

dbx

Model 120X
Digital Series

Subharmonic Synthesizer

Instruction Manual

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a division of BSR North America Ltd.



INSPECTION and INSTALLATION

Your unit was carefully packed at the factory in a protective carton. Nevertheless, be sure to examine both carton and contents for any signs of damage that may have occurred during shipping. If there is such evidence, don't destroy the carton or any of the packing material, and notify your dealer or distributor immediately.

In any case it's a good idea to save the carton and packing materials should you ever need to ship your unit in the future.

In addition to a 120X-DS and this instruction manual, the carton should contain a set of hookup cables with RCA phono, or pin, plugs, a warranty/registration card, and a pair of brackets for mounting the unit into a standard audio-equipment rack.

No special cooling or ventilation is required in any installation; other components may be stacked above or below the 120X provided they don't generate excessive heat.

WARNING

TO PREVENT FIRE OR SHOCK HAZARD,
DO NOT EXPOSE THIS COMPONENT
TO RAIN OR MOISTURE.

This triangle, which appears on your component, alerts you to the presence of uninsulated dangerous voltage inside the enclosure — voltage that may be sufficient to — constitute a risk of shock.



This triangle also appears on your component, and it alerts you to important operating and maintenance instructions in this accompanying literature.

CAUTION
To Reduce Further the Risk of Shock, Do Not Remove the Cover or Back. There Are No User-Serviceable Parts Inside; Refer All Servicing to Qualified Personnel.

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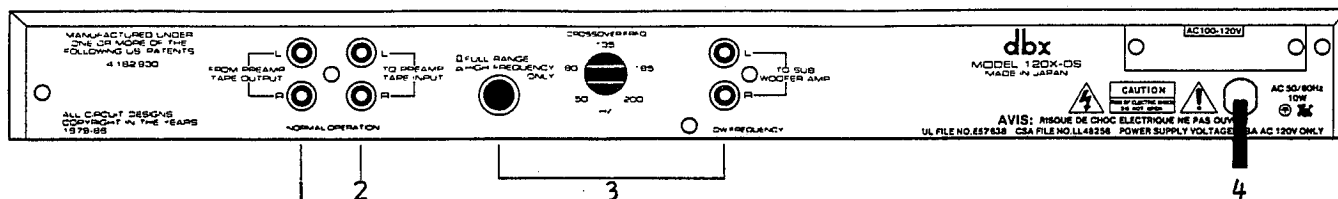
SPECIFICATIONS

Frequency response (no synthesis, full-range mode).	25 Hz-20 kHz \pm 1dB
Dynamic range.	105 dB
Total harmonic distortion (THD), (no synthesis, either output).	0.05%
Intermodulation distortion (IMD) IHF or SMPTE (no synthesis, either output).	0.05%
Output noise (either output)	-90 dBV, controls @ maximum
Equivalent input noise	-95 dBV
Maximum input and output	6 V
Synthesis frequency range.	27-55 Hz (from 54-110-Hz input signal)
Crossover.	12 dB/octave high- pass (-3dB @ 120 Hz), 6 dB/octave derived lowpass; phase- coherent (unity-sum); variable 50-210 Hz
Power requirements	see rear of unit

Notes

- 1) Specifications are subject to change without notice.
- 2) All data are for 20 Hz-20 kHz unless otherwise specified; line inputs are driven by a source impedance of 1 k-ohms and outputs are loaded by 10 k-ohms in parallel with 1000 pF; all voltages are rms (root-mean-square).
- 3) Dynamic range is defined as the difference between the maximum rms 1-kHz output signal and A-weighted noise. All noise figures are A-weighted.
- 4) SMPTE IMD is measured with 60 Hz and 7 kHz mixed 4:1; IHF (difference-tone) IMD is measured with 19 kHz and 20 kHz mixed 1:1; output 1 V.
- 5) Inputs and outputs have identical polarity.
- 6) All dbx home products are designed to be used with components whose output impedance is less than or equal to 5 k-ohms. All units are designed to drive loads of at least 5 k-ohms in parallel with 1000 pF or less.

REAR CONNECTIONS



Turn your system off and the volume all the way down.

"Preamp" stands for your preamp, receiver, or integrated amp -- or the tape-monitor (record/play) loop of an equalizer or other component.

1 FROM PREAMP TAPE OUTPUT. Connect your preamp's Tape Out to these inputs.

2 TO PREAMP TAPE INPUT. Connect these outputs to your preamp's Tape In. (Note that with some components Tape Out is called Tape Rec and Tape In is called Tape Play or Tape Monitor, and there are other variations.)

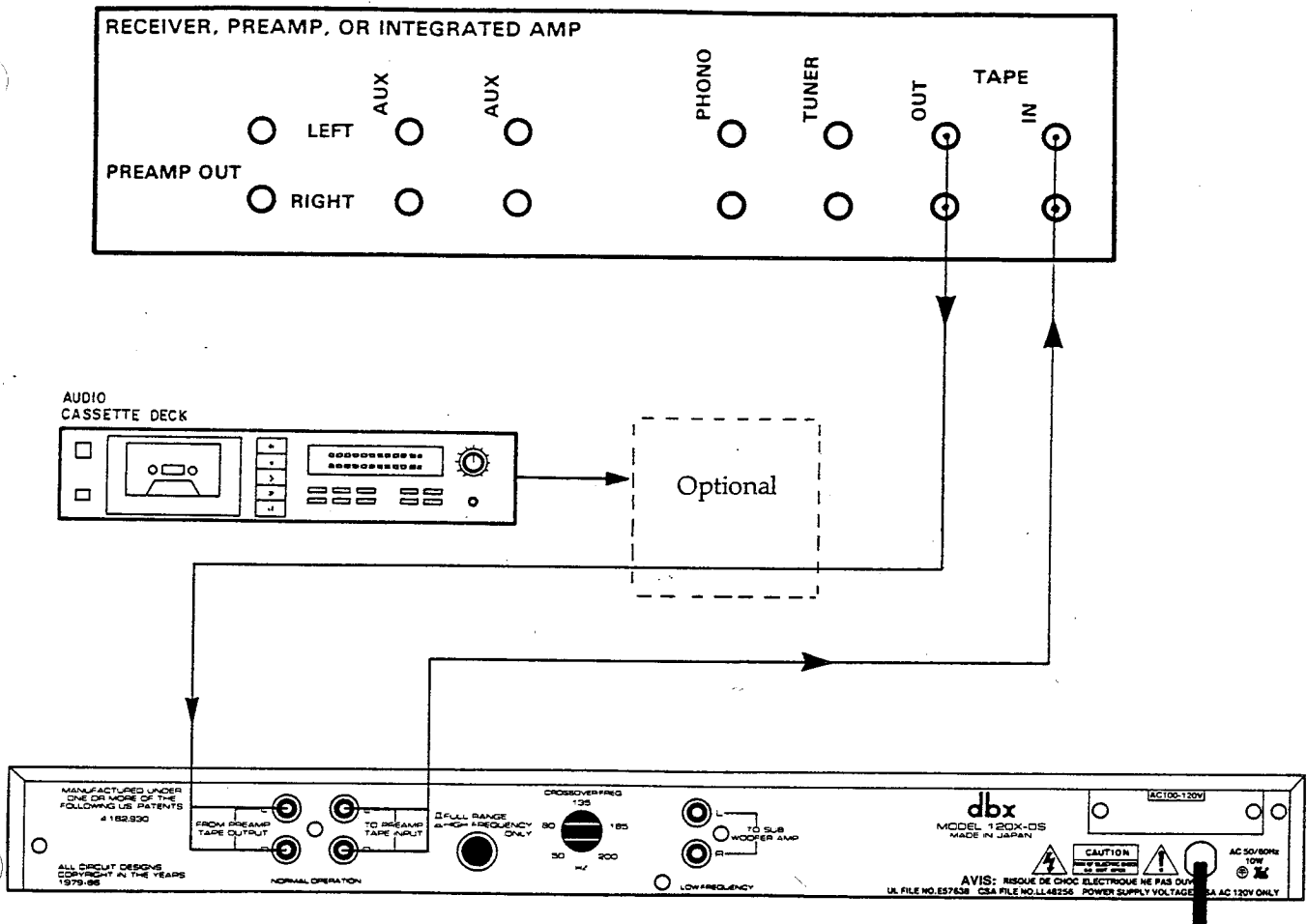
3 FULL RANGE/HIGH FREQUENCY ONLY button and LOW FREQUENCY/TO SUBWOOFER AMP Output jacks. Leaving this button out sends the full-range (20 Hz-20 kHz) signal out of the outputs immediately to the left. This is Normal Operation (that is, your system has no subwoofer/extra amplifier).

Pushing the button in, to High Frequency Only, is for biamped subwoofer applications. What this means is that the signal gets divided: the Outputs to the left become "HF Only" and send out the higher frequencies, from your chosen crossover frequency up to 20 kHz, while the Outputs to the right, called Low Frequency Out, send to your subwoofer amplifier the low bass from 20 Hz up to the crossover frequency.

4 POWER CORD. Connect this cable to the appropriate power source. If another piece of equipment has a switched outlet (your preamp, for instance), that's one good place to plug in.

If you ever need to change the voltage setting, unplug the unit from the wall jack and also push the power switch off. Then unscrew the small voltage cover plate near the ac cord, move the switch with a small screwdriver, turn the plate upside down (180°, in other words, which exposes the switch in its new voltage position), and screw it back on. Don't turn the plate over.

TYPICAL HOOKUPS



With a component with only one tape-monitor loop

The preamp's Tape Out or Tape Rec goes to the From Preamp Tape Output on the 120X-DS. If you have a tape deck, it goes here, between the preamp and the 120X-DS, with the preamp's Tape Out going to the deck's inputs and the deck's outputs going on to the 120X-DS's input called From Preamp Tape Output. Red plug = right channel.

With or without a tape deck, the signal returns to the preamp's Tape In from the 120X-DS's To Preamp Tape Input jacks.

To use the 120X-DS in playing records, listening to CDs or video sources, or listening to the radio in this setup, you must select Tape Monitor on your preamp and, if you have a tape deck,

turn it on and put it in Source. Be sure that its recording-level and any output-level controls are at their normal positions, not all the way down. To use the 120X-DS in playing tapes, operate your deck normally, pushing its Tape/Source to Tape.

Preferable to that setup is putting the 120X between preamp and power amp (with a receiver, this means between Pre Out and Main In if the receiver has that option). Some care is called for in turning the power amp and 120X-DS on and off, to prevent any low-frequency transients from harming speakers and startling listeners. Try always to turn the 120X-DS on first, before the power amp, and the amp off first, before the 120X.

Other situations

If you have a dbx noise-reduction unit and/or other signal-processing equipment, study the other diagram on the preceding page and read on.

If you have two tape-monitor loops with dubbing capability and only one tape deck, it's best to put the deck in the first loop and the 120X-DS in the second. If your preamp has an EP (external processor) loop, so much the better; put the 120X-DS there.

In a complex system (one with other signal processors), place the 120X-DS last in the chain except as noted below. Other processors might include a dbx dynamic-range expander, an ADC graphic equalizer (for altering program material), or a dbx noise-reduction unit, or all three. The order shown is the one we recommend as most quiet and flexible but it may be altered if necessary, although it's essential to keep the path between noise-reduction unit and tape deck clear of any signal processors.

Two sound-processor categories that should come after a model 120X-DS in the chain are speaker-only ("dedicated") equalizers and automatic equalizers like the dbx 10/20. These should have the last word on the sound -- even after the 120X-DS's bass augmentation. Note that most speaker-only equalizers (e.g., those by dbx, Allison, Bose, EV, McIntosh, et al.) provide large low-bass boosts. So do some of the new receivers (e.g., NAD). EXTREME CAUTION is required when using the 120X-DS with them.

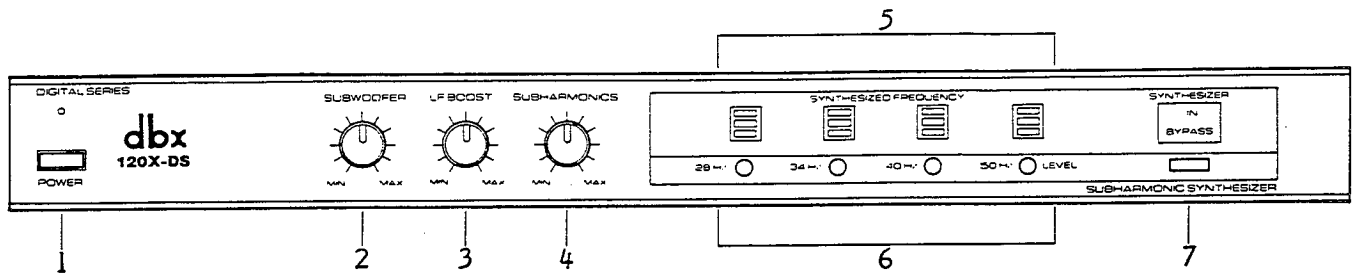
Those whose stereos approach this complexity should investigate the dbx 200 and 400 series Program-Route Selectors.

Subwoofer systems

Connect the 120X-DS's To Subwoofer Amp jacks to the inputs to the subwoofer's amplifier and use the front-panel Subwoofer knob to set the level. Even if your subwoofer setup has its own crossover, the 120X-DS's is probably more precise and is certainly more flexible; we recommend using it. Set the frequency according to what the subwoofer prefers for its crossover (consult its instruction manual). Barring that, other options are (1) tuning your total system bass by ear, which is not easy but will be instructive, making your low-frequency hearing discriminating, or (2) leaving the knob around or below the middle of its rotation, in the 100-135 Hz region.

If your subwoofer setup is one without its own, separate power amp, don't use the To Subwoofer Amp jacks of the 120X-DS. Use the Full-Range ones (being sure the button is out) instead and run the subwoofer system the way you always have.

FRONT PANEL



1 **POWER.** This turns the unit on and off. If you plug the 120X into a switched jack, you can leave it in and power it up with your system. Otherwise, be sure turn it on first (before receiver or power amp) and off last (after everything else is off).

2 **SUBWOOFER.** This knob controls the level of the below-120-Hz signal (original program plus synthesized harmonics) coming out of the Low Frequency jacks (To Subwoofer Amp). If you turn the knob up too far the bass may become unnaturally heavy. Note that this knob does nothing if your subwoofer system is not a biamped one.

3 **LF BOOST.** This knob increases the bass on each channel, but its action is somewhat different from and gentler than that of most bass tone controls. In the 150- and the 30-Hz areas it's much less strong, and even at its own boost peak, in the 60-Hz area, it is less boomy (and potentially damaging) than the typical bass control. Thus it might be said to fill in the "gap" between the very low bass (below 55 Hz) the 120X-DS creates and the mid-bass of the original program, smoothly and effectively evening out the total apparent bass output. For this reason this knob does not have a lot of overlap with the Subharmonics knob: the boost comes after the subharmonics are summed in, but most of them are lower than the knob's range of maximum effect. LF Boost may be used by itself, as an all-purpose bass control, although it can't lessen bass and, as noted, the shape of its curve is different. Be cautious about cranking it all the way up, especially if you're using any other bass tone control (not advised) or speaker equalizer (see the Hookup section) -- or if the Subharmonics knob is past its midpoint too.

4 **SUBHARMONICS.** This knob, along with the individual frequency trims, controls the amount of synthesized bass that the 120X-DS adds to the program. Its effect depends not only on where it is set between MINimum and MAXimum but also on how much bass is present in the original signal to be augmented.

5 **SYNTHESIZED FREQUENCY LEDs.** These LED columns show, by frequency, the amount of new signal being generated by the 120X-DS in response to the original program that may be added in. The numbers below them are the centers of the new bass frequencies, exactly half the frequencies of the incoming signals.

6 **28, 34, 40, 50 Hz LEVEL trims.** These individual knobs let you custom-tailor the amount of the above synthesized frequencies to be added in, tuning the ultimate bass response of your system to taste. For example, if the sound is woofy or growly (as on male announcer), try turning down the 50-Hz level. If your woofers are bottoming out (making a ticking, popping sound) or fuses are blowing or your amp is clipping, try turning down the 28-Hz level. If your room booms around 40 Hz (not uncommon), try moderating that level too. Experimentation will pay off with smooth, full, deeply extended bass.

7 **SYNTHESIZER button.** This switches the 120X-DS's action into and out of operation, enabling comparisons. The button removes the 120X-DS and the incoming program is not augmented or boosted in the bass.

INTRODUCTION TO SUBHARMONIC SYNTHESIS

Many of the components in your hi-fi system may be specified as having flat frequency response from 20 Hz to 20 kHz, but your loudspeakers, even if they are accurate to begin with and properly placed in your room, more than likely roll off in response below 50-60 Hz. Furthermore, your system seldom has to handle any frequencies below this range, because not much program material is ever recorded or broadcast that low, even with the advent of Compact Discs -- although there are those dangerous test and "showpiece" CDs. If very low bass is done away with, as usually happens with all non-digital media, it's easier on equipment, from record cutters and tape recorders to speakers and power amps.

Furthermore, even at loud listening levels the ear is not nearly as sensitive to low frequencies as it is to high ones, and this insensitivity increases at softer levels. If a 1- or 2-kHz sound (the frequency area where the ear is most sensitive) is at 95 dB SPL (loud orchestral music), a 50-Hz tone has to be at about 115 dB SPL to sound equally loud -- 20 dB louder! At lower levels, the difference is greater: a 2-kHz sound at 60 dB SPL (quiet chamber music) is equaled in loudness by a 50-Hz tone at 85 dB SPL, a difference of 25 dB. So to maintain the proper listening balance at the softer level in just this concert-hall range, 50 Hz would have to be boosted fully 5 dB (30 Hz would have to be boosted about 8 dB to maintain the balance). And at levels lower than 60 dB (which are common in the home), the relative differences are greater.

Then there are times simply when more and lower bass is wanted. With the 120X-DS, you can go get it -- provided your woofers (and neighbors) can handle it.

Clearly, the model 120X-DS will prove useful for listening at all levels below the very loudest in the home. It performs a different kind of "loudness compensation": it restores or augments what may be diminished or absent in the lowest octave, and it increases to the proper levels all of those sounds the ear begins to miss in moderate and quiet listening.

NOTES ON USE

Begin by setting the preamp's bass control to flat (usually noon) and seeing that any "loudness contour"/low-level bass-boost button or knob is likewise out of the signal path. Later on you can resume using these controls (in moderation), as you become familiar with how they differ from the 120X-DS's controls and what combinations of settings are euphonious. Boosting everything now at the start will likely send something into distortion.

Then pull out some of your favorite listening material (but not if it's bass-shy). If your taste runs to popular music, especially rock, start by setting the Subharmonics knob at its midpoint and vary the LF Boost knob from 1/3 to nearly full right. Be careful, again, not to turn it right recklessly and/or at loud listening levels. After you find a boost level that thumps as low and hard as you like, experiment with the Subharmonics knob for satisfying levels of "felt" bass. You may find that the rock (and other) cuts you like best take on a whole new life, as will pop-FM stations.

Similarly jazz, especially walking-bass solos and big-band blowouts with swing drumming. Like pop and rock, these often loud and exciting recordings may have been compressed and had their deep bass filtered out. The model 120X-DS will put back the sock.

With classical music a lighter hand is called for, especially with the Subharmonics knob. Also, note that here it really pays to play with the individual frequency levels. The growl of organ pedals and the "oomph" of full-orchestra attacks can be brought up even using the midpoint Subharmonics setting (and below). Some piano repertory likewise can have lower-frequency textures extended and pleasingly thickened, notably the larger 19th-century Romantic works, which have considerable impact heard live. The same goes for the symphonies of the period. But excessive bass augmentation/synthesis and boost will make many classical instruments boomy. In the same vein, spoken and vocal material calls for no subharmonic synthesis, nor do upper strings and woodwinds.

EXPERIMENTATION AND POSSIBLE PROBLEMS

Phasing

Since you are going to be increasing the bass response of your music system, it may be a good time to recheck your speaker wiring to ensure that the loudspeakers are moving in phase with each other. When they are in phase, their cones move together, forward or backward, at the same time. For full details refer to the speakers' instruction manual. Briefly, the way to check phasing is to ascertain that the two speakers are hooked up identically, from the power amp's output connections through the two sides of each speaker wire (cable) to the input terminals of the back of the speaker. It doesn't particularly matter how one side (either right or left) is done, but the other channel must be exactly the same. While you are doing rewiring, you might want to replace any flimsy or thin speaker wire with heavier "lamp" or "zip" cord, available at most hardware stores, 16-gauge or lower.

By the way, all speaker wire has one conductor side coded to make proper hookups easier. Usually this side has a thin ridge or bead running the length of the wire; sometimes the wire itself is different colors, one side silvered and the other copper.

Loudspeaker placement and listener positions

Generally, the most marked way to change the sound in your room is by repositioning the speakers; this often has an even greater effect than buying new ones. Now might be the time to relocate yours. Most listeners know that speakers apparently produce more bass near wall or wall/floor intersections than far from them. But it's not as widely known that this increase usually comes from uneven, boomy bass. It's almost as easy to get smoother and more even bass. The rule (unless the speaker manufacturer specifically advises otherwise) is to place each speaker so that the distances from the center of its woofer to the three nearest boundaries (walls and floor, usually) are as different as possible. These distances are measured along the speaker-cabinet sides, not in a straight line. When these distances are the same, the bass response of most speakers is roughest, with peaks and dips more than 10 dB apart over just a few notes. Putting a conventional box-shaped speaker woofer-down in a corner will make it sound very bassy (and yes, a few of the low notes are being strongly emphasized), but for evenness of bass it's the worst spot possible.

The formula for calculating maximally different distances a, b, and c and least-bumpy speaker placement is $a/b = b/c$, or $b^2 = ac$, a, b, and c not equal, of course.

The same acoustical laws apply to your listening position: the smoothest bass will result when the distances from your head to the three nearest boundaries are as different as possible. Likewise rooms: the boomiest rooms have all three dimensions the same, and the smoothest have them maximally different.

Timbral Balances

If you do wind up repositioning your speakers, it might be desirable to reset any output-level controls on the back of the cabinets for tweeters and midranges. Many speakers are flattest with these controls all the way up, and the new increase in bass might be better-balanced by such a maximum setting.

Turntable Feedback

Finally, any or all of these improvements in bass may well make your record player more susceptible to feedback, wherein the turntable base, platter, cartridge/stylus, and/or the disc itself actually pick up and replay bass from the speakers. One symptom is an increasing, flapping rumble as you turn the volume up (more severely, the system begins to howl) that disappears or is markedly reduced when the tonearm is lifted off the record. The cure is to isolate the turntable, making it immune to low-frequency vibrations (including footsteps).

The first step is to locate the turntable and the speakers as far apart as is practical. Next -- short of replacing it, since some turntables are much more prone to feedback than others -- is to place some vibration-damping material under the base. This can be dense foam, supermarket sponges, or special shock-absorber feet designed for just this problem. A massive base or table under the turntable may "decouple" it from the speakers, too. (Anything that achieves this decoupling is advisable, probably.) Severe cases, e.g., a springy floor that transmits bass from speaker back to record player irrespective of how cushioned the latter is, may be addressed by mounting the turntable on large stiff furniture-type coil springs or by putting up a wall-mounted shelf for the turntable.

CAUTIONS

Levels

Very low bass calls for considerable amplifier power and for loudspeakers that can take this considerable power. The model 120X-DS, as we have said, not only can boost the bass that is present in the original program but can generate sizable amounts of new bass at even lower frequencies. And it can do both of these things at once. Therefore, be wary of using the 120X-DS at its extreme settings at any kind of loud volume level, especially with compact discs. Don't, for example, try to reproduce non-musical sounds like artillery explosions or gunfire with the 120X-DS (or at anything above a modest level with any system). When installing the 120X-DS, furthermore, turn down the volume control(s) before you turn your stereo back on. Be sure to do this, for woofers can be readily damaged by very low loud bass, intentional or otherwise. If cracking, popping, or buzzing sounds are heard (even at seemingly high frequencies), lower the volume right away and decrease the 120X-DS settings.

Carrying ability

Low frequencies carry well, much better than higher ones. Perhaps your neighbors are aware that you acquired a CD player. If you boost and/or produce bass with your model 120X-DS, especially while playing pop music loudly, the effects of the 120X-DS will be that much more audible outside of your listening area. You will want to be alert to these changes, too.

Avoiding transients

Any sharp noises from your sound system -- turn-on thumps, switching pops, tuner bursts, record ticks, dropped tonearms -- are hard on your speakers, and since the 120X-DS amplifies and augments all low-frequency information, extra caution is called for at all times. To be safer, turn the power amp on last and off first, and always keep the main volume control low or off when turning the system on, too. Also use the preamp's muting switch, if it has one. This might be a good time to clean (or have cleaned) all switches, buttons and knobs on your equipment if any rasp or crackle, and to check that the turntable cueing is gentle. dbx cannot take any responsibility for any damage to amplifier, loudspeakers, or other stereo components that results from using the model 120X-DS.

WARRANTY and FACTORY SERVICE

All dbx products are covered by a limited warranty (warranties for products purchased outside the USA are valid only in the country of purchase and the USA). For details, consult your warranty/registration card or your dealer/distributor.

The dbx Customer Service Dept. will help you use your new product. For answers to questions and information beyond what's in this manual, write to:

dbx
71 Chapel St.
Newton, Mass. 02195 USA
Attn: Customer Service

You also may call (617) 964-3210 during business hours (USA Eastern time). The Telex is 92-2522.

Should problems arise, consult your dealer or distributor. If it becomes necessary to have your equipment serviced at the factory, repack the unit, including a note with a description of the problem and the date of purchase, and send the unit freight prepaid to the above address, marking it Attn: Repairs.

FOR USERS IN THE UNITED KINGDOM

Important

The wires in the unit's mains lead are coloured in accordance with the following code:

Blue: Neutral
Brown: Live.

As the colours of the wires in the mains lead of this apparatus may not correspond with the coloured markings identifying the terminals in your plug, proceed as follows:

The blue wire must be connected to the terminal that is marked with the letter N or coloured black;

The brown wire must be connected to the terminal that is marked with the letter L or coloured red.

Ensure that all terminals are securely tightened and that there are no loose strands of wire.

Warning

This unit must be protected by a 3-amp fuse, preferably using a fused plug.

Also, do not remove the cover without first disconnecting the unit from the mains supply.

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