



DIGITAL SPEAKER PROCESSOR

DS48

- *User Guide*
- *Reference Manual*

BBE®

professional products

**WARNING**

To prevent fire or shock hazard, do not expose the unit to rain or moisture.

ATTENTION: RISQUE DE CHOC ELECTRIQUE - NE PAS OUVRIR.



The lightning flash with arrowhead symbol, within an equilateral triangle, is intended to alert the user to the presence of uninsulated "dangerous voltage" within the product's enclosure that may be of sufficient magnitude to constitute a risk of electric shock to persons.



The exclamation point, within an equilateral triangle is intended to alert the user to the presence of important operating and maintenance (servicing) instructions in the literature accompanying the appliance.

For your protection, please read these safety instructions completely before operating the appliance, and keep this manual for future reference.

Carefully observe all warnings, precautions and instructions on the appliance and described in the operating instructions supplied with the appliance.

INSTALLATION

Water and Moisture - Do not install the appliance near water: for example, near a bathtub, washbowl, kitchen sink, laundry tub, in a wet basement, or near a swimming pool.

Heat - Do not install the appliance near sources of heat such as radiators, heat registers, stoves, or other appliances that produce heat.

Ventilation - Situate the product so its location or position does not interfere with its proper ventilation. For example, you should not place the product on a bed, sofa, rug, or similar surface that might block the vent openings, or placed in a built-in installation, such as a bookcase or cabinet that might impede the flow of air through the ventilation openings.

Wall or Ceiling Mounting - If your appliance can be mounted to a wall or ceiling, mount it only as recommended.

USE

Power Source - Connect the appliance to a power supply only of the type described in the operating instructions or as marked on the appliance.

Power-Cord Protection - Route the power cord so that it is not likely to be walked on or pinched by having objects placed on it, paying particular attention to the plugs, receptacles, and the point where the cord exits from the appliance.

Grounding or Polarization - Do not defeat the grounding or polarization feature of the AC power cord. If your AC receptacle will not accept the power cord plug, contact your electrician to install a proper AC receptacle.

When not in use - Unplug the power cord of the appliance from the outlet when left unused for a long period of time. To disconnect the cord, pull it out by grasping the plug. Never pull the plug out by the cord.

AC Receptacle - Check to make sure that the AC receptacle holds the power cord plug firmly and securely. If the power cord plug is loose, contact your electrician to replace the defective and unsafe AC

Foreign Objects - Be careful that foreign objects and liquids do not enter the enclosure through openings.

SERVICE

Unplug the appliance from the wall outlet and consult qualified service personnel when:

- the power cord or the plug has been damaged.
- a solid object or liquid has fallen into the cabinet.

- the appliance has been exposed to rain or moisture.
- the appliance does not appear to operate normally or exhibits a marked change in performance.
- the appliance has been dropped, or the enclosure damaged.

Do not attempt to service the appliance beyond that described in the operating instructions. For all other servicing, refer to qualified service personnel only.

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IMPORTANT! BEFORE YOU BEGIN, PLEASE CHECK THE CONTENTS WITHIN THIS BOX TO INSURE THESE ITEMS ARE INCLUDED:

1. The BBE DS48 Digital Speaker Processor.
2. The BBE DS48 Digital Speaker Processor User's Manual.
3. Power cord.
4. Warranty registration card.
5. Software Disc
6. DB-9 type serial cable for connection between unit and PC.

If any of these items are found to be damaged or missing, immediately contact the BBE dealer you purchased it from. This manual will help you to effectively utilize the BBE DS48. Reviewing the information contained in this manual will answer most of the common questions that our service department receives. If you still have questions, please feel free to call 800-233-8346.

Crossovers

Parametric Equalizers

Driver Alignment Delay

Speaker Protection limiter

10 user memories

- 4 inputs 8 outputs and includes 10 configurations
- Choice of Operating and Crossover Modes: 4 X 2-way, 2 X 3-way + 2 Aux, 2 X 4-way, 1 X 5-way + 3 Aux, Mono Dist., Stereo Dist., LCRS w/Mono Subs, 4 X 4 Processor, Muted/Flat Startup
- Input gain control for each channel
- Separate crossover controller
- 5 band fully parametric equalizer
- Driver Alignment Delay for each output up to 7ms in .1ms increments
- Output gain and phase control
- Three front panel encoders to speed programming
- Security lockout to discourage system tampering
- RS-232 remote control PC interface (Windows compatible software included)
- Each group parametric equalizer has 360 ISO frequencies with + or - 12dB gain
- Each group Q value is from 0.5 to 128 and provides Hi shelf/Lo shelf select function.
- Separate limiter with Attack, Hold, Decay and Threshold parameters
- High Pass and Low Pass filter avail for each channel @ 6 or 12dB slope
- Choice of 6dB, 12dB, 18dB, 24dB, 48dB Butterworth, Linkwitz-Riley or Bessel frequency response curve
- Memory for up to 30 on-board user programs
- 8X7 bit input/output precision digital LED meter.
- 2X20 LCD backlit. LED Display

Thank you for choosing the BBE DS48 Speaker Management System. This product will enable you to obtain the best possible performance from your loudspeaker system. You can also reduce the amount of outboard gear that is required to transport, set-up and operate as part of the sound system.

The DS48 offers many powerful functions. It is highly recommended that you read through this manual before you begin connection and operation. For those that are familiar with this type of device or if you simply can't wait to hear how good your system will sound, a Quick Start section follows on pages 4-5.

SOME TERMS THAT WILL BE USED IN THIS MANUAL:

Configuration: This refers to a particular group of settings, with the primary parameter being the crossover type.

Program: A program is a configuration with either the factory default or a user-created name.

Configuration and Program may be used interchangeably, though a configuration must be programmed for a program to exist.

Parameter: A component of a setting such as the center frequency of one band of parametric EQ or the attack time of a limiter.

WARNING! To prevent possible speaker or amplifier damage, always power-up peripheral devices first, wait 10 seconds, and then turn on the power amplifier. Turn off power amplifier first, then power-down peripheral devices.

WHAT IS A SPEAKER MANAGEMENT SYSTEM?

A Speaker Management System uses digital signal processing to accomplish multiple functions that affect the audio signal between the mixer and the power amplifiers. These functions include crossover, equalization, delay, limiting, high-pass and low-pass filtering as well as signal distribution. Programs may be created, selected and edited with the DS48's front panel controls. However, to create new programs, it is best to use the included free PC software and configure the programs using the graphical user interface (GUI) and a Windows PC.

2.1 Crossover:

This function uses filters to divide the audio spectrum into multiple bands, such as Highs, Mids, and Lows. When these separate signals are individually amplified and sent to a speaker matched for that range, the result is a much more efficient system with more punch and clarity as compared to system using a two or three-way speaker box with a passive cross-over. The common terms used for two or three-way systems are "bi-amp" and "tri-amp".

2.2 Equalization:

This function provides control of the tonal spectrum. It can be used to compensate for differing acoustic conditions, speaker cabinet responses or boosting/cutting certain frequency ranges to create a specific type of sound. In some rooms, "ringing" or feedback is present due to a number of conditions. Use the PEQ function to reduce the ringing frequencies.

2.3 Delay:

This function is used to "time-align" the different transducers in a speaker system. A properly aligned system will have better phase coherence resulting in more focused sound.

2.4 High Pass and Low Pass Filters:

These are used to reduce any signal outside of the desired bandwidth and are part of the equalization function. This frees the power amps and speakers from trying to reproduce signals that are not an intended part of the mix or simply beyond the reproduction range of the loudspeakers.

2.5 Limiting:

This function prevents a signal from exceeding a certain pre-determined level. It prevents input overload with its resultant distortion and also keeps amplifiers from clipping, which protects the speakers.

2.6 Signal Distribution:

This allows the signals from each of the four inputs to be processed and sent to the corresponding output. The crossover function is not active when in this mode. An LCRS (Left, Center, Right, SUB) mode is also available.

1. LCD Display

The 2x20 backlit LCD displays the program and programming choices of the unit.

2. <BACK/NEXT> Buttons

These buttons allow navigation for selection of sub-menus and some parameter values.

3. Menu

This is one of two buttons that will access the front panel programming. This one is used primarily to select which program to call up, edit or save.

4. Gain

This is one of two buttons that will access the front panel programming. This, along with the <Back/Next> buttons accesses the various parameters of a program.

5. Enter

Hitting this button will write the current selection to memory.

6. Quit

This exits the programming menu and returns the display to showing the selected program.

7. FREQ Encoder Knob

This acts as the main value selector dial for most parameters other than those associated with EQ, Q and EQ Gain.

8. Q Encoder Knob

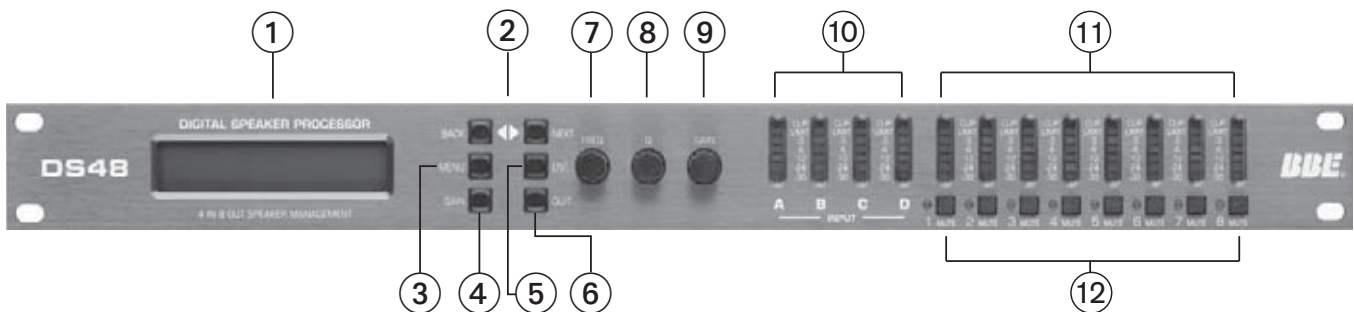
This adjusts the Q of a selected equalizer band.

9. GAIN Encoder Knob

This adjusts the Gain levels of Inputs, Outputs and any selected equalizer band.

10. Input Meters

These display the levels of the four inputs. The seven LED lamps per display are in 6 dB steps from -30dBV to -6dBV, then -3dBV, then Limit (0dBV), then Clip (+8 dBV)



FRONT PANEL

11. Output Meters

These display the levels of the eight output channels. The seven LED lamps per display are in 6 dB steps from -30dBV to -6dBV, then -3dBV, then Limit (0dBV), then Clip (+8 dBV)

12. Output Mute Buttons

Pressing one of these buttons will mute the respective Output channel and the LED will illuminate. All outputs will mute automatically during certain program selection and editing processes, to protect the loudspeakers

REAR PANEL

1. Power Jack

This accepts a standard IEC type AC bayonet plug. Because the unit uses universal switching power supply, no voltage selection is required. The ON/OFF power switch is also located here.

2. RS232 Interface

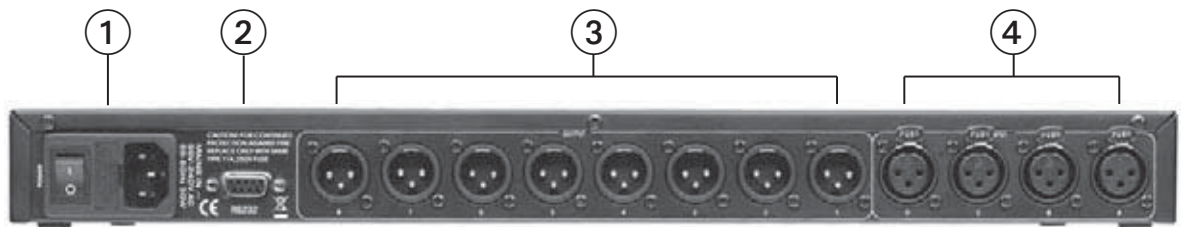
Connect this to the serial port on a PC using the included cable or other standard DB-9 type cable. With the software installed, the PC can now monitor and program the DS48.

3. XLR Outputs 1-8

These are balanced (Pin 2 Hot) XLR outputs.

4. XLR Inputs A-D

These are balanced (Pin 2 Hot) XLR inputs that accept the signal from the outputs of the mixer.

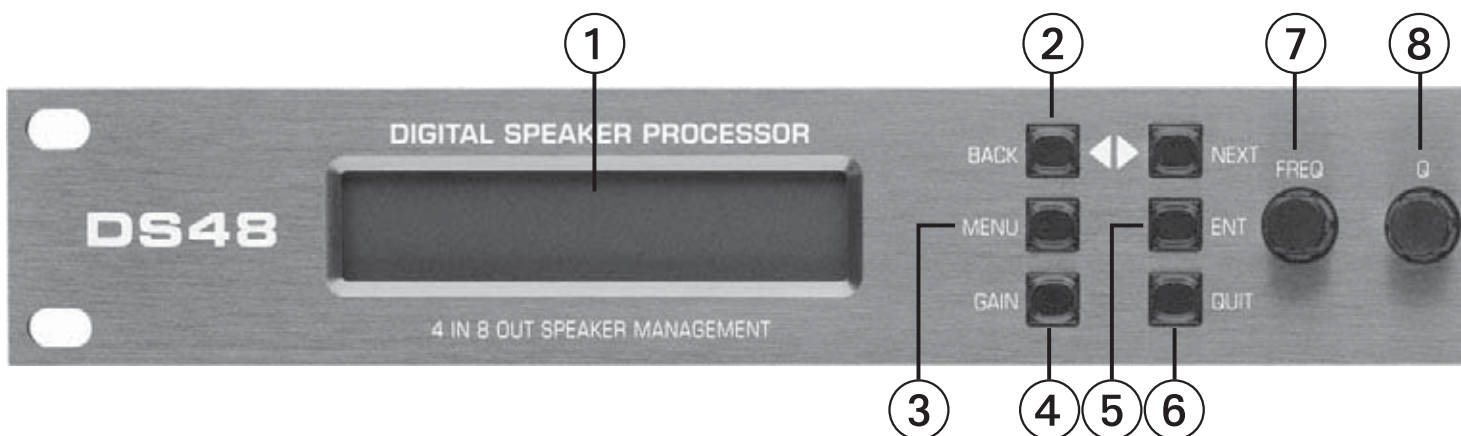


NOTE: This section will describe navigation of the front panel controls as follows:

The button to press will be shown in ALL CAPITALS. For QUICK START, a number following in parentheses (#) will also be included. These refer to the same names and numbers as shown in Figure 1, Front Panel Controls and Indicators. The expected display text is shown in "quotation marks". If you press a button and the display does not change, it means that the button has no effect for that particular menu item.

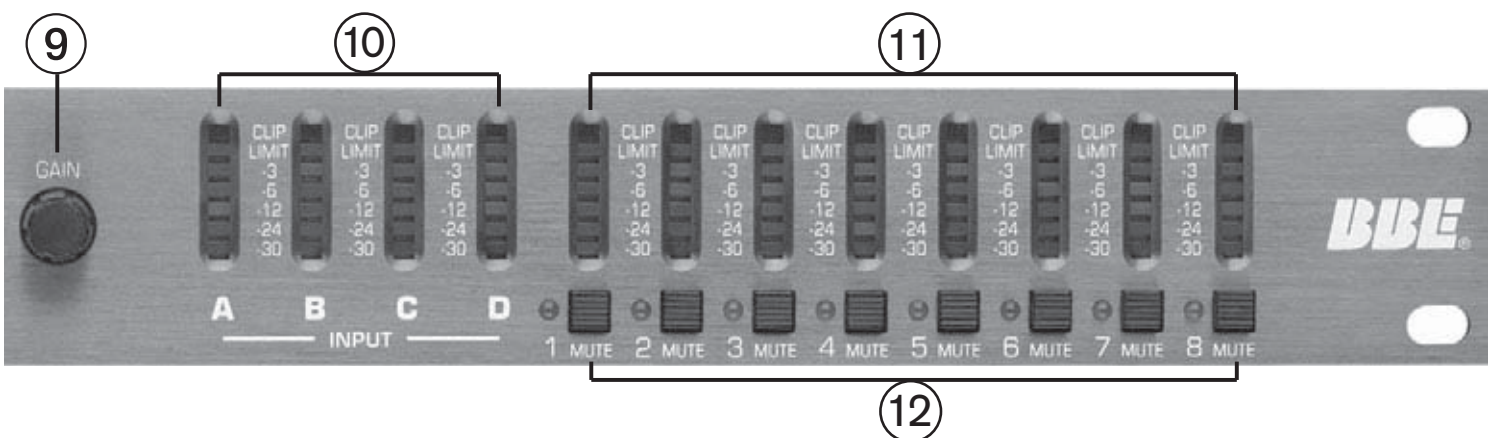
If you get to a certain point in the menu and want to go back, but cannot, press QUIT (6) and begin the steps again. This is normal for the unit.

1. Before hooking up the system, make sure that all items are OFF, especially the power amps.
2. Use high quality balanced XLR mic cables to make the connections. The feeds from the DS48 at "front of house" can also be sent through the audio snake returns to the amp stacks if used in a live setting.
3. You should know the frequency response and limits of your loudspeakers
4. Connect the main output or outputs of your mixer to the inputs of the DS48.
5. Depending on the configuration you select, connect the appropriate number of outputs from the DS48 to your power amp inputs.
6. Turn on the DS48.
7. After a brief start up, the display will show "2 x 2 WAY X-OVER"
8. Press MENU (3).
Press ENTER (5).
Press NEXT (2) "Design a Xover"
9. Press ENTER (5).
Select the crossover mode desired with the BACK/NEXT (2) buttons. After selection, Press ENTER (5).



Depending on the mode selected, other options will appear for this level of the menu, primarily concerned with input and output assignments. Some assignments are fixed with the crossover type selected. Only those assignments that can be selected will show on the display. Either the BACK/NEXT (2) buttons or the Parameter dial will work for stepping through the selections.

10. Press GAIN (4). Set the gain for Input A with gain knob (9).
Press NEXT (2) and set the gain for Input B with gain knob (9).
Repeat procedure to set gain for outputs C & D.
Gain value is selected with the GAIN knob (9).
After setting all gains, press NEXT (2) again.
11. You are now in the Output programming section. Depending on the configuration selected, the different outputs will show in the upper left corner of the display as OP1, OP2, etc. You can select an output and then step through the parameters of with the BACK/NEXT (2) buttons OR use the GAIN (4) button to step through the outputs, changing the same parameter for each output as it is displayed and cycle through the outputs for each parameter.
12. In the PEQ screen, the ENTER (6) button is used to toggle between
PEQ “ \diamond ”,
Low Shelf “}”,
Hi Shelf “{”, and
Bypass “=”
13. After completion of the patching and programming, power up the rest of the system and enjoy improved sound quality.
14. Practice “safe sound”.



Your DS48 was carefully packed at the factory and the packaging was designed to protect the unit from rough handling. Nevertheless, we recommend that you carefully examine the packaging and its contents for any signs of physical damage that may have occurred in transit.

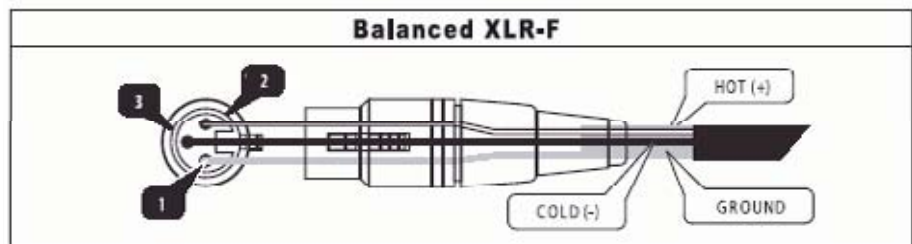
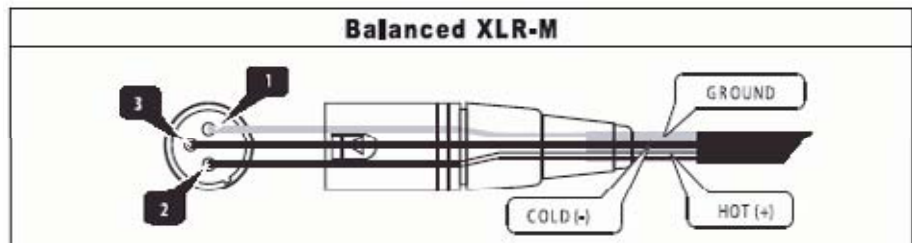
6.1 RACK MOUNTING

The DS48 fits into one standard 19" rack unit of space. Please allow at least an additional 4" depth for the connectors on the back panel. Though this device does not generate significant heat, be sure that there is enough air space around the unit for cooling. To avoid overheating, do not place the DS48 in rack above devices that generate significant heat such as power amplifiers.

6.2 CONNECTORS

The DS48 must be installed using standard 3-pin type XLR jacks. Although the inputs are fully balanced, the automatic servo-functions allow them to operate with unbalanced source/loads. Audio outputs also use XLR jacks.

PIN 1 = Ground
PIN 2 = HOT (+)
PIN 3 = COLD (-)



There are two methods of creating and selecting programs on the DS48.

1. The first method uses the front panel controls of the unit and requires stepping through menus to access the proper parameters that need adjusting. Once programs have been saved to the onboard memory, calling up a program is quite simple. See QUICKSTART for an example of navigating and creating a program.

2. The second method uses the included Graphical User Interface (GUI) software run on a Windows PC. The computer connects to the DS48 and gives a more global view of the parameters and the choices for settings. This is the most efficient method to create the programs you use most and want to save to memory on the unit. They can then be called up as needed. If an adjustment is required and it is not convenient to hook up a PC, the edits can be made from the front panel controls of the unit. The Sysomax software also lets you monitor and remote control a DS-48 in real time from your computer.

NOTE: More detailed descriptions of how the various functions work are in Section 8, Creating A Program.

7.1 Navigating Front Panel Controls

There are six buttons and three encoder knobs on the front panel, as well as mute buttons for each of the outputs. In conjunction with the display, the six buttons and three knobs let you create, edit, save, recall and delete programs. You can also set security levels as to how much access to the programming menus, if any, is available to multiple users.

When the unit powers up, it will display the currently selected program by showing either the crossover type or a name for that program that has been selected and saved.

7.1.1 Hints for Operation:

The MENU and GAIN buttons access the different levels of the available selections. MENU is used to access submenus for Crossover, Security, Subsystem and Interface.

The GAIN button is used to access specific parameters for a configuration

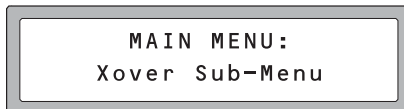
NOTE: In some sub-MENU items, both the arrow keys and the FREQ knob will select different parameter values. If you get to a spot where you need to step back and the

BACK button will not step you back, simply hit EXIT and start again.

Where an additional "ENTER" press is required to write the selection to memory, the screen will prompt you with "[ENTER] to Confirm".

The LED display also offers some navigation help. Left or right arrows on the top line indicate the BACK/NEXT buttons will step to other choices.

7.2 SUBMENUS



7.2.1.1 Crossover Submenu

This menu selects the type of crossover and is the primary submenu to create, recall, delete, and name a program configuration.

Press MENU and ENTER to access this submenu. Then use the BACK, NEXT and ENTER buttons to adjust the Xover Submenu. Included submenus follow:

7.2.1.2 Load a Xover:

This will load a configuration that has previously been saved into the memory of the unit. Until you have saved other programs into the unit, nothing will be available to load. Only the previously selected program will display.

7.2.1.3 Design a Xover;

Use this mode to select from the ten different types of X-OVER and distribution configurations.

7.2.1.4 Store a Xover:

Store all the configuration settings of a X-OVER. The DS48 will store up to 30 program configurations in user memory locations. (An unlimited number can be stored on a PC or other PC accessible memory.) Each of the 30 programs can have a name containing up to 16 letters and numbers. If the program name is not edited, it is stored under the corresponding mode name, such "2 x 4 WAY XOVER".

7.2.1.5 Erase a Xover:

This will delete a user-created configuration.

7.3 Security Submenu

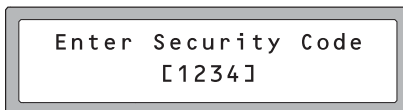
This menu allows you lockout various combinations of any or all front panel programming functions. A password with up to four-characters is created by the primary user and entered using the FREQ knob to select the character and the BACK/NEXT buttons to move the cursor to the four available spaces. To unlock the system, the password must be re-entered.

Press MENU, NEXT and ENTER. Then use the NEXT/BACK and ENTER buttons to adjust the Security Submenu.

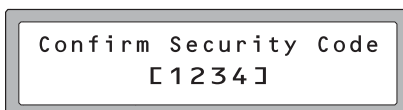
The various locking modes are as follows:

1. LOCK: Changes only: Parameters can be viewed, but cannot be adjusted. MUTE buttons are valid.
2. LOCK: Changes + View: Parameters cannot be viewed or adjusted. MUTE buttons are valid.
3. LOCK: Changes + Mutes: Parameters can be viewed, but cannot be adjusted. MUTE buttons are not valid.
4. LOCK: Everything: Parameters cannot be viewed or adjusted. MUTE buttons are not valid.

Once a security mode is selected, press ENTER. You will be prompted to enter a security code. This can be from one to four characters. Any of the characters available from the on-board selection choices may be used.



Enter Security Code
[1 2 3 4]



Confirm Security Code
[1 2 3 4]

A. Press the BACK/NEXT buttons to shift the cursor to one of the four positions. Then rotate the FREQ knob to select the desired character (letter, number or symbol). Repeat for the other three positions.

B. Press "ENTER", confirm the password and display as follows:

C. The system is locked when the reentered password matches the original entry otherwise the locking operation is invalid. If invalid, the screen will show "Bad Confirmation". If the codes match, the screen will show "Lock Success". Though up to four characters may be used, the lock out will work with just a single character. The initial and confirming entry must both be in the same position. NOTE: If nothing is entered (all blanks) the unit will still lock.

7.4 Subsystem Submenu

This menu allows selection of Input Linking and a choice of "wake up time" fade in or Mute Hold. Press MENU, NEXT and NEXT again. Then use the BACK/NEXT and ENTER buttons to adjust the Subsystem Submenu. Subsystem Submenu items are as follows:

1. Input option:

Determines whether the A/B and C/D inputs are linked or separate.

2. Wake up time:

A. Determines whether the outputs will stay muted on power up until manually switched off (Mute Hold) or the level will gradually fade up to the operating level (Fade In). The fade-in time is fixed.

Wake up 1 Fade-in: Mutes are off, but Output channels rise to programmed levels gradually.

Wake up 2 Mute Hold: All Output channels are muted until the mutes are manually disabled either on the front panel or through the GUI.

7.5 Interface Submenu

```
Interface Setup:
Remote ID Num= 1
```

This submenu selects the remote ID number for the unit. This number is identified by the PC when connected for programming.

Press MENU, then NEXT three times and then ENTER. Use the BACK/NEXT or FREQ knob to enter an ID value between 1 and 64.

Use this function when multiple DS48 units are used. Master Control unit is set as 1; slave units are set with subsequent numbers.

7.6 Parameter

Parameter lets you set the specific values for a configuration. These are set for the outputs of the device. Inputs require only a gain setting. Parameters for Outputs include such things as polarity, EQ, Limiter, Delay, HiPass Filter, LoPass Filter, and Filter Type.

7.6.1 Gain:

The first press of the GAIN button will go to Input Level adjustment for A or A&B if the first two inputs are linked. Repeated pressing of the NEXT button will step through the succeeding inputs and continue to the Outputs. Once in Outputs, additional presses of GAIN will cycle you through the eight output channels. Use the BACK button to cycle back to the Inputs if needed.

7.6.1.1 Inputs:

Press GAIN to enter the Parameter setup menu. Set the gain for Input A using the FREQ knob. Press NEXT and set the gain for Input B using the FREQ knob. *Repeat procedure to set the GAIN for Inputs C and D.*

```
Input A Gain
Gain=0.0dB
```

7.6.1.2 Outputs:

Press NEXT again and the screen will display an Output (Op1 = Output 1). Set the desired input gain level. At this point you can use the BACK/NEXT buttons to step through each of the parameters for the currently selected output. Press the GAIN button again to go to the next Output and program all of its parameters.

```
Op1 Low Gain
Gain=0.0dB
```


(The GAIN button will now select only the Output channels; the gain adjustment screens for the Inputs will not be displayed unless you use the BACK/NEXT buttons or exit the menu and start again.) Each Output will have both a number and name displayed. The names are taken from a default list with labels such as Low, Mid, Highs, Sub, etc.

An alternate method is to program a single parameter for Output 1, such as DELAY, then press the GAIN button to go to each of the Output channels in turn and program the delay parameter for that channel. Now select the next parameter and program that for each of the outputs in sequence. In some cases this may make it easier to keep track of the comparative values between outputs. For simplification, we will follow through programming all the parameters for a single output.

Set the Gain for Output 1. Range is -40 dB to + 6 dB

```
Op1  Low  Gain
Polarity=[+]
```

7.6.1.3 Polarity:

Set the polarity for Output 1. Switching this will change the phase of the signal 180 degrees. If Outputs are linked, reversing the polarity of one of the linked channels will also reverse the polarity of the other linked channel.

```
Op1  LOW  Delay
0.0ms  0m  0.0ft
```

7.6.1.4 Delay:

Set the Delay time for Output 1. Delay is used to align drivers in a stack that may be in different vertical planes or multiple speaker in a stack. Delay range is 0ms to 7ms selectable in .1 ms increments. The delay is displayed in milliseconds, meters and feet.

NOTE: Though there are some variables, generally speaking the speed of sound in 71 degree Fahrenheit dry air at sea level is ~773miles per hour. This is ~345 meters per second and about 1.13 feet per millisecond. .5 milliseconds equates to about 6.78 inches. .1 milliseconds equates to about 1.36". The DS48 displays 1ms = 343mm = 1.1ft.

```
Op1  High  HPF  /
4.00KHz  FLAT  THRU
```

7.6.1.5 HPF:

This is part of the crossover function. Sets the "knee" (corner frequency) and filter slope type for the HiPass Filter (HPF). Frequencies below the selected frequency will be filtered by the selected filter type and slope. Rotate the FREQ knob to select the frequency and the Q knob to select the filter type.

```
Op1  High  LPF  \
4.00KHz  Butwth  24dB
```

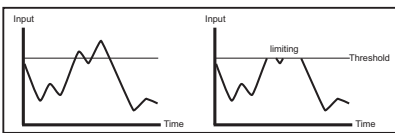
7.6.1.6 LPF:

Set the "knee" (corner frequency) and filter slope type for the LoPass Filter (LPF). Frequencies above the selected frequency will be filtered by the selected

Op2 LOW PEQ:2 ✧
2.00KHz Q=3.0 +0.0dB

NOTE: when using Hi shelf or Lo shelf, set Gain=0.0dB, change Q-value to Hishelf/Loshelf.

✧ means PEQ
} means Lo shelf
{ means Hi shelf
= means PEQ bypass



The signal BEFORE gain control and AFTER limiter processing

Op3 Mid Limiter
Level=0.0dB

filter type and slope. Rotate the FREQ knob to select the frequency and the Q knob to select the filter type.

HiPass: frequency range 10Hz~16.0KHz

LoPass: frequency range 35Hz~22.0KHz

Use HPF and LPF together to define the frequency band for this channel of the crossover.

7.6.1.7 PEQ:

Set the parameters for the five available bands of parametric EQ. Use the FREQ, Q and GAIN knobs to adjust the three parameters in the display. These include Frequency, Q, and Gain (Cut or Boost). Pressing the ENTER button in this mode will select the symbol in the upper right corner. Depending on other settings, the choices will include some or all of the following:

✧ (PEQ), } (Lo shelf), { (Hi shelf), = (PEQ bypass)

The choices for the PEQ center frequencies are 360 ISO frequencies between 20 Hz and 20 kHz.

Q is 0.5 to 128 and Hi Shelf or Lo Shelf.

Gain is +/- 12 dB

7.6.1.8 Limiter:

The limiter is used to limit the signal going to the output stage and ultimately the amps, to a predetermined maximum level, with the intention of preventing clipping and its resultant distortion.

There are four parameters available to set for the Limiter

1. Input Level sets the point at which the limiting circuitry will activate. This is sometimes referred to as Threshold. The range is -20dBV to +15dBV. A lower input level will activate the limiter sooner, affording more protection, but possibly creating more sonic artifacts if the limiter is activating and deactivating too frequently. Ideally, the limiter should be set so that it activates occasionally on peaks in the program.

This control is also tied to the front panel level display meter for its selected output. As you lower the Limiter input level, the sensitivity of the meter will increase. This means a lower input level will result in the same signal showing more level on the Output channel display. Ideally, the output level should just approach and occasionally cross into limiting.

```
Op3 Mid Limiter
ATTACK=12ms
```

```
Op3 Mid Limiter
hold=0.0ms
```

```
Op3 Mid Limiter
Decay=120ms
```

```
Op4 High source
source: sumA+B
```

```
Op2 Name
Name: Low
```

```
Copy Output Data
[Enter] to copy
```

```
Source Output:[1]
```

```
Source Output:[1]
Target Output:[2]
```

2. Attack. This is the amount of time that elapses before the limiter reduces the gain to the program level after the threshold point has been exceeded by the incoming signal. Generally, set shorter attack times on outputs that are feeding mids and highs and longer attack times for lows and subs. The time should be chosen carefully as the danger of dynamics distortion usually increases with shorter attack times. The attack time of the DS48 can be set within a range of 1 to 100 milliseconds.

3. Hold determines how long the limiter's gain reduction stays in place, even after the input signal has fallen below the Threshold. Use this to smooth out "choppiness", "pumping" or other artifacts that may occur under certain settings and program material. The hold time of the DS48 can be set within a range of 0.0 to 100 milliseconds in 1ms increments.

4. Decay: This control determines the how quickly the limiter removes the gain reduction and returns the signal to unity gain once the input signal has fallen below threshold. In instances where the limiter is constantly and repeatedly activated, a longer Decay time will prevent excessive retriggering and provide a more consistent signal. This control can be adjusted from 10ms to 1000ms in 10ms increments.

7.6.1.9 Input Signal:

In this menu, LCD displays the current input channel for the selected output. This parameter can be adjusted through all 4 input sources.

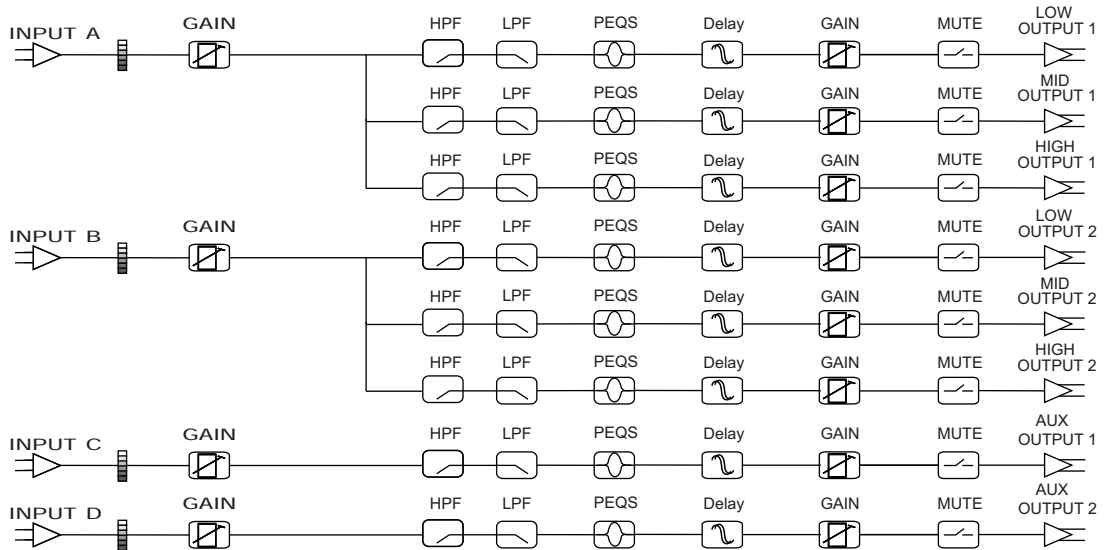
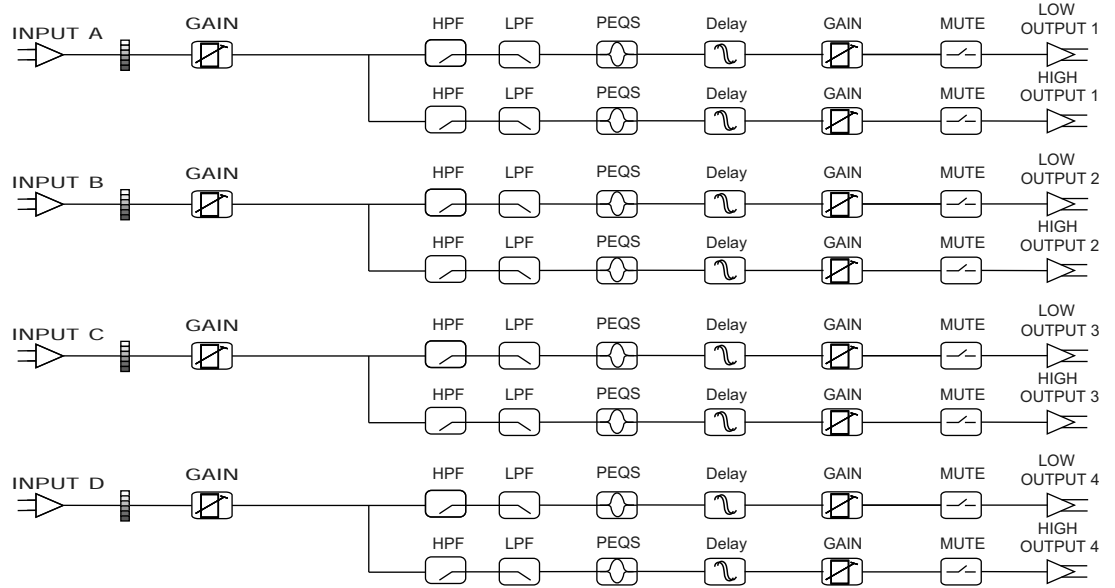
7.6.1.10 Name of channel:

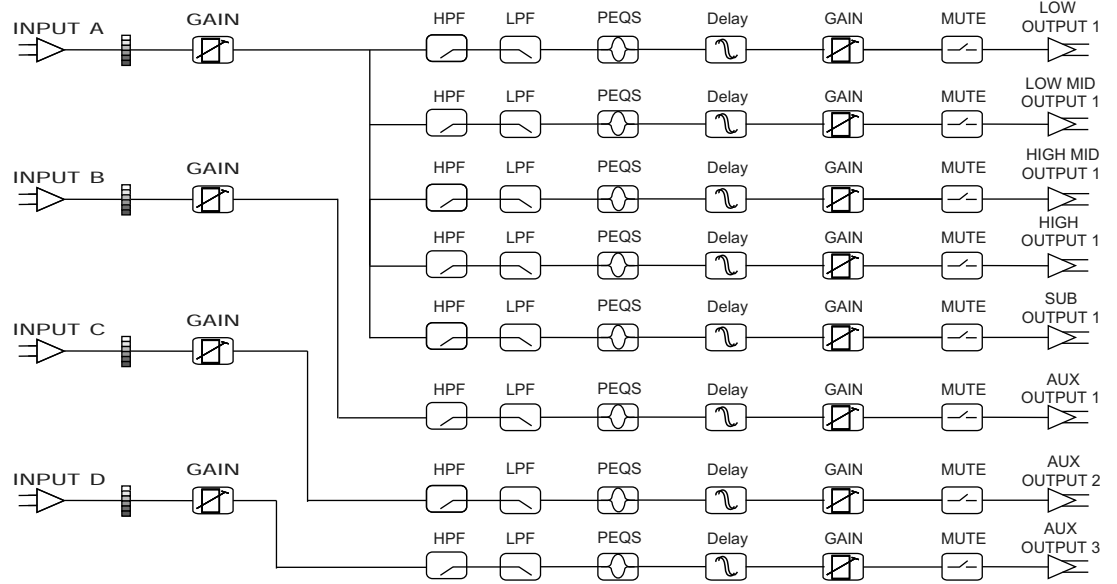
This function allows you to choose a name or label for an output channel. There is a fixed list of 32 choices to choose from. Use the PARAM Rotate to change the channel name.

7.6.1.11 Copy Output Data

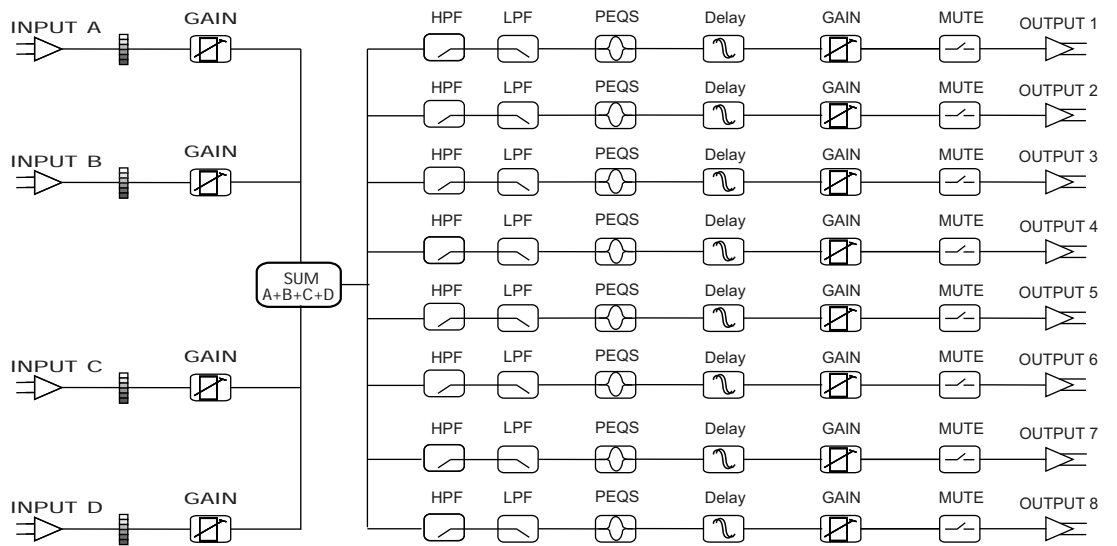
This allows you to copy the settings from one output channel to another, saving setup time.

Press ENTER and select the source channel with either the FREQ knob or the BACK/NEXT buttons. Press ENTER again and select the target channel to copy to. Press ENTER and then ENTER again to confirm.





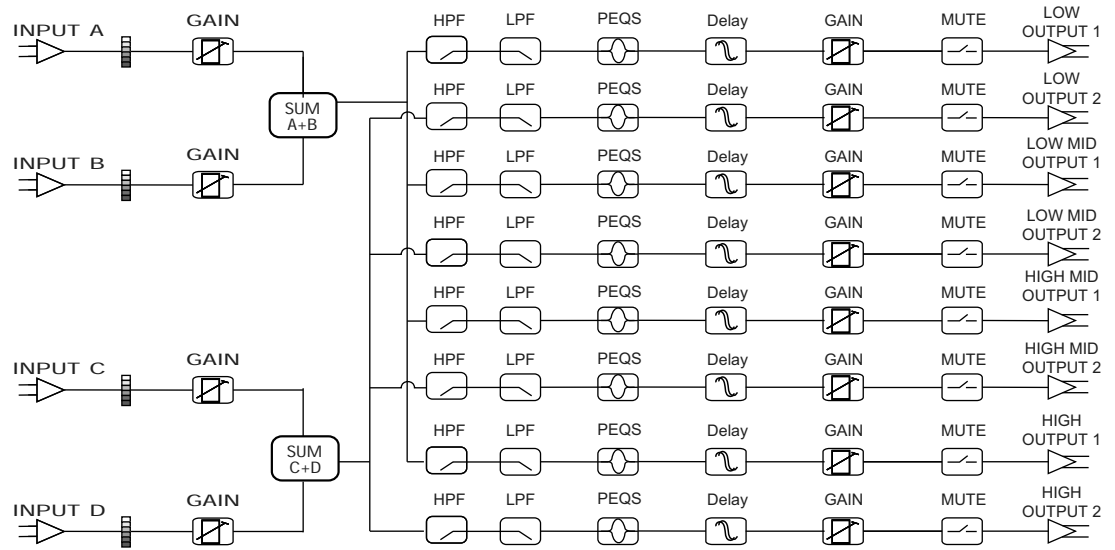
**1X5 WAY AND
3 AUX**



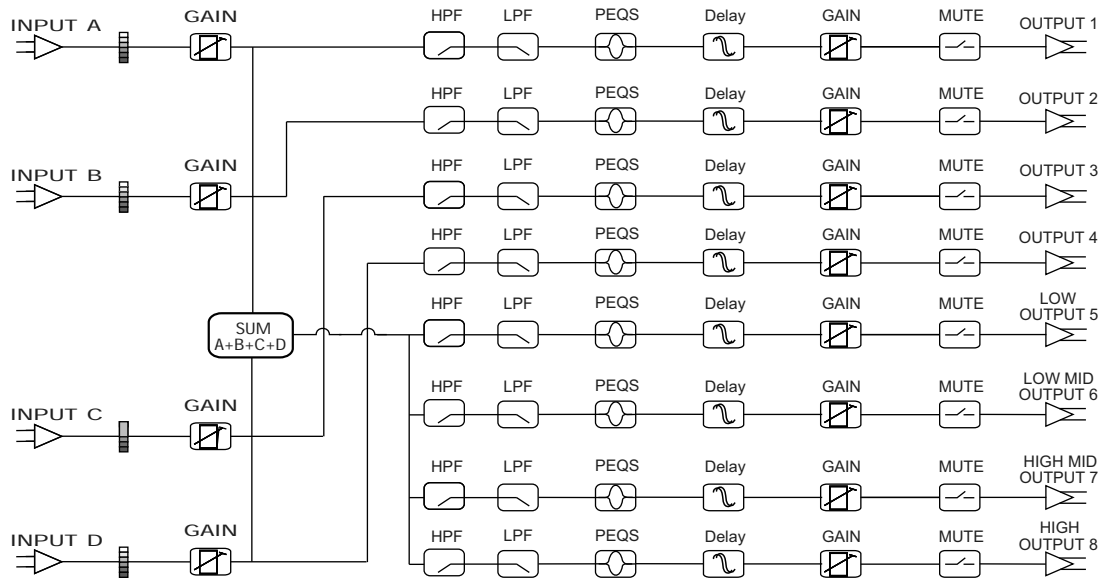
**MONO
DISTRIBUTION**

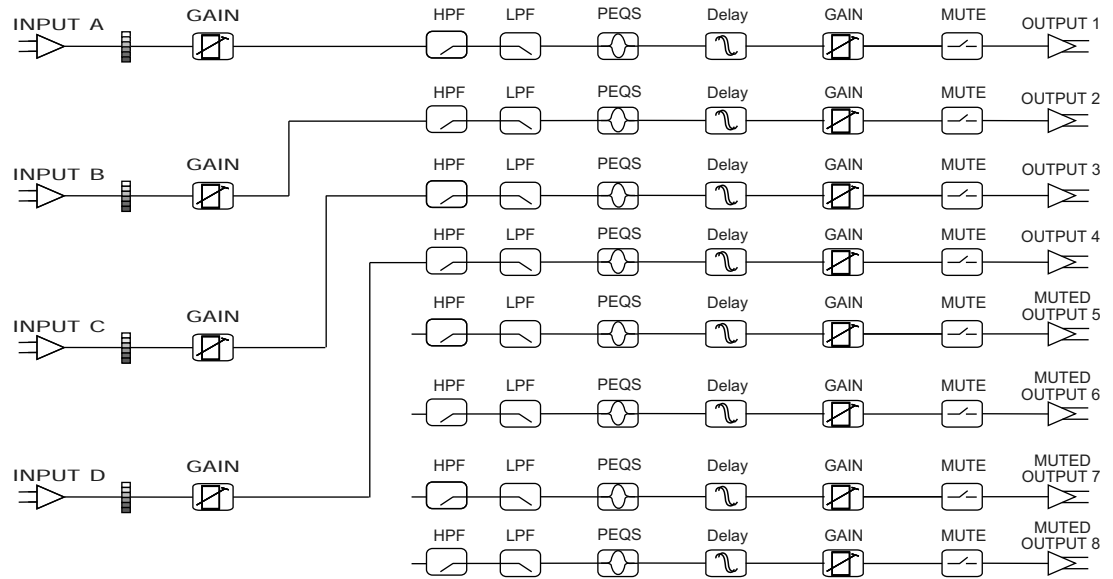
BLOCK DIAGRAMS

**STEREO
DISTRIBUTION**

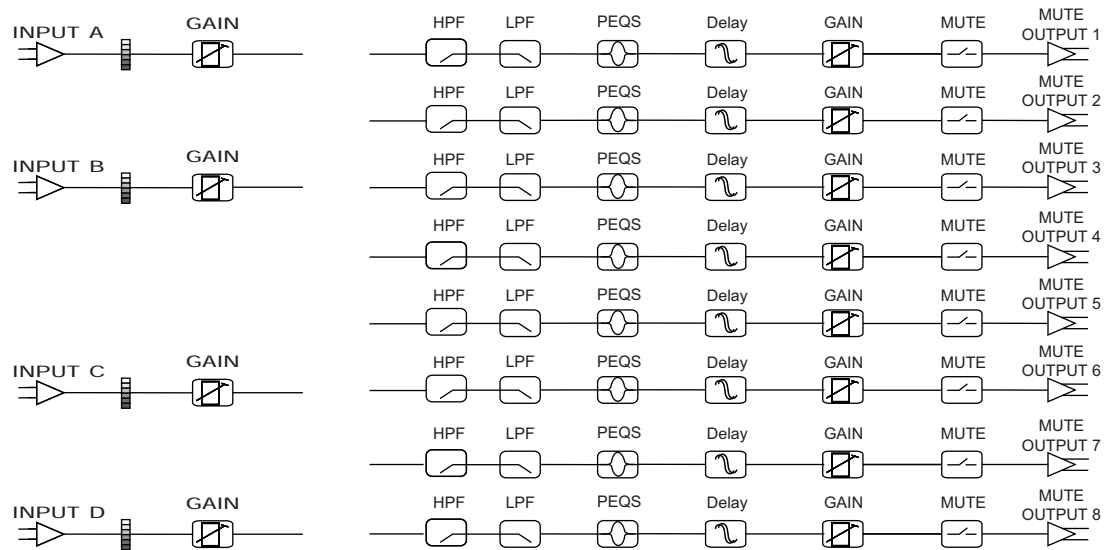


**LCR WITH
MONO SUBS**





4X4 PROCESSOR



**MUTED,
FLAT STARTUP**

GRAPHICAL USER INTERFACE (GUI)

The BBE SYSOMAX software provides a graphical method of creating and editing programs on the DS48. It can also be used to make changes in real time, if adjustments are required during live operation. Full metering and control of all settings is available on the PC.

Because it provides a more graphic and overall view, this method will allow you to program settings more efficiently than using the front panel navigation method on the DS48.

Though the DS48 stores up to 30 programs, a virtually unlimited number can be written and stored on a computer with the software installed.

Programs can be created whether or not the computer is connected to the DS48 processor. However, it must be connected to write or modify programs to the on-board memory of the DS48 itself.

All the functions available onboard the unit are duplicated in the software.

8.1 MINIMUM SYSTEM REQUIREMENTS

Your SYSOMAX software has the following minimum system requirements for operation:

- Microsoft Windows 98, ME, NT4, 2000, or XP.
- Personal computer with Pentium 2 or higher processor.
- 20 megabytes (MB) of free hard disk space.
- 64 MB RAM.
- Computer RS-232 serial port for connecting the DB-9 type serial programming cable to the computer (if your computer only has USB ports, adapters are commonly available.)
- DB-9 type serial cable for connecting the device to the computer. This cable is included with the unit. Should it become lost or damaged, replacement cables are available at electronics and computer supply stores.

8.2 INSTALLING SYSOMAX ON YOUR COMPUTER

To install SYSOMAX from the CD-ROM:

1. Insert the CD-ROM into the computer's CD-ROM drive.
2. Select My Computer from the Desktop or Start menu.

3. Click on BBE (D) (CD-ROM drive is usually drive D)
4. Double click on the file that then displays: DS48Setup_v13.exe
5. The Setup Wizard screen will appear.
6. Follow the prompts displayed on the screen to install the program.
7. When the installation is complete, eject the CD-ROM

8.3 STARTING UP SYSOMAX

To create a preset program on a DS48 unit, first connect it to the computer with the serial cable. If your computer only has USB ports, adapters are available from computer suppliers.

NOTE: Alternatively, you can start SYSOMAX and create a program offline, without connecting to the unit. Always remember to save your programs. To upload the program to the unit, you must then connect the cable between the unit and the computer.

After the connection is made you can start up SYSOMAX™ by using the Start menu on your Windows desktop, or by using Windows Explorer or My Computer.

8.3.1 From the Start menu:

1. On the Windows taskbar, click the Start button.
2. From the Start menu, select Programs, then DS48. Then click on the next DS48 icon that appears.

8.3.2 From Windows Explorer or My Computer:

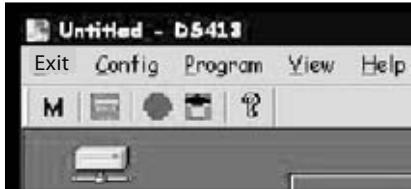
Use Windows Explorer or My Computer to navigate to the folder in which SYSOMAX resides, then double-click the SYSOMAX.exe icon, or highlight it and press ENTER.

Once you have started the program, you can choose to either operate the program online or offline to the unit. To exit the program, click the SYSOMAX Exit button in File menu of the title bar.

8.4 Navigating SYSOMAX

1. When the program starts, the main screen will be displayed. This is a flow chart of the various signal paths and processes.
2. You can select items from the drop down menus, the icons on the Toolbar or by clicking on one of the flow chart boxes.

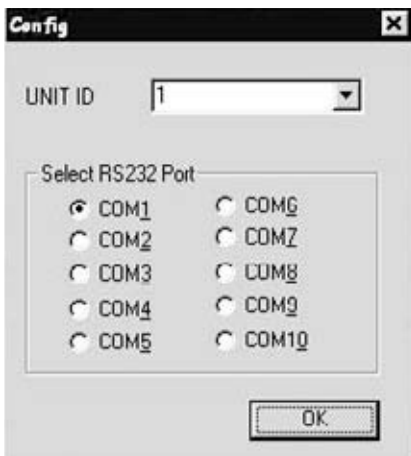
GRAPHICAL USER INTERFACE (GUI)

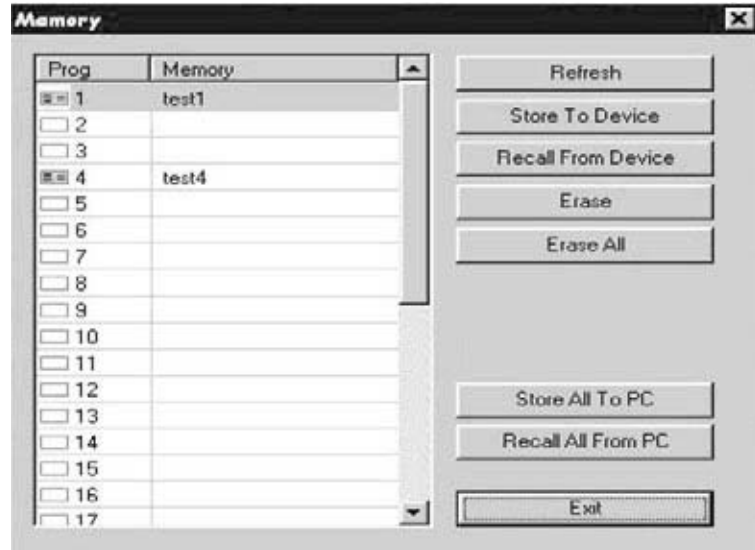


8.4.1 Top Line Menu

This section provides an overview of the menu and screen choices. Those that require a more detailed description are covered in subsequent sections.

1. Exit lets you select EXIT to exit the program.
2. Config provides six choices:
 - A. Online, which will open the RS-232 connection to the DS48 when it's properly connected.
 - B. Offline, which will close the connection to the unit.
 - C. RS-232 lets you select the Com port for your particular computer.
 - D. Config opens the Config window. This window lets you select one of the ten available modes.
 - E. Data Copy lets you copy settings from one port to another, saving repetitive programming steps.
 - F. Lock/Unlock opens the Lock Unit window.
3. Program offers two choices: Device Program Manager which opens the Memory Screen (see below) and Upload Current Program from Device, which will load the program currently running on the DS-48 to the computer for editing and/or saving.
4. View lets you select whether or not to display the Toolbar and Status Bar on your screen. The Toolbar is comprised of five Icons.
5. Help displays the version of the software.
6. Icon Bar offers five choices. From left to right they are :
 - A. M opens the Memory management window. This is where you can name, save, erase, upload and download programs to/from the compute and the DS48. {See 8.4.2}
 - B. RS232 Config
 - C. Online/Offline
 - D. Upload Current
 - E. About





8.5 Device Program Manage/Memory

Clicking the Memory icon or selecting Device Program Manage from the Program Menu will open a dialog box with a table displaying 30 memory locations and spaces for names as well as 10 buttons.

To Store a program as a memory location, click on the desired Prog line in the table for the desired save location. Then click either Store to Device or Store to PC. Write a new name in text box if desired and click OK. The dialog box will close and you will be returned to the main screen view.

Refresh will upload the stored programs in memory from the device to the computer.

To rename a program that has already been named, click on a program location in the table, then click Rename. Enter the desired name in the text box and click OK. The dialog box will close and you will be returned to the main screen view.

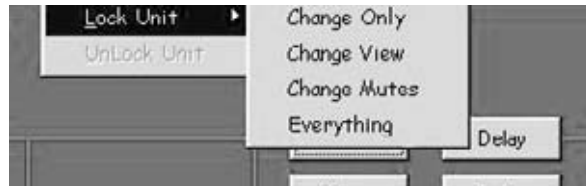
Recall downloads the current version of the selected program from the computer to the device.

Erase will immediately erase a selected program. Use caution as there is no "confirm" window before the command executes.

GRAPHICAL USER INTERFACE (GUI)

Erase All will erase all programs in the memory table and in the device. There is a confirm screen before this command executes.

Exit will close the window.



8.6 Lock Unit

Found under config dropdown menu

Provides four options for security lockouts in the pull-down menu. Make your selection and enter your password in the text box. You will then need to confirm the password and OK the lockout. To unlock the unit, under the Config menu, click on Lock/Unlock Unit. Enter the password in the text box and click OK. Then click on the Clear Password box.

NOTE: If you forget the password, there is a code to unlock the unit so you can reset the password: COLO

8.7 Help

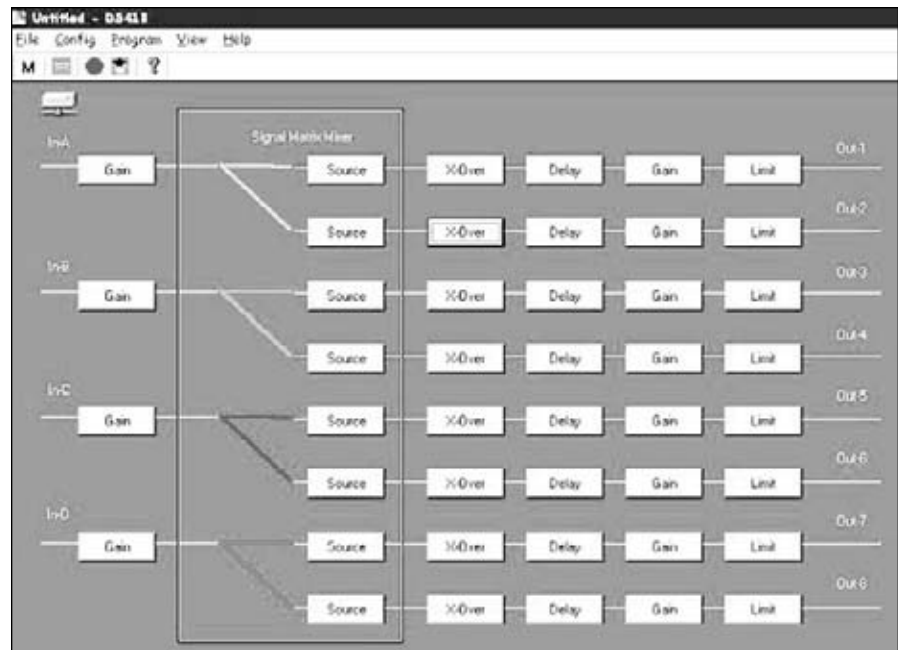
Provides the version information

Once the device type and crossover type have been selected, the main screen will show blocks for each programmable section. This is referred to as the “Flow Chart”. The term “program” is used here as an equivalent to “preset” or “configuration” as used on other programmable devices.

Clicking on any box in the “flow chart” other than the Input Gain or Source will display the Device Window. This window has tabs at the top that provide access to all the other windows for various functions. Each function window may in turn have additional windows. Simply click on the tab for the desired function. If it is not the one that the window was opened under.

Example: Click on X-over for channel A. If Output 1 is assigned to Channel A, then the crossover screen for Out-1 will appear with the Out-1 tab highlighted. Now if you want to set a delay for that output, just click on the Delay tab and the Delays window will open.

Clicking on any of the Input Gain boxes (label In-A, In-B, etc.) or Source boxes will open the Input Signal Selection Window.



CREATING A PROGRAM

Whenever any screen windows, other than the main one, are displayed, the top-level menu will be disabled until the window is closed. To close a window, hit the escape key (esc) or Exit in the window.

When entering values into text boxes you can use your pointing device such as a mouse or touchpad. You can also use the up/down/left/right cursor arrows for certain functions such as Gain sliders and up/down incremental value arrows.

NOTE: Downloading a program from the device to the computer will enable the screen to graphically show the routing of input to outputs with different colored lines.

9.1 GAINS:

9.1.1 Input Signal Selection.

Clicking on an input Gain box or Source will open a new screen labeled Input Signal Selection. This window offers gain adjustment for the four inputs plus routing assignment. The routing allows you to select which of the four inputs go to which of the eight outputs. In all but the Mono and Stereo distribution modes, there are limits as to how many and which outputs may be assigned to the inputs.

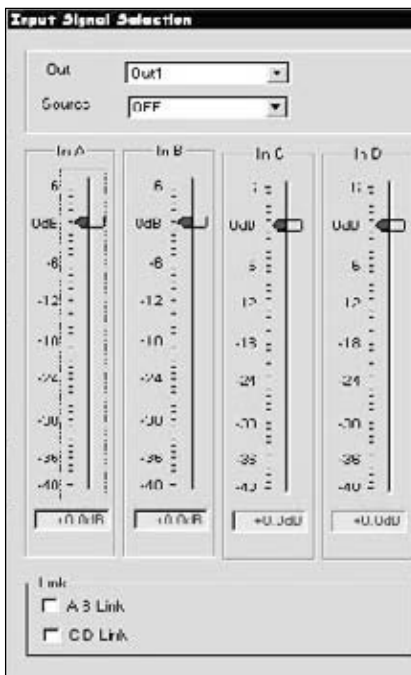
To set the Gain for an input channel, either use your pointing device to drag the slider to the appropriate setting, enter a value directly into the text box under the slider or click on the slider until the border line appears and use your cursor keys. If a value beyond the operating range is entered numerically, the system will default to the closest minimum or maximum setting.

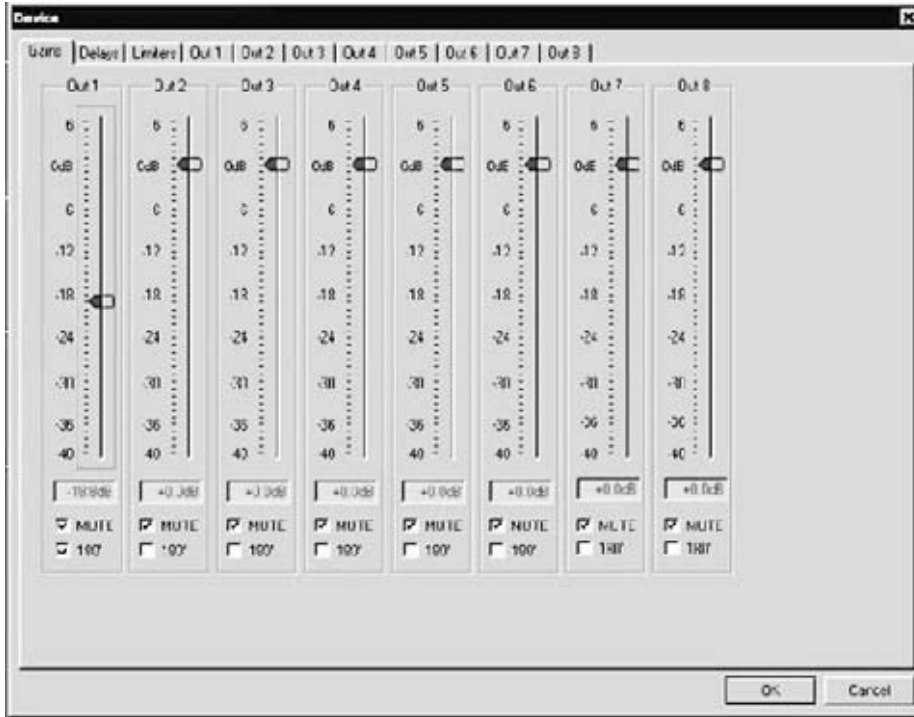
9.1.2 Output.

The Output channels add check boxes for Mute and 180°. Mute turns the Output mutes on or off. If off, the default is for the channels to fade up when activated. The 180° when selected reverses the polarity of the signal for that channel.

These choices are also available for the selected output channel under the Out 1, Out 2, etc. tabs.

To set the Gain for an output channel, either use your pointing device to drag the slider to the appropriate setting, enter a value directly into the text box under the slider or click on the slider until the border line appears and use your cursor keys. If a value beyond the operating range is entered numerically, the system will default to the closest minimum or maximum setting.





9.2 DELAYS:

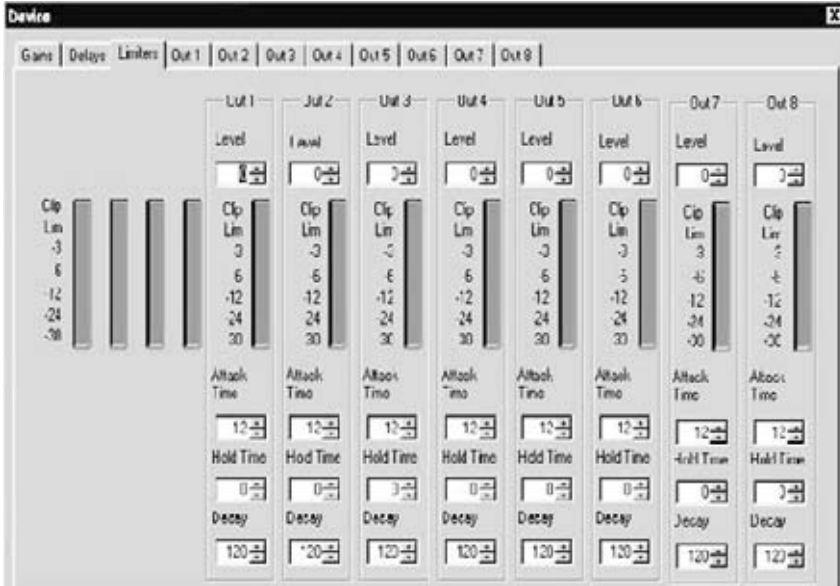
Clicking the Delays tab will open the Delays window. There is a text box for each output and a display Units selector. The Units selector gives you a choice of whether the delay is expressed in milliseconds, feet or meters. Use the up/down arrows to select the incremental values for each output and click OK when finished.

9.3 LIMITERS:

Set the desired value for each of the four parameters per Output channel. Note that Hold Time and Decay select is in 10 ms increments. If using the computer connected to a unit in real time with program material, the meters on the computer screen will mirror those on the unit's front panel. This provides remote monitoring of the signal levels.



CREATING A PROGRAM



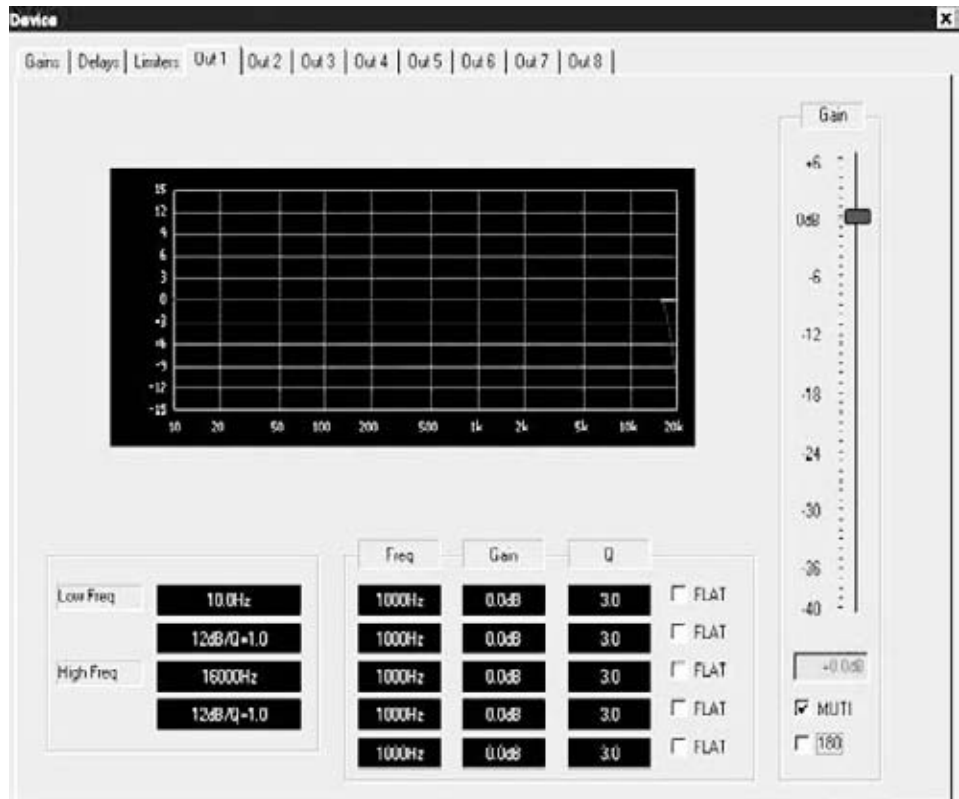
9.4 OUT 1, OUT 2, etc.

Each tab selects an output channel. Use this screen to program crossover frequencies, filter type, and up to five parametric EQ's. In addition, the same programming choices as on the GAIN screen are duplicated here, but just for the selected output channel.

9.5 Crossover Filters:

The Low and High frequencies set the frequency bandwidth for the selected channel of the crossover. For example, in a three-way crossover, the Low Band might be 60 Hz to 200Hz; the Mids 200Hz to 1800Hz and the Highs 1800Hz to 15 kHz.

The different filter types and slopes, including Bessel, Butterworth, Linkwitz-Reilly and shelving filters with different Q values each offer particular advantages and disadvantages depending on the application and conditions.



Most analog crossovers use 24 dB/octave, so this is a good place to start.

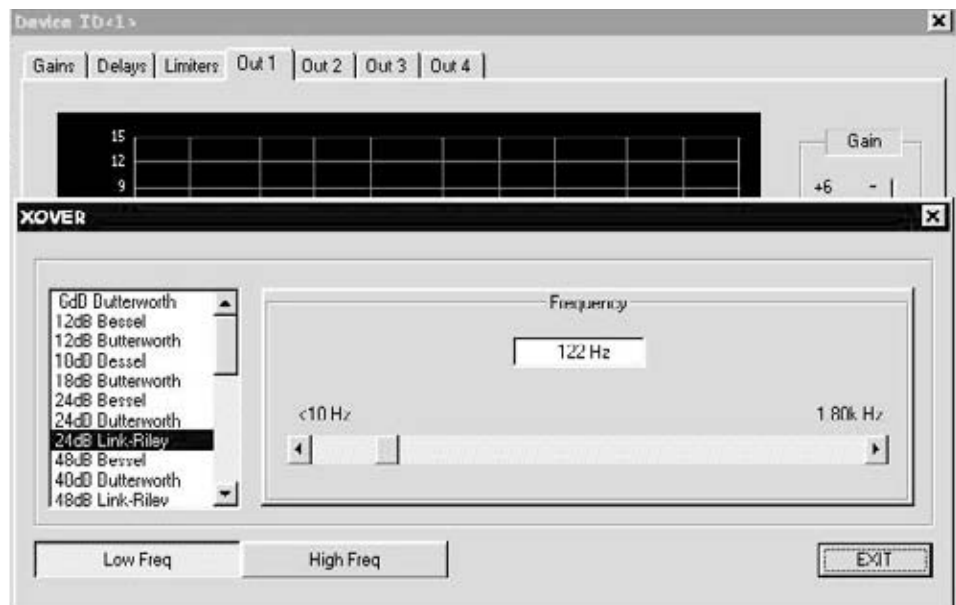
The window also includes a graphic display that shows the response curve of the currently selected filters and equalizers in a Level vs. Frequency graph.

Clicking on any of the filter text boxes (lower left of the window) opens a new window called XOVER. Use the sliders to browse the available filter types and click on the desired one. Use the horizontal slider to select the corner or “knee” frequency. This is the frequency point at which a filter begins to attenuate any signal above (for Low Pass) and below (for High Pass) the selected frequency. The choices are preset in specific increments and ranges that correspond to the selected crossover architecture (2 Way, 3 Way, etc.).

The description of filters as 16dB, 24dB, 48 dB, etc. actually means XX dB PER OCTAVE. A higher number means a steeper attenuation slope. You can see the different slopes selected in the graphic display window.

You can use the PEQ to help compensate for dips or peaks at the crossover points. Remember though that less equalization is better: try to use a combination of slope, filter type and frequency to get the crossover point between bands (for instance: low to mids or mids to highs) as “flat” as possible. This will minimize the need for additional equalization.

Always check the manufacturers specifications for the speakers you are using so the proper crossover settings can be used, Incorrect settings or mis-wiring (sending lows to a HF driver for instance) can damage or destroy your equipment. BBE Sound is not liable for any direct or consequential damages caused by improper use of its equipment.



CREATING A PROGRAM

9.6 Parametric Equalizers:

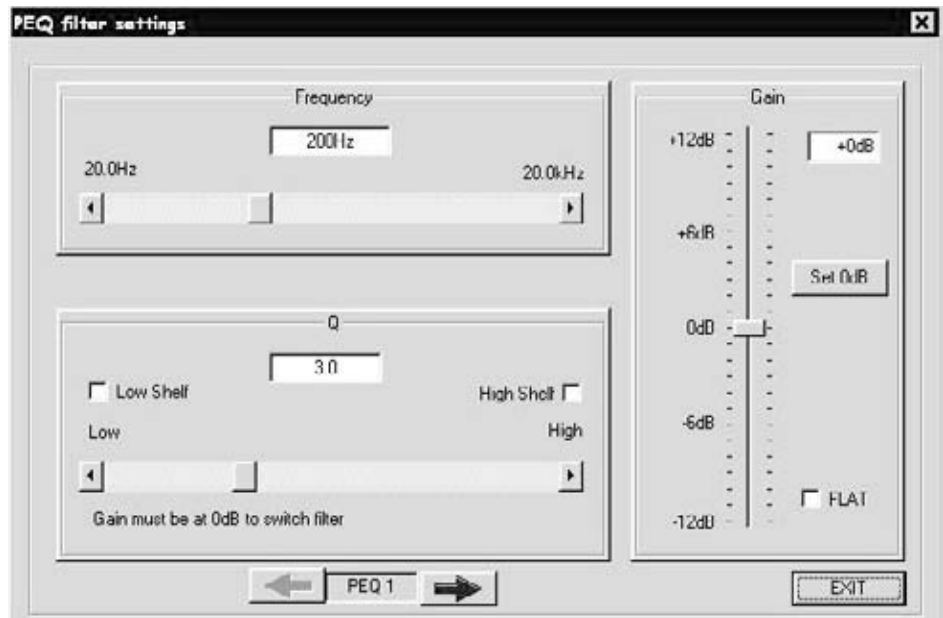
The next set of text boxes provides Frequency, Gain and Q setting choices for five bands of parametric equalization (PEQ) per output channel. There is also a check box for Flat, which will bypass the settings for that particular filter. In a similar manner to the Crossover filters above, clicking on any text box will open the PEQ filter settings window. Use the sliders to select values for Frequency Q and Gain (cut/boost). An additional check box for FLAT will bypass all value selections.

At the bottom of the screen are forward and back arrows to step through the five PEQ's.

Gain must be set to 0 (zero) to select a different type of filter including the Hi or Low Shelf filter. Gain must remain at 0 for the shelving filters. Click the Set 0dB button to move the Gain slider to 0 dB or move the slider. If Low Shelf is selected and the Gain is moved to a setting other than 0, the shelving filter will be disabled and the screen functions will "grey out".

To adjust the gain for Input A, use your pointing device (mouse, touchpad, etc.) to position the cursor over the box.

NOTE: Whatever program settings are current will be what is saved as the program, unless a different program is recalled.



BALANCED INPUTS

As standard, the DS48 comes with electronically servo-balanced inputs. This circuit design features automatic hum and noise reduction for balanced signals and thus allows for trouble-free operation even at high operating levels. Externally induced mains hum etc. will be effectively suppressed. The automatic servo-function recognizes the presence of unbalanced connectors and adjusts the nominal level internally to avoid level differences between the input and output signals (correction 6 dB).

Input Impedance	.....10KOhms
CMRR	.....50dB (30Hz~20KHz)
Output Impedance	.....<50Ohms
Maximum output electrical level	Vpp=7.6V
Frequency Resp	.....20Hz~20.0KHz
Dynamic Range	.....110dB (A weighted)
Distortion	.....0.01%(THD)
A/D Processor	.....AK5392; 24 bit data channel, processing Full 48-bit double-precision mode, 24bit/48khz sample rate
AD latency	.....0.806MS;
DA latency	.....0.513MS
Maximum Delay	.....7ms (selectable in .5 ms increments)
Output gain	.....-40dB~+6dB (+/-0.5dB)
Input gain	.....-40dB~+6dB (+/-0.5dB)
Parametric Equalizer	
Filter Gain	.....+/-12dB in 1dB steps
Center Freq	.....20Hz~20KHz 31 ISO
Q value	.....0.5~10
Shelving	
Lo-shelf	.....20Hz~1kHz
Hi-shelf	.....1kHz~20kHz
Shelf gain	.....+/-12dB in 1 dB steps
HPF&LPF Filter	
Frequency (high pass)	.....<10Hz~16.0kHz
Frequency (low pass)	.....35Hz~22.0kHz
Response curve	.....Butterworth 6dB, 12dB, 18dB, 24dB, 48dB Bessel 12dB, 18dB, 24dB, 48dB Linkwitz-Riley 24dB, 48dB
Limiter Level	.....-40~+3dB
Attack time	.....1~100ms
Holding time	.....0~100ms
Decay time	.....10-1000ms
LCD 2X20 Backlit	
Input LED	.....-30dB, -24dB, -12dB, -6dB, -3dB, Limit, Clip
Output LED	.....-30dB, -24dB, -12dB, -6dB, -3dB, Limit, Clip
Connectors	
Input	.....XLR-3F (Pin 2 "Hot")
Output	.....XLR-3M (Pin 2 "Hot")
	RS232
Power	.....110VAC 60Hz, 220VAC 50Hz,
Weight	.....8 lbs (3.6 kg)
Size	19" x 1.74" x 8.66" (80mmX44mmX220mm)

SERVICE • WARRANTY • MAINTENANCE

11 SERVICE

We recommend that if at all possible, a BBE DS48 that requires service be sent to our facility in Huntington Beach, California. We request that a "RETURN AUTHORIZATION" be issued by the dealer from whom you purchased the unit. If this is not possible, call BBE Sound, Inc. directly at (714) 897-6766, extension 116 to obtain a "RETURN AUTHORIZATION". Include a copy of the bill of sale with the unit when it is shipped to BBE Sound, Inc. so that the service can be expedited.

As the repair turnaround time is minimal, we request that the unit be sent to BBE Sound, Inc. We also need to add reliability data to our files so that future revisions may be undertaken, if necessary, to improve the product. If unit has been purchased outside the US, please contact your national distributor.

12 WARRANTY

Warranty registration of the unit to BBE Sound, Inc. is not necessary. It is strongly recommended that you retain a copy of the bill of sale for future reference.

IT IS THE SOLE RESPONSIBILITY OF THE END USER TO PROVIDE THE BILL OF SALE OR OTHER MEANS OF PROOF OF PURCHASE TO VALIDATE THE WARRANTY IF WARRANTY SERVICE IS REQUESTED.

The BBE DS48 DIGITAL SPEAKER PROCESSOR is warranted against defects in material and workmanship for a period of two (2) years from date of purchase from BBE Sound Inc. or from an authorized dealer. During this period, we will repair units free of charge providing that they are shipped prepaid to BBE Sound, Inc., 5381 Production Drive,

Huntington Beach, CA 92649. We will pay return UPS shipping charges within the USA. All charges related to non-UPS shipping, including customs clearance, will be billed. The warranty will be honored for the longer of either 90 days from the date of any service or the remainder of the original 2 Year factory warranty. This warranty will be considered null and void by BBE Sound, Inc. if any of the following is found:

1. The equipment has been physically damaged.
2. The equipment shows signs of abuse.
3. The equipment has been electrically damaged by improper connection or attempted repair by the customer or unauthorized third party.
4. The equipment has been modified without authorization.
5. The bill of sales indicates that the purchase date of the equipment

is not within the warranty period.

All non-warranty repairs are warranted for a period of 90 days from the date of service.

BBE Sound, Inc. is NOT LIABLE FOR CONSEQUENTIAL DAMAGES. Should the unit fail to operate for any reason, our sole obligation is to repair it as described above.

DO NOT RETURN ANY PRODUCT TO THE ABOVE ADDRESS WITHOUT INSTRUCTIONS AND AUTHORIZATION ISSUED BY THE ABOVE LOCATION.

13 MAINTENANCE

Maintenance of the BBE DIGITAL SPEAKER PROCESSOR is limited to proper cleaning of the unit with mild household cleaner such as Formula 409™ or Windex™. The chassis and cover are steel finished with a durable polyurethane paint, while the front panel is an anodized aluminum extrusion. There are no user replaceable parts and the unit should not be opened for any reason unless you are a qualified technician.

Calibration should be performed if parts are replaced or if a performance check-out indicates a problem with calibration. Long term use has shown that over the life of this unit there is little or no drift of the components in the BBE DIGITAL SPEAKER PROCESSOR that would cause a change in calibration. A very conservative design philosophy has resulted in a piece of equipment which runs very cool and should give years of trouble-free service.

BBE[®]
Sound Inc.

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Huntington Beach, CA 92649
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