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DBX 4BX DYNAMIC-RANGE EXPANDER

Manufacturer's Specifications

Expansion: 0 to 50% (in dB), for each of three bands (1:1.5 maximum).

Impact-Restoration Gain: 0 to +12 dB, each band.

Transition-Level Range: 30 to 300 mV, mid-band.

Volume-Control Range: −40 to +10 dB.

Frequency Response: 20 Hz to 20 kHz, ±0.5 dB, with no expansion.

Noise: −90 dBA re: 1 V.

Harmonic Distortion: Less than 0.15% without expansion.

Maximum Input/Output Level: 6 V at unity gain.

Impedance: Input, 1 megohm; output, 200 ohms.

Dimensions: 17-15/16 in. (456 mm) W × 3½ in. (89 mm) H × 12¼ in. (311 mm) D.

Weight: 11 lbs. (5 kg).

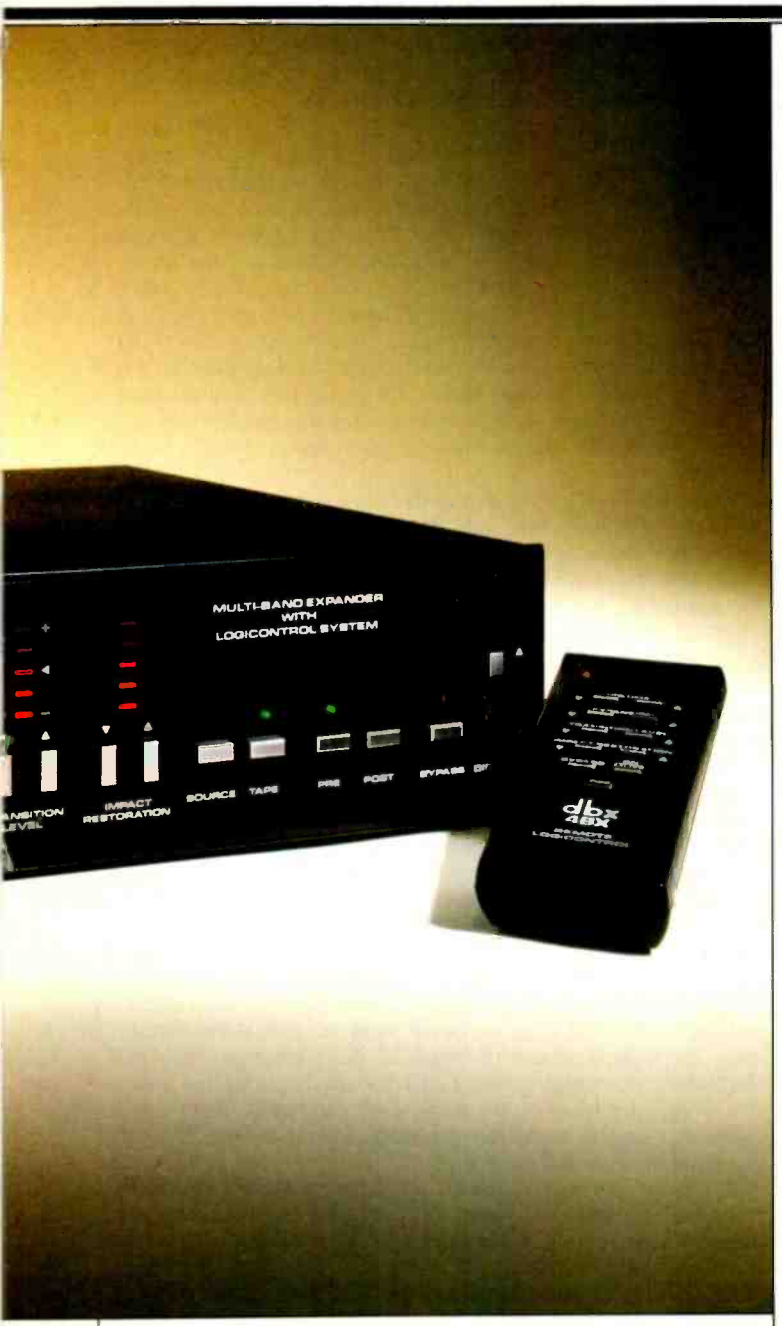
Price: $799.00.

Company Address: 71 Chapel St., Newton, Mass. 02195.

For literature, circle No. 90

The Model 4BX is the latest and most sophisticated in dbx's series of expanders designed to recapture the dynamics lost in recording or broadcasting. There are three bands of processing in the 4BX, to minimize such unwanted effects as "pumping" of the high frequencies in reponse to dynamic variations in the bass. The three bands cover frequencies from 150 Hz down ("LF"), from 150 Hz to 6 kHz ("MF"), and from 6 kHz up ("HF"). Gain change in each band is indicated by a horizontal row of LEDs—six yellow LEDs to the left indicate up to 20 dB of downward expansion, and upward expansion is indicated with six red LEDs to the right (+12 dB maximum). Below this array is a row of 12 red LEDs that illuminate, from left to right, to show the amount of instantaneous impact restoration, again to a maximum of 12 dB.

The "Volume," "Expansion," "Transition Level" and "Impact Restoration" controls all have separate momentary-contact increase and decrease buttons. Above each set of buttons is a five-bar red-LED ladder. For "Volume," the "rungs" indicate gain, in 10-dB steps from −30 to +10 dB. The "Expansion" indications are in steps of 10%, from 10% (1.1:1) to 50% (1.5:1). The "Transition Level" indicators have



a minus sign at their bottom bars, a reference arrow in the middle, and a plus sign at the top. There are no designations along the "Impact Restoration" ladder, but with increasing action, more LEDs turn on. In all cases, the actual control is much finer than the resolution of the LED steps, indicated to some extent by the intensity of the top-most lit LED. The "Volume" (gain) can be immediately muted by 40 dB with the light-touch "Power On/Mute" button. Another touch returns the volume to its previous setting.

There are also light-touch buttons with status lights for "Off," for "Source" and for "Tape" (the latter two electrically interlocked), as well as for "Pre" and "Post" (with similar interlocking). At the very right of the front panel is a vertical slider for setting the brightness of all of the LED displays, anywhere from completely off to "easily seen in a bright room." The one exception is the red LED above "Off" to show that the unit is, in fact, still on. When "Bypass" is used, the gain-change LEDs are extinguished, but other indications remain on. The "Pre" and "Post" switches offer the choice of processing either the signal fed to a tape recorder or the playback signal. All functions except "Source/Tape" and "Pre/Post" switching are duplicated on the infrared remote control supplied; a green LED next to the receptor on the front panel acknowledges receipt of remote commands. A good feature is that continuous, smooth level changes can be made by holding down the appropriate button on the panel or on the remote control; it is not necessary to make a series of small steps, though small steps can be made with short taps of the button.

The back panel has stereo pairs for line in/out and tape recorder in/out. There is also a screw-type fuse-holder, not supplied by most manufacturers these days. Two trim pots, one for the "HF/Transition Level" and the other for the "Impact Restoration" release rate, are both set at the factory and best left alone by casual diddlers. More on these later.

Removal of the steel top and side cover revealed a nearly chassis-size p.c. board with another board above it on standoffs. There was also a small, vertical p.c. board for the remote-control receptor preamp. The soldering was excellent, parts quality was high, and parts were identified. Interconnections between boards, including the full-size front-panel one, were with multi-pin cabling.

Measurements

Figure 1 shows the swept-frequency responses for a number of conditions. First, the input level was adjusted for 1-kHz unity gain, even with expansion introduced. Then, responses were taken in "Bypass" and with 1.5:1 expansion switched in, and for four settings of the back-panel "HF/Transition Level" control. The response is very flat in "Bypass," but note that, with the expansion switched in, there is some elevation of the low-frequency band. The level of the high-frequency band varied greatly over the range of the control, from −3.5 to +19 dB for the same input level. The +3 dB setting was used for the next responses, with the input level increased 5 dB and for expansions of 1.3:1 and 1.5:1. Similar plots were made with the input level reduced 10 dB. All of the expansions are quite accurate (with the unity-gain offsets factored in), and the curve shapes are consistent for the same expansion.

The responses without expansion were within 0.3 dB from 20 Hz to 20 kHz (within 0.2 dB in "Bypass"), and the −3 dB points were at 6.0 Hz and 90 kHz, for both cases. With some expansion, the responses indicated the filter crossovers—around 150 Hz between the low- and mid-frequency bands, and from just below 2 kHz to a bit above 6 kHz between the mid- and high-frequency ones, depending on the setting of "HF/Transition Level." For most of the tests, the crossover was between 4 and 6 kHz. Others checks demonstrated that the filter roll-off rates were fairly high, judged to be completely satisfactory for the needed isolation between bands.

The 4BX made great improvements in what was received from all the pop/rock stations. This was less certain with the classical.

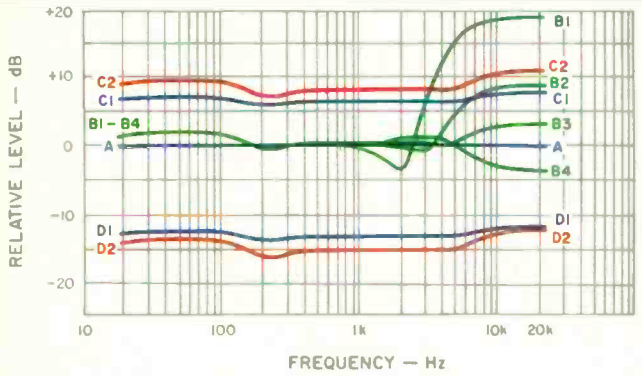


Fig. 1—Swept-frequency response for various control settings: "Bypass" position (curve A), and with 1.5:1 expansion switched in, at four settings of the rear-panel "HF/Transition Level" pot (curves B1 through B4). With input level raised 5 dB, mid-frequency level rises 6.5 dB with 1.3:1 expansion (curve C1) and 7.5 dB with 1.5:1 expansion (curve C2). With input level lowered 10 dB, mid-frequency level falls 13 dB with 1.3:1 expansion (curve D1) and 15 dB with 1.5:1 expansion (curve D2). All C and D curves were made with "HF/Transition Level" set at +3 dB.

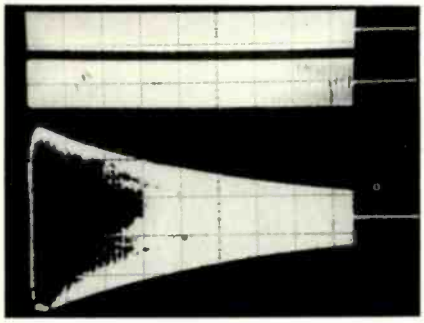


Fig. 2—Response to 500-Hz tone burst of 425-mS duration: Input (top), output with 1.3:1 expansion (center), and output with 1.3:1 expansion plus maximum "Impact Restoration" (bottom). Scales: Vertical, 2 V/div.; horizontal, 50 mS/div.

The input level for unity gain, with "Transition Level" set to its minimum, was 860 mV at 1 kHz. The level was 11 mV for the maximum setting, and 78 mV with "Transition Level" set for the middle indication. For those who think of it in terms of adjusting a threshold, this probably seems a bit backwards; if, however, the "Transition Level" adjustment is thought of in terms of effect, it becomes quite logical—lowering the threshold on an expander *will* increase the output level.

The maximum input/output voltage was 6.8 V or greater, from 20 Hz to 20 kHz. There was no slew-rate limiting observed with an input of 2.0 V and a 1.2:1 expansion, even at 100 kHz. The harmonic distortion was 0.03% or less over a range of levels across the band, except for increases with higher levels when using expansion.

The input impedance measured 920 kilohms at 20 Hz and 470 kilohms at 1 kHz, falling to about 30 kilohms at 20 kHz—still much higher than most high-fidelity equipment at this frequency. The output impedance was very close to 225 ohms from 20 Hz to 20 kHz. "Volume" and "Transition Level" could be controlled very smoothly over their entire ranges; with a fast, light touch it was possible to make changes of ±0.5 dB, if required. Muting was very close to the rated 40 dB; the exact result depended on the 0-dB adjustment, which was affected by one's judgment of the LED's brightness for that level. The expansion settings also could be changed very smoothly, and the expansions remained accurate over a wide range of levels, from −60 to +20 dB.

Referred to 1 V, the signal-to-noise ratio was 93.5 dBA with no expansion, and actually increased to over 100 dBA with 1.5:1 expansion set in. Varying the "Transition Level" and "Volume" settings introduced some changes, as might be expected, but S/N did not change with variations in the "Impact Restoration" setting.

Tone bursts were used to check response times of the gain-change LEDs: 70 Hz for "LF," 700 Hz for "MF" and 10 kHz for "HF." For a correctly indicated +6 dB gain change, the required durations were 30 mS for "LF" and 8 mS for "MF" and "HF." The gain-change indicator thresholds were a bit on the low side near unity gain, with the steps more linear (in dB) toward the extremes. I did not judge this to be particularly negative, as the higher resolution near unity gain helps to set a good transition level, especially with moderate expansion.

Next, a look was given to the characteristics of the "Impact Restoration" circuit. Figure 2 shows the 4BX's response to a 500-Hz, 425-mS tone burst, first with just 1.3:1 expansion and then with maximum "Impact Restoration" added. The "HF/Transition Level" was set so that the expansion generated about +4 dB of gain change. "Impact Restoration" creates a sharp rise in level, to about four times (+12 dB) the level of the expanded waveform; then, quite quickly, there is a period of decay, approaching the expanded level at the time of cutoff. Another check showed that the decay time could be set anywhere from 25 mS to 1.5 S using the rear-panel control. The decay times, as would be expected, were longer for tone bursts in the "LF" band and shorter for those in the "HF" band. The decay-time pot was reset to about 0.6 S for further tests.

While trying the various controls and looking for the limits over which "Impact Restoration" would work, I noted some odd waveforms, but they seemed to be somewhat sporadic. Here's what emerged after a bit of digging: (1) "Impact Restoration" did not function on bursts that were well below the unity-gain point; (2) it functioned normally on bursts up to and above the transition level, and (3) there was a small range somewhat below this point where it acted incompletely or after a delay period. Figure 3 shows what one of these looked like (top), with a delay of almost 100 mS. Small increases in level smoothly eliminated the delay and produced the expected waveform (bottom). At this point, I

Even if the price is too challenging, the 4BX is worth a listen to hear what's possible with this well-designed unit.

decided that I could be chasing something of little significance as far as sonic qualities were concerned.

Use and Listening Tests

The owner's manual is very well written, providing good detail in the instructions and the background material. The cautions on using "Pre" for tape recording are right to the point: Expanding into noise and saturation is all too easy! The remote control was used for all of the listening tests, and it was considered essential for using the dbx unit to its best advantage. Most tests were run with discs, although some time was spent trying local FM stations; it was quickly proven that the 4BX made great improvements in reception with all of the pop/rock stations. This was less certain with the classical stations, and I was interested in repeating the listening source—easy to do when I played records.

In general, I felt the 4BX improved the classical listening, and I concluded that, for the discs I tried, 1.3:1 expansion was about right, with "Impact Restoration" about halfway up. Portions of Mussorgsky's *Pictures at an Exhibition* (Colin Davis, Concertgebouw Orchestra, Philips 9500744) were especially enjoyable. Here and there, I seemed to hear some gentle garbling, but I couldn't pin anything down.

In the pop discs, the improvements were emphatic and most desirable. I had known how compressed many of these were, even some of the audiophile discs, but I was still surprised how great they sounded—usually with 1.4 to 1.5:1 expansion and "Impact Restoration" most or all of the way up. Ones I liked in particular were Linda Ronstadt's *Prisoner in Disguise* (Asylum 7E-1045) and Buddy Spicher and Friends with *Yesterday and Today* (Direct Disk DD 102).

Wondering if I could see any level oddities, I made a strip-chart recording of the first part of "Georgia on My Mind" from the Spicher record. Figure 4 shows the recordings for no expansion or "Impact Restoration," 1.3:1 with some "Impact Restoration," and 1.5:1 with maximum "Impact Restoration." The chart speed and pen response were not fast enough to show the effects of "Impact Restoration," but the smooth expansion is quite evident. Other runs demonstrated that shifts in "HF/Transition Level" did not affect the expansion in any way. High-speed recording did not reveal any jogs or delays in "Impact Restoration" response over the range of levels shown.

The dbx 4BX dynamic-range expander has a high price tag, so it is likely that most audiophiles will need proof of the value of this add-on. There are no caveats on its basic performance, and for those who enjoy pop/rock music from any source, this unit delivers a new and yet real world. It was astounding how lifeless some of the recordings became with a push of "Bypass." In a couple of the classical music trials, it seemed as though the bass was slightly less extended with the 4BX, but it was also noted that the sound was slightly brighter, and that might have affected the judgment on bass. For those who would like to revive the half-dead, constricted discs we all have, or hear over the air, the dbx 4BX could very easily be well worth its challenging price tag. Even if you don't think you would ever buy it, give the Model 4BX a listen with some of your favorite discs just to hear what's possible with this well-designed unit.

Howard A. Roberson

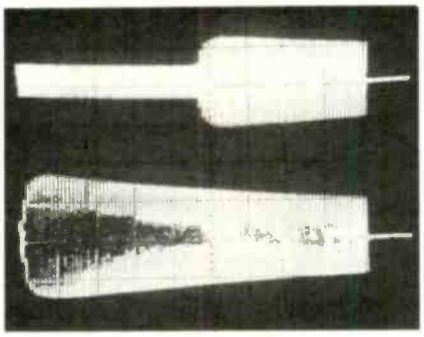


Fig. 3—For signals below transition level, a delay may occur before "Impact Restoration" takes effect (top). With input above transition level, "Impact Restoration" works immediately (bottom). Signal shown is 500-Hz, 180-mS tone burst, with no expansion. Scales: Vertical, 0.2 V/div.; horizontal, 20 mS/div.

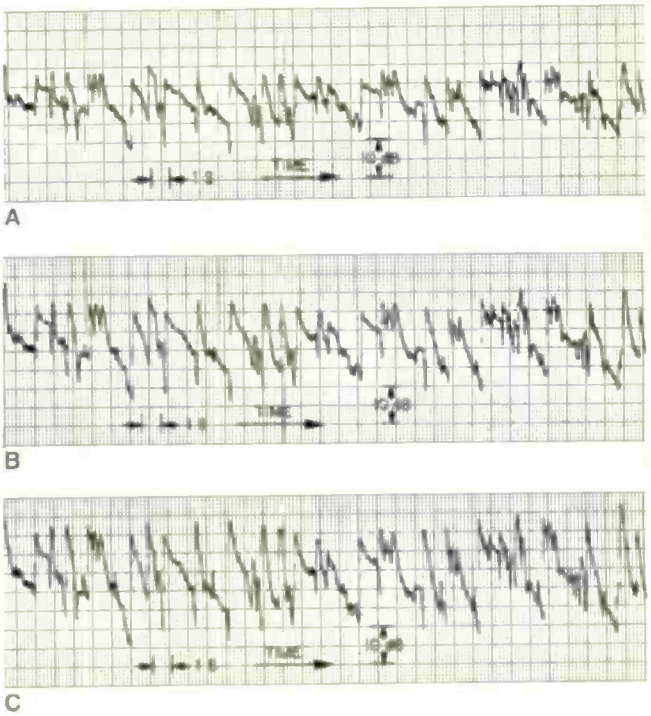


Fig. 4—Music levels of opening section of "Georgia on My Mind" (Buddy Spicher and Friends), in "Bypass" (A); with 1.3:1 expansion and "Impact Restoration" setting of 0.4 (B), and with 1.5:1 expansion and full "Impact Restoration" (C). Effects of "Impact Restoration" are not clearly visible here because of the slow speed of the chart recorder.