

THE THEATRE ORGAN IN STEREO

PART VI BASS ENHANCEMENT

Getting the Pedal Notes Without Turning Everything Else to Mud

by Ron Musselman

In the first installment of this series, we were introduced to several high quality loudspeakers that can do justice to recorded theatre organ music, along with all other less-demanding forms of music or sounds which a person might be interested in hearing.

In this concluding article, we return to the subject of loudspeakers, but this time to cover another area. The first time, we were concerned only with complete speaker systems with extended response down to at least 32 Hz (16' pedal C) with no modifications. Now we concentrate on some "after-market" devices of interest to those who may already have a good pair of loudspeakers that start to pale at about 40 Hz, but with some assistance can produce clean output down to lower frequencies. If the bottom octave is a little weak, why not just turn up the bass control on the amplifier? After all, it's a simple solution and doesn't cost anything. But this action only partly solves one problem while creating a new one. The partial solution is that the sagging low end is picked up, but the lift doesn't match the

woofer's sag. This results in the bass loudness being uneven from note to note, much like a poorly-regulated set of pipes. Another problem raised by the typical bass boost is the "muddying" of everything else. Because of the textures and spectral balance heard in many pipe organs, this effect is not perceived quite as acutely as it is with a human voice or something like a plucked string bass (espe-

cially acoustic). However, all but the least critical of ears will spot it immediately, and much of the naturalness of the best system will be lost. With some combinations of sounds, the effect will be minimal, but with most recordings, the amplifier's bass boost will be an unwelcome intrusion. Even given an excellent system with wide, unexaggerated response, some listeners would still choose to crank up the bass control to anywhere from 2/3 boost to maximum. Some untrained ears are not satisfied until the bottom is pushed to the point where everything has a decidedly heavy, tubby quality. This action completely destroys one of the qualities many speaker designers have worked hard for the past 25 years to achieve; extended bass response *without* a false mid-bass emphasis that makes male voices sound bassy and imparts a thick texture to music. Such a listener will say, "I like a lot of bass." That is fine if that sort of added coloration is what they prefer, but it is a "juke box in a beer joint" departure from realism. This article is not addressed to those with such a specialized taste.

The average audiophile with good-to-superb equipment at his disposal would have no need to push his speakers for more bass, for the simple reason that most musical instruments produce no fundamental energy much below 50 Hz, a frequency well within the reach of a well-designed eight-inch woofer, even unboosted. And contrary to a widespread belief, the lower notes of a

ATOS PAST PRESIDENTS

Richard Simonton	February 1955 — October 1958
Judd Walton	October 1958 — July 1961
Tiny James	July 1961 — July 1964
Carl Norvell	July 1964 — July 1966
Dick Schrum	July 1966 — July 1968
Al Mason	July 1968 — July 1970
Stillman Rice	July 1970 — July 1972
Erwin A. Young	July 1972 — July 1974
Paul M. Abernethy	July 1974 — July 1976
Ray F. Snitil	July 1976 — July 1978
Preston M. Fleet	July 1978 — November 1978
Tommy Landrum	November 1978 — July 1980
Richard R. Haight	July 1980 — June 1981

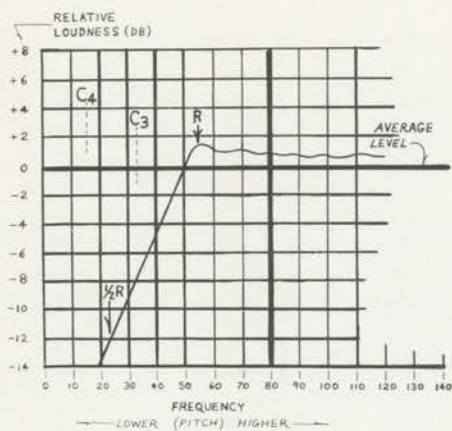


FIG. 1. UNASSISTED WOOFER CURVE

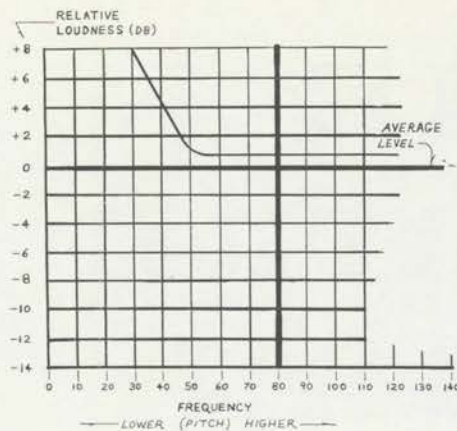


FIG. 2. CORRECTIVE CURVE OF EQUALIZER

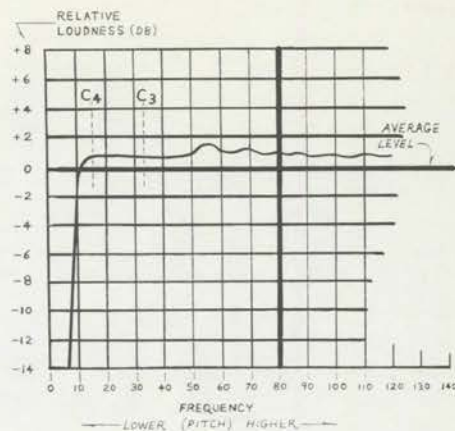


FIG. 3. CURVE OF BASS RESPONSE WITH EQUALIZER

piano do not require a speaker with extended bass response for accurate reproduction. Even though the "A" string vibrates at 27 Hz, an insignificant amount of the resulting output is fundamental. So many golden-eared listeners have found happiness with moderate-priced loudspeakers with useful lower limits of about 40 Hz. But the pipe organ enthusiast is a special case. He attends concerts and is exposed to everything from sensational 16 Hz fundamentals to harmonics up in the sonic stratosphere. So even with the cleanest loudspeakers, if the lowest octave-and-a-half or two are left out, he'll miss it. Of course, bass response isn't an all-important issue, but pedal fundamentals, even those of a soft Bourdon, are necessary for realism, and the richness of that sound is just one of the qualities that set the pipe organ apart from all other musical instruments and make it a total listening experience.

The typical theatre organ enthusiast who has invested in a quality component system probably has a pair of large bookshelf speakers with 10- or 12-inch woofers. A goodly number of these modern acoustic suspension (sealed) systems with well-damped 10-inch woofers are strong down to about 45 Hz. Below that point, the response is still very clean, but weakens as the scale is descended. For a similar 12-inch woofer, the lowest strong fundamental reproduced is usually around 40 Hz. Not bad, but the pedal line on many recordings will sound subdued, even if the low end was not cut in recording. So if the bass boost on the amplifier can't supply a complementary curve to give the woofers

truly level response down to 30 Hz, then what is the solution? Many owners of average-sized speakers in average-sized rooms have asked that question, and more than one accessory manufacturer has come up with an answer; a specialized equalizer designed to give a progressive boost at low frequencies which accurately mirrors the woofer's sag. To interface properly with the woofer, this equalizer should have no effect on the frequencies at or above the point where the unassisted woofer's output begins to drop. That is precisely where common tone controls fail as bass extenders. Their point of maximum boost is usually 50 or 60 Hz (and as high as 100 Hz), and extends up to and beyond the 100 Hz region, which is why they make human voices and everything else in the mid-bass area sound so unnatural. Their 50 Hz peak assists the average woofer where it is still doing fine. So the bass winds up being too aggressive and dominates everything. But a correctly designed and used bass equalizer will give just enough push to keep acoustic output undiminished down to the lowest bass. The bass curve of an average high quality woofer, the action of a bass extender unit, and the resulting bass response are illustrated by Figures 1, 2 and 3. In Figure 1, we see the graph of the woofer's bass response. Note that its output is very level from the mid-bass region down to its point of resonance (indicated by "R"), with only a small rise at that frequency of 55 Hz. But as a sealed woofer's output drops at 12 db per octave below its resonance point, this woofer will be down about 8 db at 16' pedal C, or about half as strong as its mid-bass

output. This pitch is indicated by "C₃." The 12 db-down point occurs at 23 Hz, indicated by "1/2 R." Obviously, a sizable portion of the 32' octave will be out of the picture. 32' low C is indicated by "C₄." This graph and a set of distortion readings of less than 2% describe the performance of a fine woofer needing only a little help to provide extended bass reproduction. This calls for a special equalizer having no effect on anything above 55 Hz but which applies a boost increasing steadily at a rate of 12 db per octave below that pitch. Figure 2 shows the curve of such a device. Above 55 Hz, the line is flat, indicating that no boost is applied at higher frequencies. (As with all graphs shown in this article, the linear portion of the curve has been raised slightly above the "0 db" reference line for clarity.) Below 55 Hz, note that the curve starts to rise and continues upward at a rate of 12 db for each octave below 55 Hz. This boost matches the woofer's drop very closely. In Figure 3, we see the result of the use of this equalizer with the woofer described by Figure 1. Note that its output now continues without attenuation down to 16 Hz (32' low C). The rapid reduction in output below 16 Hz is caused by the use of a low frequency filter. It eliminates unwanted subsonic input, such as a loud thump caused by the stylus dropping into the lead-in groove at the beginning of a record, or noise from foot traffic picked up from the floor. With the woofers already operating near their design limit to reproduce organ pedal tones, the introduction of such uncontrolled material adds even more to the load and could cause permanent

damage to the woofers. It is wise to have a subsonic filter in the circuit for protection. In fact, several bass-boost devices and complete sub-woofer outfits feature filters which begin rolling off at 20 or even 25 Hz.

Of several "electronic sub-woofers" available in retail outlets, one of the finest is called just that; "The Electronic Subwoofer," by Allison Acoustics. It connects to receivers or amplifiers quickly and easily. Although designed to extend the response of Allison loudspeakers flat down to 20 Hz, it will work perfectly with a number of widely-distributed acoustic suspension speakers (the three turnover points are designed for woofer resonant frequencies of 45, 52 and 59 Hz). This beautifully engineered and crafted device sells for about \$290.

Another approach to augmenting bass-shy woofers of otherwise top-notch performance is the use of a ten-band graphic equalizer. Unlike ordinary tone controls which affect broad areas of bass and treble, this type of equalizer can boost or roll off relatively small parts of the total spectrum, as it is divided into ten separate areas, rather than only two. In a ten-band unit, each control governs a bandwidth of about one octave. Typically, the two bottom controls are centered at 30 Hz and 60 Hz. When used with many ten-inch woofers with resonant frequencies of about 55 Hz, lifting the 30 Hz control up to the +6 or +8 db line will give authoritative response down to 16' low C. Several ten-band units are now being made by well-known manufacturers and can be found at discount stores from about \$150 to \$275. With their overall flexibility, they can be a great help in making your system sound better in a room with indifferent acoustics, if their controls are used judiciously.

If the reader wishes to purchase an equalizer to extend his system's bass response, a couple of things must be considered first, one of which is the increased demand that would be placed on his amplifier. For the stereo buff who has at least 100 or 200 watts per channel at his disposal in a listening room of average proportions, no problems with power limitations should be encountered. But for those who are using an amplifier with 40 or 50 watts per

channel, be forewarned not to expect very high listening levels with the lower pedal notes. This is especially true if you listen to recordings with heavy fundamentals at 16' or lower. The reproduction of this sort of material without breakup is possible if you are willing to accept moderate listening levels. But it is just out of the question to expect 50 watts per channel to provide anywhere near the "live" sound pressure levels of some of the more adventurous, no-holds-barred recordings being pressed these days.

One other factor to consider is the limitations of the speakers themselves. They should be of the acoustic suspension type (sealed) with a ten- or twelve-inch woofer, although the most rugged eight-inch woofers may be able to provide fairly strong, clean response to 30 Hz, such as the Allison 5 or 6. As a general rule, the more reputable brands such as AR, Cambridge, Advent, EPI, Cizek, Boston Acoustics, or many of the earlier KLH models, will take large amounts of low frequency boost without distress. The main requirement is that the woofer be of robust construction and low in bass distortion to begin with. A marginal woofer with limited power handling capacity will not benefit from equalization. In any case, you would do well when shopping around to seek a knowledgeable salesperson who has your best interests at heart. Whether

you are just starting to select pieces for a system or looking for an equalizer to add to an existing one, a truly professional audio consultant who is "on your side" can help you avoid costly mistakes.

If we all had our "druthers," I suppose most of us would own immaculate Wurlitzers or Robert-Mortons of at least twenty ranks speaking into a spacious music room attached to our homes. And, of course, our instruments would all be equipped with digital players to allow the non-musicians among us to enjoy the playing of the masters "live," anytime the mood strikes. The cost for this ultimate "zero-distortion" playback machine could easily exceed \$100,000, not to mention ongoing maintenance costs. At current prices, we have seen that a wide-range top-drawer component system with no significant performance compromises can be assembled for no more than \$1500. Given the fine gear now on the market and the truly outstanding recordings of the past few years, it is now possible to re-create, with almost breathtaking naturalness and impact, the sound of a pipe organ in the living room, whether it is of six ranks, 15, 36, or 40-plus. Considering the cost of the real thing, the manifestation of the hobby that most of us must settle for turns out to be not so much a second choice as a sensible alternative. □

ATOS Minutes

Telephonic Board of Directors' Meeting April 29, 1982

1. The meeting, via telephone conference call, was called to order by President Lois F. Segur at 9:10 p.m., EST.
2. Attendance, per the roll call, was comprised of: Directors Lowell Ayars, Preston "Sandy" Fleet, Rex Koury, Ashley Miller, Tim Needler (Secretary), and Bill Rieger. Also in attendance were ex-officio directors, President Lois F. Segur and Vice-President Dale Mendenhall. Guests were Treasurer Bob McGillivray and ATOS Corporate Attorney, Elizabeth Eisner. Absent were Directors Paul Aber-

nethy and John Ledwon and immediate past President, Richard Haight. These absences were approved by the Board.

3. President Segur opened the floor to questions about the proposed new Bylaws. Treasurer McGillivray asked why the phrase "Chairman of the Board" was used in Section 3.3 since it doesn't appear elsewhere. Attorney Eisner replied it was merely a broadline form that could apply later without having then to change the present bylaws. The phrase, while not now applicable and not necessary, could be left in without causing problems, she stated. The Board concurred.