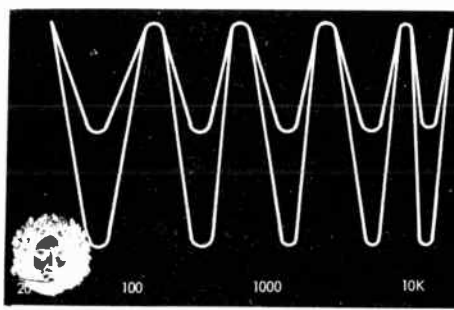




Buying Watts And Other Things



Leonard Feldman

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ONCE YOU'VE gotten past the traumatic decision involving audio power requirements of your ultimate system, you'd think the choice of an amplifier (integrated, basic, or part of an all-in-one receiver) would be relatively simple. You've waded through the literature regarding power ratings. You now understand that continuous power ratings (often erroneously dubbed rms power) are more meaningful (and less inflated) than "dynamic power", "music power" or "IHF music power". You've learned to steer clear of products which feature "peak power" or even "instantaneous peak power" ratings. You've even selected your speaker systems and been told by the speaker manufacturer's brochures how much power you should supply to them (and, perhaps, how much power you'd better *not* supply—ratings in this area are still quite vague) and you're ready to shop for the electronic "heart" of your system—par-excellence. It's only then that you are faced with a host of *new* decisions.

Watts Versus Features

Basically, an audio amplifier has one primary *raison d'être*. It's supposed to accept low-amplitude electrical signals which represent your various program sources and *amplify* them until they are powerful enough to drive your loudspeaker systems. It should perform this task without introducing distortion, and the broadest definition of distortion means the introduction of any differences to the output signal

as compared with the input signal. That means differences in *content* (harmonic or intermodulation distortion) as well as differences in relative amplitude of the frequencies contained in the original signal (flat frequency response). Writers in this field have, at various times, suggested that the ideal amplifier is best described as a "piece of wire with gain" and not a few manufacturers have, over the years, used that cliché to describe their products.

In point of fact, though, as you begin to examine the amplifier products currently available, you find that this single objective is augmented by countless features including controls, switches, lights, jacks, sockets and other seemingly unrelated appurtenances which, at first glance, even seem to contradict the stated objective of "pure" amplification. It is these features that we'd like to sort out in terms of their usefulness (or superfluousness) in a high fidelity music reproduction system.

Tone Controls

Only the arch-conservative purist will argue against the need for bass and treble tone controls in a modern hi-fi system. They're needed, we are told, to correct for all manner of sonic deficiencies which exist elsewhere in the system—such as poor lower bass response in our speaker systems, improperly equalized program source material, highly absorbent room furnishings (which gobble up the "highs") and the like. Yet, as you tour the audio shops (and the homes of your friends who own hi-fi setups), make a note of how few listeners actually move their bass or treble knobs away from the sacrosanct "flat" settings. There may be an ego problem here. To depart from "flat response" is to tacitly admit that "some other part of the system" is anything but flat and that implies poor judgment on the part of the audiophile in his "system assembly". On the other hand, the majority of "tone control" circuits may simply not be suited to the required "sound tailoring" job at hand. Consider Figure 1—the typical range of control afforded

by the usual bass and treble controls. If, indeed, the deficiency noted in a particular system involves the need for boosting frequencies below, say, 150 Hz to make up for poor lower bass reproduction, the typical tone control cannot correct this situation without simultaneously boosting frequencies from about 500 Hz down, a solution which leads to so-called "barrelly" sound.

Selectable Crossover

Some amplifiers switch positions (two, three or even more) which predetermine at what frequency boost or attenuation begins when the tone controls themselves are rotated. Thus, as shown in Fig. 2, it would be possible with such an arrangement to set up a response curve which only emphasizes (or attenuates) the extremes of frequency which require such alteration.

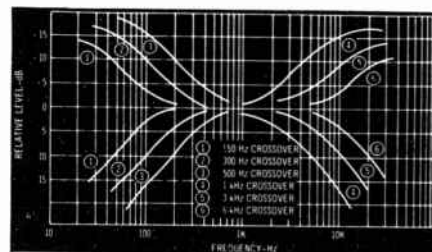


Fig. 2—Selectable crossover tone controls offer greater choice of tonal correction possibilities.

A lovely feature *if you need it*. Obviously, if your tendency is to leave the tone controls in their flat position (or even by-pass them by means of a suitable switch sometimes provided for that purpose), then the added cost of selectable cross-over tone control circuits is not for you.

Graphic Equalizers

On the other hand, if your listening acuity is such that even selectable crossover tone controls fail to adjust the response to what you consider to be correct, you may want to consider an amplifier with *more* than the usual bass and treble controls. The first step in this direction is to be found on several models which now offer mid-range tone controls, as well as bass

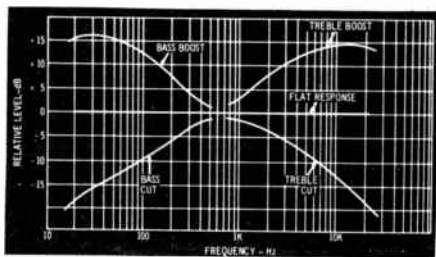


Fig. 1—Typical range of adjustment afforded by most tone control circuits.

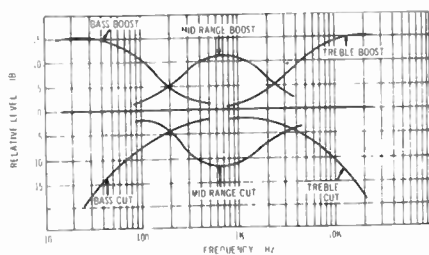


Fig. 3—Mid-range tone control permits additional response alteration.

and treble. As shown in Fig. 3, this extra control offers adjustment of mid-frequency emphasis. Early versions of this feature used to be called "presence" controls, in that they tended to emphasize the sound of vocalists—since vocal programming is primarily in the mid-audio range.

If your acoustic environment is such that even *three* tone controls won't suffice, there are amplifiers on the market that sport as many as *five* separate tone controls, each able to control a specific segment of the audio frequency spectrum. The name "graphic equalizer" has been applied to such multiple tone control arrangements and, if self-contained segmented tone controls still don't satisfy you, you can purchase *separate* graphic equalizers with ten, twelve or even twenty-four segmented controls. The action of a five-segment graphic equalizer built into an integrated amplifier is shown,

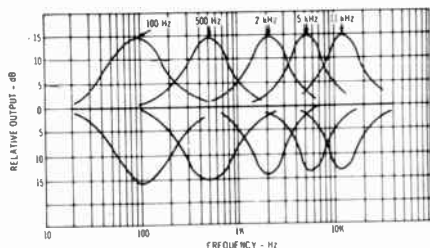


Fig. 4—A five-segment tonal equalizer provides even more accurate tailoring of overall frequency response.

graphically in Fig. 4. Obviously, the more segments—the more circuitry, and the more circuitry, the higher the cost.

Tape Monitor Facilities

Speaking of "add on" devices to your amplifier, manufacturers of such devices ought to be eternally grateful to some remote tape-recorder manufacturer of yesteryear who had the bright idea of building separate "record" and "playback" heads into his machine, plus enough electronics for both to operate simultaneously. This clever innovation permitted the recordist to "monitor" the results of his recording efforts a fraction of a second after the tape has been recorded—providing he could feed the

output of his tape-deck's playback preamplifier into a suitable input on his amplifier—the *same* amplifier he was using as a program source for *making* the recording. In order to do this, amplifier manufacturers provided a switch called "Tape monitor", which is nothing more than a means for "breaking" the signal path at a suitable point in the amplification chain. The program to be recorded is fed to the tape-deck from the "source" side of the "break", while the resultant recorded signal is fed to the other side of the "circuit break"—the side that ultimately leads to the loudspeakers or output of the amplifier. Once this "break" became universally available on most component amplifiers, it also served as the necessary connection point of all manner of devices (including the graphic equalizers that are bought separately) which could be "added" to a system. Were it not for this simple circuit-interruption point, it would be impossible, for example, to add any of the four-channel decoders which now permit easy conversion of stereo systems to quadraphonic sound.

Some amplifiers now feature two or even three tape-monitor jack-pairs. Among other things, this permits the user to record onto two tape recorders simultaneously or to dub from one recorder to another. Again, if you are *not* that heavily involved in recording work, the presence of two or more tape monitor circuits is a redundancy you should not have to pay for.

Phono Inputs

Speaking of "doubles", many amplifiers offer multiple pairs of phono-input jacks. In some, both pairs are identical and offer equal sensitivity, regardless of which pair is used. These arrangements are intended for the owner of, say, a record changer and a manual turntable who might want to do casual, extended listening via his record changer but may want to "single play" more critical recordings on a manual turntable. In yet another arrangement, some amplifiers are equipped with pairs of phono inputs which have different sensitivities. For example, the PHONO 1 inputs may be designed for cartridge outputs in the range of from 1 to 3 millivolts, while the PHONO 2 inputs may accept cartridges having outputs from 4 to 8 millivolts. Obviously, if you *know* what the nominal output of your phono cartridge is and do not plan to own two record playing facilities, there's really no point in spending the extra money for the dual phono input feature.

Filters, High and Low

The use of filters for the "elimination" of turntable rumble and high frequency noise (record scratch, tape hiss, FM background noise) is, at best, a compromise remedy. There's no question about it—filters *do* alter what is often "perfectly flat" frequency response. Rumble consists of very low frequency signals (usually below 60 Hz) and in order to reduce its effects, an amplifier's response must be attenuated at very low frequencies. Unlike "bass tone control action", however, such filters are designed to start cutting at or about the frequencies which are

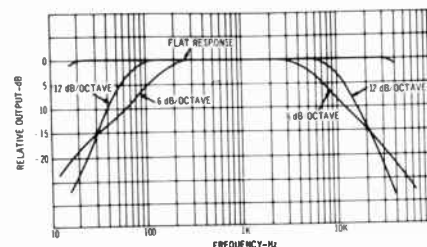


Fig. 5—Filters attempt to cut out unwanted rumble and hiss without destroying too much of musical value.

involved. This is illustrated in Fig. 5. The action of two kinds of low frequency filters is shown. Note, that the more gradual sloping response curve has to start cutting frequencies at about 150 Hz in order to provide 15 dB of attenuation at 30 Hz. This filter has a slope of 6 dB per octave. The preferred 12 dB per octave filter (steeper sloped line) needn't start altering frequencies above 100 Hz to afford the same 30 Hz attenuation. These two values of "slope" are generally found in high-frequency filters, as well. Both filter types must necessarily bite into musical content, and if you don't suffer from turntable rumble or record scratch hiss, is there any point in "buying" filters as part of your amplifier arrangement?

Microphones and Mixing

The breach between "professional" amplifying equipment (normally associated with recording studio or broadcast use) and "consumer" equipment continues to narrow and quite a few amplifiers sold for home use now include microphone input jacks. Some of these simply avail themselves of the high amplification capability of the phono preamplifier stages—removing the required RIAA record equalization and connecting the microphone input jack to these circuits by means of a position on the selector switch. This simple arrangement really offers very

little more flexibility than the microphone inputs already available on your tape recorder, unless you take special delight in using your entire high fidelity system as a public address system in your living room. There are, we are told, people who suffer from an affliction which is the reverse of "mic fright". They love to hear themselves over loudspeakers—it seems to provide the extra sonority akin to that special sound one hears when singing in a tiled shower. If you get your kicks that way, then the extra mic position on your amplifier's selector switch will provide that extra ego stimulant at very little extra cost.

If, on the other hand, you want to "mix" live sounds with other program sources, the amplifier you choose should be equipped with a separately controlled microphone preamplifier circuit—one which is capable of being mixed in with other program sources and one which has its own level control, apart from the master volume control, so that you can attempt that "professional" mix of program" just like the recording engineers do". If you're really serious about "live recording", however, you may be better off using one of the many "outboard" microphone mixers which not only contain preamplification but provision for four or six microphones to be connected—each with its own associated level control. Outputs of most of these mixers plug simply into a high-level (Aux) input on your amplifier or receiver.

Input Level Adjustment

While a manufacturer has total control over the audio level of AM and FM radio signals recovered in his receiver product, he cannot predict what levels of phono signal, tape signal and the like you're likely to feed into the other various inputs of his product. If you pick products that all produce voltage outputs that are about equal and also equal to the internally supplied AM or FM detected audio signals, you're in luck. When you switch from one program source to another, you won't have to race to the volume control to adjust for differences. More than likely, however, one or more of your signal sources is going to be greater in amplitude than the others and when switching from or to that source, it can be quite annoying (if not disturbing) to experience extreme level shifts. One of the ultimate refinements offered by some receiver manufacturers and quite a few amplifier makers consists of a group of input level controls, each associated with a

particular pair of input jacks. These enable you to carefully adjust all program source voltages so that as you switch from one program source to another, loudness remains constant.

The idea is lovely and of course, it does cost money in terms of extra controls on the amplifier or receiver. Allowing, even, that you are that much of a perfectionist, there is still room for redundancy. For example, if your tape player has its *own* output level control, you can set it to correspond with radio levels. If you own a separate amplifier and tuner, the tuner may well have an output level control too, obviating its need on the input of the amplifier. About the only instance in which separate input level controlling is not likely to be available other than on the amplifier is that associated with phono listening. However, as we've already pointed out, many amplifiers offer a choice of input sensitivity here, so you may not encounter too great a level shift even in the case of records.

For The Amplifier That Has Everything

The remaining few niceties that we'd like to mention fall into the category of "luxury" features that really don't contribute audibly to the performance of an amplifier but are, nevertheless, available as "convenience" features. We will not comment upon their "usefulness" but simply mention that they can be had—all at added cost since all involve additional circuitry and/or mechanical parts additions.

Included in this group are such things as attenuator switches, program indicator lights and level meters. The attenuator switch, which may not be familiar to most readers, is simply a switch which, when thrown, reduces overall listening level by about 20 dB. It's supposed to be used when the phone rings and you want to lower listening level so that you can hear the party on the other end of the line. Obviously, you could turn down the volume, but the theory here is that by throwing the switch during the phone conversation you can restore *exactly* the same listening level you had before after the phone is hung up. We leave that one to your own judgment.

Program indicator lights are great fun to watch as you rotate your program selector switch or push the selector buttons. Unless your amplifier is equipped with a remote control cable with which you can switch programs from many feet away, we fail to see

what information they add in operating the amplifier, since you can read the designations around the selector knob just as easily at the time of program selection. Of course, some people forget easily, I suppose, by the time they reach the comfort of the listening chair or sofa, so if it's lights you want, lights you shall have.

Recently, level meters have found their way onto home amplifiers. Often, they provide a good indication of how much power is being supplied to the loudspeakers and, with today's more powerful amplifiers, this often serves as a warning device if the meter calibration is accurate. It is not rare to "blow up" or destroy a speaker by feeding it too much power and if you watch the meters, this tragedy can sometimes be prevented. If, however, the meters are used to establish correct recording levels, it must be fairly stated that most recorders (even cassettes) have more accurately calibrated record-level meters for this purpose, so once again, the presence of meters on an amplifier for this purpose may be a useless redundancy.

It has not been our purpose to put down any of the modern features and controls associated with the current crop of solid-state amplifiers. On the contrary, we think that manufacturers have brought a great deal of ingenuity and innovation to their products. Receivers and amplifiers sold for home use today often exceed the performance capabilities and control flexibility of the professional equipment of just a few years ago. All we're saying is that the prospective purchaser of a home music system should try to evaluate his needs before taking the plunge and, if possible, purchase the correct amount of power *and* the appropriate features which he is likely to use in the foreseeable future. Admittedly, as one goes up the scale in power and price, one generally finds more and more of the features we've discussed, so that it's often difficult to separate the "features" from the power rating and low-distortion capability of some products. There are exceptions, however. *Some* low-power units offer very low distortion plus a host of control features such as those we've discussed. Some super-power units offer a minimum of extra controls and switches and a maximum of good audio performance. You're likely to find just about everything you want in between if you shop carefully and knowledgeably. The point of the whole story is: but anything you need—but *use* what you buy if you really intend to get your money's worth.