Amplifier Q's and A's--Mainly For Beginners

Q. *Is it still necessary for amplifiers to be divided into a preamp and a power unit? Why should I be bothered with all those connecting cables?*

A. Years ago, in the tube era, were several advantages in having separate units. For some cabinet installations, the main amplifier with its massive power and output transformers could be placed at the bottom, leaving the control unit to be mounted in the most convenient position. Secondly, the radiated hum field from the power transformer was more difficult to control in an integrated unit. Thirdly, the sheer size of a high-power integrated unit was a disadvantage in itself. But with solid-state techniques these advantages have tended to disappear. Power transformers can be much smaller and there are no output transformers to contend with. And so, integrated amplifiers with powers up to 100 watts per channel are every bit as good as separates. But for very high powers—of the order to two or three hundred watts, there is the problem of size and heat dissipation, and so separates are to be preferred.

Q. How about receivers? Are separate tuners and amplifiers better?

A. Much the same arguments apply here too. Two big problems with FM tuners using tubes was drift caused by heat dissipation, and, secondly, size. Now, many receivers have very elaborate amplifier sections and give a high standard of FM performance too. Even so, separate tuners are still recommended for those who want the last dB of performance. And, of course, they are even more versatile—why buy a new set of equipment if all you need is better FM reception?

Q. *I can see that transistors have many advantages over tubes—freedom from microphony, less hum, small size, and they do not age. But aren't these advantages realized at the expense of noise and distortion?*

A. Definitely not! Taking the question of noise first, modern audio transistors can have a significantly lower noise level than the very best tubes—which is one reason why they are extensively used in studio equipment and microphone preamplifiers working with extremely small signals. As for distortion, it must be said that many early solid-state amplifiers had a higher distortion than their tube counterparts. Crossover distortion was a problem at low volume levels and another factor was the actual *distribution* of spurious harmonics. Although the overall measurable distortion might be quite low, the proportion of high order harmonics, like the fifth, seventh, and ninth, was high. It has long been known that these high order harmonics are subjectively more unpleasant and in fact, several proposals have been made for a realistic "weighting factor." The effect, as far as the listener is concerned, is a harshness of the sound, variously interpreted at the time as a brilliance, a clarity, or "that transistor sound." But, of course, during the past few years, developments in circuitry and improvements in transistors have changed the picture completely. Modern solid-state amplifiers have a lower distortion and better signal-to-noise ratio than possible with tube amplifiers. Elimination of the output transformer (necessary with tubes) has meant that the designer can achieve stability, wide bandwidth, good transient response, and a damping factor effective over the whole band. True, all these parameters *can* be met with output transformers but not too easily and certainly not cheaply. For instance, to maintain the low frequency response, a high primary inductance is required, but the windings have to be sectionalized to reduce self-capacity or high frequency and stability will suffer. As a matter of interest, some time ago. Peter Walker demonstrated a bridge method of evaluating the distortion of an amplifier using any kind of input signal, *including speech and music.* Briefly, it involved the balancing out of the input signal with the output—what's left is distortion, a deviation from the original. It could be displayed on an oscilloscope or amplified and fed into a loudspeaker if so desired. Obviously, this method must be almost foolproof as it takes into account IM, THD, transient mutilations, frequency deviations, thermal effects, and so on. I said *almost* as phase effects could cause instability unless precautions are taken. At the demonstration, Peter Walker proved that the distortion detected by the bridge was greater on his old and respected Quad tube amplifier than on his 303 transistor amplifier!

Q. *If I buy an add-on power amplifier for quadraphonic sound, will I need the same power for the rear channels?*

A. Yes. Many recordings demand equal power from all four speakers although a few use ambience only for the rear channels. *Overall* sound level, however, should be about the same as for conventional two-channel, although opinion is divided on this issue.

Q. *What noise level is inaudible? My amplifier is rated at 65 dB for* PHONO, *yet the background noise is quite loud.*

A. This is not an easy question to answer because there are so many factors involved. Here are some of them: Distribution of the noise (i.e., the proportions of low and high frequencies), loudspeaker characteristics, room characteristics, and method of measuring. A speaker system with a "peaky" treble will over-emphasize hiss, and obviously a low frequency hum of 60 Hz would be more audible from a loudspeaker with a resonance in that region. Again, a hum that would be completely inaudible on a small bookshelf speaker might be unbearably loud on a large corner horn system. In practice, a signal-to-noise ratio of 50 dB or above (referred to full amplifier rated output) would be unobjectionable.

Q. *Is there any point in buying an amplifier having a higher output than I need? Would it sound cleaner at low levels?*

A. In general, it is wise to allow as large a factor of safety as possible. It would surprise many people to know that what often passes as a roughness in the sound or is dismissed as a recording defect is actually overloading. Many of our present day loudspeakers are relatively inefficient (0.5% is not uncommon) and they really *do* need a fair amount of power, especially in a large, well-damped room. Usually, there is no detectable difference between very large and small amplifiers at low listening levels, although it must be said that transient peaks are often larger than many people imagine! A lot depends on the amplifier's overload characteristics—some clip peaks cleanly without fuss, while others produce an excruciating noise! *G.W.T.*