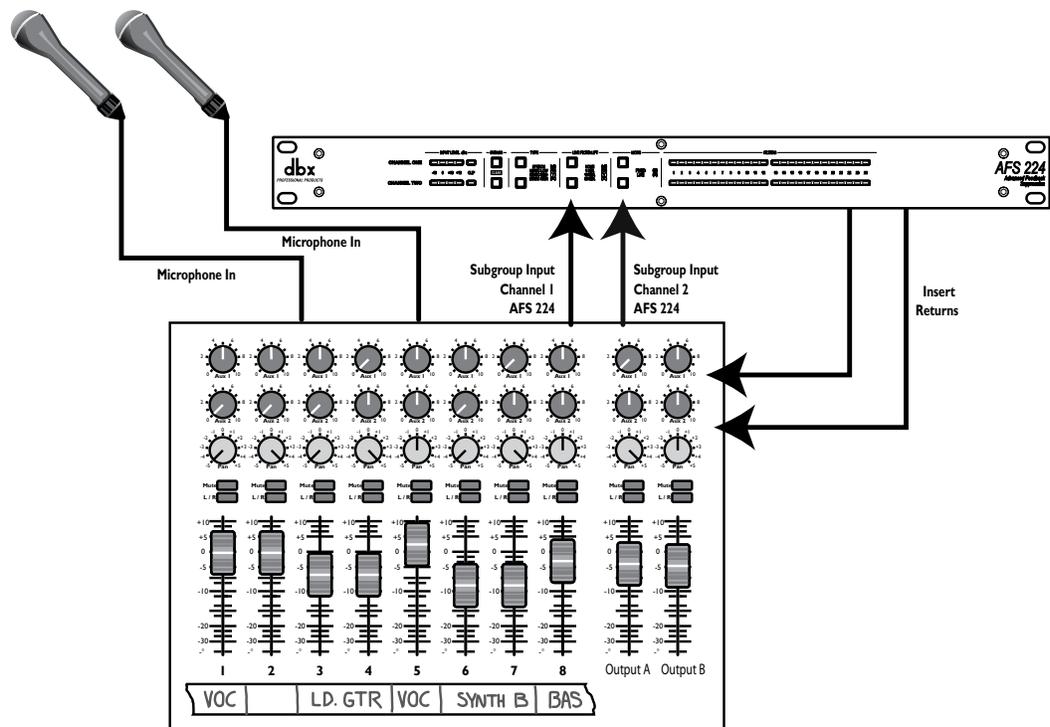
1. Turn off the power to the mixer and amplifiers.
2. Ensure the AFS 224 is configured for dual mono operation (this is the default configuration). See “Linking Channels” for further information.
3. Connect the mixer’s channel insert sends to the input of the AFS 224.
4. Connect the outputs of the AFS 224 to the mixer’s channel insert returns.
5. Apply power to the mixer and amplifiers.



Application 2 – Mixer Subgroup Inserts

This setup is ideal for applications that require feedback suppression on certain instruments (such as microphones) while keeping instruments that desire feedback (such as guitars) separated. This application provides two channels of feedback suppression with up to 24 filters per channel.

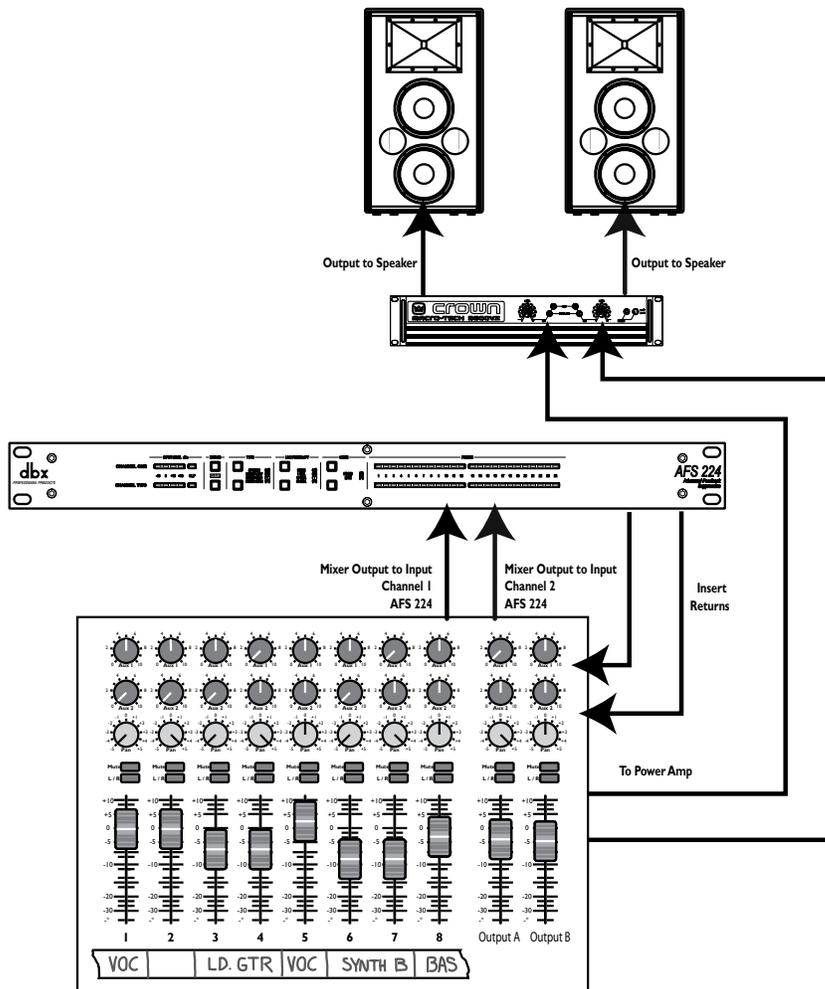
1. Turn off the power to the mixer and amplifiers.
2. Ensure the AFS 224 is configured for dual mono operation if processing two independent subgroups (this is the default configuration). If processing subgroups containing stereo material, the AFS 224 should be configured for stereo linked operation. See “Linking Channels” for further information.
3. Connect the mixer’s subgroup insert sends to the inputs of the AFS 224.
4. Connect the outputs of the AFS 224 to the mixer’s subgroup insert returns.
5. Apply power to the mixer and amplifiers.



Application 3 – Mixer Master Stereo Output Inserts

This application provides feedback suppression over the entire mix using the master inserts on the mixing console. This application provides two channels of feedback suppression with up to 24 filters per channel.

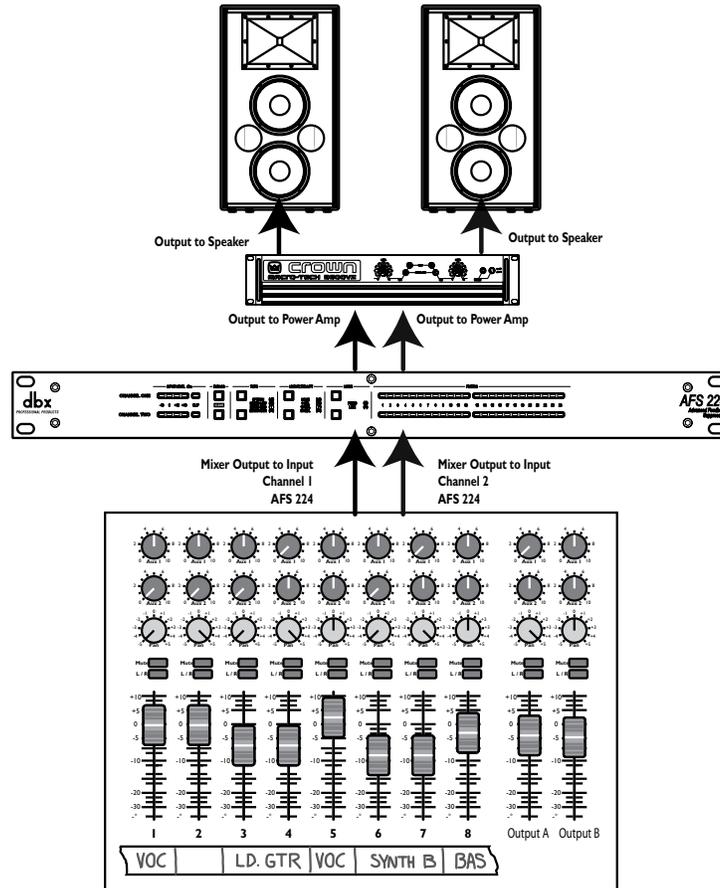
1. Turn off the power to the mixer and amplifiers.
2. Ensure the AFS 224 is configured for stereo linked operation. See “Linking Channels” for further information.
3. Connect the mixer’s master insert sends to the inputs of the AFS 224.
4. Connect the outputs of the AFS 224 to the mixer’s master insert returns.
5. Apply power to the mixer and amplifiers.



Application 4 – In-line Between Mixer & Amp

This application is ideal for dedicated feedback suppression on the entire mix, when your mixer does not have master insert connections. This application provides two channels of feedback suppression with up to 24 filters per channel. If your mixer does have master insert connections, it is recommended that you connect the AFS 224 to these master insert jacks as described in Application 3.

1. Turn off the power to the mixer and amplifiers.
2. Ensure the AFS 224 is configured for stereo linked operation. See “Linking Channels” for further information.
3. Connect the master outputs of the mixer to the inputs of the AFS 224.
4. Connect the outputs of the AFS 224 to the power amp’s inputs, or active crossover if using one.
5. Apply power to the mixer and amplifiers.

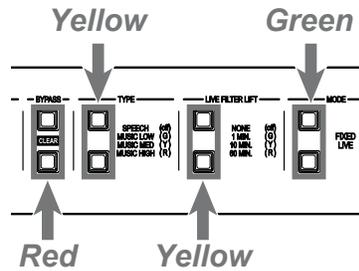


Quick Start

For best performance, it is recommended that you perform the following:

- Ensure you have properly configured the AFS 224 for your application (i.e. dual mono operation or stereo linked operation). See “Linking Channels” for further information.
- Ensure that the gain structure has been properly set. See “System Connection & Gain Structure”.

Step 1. If you intend to initially ring out the system before hand, using Fixed Mode, set all buttons to the colors indicated on the right. If the system will be used for speech reproduction only, set the TYPE buttons to SPEECH (TYPE LEDs Off). If you intend to simply use Live Mode and do not intend to ring out the system before hand (this is the easiest and fastest way to get up and running with the AFS 224), press and release the **<BYPASS>** buttons to activate the AFS processing (BYPASS LEDs off) and skip to Step 7.



- Step 2.** With signal present, perform a soundcheck and bring up the channel fader for each microphone that you intend to ring out. Try to set each microphone as close as possible to the desired performance level while still remaining under the point of feedback. If feedback does occur, slightly lower the channel fader until the feedback disappears.
- Step 3.** Fully attenuate the mixer’s master output faders and mute all other mixer channels which you do not intend to ring out.
- Step 4.** With no signal present in the microphones which you are about to ring out (any signal present will be mistaken for feedback by the AFS 224 and notched out), press each channel’s **<BYPASS>** button so that the button’s LEDs are no longer lit (AFS processing is now enabled).
- Step 5.** Slowly raise the mixer’s master output faders. At some point feedback will begin to occur. Raise the faders until either you are a few dB above the level at which the system will be operated or until all Fixed filters are set (indicated by the **<MODE>** button LEDs flashing green).
- Step 6.** Now set your mixer’s master output faders back down to the level at which the system will be operated.
- Step 7.** Press each channel’s **<MODE>** button until both are lit red (you are now in Live Mode).
- Step 8.** If you would like to lockout the front panel controls, lock out the AFS 224 as described in the “Front Panel Lockout” section of this manual. The system is now ready for use.

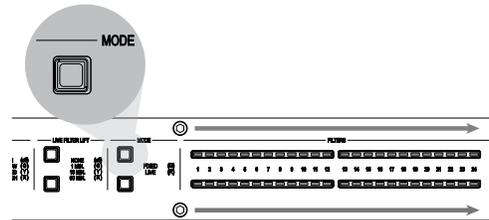
Setup Mode

The AFS 224 Setup Mode is used to set the total number of AFS filters available and allocate the number of Fixed versus Live filters available in each channel. The number of Live filters is the difference between the total number of filters and the number of Fixed filters (**Live Filters = Total Number of Filters - Fixed Filters**).

NOTE: If channels are linked, all selections made in Setup Mode will affect both channels. In order to edit channel options independently, you must first unlink the channels as described in the “Linking Channels” section of this manual.

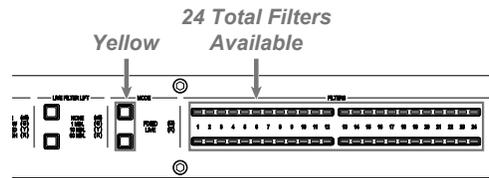
Entering Setup Mode

Press and hold the CHANNEL ONE **<MODE>** button until the Filter LED’s begin lighting from left to right, then release the button. You are now in Setup Mode. This is indicated by the **<MODE>** buttons lighting yellow. You are now in the Set Total Number Filters Menu. Pressing and releasing each channel’s **<MODE>** button will now toggle you between the Set Total Number Filters Menu (yellow LED) and the Set Number Fixed Filters Menu (green LED).

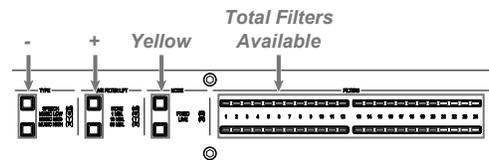


Selecting the Total Number of Filters

When in Setup Mode, the Set Total Number Filters Menu is indicated by the selected channel’s **<MODE>** button lighting yellow. If the **<MODE>** button LEDs are not lit yellow, press the **<MODE>** button(s) until they are. The current setting for the total number of filters are indicated by the number of Filter LED’s lit for each channel.



To change the total number of filters, use the channel **<LIVE FILTER LIFT>** button to increment and the **<TYPE>** button to decrement the total number of filters for each channel. Each press of the button will increment or decrement the total number of filters. Press and hold each button to slowly increment or decrement the number.



WARNING! Changing the total number of filters may remove feedback filters already set.

Selecting the Number of Fixed Filters

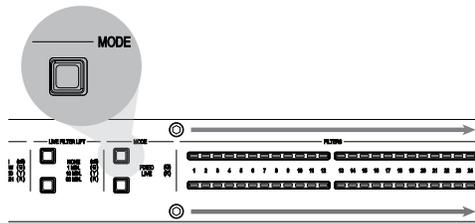
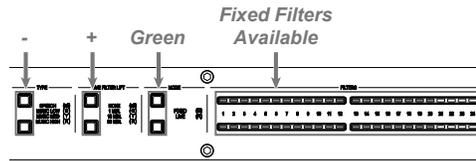
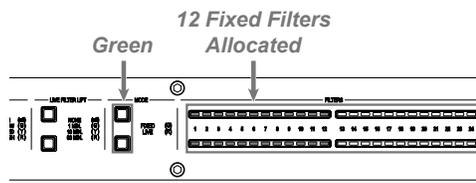
When in Setup Mode, use the channel **<MODE>** button(s) to toggle to the Set Number Fixed Filters Menu indicated by the selected channel's **<MODE>** button lighting green. The current setting for the number of Fixed filters is indicated by the number of Filter LED's lit for each channel.

To change the number of Fixed filters, use the selected channel's **<LIVE FILTER LIFT>** button to increment and the **<TYPE>** button to decrement the number of filters. Each press of the button will increment or decrement the total number of Fixed filters. Press and hold each button to slowly increment or decrement the number.

WARNING! Changing the number of Fixed filters may remove feedback filters already set.

Exiting Setup Mode

To exit Setup Mode and return to Normal Operating Mode, press and hold the CHANNEL ONE **<MODE>** button until the Filter LED's begin lighting from left to right, then release the button (same as entering Setup Mode).



Fixed Mode

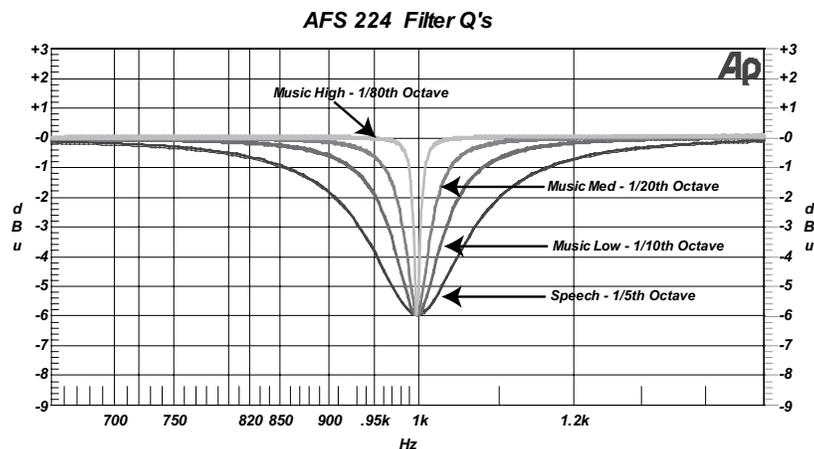
The AFS 224 offers two main modes of operation: Fixed Mode and Live Mode. Fixed Mode is used to detect and remove feedback problems in the system due to microphone placement, room modes, etc.. Once set, these filters are stored in the AFS 224 (even after a power cycle) and are not removed until cleared by the user. The AFS 224 can be put into Fixed Mode by pressing the **<MODE>** button until it lights green. When all Fixed filters have been used, the **<MODE>** button will flash green indicating there are no more Fixed filters available.

Ring out a system

Fixed filters are set before a performance in a process called “ringing out a system”. This is done after all other system EQ’ing has been performed. See the “Quick Start” section of this manual for information regarding ringing out a system.

Using Types in Fixed Mode

The AFS 224 offers several feedback suppression types. These are Speech, Music Low, Music Medium and Music High. The selected type controls the width of the notch filter used to remove the feedback. Music High uses very narrow notch filters minimizing the effect on the music. The Speech type uses much wider notch filters allowing the AFS 224 to work faster. See “Type” in the “Front Panel” section of this manual for further information.



During the filter setting process, the filter type can be changed by pressing the channel’s **<TYPE>** button. This will change the filter type for the next filter and will not change existing filters. When all Fixed filters have been used, new feedback occurrences will not be removed. Pressing the **<MODE>** button will place the AFS 224 into Live Mode (indicated by the **<MODE>** button(s) lighting Red) and feedback will continue to be removed. If more Fixed filters are needed, reallocate more filters by following the steps in Setup Mode or clear the filters (see the “Clearing Filters” section) by pressing and holding the **<BYPASS>** button until all the Filter LED’s blink and repeat the ring out procedure with a wider filter type.

WARNING! Ensure the system’s gain is reduced before clearing filters.

Live Mode

Live Mode allows feedback filters to be set and removed based on changes in the environment and is designed to be used during a performance. The AFS 224 can be put into Live Mode by pressing the **<MODE>** button until it lights red. Once in Live Mode, if feedback occurs, a filter will be set at the feedback frequency. If there are additional occurrences of feedback, additional notch filters will be set until all the Live filters are used. If new frequencies begin to feedback and no more Live filters are available, the AFS algorithm will take the first Live filter set, and move it to the new feedback frequency. The AFS 224 will continue to “round robin” through the Live filters as new feedback is detected.

Using Live Filter Lift

Live Filter Lift provides maximum sonic integrity by removing unnecessary feedback filters. The Live Filter Lift function provides a timer for each of the Live filters. This timer length can be adjusted by pressing the **<LIVE FILTER LIFT>** button and can be switched between: off, 1 minute, 10 minutes, or 60 minutes. The Live Filter Lift default time is 10 minutes from the factory. If Live Filter Lift is on, once a filter's time period has expired, the AFS algorithm will check to see if the feedback filter is still necessary. If no longer needed, the notch filter will then slowly lift. If the filter is still required to eliminate feedback, the timer will be reset. If Live Filter Lift is off, the notch filters will remain in place until they are cleared by the user, the AFS 224 is power cycled, or until needed for other frequencies.

Using Types in Live Mode

As in Fixed Mode, the AFS 224 offers several feedback suppression types. These types control the width of the notch filter used to remove the feedback. The Speech type uses wider notch filters allowing the AFS 224 to work faster. The Music types provide sharper notch filters than the Speech type, with up to 1/80th of an octave in the Music High type (see AFS filter Q graph on the previous page). Pressing the **<TYPE>** button switches between the different types. You can select different types for both Live and Fixed Mode.

Other Functions

Clearing Filters

To clear the Live filters, press and hold the **<BYPASS>** button on the selected channel for approximately two seconds. The currently assigned Live filter LEDs will flash. If you wish to clear only the Live filters, release the **<BYPASS>** button at this time. If you wish to clear all filters (Fixed and Live), continue to hold the **<BYPASS>** button an additional two seconds until all filter LEDs are flashing. At this point, release the **<BYPASS>** button and all filters will be cleared.

WARNING! Ensure the system's gain is reduced before clearing filters.

Front Panel Lockout

To lockout all access to the front panel of the AFS 224, press and hold the CHANNEL ONE **<LIVE FILTER LIFT>** button until all filter LEDs light from outside to inside, then release. To unlock the front panel, press and hold the CHANNEL ONE **<LIVE FILTER LIFT>** button until all filter LEDs light from inside to outside, then release.

Linking Channels

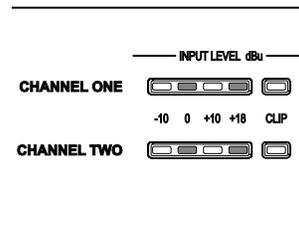
To toggle between linked and unlinked operation, press and hold the CHANNEL ONE **<TYPE>** button until all button LED's flash, then release the button. Mode of operation can be verified by simply pressing one of the **<BYPASS>** buttons to see if the other channel's **<BYPASS>** button also changes. If it does, the channels are stereo linked. If it does not, the processor is configured for dual mono (unlinked) operation.

Factory Hard Reset

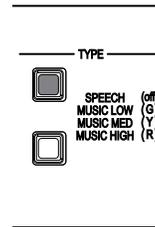
In the event that you would like to set all parameters back to their factory default state, please perform the Factory Hard Reset procedure outlined below.

WARNING! Performing this reset will clear all set filters. Ensure the system's gain is reduced and amplifiers are off before performing this procedure to ensure the system does not go into feedback once the filters are cleared.

Step 1. Power on the unit while pressing and holding both channel's **<LIVE FILTER LIFT>** buttons until the CHANNEL ONE and CHANNEL TWO INPUT LEVEL meters display the LED pattern shown on the right, then release the buttons.



Step 2. The CHANNEL ONE **<TYPE>** button LED should now be lit red. All other LEDs should be off.



Step 3. Press and hold the CHANNEL TWO **<BYPASS>** button until all button LEDs flash, then release the button.

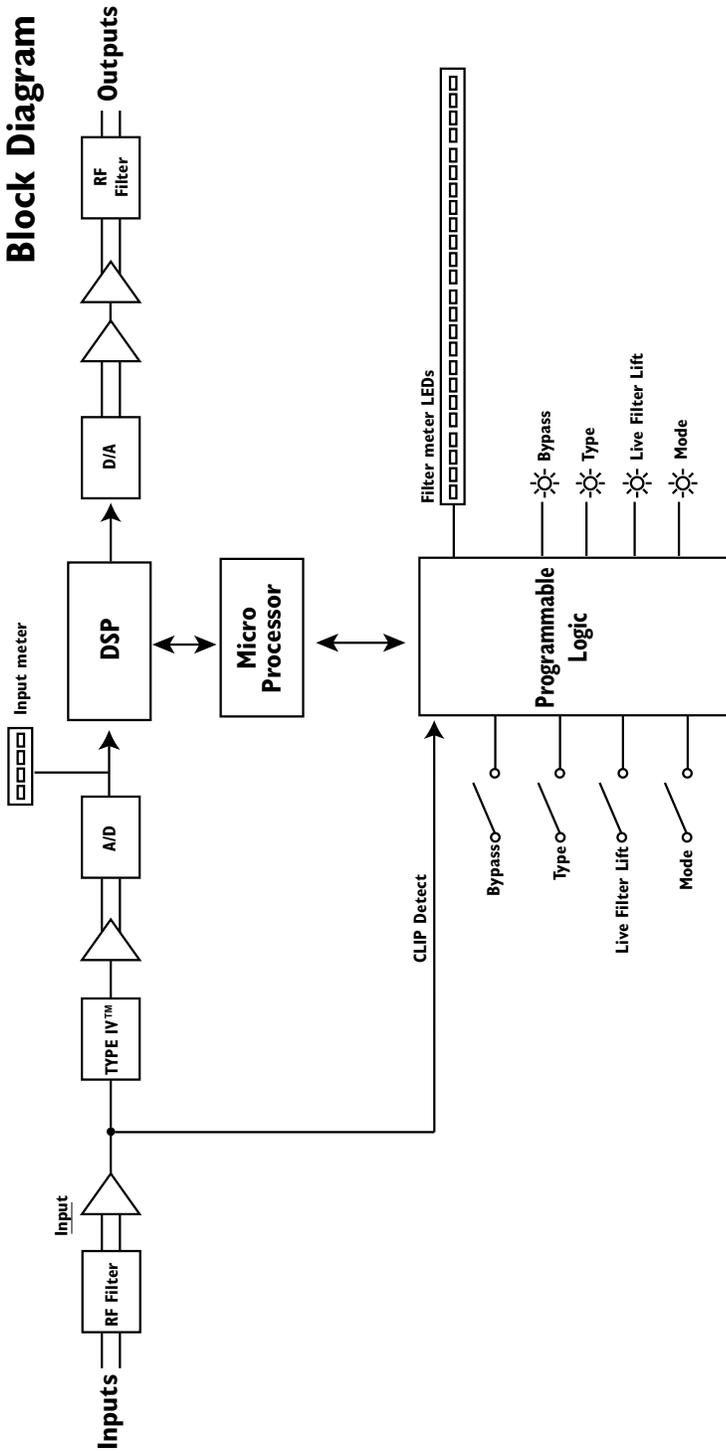
Step 4. Press and hold the CHANNEL ONE **<BYPASS>** button until all button LEDs flash again, then release the button.

All settings will now be back to their factory default state and the unit is now ready to operate. The AFS 224's factory default settings are as follows:

| Parameter | Default Value |
|-------------------------|---------------|
| Total Number of Filters | 24 |
| Fixed Filters | 12 |
| Live Filters | 12 |
| Channel Link/Unlink | Unlinked |
| Front Panel Lockout | Unlocked |
| Bypass | On |
| Type | Music High |
| Live Filter Lift Time | 10 Minutes |
| Mode | Live |

Block Diagram

**AFS 224
Block Diagram**



Specifications**Analog Inputs:**

| | |
|-----------------------|---|
| Number of Inputs: | 2 |
| Connectors: | Female XLR and 1/4" TRS |
| Type: | Electronically balanced/unbalanced, RF filtered |
| Impedance: | Balanced 50k Ω , Unbalanced 25k Ω |
| Max input line level: | +20dBu |
| CMRR: | >40dB, typically >55dB @ 1kHz |

Analog Outputs:

| | |
|--------------------|--|
| Number of Outputs: | 2 |
| Connectors: | Male XLR and 1/4" TRS |
| Type: | Electronically balanced/unbalanced, RF filtered |
| Impedance: | Balanced >120 Ω , unbalanced >60 Ω |
| Max Output Level: | +20dBu |

A/D Performance:

| | |
|-------------------------|--|
| Type: | dbx Type IV™ conversion system |
| Dynamic Range: | >113dB A-weighted, >110dB unweighted, 22kHz BW |
| Type IV™ dynamic range: | >119dB, A-weighted, 22kHz BW >117dB, unweighted, 22kHz BW |
| A/D Conversion: | 24 bit |

D/A Performance:

| | |
|-----------------|------------------------------------|
| Dynamic Range: | 112dB A-weighted, 109dB unweighted |
| D/A Conversion: | 24 bit |

System Performance:

| | |
|----------------------------|--|
| Sample Rate: | 48kHz |
| Dynamic Range: | >109dB A-weighted, >106dB unweighted, 22kHz BW |
| THD+N: | 0.003% typical at +4dBu, 1kHz |
| Frequency Response: | 20Hz – 20kHz, +/- 0.5dB |
| Interchannel Crosstalk: | >80dB typical |
| Crosstalk input to output: | >80dB typical |
| Operating Voltage: | 100VAC 50/60Hz, 120VAC 60Hz and 230VAC 50/60Hz |
| Power Consumption: | 9 Watts |

Safety Agency Approvals: UL 6500, IEC 60065, EN 55013, E 60065



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