Physical preparation

Sound card Go for a quality card with well-supported Linux drivers. Use the line input, not mic. Keep it as far away from other cards as possible. Mute all unused inputs. See the Linux Audio-Quality-HOWTO at
http://www.linuxdj.com/audio/quality/

Preamp The vinyl was created with the famous RIAA curve applied (boosting treble and reducing bass frequencies), so for faithful sound the preamp must reverse this process. The phono input on a stereo receiver takes care of it. If the receiver has no phono input, a phono preamp can be bought separately. Use a quality, shielded cable to connect to the sound card. Don't neglect the quality of the turntable and especially the stylus.

Kernel The preemptible kernel patch is recommended for use with the 2.4 series (*http://www.tech9.net/rml/linux/*), or use the 2.6 series and enable the preemptible option.

Software choices The standard package, now sadly out of date is *gramofile(http://panic.et.tudelft.nl/~costar/gramofile/)*. It handles the basics of capture/track-splitting/filtering. Using *xmcd2make* (*http://freeengineer.org/*) requires more software preparation but greatly aids encoding of the resulting wav files. A console mixer called *umix* (*http://umix.sourceforge.net/*) displays numeric levels, allowing accurate recreation of levels.

Newer choices are X-based, most notably GNOME Wave Cleaner (*http://gwc.sourceforge.net/*). From the web site "The goals are simple -- denoise, dehiss and amplify audio files. With the use of libsndfile, you can now do this on a multitude of audio formats, wav, au, aiff, ... ". It currently depends on GNOME 1.4 libs, but the author acknowledges that it's time for an update.

Commercial CD labeling systems don't yet seem to recognize the Linux community, but a useful free Linux choice is *cd-circle-print* (Debianized as *cd-circleprint*) (http://sourceforge.net/projects/cd-circle-print) which uses a perl/tk frontend to produce PostScript output. Too bad it seems to be orphaned and in need of bug fixes.

Clean vinyl Before capturing the vinyl sound of an old LP, cleaning is recommended. Also, playing it once to "knock the dust out of the groove" is a good idea. Distilled water, a special record brush, and a clean soft bath towel make a simple, inexpensive cleaning combination. A nice place to dry is centered on an inverted drinking glass so both sides can dry at once.   For "accumulated 'net wisdom'" on LP cleaning see
http://www.artsandmedia.com/lpclean.html

Sample installation on a Knoppix system

Starting with an installation of Knoppix 3.3 of 11-19-03, I was able to remove the standard gramofile, then install gramofile 1.6vd3 and xmcd2make plus all their dependencies in just a few steps:

- From ftp://ftp.freeengineer.org/pub/xmcd2make download gramofile-1.6vd3-3.i386.rpm and xmcd2make-0.6-1.i386.rpm
- apt-get remove gramofile
- apt-get install swig mpgtx
- alien -i gramofile-1.6vd3-3.i386.rpm
- alien -i xmcd2make-0.6-1.i386.rpm
- then copy Gramofile.pm and Gramofile.so into the perl PATH:
      #cp -vp /usr/lib/perl5/5.8.0/i386-linux-thread-multi/Gr* /usr/share/perl/5.8.2

Capture and process the sound of vinyl

Gramofile was designed to handle the basic steps in a single console-based application. Xmcd2make carries on from there.

- prepare xmcd file
      copy and paste the text from http://www.freedb.org/, or edit from a blank xmcd file
- capture audio stream to wav file
      gramofile's "Record Audio" menu item, or some other wav capture app
- detect tracks, make corrections if required
      gramofile's "Locate Tracks" menu item, gramofile's "Process the Audio Signal" menu item with "detect tracks" checked, or the findtracks command, eg "findtracks <file.wav> --min-silence-blocks 12"
- prepare the make file
      xmcd2make generates the make file based upon the xmcd file and tracks files, eg "xmcd2make <basename> –bitrate 224"
- split the tracks
      "make proc" creates a separate wav file for each track. Play back to verify tracks were split correctly. If not, edit the tracks file, delete any wav file whose start/end changed, and rerun "make proc".
- filter as desired
      gramofile's "Process the Audio Signal" menu item (a song or side at a time), or GNOME Wave Cleaner for finer grained control with more advanced filtering options and algorithms
- proceed with encoding
      "make" encodes all tracks to ogg files, with the file name bearing the song title. Encoding to mp3 is an option via *bladeenc* or *lame*.
- burn to CD
      Linux offers an abundance of CD burning programs
- print labels
      cd-circleprint produces PostScript files and wraps text across the upper or lower circumference, and allows setting of text and background colors or background image.

Note: The above steps can look complex, but after 2 or 3 albums will become obvious and perhaps even enjoyable! This procedure can also be used to capture radio broadcasts or any other audio source.

Addendum:

Findtracks options

Usage: /usr/local/bin/findtracks wav_file_name [options]

findtracks is a script which wraps the Gramofile::tracksplit function for simple command line or shell script usage, creating a gramofile .tracks file, and optionally a graph file as output. *findtracks* requires *gramofile* with the perl-swig extensions (1.6p).

```
--help       -h                this message
--make-use-rms                 default = 1
--make-graphs                  default = 0
--blocklen                     default = 4410
--global-silence-factor        default = 150
--local-silence-threshold  default = 5
--min-silence-blocks           default = 20
--min-track-blocks             default = 50
--extra-blocks-start           default = 3
--extra-blocks-end             default = 6
```

Any of these defaults can be overridden by using a .gramofilerc in your home directory.

Other useful software:
WaveSurfer is "an open source tool for sound visualization and manipulation" (http://www.speech.kth.se/wavesurfer/), which is cross-platform, under a BSD style license.

Audacity "is a free audio editor. You can record sounds, play sounds, import and export WAV, AIFF, and MP3 files, and more. Use it to edit your sounds using Cut, Copy and Paste (with unlimited Undo), mix tracks together, or apply effects to your recordings." (http://audacity.sourceforge.net)

"Planet CCRMA (CCRMA is pronounced 'karma') at Home is a collection of rpms (RPM stands for RedHat Package Manager) that you can add to a computer running RedHat 7.3, 8.0, 9 or Fedora Core 1 to transform it into an audio workstation with a low-latency kernel, current ALSA audio drivers and a nice set of music, midi, audio and video applications." (http://www-ccrma.stanford.edu/planetccrma/software/planetccrma.html)

A relevant article (from a Win-perspective) appeared in NYT on 01/01/2004 (http://www.nytimes.com/2004/01/01/technology/circuits/01basi.html), entitled "From Vinyl to Digital, Hold the Crackle".

This summary prepared by Tom Younker (tom@darecomputer.com). He embarked on this conversion process in the fall of 2001, and wrote an article for *Linux Journal* in January 2003, which was published in September 2003. He runs a small business focused on computer repair, problem solving and raising awareness of open source.