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Guardian Audio®

DX480

Digital Speaker Processor
Owners Manual

Important Safety Instructions

1. READ AND KEEP THESE INSTRUCTIONS
All the safety and operating instructions should be read before the product is operated. The safety and operating instructions should be retained for future reference.

2. HEED ALL WARNINGS
All warnings on the product and in the operating instructions should be adhered to.

3. DO NOT USE THIS APPARATUS NEAR WATER

4.CLEAN ONLY WITH DRY CLOTH
Unplug the unit from the wall outlet before cleaning. Do not use liquid cleaners or aerosol cleaners. Use a damp cloth for cleaning.

5. DO NOT BLOCK ANY VENTILATION OPENINGS
Slots and openings in the cabinet back or bottom are provided for ventilation, to ensure reliable operation of the limit and to protect it from overheating. These openings must not be blocked or covered. The openings should never be blocked by placing the product on a bed, sofa, rug, or similar surface. This product should not be placed in a built-in installation such as a bookcase or rack unless proper ventilation is provided or the manufacture's instructions have been adhered to.

6. DO NOT INSTALL NEAR ANY HEAT SOURCES
This Product should be situated away from heat sources such as amplifiers or other products that produce heat.

7. DO NOT DEFEAT THE SAFETY OF THE POLARIZED OR GROUNDING-TYPE PLUG
A Polarized plug has two blades with one wider than the other. A grounding-type plug has two blades and a third grounding prong. The wide blade or the third prongs are provided for your safety. If the provided plug does not fit into your outlet, consult an electrician for replacement of the obsolete outlet.

8. PROTECT THE POWER CORD FROM BEING WALKED ON OR PINCHED AT PLUGS, CONVENIENCE RECEPTACLES, AND THE POINT WHERE THEY EXIT FROM THE APPARATUS.

9. ONLY USE ATTACHMENTS/ACCESSORIES SPECIFIED BY THE MANUFACTURER.

10. USE ONLY WITH CART, STAND, TRIPOD, BRACKET, OR TABLE SPECIFIED BY THE MANUFACTURER, OR SOLD WITH THE APPARATUS. WHEN A CART IS USED, USE CAUTION WHEN MOVING THE CART/APPARATUS TO AVOID INJURY FROM TIP-OVER.
Do not place this unit on an unstable cart, stand, tripod, bracket, or table. The unit may fall, causing serious injury to someone, and serious damage to the appliance. A unit and cart combination should be moved with care. Quick stops, excessive force, and uneven surfaces may cause the product and cart combination to overturn.

11. UNPLUG THIS APPARATUS DURING LIGHTNING STORMS OR WHEN UNUSED FOR LONG PERIODS OF TIME.
For added protection for this unit during a lightning storm, or when it is left unattended and unused for long periods of time, unplug it from the wall outlet and disconnect the antenna or cable system. This will prevent damage to the unit due to lightning and power line surges.

12. REFER ALL SERVICING TO QUALIFIED SERVICE PERSONNEL.

13. WARNING: TO REDUCE THE RISK OF FIRE OR ELECTRIC SHOCK, DO NOT EXPOSE THIS APPARATUS TO RAIN OR MOISTURE.

Table of Contents

1.0 Introduction

The DX series is a digital loudspeaker management system designed for the touring or fixed sound installation markets. The absolute latest in available technology is utilized with 32-bit (40-bit floating point) processors and high performance 24-bit Analog Converters. The high-bit DSP prevents noise and distortion induced by truncation errors of the commonly used 24-bit fixed-point devices. A complete set of parameters include I/O levels, delay, polarity, 6 bands of parametric EQ per channel, multiple crossover selections and full function limiters. Precise frequency control is achieved with its 1 Hz resolution. Inputs and outputs can be routed in multiple configurations to meet any requirement. The DX series can be controlled or configured in real time on the front panel or with the intuitive PC GUI accessed via the USB or RS485. Software upgrade for CPU and DSP via PC keeps the device current with newly developed algorithms and functions once available. Multiple setup storage and system security complete this professional package.

Shipped contents:

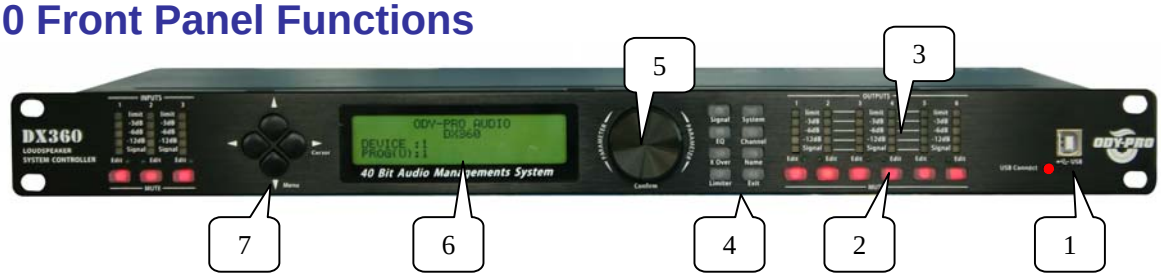
- DX-240/260/360/480 unit

- DxDrive CD (incl. User Manual & PC Software)

2.0 Features

- 32-bit (40-bit floating point) DSP (Highly accurate digital processing)
- High Performance 24-bit A/D and D/A Converters
- Accurate 1 Hz Frequency Resolution.
- 6-Band Parametric Equalizers for each Input and Output
- Full-Function Limiters on Output Channels
- One Touch" easy access setup button
- Backlit 4-Line x 32 Character LCD Display
- Full 5-segment LEDs on every Input and Output
- Storage up to 30 Program Setups
- USB and RS-485 interfaces for PC Control and Configuration
- Pink noise and single frequency generator
- Original Neutrik XLR connectors
- Security Lock

3.0 Front Panel Functions

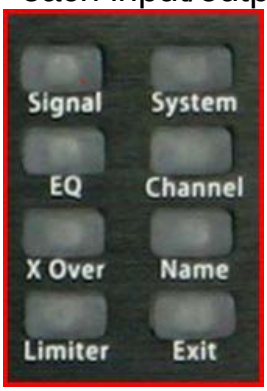


1. **USB** – a standard Type B USB connector. Proper device driver must be installed prior to usage.The red LED will indicate the USB cable is connected.

2. **Mute keys** – Mute/Unmute input and output channels. When an input channel is muted, a red LED will come on for indication.
When **Menu Control** key is pressed, it selects the corresponding channel for the LCD menu display and is acknowledged by a green LED above the button. The last modified menu will be displayed on the LCD. While the Menu Control key is held down, multiple channels can be linked or unlinked by pushing the desired channels. This eases programming for same parameters across multiple channels. Multiple Inputs can be linked together and multiple outputs can be linked together. Inputs and Outputs are linked separately.

3. **Peak Level LED** - Indicates the current peak level of the Signal: Signal, -12dB, -6dB, -3dB, Over/Limit. The Input **Over** LED refers to the device's maximum headroom. The Output **Limit** LED references to the threshold of the limiter.

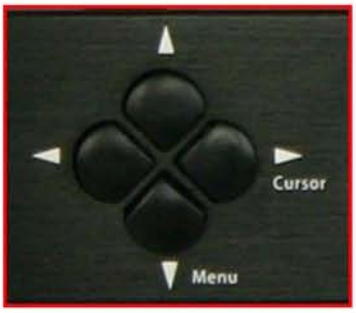
4. **Menu keys** - There are 8 menu keys for Signal-Gain/Phase/Delay, EQ, X'over (Crossover), Limiter, Channel (Input Mix), Name (Channel name) for each input/output channel, and System and Exit control for main system.



5. **Rotary Thumb Wheel** - Changes parameter data values and confirms. The wheel has travel velocity sensing to ease large incremental data modifications. For modifying delay and frequency (1 Hz resolution), pressing the **Speed** key simultaneously will increase/decrease the data value by 100x. To confirm the setting push the wheel one time.

6. **LCD** – 4 line x 32 words shows all the necessary information to control the unit.

7. Cursor control- 4 key Cursor control.



4.0 Rear Panel Functions

1. **Main Power** - Connects via a standard IEC socket. A compatible power cord is supplied with the unit. The voltage input is 90-240VAC, 50-60Hz.

2. **Main Fuse** - T2.5A-250V. Slow blow type.

3. **Power switch** - Controls power On/Off.

4. **RS485** – Allows remote control the device up to 1000M.

5. **XLR input and outputs -** Separate 3-pin XLR connectors are provided for each audio input and output. The device's output stage employs the balanced impedance topology. All I/O connectors have pin 1 as ground (shield), pin 2 as + and pin 3 as -.

5.0 Powering Up the Device

- After powering up the unit, the following initialization screen is displayed on the LCD:
- The initialization process takes about 8 seconds and during that period the unit boots and displays the device model and firmware version.
- After the initialization process is finished the DX displays its main screen:
- The screen shows the current program number and program name assigned to the unit. If the 2 fields are empty, it means that no program is assigned, the last data before previous power down is recalled instead.
- Now the DX is ready to operate.

```
** DX Series **
DX-480 v1.00
DEVICE : 1
PROG (U):1

(U)> User program (F) factory program
```

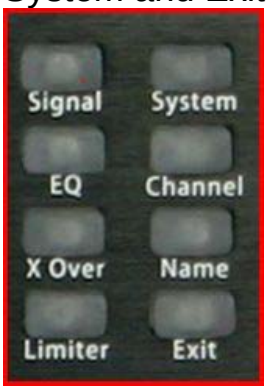
6.0 Operating the Device

Tips: Channel Linking – While holding down the Mute for 2 seconds, more than 1 channel from the same group (Input or Output group) can be selected to link the channels together. The green LEDs above the **Mute** buttons are lit for the linked channels. Any modification of the data for the selected channel will be applied to the linked channels as well. To cancel the linking, simply deselect the desired channel if the Mute key is still pressed.

6.1 Input menus

Each of DX input channel has a separate Mute key. Hold down the Mute key for 2 seconds then the Channel menu can be use and the green LEDs above the Mute button are lit.

One Touch easy access setup button
DxDrives 8 one touch setup buttons let the user easily direct control for Signal, EQ, X over, Limiter, Channel, Name for each input/output, and System and Exit button.



-Signal-Gain/Phase/Delay - Signal parameters

- LEVEL - Gain, -40.00dB to +12.00dB in 0.1dB steps.
- POL - Polarity, can be normal (+) or inverted (-).
- DELAY - Delay in 21us steps. Can be displayed in milliseconds, feet or centimeters.

The time unit of the delay can be changed in the **System** menu. The maximum delay permitted is 1000ms.

```
OUI_1:XXXXXX  MENU:Signal
LEVEL:0.00dB
POL   :+
DELAY :0.105ms
```

-EQ - EQ parameters

- EQ# - Selects one of the 6 available Equalizers.
- LEVEL - EQ level gain. Ranges from -30.00dB to +15.00dB in 0.1dB steps.
- FREQ - EQ center frequency. Ranges from 20 to 20,000Hz in either 1Hz steps or 1/36 octave steps
- BW - EQ Bandwidth. Ranges from 0.05 to 3.00 octaves in steps of 0.01 octave steps for PEQ.The Q value is automatically shown beneath the octave value. For Lo-Sht or Hi-Shf, it is either 6 or 12dB/Oct.

Type - Type of EQ. The types can be parametric (PEQ), Lo-shelf (Lo-shf) and Hi-shelf (Hi-shf).

.

```
OUT_1:xxxxxx  MENU: EQ
EQ#:EQ1          BW:0.50OCT
LEVEL:0.00dB        Q=28.85
FREQ  : 1000HZ   TYPE:PEQ
```

-X Over **-** Crossover Parameters

- FTRH - Filter Type of low frequency crossover point (high pass). Types can be Butterworth, Linkritz Riley or Bessel.
- FRQH - Filter cut-off Frequency of low frequency crossover point (high pass). Ranges from 20 to 20,000Hz in either 1Hz steps or 1/36 octave steps. The frequency steps can be selected in the
- SLPH - Filter Slope of low frequency crossover point (high pass). Ranges from 12 to 48dB/octave. If the selected Filter Type is Linkritz Riley, the available slopes are 12 / 18 / 24 / 48 dB/octave.
- FTRL - Filter Type of high frequency crossover point (low pass).
- FRQL - Filter cut-off Frequency of high frequency crossover point (low pass)
- SLPL - Filter Slope of low frequency crossover point (high pass). Ranges from 12 to 48dB/octave. If the selected Filter Type is Linkritz Riley, the available slopes are 12 / 18 / 24 / 48 dB/octave.

```
OUT_1:XXXXXX     MENU:X-Over
FTRH: Butwrth    FTRL: Butwrth
FRQH: 1000Hz     FRQL:1000Hz
SLPH: 24dB       SLPL:24dB
```

-Limiter - Output Limiter

• THRESH - Limit Threshold. Ranges from -20 to +20dBu in 0.5dB steps.

• ATTACK - Attack time. Ranges from 0.3 to 100ms in 0.1ms steps, then ranges from 1 to 100ms in 1ms steps.

• RELEASE - Release time. Can be set at 2X, 4X, 8X, 16X or 32X the attack time.

```
OUT_1:XXXXXX          MENU:Limiter
THRESH:+20.0dB
ATTACK:10ms
RELEASE:2X (20ms)
```

-Channel - Input Mixer

• 1,2,3,4– Input channel source for the current output channel. Can be used to mix the input source or disable it. If more than one input sources are enabled, they will be added together as the source for the current output channel.

```
OUT 1 :              MENU:Source
InA:ON
InB:ON
InC:OFF
InD:OFF
```

Name - Channel Name

• Name - Channel name. It is 6 characters in length.

```
OUT 1:XXXXXX         MENU:Name
NAME:XXXXXX
```

6.2 System Menus

The **System Menus** allow the user to control and change parameters that are related to the system behavior and general operation. It can be accessed by pressing the **System One Touch** key.

SYSTEM MENU
*Load a Xover
Store a Xover
Erase a Xover
System Set
Signal Generate

-Load a Xover - Program Recall
The DX has a built in non-volatile memory that can store up to 30 different program setups. A program can be recalled using this menu.

⇩

Load a Xover
*User Mode
Factory Mode

⇩

Load a Xover: User Mode
*1
2
3…

- PROG - Program Number to be recalled.

-Store a Xover - Program store
The DX has a built in non-volatile memory that can store up to 30 different program setups. A program can be stored using this menu. The old program with the same program number will be replaced. Once the program is stored in the flash memory, it can be recalled at a later time, even after power down.

Store a Xover
*1
2
3…

- PROG - Program Number for the current data to be stored.

Erase a Xover

Erase a Xover
*1
 2
 3…

-SYSTEM Set

SYSTEM MENU
*Password
 BackLight Set
 Delay Unit
 Device ID
 Systen info

*Password- The password of the DX is 6 characters in length.

⇩

SYSTEM SETUP MENU: Password
------
*0 *

BackLight Set
SYSTEM SETUP MENU: Time
 Light on / 20 s

The LCD display can set always on or switch off after 20 Second.

Delay ID
SYSTEM SETUP MENU: Delay
DELAY UNIT: ms /cm / ft

Set the Delay unit in milliseconds, centimeters or feet.

Device ID
SYSTEM SETUP MENU: Device
DEVICE ID: 1

Set the Device ID from 1 to 250

System Info
Version: V1.0.1
Copy Right :
Created by:
Creaded Date: 2008-08-18

-Signal Generate
*Normal
  Pink Noise
  Tones (XXXX Hz)

Normal- Normal mode
Pink Noise-Pink Noise Generate mode
Tones- Tones mode, can select any frequency from 20Hz to 20kHz.

- NAME - Program Name, allows a maximum length of 12 characters.

```
SYSTEM Recall
P:1 XXXXXXXXXXX
SYSTEM Store
P:1
SYSTEM Store
NAM:XXXXXXXXXXX
```

Security - Security Lock

The DX enables the user to secure the unit and prevent undesired changes in the setup. In order to lock/unlock the unit the user must enter the correct password.

- PASSWORD – Under the System Manu

The password of the DX is 6 characters in length. The user can change it via the PC application software. The factory default of a new unit does not require a password.

*Password

⇩

SYSTEM SETUP MENU: Password

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*0 *

7.0 Quick Reference

Parameters Menu
<<Menu>>
Field
<<Cursor>> Min Max Steps Units
Level Signal LEVEL -40 +15 0.1 dB
Polarity Signal POL + / -
Delay Signal DELAY 0-1000ms 21us steps
EQ Number EQ EQ# 1- 6
EQ Level EQ LEVEL -30 +15 0.1 dB
EQ Frequency EQ FREQ 20 20,000 1 Hz
EQ Bandwidth EQ BW 0.05 to 3 0.01 Octave
Crossover Low XOver FTRH / Butterworth / Linkwitz-Riley / Bessel
Crossover Low XOver FRQH 20 20,000 1 Hz
Crossover Low XOver SLPH 12/18/24/48 octave
Crossover High XOver FTRL Off / Butterworth / Linkwitz-Riley / Bessel
Crossover High XOver FRQL 20 20,000 1 Hz
Crossover High XOver SLPL 12/18/24/48 octave
Out Limiter Thresh Limit THRESH -20 +20 0.1 dBu
Out Attack Time Limit ATTACK 0.3-100ms 1 ms
Out Release Time Limit RELEASE 2 / 4 / 8 / 16 / 32X Attack time
Source Source 1, 2, 3 , 4 Off / On
Channel Name Ch-Name NAME 6 characters

8.0 PC Control Software

The DX series is shipped with a special PC Control Software -DxDrive gives the user an option to control the unit from a remote PC via the USB or RS485 serial communication link. The software makes it much easier to control and monitor the device allowing the user to get the whole picture on one screen. Programs can be recalled and stored from/to PC's hard drive,

The LCD will display below when PC software are connected

PC Connection……..

9.0 Specifications

Inputs and Outputs

Input Impedance: >10k Ohms
Output Impedance: 50 Ohms
Maximum Level: +20dBu
Type: Electronically balanced

Audio Performance

Frequency Response: +/- 0.1dB (20 to 20 kHz)
Dynamic Range: 115dB type (unweighted)
CMMR: > 60dB (50 to 10 kHz)
Crosstalk: < -100dB
Distortion: 0.002% (1 kHz @+4dBu)

Digital Audio Performance

Processor: 32-bit (40-bit floating point)
Sampling Rate: 48 kHz
Analog Converters: High Performance 24-bit
Propagation Delay: 1.5ms

Front Panel Controls

Display: 4 x 32 Character Backlit LCD
Level Meters: 5 segment LED
Buttons: Mute/Edit Controls
Menu Controls
Dial Encoder: Embedded Thumb Wheel

Connectors

Audio: 3-pin XLR
RS-485 X 2
USB: Type B
Power: Standard IEC Socket

General

Power: 90-120 or 200-240 VAC (50-60Hz)
Dimensions: 19”x1.75”x9” (483x44x229 mm)
Weight: 7lbs / 3.2kg

Audio Control Parameters

Gain: -40 to +15dB in 0.1dB steps
Polarity: +/-
Delay: Up to 1000ms per I/O
Parametric Equalizers (6 per I/O)
Type: Parametric, Hi-shelf, Lo-shelf
Gain: -40 to +12dB in 0.1dB steps
Bandwidth: 0.05 to 3 octaves (Q=0.404 to 28.852)
Crossover Filters (2 per Input / Output)
Filter Types: Butterworth, Bessel, Linkwitz Riley
Slopes: 12 to 48dB/Oct

Limiters
Threshold: -20 to +20dBu
Attack: 0.3 to 100ms
Release: 2 to 32X the attack time

System Parameters

No. of Programs: 30, (10 factory program and 20 user define)
Program Names: 12 character length
Delay Units: ms, ft, m
Frequency Modes: 36 steps/Oct, 1Hz resolution
Security Lock: Lock/Unlock
Copy channels: All parameters (with PC software)
Channel Names: 6 character length

Note: Specifications subject to change without notice