

IN BOTH EARS

Quick, Watson The (Phono) Needle

There's a time-encrusted cliché to the effect that the best things in life come in small packages, with diamonds offered as proof. In that case, the cartridge with its diamond stylus ensconced on the end of the tonearm of your record player comes right within this category.

Of all the components in a high-fidelity system, the cartridge is the most neglected, the least understood. This is a strange situation, since the kind of music supplied by your hi fi depends directly and most often on the phono cartridge. Phono records represent our prime music source, taking precedence over tape and broadcasts, so overlooking the cartridge is a sound tactical error.

The cartridge is just one member of a strange family called transducers, devices that change one form of energy to another. This makes the cartridge first cousin to a storage battery, a steam generator, a loudspeaker, a microphone and a solar cell.

In following the grooves cut into your phono record, a diamond stylus (your grandfather called it a needle) can wiggle back and forth as much as 20,000 or more times per second. This mechanical belly dance moves a tiny cantilever to which is attached a coil, a magnet or a small bit of iron, depending on the design of the cartridge. The coil, magnet or iron, in motion produced by the movement of the stylus, helps produce a tiny electrical voltage which corresponds in every respect (or which should do so) to the undulations in the record grooves. This voltage is then fed into a pre-amplifier where it is strengthened, then into a power amplifier where it is given heavy doses of current, strong enough to operate your stereo speakers.

All of this sounds simple enough, and it is. Up to now the cartridge and its stylus is just a device for generating a voltage. It is when we start making other demands on it that we encounter some problems.

We want the cartridge to develop enough voltage so it will be strong enough to drive the pre-amplifier to which it is connected. Cartridge voltage output should be large enough to eliminate the need for a pre pre-amplifier or a special cartridge output transformer.

We don't want the cartridge to develop electrical noise. We want to be able to replace the stylus easily and quickly when it becomes worn, as it inevitably will. We want the stylus assembly to be able to move easily, to be quickly responsive to the faintest modulations cut into the record grooves, yet we do not want the stylus to vibrate of its own accord.

We want the cartridge to supply relatively equal signal outputs for both stereo channels. And we don't want the signal from one stereo channel drifting over to the other.

In short, what we want the cartridge to do is to recapture for us as much of the original sound as possible out of the record grooves,

without adding to, modifying, or distorting that sound. We want the cartridge to respond to all frequencies without favoritism, starting at about 20 Hz, or lower, and extending to 20 kHz, or higher.

This isn't a complete list, but it is indicative of our demands. Quite often these present conflicting requirements.

A cartridge with a coil at one end of the cantilever is, quite obviously, called a moving-coil cartridge. If it has a tiny magnet affixed there instead it is called a moving magnet cartridge, but that's as far as semantic logic will take us, for if it has a bit of iron in place of the coil or magnet it is called a variable reluctance type. Of these three, the most popular, the most widely used is the moving magnet. Serious audiophiles have expressed a preference for moving coil cartridges, claiming superior sound output, but until recently such cartridges have been accompanied by any number of disadvantages. One of these has been low audio signal voltage output, so low that such cartridges have required either an accompanying step-up transformer or a pre pre-amplifier. Also, with a typical moving coil cartridge, replacement of the stylus could not be done by the user. Installing a new stylus meant returning the cartridge to the original manufacturer.

These problems have been overcome in the Satin line of moving coil cartridges. No output transformer or pre pre-amplifier is required since the cartridge has sufficient output so it can be connected directly to the magnetic phono input of any high quality preamp. In the Satin cartridge the stylus assembly is attached to the cartridge by magnetic force and so stylus replacement is just as easy, if not more so, than in the usual moving magnet type.

One of the ways of getting higher voltage output in the moving coil cartridge is to use more turns or wire in the moving coil. Satin has achieved this with an extremely thin aluminum ribbon measuring 10 microns x 100 microns. There are two such coils, one for the left sound channel, the other for the right.

All cartridges require damping of the movement of the cantilever to avoid unwanted cartridge resonance. Ordinarily, rubber is used. It is quick and convenient, but natural rubber is a vegetable product and even when made with anti-oxidants gradually loses its flexibility and becomes stiff.

The damping system in the Satin cartridges consists of a lubricant and an electromagnetic force that damps in proportion to the speed of movement of the cantilever. With rubber-type damping material the whole system sometimes fails to respond to very small vibrations superimposed on a larger wave of vibration, especially when the small vibration is below a certain level. With the Satin damping system the cartridge never misses the smallest signal oscillation in the record groove.

The Satin Model M-18 carries a nationally advertised retail value of \$155.00. Satin has available a free booklet entitled "The Cartridge Handbook: What You Should Know Before You Buy a Cartridge." You can get a copy by writing to Osawa & Co. (USA), Dept. CN, 521 Fifth Avenue, New York, N.Y. 10017.

Every time you position the stylus of a cartridge into record grooves you are present at the accouchement of sound. But if that sound is to be strong and healthy and beautiful, the tool of parturition — the cartridge in this case — must be electrically and mechanically competent.

After all, that's where your sound begins.

Martin Clifford

Mr. Clifford, whose column will be a regular feature in Ampersand, is an authority on stereo equipment.

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