

DQX™206

INSTANT DELAY

Operating Guide



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Section 1: Introduction

Welcome to the world of Sabine! At Sabine Inc. we pride ourselves in finding innovative, cost effective solutions to challenges in the ever-changing field of professional audio and musical performance. The DQX-206 continues the Sabine tradition of quality performance and value. The DQX-206 offers these impressive features:

- 2 inputs, assignable in any configuration up to 6 outputs
- 20 bit A/D and D/A conversion
- Automatic Delay Set-up. With a microphone placed in the auditorium the DQX-206 automatically calculates and sets the precise delay time for quick and accurate speaker alignment. Calibrate up to six speakers in less than two minutes
- ClipGuard™ Adaptive Clip Level Control automatically adjusts clip level to match the input signal, increasing the effective dynamic range to >105 dB. The DQX handles input/output levels to 28 dBV and eliminates digital clipping.
- Each of six outputs has:
 - Up to 2.5 seconds of delay
 - 3 programmable EQ filters (either parametric, high pass, or low pass)
 - Full-featured, programmable limiter
 - Output level control
- Automatic speaker polarity indicator
- Delay indications in milliseconds, feet, or meters
- Front panel control lockout to prevent tampering or unauthorized adjustments
- Up to 30 memory storage locations, for saving and recalling all DQX parameters
- Optional Temperature Probe: senses and compensates for ambient temperature variations to maintain correct delay times
- Optional Remote Control Switching via contact closures

If you're anxious to get started using your DQX-206, please refer to Section 6.0, Quick Start-Up Reference. For background information on appropriate uses of digital delays, please see Section 7.0, Overview and Philosophy of Digital Delays. For more detailed information about using specific features, please refer to each appropriate section in the manual.

Section 2: Front & Back Panel Views & Controls

Fig. 1: Front Panel

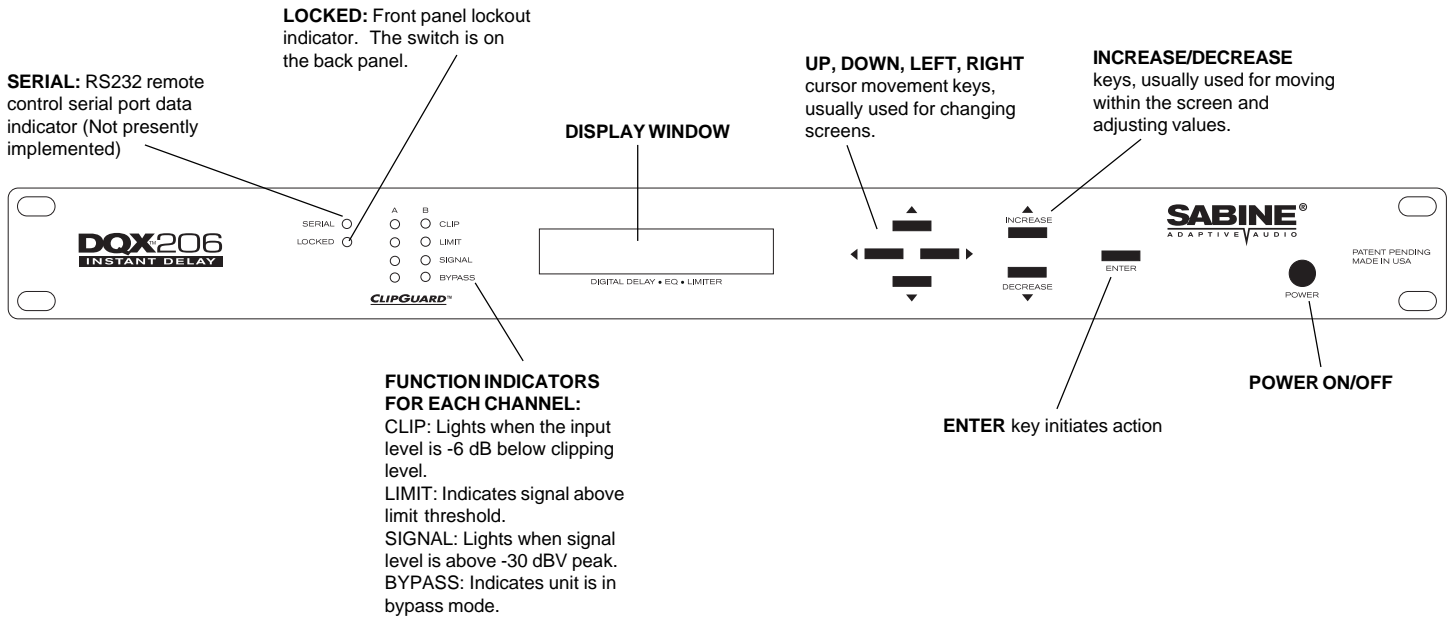
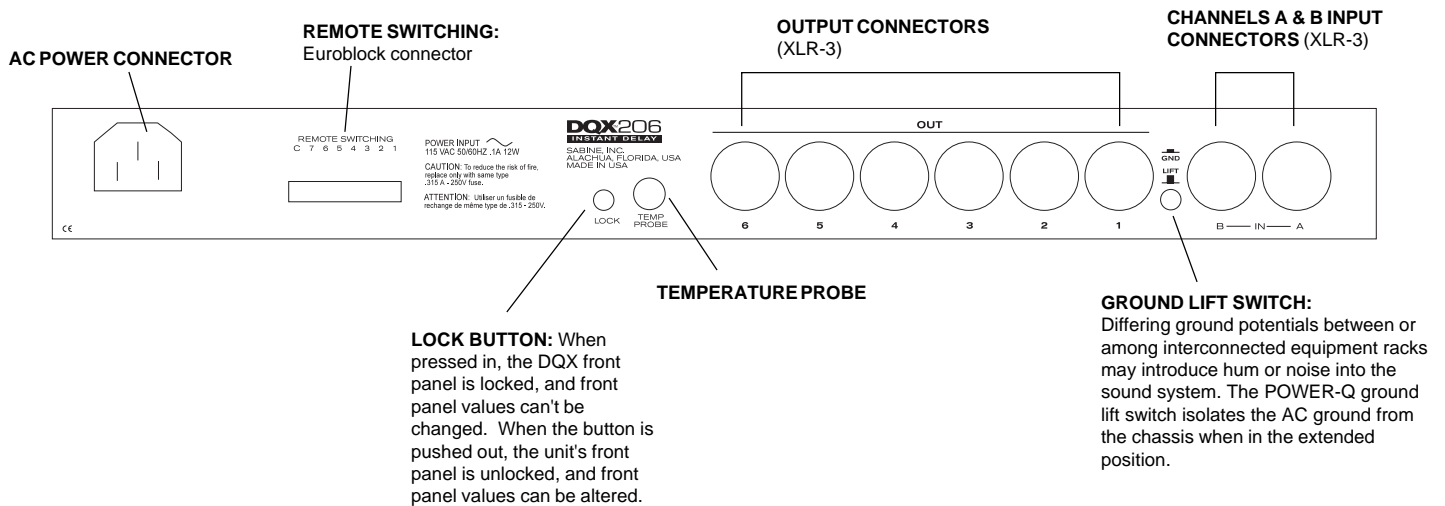
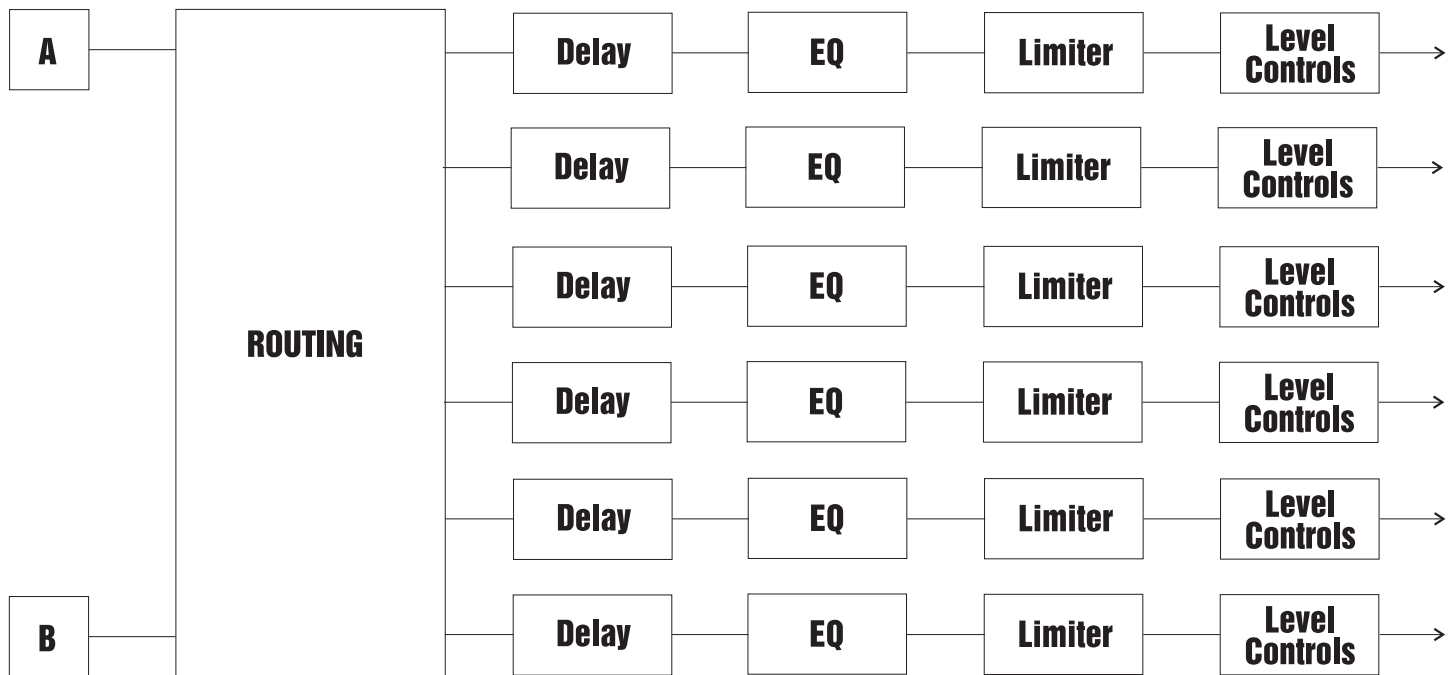


Fig. 2: Back Panel



Section 3: Block Diagram and Internal Signal Paths

Fig. 3



Section 4: Screen Order (screens scroll in circular order)

1 A 0.72mS -13
DELAY: select output

1. Manual Delay Set-up

1 1 P 10291 0.01 -80
FILTER: select output

2. Adjusting EQ Filters

1 S 95 0.05 +20
LIMIT: select output

3. Adjusting Limiters

A Manual +29
CLIPLVL: select input

4. Setting Clip Level

Temperature 20.0 C
TEMP PROBE: set unit

5. Optional Temperature Sensor

A Active
BYPASS: select input

6. Bypassing the DQX

0 Load Save
MEMORY: Choose preset

7. Saving and Loading Presets

Run AUTO Delay Setup
<ENTER> to start

8. Automatic Delay Set-up

Speaker: 1 2 3 4 5 6
Polarity: ? ? ? ? ? ?

9. Speaker Polarity Check

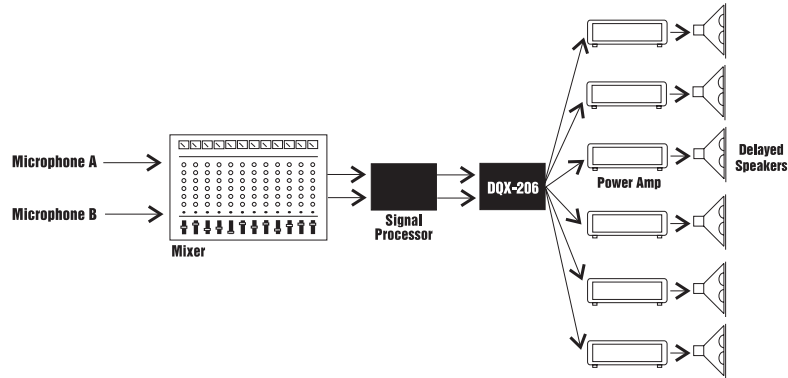
Channel: 1 2 3 4 5 6
Limit: N N N N N N

10. Limiter Indicator

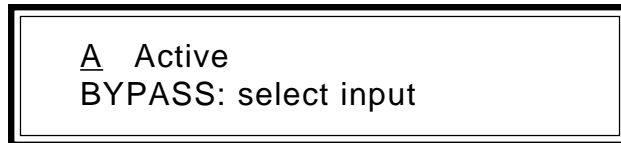
Section 5: Installation

5.1 Where to Install Your DQX-206 in the Sound System. The DQX-206 will typically be placed in the signal chain directly before the input to the power amplifiers driving your speakers. If you are using a graphic equalizer, a Sabine FBX-1020, FBX-2020, or POWER-Q in your system, place this equipment in line after the mixer output, but before the DQX-206 inputs. Correct installation will look like this:

Fig. 4:
DQX installation

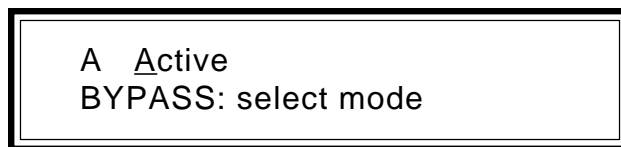


5.2 Bypassing the DQX-206. Since the DQX-206 distributes the sound from two inputs into up to six outputs, a hard-wire bypass is impossible. However, it is quite a simple matter to bypass the filters and delay of the DQX-206, maintaining distribution of the input signal to any of the outputs to which it is routed. The bypass function will NOT bypass the limiter. To bypass the processing downstream from the input (except for the distribution to more than one output), use the four cursor keys next to the display window to scroll to the following screen on the DQX-206:



This screen allows selection of the input signal (channel A or channel B) using the increase/decrease switches, as indicated by the underscore on the top line (under the “A” in the example). The signal in the selected channel will bypass the filters and delays of the DQX (there will still be a .72 ms delay at the output signals, due to the processing time of the DQX analog-to-digital and digital-to-analog conversions).

Use the right cursor key to move the cursor to Active, as shown:



Use the increase/decrease buttons to switch between active and bypass modes for the input channel chosen. When either or both input channels are bypassed, many functions and controls for the DQX are rendered inoperative. Functions and keys that remain operational during bypass include: (1) output level adjustment in the delay screen; (2) all limiter controls, and (3) the increase/decrease keys, which are used to change from active to bypass modes.

Section 6: Quick Start-Up Guide

Place your DQX-206 in the signal path following the mixer and any other signal processing equipment, but before the power amplifiers, after you have set up your sound system and placed all speakers in their final positions. Make sure you route the (up to) 6 outputs of the DQX to the correct amplifiers! If you are using graphic EQs, or other signal processing gear (such as a Sabine FBX-1020Plus or FBX-2020Plus to control feedback), patched between the mixer and the power amplifier, refer to section 5.0 for more information.

6.1 Automatic Delay Set-up. The simplest method for time aligning your speakers is to use the Sabine Automatic Delay Set-up procedure. Follow these simple steps:

- Place a microphone at your chosen reference position (see section 8 for more information) in the acoustical space (the type or quality of the microphone will not matter, as long as it passes signal). Plug the microphone into the mixer, and raise the gain of the mic input to a reasonable level (audible but free of feedback.) as the DQX-206 requires a signal level at its input between -10dBv and 0dBv peak for proper operation. Do not use any equalization on the mic reference channel - at either the mixer or mic points.

- Make sure the DQX-206 is correctly installed in your sound system, and all the necessary power amplifiers and components are turned on with proper gain settings. If your setup is correct, the delay reference microphone signal will pass through the mixer, into the DQX-206, out through the power amplifiers to be heard through up to 6 speakers. Any amplified signal will in turn be heard by the microphone and routed through the system again. After verifying all this, please use the up or down cursor keys to scroll to this screen:

Run Auto Delay Setup
<ENTER> to start

- Press Enter. You'll be asked to verify the setup of the reference microphone (press ENTER again) and whether you want to "Reset All Delays." Pressing ENTER when prompted by this screen will usually be the correct choice; see section 8.2 for exceptions.

- You must elect to "Start or Skip" alignment for each of up to six possible speakers in your setup. For speakers you are aligning, you must set the level of the reference signal, then press ENTER to initiate Auto Delay Setup for each speaker. When you attempt to align more speakers than exist in your setup, the DQX's attempt to play the test signal will fail, and you must select "Done" from the menu choices to end the setup procedure. If you are testing a full complement of 6 speakers, the DQX will automatically stop.

- At the conclusion of Auto Delay Setup, the DQX will remind you to turn down your reference microphone to avoid feedback. When you confirm this, the DQX will automatically display the Speaker Polarity Check screen.

6.2 Speaker Polarity Check. The DQX-206 will automatically detect the polarity of your speaker cabinets. Before testing, the speaker polarity screen looks like this:

Speaker:	1	2	3	4	5	6
Polarity:	?	?	?	?	?	?

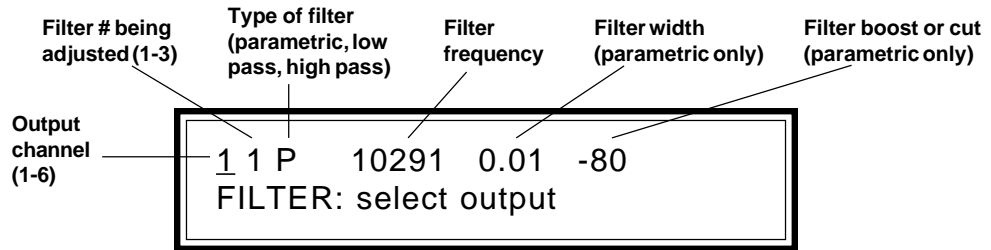
After running Auto Delay Set-up, the question marks will be replaced by either a + or -, as shown:

Speaker:	1	2	3	4	5	6
Polarity:	+	+	+	+	+	+

This screen indicates a common positive polarity of all speakers, indicating the system is wired correctly. Across-the-board negative polarities would also be an acceptable test outcome, since all speakers would produce phase consistent audio. However, if all speakers don't show the same polarity (i.e., some show + and some indicate -), the speaker systems will produce out-of-phase audio. Check the wiring of the speakers that differ (also check the wiring of the other components in that signal path). Make corrections as needed and run the test again, until you obtain consistent polarity.

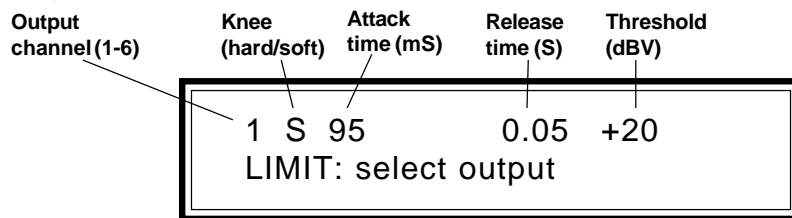
6.3 Editing Delay Times and Other Parameters. Once delay times are set and you've verified your speaker polarity consistency, you are ready to run signal through the DQX-206. Disconnect your reference microphone. All other parameters can be edited "on the fly." However, auditioning an audio program while altering delay times will produce a "popping" sound in the audio. This is normal and unavoidable, and will disappear as soon as you stop adjusting delay times.

6.4 Setting EQ Filters. Filters are set in the second screen. Use the up/down cursor keys to scroll to this screen:



You may set up to three filters for each output. The filters can be parametric, high pass, or low pass filters in any combination totalling three. The left/right cursor keys to the right of the display screen control the parameter selection. The two buttons (increase/decrease keys) to the right of the array of four change the chosen parameter values up or down.

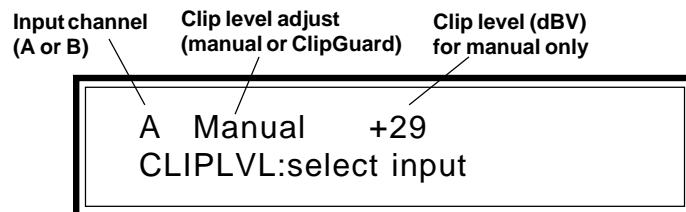
6.5 Setting Limiters. The limiter for each output of the DQX-206 is accessible in the third screen. Use the up/down cursor keys to scroll to this screen:



You may select different limiter parameters for each output (hard or soft knee), attack time, release time, and threshold. Parameters are chosen using the left/right cursor keys to the right of the display screen; parameter values are increased or decreased using the two increase/decrease buttons to the right of the four cursor keys.

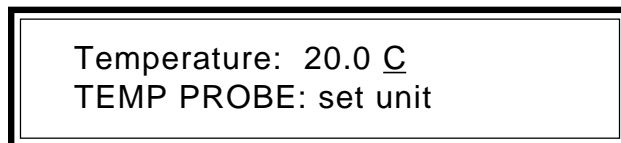
6.6 Setting Clip Level. For simplest, quickest set-up, set the Clip Level to "ClipGuard™." This function automatically optimizes the clip level adjustment in the digital signal path, maintaining unity gain and increasing the dynamic range of the unit to >105 dB.

The Clip Level screen is reached by scrolling with the up/down cursor keys. It appears as follows:



ClipGuard™ is the default setting, but if the default has been changed, ClipGuard™ must be chosen separately for each input channel (A and B). This is done by scrolling with the left/right cursor keys to the right of the screen, and using the two increase/decrease buttons to choose the correct option. Clip level (in dBV) may also be adjusted when clip level is set to "Manual."

6.7 Temperature Probe. If you have an optional temperature probe for the DQX-206, plug it into the jack on the back of the unit. This will automatically compensate for varying delay times necessitated by deviation from the air temperature at the time of delay set-up (the speed of sound changes with air temperature). The screen will show the following message when the sensor is in place:



The temperature probe will indicate the ambient temperature in either Fahrenheit or Centigrade (measurement scale is user selectable with the increase/decrease keys). When the temperature probe is not present the screen will indicate "NO Sensor."

Your DQX-206 should now be up and running. For more complete information, please refer to the manual instructions that follow.

Section 7: Overview & Philosophy of Digital Delays

Synchronize loudspeakers, eliminate comb filter distortion, align the acoustic image

Why Digital Delays?

The most intelligible sound occurs when two people speak face to face. The sound is loud and dry and the direction of the sound aligns with the speaker. It stands to reason that the most intelligible sound systems are the ones that come closest to emulating face to face communication. If this is your goal, a digital delay is essential to your sound system.

Until recently, a digital delay's cost was prohibitive for the average user. Only high-end applications could justify the cost. But recent drops in component prices now put the benefits of digital delays within affordable reach of every user.

There are three distinct applications for digital delays. The first and most important is **synchronization of the loudspeakers** to control excess reverberation and echo. Secondly, digital delays help **control comb filter distortion**, and finally, digital delays are useful for **aligning the acoustic image** so the direction of the sound seems to be coming from the performer rather than the loudspeaker.

This manual goes beyond the typical operating guide that only explains the front and back panel adjustments. Instead, we discuss the basic acoustical concepts needed to get the most out of your DQX-206 and present examples of several practical applications.

*Special thanks to
Hans Drobilitsch of
Hans Drobilitsch
Audio GmbH.
(Wollersdorf,
Austria) for his
invaluable technical
advice.*

Loudspeaker Synchronization

Sound travels at about 1,130 feet per second in air, or about 1 millisecond per foot. On the other hand, electronic signals travel almost one million times faster through your sound system to the loudspeakers. The main task of digital delays is to synchronize multiple loudspeakers so the sound traveling different distances arrives at the listener's ears at about the same time. Synchronizing the loudspeakers reduces reverberation and echoes for improved intelligibility.

How to Synchronize Your Signals

There are several powerful tools available for precisely measuring the time a loudspeaker signal takes to arrive at a certain point in the audience. Most of these tools are very sophisticated and tend to be quite expensive. Fortunately, simpler tools are sufficient for most applications.

In the 1930's, engineers synchronized the low and high frequency speakers in movie theaters by feeding a sharp click through the system. They moved the speakers until they could only hear a single sharp click coming from both speakers. You can use this same method with a common child's toy called a clicker. Pressing the thin metal strip makes a loud sharp click. A clicker is especially useful when synchronizing the direct sound from the performer with the sound from the loudspeakers.

Alternatively, you can use a phase checker especially for synchronizing the signals of two loudspeakers (either LF and HF or two full range systems) since most of the phase checkers include a click generator and receiver. Phase checkers are quite affordable and have other uses besides synchronizing.

Processing (or Group) Delays

Converting signals back and forth from the analog to digital domain always delays the signal a little. These conversion delays are often called processing (or group) delays, and usually range between 0.9 to 5 milliseconds. You will notice that Sabine delays always display the processing delay as the smallest possible delay value. For the DQX-206, the processing delay is 1.08 milliseconds. You can simply bypass the unit for 0 seconds delay.

Not all manufacturers acknowledge processing delays in their specifications, but you must take them into account when synchronizing your system. Make sure all digital equipment is on and not bypassed when synchronizing. Also, be careful to make an appropriate adjustment in your delay lines if you later add any type of digital equipment to the system.

Center Cluster Speakers

Center cluster speakers offer several advantages over systems that have speakers mounted on the sides. The most obvious advantage is that the distance to the closest and most distant locations in the audience is almost equal, so most listeners hear about the same level. Center clusters also offer two other advantages regarding the visual imaging.

Studies have shown that people can detect even small horizontal changes in the direction of a sound source, but vertical shifts are much less noticeable. This suggests that the sound from center-cluster speakers is more likely to be visually aligned with the performer than loudspeakers placed on each side of the stage.

All those in the audience who are closer to the performer than the center cluster will hear the direct sound from the performer before they hear the sound from the loudspeakers. This makes the sound seem to come from the performer, not the loudspeakers. (See the Precedence Effect discussion on page 11.)

Comb Filter Distortion

Many who took high school science may remember ripple tank experiments where waves are generated from two separate point sources. The waves from each source combine to form visible interference patterns. In some places, the wave crests and troughs are in phase so they combined to make a larger wave. In other places the crests are out of phase, so the crest of one wave source is canceled by the trough of the other. Ripple tank experiments show the interference patterns are strongest when the amplitude of the waves from each source is equal.

A similar interference occurs in sound systems when a signal is delayed and mixed back into the original signal. These interference patterns are called COMB FILTERS because their frequency response plots look like the teeth of a comb (see Figs. 5 & 6). There are a number of common situations that cause comb filters. For example, when the program is played through two loudspeakers, the loudspeaker that is farther away interferes with the closer loudspeaker. Comb filters are also created when a performer is picked up by two microphones, one closer than the other. You even introduce comb filters by mixing digital effects back into the "dry" signal at the mixer's effects loop.

Fig. 5:
COMB FILTERS. Input signal mixed with a 2 msec. delayed signal. (Both signals have the same amplitude. Max. filter gain is +6dB, and max. depth is $-\infty$.)

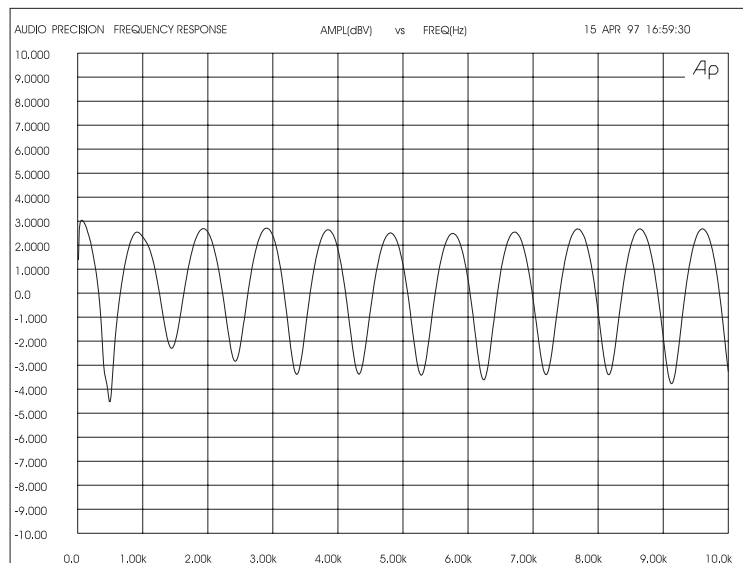
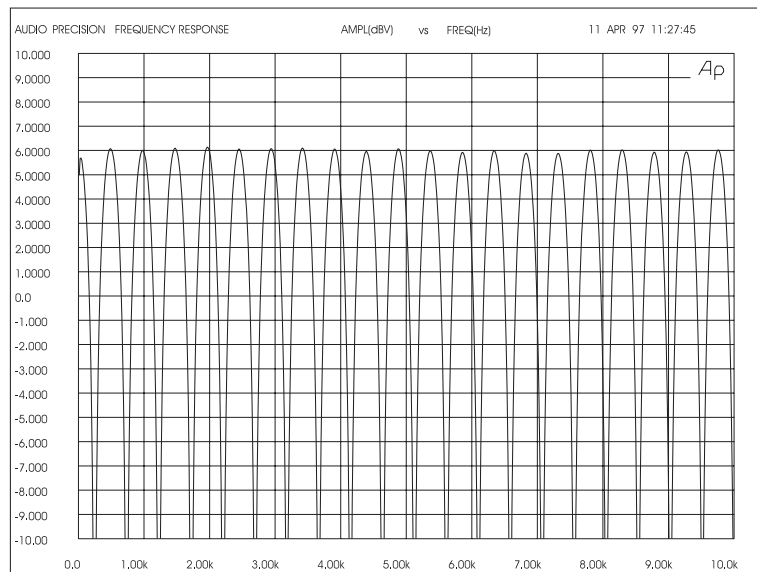


Fig. 6:
COMB FILTERS. Input signal mixed with a 2 msec. delayed signal. (Delayed signal has 10dB less amplitude. Max. filter gain is +2.5dB, and max. depth is -3.) Reducing the amplitude of the delayed signal reduces the comb filters' effect.

Calculating Comb Filter Frequencies

The frequencies of the reinforcements and cancellations depend on the delay time (the time difference between the arrival times of the original signal and the delayed signal). The frequency of the first cancellation occurs at $1/(2 \times t)$ Hz, where t = the delay time in seconds. The cancellations are separated by $(1/t)$ Hz. Fig. 7 shows how the comb filters change with the delay time.

Delay time = 0.002 sec.		Delay time = 0.003 sec.		Delay time = 0.004 sec.	
Cancellation Freq. (Hz)	Reinforcement Freq. (Hz)	Cancellation Freq. (Hz)	Reinforcement Freq. (Hz)	Cancellation Freq. (Hz)	Reinforcement Freq. (Hz)
250	500	167	333	125	250
750	1000	500	667	375	500
1250	1500	833	1000	625	750
1750	2000	1167	1333	875	1000
2250	2500	1500	1667	1125	1250
2750	3000	1833	2000	1375	1500
3250	3500	2167	2333	1625	1750
3750	4000	2500	2667	1875	2000
4250	4500	2833	3000	2125	2250

Fig. 7:
Comb filters get closer as delay time increases.

Comb Filter Amplitude

If the original signal and the delayed signal are the same amplitude, the reinforced frequencies increase in amplitude by 6dB, while the out-of-phase frequencies cancel completely to $-\infty$ dB.

Comb filters cause a lot of problems. The frequencies that are reinforced are prone to excite feedback, while the out-of-phase cancellations make the program sound thin and over equalized.

Try this simple experiment to hear what comb filters do to your sound.

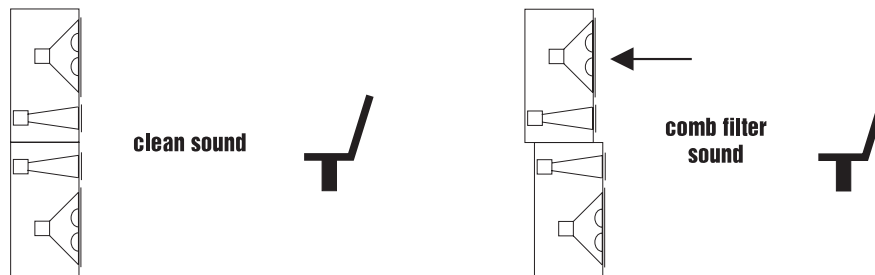


Fig. 8:
Comb filters noticeably affect your sound.

Stack two identical full-range loudspeakers as shown in Fig. 8. Carefully align the HF horns and wire the speakers in mono. Stand in front while listening to your favorite full-spectrum CD. Ask a friend to move the top speaker slowly away from you. The degradation in sound quality you hear is caused by comb filters. The experiment is most dramatic when you use good quality speakers.

Correcting Comb Filters

Comb filters are inevitable to some degree in every live sound system, and they cannot be corrected with equalization. Fortunately, most comb filter problems can be reduced to a minimum by synchronizing the signals and reducing the amplitude of the delayed signal. The examples below show several practical applications.

The Precedence Effect: Aligning the Acoustic Image

Helmut Haas published a study in 1951 describing a series of experiments that demonstrates how people perceive delayed signals and echoes. In his experiments, a listener was positioned between two speakers placed 3 meters away; one was placed 45 degrees to the right and the other was placed 45 degrees to the left. When the same program was played through both speakers simultaneously, the listener perceived the acoustic image (the direction from which the sound seemed to be coming) centered between the speakers.

When Haas delayed the signal going to one of the speakers by somewhere between 5 to 35 milliseconds, the listener perceived a shift in the acoustic image to the speaker heard first. While the delayed speaker did not contribute to the apparent direction of the sound, it did make the program seem louder and "fuller."

Haas showed that you must increase the loudness of the delayed signal by about 8 to 10 dB (twice the perceived loudness) in order for the acoustic image to move back to the original center position. Increasing the loudness more than this, or increasing the delay somewhat more than 35 milliseconds, makes the delayed signal sound like an echo.

The phenomenon describing how the acoustic image follows the signal we hear first is called the Precedence Effect. The phenomenon that makes two distinct sounds heard less than 35 msec. apart seem like only one sound is called the Haas Effect. However, the terms are often used interchangeably in the sound industry.

7.1 Digital Delay Applications & Uses

APPLICATION I: Under-The-Balcony Speakers

Fig. 9:
Overhead view
of under-balcony
application.

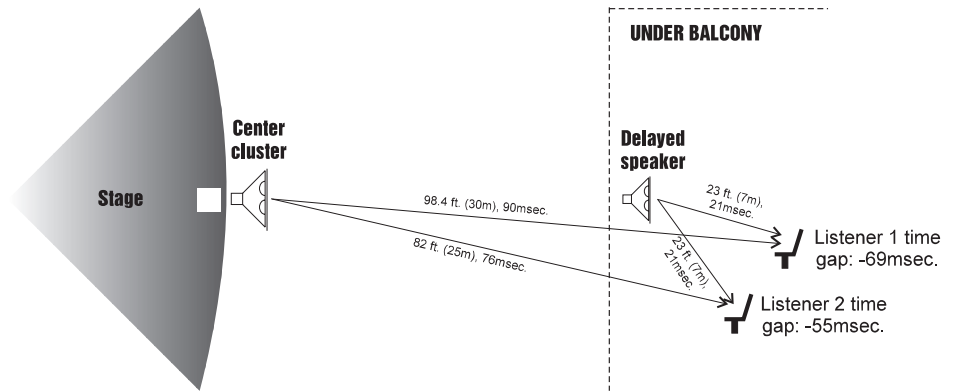


Fig. 9 above shows a typical situation where the performer is amplified by a center cluster hanging above the stage. Almost everybody in the audience will enjoy good sound, except those seated in the shadow of the balcony. So we add an under-balcony speaker to fill in the shadow.

Now we have sufficient volume under the balcony, but the sound from the two speakers arrives at the listener's ears some 76 to 84 milliseconds apart. The two signals, along with their echoes, result in an unintelligible cacophony. We must delay the sound from the under-balcony speaker to synchronize the signals. Do we set the DQX-206 delay to 76 or 84 milliseconds? Obviously, the geometry will not allow us to exactly synchronize every location under the balcony; we have to compromise.

First, you must consider the program type. For spoken word programs, you will produce the best intelligibility if the signals from the under-balcony speakers arrive within 10 msec. of the signals from the center cluster. Therefore we should set the delay to 84-86 msec. You can allow a little more reverberation for programs that are mostly music.

Next, we must eliminate comb filter distortion. Find the axis where the levels of the center cluster and under-balcony speaker are equal. (See "Comb Filter Distortion" described previously.) Use the DQX-206 to precisely synchronize the speakers along this axis to eliminate the most severe comb filters. Comb filters off the equal-level axis are much less of a problem since a louder signal is not affected very much by a weaker signal.

Finally, you can experiment with adding 5 to 10 milliseconds delay to both sets of speakers to enhance the Precedence Effect for the audience seated near the performer.

In the final analysis, every setting is a compromise, and your ear has to be the final judge. Check the sound in several different locations throughout the auditorium and correct the most severe irregularities.

Application II: Center Cluster with Front Fills

Fig. 10 describes a typical application that has a stage with a microphone, a center cluster above the stage, and front fills in front of the stage. There must be thousands of installations throughout the world like this that "get by" without digital delays. But with the DQX-206, you can improve the intelligibility and add a new quality without ringing up any significant costs. Use the DQX-206 in this situation to align the visual image with the acoustic image. The program is much more enjoyable when the amplified sound seems to be originating with the performer, not the loudspeakers.

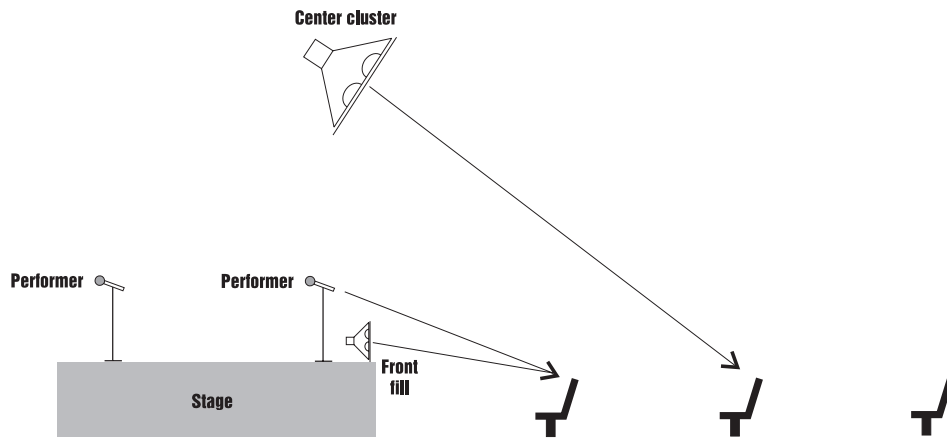


Fig. 10:
Synchronizing
center clusters
and front fills.

Find a central place in the audience where the center cluster is 6 to 8dB louder than the direct sound from the performer. Delay them so that their sound arrives 5 to 8 milliseconds after the direct sound from the performer. Experiment by bypassing the DQX-206 in and out to hear how the source of the sound seems to move from the loudspeakers to the performer and back. Now your ears have the same directional information as your eyes, so the performance will sound more natural and exciting. The best seats in the house just got better.

What about the front fills? Their purpose is to add intelligibility and listening comfort to the first few rows nearest the stage by filling in the areas missed by the center clusters. Simply add about 8 msec. to the front fills to take advantage of the Precedence Effect.

The 8 msec. setting presumes the performer is standing on the front few feet of the stage. But some stages are well over 30 feet deep. What if there is a second performer standing 25 feet behind the first? The direct sound from his or her voice will reach the first few rows about 25 msec. after the first performer's. The audience will perceive the first performer directly and the second performer through the loudspeakers.

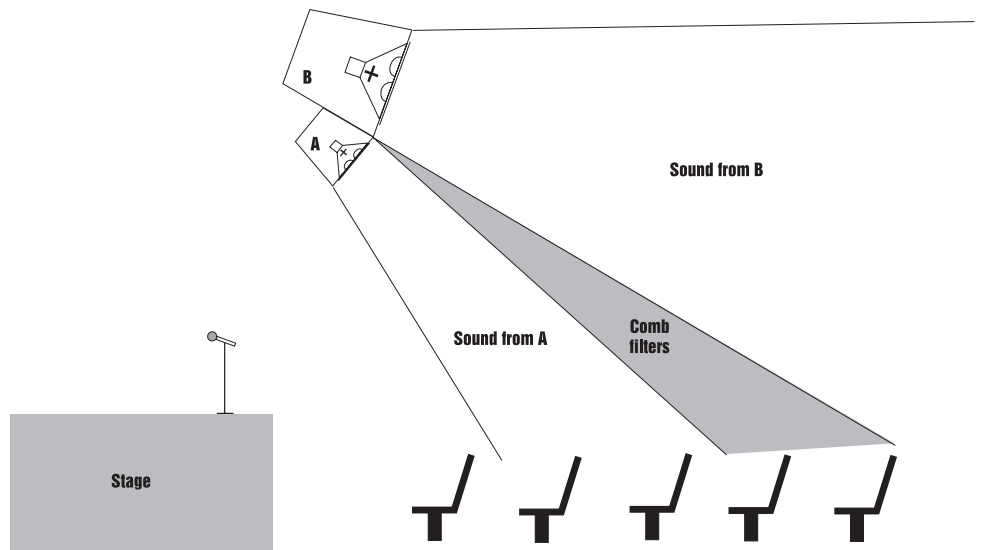
We can add the advantage of the Precedence Effect to the second performer by placing a DQX-206 in the mixer's channel insert point and adding a 25 msec. delay.

Certainly taking advantage of the Precedence Effect is not as obvious to the audience as eliminating feedback, but it is nice to know you did all that is possible to make the performance enjoyable.

Application III: Synchronizing the signals of a far-throw and short-throw loudspeaker.

In order to reach the proper coverage in larger venues, we often stack two full range speakers - a short-throw center cluster for the audience below and a far-throw speaker for the back of the auditorium. It is almost impossible to perfectly align the stacked speakers mechanically, so comb filter distortion becomes a problem in the area where the levels from both speakers are equal. The same thing happens with speakers mounted on the right and left sides.

Fig. 11:
Aligning far- and
short-throw
speakers. (The
level from both
speakers is equal.)



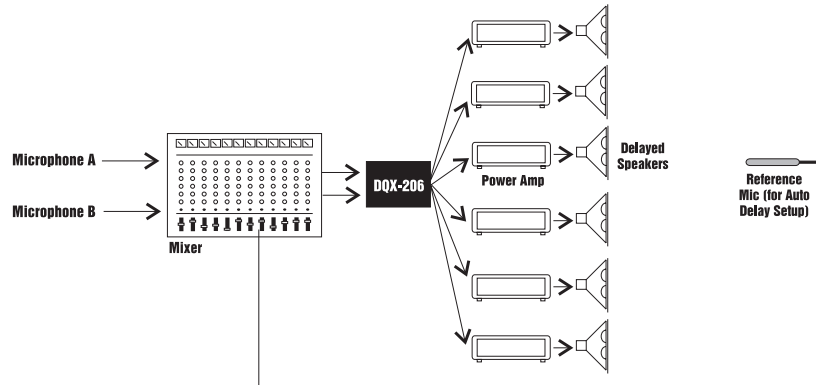
It is impossible to remove comb filters with equalization, but the DQX-206 eliminates them in short order without affecting the spectral balance for the rest of the audience. Find the axis where the levels from the two speakers are equal. This is where the comb filters are most severe. Carefully adjust the DQX-206 so that the signal from both speakers arrives at precisely the same time. The DQX provides 20 microsecond resolution for this purpose.

Use the same procedure to align speakers within a cluster when necessary.

Section 8: Setting Delay Times

8.1 Automatic Delay Setup. Once your sound system is set up, your speaker locations are finalized, and the mixer and amplifiers are connected and operational, you are ready to initiate the Automatic Delay Setup feature of the DQX-206. Here is an example of a possible 6 speaker setup in a hypothetical auditorium:

Fig. 12:
Six-speaker setup



Your first and a very important decision is reference microphone placement. Obviously, it is not possible to have all sound from all speakers arrive at all locations at the same time. Fortunately, sounds from aimed and placed speakers are not designed to project equally to all points in the auditorium. A compromise can usually be reached, balancing delay considerations, audience distribution, and the fact that volume diminishes rapidly as distance from a speaker increases. The reference microphone should be placed in a position which, in your judgment, will provide the best listening results for the largest portion of the audience.

The ref mic will serve as the one location which will compare the length of time sound takes to travel to its location from the six speakers, as they each sequentially emit several short audible pulses generated by the DQX. The DQX-206 will automatically emit the pulses (which are very short, about 20 milliseconds long), starting with one speaker, and sequentially emitting the pulse through the others. In a very short time, all speakers will have passed the pulses through the air to the microphone diaphragm, into the mixer channel, and ultimately back to the DQX. The DQX will measure the time taken to receive the signal after its generation, compare the times from generation to reception for all speakers, and insert a time delay to make all signals arrive at the reference mic at the same time. This entire process takes less than 2 minutes.

To initiate Auto Delay Set-up, scroll through the screens using the up/down keys.

```
Run AUTO Delay Set-up
ENTER to start
```

Press ENTER. The following screen will appear:

```
REF Mic Ready?
Cont Exit <ENTER>
```

Use the left/right keys to move the cursor below Cont (assuming your microphone is in place and the gain is turned up sufficiently), and press ENTER. The next screen will appear:

```
Reset All Delays?
Y or N <ENTER>
```

Use the left/right keys to move the cursor to either Y (for yes) or N. Yes means all speaker delays will be reset to minimum (1.08 milliseconds, the internal processing time of the DQX-206) prior to the onset of Auto Delay Setup. Selecting No allows the option of retaining a first set of delays for one subset of speakers, while automatically setting delays for a second subset. See Section 8.2 for more details.

When you have moved the cursor to your choice of Y or N, press ENTER again, which will produce this screen display:

#1 Speaker Alignment
Start or Skip <ENTER>

Use the left/right keys to select either Skip or Start. Skip will bypass Auto Delay Setup for speaker #1, and move on to speaker #2. Selecting Start and pressing ENTER will cause the screen to change to the following display, while producing an auditory test signal for measurement purposes:

Adjust Level: -18 dB
<ENTER> to Start

The level of the delay output will default to -18 dB to protect your speakers. Press the increase/decrease keys to change the level until you achieve your desired output gain. Press ENTER to continue. The DQX will attempt to align the appropriate speaker, as indicated by the following screen:

Aligning #1 Speaker
Quiet Please!!

The DQX will produce a series of 6 pulses during the testing sequence for each speaker to reduce the likelihood of measurement error. The DQX-206 listens for the loudest sound peak in the short time following each pulse generation and compares the values; each measurement must agree. This reduces the possibility of an extraneous sound being misinterpreted as the test signal, producing erroneous delay information. To further minimize the likelihood of extraneous sounds producing inaccurate results, we recommend that you maintain quiet during the brief testing period.

After testing one speaker, the DQX-206 will set a delay time, or if no test signal is detected, the following screen will appear:

#1 SPK Level Too Low
Retry Next Done

This indicates that the signal the DQX is receiving is **not** between) and -10dBv peak, or that the gain structure through the mixer is causing excessive noise or signal clipping.

The left/right buttons will move the cursor to select either Retry, Next or Done. Retry will reinitiate the Auto Delay Setup procedure for the selected speaker. (Note: Before selecting "Retry," make sure your reference microphone is passing signal and has sufficient gain. You may need to adjust the output level of the DQX test signal, and/or your amplifier gain.)

Selecting "Next" will instruct the DQX to proceed with testing the next speaker in the system, while selecting "Done" will conclude the Auto Delay Setup.

The Auto Delay Setup will conclude either by selecting "Done" after testing all the speakers necessary, or will automatically stop when all speakers have been tested. At the conclusion of the process the following screen will appear:

Turn Down REF Mic To
Avoid FDBK <ENTER>

Turn down or unplug your reference microphone, and press ENTER. The DQX-206 will automatically display the Speaker Polarity Screen (see Section 9). You are now ready to proceed with further adjustments and operations with additional DQX-206 controls. Read on for details.

8.2 Automatic Delay Setup with Delay Zones

Situations may arise in which the speakers you wish to time align are deployed to cover two or more separate sound zones, with little or no overlap of coverage between the speaker subsets. An example is a situation in which one DQX-206 is distributing outputs to two different rooms separated by a wall. One group of speakers (Zone A) would be set up with one reference microphone position, and the second group (Zone B) with the microphone moved to a new location. This may also be done automatically with the Auto Delay Setup procedure run as many times as there are speaker zones.

To accomplish this, follow the Auto Delay Setup procedure (as described in Section 8.1) until the following screen appears:

```
Reset All Delays?  
Y or N <ENTER>
```

Use the left/right cursor buttons to select "N" and press ENTER. Selecting "N" prevents the DQX-206 from resetting untested speakers to minimum delay; instead, it retains the existing delay setting for each speaker until it is tested and reset to a new delay setting (or until it is manually updated). Once you have selected "N" and pressed ENTER, the following screen will appear:

```
#1 Speaker Alignment  
Start or Skip <ENTER>
```

To test and automatically set the delays for the speakers in Zone A, position your reference microphone appropriately for the speakers to be tested, select "Start" for the appropriate speakers, and press ENTER to proceed with the Auto Delay Setup. For speakers excluded from Zone A, select "Skip" and press ENTER to move on to the next speaker. Once all the speakers in Zone A have been set, reposition your reference microphone and repeat the Auto Delay Setup. Make sure you select "N" when the screen asks if you wish to reset all delays. Select "Start" only for the speakers in the next zone, and "Skip" testing all Zone A speakers. The settings for Zone A speakers will be retained, and the correct delay values will be automatically set for Zone B.

8.3 Manual Delay and Output Level Setup. You may also choose to set your delay times manually, or edit the delays following Auto Delay Setup. Manual delay calibration may be facilitated by playing a sharp, well-defined sound such as a click through the DQX, and audibly aligning speakers by ear as you adjust the delay. (NOTE: don't play sound from more than two speakers at a time, and use the same speaker as a reference when auditioning sound from any combination of two speakers).

Whatever your method for setting delay times manually, adjustments are made by scrolling to the following screen (with the up/down keys):

Output channel (1-6)	Input channel (A or B)	Delay time	Output attenuation
<u>1</u> A		0.72mS	-13

DELAY: select output

The top line represents adjustable parameter values; the bottom line displays the parameter corresponding to this cursor. The underscore in the top line also indicates the cursor location and the parameter subject to adjustment. In the above example, we have selected output 1 for input A (indicated by the second field, letter A). To change to other outputs (2 through 6), use the increase/decrease keys. The screen will display your changes.

Other DELAY screens and adjustments are as follows:

1 <u>A</u>	0.72mS	-13
------------	--------	-----

DELAY: select input

This selects the input channel, A or B.

1 A	<u>0.72</u> mS	-13
DELAY: coarse set		

This coarse setting changes the delay time for the designated output, in large increments (milliseconds).

1 A	0.7 <u>2</u> mS	-13
DELAY: fine set		

This fine setting changes the delay time for the designated output, in small increments (fractions of milliseconds, with a resolution of 20 microseconds). Range is from .72 milliseconds (the processing time of the box), or .81 feet or .25 meters, to 2500 milliseconds (2829 feet or 860 meters).

1 A	0.72m <u>S</u>	-13
DELAY: set unit		

This sets the units in which delay is measured and displayed (milliseconds, feet, or meters). This saves you the trouble of converting distance to milliseconds of delay, and vice versa.

1 A	0.72mS	-1 <u>3</u>
DELAY: output lvl dB		

This sets the amount of output attenuation for the designated output, ranging from 0 dB to -95 dB.

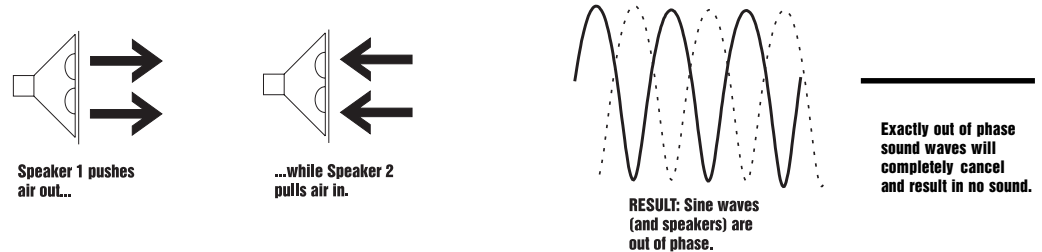
Note that all parameters in the DELAY screen are adjustable even after Auto Delay Setup. You can manually override or fine tune the automatically set delay times.

Section 9: Using The Speaker Polarity Indicator

Sound travels in a wave and obeys all the physical properties of wave forms. As discussed in Section 7.0, sound waves in many circumstances combine to create phase interference patterns known as comb filters. One of the most dramatic phase problems arises when two or more sources (i.e., sound system loudspeakers) of sound waves are wired inconsistently, so that one speaker is pushing air outward simultaneously to another pulling in. This is shown in the figure below.

Fig. 13:

From a point sound source, the sound will totally cancel from exactly out-of-phase, equal volume sources. For two separated speakers, the cancellation will vary throughout the listening environment.



The audible result of inconsistent speaker polarities producing sound is a non-linear frequency response in the listening environment from location to location. The effect will be most pronounced at any listening position where the volume of sound from two or more speakers is closest to equal.

The DQX-206 Automatic Delay Setup procedure (see Section 8.1) will automatically test speaker polarity. The best results of such testing will be obtained when, to the greatest degree possible, each speaker in a cluster or array, or within a speaker enclosure, is tested individually. For a speaker cluster, or when using an active crossover system, we recommend muting (or turning down the amplification) for all speakers except the one you wish to test. Such precise speaker testing will not be possible for a 2 or 3-way speaker enclosure with an internal passive crossover. In such a case, where the entire enclosure is tested as one unit, the polarity check should be accurate, but **results cannot be guaranteed**. Prior to initiating Automatic Delay Set-up the Speaker Polarity screen will look like this:

Speaker:	1	2	3	4	5	6
Polarity:	?	?	?	?	?	?

This indicates that information about the polarity of any of the possible six speakers in the sound system is unavailable, i.e., the polarity has not been tested. After running the Automatic Delay Set-up, however, the Speaker Polarity screen will show the following, if your speakers are wired correctly:

Speaker:	1	2	3	4	5	6
Polarity:	+	+	+	+	+	+

If one or more of your speakers is incorrectly wired (or the wiring earlier in the signal chain is wrong), your Speaker Polarity screen will indicate the problem speaker(s), for example:

Speaker:	1	2	3	4	5	6
Polarity:	+	-	+	+	+	-

This would indicate a reverse polarity wiring somewhere in the signal paths to speakers 2 and 6. Check the wiring, correct any errors, and rerun the test until all speakers show the same polarity.

Note that turning the DQX-206 off, and then back on, or otherwise losing power to the unit, will reset the unit Speaker Polarity screen to its untested default (all indicators with a question mark). This is a safety precaution to prevent the DQX-206 from indicating correct speaker polarity if the unit is switched off, moved, and setup as part of a new sound system.

Section 10: Using The Limiter Indicator Screen

The DQX allows independent programming of a limiter for each of its six outputs (see Section 12.0 for details). The Limiter Indicator Screen is a quick reference to show when the sound at any or all of the 6 outputs is being limited. Use the up/down cursor keys to scroll to the Limiter Indicator Screen, which will appear as follows (if no limiters are set):

Channel:	1	2	3	4	5	6
Limit:	N	N	N	N	N	N

Any channel with a limited output will be indicated by a "Y" under the appropriate channel on the screen. Limiters may not be turned on or off from the Limiter Indicator Screen; to adjust the limiters, see section 12.0. The Limiter Indicator Screen is designed to quickly show the status of limiter use for the DQX-206 outputs.

Section 11: Adjusting EQ Filters

The DQX-206 allows programming of up to three EQ filters for each of up to six outputs. These filters can either be parametric, high pass, or low pass filters. To adjust them, use the up/down cursor keys to scroll to the following screens (the FILTER screens):

Filter #	Filter type	Frequency	Filter width	Boost/cut
<u>1</u> 1 P		10291	0.01	-80

Output channel (1-6)

FILTER: select output

Use the up/down cursor keys to select which of the outputs (1 to 6) for which you wish to adjust filters.

1 <u>1</u> P	10291	0.01	-80
--------------	-------	------	-----

FILTER: select filter

Choose which of the three filters to adjust, for the designated output.

1 1 <u>P</u>	10291	0.01	-80
--------------	-------	------	-----

FILTER: select type

Select the type of filter. P = parametric, H = high pass, L = low pass. When you choose a parametric filter, you must also specify the frequency (next field to the right, ranging from 20 Hz to 20KHz), the filter width (ranging from .01 to 9.99 octaves), and the boost or cut (ranging from -80 dB cut to +12 dB boost). These parameters can be altered by changing the values with the increase/decrease keys.

If you choose a high pass filter to adjust, the following screen will appear:

1 1 <u>H</u>	80
--------------	----

FILTER: select type

Scrolling once to the right with the cursor keys will enable setting of the frequency at which the high pass filter will engage (range 20 Hz to 1000 Hz). Any frequencies below that threshold will be attenuated at a slope of 12 dB per octave.

Selecting a low pass filter will produce this screen:

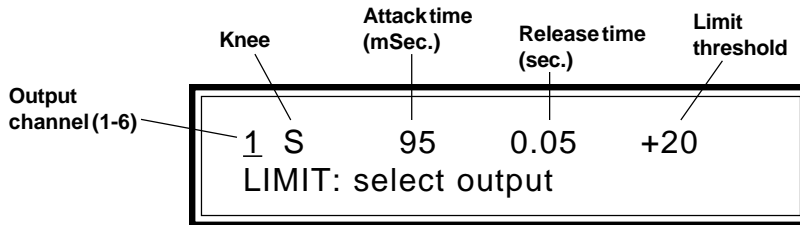
1 1 <u>L</u>	17810
--------------	-------

FILTER: select type

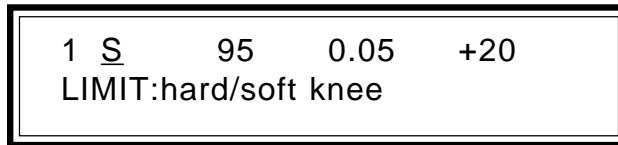
Scrolling once to the right will enable setting of the frequency at which the low pass filter will engage (range from 3150 Hz to 20KHz). Any frequencies above the threshold will be attenuated at a slope of 12 dB per octave. It is possible to set up to three filters per output channel, each programmable as described above.

Section 12: Adjusting The Limiters

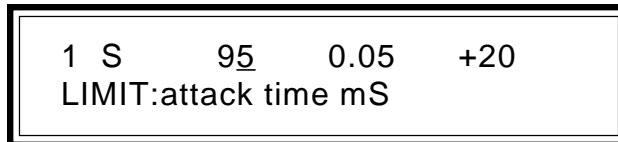
Each of the six outputs of the DQX-206 can have a limiter inserted into the signal path. The controls for the limiter are found in the LIMITER screen, accessed by scrolling with the up/down cursor keys, and which looks like this:



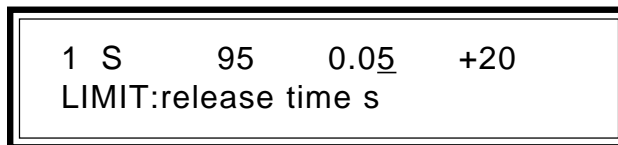
The first selectable parameter is the output. Choose which of the six output limiters you want to control:



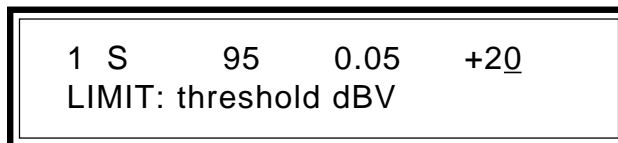
The second parameter allows adjustment of the limiter knee. Hard knee imposes limiting on the signal immediately when the gain threshold is crossed. Soft knee limiting has a more gradual onset of the limiting, starting 10 dB below the gain threshold with a gentler compression, and imposing the full limiting ratio to the signal by the time the threshold is reached.



The third adjustable parameter is the attack time of the limiter. This refers to the speed with which the limiting is applied when the threshold is crossed. This is adjustable from 1 to 95 milliseconds, in increments of 1 millisecond.



The fourth adjustable parameter is the release time of the limiter. This refers to the amount of time it takes the signal to return to unity gain when it falls below the limit threshold. This value is adjustable from .05 to 5 seconds.



The fifth parameter is the limit threshold. Any audio signal that exceeds this gain setting will be limited; below the threshold, the audio will be unaffected. This is adjustable from 0 to +29 dBV, and can also be set to "Off."

Section 13: Adjusting Clip Level

The Clip Level for the DQX-206 can be set to either manual or automatic operation using Sabine's patent pending ClipGuard™ algorithm. The selection is made from the following screen:

```
A ClipGuard
CLIPLVL: select input
```

Adjust Clip Level for either input A or B.

```
A ClipGuard
CLIPLVL: select mode
```

The second field of the Clip Level screen allows you to choose either Manual clip level control, or ClipGuard™. Choosing "Manual" enables the third field of the Clip Level screen, as follows:

```
A Manual    +29
CLIPLVL: set lvl dBV
```

The third field of the Clip Level screen allow you to set the Clip Level. The value displayed on the screen (which can range from 0 to +29 dBV) represents the upper limit to the dynamic range of the digitized audio. This dynamic range will typically be smaller than the dynamic range of the analog input feeding the DQX-206. To create the optimal balance of noise (which is more likely with low Clip Level settings) and distortion (more likely with high Clip Level settings), the Clip Level must be set correctly. For low input gain sources, this should be set at a relatively high value, minimizing noise. For high gain inputs, Clip Level should be set lower, avoiding distortion. If this is something you'd prefer no to worry about, may we suggest that you use ClipGuard™ to automatically optimize your clip level setting.

13.1 What is ClipGuard™? Setting the clip level would be a simple matter if audio wasn't dynamic, i.e., didn't vary from loud to soft volume. Of course, such an audio program wouldn't be very interesting! Your DQX-206 has a powerful new feature that intelligently and automatically matches the internal dynamic range to the constantly changing program level. We call this feature ClipGuard™. Before Sabine invented ClipGuard™, sound engineers were forced to compromise input and output levels, allowing too much noise in quiet programs, and risking clipping during high-level program peaks. With ClipGuard™ selected in the Clip Level screen, your signal-to-noise ratio and dynamic range will always be optimal, and digital clipping is impossible. Plus, ClipGuard™ acts inaudibly and maintains unity gain. For these reasons we recommend setting your Clip Level control to "ClipGuard™."

NOTE that neither Clip Level nor ClipGuard adjustments affect the output level of the signal, which always remains at unity.

Section 14: Saving And Loading Presets

The DQX-206 offers 30 memory locations for storing and recalling all settings. Once you have proper delays, limiting, and equalization set for a given application, you can save the settings, name the configuration, and instantly recall it at a later date. The memory screen looks like this:

```
0 Load Save  
MEMORY: Choose preset
```

The first field (ranging from 0 to 9) is the preset number.

```
0 Load Save  
MEMORY: ENTER to save
```

```
0 Load Save  
MEMORY: ENTER to load
```

The second and third fields allow you to save and load settings, respectively.

```
0 Load Save _  
MEMORY:change name
```

The fourth field is blank until you enter up to an 7-character alpha-numeric name for a preset. Go to this field by scrolling to the right with the right cursor key, until the above screen appears. You may enter up to 7 alpha-numeric characters using the increase/decrease keys and the left/right cursor keys. Presets can also be selected using the remote contact closure switching option (See Section 16).

NOTE DO NOT SAVE DQX settings while the unit is in BYPASS. If you do this, the unit will NOT recall the correct settings. ALWAYS store settings in active mode.

Section 15: Using The Optional Temperature Probe

The speed of sound varies with air temperature, and the delay times set for one temperature may no longer be optimal if the acoustical environment heats up or cools off.

The Sabine Temperature Probe is available as an option for the DQX-206. This plugs into the rear panel of the DQX, and has a cable long enough to extend out of your equipment rack (where the air temperature may be artificially higher) into the acoustical space.

When the Temperature Probe is plugged in, the DQX will automatically detect its presence. The following screen will be displayed (you may have to scroll up or down windows to the correct screen):

```
Temperature 20.0 C  
TEMP PROBE: set unit
```

The temperature displayed will be the ambient air temperature. You may use the increase/decrease keys to change from Fahrenheit to Centigrade (Celsius) scales.

IMPORTANT: Make sure the Temperature Probe is plugged in BEFORE you set your delays (either manually or automatically). Once the delays are set, the DQX-206 will automatically compensate for changes in the speed of sound as a function of temperature deviation. This automatic compensation will continue for as long as the Temperature Probe remains connected.

Section 16: Using The Optional Remote Control

If you have ordered the optional DQX Remote Control, the back panel of the DQX-206 (see Section 2.0) will contain a mounted 8-conductor Euro-block connector, and you will be supplied with the mating connector. This connector can be wired to any contact closure switch and will enable selection of up to 7 stored DQX-206 presets, depending on the position of the switch. This makes it possible for users to access different stored presets of the DQX, without requiring or allowing them access to the parameter adjustments of the unit itself.

Shorting the common pin to the first pin will select preset one, common to pin 2 selects preset 2, etc. The presets correspond to the first seven presets stored in the DQX-206 memory.

Section 17: Using The Back Panel Lock Button

The back panel of the DQX-206 (see Section 2.0) contains a lock-out button. When this button is depressed, all front panel controls are defeated, with one exception: it is possible to scroll through the various screens. None of the parameters, however, may be reset. When the LOCK button is depressed, the front panel LED labeled LOCKED will be illuminated.

Section 18: Troubleshooting Tips

	Problem	Suggestion
<p>In the unlikely event you should experience trouble with your DQX-206, here are some suggestions about what might be wrong. Some of these suggestions are pretty obvious, but so sometimes are the solutions! For additional assistance, call the Sabine Customer Service Department at (904) 418-2000, Monday through Friday 9:30 a.m. to 5:30 p.m., Eastern time.</p>	<p>NO AUDIO COMING FROM DQX-206 OUTPUTS</p>	<p>Check connections. Are input and output reversed? Do the DQX-206 LED ladders show signal? If yes, check connections and gain settings for the power amps downstream from the DQX.</p>
	<p>“PUMPING” AUDIO</p>	<p>Check DQX-206 limiter settings.</p>
	<p>FRONT PANEL CONTROLS DO NOT WORK</p>	<p>Check lock button setting. Is the front panel LOCKED indicator illuminated?</p>
	<p>FRONT PANEL CONTROLS APPEAR TO WORK, BUT DO NOT AFFECT SOUND</p>	<p>Is the DQX-206 in bypass? Are the bypass LEDs on the front panel illuminated?</p>
	<p>AUTOMATIC DELAY SET-UP DOES NOT WORK</p>	<p>Check reference microphone and connections. Is the microphone signal getting back to the DQX? If you tap on the microphone, can you hear it through the speakers? If not, then the DQX will not hear the microphone signal either. Tapping the microphone should cause the LEDs on the DQX to register signal.</p>
	<p>DISTORTED OR NOISY AUDIO</p>	<p>Check the Clip Level settings on the DQX. If the Clip Level is set to manual, a low value may cause distortion, and a high value may result in a hiss-like noise. The simplest solution is to set the DQX Clip Level setting to “ClipGuard™.”</p> <p>Distortion or noise may also be caused by other equipment (besides your DQX) or settings in your signal path. Place the DQX in bypass; if the problem remains, its source is probably not the DQX.</p>
	<p>MEMORY RECALL SETTINGS ARE INCORRECT</p>	<p>Make sure you save your settings while the DQX-206 is in ACTIVE MODE. Saving setting while in BYPASS will result in incorrect memory storage and recall.</p>

Section 19: Engineering Specifications

PERFORMANCE

Frequency Response: +0.0 dB, -0.3 dB @ +22 dBV, 20 Hz to 20 KHz

Dynamic Range: >94 dB

THD: <0.01% @ 22 dBV @ 1 KHz

Converters: 20-bit delta-sigma

Sample Rate: 50 KHz

DELAY

Range: 1 millisecond - 2.5 seconds per channel

Minimum Increment: 20 microseconds

Digital Resolution: 20 bit A/D & D/A

PARAMETRIC EQ

3 programmable EQ filters per output channel (any combination of parametric, high pass or low pass)

Digital notch filters controlled parametrically from 20 Hz to 20 KHz.

High pass filter with cutoff frequency, user-controllable in 1/6-octave intervals between 20 Hz and 1 KHz, 12 dB/octave roll-off.

Low pass filter with cutoff frequency, user-controllable in 1/6-octave intervals between 3.15 KHz and 20 KHz, 12 dB/octave roll-off.

Notch filter depth: User-controllable in 0.5 dB steps from +12 dB to -84 dB.

Filter width: User-controllable from 0.01 octave to 1.00 octave. Constant Q

Resolution: 1 Hz from 20 Hz to 20 KHz

LIMITER

Threshold: +29 to -10 dBV peak in 1 dB steps

Mode: Soft/Hard with variable preset

Attack: 1 to 95 msec. in 1 msec. steps

Release: 0.05 to 5 sec. in 0.05 sec. steps

DISPLAY

2 x 20 character LCD

Feet, meter, millisecond display

INPUT/OUTPUT

Input Impedance: Balanced >10 K Ohms, PIN 2 high

Output Impedance: Balanced 10 Ohms nominal, PIN 2 high

Maximum Load: 600 Ohms

Input/Output Maximum Signal Levels: Balanced +26 dBV peak

Headroom: +22 dB @ 4 dBV nominal input

I/O Connectors: XLR 3-pin

POWER INPUT

100, 117, 230 VAC +/-15%, 50/60 Hz, <18 Watt

DIMENSIONS

1-U rack mount; 19 x 1.75 x 8.5 in. (48.3 x 4.5 x 21.6 cm)

Weight: 8.0 lb. (3.6 Kg) nominal

OPTIONS

Remote Contact Closure Switching

Temperature Probe

The DQX-206 is compliant with all Year 2000 Y2K standards.

SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE.

FCC STATEMENT:



Warning: Changes or modifications to this unit not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

This device complies with Part 15, Class B, of the FCC Rules. Operation is subject to the following conditions: (1) This device may not cause harmful interference; and (2) This device must accept any interference received, including interference that may cause undesired operation.

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio TV technician for help.

This digital apparatus does not exceed the Class B limits for radio noise emissions from digital apparatus set out in the Radio Interference Regulations of the Canadian Department of Communications.

Le present appareil numerique n'emet pas de bruits radioelectriques depassant les limites applicables aux appareils numeriques de la class B prescrites dans le Reglement sur le brouillage radioelectrique edicte par le ministere des Communications du Canada.

Section 20: Safety Information

Warning! This equipment must be earthed.

Caution! Risk of electric shock. Do not open.

Caution! Shock hazard. Do not remove covers. No user serviceable parts inside. Refer servicing to qualified service personnel.

Warning! To reduce the risk of fire or electric shock, do not expose this product to rain or moisture.

Attention! Cet appareil doit être relié à la terre.

Attention! Risque de choc électrique; ne pas ouvrir.

Attention! Risque de choc; ne pas ôter les capots. Aucune pièce accessible à l'intérieur. S'adresser à un technicien qualifié.

Attention! Pour réduire le risque d'incendie ou de choc électrique, ne pas laisser l'appareil sous la pluie ou à l'humidité.

Achtung! Dieses Gerät muss schutzgeerdet sein.

Achtung! Gefahr eines elektrischen Stromschlags. Gehäuse nicht öffnen.

Achtung! Gefahr eines elektrischen Stromschlags. Gehäuse nicht öffnen.

Keine von Benutzer zu bedienenden Teile im Geräteinneren.

Überlassen Sie das Gerät zu Servicezwecken nur geschultem

Fachpersonal.

Um Brandgefahr oder das Risiko eines elektrischen Schlags auszuschließen, das Gerät vor Nässe und Feuchtigkeit schützen.

Advertencia! Este equipo debe estar conectado a tierra.

Precaución! Riesgo de descarga eléctrica. No abrir.

Precaución! Riesgo de descarga eléctrica. No desmontar las tapas.

Piezas interiores no reparables por el usuario. Reparable sólo por personal cualificado.

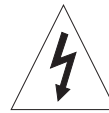
Advertencia! Para reducir el riesgo de incendio o de descarga eléctrica no exponga este producto a la lluvia o humedad.

CAUTION:

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

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

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



Warning!



The DQX-206 is designed to operate from standard AC power. Please be sure the power in your area is compatible with the power module accompanying the unit. Using the wrong input voltage may cause permanent damage to the unit and will void the warranty.

The DQX-206 is supplied with one of the following AC power cords:

Japan	100 VAC
U.S./North America	120 VAC
Continental Europe	230 VAC
United Kingdom	240 VAC
Australia	240 VAC



Caution!



Replace the fuse with a fuse of exactly the same rating specified on the rear of the product.

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

One-Year Limited Warranty

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

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

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

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

ONE-YEAR LIMITED WARRANTY/REMEDY

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

CONDITIONS, EXCLUSIONS AND LIMITATIONS OF LIMITED WARRANTIES

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

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

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

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

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

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

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

If the defect is remedial under the limited warranties and the other terms and conditions expressed have been complied with, Sabine will provide the necessary warranty service to repair or replace the product and will return it, FREIGHT COLLECT, to you, the purchaser. Sabine's liability to the purchaser for damages from any cause whatsoever and regardless of the form of action, including negligence, is limited to the actual damages up to the greater of \$500.00 or an amount equal to the purchase price of the product that caused the damage or that is the subject of or is directly related to the cause of action. Such purchase price will be that in effect for the specific product

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

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

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

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

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

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

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

INSTRUCTIONS-WARRANTY REGISTRATION CARD

1. Mail the completed WARRANTY REGISTRATION CARD to:

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

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

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

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

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

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

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

MADE IN USA.

Manufactured by: Sabine, Inc. • 13301 Highway 441 • Alachua, FL 32615-8544 USA •
Phone: (904) 418-2000 • Fax: (904) 418-2001 • www.SabineUSA.com

SABINE
ADAPTIVE AUDIO

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