Copying your vinyl records to CD using the *Audacity* programme

Some introductory notes

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INTRODUCTION

These notes were prepared for a SeniorNet(Wgtn) workshop held in September 2011 to help members use a computer to copy music from LP's to CD's/DVD's using the *Audacity* programme.

The notes have been helped by *Audacity's* on-line Quick Help and Manual, and also by an article by Mike Le Voi in the May 2011 issue of the APC (*Australian Personal Computer*) magazine.

CONTENTS

PART 1: Preparation

1.1   **Choosing a record player:**
You can either use your existing record player system[1] or purchase a dedicated 'stand alone' turntable that is designed to work directly into your PC. These turntables are available from electronic shops such as Jaycar Electronics and Dick Smith outlets[2].

1.2   **Connecting your record player to your computer**
This is done using a screened stereo audio cable that is fitted with the correct plugs to connect between the record player output and the Line In input of your PC. At the record player output there will be one of the following socket types to connect your PC to:

  a. Two RCA type sockets, marked 'Line Out' or 'Audio Out', one for each of the stereo channels. Your connecting cable will therefore need two RCA plugs to connect into these sockets (**Fig 1**). *or*

  b. One 6.5mm dia stereo headphone socket, marked 'Headphone' (or similar). Your connecting cable will therefore need a 6.5mm dia stereo headphone plug to connect into this (**Fig 2**). Note that this stereo plug has three tip segments, for left channel, right channel and earth *or*

  c. One 3.5mm dia stereo earpiece socket. In this case your connecting cable should have a 3.5mm dia stereo plug (**Fig 3**).

At your PC end of the connecting cable, a 3.5mm dia stereo plug is required to connect into the 3.5mm dia Line In socket at the rear of your computer. This audio input socket is usually coloured blue (**Fig 4**), but check this against the labelling on your PC case. (Note that the microphone input alongside is usually coloured red, and should not be used to connect up your turntable. The green socket is usually the audio out to your PC speakers).

Fig 1: RCA type plugs & sockets

Fig 2: 6.5mm plug & socket

Fig 3: 3.5mm plug & socket

Fig 4: Connecting to the 'Line In' socket on the PC

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1. If you have a good HiFi system, using this would be the best choice to maintain audio quality but note that you cannot use an 'ordinary' turntable on its own because its output level will be too low and sound poor because of the lack of proper tone correction.

2. There seem to be two price levels: one at about $90 and one at about $150. Any bundled Audacity programme will probably be obsolete, and should be ignored. Some dedicated turntables may have a USB option that enables them to be connected into a USB port on your PC. In this case, discuss what you need with the supplier.

From the above you should be able to work out what cable/adaptors you need to buy that suits your requirements[1] from one of the electronic suppliers. When you purchase this cable, choose one that has the minimum length to go between your record player and PC so as to minimise hum and other pickup noise.

1.3 Downloading the Audicity programme

This free programme is available for downloading from http://audacity.sourceforge.net/download/ The latest version (as at July 2011) is the 1.3 series (Beta) which is still under final checking but is recommended. From this series, choose the Windows 1.3.13 version and install it on your PC. (The Audacity version 2 may be available by the time you receive these notes).

1.4 Customising Audacity's Preferences

It is desirable to change some Audacity preferences before you start, and to do this, open Audacity using the Audacity shortcut on the desktop, and close any dialogue box that may appear to remind you of Audacity's Help facilities. At this stage you will have a blank Audacity window on the screen and you then click on **Edit/Preferences** on its menu and make the following changes (**Fig 6**):

Devices tab: Set the 'Recording' to **Audio (WAVE): Line In**. This is because we will be connecting the record player to the 'Line In' socket at the back of the PC.

Quality tab: Set the Default sample rate to 44,100Hz. Set the Default sample format to 16-bit. (While 32-bit would give you a small gain in quality, the files will be larger and 16-bit is the standard for burning CDs).

Interface tab: Set the 'Meter/Waveform db Range' to -60db

Import/Export tab: uncheck the 'Show Metadata Editor'

Keyboard tab: Zooming in and out will be frequently required and it is suggested that you change their keyboard shortcuts to **Numpad8** for 'ZoomIn' and **Numpad2** for 'ZoomOut'. (These keys correspond to the Up and Down arrows on the Number Pad).

1.5 Creating a folder for your Audacity projects

It is helpful to create a specific folder for all of your Audacity projects, so that the files you create can be held in this one location.

To do this, open Windows Explorer (shortcut keys: **Win key+E**), highlight the Desktop folder, and from the menu select **File/NewFolder** and type in 'AudacityProjects' as the folder name. Then key in **Enter** to create this named folder on the Desktop of your PC.
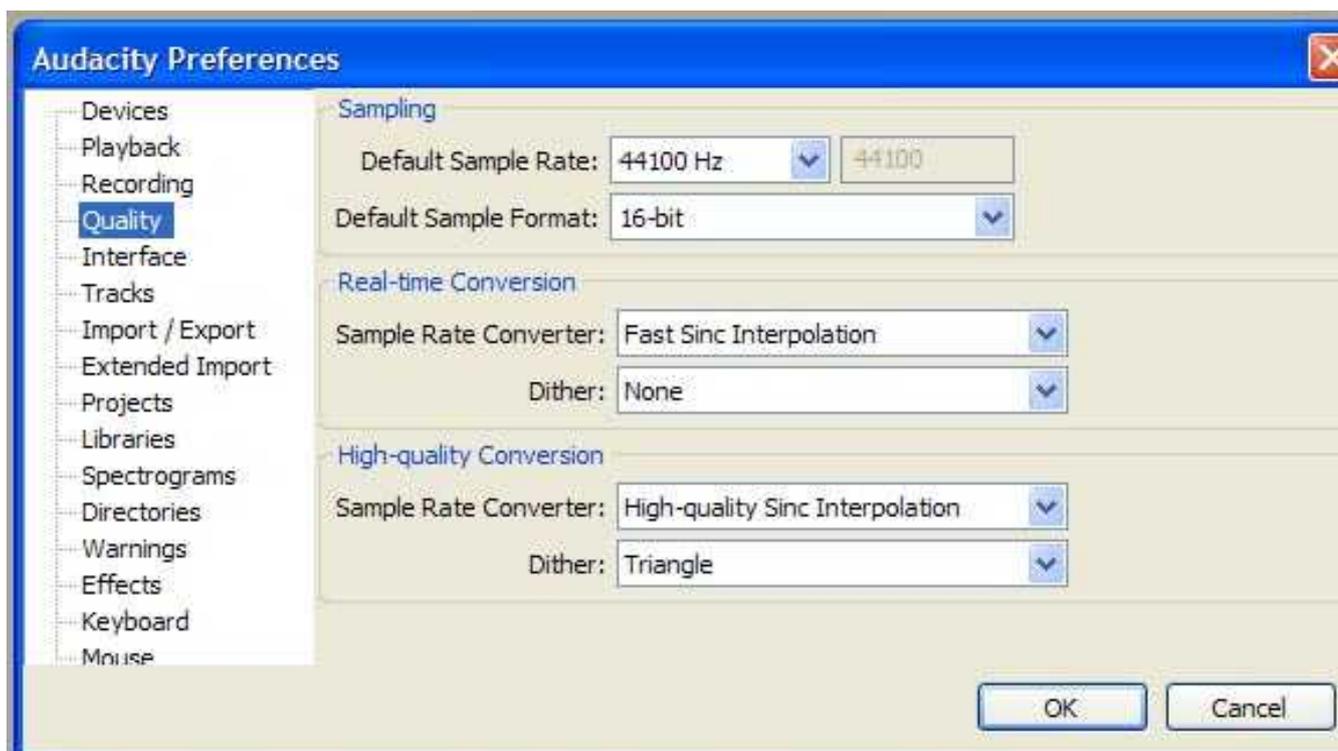

Fig 6: Audacity's preferences (Quality tab)

1. If your record player gives you a choice between a 'LineOut' and a headphone socket, use the 'LineOut' option as it will probably give you a better quality signal.

PART 2: Recording an LP

This requires creating a specific Audacity project, presetting the recording level while playing the loudest parts of the LP and then doing a fresh recording to get a complete archive file of the music. The music will be edited later by Audacity's tools to remove blemishes etc (Part 4 below).

2.1 Creating a specific Audacity project
Open Audacity by double clicking on it's icon on the Desktop. The opened window will look like **Fig 7**. Save this (blank) project by clicking on the menu **File/SaveProjectAs**. You will then get a reminder that Audacity files can only be opened by the Audacity pro-gramme. Click **OK** to clear this warning box and then save the project in your Audacity Projects folder as an Audacity Project (.aup) with the file name of the record that you will be recording. In this case the file name is to be **RenaissanceBand**. Then click **Save**.

You will see (in Windows Explorer) that this project has two parts: a *Renaissance-Band-data* folder, and a *RenaissanceBand .aup* file. Both of these are empty at this stage because we have not yet made a recording. Close the Audacity programme.
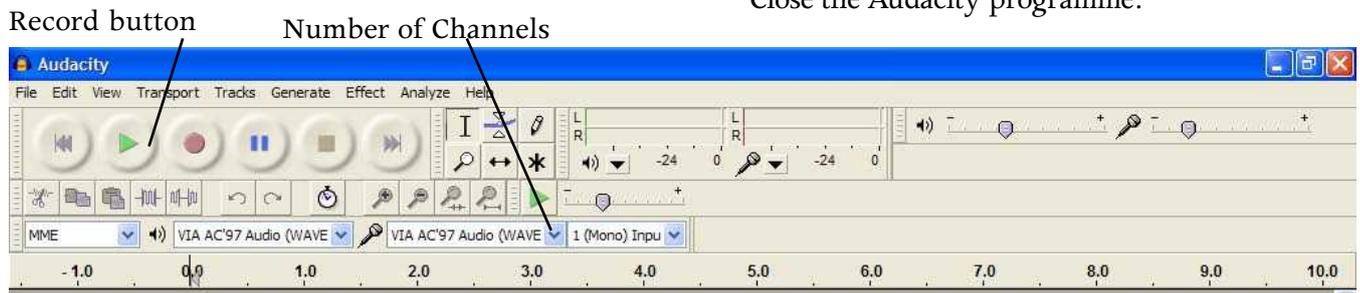
Record button   Number of Channels

Fig 7: A blank Audacity window

2.2 Trial to preset recording level
The level from the turntable has to be preset so that its loudest levels do not cause distor-tion during your final recording:

1. Connect your turntable to the PC (see Part 1 above) and switch the turntable on.
2. Open the Audacity programme and use **File/Open/RenaissanceBand.aup** to open this (empty) file.
3. Set the number of channels (**Fig 7**) to either Mono or Stereo, to suit what you will be recording In this case it will be Mono.
4. If needed, clean the record with a damp cloth. You can also wash the record with a clean cloth in a basin of lukewarm water that has a few drops of detergent added. Wipe along the LP grooves and try to keep the label dry. Finish by rinsing in clean lukewarm water and put aside to dry completely before playing.
5. Place the record on the turntable, click on the **Record** button (**Fig 7**) to start a trial recording of the music and then (gently!) lower the record player arm onto the record to play the music. If possible, choose the loudest sections of music that you will be recording.

As this trial recording proceeds, you will see that the audio track (two if in stereo) appears in the Audacity window as a wave-form to show the varying recorded level. To avoid distortion, this level should not exceed ±1.0 on the left hand vertical scale and the recording level is altered by dragging the **Input Volume slider** (**Fig 8**) to keep the peak levels within ±1.0 at the loudest parts of the music. Generally aim to keep most of the transient levels within ±0.5 which should allow the peaks to remain within the ±1.0 requirement. (The **Input Level meter**, **Fig 8**, also shows the changing levels).

In addition, in the menu you can click on **View/Show Clipping.** This highlights the exces-sive levels in red, which is a very helpful visual clue.

When you are happy with the Input Vol-ume slider setting for the loudest parts, stop the trial recording by lifting off the record

1. It is likely that this same Input Volume slider setting will suit other records as well.
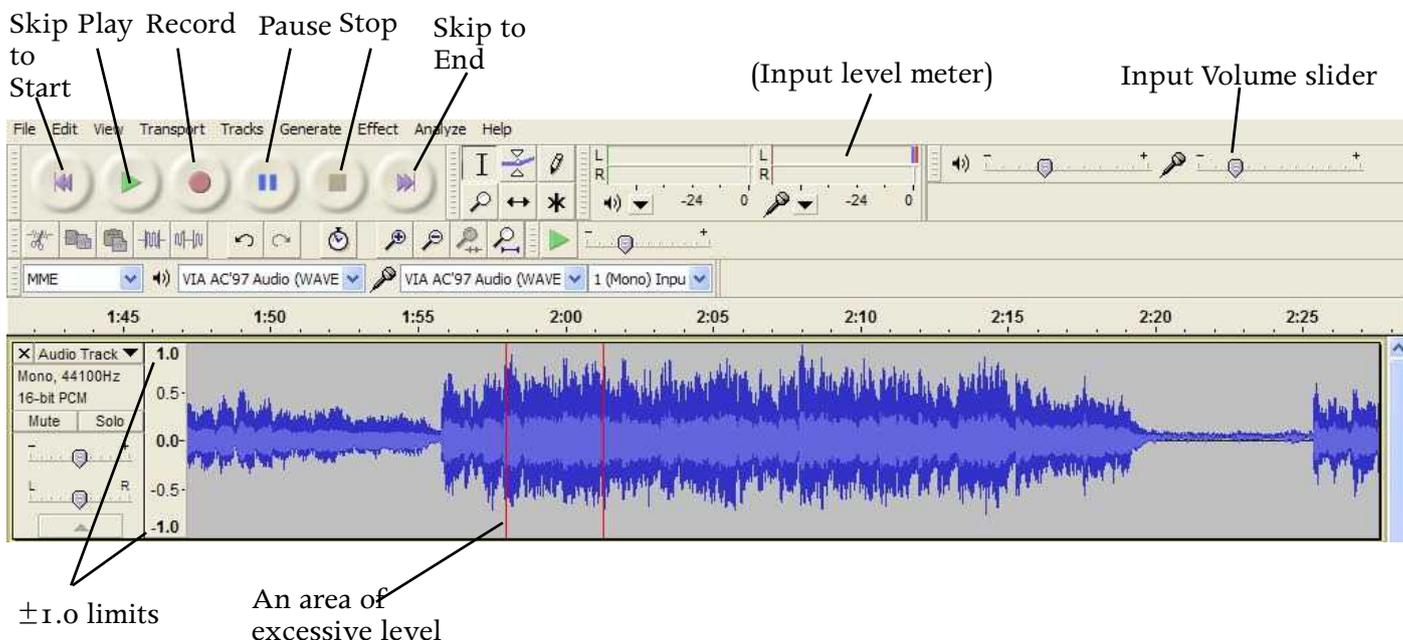
(Input level meter)   Input Volume slider

±1.0 limits   An area of
                     excessive level

Fig 8: Trial run to set the recording level

player arm and clicking on the **Stop** button (**Fig 8**). Next, double click on the waveform to select it and then use the **Delete** key to remove all of the trial recording. Now that the Input Volume slider has been correctly set for this record, we can do a repeat recording that will not have any sections that are too loud[1].

2.3 Recording the RenaissanceBand LP

Click on the Record button again, and lower the arm to the start of the LP to begin recording[1]. Do not worry about the empty

space recorded at the beginning as you will edit it out later. When side 1 has finished playing, leave Audacity recording and lift the needle and put on side 2 after a break of (say) 10 secs. When side 2 is finished, stop the LP and click the **Stop** button (**Fig 8**). Save the project by clicking on **File/Save-Project**, which will save the recording as an aup. project, with the file name **RenaissanceBand.** Leave this project open while proceeding to Part 3, below.

PART 3: Exporting the recording as a .wav file

This is an additional stage that provides a backup .wav file in case you make editing errors that corrupt your .aup project. Otherwise you would have to delete the damaged .aup project file and re-record the music all over again.

With the .aup project file still open (from 2.3 above), Select **File/Export** and then change the file name to *RenaissanceBand(Raw)* and save it as a 'Wav (Microsoft)' file in your Audacity folder. Later, this .wav file can be imported back into Audacity to provide a fresh start, if needed, by using **File/Import....** without having to re-record the whole LP. In the meantime we will use the existing open .aup file for the following editing.

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1. While you are recording, it is wise not to do anything else on your computer. This may prevent some glitches.

PART 4: Editing the recording

Notes:
- Editing can be done later away from the record player. Only the PC is required.
- Para 4.1 (removing any DC offset) should be done before any other editing.
- Paras 4.2 to 4.8 are optional, depending on the quality of the recording and your personal tastes (and there may be a trade-off between the final quality and the editing time required to achieve it . . .).

4.1 Removing any DC offset

A DC offset exists when your recording level is not centred on zero and this is checked where there is no signal, for example at the lead in or between music tracks. **Fig 9** shows a DC offset that has to be removed. To do this:
- Double click on the waveform to select all of it.

- Select **Effect/Normalize** from the menu and in the dialogue box, check 'Remove any DC Offset' and uncheck 'Normalize Maximum Amplitude'. Click OK to remove the DC offset (Fig 10). Save your work.
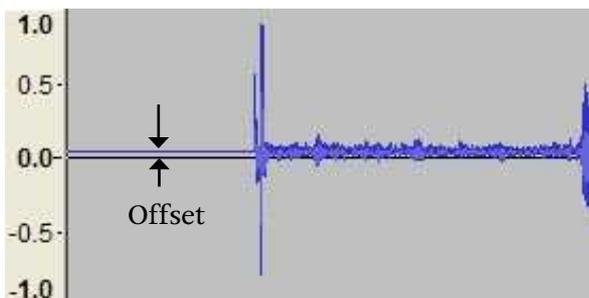

Fig 9: Offset evident

Fig 10: Offset removed

4.2 Deleting unwanted silence
Use Zoom In (Numpad8) or Zoom Out (Numpad2) as required to expand the music track.

a. To delete the unwanted silence at the beginning of the recording:
- Position the cursor at a point about two seconds before the music starts.
- Press 's' to split the recording at this point (you will see a fine double line appear).
- Double click on the unwanted track to the left of the split to select it, and then press **Delete** to remove it.

b. To delete the unwanted silence between side 1 and side 2 of the recording:
- Position the cursor about two seconds after the end of side 1, and press 's' to split the recording at this point.
- Position the cursor about two seconds before the start of side 2, and press 's' to split the recording at this point.
- Double click on the unwanted track in the middle to select it, and then press **Delete** to remove it.

You can cut out other areas (for example, between tracks) using the above method. Alternatively you can select the area to be deleted by dragging the pointer across it, and then using the **Delete** key.

4.3 Adding silence

To add a section of silence, first click on the music track where you want the silence to be inserted and then use the **Generate/Silence**…menu to key in the number of seconds of silence that you want to add (**Fig 11**).

Fig 11

4.4 Removing rumble and low frequency noise

This tool is accessed from the **Effect/HighPass-Filter** menu and is an adjustable filter to reduce the very low frequencies at a particular rate ('db/octave') below a preset cut off frequency ('Hz') (**Fig 12**). There are supplementary notes on this filter in the Audacity Help menu.

With a flat record, and a reasonable turntable/sound system, this step to remove rumble and low frequency noise can probably be omitted.
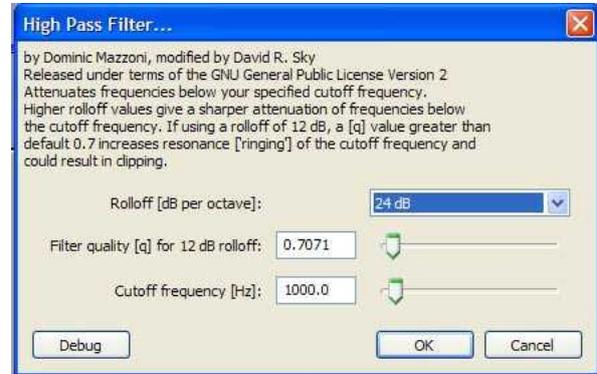
Fig 12

4.5 Removing clicks and pops

There are several methods, such as using the **Effect/ClickRemoval** menu, or the **Effect/Repair** menu. I have not had much success with the 'ClickRemoval' method but the 'Repair' method has worked well.

To use this, zoom in onto the click, select just the click width with the mouse (**Fig 13**) and use **Effect/Repair** to replace the click with an interpolated signal based on the waveform outside the click (**Fig 14**). Refer also to Audacity's on-line manual for more details on removing clicks and pops.

Another more drastic method is to just simply select the click and delete it.

Fig 13　　　　**Fig 14**

4.6 Removing hiss and high frequency noise

This is the background noise you hear when no music is being played. To remove this background noise:

- Select a noise sample at the lead in or between tracks
- Open the **Effect/NoiseRemoval** menu and click on the '**Get Noise Profile**' button
- Double click on the music track to select the whole recording.
- Go back into the **Effect/NoiseRemoval** menu and set the 'Noise Reduction' to 9db, the 'Frequency Smoothing' to 300Hz, and the 'Attack/Delay Time' to 0.25 secs. These are initial guidelines: see Audacity's manual for more info.
- Click the **OK** button to remove noise from the whole recording.

As removing noise will also (unavoidably) remove some of the music, you may consider not carrying out the above if the recording is not too noisy. Remember you can always use Audacity's **Edit/Undo** to go back to an earlier state.

4.7 Cleaning up silence

The gaps between tracks are rarely silent but can be replaced with true silence. To do this, select the area to be cleaned up by dragging the mouse over it and then use **Edit/SilenceAudio** (or the shortcut **Ctrl + L**) to replace the selected area with silence.

4.8 Fading In and Fading Out

The sound level can be shaped by using the Envelope Tool (Fig 15) and then clicking and dragging control points to vary the sound level smoothly. Refer to the Audacity help menu for details.
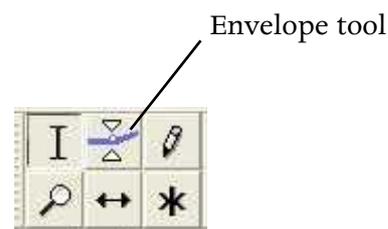
Envelope tool

Fig 15

4.9 Creating a label track to show labels

Looking ahead to creating a CD (or DVD) of the recording, we will need to create a label for each track of music. These labels will appear on a label track that will appear alongside the audio tracks of music.

There are two types of labels, one that refers to a particular selection of music ('Selection labels') and one that refers to a particular point of the music ('Point labels'). We will only use point labels here but refer to Audacity's Help menu for a full description of track labels and their uses.

To label the first track:
- Place the cursor a second or so before the first track starts (use Zoom In as required).
- Use the shortcut **Ctrl+B** to create a (blank) Point Label. This will be shown on a Label Track which has automatically appeared (Fig 16)
- Click inside the label box and type in the name of the first track ('Passameze').
- Scroll along to the next track, place the cursor on the audio track a second or so before the music track starts and use **Ctrl+B** to create another label and type in the track name 'Galliarde'.
- Repeat as required until all tracks have been named.
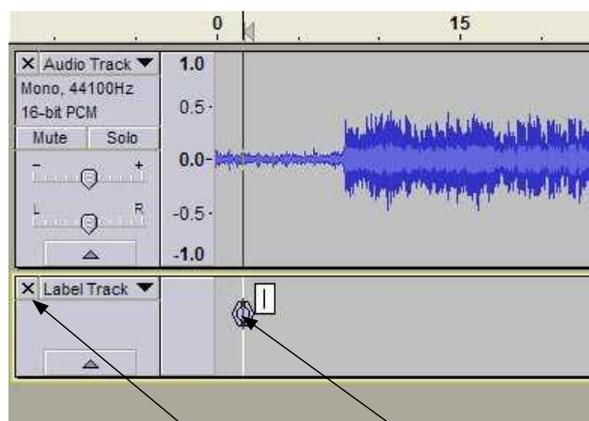
Click here to delete the label track.

Click & drag here to reposition the track marker

Fig 16

Notes:

1. A track label can be edited at any time by clicking within its text box and deleting or adding text.

2. The position of the label can be moved at any time by clicking on, and dragging the centre of the marker. (Fig 16)

3. To remove one label without affecting any other label, click in its text box, delete all of its text and then do a final Delete to delete the label.

4. To remove all labels and the label track, click the 'X' at the LH corner of the Label Track (Fig 16).

5. One advantage of having labels is that you can click on the label track (to select it) and then use the **Tab** key to quickly jump from one label to the next, without having to scroll.

6. You can add Point labels while you are playing or recording music. In this case use the **Ctrl+M** shortcut. This is useful to indicate a point of interest for examination later. For example if you hear a record 'click' while you are re-cording you can mark its position there and then, and when editing later, easily jump to it by using the **Tab** key as per 5 above. This approach may save you a lot of time, as you would not have to scroll through after recording to put in new track markers or hunt for 'clicks' that have to be individually removed etc.

You can also display the labels in tabular form for editing, by selecting the **Tracks/Edit-Labels** menu.

Before exporting the project you will need to add the record and other information that Audacity will use. This is accessed using the **File/OpenMetadataEditor** menu and filled in as required (Fig 17).
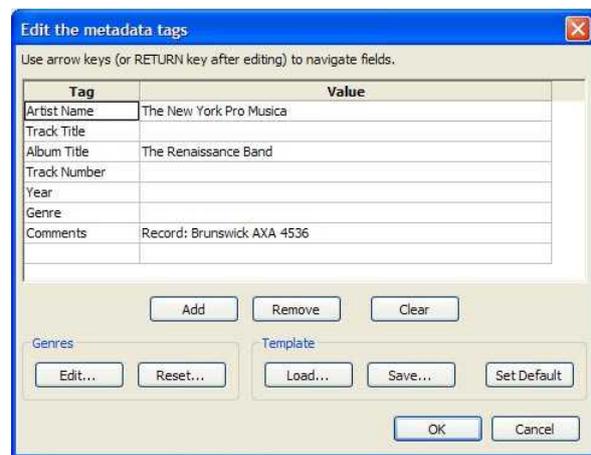

Fig 17

4.10 Exporting the Project

To then export all the tracks of the project, use **File/ExportMultiple** and in the dialogue box (Fig 18):

- Set 'Export format' to 'WAV (Microsoft) signed 16 bit PCM'.
- Set 'Export location' to be your Audacity folder.
- Set 'Split files based on Labels'
- Set 'Name files' numbering before label/track name.
- Click the **Export** button to send your music tracks to your Audacity folder.
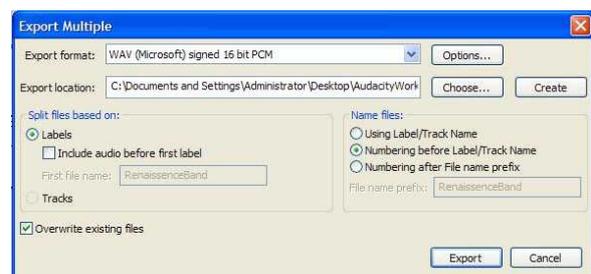

Fig 18

These individual numbered music tracks will be in the *.wav* format and you then copy them into your CD burning programme to make a music CD. Note that in doing this you should select to make a 'Music' or 'Audio' CD, *not a 'Data' CD*. This will convert your wav files to the cda format which can be played on any CD player.

After the CD has been burnt you can delete the earlier Audacity and wav files, but it may be prudent to retain the 'Raw' archive file (see Part 3 above) in case you want to repeat the exercise without having to make a new recording of the LP.

4.11 Other music sources and formats

Other music sources can be used to make a CD using the Audacity programme, in particular:

- A Cassette player output can be connected to the Line In socket at the back of your PC. Generally this will require a cable to the 3.5mm earpice socket at the cassette player.
- Music from the Internet (eg 'YouTube') can be intercepted and put onto a CD. In this case, click on **Edit/Preferences** menu in Audacity, click on the **Devices** tab, and change the recording to 'Audio (WAVE): Stereo Mixer'. No connecting cable is required in this case, as the music originates within the PC.

The MP3 is another music format that is smaller in size than the WAVE format and is used with iPods, notebooks etc. Audacity can convert and export WAVE files to MP3 format but you first have to use the **Edit/Preferences/Libraries** menu to go on-line to download the free LAME MP3 encoder. See Audacity's FAQ: *Installation & Plug-Ins* for details.