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The Martin Experience



This equipment conforms to the requirements of the EMC Directive 89/336/EEC, amended by 92/31/EEC and 93/68/EEC and the requirements of the Low Voltage Directive 73/23/EEC, amended by 93/68/EEC.

Standards Applied	EMC Emission	EN55103-1:1996
	Immunity	EN55103-2:1996
Electrical Safety		EN60065:1993

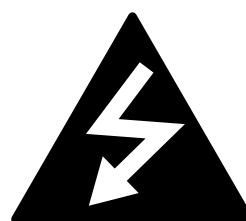
1 IMPORTANT SAFETY INFORMATION

Do not remove Covers. No user serviceable parts inside, refer servicing to qualified service personnel.

This equipment must be earthed.



CAUTION
RISK OF ELECTRIC SHOCK
DO NOT OPEN
DO NOT EXPOSE TO RAIN
OR MOISTURE



It should not be necessary to remove any protective earth or signal cable shield connections.

Do not defeat the 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 wider blade and the third prong are provided for your safety. When the provided plug does not fit into your outlet, consult an electrician for replacement of the obsolete outlet.

Only use this equipment with an appropriate mains cord.

In the USA the cord should comply with the requirements contained in the Standard for Cord Sets and Power Supply Cords, UL 817, be marked VW-1, and have an ampacity rating not less than the marked rating of the apparatus.

Thank you for purchasing the Martin Audio DX1 Loudspeaker Management System. The DX1 is designed to compliment all our current loudspeaker products that require or benefit from the use of a system controller.

2 UNPACKING THE DX1

Each Martin Audio DX1 controller is built, tested and thoroughly inspected to the highest standard before leaving the factory. After unpacking the unit please examine it for any signs of transit damage and inform your dealer if any such damage is found. Please retain all packaging in case of future re-shipment.

Please note that Martin Audio and it's distributors cannot accept responsibility for damage to any returned product through the use of non approved packaging.

3 WARRANTY

Martin Audio DX1 Speaker Management Systems are warranted against manufacturing defects in materials or craftsmanship over a period of 1 year from the date of original purchase. During the warranty period Martin Audio will, at it's discretion, either repair or replace products which prove to be defective provided that the product is returned in its original packaging, shipping prepaid, to an authorised Martin Audio service agent or distributor.

Martin Audio Ltd. cannot be held responsible for defects caused by unauthorised modifications, improper use, negligence, exposure to inclement weather conditions, act of God or accident, or any use of this product that is not in accordance with the instructions provided by Martin Audio.

Martin Audio is not liable for consequential damages.

This warranty is exclusive and no other warranty is expressed or implied. This warranty does not affect your statutory rights.

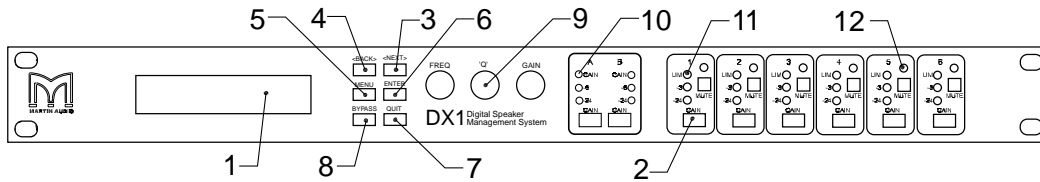
4 INTRODUCTION

The DX1 is a compact and powerful DSP based audio-processing unit ideally suited for live applications and fixed installations. To achieve this the DX1 has 2 inputs and 6 outputs, which can be configured in 5 basic modes, 2 x 2 way, 2 x 3 way, 4 way, 5 way and 6 way crossover. Each input has adjustable gain and delay, each output consists of a high and lowpass filter, 5 bands of parametric equalisation, limiter, delay (adjustable in 2.6ms steps), gain and polarity controls. RS232 interface and user memories are provided as well as a multi-level security 'lock-out' function for all controls. The DX1 is supplied pre loaded with the most common configurations for all of our current product ranges that require or benefit from the use of a system controller. Factory presets can easily be updated by downloading the current file via a PC. The DX1 can also be used as a fully configurable electronic crossover system incorporating all of the features listed below.

Features

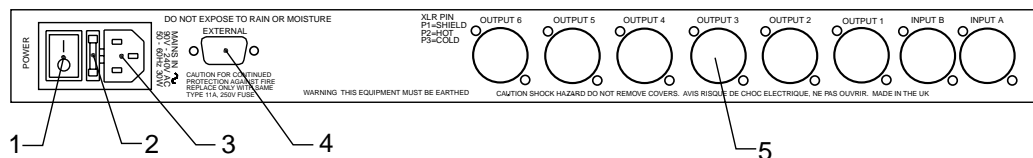
- **Superb audio quality:** Carefully optimised Double Precision processing plus 40 bit internal data path for exceptional dynamic range and sonic quality.
- A flexible 2 input, 6 output multi-mode format featuring a choice of 2 x 2 way, 2 x 3 way, 4 + 2 way, 5 + 1 way and 6 way crossover modes with limiters.
- Each parametric section provides +15dB to -30dB of gain at centre frequencies between 20Hz - 20kHz with a wide range of Qs from 0.4 to 128. All parameters feature fine resolution with 1/36th octave frequency steps, 0.1dB gain increments and 100 Q settings. Any parametric section can be set for LF & HF shelving response.
- Six high performance limiters are provided, featuring a wide range of control over Attack, Release and Threshold parameters. The output meters show headroom to the limit threshold. The meter time constants track the limiter time constants to show precise power usage.
- Variable High and Low pass filters for each output can be set for 12, 18 and 24dB per octave slopes with a choice of Bessel, Butterworth or Linkwitz-Riley responses. Independent control over High & Lowpass functions allows asymmetric crossover functions to be realised.
- Three velocity-sensitive rotary encoders provide a familiar and easy to use control format with all filter information displayed simultaneously on a backlit LCD display.
- Delay of up to 650mS can be independently set for each output with a minimum increment of 2.6µs.
- Comprehensive standard specification includes a maximum of 80 factory presets, 19 user memories, RS232 interface for factory preset updates via a PC and a multi-level security lockout function.
- The DX1 provides exceptional audio quality with a full >110dB dynamic range, high sampling rate and minimal filtering.

5 FRONT PANEL FUNCTIONS



1. **LCD Display** - Shows menu options, output information and various parameters being adjusted.
2. **Gain Keys** - Two input and six-output **GAIN** keys allow instant access to the gain screen for each channel. Pressing a second time selects the last function edited.
3. **Next Key** - Moves the display forwards through the list of available parameters for the current input or output channel.
4. **Back Key** - Moves the display backwards through the list of available parameters for the current input or output channel.
5. **Menu Key** - Activates the main menu on the LCD display. Pressing a second time selects the last menu edited. Different menus are selected by pressing the **BACK** and **NEXT** keys or using the **FREQ** control.
6. **Enter Key** - Enters the chosen menu and confirms menu selections.
7. **Quit Key** - Exits the menu.
8. **Bypass Key** - Allows the currently displayed parametric section to be bypassed. (Note: The Highpass / Lowpass filters and limiters cannot be bypassed.)
9. **Parameter Controls** - The three velocity sensitive rotary encoders allow the relevant parameter on the LCD screen to be adjusted.
10. **Input Meters** - Displays available headroom before input clipping occurs. The bottom LED displays the presence of signals between -24dB and -6dB of input headroom, with the orange LED set at 6dB below clipping. The top, red LED displays digital overflow and can therefore light without the other LEDs becoming illuminated.
11. **Output Meters** - Displays headroom before limiting occurs. The bottom LED displays between -24dB and -3dB of headroom, with the orange LED set at -3dB. The top, red LED is set at the limiter threshold for that channel.
12. **Mute Keys** - Six output mute keys with LED indicator.

6 REAR PANEL FUNCTIONS



1. **Power Switch.**
2. **Mains Fuse** - Located in a finger-proof fuseholder adjacent to the mains inlet. Always replace this fuse with the correct type as shown on the rear panel legend. (N.B. A spare fuse is located in this holder.)
3. **Mains Power** - Connected via a standard IEC socket. A compatible power cord is supplied with the unit.
4. **External** - RS232 via a 9-pin DIN DEE socket, for connection to a PC.
5. **XLR Inputs and Outputs** - 3 pin XLR connectors are provided for each audio input and output. All terminations are fully balanced, pin 2 Hot, pin 3 Cold and pin 1 Screen (shield).

7 OPERATING THE DX1

The DX1 can be used in two ways:

1. Using pre loaded factory presets to configure the DX1 for use with Martin Audio products.
2. As a generic digital loudspeaker management system. Note: this requires the user to configure the DX1 manually, i.e. by entering crossover information via the controls on the front panel. The DX1 is equipped with 19 user memories for storing these configurations.

8 USING FACTORY PRESETS

The DX1 is supplied pre loaded with the most common configurations for all our current product ranges that require or benefit from the use of a system controller. This section shows how to get up and running quickly by loading and configuring a factory preset without having to read the entire manual.

Loading a factory preset

1. Turn the unit on via the mains switch on the rear panel. The unit displays the version number of the factory preset file and starts the 'wake up' routine. After ten seconds the unit becomes operational and is now ready to load a preset.
2. Press **MENU** followed by **ENTER**. The display will read "Load a crossover". Press **ENTER** again. When using the unit for the first time the display shows "1:". This is the first of the 19 user memories. At this stage all of the user memories will be empty. Use the **FREQ** control to scroll forward to the required preset (see Appendix 3), the factory presets start at number 20. Note: If you have already loaded a preset previously the display will show the name and number of the last preset that you loaded.
3. Once the required preset is displayed, press **ENTER**. The display will prompt "[ENTER] for Recall.", press **ENTER** and the preset will instantly be loaded. Note: if you have already loaded a preset in to the unit and want to load a different preset you will be prompted "Different crossover ??? [ENTER] for Recall." after you press **ENTER**. Press **ENTER** again and the selected preset will be loaded in place of the previous one.

Note: If no action is taken after ten seconds in the menu mode the unit will return to normal 'default' mode. Repeat instructions 2. and 3. to return to menu mode.

Configuring a factory preset

Once a preset has been loaded there are three user configurable parameters. Note: all other parameters accessed via the **GAIN** buttons, such as crossover points and parametric equalisation are locked and cannot be altered by the user.

1. Output gain trim: The gain of each output channel can be adjusted by plus or minus 6dB. This is intended for normalising power amplifiers of differing gain. To alter gain trim press the **GAIN** button of the channel to be adjusted. The display now shows "Trim = 0 dB". Use the rotary control marked **GAIN** to adjust the channel gain as required.
2. Output delay: This parameter can be altered in a system incorporating more than one stereo pair of speakers in order to set inter cabinet delays, for example: between a subwoofer and a mid-high cabinet. Use the rotary **FREQ** control for 1ms increments and the rotary **Q** control for 2.6ms increments. Note: inter driver delays within a cabinet are linked together so that altering one delay will automatically adjust the other to keep drivers perfectly aligned.
3. Output limiters: All factory presets are supplied with the limiters set at their maximum level and with the time constant set to automatic. Use the rotary **GAIN** control to adjust the limit level. It is essential that the user sets the correct limit level in order to protect both amplifiers and speakers in the system. Note: the correct limit level is determined by the output of the power amplifiers and power handling of the speaker system. As a general rule of thumb, if the amplifier is clipping turn the limit level down! Please refer to Appendix 1 for a table of dBu to Vrms conversion.

The user can also edit the gain of the input channels as well as the overall system delay. This is most applicable when configuring a system that features multiple speaker systems and multiple DX1 controllers.

Note: all of the above settings are retained when the unit is switched off.

Once the preset has been configured it can be locked so that the unit cannot be accessed by unauthorised personnel, see 'Security Sub-menu' on page 18.

For a description of how to connect signal inputs and outputs to the DX1 please refer to the block diagrams on pages 11 and 12. Please note how the output connector configuration changes with respect to frequency bands (eg: low, mid, high) as the configuration of the controller changes, i.e. 2x2 way, 1x4 way, 1x6 way etc. Appendix 3 explains which outputs the frequency bands are assigned to for each preset.

Once the preset is loaded, configured and connected to the rest of the system in accordance with the block diagrams on pages 11 and 12, it is now ready for use.

9 CONFIGURING THE DX1 MANUALLY

Introduction

This section describes how to use the DX1 as a generic loudspeaker management system. We recommend that you read the whole of the manual before using the DX1 in this manner.

To simplify set-up of the DX1, 5 crossover modes are menu selectable. These all have parametric equalisers, high and low pass filters, limiters, gain and delay. For detailed information on these modes please study the block diagrams along with the following descriptions. The 2x2 way and 2x3 way crossover modes have the option available to provide precise 'ganged' parameter adjustment for stereo sources.

10 CROSSOVER MODES

All crossover modes feature adjustable crossover frequencies with a choice of slopes, 5 bands of driver compensation E.Q. per output, delay time, limiters and absolute phase adjustment for each output.

10.1 Filter slopes

A choice of Bessel or Butterworth slopes at 12/18/24dB per octave and Linkwitz-Riley at 24dB per octave are provided. Since Low and High pass functions are separately adjusted, asymmetric slopes are easily achieved if required. It should also be noted that the turnover frequency displayed on the DX1 is the -3dB point for all slopes except 24dB Linkwitz-Riley where the -6dB point is shown. If the -6dB point is to be used for the Bessel or Butterworth filter, take the required crossover frequency, multiply this by the appropriate factor from the following table and then select the closest available frequency on the DX1 display.

Filter Type	High pass filter factors	Low pass filter factors
Bessel 12dB/octave	1.45	0.69
Butterworth 12dB/octave	1.31	0.76
Bessel 18dB/octave	1.37	0.73
Butterworth 18dB/octave	1.19	0.84
Bessel 24dB/octave	1.35	0.74
Butterworth 24dB/octave	1.15	0.87

Please note that unlike conventional analogue crossovers, crossover points and slopes are set with absolute accuracy since component tolerance problems do not occur.

10.2 Time Alignment

A further advantage of the DX1 over conventional products is the provision of an independently adjustable delay section for each output. This allows the true arrival time from multiple drivers to be precisely aligned rather than relying on the compromise 'phase adjust' approach. Delay time is adjustable in 2.6µs steps (1mm). To convert from units of time (i.e. milliseconds) to units of distance use the following formula:
1 millisecond = 343mm (1.126ft) @ 20°C (68°F) or to calculate time delay for a known distance, use:

$$\text{Time delay} = \frac{\text{Distance in meters}}{20.06 \times \sqrt{273 + ^\circ\text{C}}}$$

Where °C is the temperature in °C.

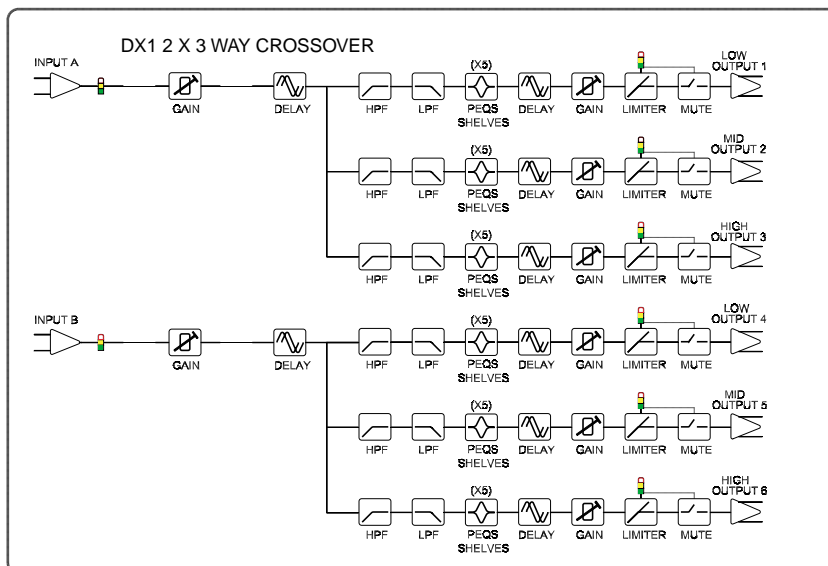
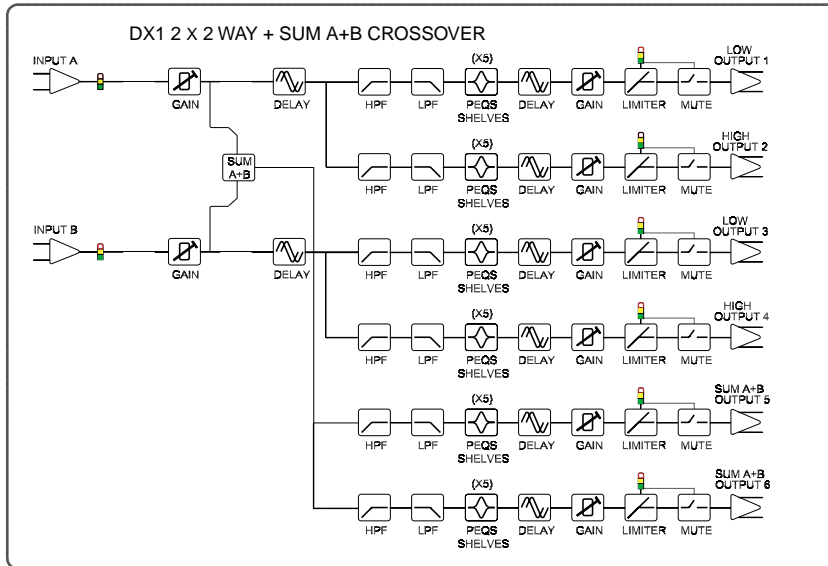
Or to simplify this equation at 20°C.

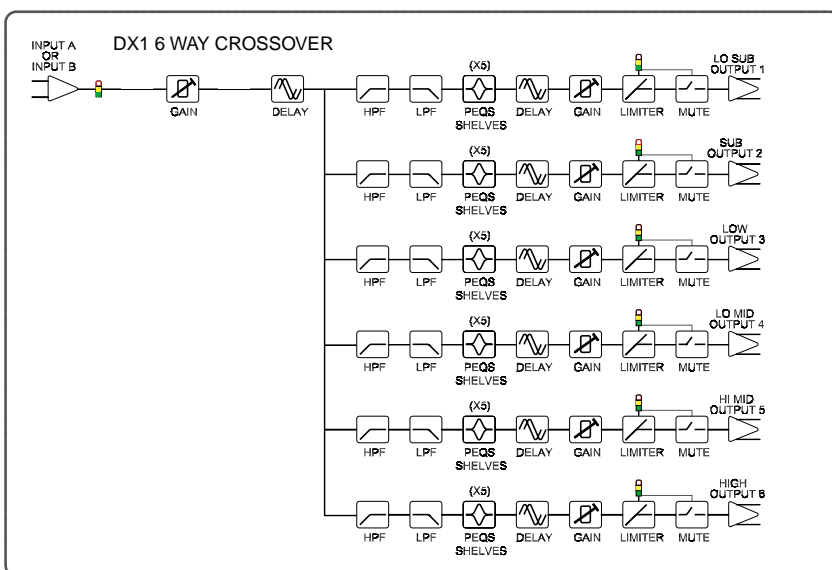
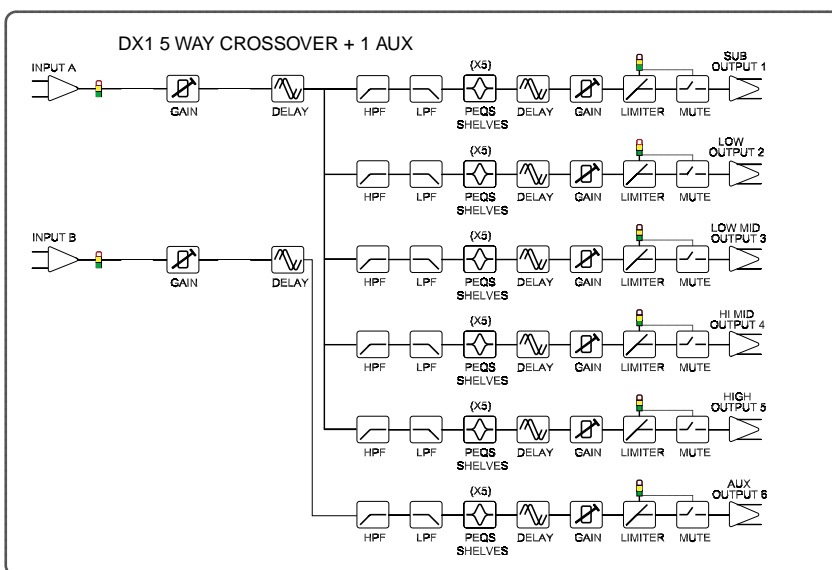
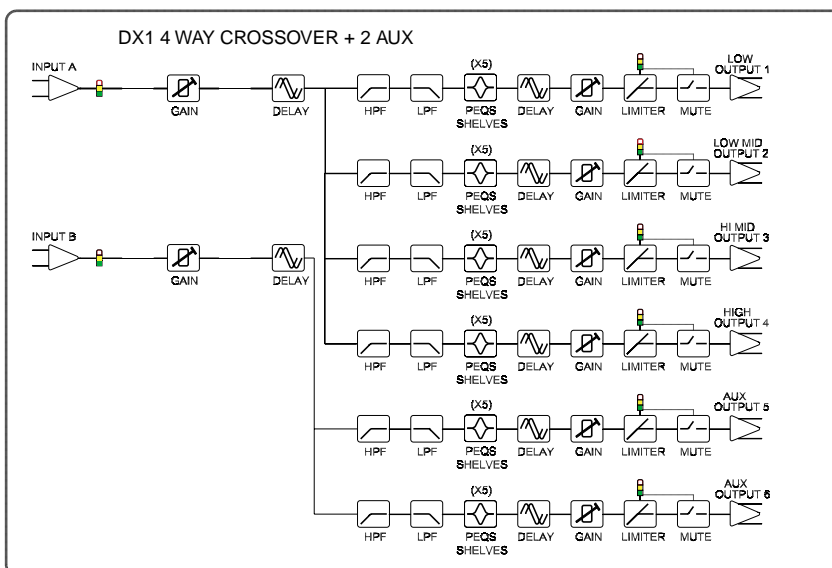
Delay time in milliseconds = Distance in meters x 2.192.

Or delay time in milliseconds = Distance in feet x 0.955

(N.B. Centigrade = (Fahrenheit – 32) x 0.5555).

11 BLOCK DIAGRAMS





12 OUTPUT LIMITERS

High performance digital limiters are provided for each output with control over attack time, release time and threshold level parameters (see page 15). This level of control allows the user to balance the required subjective quality of the limiter against the driver protection requirements. It does also mean that an incorrectly set limiter may sound awful! In particular, as with all limiters, using too fast an attack or release time will result in excessive low frequency distortion. In the 'design a crossover' sub-menu there is an option for automatic limiter time constants. In this mode the time constants will be automatically set from the Highpass filter frequency. See table below.

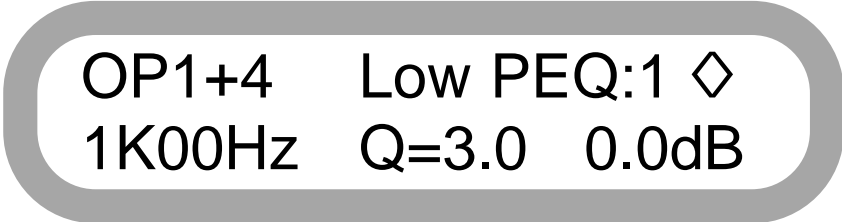
Table of automatic attack and release times.

The time constants are set by the high pass filter frequency for that channel. It is highly recommended that the automatic setting is used to ensure highest sound quality and simplicity of configuration.

<u>High pass filter</u>	<u>Auto attack time</u>	<u>Release</u>
<10Hz – 31Hz	45ms	x16 (720ms)
31Hz – 63Hz	16ms	x16 (256ms)
63Hz – 125Hz	8ms	x16 (128ms)
125Hz – 250Hz	4ms	x16 (64ms)
250Hz – 500Hz	2ms	x16 (32ms)
500Hz - 1kHz	1ms	x16 (16ms)
1kHz – 2kHz	0.5ms	x16 (8ms)
2kHz – 22kHz	0.3ms	x16 (4ms)

13 FUNCTION SCREENS

13.1 Parametric equaliser screen



OP1+4 Low PEQ:1 ◇
1K00Hz Q=3.0 0.0dB

All modes feature 5 bands of fully flexible parametric equalisation per output, with all sections selectable to Low or High frequency shelving response.

Each parametric section can be positioned at a frequency from 20Hz to 20kHz and features a wide range of 'Qs' to produce response curves ranging from broad to notch. The gain control ranges from +15dB to -30dB in 0.1dB steps. Frequency steps are 1/36 octave resolution for precise control. Since all filtering is achieved in DSP all settings are re-settable with absolute accuracy and in ganged mode parameters track identically. Very narrow band notch filters (maximum Q of 128) can be achieved and unlike analogue filters these 'tight' Q filters are entirely stable. The maximum notch depth is -30dB.

Parametric filters are carefully implemented using Double Precision processing. This method is costly in terms of processing power but yields substantial benefits in terms of the DX1's exceptional noise performance and greatly improved low frequency stability.

To adjust parametric settings:

Use the **FREQ** control for the frequency.

Use the **Q** control for the Q.

Use the **GAIN** control for the gain.

Use the **BYPASS** key to switch the parametric filter in and out of circuit.

Note: the diamond symbol in the top right hand corner of the display indicates that the filter is in circuit and the horizontal line symbol shows that it is out.

(N.B. To show parametric filters in bandwidth (BW) rather than Q, go into the system sub-menu, select 'filter Q or BW' and then select 'BW'.)

13.2 High and lowpass filter screens

OP1+4	Low	HPF
<10Hz	Bessel	24dB

Each output has an independent high pass filter and an independent low pass filter. Both filters have a range of selectable slopes which are Bessel 12dB, 18dB and 24dB, Butterworth 12dB, 18dB and 24dB, and Linkwitz Riley 24dB.

Highpass filters have a range of <10Hz (through) to 16kHz and Lowpass filters have a range of 22kHz (through) to 59Hz in 1/36 octave steps.

HPFs and LPFs can be asymmetrically set.

To adjust HPF/LPF settings:

Use the **FREQ** control for the frequency.

Use the **Q** control for the slope.

13.3 Limiter screen

OP2+5	Mid	Limiter
Atk:4.0mS		Rx16

Each output has an independent high performance limiter.

All limiters have an attack range of 0.3ms to 90ms, release times are 4, 8, 16 and 32 times the attack time and thresholds range from +22dB to -10dB in 1dB steps.

If the automatic limiter time constant option is in use, all limiter screens will say 'automatic' and the time constants will be set from the Highpass filter frequency. A table of dB to Vrms is in appendix 1.

The output meters are linked to the time constants of the limiters so true output metering is achieved.

To adjust limiter settings:

Use the **FREQ** control to adjust the attack time.

Use the **Q** control for the release time.

Use the **GAIN** control for the limiter threshold.

13.4 Delay screen

OP1 Low
Delay = 1.003mS

Each output has an independent delay time control. This can be adjusted in 2.6µS steps or in 1ms steps giving complete control over driver time alignment.

Input delay (base delay) is adjustable in 1ms steps only.

To adjust delay settings:

Use the **FREQ** control for coarse control. (1ms steps)

Use the **Q** control for fine control. (2.6µS steps)

13.5 Polarity screen

OP1 Low
Polarity = [+]

Each output has an independent polarity screen. This gives the flexibility to reverse (flip by 180°) the phase of individual outputs.

(N.B. When the outputs are ganged, the polarity screens remain individual.)

To adjust the polarity:

Use the **GAIN** control to switch between + and -.

13.6 Gain screen

O/P1+3 Low
Gain = 0.1dB

Each output and input has an individual gain screen. The outputs have a range of +15dB to -40dB, adjustable in 0.1dB steps and the inputs have a range of +6dB to -40dB, again adjustable in 0.1dB steps.

To adjust the gain:

Use the **GAIN** control.

14 CROSSOVER SUB-MENU

Press **MENU** and select crossover Sub-menu using the **BACK**, **NEXT** and **ENTER** keys. Three options are available in this sub-menu which are:

Load a crossover Loads a factory preset or crossover stored in a user memory. Note: the unit ships with all user memories empty. It is up to the user to program these memories as the application requires. However, all the most common settings for our products are included in the factory presets for your convenience and in the majority of cases it will not be necessary to use this option.

Note: loading a crossover will not overwrite the input settings.

Design a crossover Opens a utility to design a crossover. Options include format type, ganging of outputs, routing and automatic limiter time constants.

Store a crossover Stores a crossover (all output settings) to one of 19 user memories. Use the **FREQ** control to select the memory number. Press **ENTER** and you will be prompted to set the memory name. Use the **FREQ** control to scroll through the available characters. Use the **NEXT** key to move to the next character. The memory name can contain up to 16 characters. Press **ENTER** to store to memory.

Note: this sequence must be completed for a memory to store. If after 15 seconds no store has been implemented the unit will return to the default mode.

When storing a memory the LCD shows the next available empty memory automatically but any user memory number can be chosen and any user memory can be overwritten. Previously used memories are identified by a '?' question mark. Note: the factory presets cannot be overwritten. If you want to make a permanent record of the user configurable settings of a factory preset, the preset can be saved to a user memory by following the above procedure. This is especially useful if the unit is to be used with a variety of presets on a regular basis. This will not unlock the 'locked' parameters of the preset!

Note: it is not possible to save the input settings to a user memory.

15 INPUT SETUP SUBMENU

Press **MENU** and select Input Set-up Sub-menu using the **BACK**, **NEXT** and **ENTER** keys. There is one option in this menu:

Gang Inputs: Gangs A and B inputs so that precise adjustments can be made to both inputs simultaneously. In this mode the LCD will show A+B when either of the input 'GAIN' buttons are pressed.

16 SECURITY SUB-MENU

Press **MENU** and select Security Sub-menu using the **BACK**, **NEXT** and **ENTER** keys. Press **ENTER** to load one of the four selections (See below). A four-digit security code will be asked for. This can be entered by using the **FREQ** control, to select a character, and the **BACK** and **NEXT** keys to move to the next character. Alternatively, the **GAIN** keys can be used to enter a code by pressing any combination of the eight buttons. Each **GAIN** key represents it's channel labelling, so any combination of A, B, 1, 2, 3, 4, 5 and 6 can be used as a code.

Lock options:

Changes only: This option locks all parameters so that no changes can be made, including all menus.

Changes + view: This option locks all parameters and the viewing of them on the LCD including all menus.

Changes + mutes: This option locks all parameters, including all menus, and disables all mute keys.

Everything: This option locks all parameters and the viewing of them, including all menus, and disables all mute keys.

To 'unlock' the security system, press the **MENU** key and enter correct code.

IMPORTANT - Please Note that once the security system is initiated only re-entering the correct code will 'unlock' the DX1's functions. Please note the code! If the security code number is inadvertently lost contact your local Martin Audio sales office.

17 SYSTEM SUB-MENU

Press **MENU** and select System Sub-menu using the **BACK**, **NEXT** and **ENTER** keys. Several options are available in this sub-menu which are:

System Status: Displays unit information including software version and temperature. *Curr. Temp.* = current temperature in degrees Celsius.

Max1. Temp. = maximum temperature this session.

Max2. Temp. = maximum temperature ever reached.

LCD Contrast: Adjusts the LCD contrast from 0 to 100.

LED Brightness: Adjusts the LED brightness from 1 to 15.

Temperature Alarm: Sets a temperature warning between 20 and 80°C. The default screen will flash 'ALARM. Temp = n°C' when the specified temperature is reached. (N.B. the warning does not affect the performance of the unit in any respect.) This feature is intended to alert the user to changes air temperature which will have a consequent effect on delay time. This is of use when aligning remotely sited 'delay stacks' as opposed to inter drive unit delays. See page 10 for an explanation of the relationship between air temperature and delay time.

Wake-up Time: Sets how the unit starts up with one of the following options.

0 to 60 seconds: Waits the specified time before unit wakes up.

Mute hold: Turns on and holds all output mutes when turned on.

(N.B. Wake-up is a slow ramp in level for about 5 seconds.)

Output Meters: Selects whether the output meters are pre or post mute.

Filter Q or BW: Selects whether 'Q' or Bandwidth is displayed in the parametric screens.

Delay Time/Distance: Selects the display of delay in milliseconds, metres or feet.

18 INTERFACE SUB-MENU

Press **MENU** and select crossover Sub-menu using the **BACK**, **NEXT** and **ENTER** keys.

Interface Setup

Opens a utility to configure the RS232 interface.

19 INTERFACE OPERATION

The DX1 has a RS232 external interface. This allows the factory presets in the DX1 to be updated via a PC. Updates will occur when new products that require the use of a controller are released. Instructions on how to load the latest factory preset file will be supplied with the factory preset file and it's accompanying downloading software.

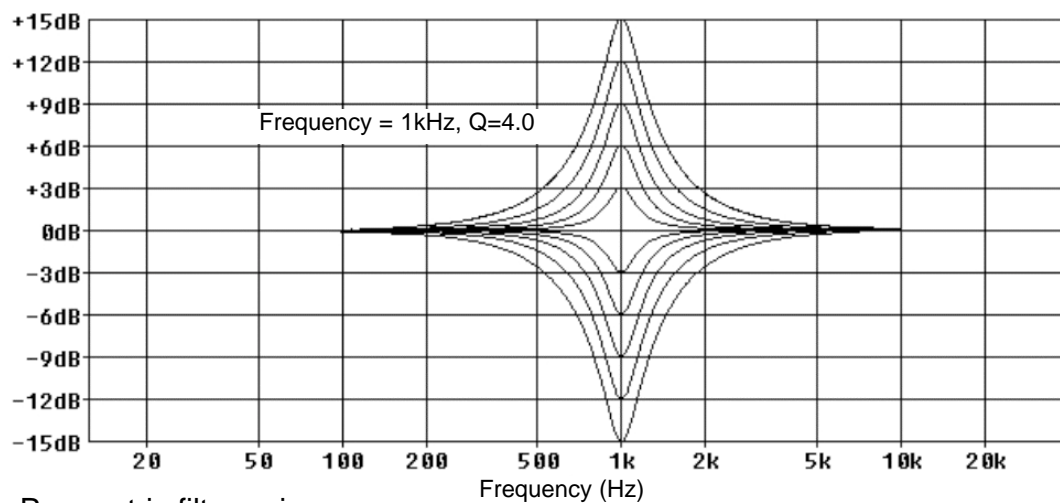
RS232 interface configuration

Select the following options in the Interface Setup menu:

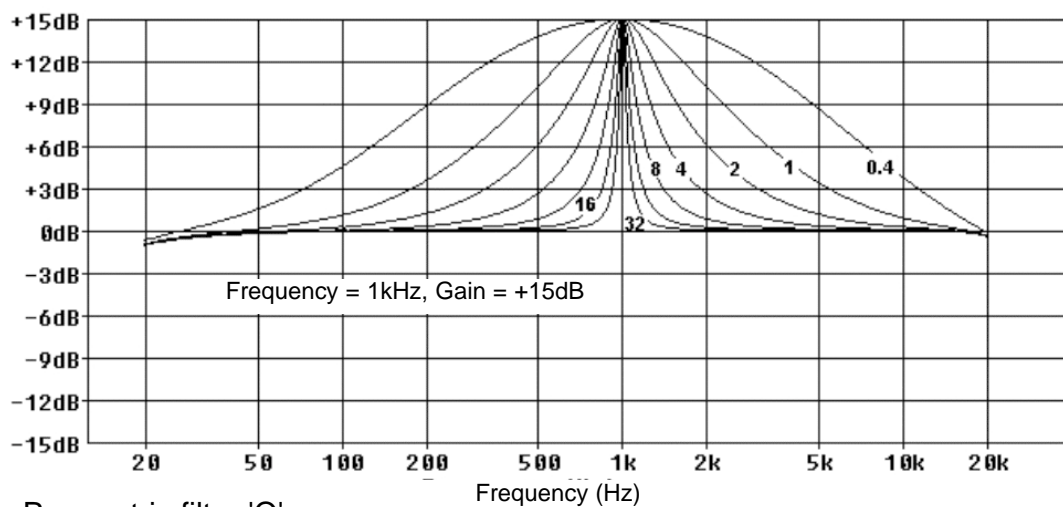
External Mode: On.

RS232 Baud: 2400, 4800, 9600, 19200, 38400 (Select the baud rate, this should correspond to the baud rate set on the computer.)

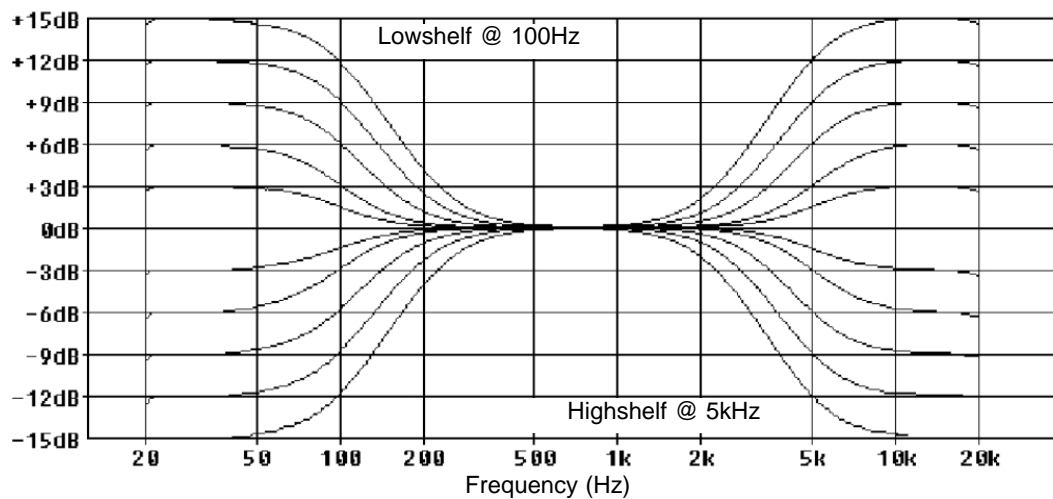
20 EQUALISATION CURVES



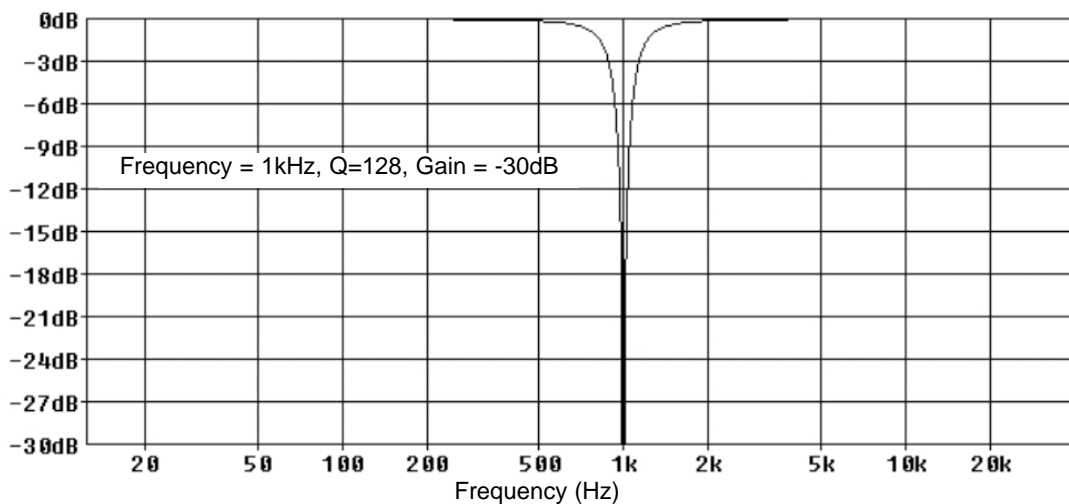
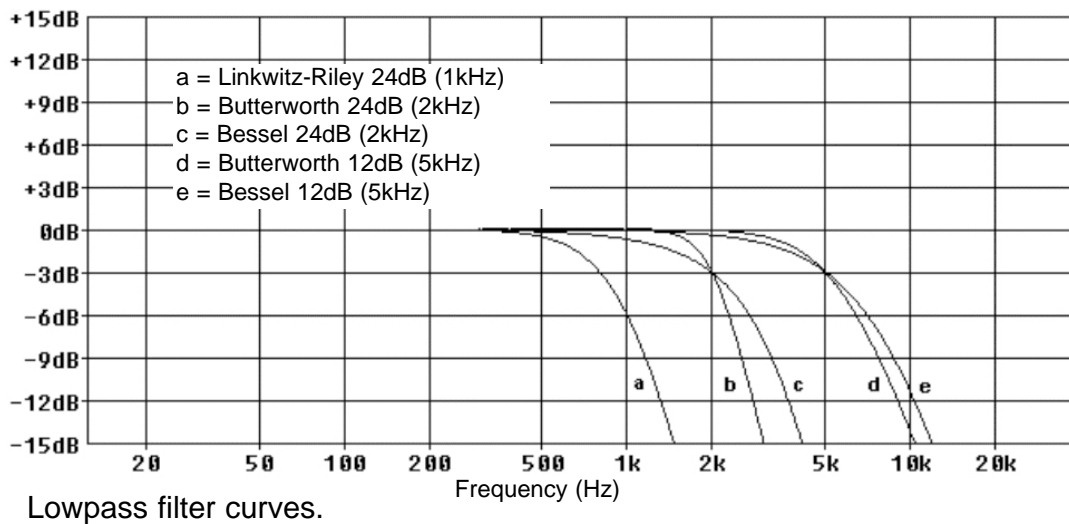
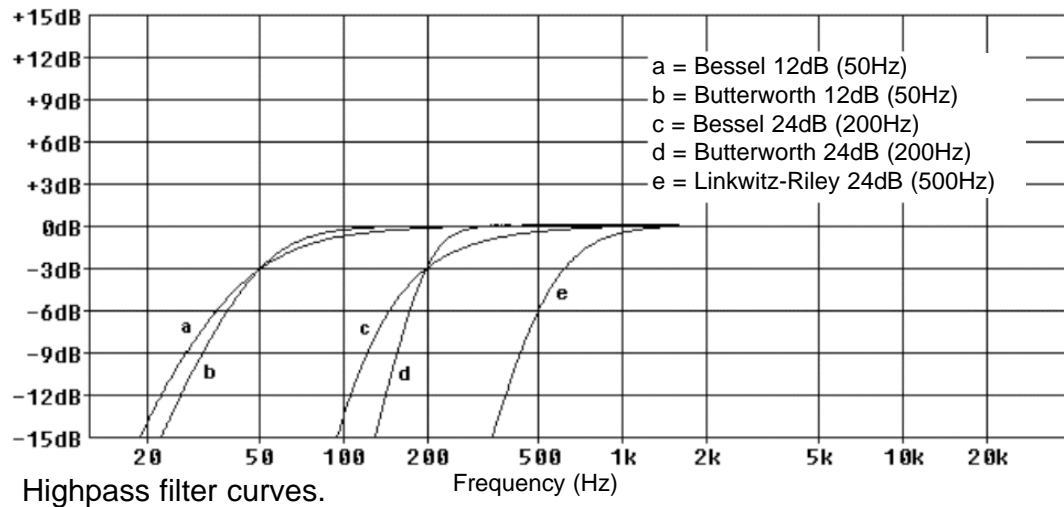
Parametric filter gain curves.



Parametric filter 'Q' curves.



Parametric filter High and Low shelf curves.



21 TECHNICAL SPECIFICATIONS

Inputs	Two electronically balanced.
Impedance	> 10k ohms.
CMRR	>65dB 50Hz - 10kHz.
Outputs	Six electronically balanced.
Source Imp	< 60ohms.
Min. Load	600ohm.
Max. Level	+20dBm into 600 ohm load.
Frequency Resp.	±0.5dB 20Hz - 20kHz.
Dynamic Range	>110dB 20Hz -20kHz. Unwtd.
Distortion	< 0.02% @ 1kHz, +18dBm.
Maximum Delay	650 ms. (Increment 2.6 µs)
Output gain	adjustable +15dB to -40dB in 0.1dB steps and mute.
Input gain	Adjustable +6dB to -40dB in 0.1dB steps.
Parametric Equalisation	
Filters	5 Sections per output.
Filter gain	+15dB to -30dB in 0.1dB steps.
Centre frequency	20Hz - 20kHz, 1/36 octave steps. (368 positions)
Filter Q / BW	0.4 to 128 / 2.5 to 0.008
(Sections switched to shelving response)	
Low frequency	20Hz - 1kHz
High frequency	1kHz - 20kHz
Shelf gains	±15dB in 0.1dB steps.
High and Lowpass Filters	
Filters	1 of each per output.
Frequency (HPF)	10Hz - 16kHz, 1/36 octave steps.
Frequency (LPF)	60Hz - 22kHz, 1/36 octave steps.
Response	Bessel / Butterworth 12/18/24dB per octave and Linkwitz-Riley 24dB per octave.
Limiters	
Threshold	+22dBu to -10dBu.
Attack time	0.3 to 90 milliseconds.
Release time	4, 8, 16 or 32 times the attack time.
Display	2 x 20 character backlit LCD.
Input meter	2 x 3 point, -24dB to digital clip.
Output meter	6 x 3 point, -24dB to limit level.
Connectors	
Inputs	3 pin female XLR.
Outputs	3 pin male XLR.
External	9 pin DEE connector (RS232)
Power	3 pin IEC.
Power	60 to 250V ±15% @ 50/60Hz.
Consumption	< 20 watts.
Weight	3.5kg. Net (4.8kg. Shipping)
Dimensions(1U)	(W) 482mm x (H) 44mm x (D) 300mm (excluding connectors). (W) 19ins x (H) 1.75ins x (D) 11.8ins (excluding connectors).
Shipping Dimensions(1U)	(W) 560mm x (H) 115mm x (D) 425mm (excluding connectors). (W) 22ins x (H) 4.5ins x (D) 16.7ins (excluding connectors).

Due to continuing product improvement the above specifications are subject to change.

22 OPERATING NOTES

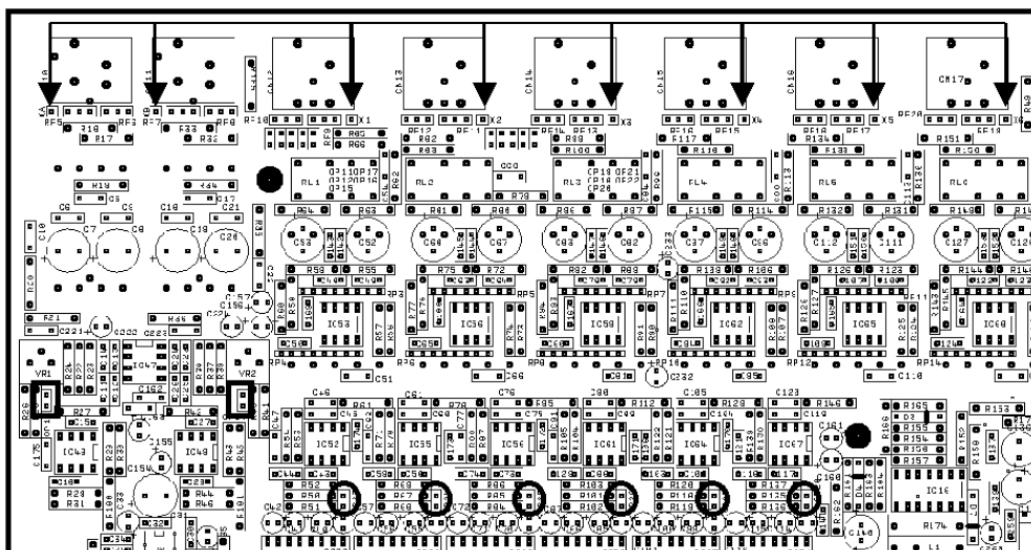
What happens on switch on?

As mentioned previously the DX1 can be programmed to go through a 'Wake up' sequence which ramps up the output level over a set time period. The default is a wake up time of 10 seconds. The DX1 remembers exactly how it was set up before it was switched off. This includes which preset or user memory was loaded and the associated gain, delay and limiter levels etc. It also remembers the input settings and the status of the **MUTE** buttons. All of the factory presets are programmed to unmute themselves automatically but this is overridden if the user manually mutes the outputs prior to switching the unit off. This is of particular note in fixed installations where an operator may decide to mute the outputs at the end of a performance and then turn the unit off. The next time the unit is powered up the mutes will stay on after the wake up routine has finished.

Grounding

The Screen (shield) pins on all audio connectors are normally connected directly to the ground pin of the IEC mains inlet. The chassis is also directly connected to this pin. Never operate this unit without the mains safety ground connected. Signal ground (0V) is in turn connected to the chassis ground.

To avoid ground loops, cable shields should be connected to ground at one end only. The normal convention is that the shield is only connected at the output XLR. Provision is also made for separately isolating each input and output shield pin permanently within the DX1 by breaking the appropriate PCB track, where marked with a box and an arrow next to each XLR connector using a small drill bit or cutter. See the following diagram for details.



XLR pin 1 Isolation points and 10dB pads

23 APPENDICES

Appendix 1

Limiter threshold in dBu to Vrms lookup table.

<u>dBu</u>	<u>Vrms</u>	<u>dBu</u>	<u>Vrms</u>
+22	9.75	+5	1.38
+21	8.69	+4	1.23
+20	7.75	+3	1.09
+19	6.90	+2	0.98
+18	6.15	+1	0.87
+17	5.48	0	0.77
+16	4.89	-1	0.69
+15	4.36	-2	0.62
+14	3.88	-3	0.55
+13	3.46	-4	0.49
+12	3.08	-5	0.44
+11	2.75	-6	0.39
+10	2.45	-7	0.35
+9	2.18	-8	0.31
+8	1.95	-9	0.27
+7	1.73	-10	0.24
+6	1.55	-11	0.22

Calculation:

$$V_{rms} = 0.7746 \times 10^{\wedge} (dBu / 20)$$

Appendix 2

Below are the default crossover settings and names for all configurations.
Note: these values are intended as arbitrary starting points and do not correspond to any of the values in the factory presets.

<u>X-over</u>	<u>Output 1</u>	<u>Output 2</u>	<u>Output 3</u>	<u>Output 4</u>	<u>Output 5</u>	<u>Output 6</u>
2x2 way+Ms	Low	High	Low	High	Msub	Aux
	120Hz – 1k82Hz	1k82Hz – 22kHz	120Hz – 1k82Hz	1k82Hz – 22kHz	24.8Hz – 120Hz	<10Hz – 22kHz
2 x 3 way	Low	Mid	High	Low	Mid	High
	22.1Hz – 120Hz	120Hz – 1k82Hz	1k82Hz – 22kHz	22.1Hz – 120Hz	120Hz – 1k82Hz	1k82Hz – 22kHz
4 way + 2	Low	LoMid	HiMid	High	Aux	Aux
	15Hz – 149Hz	149Hz – 1k31Hz	1k31Hz – 8kHz	8kHz – 22kHz	20.1Hz – 22kHz	20.1Hz – 22kHz
5 way + 1	Sub	Low	LoMid	HiMid	High	Aux
	15Hz – 80.3Hz	80.3Hz – 180Hz	180Hz – 1k31Hz	1k31Hz – 8kHz	8kHz – 22kHz	20.1Hz – 22kHz
6 way	LoSub	Sub	Low	LoMid	HiMid	High
	15Hz – 80.3Hz	80.3Hz – 149Hz	149Hz – 1kHz	1kHz – 4kHz	4kHz – 10k1Hz	10k1Hz – 22kHz

Note: All filters set to 24dB Linkwitz-Riley.

Appendix 3

New products are being added all the time. For latest presets available update your DX1 with the latest binary file!

Preset number	Loudspeaker system	Configuration	Input A	Input B	Output 1	Output 2	Output 3	Output 4	Output 5	Output 6
WAVEFRONT										
20	W8+WSX 3 WAY PASSIVE	2x3 way	o/p 1 to 3	o/p 4 to 6	Low	Lomid	Midhi	Low	Lomid	Midhi
21	W8+WSX 4 WAY ACTIVE	1x4 way	o/p 1 to 4	o/p 5 to 6	Low	Lomid	Himid	High	Aux	Aux
22	W8+W8S OR CS 3 WAY PASSIVE	2x3 way	o/p 1 to 3	o/p 4 to 6	Low	Lomid	Midhi	Low	Lomid	Midhi
23	W8+W8S OR CS 4 WAY ACTIVE	1x4 way	o/p 1 to 4	o/p 5 to 6	Low	Lomid	Himid	High	Aux	Aux
24	W8+W8S 5 WAY ACTIVE	1x5 way	o/p 1 to 5	o/p 6	Low18	Low15	Lomid	Himid	High	Aux
25	W8+WSX 4 WAY ACTIVE HF LIFT	1x4 way	o/p 1 to 4	o/p 5 to 6	Low	Lomid	Himid	High	Aux	Aux
26	W8 LONGTHROW+WSX	1x4 way	o/p 1 to 4	o/p 5 to 6	Low	Lomid	Himid	High	Aux	Aux
27	W1/W2PASSIVE/W3P	2x2 way	o/p 1 & 2	o/p 3 & 4	FR	Aux	FR	Aux	Sum A+B	Sum A+B
28	W1/W2 PASSIVE/W3P+WS2A	2x2 way	o/p 1 & 2	o/p 3 & 4	Sub	HPass	Sub	HPass	Msub	Sum A+B
29	W2 ACTIVE	2x2 way	o/p 1 & 2	o/p 3 & 4	Low	High	Low	High	Sum A+B	Sum A+B
30	W2 ACTIVE+WS2A	2x3 way	o/p 1 to 3	o/p 4 to 6	Sub	Low	High	Sub	Low	High
31	W2 ACTIVE+W8CS	2x3 way	o/p 1 to 3	o/p 4 to 6	Sub	Low	High	Sub	Low	High
32	W3	2x2 way	o/p 1 & 2	o/p 3 & 4	Low	Midhi	Low	Midhi	Sum A+B	Sum A+B
33	W3+WS2A	2x3 way	o/p 1 to 3	o/p 4 to 6	Sub	Low	Midhi	Sub	Low	Midhi
34	W3+W8CS	2x3 way	o/p 1 to 3	o/p 4 to 6	Sub	Low	Midhi	Sub	Low	Midhi
35	W3+WSX	2x3 way	o/p 1 to 3	o/p 4 to 6	Sub	Low	Midhi	Sub	Low	Midhi
36	WT2 PASSIVE	2x2 way	o/p 1 & 2	o/p 3 & 4	FR	Aux	FR	Aux	Sum A+B	Sum A+B
37	WT2 PASSIVE+WS2A	2x2 way	o/p 1 & 2	o/p 3 & 4	Sub	HPass	Sub	HPass	Msub	Sum A+B
38	WT2 ACTIVE	2x2 way	o/p 1 & 2	o/p 3 & 4	Low	High	Low	High	Sum A+B	Sum A+B
39	WT2 ACTIVE+WS2A	2x3 way	o/p 1 to 3	o/p 4 to 6	Sub	Low	High	Sub	Low	High
40	WT2 ACTIVE+W8CS	2x3 way	o/p 1 to 3	o/p 4 to 6	Sub	Low	High	Sub	Low	High
41	WT3 BIAMP	2x2 way	o/p 1 & 2	o/p 3 & 4	Low	Midhi	Low	Midhi	Sum A+B	Sum A+B
42	WT3 BIAMP+WS2A	2x3 way	o/p 1 to 3	o/p 4 to 6	Sub	Low	Midhi	Sub	Low	Midhi
43	WT3 BIAMP+W8CS	2x3 way	o/p 1 to 3	o/p 4 to 6	Sub	Low	Midhi	Sub	Low	Midhi
44	WT3 BIAMP+WSX	2x3 way	o/p 1 to 3	o/p 4 to 6	Sub	Low	Midhi	Sub	Low	Midhi
45	WT3 TRIAMP	2x3 way	o/p 1 to 3	o/p 4 to 6	Low	Mid	High	Low	Mid	High
46	WT3 TRIAMP+WS2A	1x4 way	o/p 1 to 4	o/p 5 to 6	Sub	Low	Mid	High	Aux	Aux
47	WT3 TRIAMP+W8CS	1x4 way	o/p 1 to 4	o/p 5 to 6	Sub	Low	Mid	High	Aux	Aux
48	WT3 TRIAMP+WSX	1x4 way	o/p 1 to 4	o/p 5 to 6	Sub	Low	Mid	High	Aux	Aux
LE SERIES										
49	LE 400B/C	2x2 way	o/p 1 & 2	o/p 3 & 4	Low	High	Low	High	Sum A+B	Sum A+B
50	LE 700A	2x2 way	o/p 1 & 2	o/p 3 & 4	Low	High	Low	High	Sum A+B	Sum A+B
51	LE12J BIAMP	2x2 way	o/p 1 & 2	o/p 3 & 4	Low	High	Low	High	Sum A+B	Sum A+B
BLACKLINE										
52	F8	2x2 way	o/p 1 & 2	o/p 3 & 4	FR	Aux	FR	Aux	Sum A+B	Sum A+B
53	2x8+MONO S12	2x2 way	o/p 1 & 2	o/p 3 & 4	Sub	HPass	Sub	HPass	Msub	Sum A+B
54	F10	2x2 way	o/p 1 & 2	o/p 3 & 4	FR	Aux	FR	Aux	Sum A+B	Sum A+B
55	F10+S12 OR MONO S15/S18	2x2 way	o/p 1 & 2	o/p 3 & 4	Sub	HPass	Sub	HPass	Msub	Sum A+B
56	F12/F15	2x2 way	o/p 1 & 2	o/p 3 & 4	FR	Aux	FR	Aux	Sum A+B	Sum A+B
57	F12/F15+S15/S18	2x2 way	o/p 1 & 2	o/p 3 & 4	Sub	HPass	Sub	HPass	Msub	Sum A+B
58	2x12/F15+S218	2x2 way	o/p 1 & 2	o/p 3 & 4	Sub	HPass	Sub	HPass	Msub	Sum A+B
59	F15A	2x2 way	o/p 1 & 2	o/p 3 & 4	Low	High	Low	High	Sum A+B	Sum A+B
60	F15A+S15/S18	2x3 way	o/p 1 to 3	o/p 4 to 6	Sub	Low	High	Sub	Low	High
61	2x15A+S218	2x3 way	o/p 1 to 3	o/p 4 to 6	Sub	Low	High	Sub	Low	High
62	F215	2x2 way	o/p 1 & 2	o/p 3 & 4	FR	Aux	FR	Aux	Sum A+B	Sum A+B
63	F215+S18	2x2 way	o/p 1 & 2	o/p 3 & 4	Sub	HPass	Sub	HPass	Msub	Sum A+B
64	F215+S218	2x2 way	o/p 1 & 2	o/p 3 & 4	Sub	HPass	Sub	HPass	Msub	Sum A+B
65	H2 PASSIVE+S218	2x2 way	o/p 1 & 2	o/p 3 & 4	Low	Midhi	Low	Midhi	Sum A+B	Sum A+B
66	H2 ACTIVE+S218	2x3 way	o/p 1 to 3	o/p 4 to 6	Low	Mid	High	Low	Mid	High
67	H3	2x2 way	o/p 1 & 2	o/p 3 & 4	Low	Midhi	Low	Midhi	Sum A+B	Sum A+B
68	H3+S218	2x3 way	o/p 1 to 3	o/p 4 to 6	Sub	Low	Midhi	Sub	Low	Midhi
69	H3T	2x3 way	o/p 1 to 3	o/p 4 to 6	Low	Mid	High	Low	Mid	High
70	H3T+S218	1x4 way	o/p 1 to 4	o/p 5 to 6	Sub	Low	Mid	High	Aux	Aux
EM SERIES										
71	EM 15,26,56,76	2x2 way	o/p 1 & 2	o/p 3 & 4	FR	Aux	FR	Aux	Sum A+B	Sum A+B
72	EM 186	2x2 way	o/p 1 & 2	o/p 3 & 4	Low	Midhi	Low	Midhi	Sum A+B	Sum A+B
73	EM 15,26,56,76+EM 150/201/251	2x2 way	o/p 1 & 2	o/p 3 & 4	Sub	HPass	Sub	HPass	Msub	Sum A+B
74	EM 186+EM201/251	2x3 way	o/p 1 to 3	o/p 4 to 6	Sub	Low	Midhi	Sub	Low	Midhi

Outputs marked 'Aux' or 'Sum A+B' can be configured by the user, please see 'Configuring the DX1 manually' for further explanation.

The default settings for the 'Aux' and 'Sum A+B' outputs are 'flat', i.e. no filters, parametric eq, gain or delay.

Outputs marked 'Msub' are the mono equivalent of the respective Sub outputs and are not user configurable.

DX1 Speaker Management System



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User's Guide



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