

Connecting Your Turntable

Barry Johnson – July 2008

There are many different types of equipment you may use to record your vinyl records, and many possible ways to connect them – but only some of the ways are correct. To make sure we're clear, let's first look at a few of the different types of plugs you may see:



1/4" Phone (or Phono) Plug



RCA Plug



1/8" (or 3.5mm or 4mm)

The 1/4" plug (it was originally used for telephone equipment, so it's often called a "phone plug") is most commonly used for microphones and speakers, and the RCA style of plug was commonly used for external turntables and mini-disc players. While it's hard to see from these pictures, the 1/8" plug on the right is much smaller than the 1/4" plug on the left: the barrel itself is only half as wide and is much shorter.

Each of the plugs shown is a "monaural" (or "mono") plug, carrying only one channel of music. Mono plugs and cables work for *most* applications, but there are a few exceptions and we'll note them later. Each of the plugs shown connect to two wires inside the cable: a "hot" wire in the center (or at the tip), and a "ground" wire around the outside (or the barrel of the plug itself).

Stereo (two channel) versions are available for each of these styles. In the case of RCA plugs, the stereo versions simply add another plug at each end, so that you've got one plug for the left channel and one for the right; they're usually color-coded so you don't have to guess which end is which.

On the phone (phono) plugs, you'll be able to see a "ring" of insulation (often black) separating the tip from the metal barrel. The stereo version of the plug separates the barrel itself into two sections, which means it needs a second ring of insulation. So the rule is simple: the number of insulation rings is the number of channels of music – a mono plug has one ring, and a stereo plug has two.

Recording with a Standard Turntable

If you don't have a turntable (and intend to use your Hilton set), skip this section altogether.

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The very best quality recording is produced by using a high-quality turntable. You may still have one from “the old days” of 33 1/3 RPM albums. If it’s still running well, you might wish to use it instead of a portable turntable/amplifier/mixer combination like the common Hilton Audio products.

The output signals from a “normal” turntable need to be adjusted somewhat. For reasons having to do with the physical characteristics of vinyl records and needles, the “phonograph out” signal produced by a standard turntable strongly emphasizes treble and high-frequency sounds while minimizing bass notes. This emphasis is an industry-standard bias and is present in every turntable manufactured since the mid 1950’s¹.

Your computer system doesn’t really know about this bias², so you need to “correct” the signal before sending it along to your computer, using an amplifier or pre-amplifier. Look for an amplifier that has “phono-in” and “line-out” connectors, connect the turntable’s output to the amplifier’s phono-in, and connect the line-out to your computer (more on that later).

What’s the difference between an amplifier and a pre-amplifier?

An amplifier is an electronic device that will “boost” incoming signals of various types to a signal strong enough to drive speakers – possibly even big speakers. On the other hand, a pre-amplifier is a simpler (and less expensive) device that provides only a small boost to the signal – but it’s the right size boost needed if your goal is to connect your turntable only to your computer.

If you want to connect your turntable to speakers, you’ll want an amplifier. If you simply want to connect the turntable to your computer, a pre-amplifier will be just fine.

I have a turntable, but not an amplifier. What kind should I get?

If you’re looking to play music at home directly from your turntable to speakers, you’ll need an amplifier instead of a less-expensive pre-amp. Amplifiers are available for nearly every price range (including very expensive). You’ll probably want to consult with a local expert or audiophile to help search through all the options and make your best selection.

¹ The problem was that deep bass notes would require very large side-to-side “jiggles” in the track on the record – large enough that they would cut into the adjacent groove for modern 33 1/3 and 45 RPM records. By deemphasizing the bass cuts on the record, then “equalizing” it with electronics in the amplifier, the grooves could be closer together, so playing time could be increased. The “RIAA Equalization Curve” was standardized in 1954.

It’s a little ironic: the Recording Industry Association of America (RIAA) was originally formed in 1952 to create and administer this equalization curve, aiding in the creation of gramophone-type records and the equipment that plays them. Over the years, RIAA’s mission has changed to focus almost exclusively on intellectual property rights (and the streams of money associated with those rights), and technical standards such as the equalization curve no longer even appear in the RIAA’s mission statement.

² Well, if you really needed connect without using an amplifier, Audacity does have an equalization effect that knows about the RIAA equalization curve. It also knows about the other equalization curves in use prior to the 1954 RIAA standard. But you’re better off using an amp anyway.

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If you are simply looking to connect your turntable to your computer, then a pre-amplifier is probably a better choice. There are several relatively inexpensive pre-amplifiers available for sale across the Internet, including some in the \$50 to \$100 range. You'll want a pre-amplifier that allows you to control the volume output (they all should do that), and you *probably* want one that will also support microphone input (more on that specific point later). Having control over the tonal quality of the output is a nice but not completely necessary feature.

As of this writing, Pyramid makes a nice pre-amp with microphone input that is available for sale through several outlets for about \$70.

To hook all this up, you'll connect your turntable to the "phono-in" jack on your amp or pre-amp. It's very likely this will require a cable with two male RCA connectors at each end – one for the left channel of output and another for the right. Connect the "phono-out" jacks from the amp to the computer – this will likely require a cable with two male RCA connectors at one end and a 1/8 inch stereo connector at the computer end.

Recording with a Hilton Turntable

Hilton Audio Products manufactures the majority of turntable/amplifier/mixer sets used by callers across the USA. While most of the Hilton products are very easy to connect to your computer, some do require some special care.

If your Hilton set has a "line out" or "music out" jack (usually on the back, but sometimes on the front), then that's the jack you'll want to use. The signal produced by this at the standard "line voltage" level. This jack will need either a single RCA or 1/8 inch monaural plug. If you've got this jack, use it and skip reading the rest of this section.

If you have an old Hilton AC-200 or AC-300 with a "tape record" jack (which is usually a 1/4" connector), there are some additional complications. The signal produced on this connection is exactly the same as the speaker output, except that its voltage is reduced down to "line-out" levels. This means that all of the "Hilton magic" adjustments of frequencies have already been applied to your music by the time the signal gets to this jack.

Among other things, the Hilton amplifiers boost the bass portion of the music before it's sent out to the speakers – so when you record it, the bass will be boosted. When you turn around and play it back from your computer, the bass will be boosted again – and you really won't be happy with the results. The music will have much too much "bottom" and will sound muddy.

Therefore, I recommend that you turn the music bass knob down *all the way* down (avoiding the bass boost) when you're recording from the Tape Record jack on your AC-200 or AC-300, and set the knob back to normal when you're playing the music back.

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Playback with a Hilton Turntable

Again, the more recent Hilton models incorporate a music-in jack (either a 1/8" phono or an RCA jack). If your turntable has this jack, use it for playback and you should be in good shape.

If your turntable has a "Tape Playback" jack (probably requiring a 1/4" plug), it will accept line-level signals as input. Be careful: most of these models will ignore the turntable circuits if anything at all is plugged into the Tape Playback jack. If you try to play a record and nothing happens, pull the Tape Playback plug.

Signal Boosters

If you're connecting a CD or Minidisk player (or even some laptops) to an older Hilton model, the incoming signal might not be quite strong enough to produce good volume. Hilton makes two in-line amplifiers to solve this problem:



The left one is for stereo recordings, and the right one is for monaural recordings. Round dance cuers that put the music on one track and pre-recording cues on the other track will need the stereo version, but most callers would be satisfied with the monaural. Plug the box into your CD or Mini-disk player, then connect a cable from the box to your Hilton.

These in-line signal boosters are not powered – they have no battery or power plug. So if the signal comes in one side at one voltage level, then exits the other side with more voltage, where does the extra power come from? Well, it comes from within the music itself. These amplifiers work by slightly re-arranging the sound waves – borrowing energy from quieter sections to “loan” to the louder sections. In other words, they make the loud parts louder at the expense of the quieter parts.

This distortion isn't really perceptible at low levels of boost, but can become audible at higher levels – so you normally won't want to turn the volume on the booster all the way up.

One note of caution: Hilton's monaural amplifier requires the use of a *stereo* cable. While only the left channel is boosted, the jack used within the device will short out if a mono plug is used. If you plug in one of these mono in-line amplifiers and no sound is produced, check your cable. I finally threw away all of my cables with mono jacks, just so I don't use one by accident with the amplifier.

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The Computer End

The analog signal coming into your computer will need to be turned into a digital signal by some special electronics on your computer. Most people call these electronics a “sound card”, even though they probably aren’t on a separate card at all on your computer today.

Sound cards can significantly differ in quality from one manufacturer’s computer to another, and even within a brand. Historically, the sound circuitry in laptops has been among the *worst* quality – the manufacturers have very limited space and power to afford, and sound quality usually hasn’t been a high-priority item for laptops. In addition, the sound circuitry on some laptops can pick up interference from other circuitry on the computer, leading to extra hums or crackles. Having said that, recent laptop chipsets have been getting better in quality and performance, so all of this is becoming less of an issue over time.

For desktop computers, the sound circuitry is usually handled by an external card, rather than being built into the motherboard. These external cards can vary in quality as well. If producing very high-quality music is a priority for you (and you’re using a desktop computer for recording), you may wish to invest in a high-quality sound card.

A third option, especially for laptops, is to use an “external sound card”, often called a “USB sound card”. These small devices connect to one of the USB slots on the laptop with a short cable, and move the sound circuitry completely outside the computer. One low-cost example is the Griffin Technologies iMic with a retail price of about \$40.



The iMic supports both line and microphone input levels (selectable with a switch) as well as producing line level output.

One advantage to using an external sound card like the iMic: it can provide an electronic buffer between your computer and your amplifier. In very rare cases, an amplifier can short out in such a way that it can damage your computer. A USB sound card can act like a fuse helping to protect your relatively expensive computer from damage³.

³ Ask Nick Hartley of Indianapolis for a testimonial. After he replaced his \$1200 laptop, he’s now a firm believer in always using a USB sound card as a protective fuse.

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Regardless of your choice of sound card: built-in, separate or external, you'll want to use a line-in jack if it's available, or the microphone jack on a laptop if there is no line-in.

Microphones and Laptops

One area where the built-in chipsets on most laptops really suffer in quality is the amplification of microphones. Most laptops on the market are expected to be used with very cheap microphones suitable for holding telephone-style conversations, not the high-quality, rich toned microphones used by callers.

You can record decent microphonic sound with your laptop, but you'll need some hardware to help. The best results come from using a pre-amplifier (like the ones you would use with turntables) that provide a high-quality signal boost up to line level. Using a USB sound card will still be better than using the built-in sound circuitry, but not as good as a pre-amplifier.

A good sound card for a desktop computer will also have a good microphone amplifier.

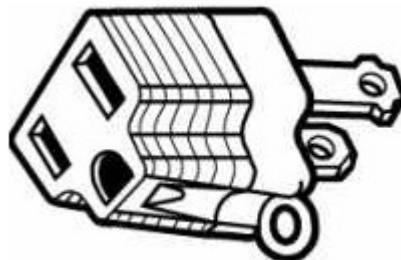
Laptop Power Cords

Finally, there is one source of noise (especially 60-cycle "hums") that can occur on all computers, but especially with laptops. It is not at all uncommon for electrical motors to generate a 60-cycle "buzz" on the *ground* wire (the third, round plug on a power cord) of a power circuit. Because electricians carefully wire all of the grounds together for an electrical circuit, that 60-cycle hum can be piped straight into your laptop through its power cord.

Because the circuitry on a laptop is squeezed so tightly together, this hum can be induced into the sound output of your computer, then amplified through your speakers on playback. It happens far more often than you might expect.

There are two very simple fixes. The first is to simply unplug your laptop and use battery power while recording or playing.

The second fix is nearly as easy: get an inexpensive three-wire to two-wire electrical adapter, and stick it on the end of your laptop power cord.



For safety reasons, you should really only use this adapter if you have a problem with sound. However, many callers simply use this adapter every time they call, and every time they record music.

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