

Chapter 3 – Copying the Original: 45 RPM Records

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First, some general copying guidelines:

1. CRT monitors are terrible noise sources. LCD monitors are much quieter. If you are using a CRT monitor it's important to keep your turntable, reel-to-reel tape deck or audio cassette deck at least four feet from the monitor.
2. Operating your monitor (especially if it's the CRT type) on a line-isolation transformer may help to reduce the noise. Also reversing the monitor's mains cord plug and/or the turntable or tape deck plug may help. (I've seen a plug reversal make a 6 dB noise level difference so it pays to experiment.)
3. Power your computer and monitor on a different electrical circuit from the one powering your audio playback equipment. Have an electrician put in a new circuit if this is needed.
4. Copy the original source to a WAV file format: at least 16-bit stereo and 44,100 samples per second. This is the "Red Book" standard for CDs. You can copy at a higher resolution and a faster sample rate and then use your audio editing software to convert to the Red Book standard but it's doubtful that any of your source material will benefit from the extra time and hard drive space needed to do this.

45 RPM Records

RCA developed and started marketing 45 RPM records and a low priced player in 1949 as a counter to arch rival Columbia who was introducing the 33-1/3 RPM LP (long play). 45s and LPs are microgroove (as opposed to wide groove 78s) so the same pickup cartridge and stylus can be used for both.

So what playback equalization is needed? It's doubtful that early 45s used RIAA simply because Columbia was pushing to have it adopted as an industry standard [1]. RCA probably used FFRR (Full Frequency Range Recording) just to show its independence or, perhaps, the so-called "RCA Victor" equalization (see table below). However, FFRR, RIAA and RCA Victor are so similar that I can't hear any difference.

FFRR	Turnover = 300 Hz	Rolloff = 2122 Hz
RIAA	500 Hz	2122 Hz
RCA Victor	500 Hz	2700 Hz (used on LPs until August 1952)

You will need a good quality turntable with a 45 RPM speed [2], a preamplifier [3], a computer with a good quality sound card [4], a program to copy the sound card output to your hard drive [5], and (VERY IMPORTANT) good quality cables to connect the preamp output to the sound card's line-in connectors [6]. 45s are mono but I prefer to copy them in stereo because I have found it

easier to do the “clean up” – that is, removing the clicks, crackle, pops and noise.

Most modern turntables include a stroboscope for setting the speed built into the outer edge of the turntable for setting 33-1/3, 45 or 78 RPM (depending on which speeds the turntable has).

1. Andre Millard, *America on Record: A History of Recorded Sound*, Cambridge University Press, 1995.

2. Most LP turntables also play 45s and they come with an adapter for the large 45 center hole. We like direct drive ‘tables and have several models that we use for LPs and 45s. For more information on selecting a turntable, please see our **Audio Help** page: “Where can I buy audio equipment in different price ranges?” Since LPs and 45s are microgroove, listening to them and copying them are quite similar. So you can find additional information in our **Audio Help** section under: “How do I listen to 33 RPM records?” and “How do I copy a 33 RPM record to CD?”

3. We especially developed our models 403, 409 and 4041 stereo preamps to restore and **listen to** LPs and 45's. (These preamps have RIAA equalization only.) Our models 407 and 408 can be set to RIAA, FFRR and RCA Victor (as well as many others). To download a data sheets or User Guide click [here](#) to go to our Preamp Products page.

4. Sound cards are not created equal. For a fairly comprehensive comparison go to (<http://www.pcavtech.com/soundcards/compare/index.htm>). The site operator, Mr. Arnold Krueger, tests the cards and posts his findings. We like the *Turtle Beach Santa Cruz* card (it has a score of 7 with 5 being the best) and the *Waveterminal 192X* (it's not rated but it does up to 24-bit sampling at up to 192 kHz). Also check out the cards at (<http://www.tracertek.com>).

5. There are many programs which you can use to copy the sound card output to your hard drive. Among other, we use the following: *CoolEdit Pro* (in May 2003 *Adobe* bought the *Syntrillim* software and *Cool Edit Pro* became *Adobe Audition*), *Dart XP Pro* (DARTEch, Inc., 7400 Metro Blvd #350, Edina, MN 55439. 800-799-1692. (<http://www.dartpro.com>) and Sony Sound Forge 8, (<http://www.sony.com/mediasoftware>).

6. Buy the best quality cables you can afford! Cheap cables have insufficient shielding to keep noise and power line hum out of your audio. If you have gotten this far, you have already spent quite a few dollars getting set up for restoration so get good cables. Primarily, we use *Dayton Audio Cables* from *Parts Express* (<http://www.partsexpress.com>). *Radio Shack Goldline Cables* are pretty good too. (<http://www.radioshack.com>)

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