

PREAMP OVERLOAD

Your phono cartridge can present a very wide range of levels to the phono preamp in your amplifier or receiver, depending on the cartridge's inherent sensitivity and the signal levels on the records you play. Whether or not the preamp can take the levels presented to it will have a considerable effect on your system's overall sound quality, but lack of standard specifications either for cartridges or preamps leaves the consumer with virtually no protection against incompatibility.

by Chris Huntley

Would you buy a system that deprived you of the full dynamic-range on your records by clipping off the peaks? Well there's a good chance you've already bought one, and through no fault of your own for you're not likely to have come across any warnings that your receiver or preamp might not be able to handle the full output of your phono cartridge.

The obvious move is to find out what your receiver will handle and what your cartridge puts out, right? Well, happy hunting.

For your receiver you have maybe a 50/50 chance of finding a figure for phono overload on the manufacturer's spec, or of finding it measured in a test review (if you're lucky enough to find such a review). And just to make matters worse, this will only be for one frequency (unmentioned, but probably 1 kHz). So far you have been doing well, for the chances of finding out what your cartridge puts out are considerably worse, as the literature likes to quote figures around "3 to 5 mV" for typical cartridge outputs.

The reason that a phono-preamp overloads is the limited voltage-swing available in its output stage. This is normally independent of frequency, but the gain to this point is that of the RIAA equalization curve, so the input overload voltage varies with frequency (the inverse of the RIAA curve).

Such an approach to the problem would be needlessly complex. It is more practical to measure the cartridge output after RIAA equalization with a circuit having unit gain at 1 kHz. This will then indicate what value of "phono-input overload at 1 kHz" is required.

With such an equalizer connected to a good cartridge, and with the aid of a peak-reading voltmeter I went through

my record collection to find out what sort of peak levels the record manufacturers have been putting on their products lately. The results are summarized in Table 1, which also shows what to expect from cartridges having other sensitivities.

If you don't find these figures alarming you are either unusually well-informed or not familiar with the signal-handling capability of phono-preamps. A search through published reviews over the last few years yielded 26 with figures for phono-input overload, and only 17 of these were better than 95 mV (reviews show RMS voltage, so peak would be about 95 x 1.4 or 135 mV). The other 9 would be unable to handle the Shure test record if you had one of the higher-output cartridges. How well the 17 would perform is also questionable, since many would be approaching clipping, and so could be quite distorted — especially at low frequencies where there is often very little feedback in the preamp circuit.

But don't waste your time trying to find published figures, for reviewers seem to ignore the phono input when it comes to distortion measurements. Perhaps it is differences in this area that cause reviewers and audiophiles to distinguish between apparently identically-performing units (tight-bass/loose-bass etc.)

The overall picture is worse still as

the units reviewed generally represent the cream of the industry, whereas there is a large number of less-expensive models competing for a larger market, and it appears they are even worse. For example, one inexpensive receiver of my acquaintance could only handle 20 mV, and so would be unsuitable for any cartridge. This is really sad as it doesn't cost any more to build an adequate circuit, so one can only suppose the delinquent manufacturers are unaware of this problem. But who can blame them when one well-known American reviewer writes "we could not fault this fine receiver in any respect" at the end of a review of a receiver that he found overloaded at only 55 mV input.

From the foregoing it would seem wise to consider the sensitivity when shopping for a new phono cartridge. In this regard, the less sensitive the better; and fortunately the better-units seem generally to be at the low end — around 1 mV/cm/sec though there's always the exception, like the Ortofon SL-15Q (for CD-4) which *Audiolab* measured at 2.15 mV/cm/sec (see *AudioScene Canada*, May, 1974).

A word of warning when comparing specs, as there is no single standard, and a figure is often quoted in mV for some other velocity — such as 3.5cm/sec — which may or may not be indicated.

The disadvantage of a low-sensitivity cartridge is that the noise of the phono

Cartridge Sensitivity	OUTPUT TO PREAMP		
	1 mV/cm/sec	1.8 mV/cm/sec	2.4 mV/cm/sec
Very frequent peaks.....	15 mV	27 mV	36 mV
Maximum on most records.....	25 mV	45 mV	50 mV
Occasional peaks.....	35 mV	63 mV	84 mV
Bass drum on Shure "Audio Obstacle Course".....	55 mV	100 mV	135 mV

Table 1 — Peak output voltage from typical cartridges after equalization (unity gain at 1 kHz). Three different cartridge sensitivities are represented.

preamp becomes more audible. Whether or not this is significant compared to the noise level of your records depends on the signal-to-noise figure for your preamp; and in this regard, preamps vary by as much as 10 or 20 dB. But here again the consumer is kept in the dark — or, worse still, misled — as one cannot directly compare specs due to the variety of different methods used (reference level and weighting factors).

Perhaps one way to get around the problem of unknown overload characteristics in commercial units is to build your own preamp. Unfortunately, the authors of many such construction projects seem to be particularly unaware of the problem, at least if their results are anything to go by. For those interested, Figure 1 shows an easy-to-build circuit with uncompromised noise performance (-86 dB referred to 3 mV at 1 kHz, "A" weighted) and adequate signal handling (250 mV at 1 kHz).

(A more elaborate project for constructing a first class phono preamp begins on page 58 — Ed.)

The conclusion one has to draw is that something should be done about this incompatibility. For a start, audio dealers should be made aware of the problem and should make sure any system they sell is OK. Manufacturers should ensure all new designs can

handle the most-sensitive cartridge (3.5 mV/cm/sec) with a reasonable safety factor (say 6 dB), meaning the input-stage must handle 250 mV at 1 kHz.

Eventually it seems reasonable to hope cartridge manufacturers will standardize on a single sensitivity (say 1 mV/cm/sec).

In the meantime, one can wonder

how much of the reputation of some cartridges are due to their actual performance and how much to their low sensitivity. One can also wonder whether some writers' aversion to transistor preamps spring from the fact that the old tube phono preamps were generally better with respect to input overload. ■

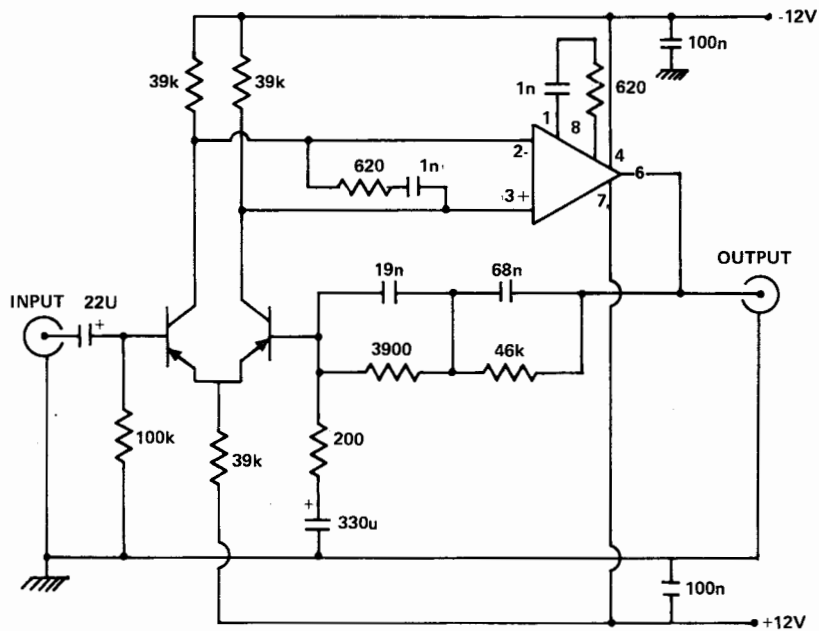


Figure 1