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MIDI and MOD format **Karen Collins www.gamessound.com**

MIDI

Musical Instrument Digital Interface (MIDI) was a protocol defined in 1982 to allow musical devices (synthesizers, keyboards, sequencers, mixing desks, computers, etc.) to be compatible in a standardised format. Only commands are transmitted, rather than actual sounds, meaning file size is very small—a distinct advantage for games, which taxed the memory of the machines. A MIDI command might, for instance, tell a synthesizer when to start and stop playing a note, at what volume and what pitch, and what "voice" or sound to use. Initially, some of this information would vary greatly depending on the devices used, which complicated programming for sound cards, but in 1991 a General MIDI standard was agreed upon. This standard laid out a template for 128 instruments and sound effects, so that the same number setting would be the same on any MIDI device: so a command saying "play number 39" would always play a slap bass. Each note played on the instrument was also given a specific number. Middle C, for instance, is note 60. There are also various MIDI controllers, including volume, tempo, timing, and duration, key pressure, each of which contains a specific number assigned to that control.[1]

The advantage of MIDI to games composers was enormous. No longer encumbered with the awkward tunings or difficult programming languages of the 8-bit machines, composers could now write their music on keyboards and give that data to developers. The most important advantage of MIDI, however, was the fact that the audio file consisted of only code, rather than recorded digital audio files (which would come later), and thereby take up little of a game's limited amount of RAM.

There were, however, several complaints about the General MIDI standard. First, the selection was limited to 128 instruments, and some of these were taken up with the seemingly ridiculous sound effects such as "bird tweet" (123) and "helicopter" (125), which may have been useful for some game composers and sound designers, but for standard musicians were rarely usable. These effects, however, are perhaps indicative of the impact that games audio was having on the manufacturers of sound chips. Roland responded to the limitations of the GM standard by creating the GS MIDI standard, which would allow for 128 variations of each of the 128 available MIDI channels. Another problem with MIDI, however, was the fact that most MIDI devices sounded differently: a "slap bass" on one person's sound card might sound very different from a slap bass on another person's sound card: the timbre, volume, or sound quality might vary (even the form of synthesis might be different, as shown above). Although for composers of console games this was not a problem, since the consoles had the same hardware in every unit, for PC users, this meant widely varying music playback quality. A few solutions were tried: many game composers would write songs using Roland's Sound Canvas, and this became a standard by which to compare MIDI cards. Another solution was to return to the idea of SysEx (System Exclusive Data), which had previously been used by some sound devices, and meant that each sound device would have an ID code specific to that device. The playback device could then read this code and know exactly what hardware configuration to use; in other words, what sounds and what effects were on which channel—so number 39, voice 16 might mean slap bass with reverb on a specific card. In order to address compatibility issues, the MIDI device would always default to the standard GM instrument. The trouble with this method was, of course, the time involved in programming for the different devices. Despite the difficulties with MIDI composing, MIDI offered an effective new standard for games composers, and although MIDI was unpredictable in the sound quality, MIDI games sequencing led to some quite original ideas, such as the creation of non-linear editing with LucasArts' iMUSE.

MOD

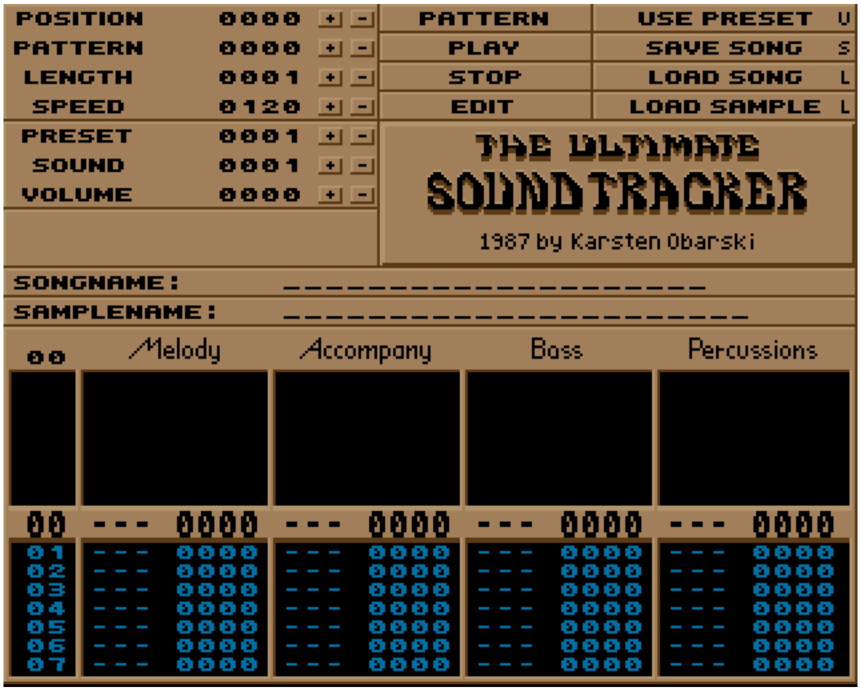
Despite being designed as a games and music computer, there were initially few utilities available to create sound on the Commodore Amiga. Most games developers created in-house programs to sequence music.[2] One such program was created by Karsten Obarski, a programmer and composer at the German reLINE Software game company. Based loosely on earlier sequencing techniques of the Commodore 64, Obarski's *Ultimate SoundTracker* sequenced patterns and would export them to assembly language for the composer. The software was released as a commercial product in 1987 and quickly became a standard for games sound on the Amiga. It was, however, quite limited, in that it viewed the use of channels in a quite strict fashion, as melody, accompaniment, bass

[1] For the full MIDI specifications, see: http://www.borg.com/~jglatt/tech/midispec.htm

[2] e.g. Darius Zendeh's Sound System, used in R-Type and Katakis games), and David Whittaker's at Psygnosis, Aegis' SOnix, EA's Deluxe Music

and lead, and only supported sixteen instruments (samples). Swedish programmers Pex “Mahoney” Tufvesson and Anders “Kaktus” Berkeman released an update to the software in 1989 known as NoiseTracker, which allowed for thirty-two instruments and was more open in terms of channel usage.[1]

Later versions of SoundTracker used what became known as the module format, or MOD, which included both patterns and instruments in the same file. Most games music on the Amiga was written in the MOD format (other formats are now known as “exotic”). Compositions were created using a software program known as a tracker, and resulting music was stored in MOD. MOD was originally designed with four channels to correspond with the Amiga sound chip, but has since been expanded. Tracker programs worked much like modern MIDI sequencers. A tracker program would store data on the notes, volume setting, effects and instrument (like MIDI), but also record digital samples of the instruments in the actual file, limited only by the size of the file (the 880Kb floppy disk).

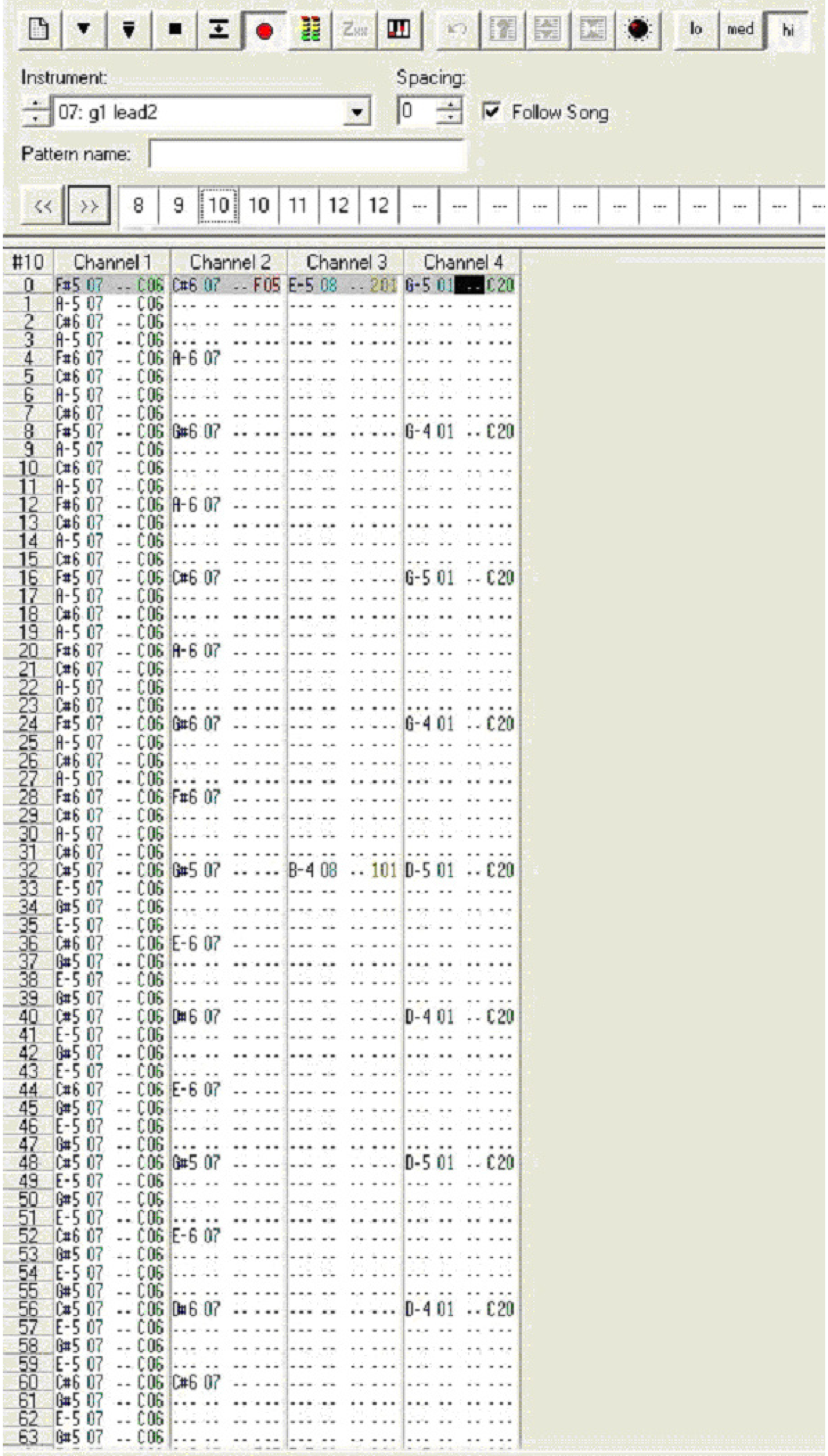

POSITION 0000
PATTERN 0000
LENGTH 0001
SPEED 0120
PRESET 0001
SOUND 0001
VOLUME 0000
SONGNAME: ____________________
SAMPLENAME: ______________________

```
00 --- 0000 --- 0000 --- 0000 --- 0000
01 --- 0000 --- 0000 --- 0000 --- 0000
02 --- 0000 --- 0000 --- 0000 --- 0000
03 --- 0000 --- 0000 --- 0000 --- 0000
04 --- 0000 --- 0000 --- 0000 --- 0000
05 --- 0000 --- 0000 --- 0000 --- 0000
06 --- 0000 --- 0000 --- 0000 --- 0000
07 --- 0000 --- 0000 --- 0000 --- 0000
```

MOD files had the advantage over MIDI, then, in that music or other sound events would sound as the composer intended, and in that more possible sounds were opened up for the composer to use. MOD files were also easier to program for non-musicians—like many game composers—and made it easy to sequence repetitive loops. In fact, the tracker format of using blocks to represent music in a linear fashion has been incorporated into today’s sequencing software. The MOD format was easily adaptable to games sound, in that patterns (sequences) could be arranged to change volume, jump to other sequences, start or stop instruments, etc. Although MOD files dominated the Amiga games scene, the MOD format never really caught on for gaming in general because of the required file size, and the fact that there were nearly twenty different formats, which would allow for a different sampling rates, and different numbers of tracks. Although there were a few game companies outside the Amiga scene that used tracker format (Epic Megagames, for instance), the majority outside of Amiga composers used the better supported MIDI.

By using the Windows program Modplug Tracker, MOD files can now be opened and explored, to hear the samples individually and view the sequencing data. Using Modplug to open one of the files from the *Shadow of the Beast II* game (Prison song), we can see how the tracker format lays out the song. The squares listing the numbers “8”, “9”, “10” etc. are the patterns (sequences) that make up this particular song. This song plays pattern 8, followed by pattern 9, pattern 10 twice, pattern 11, and pattern 12 twice, before looping. Pattern 10 is open below, showing the 64 notes in the pattern (each pattern in this song has 64 beats). Each row is played in sequenced order following the 64 numbers in the leftmost column. The four channels of available sound are shown in columns. The channel information shows the note to be played based on the sample referred to. Samples have been transposed and all set to C5 originally, and these are then transposed to the notes indicated. The second number in each column tells the tracker which sample to use for the note. There are only four sounds in this sequence: Channel one and two both contain sample #07, a thin electric guitar-like sound (called “g1 lead2”), Channel three has sample #08, a fat analogue bass, and Channel four has sample #01, pitched percussion. (see Page 3)

[1] For samples, see Mahoney’s website, http://www.ejeson.se/mahoney/index_download.php



Instrument: 07: g1 lead2

Spacing: 0

☑ Follow Song

Pattern name:

```
#10  Channel 1      Channel 2      Channel 3      Channel 4
 0   F#5 07 -- C06  C#6 07 -- F05  E-5 08 -- 201  G-5 01 -- C20
 1   A-5 07 -- C06  --- -- -- ---  --- -- -- ---  --- -- -- ---
 2   C#6 07 -- C06  --- -- -- ---  --- -- -- ---  --- -- -- ---
 3   A-5 07 -- C06  --- -- -- ---  --- -- -- ---  --- -- -- ---
 4   F#6 07 -- C06  A-6 07 -- ---  --- -- -- ---  --- -- -- ---
 5   C#6 07 -- C06  --- -- -- ---  --- -- -- ---  --- -- -- ---
 6   A-5 07 -- C06  --- -- -- ---  --- -- -- ---  --- -- -- ---
 7   C#6 07 -- C06  --- -- -- ---  --- -- -- ---  --- -- -- ---
 8   F#5 07 -- C06  G#6 07 -- ---  --- -- -- ---  G-4 01 -- C20
 9   A-5 07 -- C06  --- -- -- ---  --- -- -- ---  --- -- -- ---
10   C#6 07 -- C06  --- -- -- ---  --- -- -- ---  --- -- -- ---
11   A-5 07 -- C06  --- -- -- ---  --- -- -- ---  --- -- -- ---
12   F#6 07 -- C06  A-6 07 -- ---  --- -- -- ---  --- -- -- ---
13   C#6 07 -- C06  --- -- -- ---  --- -- -- ---  --- -- -- ---
14   A-5 07 -- C06  --- -- -- ---  --- -- -- ---  --- -- -- ---
15   C#6 07 -- C06  --- -- -- ---  --- -- -- ---  --- -- -- ---
16   F#5 07 -- C06  C#6 07 -- ---  --- -- -- ---  G-5 01 -- C20
17   A-5 07 -- C06  --- -- -- ---  --- -- -- ---  --- -- -- ---
18   C#6 07 -- C06  --- -- -- ---  --- -- -- ---  --- -- -- ---
19   A-5 07 -- C06  --- -- -- ---  --- -- -- ---  --- -- -- ---
20   F#6 07 -- C06  A-6 07 -- ---  --- -- -- ---  --- -- -- ---
21   C#6 07 -- C06  --- -- -- ---  --- -- -- ---  --- -- -- ---
22   A-5 07 -- C06  --- -- -- ---  --- -- -- ---  --- -- -- ---
23   C#6 07 -- C06  --- -- -- ---  --- -- -- ---  --- -- -- ---
24   F#5 07 -- C06  G#6 07 -- ---  --- -- -- ---  G-4 01 -- C20
25   A-5 07 -- C06  --- -- -- ---  --- -- -- ---  --- -- -- ---
26   C#6 07 -- C06  --- -- -- ---  --- -- -- ---  --- -- -- ---
27   A-5 07 -- C06  --- -- -- ---  --- -- -- ---  --- -- -- ---
28   F#6 07 -- C06  F#6 07 -- ---  --- -- -- ---  --- -- -- ---
29   C#6 07 -- C06  --- -- -- ---  --- -- -- ---  --- -- -- ---
30   A-5 07 -- C06  --- -- -- ---  --- -- -- ---  --- -- -- ---
31   C#6 07 -- C06  --- -- -- ---  --- -- -- ---  --- -- -- ---
32   C#5 07 -- C06  G#5 07 -- ---  B-4 08 -- 101  D-5 01 -- C20
33   E-5 07 -- C06  --- -- -- ---  --- -- -- ---  --- -- -- ---
34   G#5 07 -- C06  --- -- -- ---  --- -- -- ---  --- -- -- ---
35   E-5 07 -- C06  --- -- -- ---  --- -- -- ---  --- -- -- ---
36   C#6 07 -- C06  E-6 07 -- ---  --- -- -- ---  --- -- -- ---
37   G#5 07 -- C06  --- -- -- ---  --- -- -- ---  --- -- -- ---
38   E-5 07 -- C06  --- -- -- ---  --- -- -- ---  --- -- -- ---
39   G#5 07 -- C06  --- -- -- ---  --- -- -- ---  --- -- -- ---
40   C#5 07 -- C06  D#6 07 -- ---  --- -- -- ---  D-4 01 -- C20
41   E-5 07 -- C06  --- -- -- ---  --- -- -- ---  --- -- -- ---
42   G#5 07 -- C06  --- -- -- ---  --- -- -- ---  --- -- -- ---
43   E-5 07 -- C06  --- -- -- ---  --- -- -- ---  --- -- -- ---
44   C#6 07 -- C06  E-6 07 -- ---  --- -- -- ---  --- -- -- ---
45   G#5 07 -- C06  --- -- -- ---  --- -- -- ---  --- -- -- ---
46   E-5 07 -- C06  --- -- -- ---  --- -- -- ---  --- -- -- ---
47   G#5 07 -- C06  --- -- -- ---  --- -- -- ---  --- -- -- ---
48   C#5 07 -- C06  G#5 07 -- ---  --- -- -- ---  D-5 01 -- C20
49   E-5 07 -- C06  --- -- -- ---  --- -- -- ---  --- -- -- ---
50   G#5 07 -- C06  --- -- -- ---  --- -- -- ---  --- -- -- ---
51   E-5 07 -- C06  --- -- -- ---  --- -- -- ---  --- -- -- ---
52   C#6 07 -- C06  E-6 07 -- ---  --- -- -- ---  --- -- -- ---
53   G#5 07 -- C06  --- -- -- ---  --- -- -- ---  --- -- -- ---
54   E-5 07 -- C06  --- -- -- ---  --- -- -- ---  --- -- -- ---
55   G#5 07 -- C06  --- -- -- ---  --- -- -- ---  --- -- -- ---
56   C#5 07 -- C06  D#6 07 -- ---  --- -- -- ---  D-4 01 -- C20
57   E-5 07 -- C06  --- -- -- ---  --- -- -- ---  --- -- -- ---
58   G#5 07 -- C06  --- -- -- ---  --- -- -- ---  --- -- -- ---
59   E-5 07 -- C06  --- -- -- ---  --- -- -- ---  --- -- -- ---
60   C#6 07 -- C06  C#6 07 -- ---  --- -- -- ---  --- -- -- ---
61   G#5 07 -- C06  --- -- -- ---  --- -- -- ---  --- -- -- ---
62   E-5 07 -- C06  --- -- -- ---  --- -- -- ---  --- -- -- ---
63   G#5 07 -- C06  --- -- -- ---  --- -- -- ---  --- -- -- ---
```