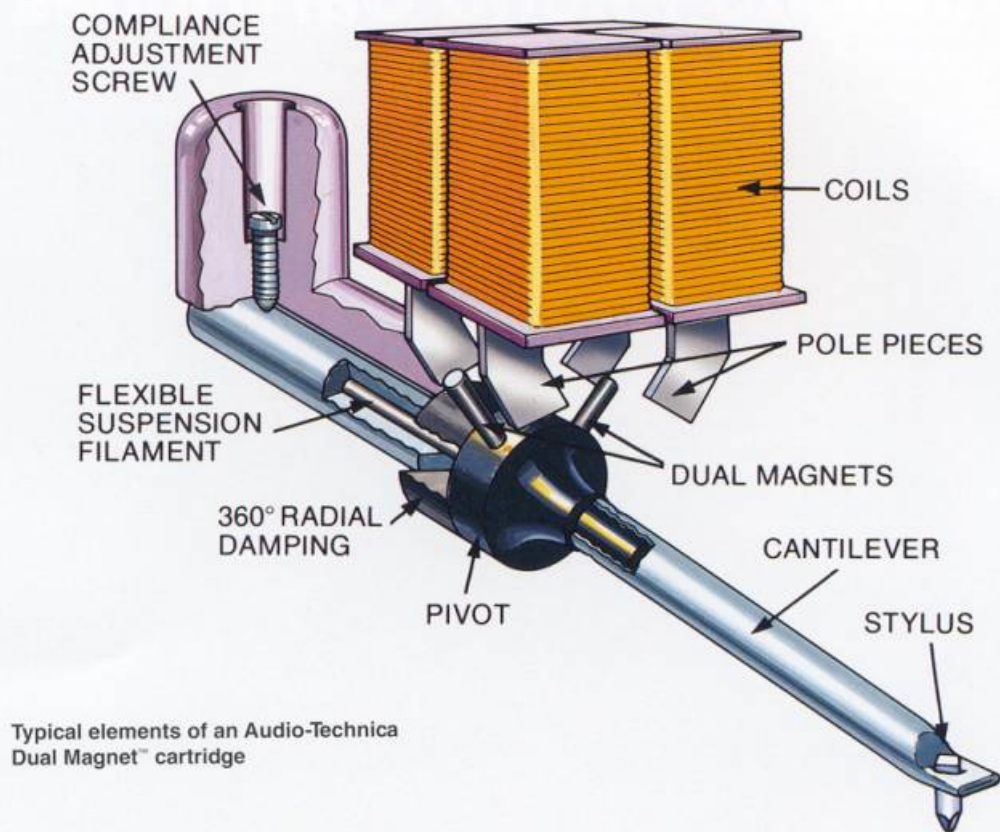


A Guide to Phono Cartridges



audio-technica[®]



Choosing the Right Cartridge

The ultimate performance potential of any record playing system is defined by the capabilities of the phono cartridge. Tonal balance, response range, clarity on musical peaks, stereo separation and imaging, and freedom from noise and distortion are all affected at the outset. The selection of this *first* component is critical to the full enjoyment of the rest of your system.

Your choice of cartridge can also strongly affect the life of your records. With vinyl records becoming more and more difficult to replace, it's an important point to keep in mind when selecting a cartridge or upgrading your system.

And since Audio-Technica has long been recognized as a world leader in phonograph cartridge design and production, we offer a wide range of models designed to match turntable/tone arm requirements, performance levels and budget considerations. This brochure is intended to help make your decision easier by giving you information on cartridge features and important specifications. It will also give you specific "numbers" for all of our cartridges, with more detailed information on our Audiophile Series. But no matter which model you select, we're confident you'll find your Audio-Technica cartridge to be an outstanding value in every respect.

How Does a Magnetic Cartridge Work?

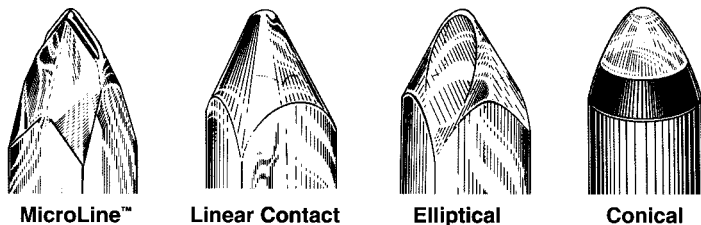
First, a word about how record grooves are created. Left- and right-channel audio signals drive two coils, mounted at 90 degrees to each other, in a cutter head. The combined motion of these two signals causes the cutter stylus to carve out an undulating groove in a master record. Modulations in the groove walls, then, are "analog" mechanical equivalents of the original audio signals. It's the cartridge's job to "read" these modulations and to reconstruct the original stereo signals.

Most cartridges on the market today reconstruct these signals by utilizing a "moving magnet" system. The stylus (or needle) of the cartridge is attached to an arm (called a cantilever) that can pivot as the stylus is moved by the record groove. A magnet at the other end of the cantilever moves between metal poles that extend from coils of wire, causing an electrical flow that is eventually amplified and heard as sound.

It is no coincidence that our approach to moving magnet cartridges closely duplicates the structure of the record cutting head. Instead of using a single, large magnet, A-T's patented Vector-Aligned™ Dual Magnet™ design positions *two* tiny magnets 90 degrees apart – directly in line with the two groove walls – with a separate, independent coil structure for each magnet. This ideal geometry and low magnet mass allow exact translation of record groove motion into matching electrical signals, ensuring excellent channel separation, extended frequency response and superb tracking.

What's the Difference in Styli?

Audio-Technica offers four different diamond stylus shapes: MicroLine™, Linear Contact, Elliptical and Conical.



The MicroLine stylus almost exactly duplicates the shape of the cutting stylus used to produce the original master disc. This enables it to track portions of the groove other styli cannot reach, resulting in extremely accurate tracing of high frequency passages and ruler-flat frequency response within the audible range. The unique multi-level shape wears more evenly, allowing greatly extended record and stylus life.

The sophisticated Linear Contact stylus provides a vertical contact area several times that of the elliptical, enabling it to respond to delicate groove modulations. The wide front radius distributes the stylus pressure more evenly, reducing wear on both the stylus and record.

The elliptical stylus has two radii, the front radius being wider than the side radius. This allows the stylus to ride in the center of the groove, like the conical, while the smaller side radius can more accurately track higher frequencies. Elliptical styli are available in several sizes – such as 0.2 x 0.7 mil, 0.3 x 0.7 mil and 0.4 x 0.7 mil – with the first number indicating the side radius. The smaller the side radius, the better the sound quality can be.

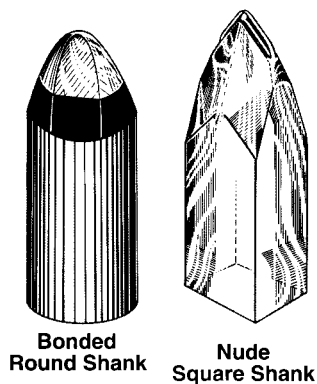
The conical stylus is the simplest, least expensive and most widely used stylus. Its spherical tip, which has a typical radius of 0.7 mil, normally touches the center of the record groove walls. The conical design works best in moderate to lower priced, and older, record players with higher tone arm tracking forces.

Nude or Bonded Styli?

Nude styli, shaped from whole diamonds, are more costly than bonded styli, with their diamond tips “bonded” to metal shanks before finishing. But because of their lower mass, nude styli track more accurately. Also, since our nude styli are grain-oriented, with their longest-wearing faces touching the record surface, they last longer.

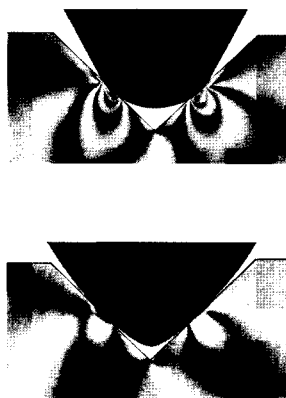
Square Shank or Round?

Square-shank nude styli cost even more than round-shank nude to make, but mounting them in laser-cut square holes in the cantilever locks them precisely in correct alignment with record grooves.



Is Tracking Force Important?

Yes, but not to the exclusion of other characteristics. Each cartridge (no matter who makes it) operates best in a particular range of tone arm tracking forces. It is important that this range is within the capabilities of your turntable if optimum performance is to be achieved. Keep in mind also that record wear goes up as *pressure* on the record surface increases. For a given tracking force, *pressure* on the groove wall will be highest with a small elliptical tip (say 0.2 x 0.7 mil) and lowest with a MicroLine stylus. But always stay within the recommended range. Tracking too *light* can cause as much (or more) damage as tracking too heavy.



Stress analysis photo shows the effect of a 2-gram tracking force. The elliptical stylus (top) contacts the groove in a concentrated area with high pressure. The MicroLine stylus (bottom) contacts the groove over a larger area, resulting in reduced pressure and less record wear.

What about Specifications?

The most important specifications include frequency response, channel separation, channel balance and output level. These “numbers” are an attempt to describe how your cartridge will perform, and how well it will meet your needs.

Frequency response is a measure of the range of sounds that the cartridge will reproduce uniformly. This “flatness” of response ensures that no frequencies are given over- or under-emphasis. And uniform response is a hallmark of Audio-Technica Vector Aligned cartridges, with even the least expensive units providing smooth reproduction within their stated ranges.

Channel separation is another key spec. It is the measure of how well one channel “ignores” the other stereo channel, so that you don’t get right-side sound from your left-side speaker. It’s measured in dB, and the higher the number, the better. Separation is especially important at the higher frequencies, a region where A-T cartridges are particularly outstanding.

Channel balance is a measure of both production quality and good basic design. Both sides of a stereo cartridge should be equally loud if equal recorded levels are present.

Output level is important in matching your cartridge to the electronics. Too low a level can result in noise, too high a level can over-drive a preamp into distortion. However, the output levels of all A-T Dual Magnet cartridges will work well with virtually any magnetic phono input.

There are a number of other measures of phono cartridge performance, but in the final analysis, the most important characteristics to you will probably be how well the cartridge performs audibly, how it interfaces with your other system components, and how carefully it preserves your record library for future use.

Which Cartridge is Best?

No single cartridge is best for everyone. For most people the question is really, "Which cartridge offers me the best value?"

But for a long-term investment in the finest sound reproduction, coupled with longest record life, we suggest our three Audiophile Series cartridges.

All Audio-Technica Audiophile Series cartridges are significant achievements in precision manufacturing.

They are hand-assembled with tolerances held to mere thousandths of an inch. Stringent quality control assures that these tolerances, as well as performance criteria, are maintained by every A-T Audiophile cartridge. The meticulous care and attention given to every detail in both design and construction results in superb cartridges that offer serious listeners the ultimate in musical enjoyment.

Audio-Technica Audiophile Series



AT-ML150



AT440ML



AT-OC9

Dual Moving Magnet

The AT-ML150 and AT440ML are our two finest moving magnet cartridges. Both feature the Vector-Aligned Dual Magnet design, MicroLine stylus and Audio-Technica's exclusive Paratoroidal Signal Generator.

This unique signal generating system is composed of a unified, laminated coil core wound with a single piece of wire. Internal mechanical and electrical connections are eliminated, minimizing magnetic losses and assuring better signal transfer. The use of PCOCC wire (Pure Copper by Ohno Continuous Casting), a special copper with virtually no transverse crystal barriers to impede signal transmission, perfects the performance of the advanced paratoroidal coil design. Thus, the coils of the AT-ML150 and AT440ML transmit distortion-free sound in which even the most subtle sonic details are reproduced with clarity and purity.

The AT-ML150 boasts other features as well, such as a light-weight yet extremely rigid gold-plated beryllium cantilever, mu-metal shielding to further enhance channel separation, an anti-resonance ceramic mounting base, and even PCOCC copper output terminals.

Dual Moving MicroCoil™

The AT-OC9 possesses the basic A-T Vector-Aligned design, but utilizes two tiny moving *coils* mounted at 90 degrees in place of the two moving magnets.

Many serious audiophiles prefer moving coil designs, citing clarity and transparency of tone, better defined transients, precise stereo imaging and lower distortion as the reasons for their preference. (Please note that moving coil cartridges require receivers or preamps with special compatible inputs. Also, their stylus assemblies are not field-replaceable.)

The AT-OC9 features an elliptical stylus, PCOCC coil windings for low-loss signal transmission, a high-flux samarium cobalt magnet and a low-resonance, gold-plated beryllium cantilever.

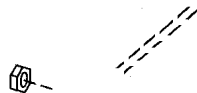
A Word About Mounts

Audio-Technica cartridges are designed with one of three mounting options: the P-mount (plug-in), the half-inch ($\frac{1}{2}$ ") mount or the universal mount.

A P-mount cartridge has four terminals at the back that simply plug in to the end of the tone arm. The cartridge is then secured to the tone arm with a single screw.



P-Mount



A half-inch mount cartridge also has four terminals at the back, but they are larger pins that connect to four individual wires at the end of the tone arm. The cartridge is secured to the tone arm's headshell with two screws, spaced $\frac{1}{2}$ " apart.

An A-T universal mount model is a P-mount cartridge with an included half-inch adapter bracket. It is thus compatible with both P-mount and half-inch mount tone arms.



Half-inch Mount

| Model | Frequency Response (Hz) | Output (mV at 1 kHz, 5 cm/sec) | Channel Separation dB at 1 kHz/10 kHz | Channel Balance (dB) | Vertical Tracking Force (grams) | Stylus Shape | Stylus Construction | Cantilever | Recommended Load Impedance (ohms) | Mount |
|---|-----------------------------------|---|---|--------------------------------|---|-----------------------------|----------------------------|-----------------------|---|--------------|
| AT-ML150 | 10-30,000 | 4.0 | 31/21 | 0.5 | 0.95-1.55 | MicroLine™ | Nude square shank | Gold-plated beryllium | 47,000 | Half-inch |
| AT440ML | 5-32,000 | 5.0 | 30/20 | 0.75 | 0.8-1.6 | MicroLine™ | Nude square shank | Tapered alloy tube | 47,000 | Half-inch |
| AT-OC9 | 15-50,000 | 0.4 | 31/21 | 1.0 | 1.25-1.75 | Special elliptical polished | Nude square shank | Gold-plated beryllium | 20 | Half-inch |
| AT132EP | 10-30,000 | 5.0 | 30/20 | 0.75 | 0.8-1.6 | 0.2 x 0.7 mil elliptical | Nude square shank | Tapered alloy tube | 47,000 | Universal |
| AT120 E/T | 15-25,000 | 5.0 | 29/20 | 1.0 | 1.0-1.8 | 0.3 x 0.7 mil elliptical | Nude round shank | Alloy tube | 47,000 | Half-inch |
| AT331LP | 10-30,000 | 3.0 | 31/21 | 1.0 | 1.0-1.6 | Linear Contact | Bonded round shank | Tapered alloy tube | 47,000 | Universal |
| AT316EP | 10-27,000 | 5.0 | 29/20 | 1.0 | 1.0-1.5 | 0.3 x 0.7 mil elliptical | Nude round shank | Alloy tube | 47,000 | Universal |
| AT311EP | 15-27,000 | 5.0 | 29/18 | 1.25 | 1.0-1.5 | 0.3 x 0.7 mil elliptical | Bonded round shank | Alloy tube | 47,000 | Universal |
| AT301EP | 15-25,000 | 5.0 | 26/17 | 1.5 | 1.0-1.5 | 0.4 x 0.7 mil elliptical | Bonded round shank | Alloy tube | 47,000 | Universal |
| AT300P | 20-22,000 | 5.0 | 26/16 | 1.5 | 1.0-1.5 | 0.6 mil conical | Bonded round shank | Alloy tube | 47,000 | Universal |
| AT71ELC | 20-22,000 | 3.5 | 22/17 | 1.5 | 1.0-2.0 | 0.4 x 0.7 mil elliptical | Bonded round shank | Alloy tube | 47,000 | Half-inch |
| AT70L | 20-20,000 | 3.5 | 20/15 | 1.5 | 1.5-2.5 | 0.7 mil conical | Bonded round shank | Alloy tube | 47,000 | Half-inch |
| AT92ECD | 15-27,000 | 3.5 | 29/18 | 1.25 | 1.0-1.5 | 0.3 x 0.7 mil elliptical | Bonded round shank | Alloy tube | 47,000 | Universal |
| AT91ECD | 15-25,000 | 3.5 | 26/17 | 1.5 | 1.0-1.5 | 0.4 x 0.7 mil elliptical | Bonded round shank | Alloy tube | 47,000 | Universal |
| AT90CD | 20-20,000 | 3.5 | 24/15 | 1.5 | 1.0-1.5 | 0.7 mil conical | Bonded round shank | Alloy tube | 47,000 | Universal |
| AT3482P | 20-20,000 | 5.0 | 24/15 | 1.5 | 1.0-1.5 | 0.7 mil conical | Bonded round shank | Carbon fiber | 47,000 | P-mount |
| AT3482H/U | 20-20,000 | 5.0 | 24/15 | 1.5 | 1.0-1.5 | 0.7 mil conical | Bonded round shank | Carbon fiber | 47,000 | Universal |
| CN5625AL | 20-20,000 | 4.2 | 20/15 | 1.5 | 1.5-3.0 | 0.7 mil conical | Bonded round shank | Alloy tube | 47,000 | Half-inch |
| ATP-2 and ATP-2XN (extra stylus included) | 15-22,000 | 5.3 | 23/17 | 1.5 | 3.0-5.0 | 0.4 x 0.7 mil elliptical | Bonded round shank | Alloy tube | 47,000 | Half-inch |

| | | Stylus Tip | |
|--------------|-----------|--|--|
| Series | Mount | Conical | .4 x .7 Elliptical |
| Standard | Half-inch |  <p>CN5625AL</p>  <p>AT70L</p> |  <p>AT71ELC</p> |
| | P-Mount |  <p>AT3482P</p> | |
| | Universal |  <p>AT90CD</p>  <p>AT300P</p>  <p>AT3482H/U</p> |  <p>AT91ECD</p>  <p>AT301EP</p> |
| Professional | Half-inch | |  <p>ATP-2 ATP-2XN</p> |
| Audiophile | Half-inch | | |

.3 x .7 Elliptical



AT120E/T

Premium Elliptical

.2 x .7

Linear Contact/MicroLine™



AT92ECD



AT311EP



AT316EP



AT132EP

Linear Contact



AT331LP

Special Elliptical Polished

MicroLine™



AT-OC9

Dual Moving MicroCoil™



AT440ML



AT-ML150