

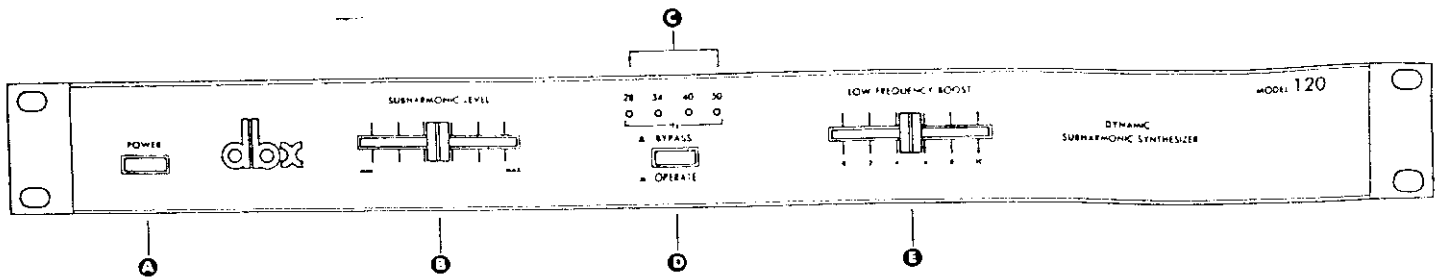
**dbx**

**Model 120**

Subharmonic Synthesizer  
**INSTRUCTION MANUAL**



120



## FRONT PANEL

- A POWER. This button turns the unit on and off.
- B SUBHARMONIC LEVEL. This slider controls the amount of synthesized bass that the 120 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. It works independently of the LOW FREQUENCY slider.
- C LED row: 28,34,40,50 Hz. These light-emitting diodes (LEDs) light up whenever the model 120 is synthesizing bass subharmonics, and they get brighter according to the setting of the SUBHARMONIC LEVEL slider and according to the amount of bass being synthesized (which depends on that in the incoming program material). The numbers above the LEDs are the centers of the bass frequencies being generated by the 120 — and are exactly half the frequencies of the incoming, original program's signals.
- D BYPASS/OPERATE button. This switches the 120's subharmonic-synthesizing action into and out of operation, enabling comparisons. Left out, at BYPASS, the button removes the 120's subharmonic synthesis and the incoming program is not augmented in the bass. (The LOW FREQUENCY BOOST slider, described below, still affects the program, however.) When the button is in, to OPERATE, new bass harmonics are synthesized, depending on the program material.
- E LOW FREQUENCY BOOST. This slider boosts the bass on each channel, but its action is a little different from that of most bass tone controls. In the 200 and the 30 Hz areas it is less strong, and in the 50-100 Hz area it is about the same. Thus it might be said to fill in the "gap" between the very low bass the 120 provides and the mid-bass of the original program, effectively smoothing out the total apparent bass response. (See Fig. 1.) Its action is independent of the SUBHARMONIC LEVEL control; it may be used by itself, as an all-purpose bass control, although it cannot lessen bass and, as noted, the shape of its curve is different. Be cautious about pushing it all the way to the right. And be especially wary of pushing it all the way right when the SUBHARMONIC LEVEL control likewise is at one of its higher settings, because the LOW FREQUENCY BOOST slider increases not just program-material bass but the new, synthesized subharmonic frequencies as well.

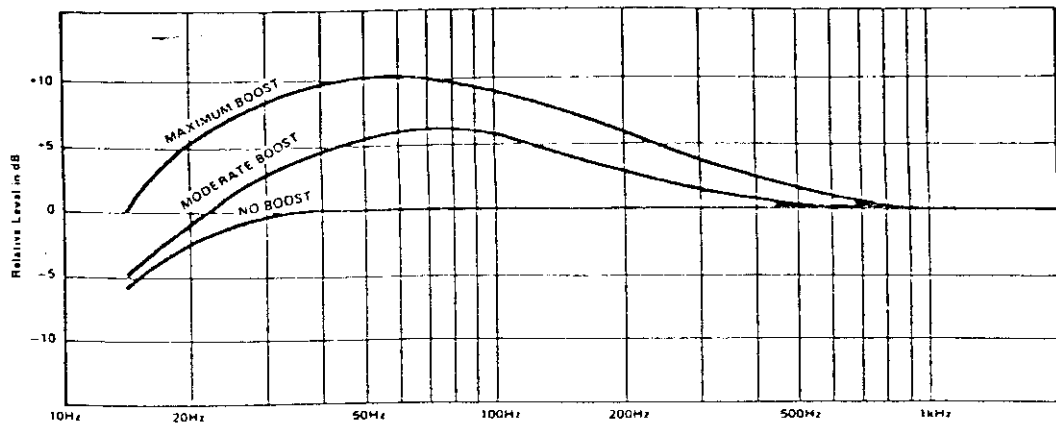
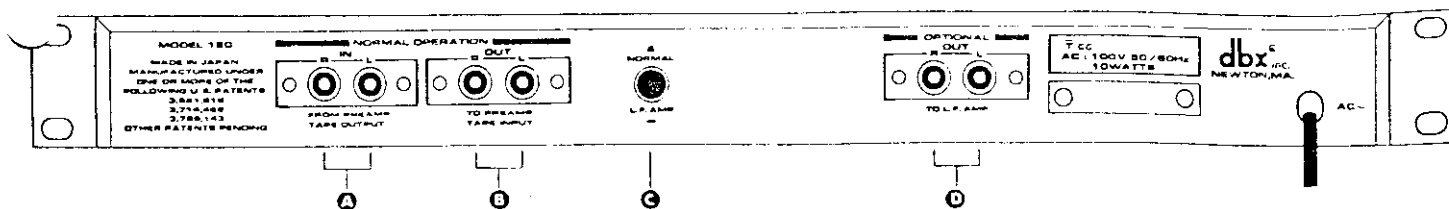


Figure 1



## REAR JACKS and CONNECTIONS

- A NORMAL OPERATION:FROM PREAMP TAPE OUTPUT. Connect the "Tape Out"\* jacks of your preamp, receiver, or integrated amp\*\* to these model 120 inputs, left to left and right to right. (Right commonly is designated by red cable ends; for some people it helps to remember that the words "right" and "red" start with the same letter.)
- B NORMAL OPERATION:TO PREAMP TAPE INPUT. Return the signal from these model 120 outputs to the "Tape In"\*\*\* jacks on your preamp.
- C NORMAL/LF AMP button. Use this button only if you are using a separate power amp and subwoofer in your system to reproduce low frequencies. Pushing it in (to LF AMP) causes the bass, as controlled by the settings of the SUBHARMONIC LEVEL and LOW FREQUENCY BOOST sliders and by the amount in the program material, to go to the OPTIONAL:TO LF AMP jacks, which are to the right (and are discussed below) — and only to them. The TO PREAMP TAPE IN jacks get the original input signal, unaffected by the two front-panel sliders.

(Note that the model 120 is not a substitute for a properly matching active crossover network for those systems with subwoofers. Depending of course on the setting of the LOW FREQUENCY BOOST slider, the LF AMP jacks may send to the subwoofer amplifier information as high as 300-400 Hz, which few subwoofers are designed to reproduce. Remember that middle C is around 260 Hz. In the absence of a crossover, no damage will be done to subwoofer and amp by having the model 120 do the frequency-band distributing, and such a setup may produce pleasing special effects. But it will not yield the most natural sound. Keeping the LOW FREQUENCY BOOST slider down will help, although if it is all the way left, then the subwoofer amp receives only signals synthesized by the 120, that is, the new ones, from 27 to 55 Hz. The problem with this setup is that the higher bass will not get reinforced by the subwoofer. You can try to strike a balance and achieve well-blended bass by setting the LOW FREQUENCY BOOST slider in the middle, but its action — again see Figure 1 — will always be less sharp than a crossover. Also remember that the 120's NORMAL OPERATION: TO PREAMP TAPE INPUT jacks will still be sending a full-range signal, original bass and all, to your regular speakers, and in the absence of a proper crossover they too will be reproducing the bass of the original signal and adding it to the subwoofer's augmented contribution. Further, one reason for using an active crossover and subwoofer in the first place is to prevent your regular speakers from receiving and having to reproduce very low frequencies, and if you use a model 120 to distribute the signal, there is no lightening of the load to those speakers. The result will likely be too much for regular listening. A crossover network is designed to prevent all of these problems; the 120 is not.)

D OPTIONAL:TO LF AMP. See above. Normally these jacks aren't used. If you do use them to feed original and synthesized bass to a crossover/power amp/subwoofer, connect these 120 output jacks to the input jacks of the subwoofer unit.

If you do have a subwoofer setup and a 120, by the way, the best place for the 120 is between the preamp's "Main Out" and the power amps' inputs, not in the preamp's tape-monitor loop. If the 120 is in the tape-monitor loop of the preamp, you will have to control main-speaker and subwoofer volume levels separately, whereas if the 120 is between preamp and power amp (or if your receiver or integrated amp has "Preamp Out"/"Main Out" and "Main In") the preamp's volume control will control everything at once.

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\*Also called TAPE REC,REC,TO TAPE REC,TO TAPE IN(PUTS),(OUT) TO TAPE,TAPE OUTPUT,etc.

\*\*For simplicity's sake, "preamp" will mean preamp, receiver, integrated amp, or the tape-monitor loop of an equalizer or other component.

\*\*\*Also called PLAY,TAPE PLAY,PLAYBACK,(IN) FROM TAPE,FROM TAPE OUT(PUTS), etc.

## 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, beyond the limits of hearing for most people. Your electronic equipment (preamp, amp, radio) probably meets this within a decibel (dB) or two, your phono cartridge within two or three, your tape deck (at low recording levels) within a few more. Your loudspeakers, however, even if they are accurate to begin with and properly placed in your room, more than likely roll off in response below the 50-60 Hz region. Furthermore, your system seldom has to handle any frequencies below this range, because little program material is ever recorded or broadcast that low. (If this very low bass is sacrificed, it's easier on equipment, from record cutters and tape recorders to speakers and power amps.) Finally, 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 2 kHz sound (the frequency 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, a difference of some 20 dB. 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). At levels lower than 60 dB (which are common in the home), the relative differences are greater.

Therefore the model 120 will prove useful for listening at all levels below the very loudest in the home. (At loud levels, not only is the 120 not needed, except perhaps for a little lowest-octave restoration through subharmonic synthesis, but using its full capabilities could harm your loudspeakers.) It performs a different kind of loudness compensation: it restores what isn't there in the first place and it increases to the proper levels 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 at 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 120's controls and what combinations of settings are useful. Boosting everything now at the start will likely send things into distortion, especially your speakers.

Then pull out some of your favorite records (but not ones that are bass-shy). If your taste runs to popular music, especially rock, start by setting the SUBHARMONIC LEVEL slider at its midpoint and vary the LOW FREQUENCY BOOST slider from 1/3 to nearly fully right. Be careful, again, not to push it right recklessly and/or at loud listening levels. After you find a BOOST level that thumps as hard as you like, experiment with the SUBHARMONIC slider for satisfying levels of "felt" bass. You may find that the rock cuts you like best take on a whole new life.

Similarly jazz, especially walking bass 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 120 will help fix this by putting some of the sock back into them.

With classical music, a lighter hand is called for, especially with the SUBHARMONIC LEVEL slider. The growl of organ pedal and the "oomph" of full-orchestra attacks can be brought up even at the midpoint setting and down. Some piano repertory likewise can have lower-frequency textures extended and pleasingly thickened, notably the larger 19th-century Romantic works, which have considerable impact when heard live. (The same goes for the symphonies of the period.) But excessive bass augmentation and boost will make some classical instruments boomy and will make male voices unnatural-sounding, while string and female-vocal music doesn't have much bass to offer the 120 in the first place.

Despite these guidelines, we urge you to experiment, since musical sound in the home is so much a matter of taste. You may wish to mark tentative settings of the 120 on your most exciting records and tapes to refer to for future playings.

## EXPERIMENTATION AND POSSIBLE PROBLEMS

### Phasing

Since you are going to be increasing the bass response of your music system, it is 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 on the back of the speaker. It doesn't particularly matter how one side (either left or right) is done, but the other channel must be exactly the same. While you are doing any rewiring, you might want to replace all flimsy or thin speaker wire with heavier "lamp" or "zip" cord, available at most hardware stores, no. 16 gauge or lower.

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

## Loudspeaker Placement and Listener Positions

Generally, the way to change the sound in your room most markedly is by re-positioning the speakers; this often has an even greater effect than buying new ones. Now might be the time to experiment in this area too. Most listeners come realize that speakers apparently produce more bass near wall or wall/floor intersections than far from them. But this increase comes from uneven, boomy bass. Research over the last decade has shown that it is just as easy to get smooth and even bass. The rule (unless the speaker manufacturer specifically advises otherwise) is to place speakers so that the three distances from the center of the woofer to the 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 conventionally box-shaped speaker woofer-down in a corner will make it sound very bassy at first (and a few of the low notes are being strongly emphasized), but for evenness of bass it's the worst spot possible, because the distances from woofer center to boundaries are all the same.

The same acoustical laws apply to your listening position: the flattest bass will result when the distances from your head to the nearest boundaries are as different as possible.

## Balances

If you do wind up relocating your speakers, it might be desirable to reset the output-level controls on the back of the cabinet for the tweeters and mid-ranges. 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.

## 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 as far from the speakers as is practical (or vice versa). Next — short of replacing it, since some turntables are much more prone to feedback than others — is to place some vibration-dampening 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 probably is advisable.) Severe cases, e.g., a

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\*The reason for this is that rooms in houses are almost always small (acoustically) in terms of bass wavelengths (measurable in feet). Such rooms cannot distribute bass very smoothly. It bounces around, reflecting off walls and floor (or it "leaks out" through the flexing of walls and floors that aren't stiff). The worst bouncing around occurs when the three woofer-to-nearest-boundary distances (A,B,C) are the same ( $A=B=C$ ), which makes the reflections of a given frequency all return at the same time. This causes a large peak (reinforcement) or a dip (cancelation). When these bass reflections have different distances to travel they come at different times, and are smoother to hear. The formula for maximally different distances and least-bumpy speaker placement is  $A/B = B/C$ , or  $B^2 = A \times C$ .



springy floor that transmits bass from speaker back to record player irrespective of how cushioned the latter is, may be addressed 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 120, 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 120 at its extreme settings at any kind of loud volume level. When installing the 120, 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.

If cracking, popping, or buzzing sounds are heard (even at relatively high frequencies), lower the volume right away and decrease the LOW FREQUENCY BOOST and/or SUBHARMONIC LEVEL settings.

### Carrying Ability

Low frequencies carry well, much better than higher ones. Perhaps your neighbors are aware of this fact. If you boost and/or produce bass with your model 120, especially while playing pop music loudly, the effects of the 120 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 120 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 hi-fi components that results from using the model 120.