

About the Phillips piano roll MIDI files

I began offering MIDI files derived from piano rolls in the late 1990s, produced by roll reading equipment built during 1979-80. The website photo gallery shows photos. My quest for more MIDI files began again in 2011, when I commissioned new roll reading equipment which had been in development for the previous five years. The new reader, unlike the old, was designed to record all types of reproducing piano rolls.

At the time of writing, the new reader has recorded over 5500 rolls, which when integrated with the previous files, gives over 6500 standard MIDI and e-roll MIDI files of piano rolls. This number will increase as more roll recordings are made. At this stage, the rolls of greatest importance to record are original Welte-Mignon (red) rolls. If you can assist by loaning Welte-Mignon rolls to record, please contact me at peter@petersmidi.com.

General

All MIDI files (both standard and e-roll) are type 0, set to Channel 1. The e-roll files were produced by recording the output of the roll reader into MIDI program Cakewalk, version 9. These files can only be played on a MIDI-equipped pneumatic reproducing piano. Standard MIDI files have been processed to make them compatible with modern MIDI instruments. The Cakewalk program supports the insertion of metatext into MIDI files through an 'information box'. All files include metatext giving the title, composer, pianist, roll number and issue (or recording) date.

File names generally have the format: <title of work>(composer)<pianist>XX *optional e* (For example, Ave Maria (Gounod) Ganz DA e.mid)

- <title of work> is generally taken from the roll label, often abbreviated to suit. Instead of Etude Op. 25 No. 1, the title might be Etude 25-1. Titles are therefore typically as found in piano roll catalogues for the particular brand of roll.
- (composer) – surname, often abbreviated, for example, Schmn for Schumann. Etudes, Preludes, Mazurkas and Waltzes by Chopin, and Moments Musical by Schubert do not have the composer identified, the only exceptions for works with these titles. Popular titles are less likely to have composers identified.
- <pianist> – surname, sometimes abbreviated. The pianist is not always identified, particularly in popular titles. In classical titles.
- XX. This two-letter code identifies the type of roll a MIDI file is derived from:
 - AA = Ampico A, AB = Ampico B, A = Ampico A from previous batch.
 - DA = Duo-Art
 - WM = Welte-Mignon, WL = Welte Licensee, WG = Welte Green
- *optional e*. Identifies e-roll files for playing on an original pneumatic piano fitted with MIDI valves. These files do not suit a Disklavier or equivalent.

Volume level The velocity level range used in the standard MIDI files is around 37 to 85, to suit a solenoid MIDI piano such as a Disklavier or PianoDisc. Depending on your listening environment and player instrument, this range may mean some performances are too loud. Reducing the volume level from 100 (maximum) to around 85 will, depending on the instrument, still allow all soft notes to play, while lowering the overall volume.

Catalogues These can be downloaded as PDF files. There are three versions for each MIDI file library: in order of title, where detailed title information is provided; in order of composer, where composer details are given along with a condensed title; in order of pianist where pianist details are provided. That is, the catalogues are not simply rearranged versions of each other. Welte catalogues include roll number order.

Playing the files

The following describes tried and tested ways of playing our MIDI files.

- **Computer connected to the MIDI instrument**

For a PC – Over the many years of owning MIDI pianos, I have tried a number of MIDI player programs, and my favourite is a freeware program called vanBasco's Karaoke Player. It can be downloaded from <http://www.vanbasco.com/>

The vanBasco Player is shown below, loaded to play an Ampico MIDI file. The display shows the metatext embedded in the MIDI files. Playlists can be set up and the player set to continual play, or to stop after each item. The tempo, key and volume settings for a particular file can be saved with the file. (We are developing a MIDI file player and a relational database to work with the MIDI player, planned for end 2017.)



vanBasco Karaoke Player (for PC only)

For a Mac – There are a number of free or inexpensive MIDI file players for the Apple Mac. Of these, the only one I have found that displays the metatext embedded in the MIDI files is a program called MidiKit, which I have used in conjunction with a device called *iConnectMIDI4*. This setup can be used to play files into any MIDI-equipped piano, in which a file being played is sent to the *iConnectMIDI4* device over WiFi. The device itself is connected by a MIDI cable to the instrument playing the file. A similar system exists for PC computers, but my experience is that the Apple version is better, with no latency losses or problematic dropouts.

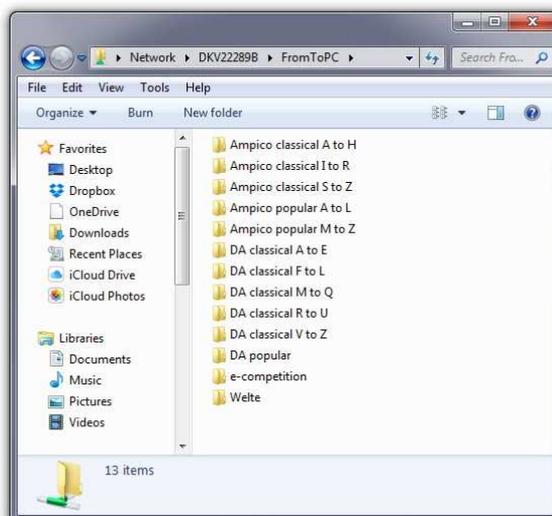
For a tablet – My experience is limited to the Apple iPad, however Android tablets are likely to be similar. MIDI file players are available for these devices, but are usually limited in their capabilities. An app called *MIDItrail* shows a piano roll view of the MIDI data and part of the embedded metatext.

- **MIDI adaptor**

Any setup to play MIDI files usually requires a MIDI adaptor, the exception being if the *iConnectMIDI4* device is being used. There are numerous USB MIDI adaptor offerings, some costing only a few dollars. I have used many types of MIDI adaptors and have also experienced the problems the cheaper devices can cause. The most reliable adaptor appears to be the Roland UM-ONE. This adaptor has been around for years, and the most recent version has a switch to select either computer or tablet.

- **On Disklavier from files stored on its hard drive**

The Mk IV and later series of Disklaviers have a hard drive accessible through a network, which means files on the hard drive can be played remotely using the instrument's controller, or an iPhone or iPad app. However, these apps are limited, and selecting a file to play requires scrolling through the list of files without inadvertently causing an unwanted file to play. As a suggestion to minimise this, my own setup has the MIDI files in a number of directories on the Disklavier hard drive. These are labelled as titles A to H, I to R and so on as shown on the right.



MIDI file libraries

Our MIDI files are available for playing on either a MIDI-equipped pneumatic reproducing piano, or a standard MIDI instrument. There are three brands of piano rolls, so there are in effect six libraries of music. These are discussed below.

- **Ampico library**

Classical – My research into piano catalogues shows that in the case of Ampico classical (or art) music, there are around 1480 recordings of 1265 works on a total of 1455 rolls. Presently, we offer over 1300 of the recordings or close to 90 percent of the catalogue. These figures exclude accompaniment, educational and specialist rolls, as these are a category where listening to the music is secondary. Of the roll recordings yet to be converted to MIDI files, most are of early issues by pianists such as Brockway and Volavy. Virtually all recordings made by high-ranking pianists on Ampico roll are included in the library.

Popular – Ampico popular music is often regarded as the best on piano roll because of the calibre of the pianists and the arrangements. It is almost impossible to determine how many Ampico roll recordings there are of popular songs and shows, as some were used in medleys as well as being stand-alone recordings.

Presently we have around 1230 MIDI files of popular music from Ampico rolls, including many roll recordings made during the 1930s. Most of the recordings from this period were made by Adam Carroll, Frank Milne (and all his pseudonyms), Victor Arden and Phil Ohman. Many of these recordings were issued for the Duo-Art, Ampico and Welte Licensee instruments, as all companies were now owned by Aeolian. The library includes the last popular rolls to be issued (mid 1941) as well as a range of recordings made during the 1920s and earlier.

- **Combined Ampico and Duo-Art popular library** – Available only as standard MIDI files, this library of 1786 standard MIDI files contains all the popular music we presently have that was recorded for the Ampico and Duo-Art reproducing pianos, with duplicates of the same performances removed.

- **Duo-Art library**

Classical – There were around 1980 recordings of classical works made for the Duo-Art reproducing piano. We currently offer nearly 1750 of the recordings, or 88 percent of the catalogue. These figures exclude accompaniment, educational and specialist rolls. They include Duo-Art S series rolls (specials) and rolls produced by Gordon Iles through Artona. In the majority of cases, the MIDI files were derived from original rolls.

Popular – After 1931, all popular music for the Duo-Art was also issued for the Ampico, as already explained. Legendary roll recording artist Frank Milne appears on Duo-Art rolls exclusively from 1922 to 1931, afterwards also on Ampico. As it turns out, the majority of his roll recordings are in our Ampico popular library. As for Ampico, it is almost impossible to determine how many Duo-Art roll recordings there are of popular songs and shows. Presently we have just over 600 MIDI files of popular music from Duo-Art rolls, some from roll recordings made during the 1930s.

e-roll and standard MIDI files – The e-roll library has three Duo-Art test rolls as MIDI files, the only difference to the standard library.

- **Welte library**

Welte reproducing pianos came in three versions: Mignon (T-100), Green (T-98) and Licensee. Rolls for the Mignon and Green instruments are relatively scarce in countries outside Europe.

Welte-Mignon (T-100) – Welte produced nearly 2200 recordings of classical works covering nearly 1920 works. About 1000 of these recordings were also issued for the Licensee instrument. Our library of Welte-Mignon MIDI files presently contains nearly 530 files of classical music, and over 35 files of popular music. The majority of the classical files are played by significant artists and, with few exceptions, were derived from original T-100 (red) rolls.

Welte Licensee - Classical – The De Luxe company made over 1000 recordings of classical works for the Welte Licensee reproducing piano. Currently, we have around 800 files of classical music from Welte Licensee rolls. About half of these were recorded by De Luxe, the rest being Licensee versions of Welte-Mignon rolls. A number of Licensee rolls have been derived by enthusiasts from T-100 or T-98 rolls, adding to those recorded by De Luxe and those issued by the factories derived from Welte-Mignon masters. It is therefore impossible to know how many Licensee rolls there are of classical music. As a guide, De Luxe classical rolls are numbered from 6000 up.

Welte Licensee - Popular – Most of the rolls of popular music for the Licensee instrument were recorded by De Luxe. Presently, we offer around 140 files of popular music for the Welte Licensee.

Sources of rolls

Virtually all the MIDI files we offer came from rolls held by Australian collectors, along with a few from international collectors. The most significant collection was that owned by my long-time friend Denis Condon, who died in 2012. His collection of over 7500 rolls was purchased by Stanford University in 2014, however I was able to record all the rolls I sought before it left Australia. The collection was assembled by Condon (a music lecturer and writer) over some 50 years and is regarded as a most important collection for its content and historical value.

Most collections in Australia are limited to hundreds, not thousands of rolls. However, collectively these have provided many additional recordings from rolls not in the Condon collection. One contributor is a musicologist with an academic interest in Vladimir de Pachmann, which has resulted in MIDI files of all but one of the piano roll recordings Pachmann made. Another collector of 1930s popular music made his roll collection available for recording. A nearby collector gave me access to over 500 original Duo-Art rolls he had brought with him from England when he immigrated to Australia. Files derived from my own roll collection are also in the library.

How the MIDI files are produced

The *Sydney Morning Herald* newspaper published an article in mid-March 2017 about my work with piano rolls, and produced a short video showing the recording equipment in operation. It can be viewed via this link:

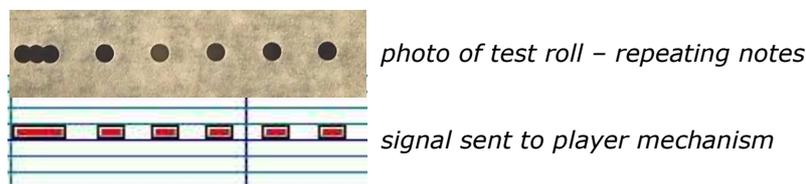
<http://www.smh.com.au/video/video-entertainment/video-art-and-about/play-it-again-piano-20170217-4qoif.html>

A number of impromptu videos have been posted on YouTube by Glenn Amer that show the roll reading and ancillary equipment in use.

- Recording a Welte T-100 roll and monitoring the playing on a Disklavier:
<http://www.youtube.com/watch?v=cmHo2FgycUE&feature=youtu.be> (Video could do with editing, but shows the process as it was in February 2014.)
- Recording a Duo-Art roll and monitoring the playing on a Duo-Art instrument:
<https://www.youtube.com/watch?v=MmkU0KHCUyM> (Unedited, made in March 2012, shows the roll reader recording Paderewski playing his Minuet.)
- Converting an Ampico e-roll to a standard MIDI file:
<https://www.youtube.com/watch?v=p9HTpAk5vc4> (Filmed September 2014, shows the equipment used to convert Ampico e-rolls to standard MIDI files.)

Why a roll reader and not a roll scanner

A piano roll is, in effect, a data sheet that controls a set of pneumatic valves that open or close according to perforations passing over holes in a tracker bar. The valves operate the player's notes, pedals and expression, so the signals the player mechanism receives come from the pneumatic valves. Because perforations travel over a tracker bar hole about the size of a single punch, a valve is turned on for a longer period than it would appear when looking at the roll perforation. The effect on notes is shown by comparing a test roll and a MIDI file of the pneumatic signal sent to the player mechanism.



Looking at the piano roll suggests notes are on for a shorter period than they are off. However, when seen as the equivalent to the pneumatic signals it becomes clear the notes are on and off for an equal amount of time.

The differences between observed piano roll data and the signals that actuate the player mechanism are compounded when looking at Ampico and Duo-Art tracker bars. Both types have a number of elongated tracker bar holes, and the Duo-Art bar has the expression reading holes set before the note holes.

A roll reader incorporates an identical 'reading' system to that used in a player piano. Electrical signals are produced by the action of sensors that have equivalent characteristics to the pneumatic valves in a player piano. The roll passes over a tracker bar at its marked playing tempo, as if playing the roll. The MIDI file that results is therefore an electronic equivalent of the pneumatic signals a player piano would receive when playing the roll. I refer to this as a 'performance file', as it is the type of file required to play a musical instrument. A MIDI file derived from a photo image or scan of a roll is therefore a 'data file', as it captures the roll data. Files produced this way are used by roll recutting companies to operate MIDI-controlled perforators to produce piano roll duplicates.

Another aspect is paper speed acceleration as a roll plays. By using the correct sized spools, a roll reader will maintain the correct tempo relationship to the original recording. That is, the playing does not get faster as the paper speed accelerates caused by the increasing diameter of the take-up spool. Because a constant paper speed is used when scanning or photo imaging a roll, a MIDI file thus derived, if played, will exhibit deceleration as it plays, in which the playing will get slower by typically 10 to 15 percent.

MIDI files of piano rolls taken from roll images can be converted to performance files using algorithms that make all the necessary changes to the MIDI data. However, the complexity of the algorithms is a factor that could affect the translation accuracy. This is one of several factors that convince me of the merits of a roll reader.

A significant advantage of a roll reader is being able to monitor the recording in real time by hearing it playing on a piano, and observing the computer display as the roll is being recorded. This type of feedback helps ensure minimal errors in the MIDI files. Another advantage is the efficiency of the process. Overall, the typical time to record a roll is its playing time plus reroll time. It is this factor that has allowed me to record some 5500 piano rolls since the start of 2012, and, because of the effort put into developing the roll reader, to be confident of their accuracy.

Producing standard MIDI files of piano rolls

The process to convert an e-roll file to a standard MIDI file is also called 'emulation'. Another term is expression decoding, as this is the main part of the process. The other part is converting pedal information on the roll to controller data to operate the pedals on a MIDI piano. The latter is easy to achieve; not so easy is translating the expression perforations on a piano roll to velocity data suitable for a MIDI piano.

The methodology I have used is to build analogue models of the expression systems and to use data derived from a model to develop software for that system. The YouTube videos show two analogue models (Ampico and Welte), which are now retired, having been morphed into software. The models, and therefore the software are based on data derived from service manuals, test rolls and measurements.

To produce standard MIDI files requires playing each e-roll file through the relevant decoding system, while monitoring the result. This additional monitoring has occasionally shown errors that were missed in the recording process. I would not be brave enough to say there are no errors in the files, but the process I have used has captured most of them. I welcome reports on any problems you may find.

Thank you for your interest
Peter Phillips