www.trachtman.org/rollscans/scanningbackground.htm, by Warren Trachtman
The Difference between e-MIDI and e-Roll, by Walter Tenten

What Is An E-roll?

When is a midi file not a midi file?

When it is an e-roll!

Ordinarily, midi files are thought to be of only 2 types, - "midi type 0", and "midi type 1". Both have similar characteristics with regards to "velocities". In reproducing pianos, we think of dynamics as a method of describing a reproduction of an artist's original performance at time of recording back in the teens and twenties. Music rolls aimed at reproducing pianos have dynamic coding in their margins to pneumatically control levels of dynamics in emulation of an artist's original performance. The effect today is the ability to bring a legendary master of the piano back to life to perform once again for you privately, personally, in the warmth and comfort of your living room.

Original rolls, now approaching a century in age, are rapidly self-destructing. Of the thousands of original titles manufactured in the teens and twenties, only a tiny fraction will ever be recut, due simply to the reality of today's market place. This means that many of these century old rolls will not ever be recut. As they self-destruct, they will become ever scarcer. A method had to be found to archive the content of aging, fragile rolls while still possible to do so.

The dominant pioneer in this initiative is Richard Stibbons in the UK, who developed a way to scan a music roll in such a manner as to capture 100% of the data contained within the perforations. He then developed software emulators for Duo-Art, Ampico and Welte-Licensee, to name but a few. The initial result was midi type 1 files capable of being played not only in a computer or electronic keyboard, but also solenoid pianos such as Disklavier, PianoDisc, Pianomation or Pianocorder. These files contain dynamic values imbedded within the files as "variable velocities".

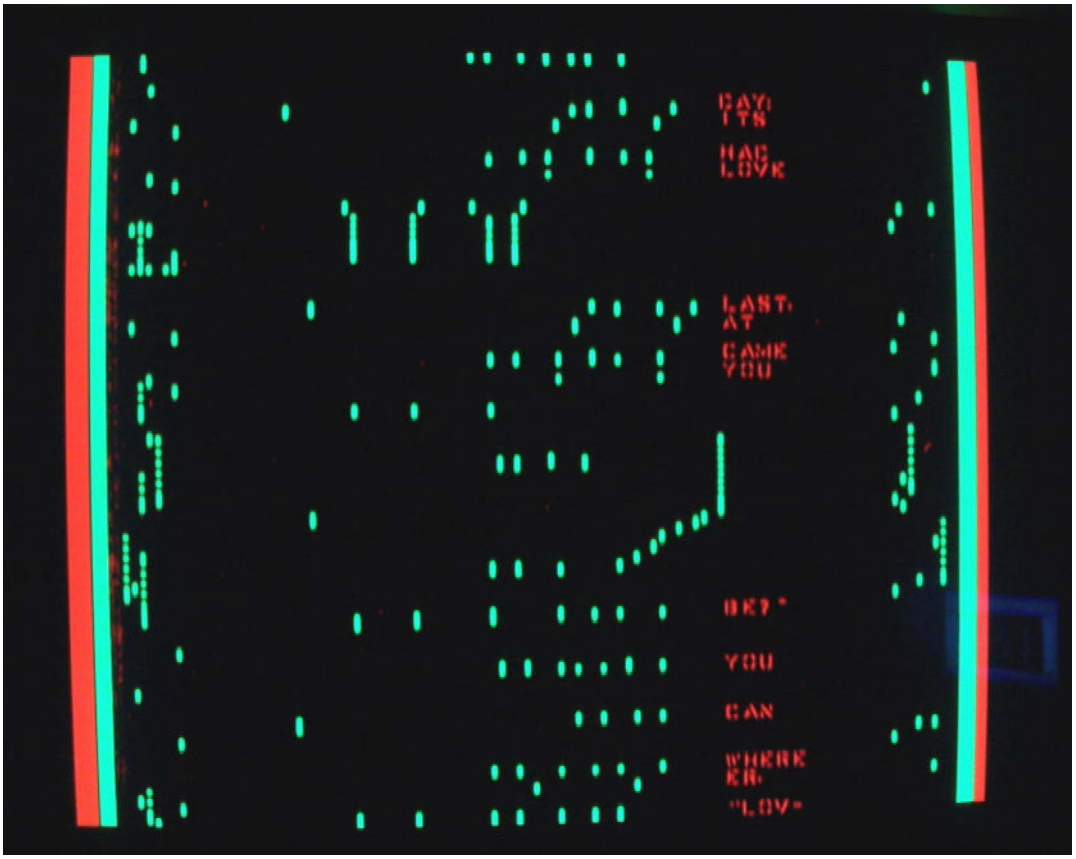
Within our avocation of mechanical musical instruments, a method has been found to adapt midi to operate automatic instruments equipped with e-valves. Basically control codes in the roll come through as midi notes with silent velocities typically less than 5, while all the playing notes come through with audible fixed velocities typically 65. In theory, e-rolls could come through with all midi notes having a silent velocity of 5 or less. However, the audible velocities provide for the ability to simply audit the tune.

A pneumatically operated instrument can be fitted with e-valves, one valve per tracker bar port. Each e-valve substitutes for a specific port in a tracker bar. Each e-valve is spliced into existing pneumatic tubing through simple Tee's. Through an appropriate off-the-shelf midi controller, each midi "note" controls a specific e-valve, turning it on or turning it off, no different than the absence or presence of holes in a paper music roll.

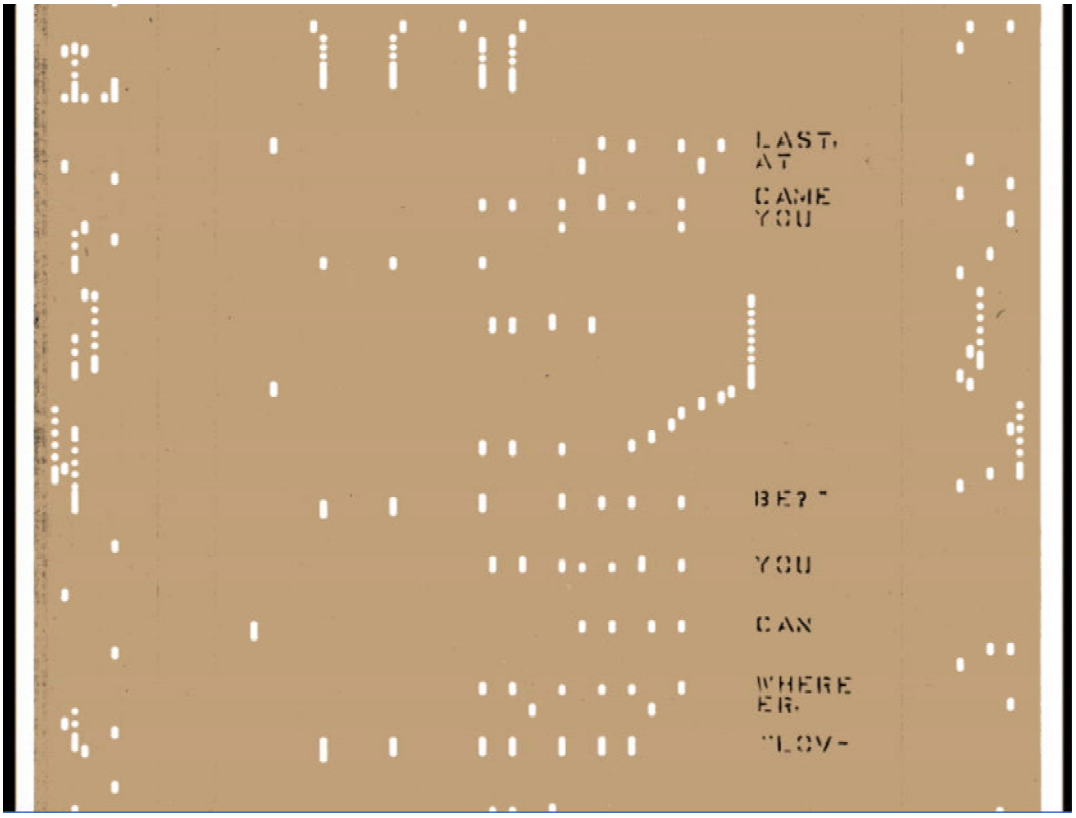
What follows is a series of images illustrating the process of archiving a roll, then using the archive file to create midi type 1 and e-roll files simultaneously. To begin with, have a look at Larry Doe's MK4 roll scanner, which is at the current level of development, at:

members.shaw.ca/smythe/MK4.htm

Then return to this page and view each of the following progressive images.

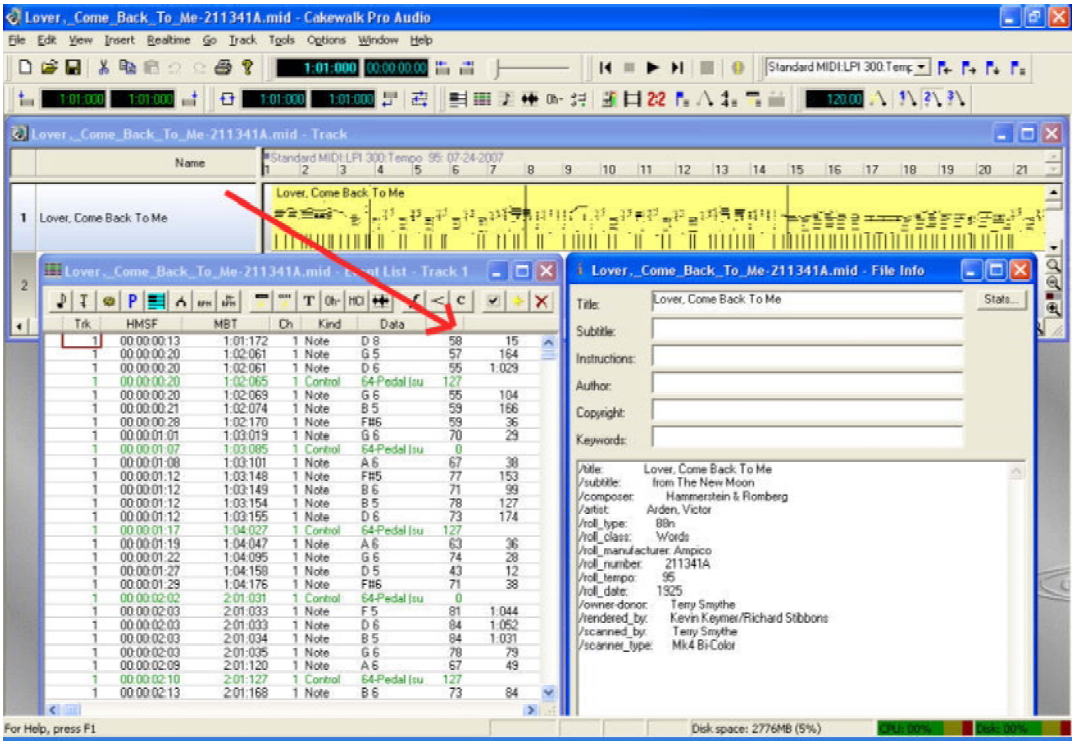


This is the computer's screen display during the actual scanning of the roll. Note that the MK4 hardware/software developed by
Larry Doe and Anthony Robinson has the ability to capture 100% of the data in the roll, including anything printed on it such as
lyrics or operator instructions. Green is data, red is anything printed. The paper is given a black background. Outside paper
edges is blue. And the red edges is the absence of data outside the scan area. When the scanning of the roll is complete,
an archive file is created having a file extension of .CIS. The roll being scanned is Ampico #211341A, Lover Come Back To Me.
The A suffix to the file name (catalog number) simply signifies to the subsequent software processing that it is an Ampico. An e-roll file will have a trailing "E" to signify it is an e-roll.

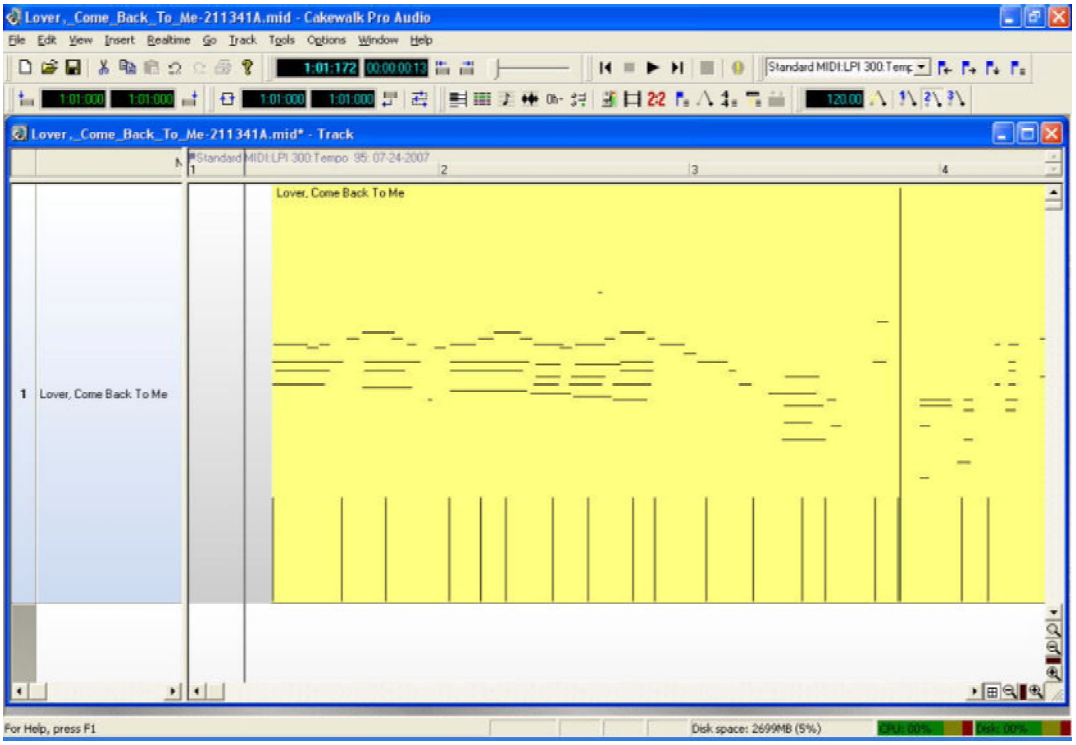


This is a view of the finished .CIS archive file, as seen within Anthony Robinson's CISVIEWER.
This view displays 100% of the roll data, including the lyrics.

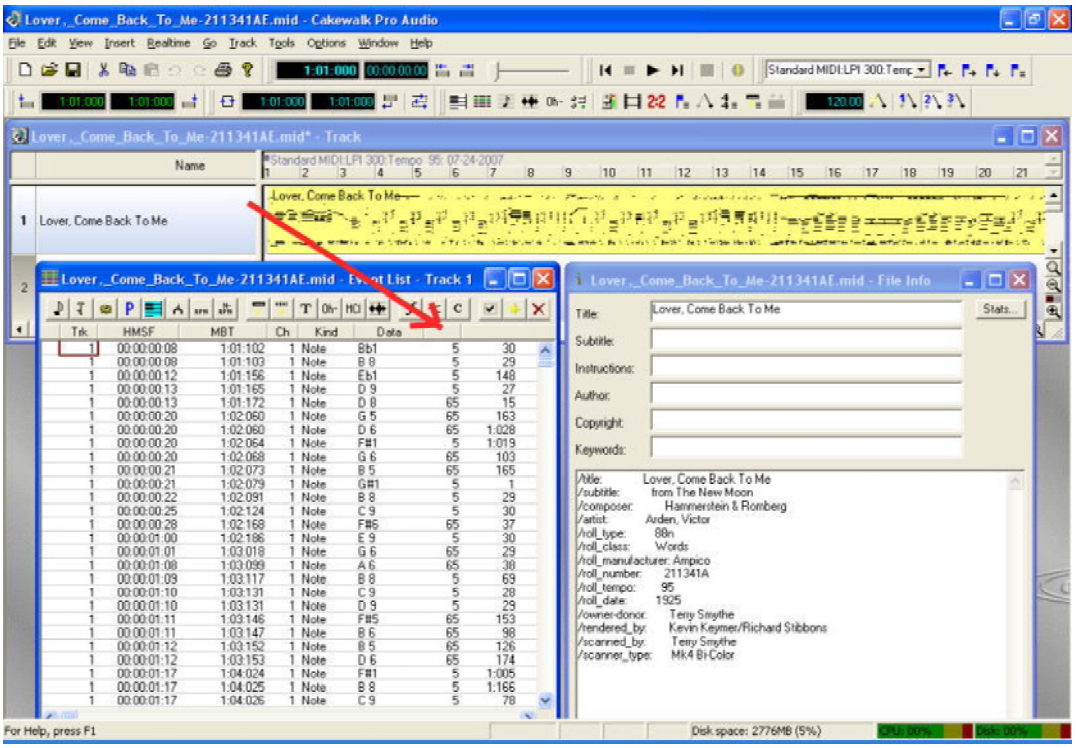
Again, this is another view of the same .CIS archive file, but with the lyrics turned off, so a visual check can be made
on the perforation data. Note that the archive file contains 100% of the music (perforations) data.



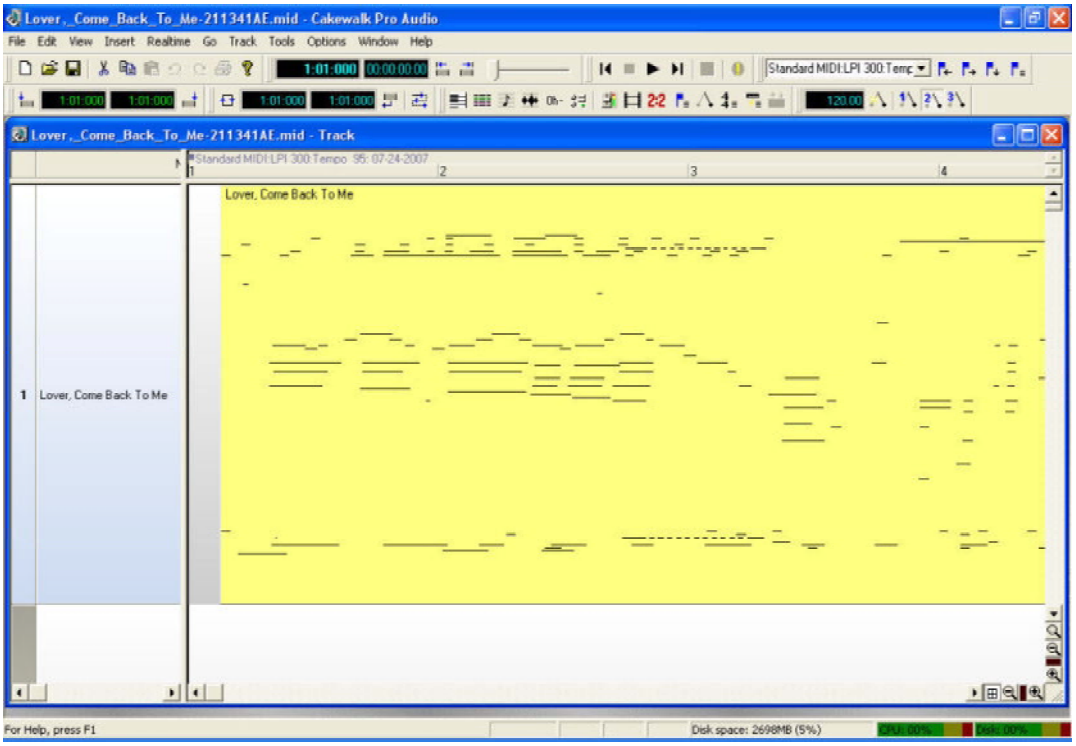
The .CIS archive file is then processed to simultaneously create both a midi type 1 file and an e-roll file. This view is of the midi type 1 file
as seen within Cakewalk midi editor. The roll display does not show any of the control codes other than sustain and soft. The sustain
pedal controls are seen as short vertical marks. The left display illustrates variable velocities, typically in the range of 35 to 110,
equivalent to the expression coding in the roll. These midi type 1 files will play on a solenoid piano with a satisfying emulation
of original coded dynamics in the roll.



Here is the same Cakewalk display of the midi type 1 file, without the edit windows, but with lateral and vertical expansions maximized.
Only playing notes, sustain and soft are displayed.



This is a view of an e-roll as seen within Cakewalk midi editor. Note now that all the Ampico control codes are now visible in the
roll image display, basically a full image of the roll. By expanding the display both horizontally and vertically, one sees instantly a
true image of the roll, no different than the roll image as seen in Anthony's CISVIEWER. Note also that now velocities are seen
as a fixed silent velocity of 5 for all control codes and a fixed velocity of 65 for all playing notes. This e-roll file can be played
in a computer, but is musically unsatisfying, no dynamics or sustain/soft, serves only to audit the file.



Here is the same Cakewalk display of the e-roll file, without the edit windows, but with lateral and vertical expansions maximized.
Note that now the Ampico marginal coding is visible, not only in the roll image, but also in the events window, as above.

What is displayed here are the midi type 1 files and e-rolls that emerge from an Ampico roll. The piano is music is seen as a single track. Midi type 1 files emerging from scanning other roll formats such as nickelodeons, orchestrions, pipe organs, etc., may display more than one track, such as the 2 manuals on a 2 manual pipe organ. The e-roll format has now settled as a single track showing the entire roll image.

E-rolls can now be used on similar, but different instruments by simply remapping the tracks. The general rule in an e-roll is that once note 0 has been established, the midi notes will flow in straight progression with the tracker bar ports. Using a super simple utility "MidiRepl",

Rick McDowell has successfully remapped e-rolls from a Wurlitzer 150 roll to play a Wurlitzer 165 equipped with e-valves. MidiRepl, among a number of freely available midi utilities, is available off Gunther Nagler's GNMIDI site:

www.gnmidi.com/gnfreeen.htm

For another excellent explanation, see Warren's Trachtman's essay on same subject at:

www.trachtman.org/rollscans/scanningbackground.htm

and Walter Tenten's explanation at:

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Back to **E-valves**