

MXTracker

User manual

Patterns, instruments, ornaments, the hardware envelope, SID shapes and digidrums
— music for one to three AY chips right on the Next.

FileEditSongInstrOrderPlaySetupHelpMXTracker 1.1

▶Play■Pat■Stop■RecOct:4Stp:01Spd:07Vol:FEnv:A/0100Chan:6Pat:07

Title: Bamboo and SteelAuthor: Shrek/MB Maniax

INSTRUMENT	01	LEN	15	LOOP	14	LINK
##	TNE	TONE	N/E	V	Aa5	S01 D-- AY1
00	T--	-0008	+00	D	--	
01	T--	-0003	+00	F	--	
02	T--	+0000	+00	E	--	
03	T--	+0000	+00	E	--	
04	T--	+0000	+00	D	--	
05	T--	+0000	+00	D	--	
06	T--	+0000	+00	C	--	

ORNAMENT	0	LINK
LEN	01	LOOP 00
00	+00	
01	+00	
02	+00	
03	+00	
04	+00	
05	+00	
06	+00	

ORDER	07/1A	
##	PAT	LEN
04	04	40
05	05	40
06	06	40
07	07	40
08	08	40
09	09	3C
0A	0A	3C

	CH1		CH2		CH3		CH4		CH5		CH6		N	ENV	AY1
39	---		---		---		---		---		---				
3A	---		---		---		A-3	0D07	A-2	4D0A	---				
3B	---		---		A-3	3D07	---		---		C-4	2D06			
3C	A-3	1D0D		B-1	2D0B	---	---		G-2	4D0A	---				
3D	---		---		---		---		F-2	4D0A	---				
3E	---		---		---		C-4	0D07	---		---				
3F	---		---		---		---		B-1	3D0C	---				
00	F-4	1D0D		C-2	2D0C	---	---		B-1	3D0C	---		01		
01	---		---		---		---		B-1	3D0C	---				
02	C-4	1D0D		---		A-3	3D07	C-4	0D07	---	---				
03	---		---		---		---		B-2	4D09	---				
04	A-3	1D0D		A-1	2D0A	---	---		---		---				
05	---		---		---		---		E-3	5D0A	---				
06	C-4	1D0D		---		A-3	3D07	F-4	0D07	---	---				
07	---		---		---		---		B-2	4D09	---				
08	F-4	1D0D		C-3	2D0C	---	---		B-1	3D0C	---				

Loaded,AY ABCPos:07Line: 01



Contents

01 Quick start

The screen
The transport row

Key notation
A first melody

02 Basic concepts

How a song is put together
The AY chip and channels
A pattern cell
Instrument
Ornament
Hardware envelope

Noise
The AY global track
Banks and LINK
SID shape
Digidrum

03 Controls, menu and Undo

Global keys
Menu
Keyboard shortcut help

Undo and Redo
Confirmations

04 Entering notes and moving

Moving the cursor
The note keyboard
Special notes

Writing into the pattern
How channels are displayed

05 Blocks, clipboard and transforms

Selection and clipboard

Selected-block transformations

06 Effect commands

The command list
Per-pattern speed

Command A and SID

07 AY global track: noise and envelope

Keys
Blocks in the strip

Envelope shapes
Envelope as note

08 Instruments

Keys
Mouse control
Loop and tail (REL)

LINK between chips
Drum and SID in the header
Preset library

09 Ornaments

Keys

LINK

10 **SID shapes and BUZZ**

SID shape editor

How the instrument shapes the SID

How many voices play at once

Buzzer (BUZZ)

11 **Digidrums**

The drum manager

A drum in an instrument

Playback

Memory and files

12 **Order list and patterns**

Keys

Pattern length

Moving, cloning and copying a pattern

The pattern manager

Song loop

13 **Files and export**

Song title and author

Saving and loading

Importing PT3 and MXC

Exporting PT3 and MXC

The .mxplay player

Quitting

14 **Song, setup and diagnostics**

Channel count and speed

Swapping two voices

Display and editor

Sound chip and stereo

Diagnostics

About

15 **Mouse (K-Mouse)**

MXTracker is a tracker for one to three AY sound chips on the ZX Spectrum Next. The manual opens with a quick start and a tour of the screen, explains the concepts and then goes editor by editor. The box at the top searches the text in the current language.

01 Quick start

This chapter tours the screen and shows how to enter and play a first melody in a few minutes. Each part of the screen is covered in detail in the following chapters.

File Edit Song Instr Order Play Setup Help MXTracker 1.1									
▶Play ▮Pat ▮Stop ▮Rec Oct:4 Stp:01 Spd:07 Vol:F Env:A/0100 Chan:6 Pat:07									
Title: Bamboo and Steel Author: Shrek/MB Maniax									
INSTRUMENT 01				LEN 15	LOOP 14	LINK	ORNAMENT 0 LINK		ORDER 07/1A
##	TNE	TONE	N/E	V	AaS	S01 D--	AY1	LEN 01	LOOP 00
00	T--	-0008	+00	D	--			00	+00
01	T--	-0003	+00	F	--			01	+00
02	T--	+0000	+00	E	--			02	+00
03	T--	+0000	+00	E	--			03	+00
04	T--	+0000	+00	D	--			04	+00
05	T--	+0000	+00	D	--			05	+00
06	T--	+0000	+00	C	--			06	+00
##	PAT	LEN							
04	04	40							
05	05	40							
06	06	40							
07	07	40							
08	08	40							
09	09	3C							
0A	0A	3C							
CH1	CH2	CH3	CH4	CH5	CH6	N	ENV	AY1	
39	---	---	---	---	---	---	---	---	---
3A	---	---	---	---	---	---	---	---	---
3B	---	---	A-3	3D07	---	---	---	---	---
3C	A-3	1D0D	---	B-1	2D0B	---	---	---	---
3D	---	---	---	---	---	---	---	---	---
3E	---	---	---	---	---	---	---	---	---
3F	---	---	---	---	---	---	---	---	---
00	F-4	1D0D	---	C-2	2D0C	---	---	---	---
01	---	---	---	---	---	---	---	---	---
02	C-4	1D0D	---	A-3	3D07	C-4	0D07	---	---
03	---	---	---	---	---	---	---	B-2	4D09
04	A-3	1D0D	---	A-1	2D0A	---	---	---	---
05	---	---	---	---	---	---	---	E-3	5D0A
06	C-4	1D0D	---	A-3	3D07	F-4	0D07	---	---
07	---	---	---	---	---	---	---	B-2	4D09
08	F-4	1D0D	---	C-3	2D0C	---	---	B-1	3D0C
Loaded.									
AY ABC Pos:07 Line: 01									

The main screen during playback. Menu and info rows at the top, the instrument, ornament and order list panels below them and the pattern with six channels and the AY global track (columns **N** and **ENV**) at the bottom. The green row is playing.

The screen

AREA	WHAT IT SHOWS
menu (row 0)	File Edit Song Instr Order Play Setup Help ; open it with 0 , CS+1 or a click; the program version is on the right
transport row	playback and record buttons and the current editor settings (table below)
title and author	the song's Title: and Author: ; live AY registers when the AY monitor is on
INSTRUMENT panel	seven rows of the current instrument; the header shows length, loop, LINK , S = SID shape, D = drum and AY = chip bank
ORNAMENT panel	the current ornament: length, loop and semitone offsets
ORDER panel	the order of patterns in the song: position, PAT and LEN ; the header shows current position / number of positions. The green row is playing
pattern	channels CH1-CH9 with hexadecimal row numbers on the left; the channel header colour shows its AY chip
N ENV AYx strip	the AY global track: noise period, envelope shape and period
status row (bottom)	help for the field under the cursor and messages; on the right AY / YM , stereo ABC / ACB , position Pos: and row Line:

A mouse click or a menu item moves the cursor into the instrument, ornament or order list panel. **CS+SPACE** (ESC) returns to the pattern.

The transport row

FIELD	MEANING
Play	play the song from the current position (SS+ENTER)
Pat	loop the current pattern (ENTER)
Stop	stop (CS+SPACE)
Rec	record mode (SPACE); keys write into the pattern only while it is lit
Oct:	keyboard octave 1–7
Stp:	step: how many rows the cursor moves down after entering a note or value (0–16; 0 = stay)
Spd:	the song's starting speed in ticks per row; command B changes it mid-song
Vol:	the volume written with every new note; any volume typed by hand replaces it
Env:	the envelope shape and period last entered in the global track; a new shape takes this period
Chan:	the song's channel count: 3, 6 or 9
Pat:	the number of the pattern in the grid

Clicking **Oct:**, **Stp:**, **Spd:**, **Vol:** or **Chan:** raises the value with the left button and lowers it with the right.

Key notation

The scanner reads the classic 8x5 matrix, so everything goes through CAPS SHIFT (CS) and SYMBOL SHIFT (SS) — it works on a real Spectrum Next without a PS/2 keyboard too.

WRITTEN AS	WHAT TO PRESS
CS	CAPS SHIFT
SS	SYMBOL SHIFT
EXT.MODE	CAPS SHIFT and SYMBOL SHIFT held together (EXTEND on the Next keyboard); EXT.MODE+Z = hold both and press Z
arrows	CS+5 left, CS+6 down, CS+7 up, CS+8 right
BREAK , ESC	CS+SPACE — closes a window, cancels, stops playback
DELETE	CS+0 — deletes
TAB	SS+SPACE — next channel

A first melody

- 1 An empty song is ready after start-up; otherwise **File / New song** creates one.
- 2 The cursor sits in channel **CH1** in the note column. Press **SPACE** — **Rec** lights up in the transport row.
- 3 Play the keyboard: the bottom row **Z X C V B N M** are the white keys, **S D G H J** the black ones (see Entering notes and moving). Each note is written with the current instrument and the **Vol:** volume, and the cursor moves down **Stp:** rows.
- 4 **ENTER** loops the pattern, **CS+SPACE** stops it.
- 5 **SS+5** / **SS+8** picks another instrument; shape its sound in the **EXT.MODE+I** editor.
- 6 Next part of the song: click the grey row below the last position in the **ORDER** panel. A position with a new pattern is added and the grid switches to it.
- 7 **SS+ENTER** plays the whole song from the current position.
- 8 **SS+S** saves the song as MXM. To play it outside the tracker, use **File / Export MXC**.

Made a mistake? **EXT.MODE+Z** undoes the last change; the history holds up to 64 steps.

02 Basic concepts

This chapter explains the terms the rest of the manual takes for granted: what a pattern, an instrument, an ornament or the envelope is and how they fit together. If you have used an AY tracker before, feel free to skip it.

How a song is put together

A tracker builds music from tables. The **order list** (the **ORDER** panel) is the list of positions played top to bottom; each position points at one **pattern**. A pattern is a grid: rows follow each other in time and every **channel** has one **cell** per row holding a note and other events. The player runs a pattern row by row, moves on to the next position, and after the last position returns to the loop point marked by the green triangle in the order list. On top of that a song carries its title, author, initial speed and the full set of instruments and ornaments; everything is stored in a single MXM file.

A pattern is 1–96 (**60h**) rows long; a new one starts at 64 (**40h**). A song can use up to 64 patterns, numbered **00–3F** in hex. One pattern number may sit on several positions — a chorus is edited once and changes everywhere. The **PAT** column in ORDER selects which pattern a position plays and **LEN** shows its length.

A **tick** is the tracker's heartbeat: one screen refresh, i.e. a fiftieth of a second on a PAL machine. Instruments, ornaments and effects advance one step every tick. **Speed** (**Spd:** in the transport row) is the number of ticks per pattern row — a higher number means a slower song. The **B** command can change the speed anywhere mid-song.

The AY chip and channels

The AY (AY-3-8912, switchable to the compatible YM2149) is the Spectrum's sound chip with three tone channels. Thanks to TurboSound Next the Spectrum Next has three of these chips, so a song can use 3, 6 or 9 channels: **CH1–CH3** play on the first AY, **CH4–CH6** on the second and **CH7–CH9** on the third.

A channel plays at most one note at a time. Its sound is mixed from two sources: the **tone** — a square wave pitched by the note — and the shared **noise**. The channel's loudness is either a fixed 0–15 value or taken over by the **hardware envelope**. Which of these are heard at any moment is controlled by the current instrument row.

Two things exist only once per chip and are shared by its three channels: the noise generator (a single period for the whole chip) and the envelope generator (a single shape and period). That is why both are entered in the **N ENV AYx** global track next to the pattern rather than in channel cells.

A pattern cell

A cell is one event of one channel on one row. The selected channel shows all of its fields, left to right:

FIELD	MEANING
note	C-1 – B-8 starts a note; ≡ silences the channel and R-- is a release — the difference is described in Entering notes and moving
instrument	two hex digits: which of the 32 instruments plays from this row on
ENV	E = the envelope drives this channel’s volume, D = back to fixed volume
ornament	one digit 0-F selects one of the 16 ornaments; the empty ornament 0 returns to a plain tone
volume	0-F ; scales the volume prescribed by the instrument
delay and command	two effect digits: the second is the command number, the first sets how many ticks pass between effect steps
parameter	four digits carrying the command’s value

The key rule: an empty field (dots) means **no change**. A cell is an event, not a state — instrument, volume, ornament and envelope stay in force from the row where they were written until another row overrides them. A note therefore doesn’t need a volume filled in, and a channel with no new note simply keeps playing the previous one.

Instrument

An **instrument** (PT3 calls it a sample) defines the timbre. It is a table of up to 46 rows: from the moment a note starts, one row plays per tick, and at the end the table returns to its loop. The loop may end before the end of the table: the remaining rows are the tail, which an instrument with the **REL** flag plays after an **R--** event. Each row sets whether tone, noise or both are heard, the volume step 0–15, how far the pitch is offset, and how the noise or envelope period shifts. Those few columns are enough for decaying pianos, vibrato, basses and drums — drawn in the instrument editor described in the Instruments chapter.

Every AY chip has its own bank of 32 instruments. When a note is written into the pattern the current instrument number is filled into the cell automatically, so normally you just play, switching instruments with **SS+5** / **SS+8**.

Ornament

An **ornament** is a table of up to 32 pitch offsets in semitones, again one row per tick and with a loop. It is added to the played note: an ornament cycling **0 +4 +7** turns a single note into a rolled major chord (an arpeggio) — the classic substitute for chords on a chip where each channel has just one tone. It also serves for trills and fast runs. Each AY has a bank of 16 ornaments; number **0** is usually left empty so it acts as “no ornament”.

Hardware envelope

The **envelope** is a volume contour generated by the chip itself: a saw, a triangle or a one-shot attack or decay, defined by a **shape** **0-F** and a 16-bit **period**. A channel opts in with an **E** event in its **ENV** column (or via a flag in the instrument row); from then on its loudness is driven by the envelope instead of the 0–15 numbers.

With a long period the envelope slowly shapes the volume. With a short one it oscillates so fast that it becomes another oscillator — hence the typical envelope basses and “buzzy” sounds of AY music. In that case the pitch comes from the envelope period, not from the played note. Shape and period are entered in the global track; the shape table with waveform sketches is in the AY global track chapter, and **EXT.MODE+F** opens the picker.

Noise

Noise is a random signal for drums, explosions or surf. The chip has a single noise generator with period `00-1F` (lower = higher, hissier noise) shared by all three channels. Whether noise is mixed into a channel is decided by the instrument row; its current period is set in the `N` column of the global track, or shifted by the instrument.

The AY global track

The `N ENV AYx` strip to the right of the pattern is each chip's fourth track: it carries the events that belong to the whole AY — the noise period and the envelope shape and period. It is shown as `NN EPPPP`; dots mean "no change" just like in cells, and `=` in place of a shape changes the period without restarting the envelope. It is edited with the same keys as the pattern — details in the AY global track chapter.

Banks and LINK

Instruments and ornaments are kept per AY — three independent **banks**. The editor always works with the bank of the chip that owns the channel under the cursor. To get the same sound on every chip, switch on the **LINK** flag (`CS+L`) for that number: the item is copied into all three banks and further edits are mirrored. Details in the Instruments chapter.

SID shape

A **SID shape** turns an instrument into an Atari ST style "SID voice". A timer of the Z80 CTC rewrites the channel volume several times per tone period, following a short **wave** of 2-16 steps with levels `0-F`. With the tone switched on you hear the tone multiplied by the wave - a pulse whose width slowly drifts with the detune, the typical SID sound; with the tone off you hear the wave itself. A song has 31 shapes and an instrument points at one of them with the `SID` number in the instrument editor header (`OFF` = plain instrument). Shapes are saved in MXM files and the MXC export takes them to the `.mxplay` player too.

The shape editor, how shapes interact with the instrument and the limit of four simultaneous voices are covered in SID shapes and BUZZ.

Digidrum

A **digidrum** is a short 8-bit sample (kick, snare, cymbal) that the Next plays through its DAC alongside the AY sound. An instrument triggers it with every new note. A song can hold up to 16 drums, see Digidrums.

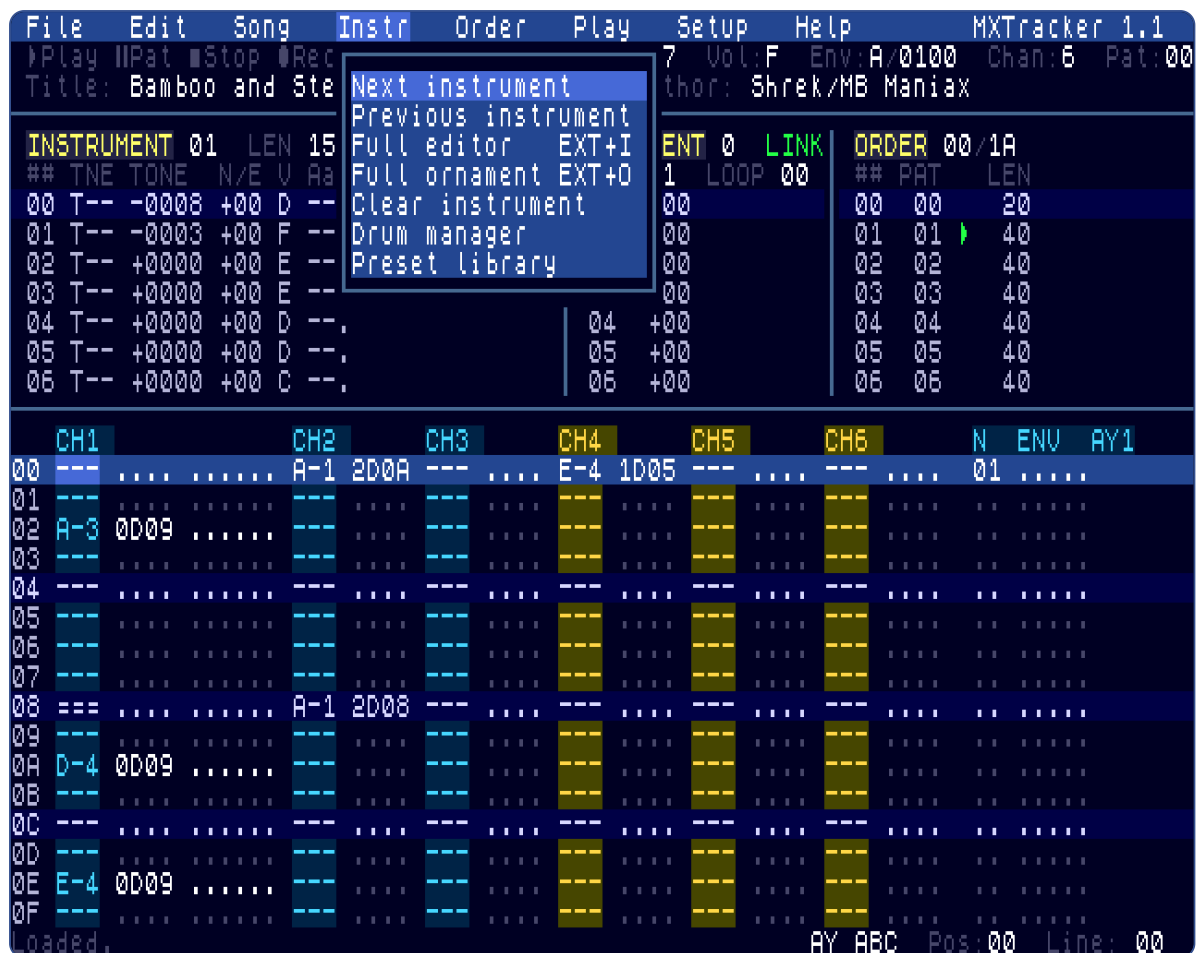
03 Controls, menu and Undo

Global keys

KEY	ACTION
0	open the menu (in hex columns with record on, 0 types a digit and the menu is on CS+1)
CS+1	always opens the menu
ENTER	loop the current pattern
SS+ENTER	play the song from the current position
CS+ENTER	play just the row under the cursor and let it ring
CS+SPACE	stop
SPACE	record on / off
SS+SPACE	next channel
SS+4	switch between the split view and full-screen pattern
SS+3	mute / unmute the channel under the cursor
SS+S	save MXM
SS+L	load MXM
EXT.MODE+Z	undo the last change
EXT.MODE+Y	redo the reverted change
EXT.MODE+H	open searchable keyboard-shortcut help
EXT.MODE+I	open/close the full-screen instrument editor
EXT.MODE+O	open/close the full-screen ornament editor
EXT.MODE+T	open transformations for the selected block

Menu

0, **CS+1** or a click on the top row opens the menu. Arrows select, **ENTER** runs the item and **CS+SPACE** or **0** closes the menu. Items that have a keyboard shortcut show it on the right.

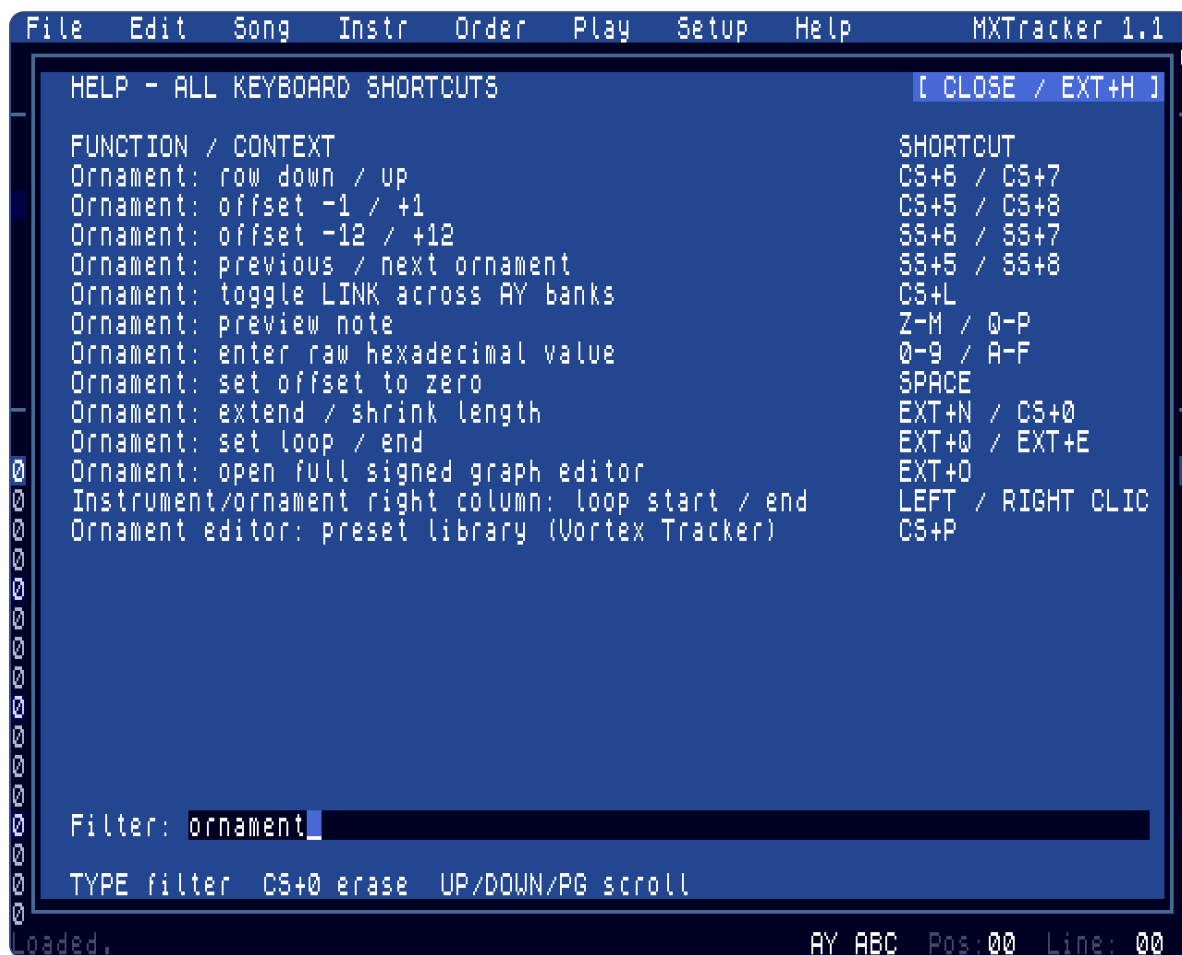


The **Instr** menu with the shortcuts of the full-screen editors.

MENU	ITEMS	CHAPTER
File	New song · Load MXM · Save MXM · Import PT3/MXC · Export PT3 · Export MXC · Quit	Files and export
Edit	Undo · Redo · Clear cell · Copy cell · Paste cell · Clear track · Clear pattern · Effect list · Transform block	Blocks, Effects
Song	Edit title · Edit author · 3 / 6 / 9 channels · Speed + / - · Edit AY globals · Swap channels A-B / B-C / A-C	Song and setup
Instr	Next / Previous instrument · Full editor · Full ornament · Clear instrument · Drum manager · Preset library	Instruments, Ornaments, Digidrums
Order	Edit order list · Pattern manager · Clone pattern · Pat length - / + · Insert position · Delete position · Clear pattern · Set loop point	Order list and patterns
Play	Play song · Play pattern · Stop · Record on/off	Transport row
Setup	AY monitor on/off · Full pattern · Narrow cells · Octave + · Step + · Sound chip AY/YM · Stereo ABC/ACB · Env as note	Song and setup
Help	Keys · PT3 import info · About	Diagnostics

Keyboard shortcut help

The **EXT.MODE+H** window lists shortcuts from every editor context. Typed text immediately filters both function descriptions and shortcut names without regard to letter case. **CS+0** removes the last filter character; up/down and **CS+3** / **CS+4** scroll; **CS+9** / **CS+2** jump to the beginning/end; and **CS+SPACE** or **EXT.MODE+H** closes the window. The mouse wheel also scrolls.



EXT.MODE+H help: typing “ornament” narrows the shortcut list at once.

Undo and Redo

EXT.MODE+Z undoes a change and **EXT.MODE+Y** redoes it; the same commands are the first two entries in the **Edit** menu. The history holds up to 64 steps and covers pattern and AY-global data, ORDER edits, instruments and ornaments including LINK, SID shapes, whole-pattern operations, cloning, and channel swaps. A paste, transformation, clear, or mouse drag is one step. A new edit after Undo discards the Redo branch.

The history stores only the bytes that changed, so writing a note takes a few bytes and clearing a whole pattern usually under a kilobyte. All steps share 32 KB; when it runs out, the oldest steps are dropped. A step larger than the whole history (it does not happen) empties it.

New song, MXM load and PT3 import start a fresh history. **Purge unused patterns** also clears it because it physically returns data pages to memory. Cursor and selection movement, playback, mute/solo, and view changes are not recorded.

Confirmations

Even with undo, the commands that may discard a larger amount of work still ask first:

- **File / New song**, **File / Load MXM (SS+L)** and **File / Import PT3/MXC** - these three only when the song has unsaved changes, since that is all they discard
- **Edit / Clear track**, **Edit / Clear pattern** and **Order / Clear pattern**
- **Order / Delete position** and the **CS+0** that removes an order row; on the last remaining position, which cannot be removed, the question is about clearing its pattern instead
- **Instr / Clear instrument**

The two buttons carry their keys: **ENTER** or **Y** confirms, **BREAK**, **N** or a click anywhere but on **[YES / ENTER]** cancels, so a stray click never deletes anything. A pattern that owns no data yet is cleared without asking, and the pattern manager keeps its own press-twice confirmation.

04 Entering notes and moving

Moving the cursor

KEY	ACTION
CS+5 / CS+8	left / right (by columns and channels)
CS+6 / CS+7	down / up
CS+3 / CS+4	16 rows up / down
CS+9 / CS+2	start / end of pattern
SS+7 / SS+6	previous / next pattern
SS+5 / SS+8	previous / next instrument

Movement keys auto-repeat while held; toggles (space, enter, menu) do not.

The note keyboard

Piano layout over two and a half octaves. The octave is picked with **Oct:** in the transport row (mouse click or **Setup** / **Octave +**). With the cursor in a pattern note column, **SS+1** through **SS+7** select that octave directly; in the other columns these combinations retain their existing functions.

LOWER ROW

Z C	S C#	X D	D D#	C E	V F	G F#	B G	H G#	N A	J A#	M B
---------------	----------------	---------------	----------------	---------------	---------------	----------------	---------------	----------------	---------------	----------------	---------------

UPPER ROW

Q C	2 C#	W D	3 D#	E E	R F	5 F#	T G	6 G#	Y A	7 A#	U B	I C	9 C#	O D	P E
---------------	----------------	---------------	----------------	---------------	---------------	----------------	---------------	----------------	---------------	----------------	---------------	---------------	----------------	---------------	---------------

the last four keys are one octave up

Special notes

KEY	ACTION
SS+1 ... SS+7	set octave 1-7 directly (note column only)
1	 note off
8	R-- release
4	clear the note in the cell

1, **4**, **8** and **0** are the only digits the piano layout does not use, and **0** opens the menu, so those three are what the note column has for its own events.

 only silences the note. **R--** is the release: on an ordinary instrument it silences the channel just like , but on an instrument with **REL** switched on (see Instruments) it cancels the loop and lets the tail play - the rest of the shape past the loop end up to **LENGTH**. PT3 knows only one of the two events and has no tail, so export writes both as its release; the MXC format keeps the tail.

Writing into the pattern

With record off the keys only preview the note and write nothing into the pattern. The preview stops as soon as the key is released.

In the other columns (instrument, ornament, volume, command, parameter) values are entered in hex, **0-9** and **A-F**. The channel **ENV** column is the exception: it takes only **E** to enable the envelope, **D** to disable it and **0** to clear the event. Other hex keys are ignored in this column.

Every note written also fills in the current instrument and the **Vol:** volume from the transport row, so the note sounds right away. After writing, the cursor moves down **Stp:** rows and wraps at the end of the pattern.

How channels are displayed

In a 6- or 9-channel song all channels remain visible. The selected channel expands to the full note/instrument/envelope/ornament/volume/command cell. Inactive channels use an 8-character summary plus a separating space with 6 channels and a shorter spaced note/instrument summary with 9 channels. Moving left/right or clicking a compact channel makes that channel the expanded one; no data is discarded. Each three-character note field has a subtle background tint matching its AY, which separates note columns from the instrument and effect fields.

The left side of the status row continuously describes the field under the cursor. It covers pattern note/instrument/envelope/ornament/volume/effect fields, all nine instrument-row fields, the signed ornament offset, the order pattern number, and AY-global noise, envelope shape and envelope period. Short system messages take precedence; contextual help returns on the next cursor movement.

The current editing row is highlighted continuously across all channels and the AY-global lane. The exact field under the cursor remains brighter (red in record mode), while the green playback row takes priority over the edit-row highlight.

05 Blocks, clipboard and transforms

Selection and clipboard

KEY	ACTION
<code>EXT.MODE+A</code>	select the three channels of the active AY, at most 64 rows
<code>EXT.MODE</code> + arrows	select rows and columns; left/right also steps between channels of the current AY
<code>EXT.MODE+C</code> / <code>EXT.MODE+X</code> / <code>EXT.MODE+V</code>	copy / cut / paste the selection or the cell under the cursor
<code>CS+0</code>	clear the selection, or the whole cell when nothing is selected
<code>SS+C</code> / <code>SS+X</code> / <code>SS+Z</code>	the original copy / cut / paste shortcuts remain available

The first `EXT.MODE` + arrow anchors a selection at the current cell. Up/down extends or contracts it by rows; left/right works **column by column** — only at the edge of a cell does it step to the neighbouring channel and jump to its opposite column. That way you can select just the note and instrument and leave the rest of the cell alone. A horizontal selection stops at the boundary of the current three-channel AY group.

`EXT.MODE+A` immediately selects the whole active AY: its three channels and the rows of the current pattern, but at most 64 — the block clipboard holds no more, so stretching the selection further is pointless. A new song starts with a pattern length of `40h` (64 rows), so by default the whole selection fits.

Normal cursor movement or a mouse click cancels the selection but keeps the clipboard. Pasting starts at the cursor and safely clips a block at the end of the pattern or the current AY.

The clipboard remembers the column window, and both paste and delete touch **only those columns** — the rest of the target cell is left untouched. A block can therefore be moved into the same columns of another channel or another AY without overwriting its commands or volume. After a paste the pasted block is left selected.

The window works in whole cell bytes, and because the delay sits in the high nibble of the command byte, `delay` and `command` always travel together. The same holds for parameter digit pairs: `PAR1` with `PAR2` and `PAR3` with `PAR4`.

A selection is at most 64 rows tall — the block clipboard and the transform preview share a fixed buffer in the data page, which has no room left to grow. Copy a full 96-row pattern with `EXT.MODE+C` in the `ORDER` panel (see Order list and patterns); that clipboard has its own page and handles the full length.

Selected-block transformations

`Edit / Transform block` or `EXT.MODE+T` opens a safe modal editor. It operates on the complete selected rectangle; with no active selection it uses the cell under the cursor. Original cells are shown on the left and the live preview on the right. `SS+SPACE` cycles the preview through up to three selected channels.

```

BLOCK TRANSFORM [ APPLY / ENTER ] [ CANCEL / BREAK ]
ROWS: 00-0F CHANNELS: 01-01 PREVIEW CHANNEL: 01

OPERATION
Transpose notes
Set instrument
Adjust explicit volumes
Fill current column
Interpolate column

CURRENT COLUMN: NOTE
VALUE / AMOUNT: +01
ROW ORIGINAL CELL PREVIEW CELL
00 --- ..... --- .....
01 --- ..... --- .....
02 A-3 0D09 ..... A#3 0D09 .....
03 --- ..... --- .....
04 --- ..... --- .....
05 --- ..... --- .....
06 --- ..... --- .....
07 --- ..... --- .....
08 === ..... === .....
09 --- ..... --- .....
0A D-4 0D09 ..... D#4 0D09 .....
0B --- ..... --- .....
0C --- ..... --- .....
0D --- ..... --- .....

Live preview only; nothing changes until APPLY, CANCEL restores everything.
UP/DOWN operation LEFT/RIGHT value SS+LEFT/RIGHT coarse SS+SPACE channel
0-9/A-F direct value for instrument or fill

```

Block transformation: the original cells on the left, the live preview on the right (a transposition by one semitone here).

The available operations are:

- **Transpose notes** shifts real notes by -24 to +24 semitones. Empty cells, note-off and release events are unchanged, and results are clamped to the valid C-B note range.
- **Set instrument** assigns instrument **00-1F** to rows containing a note or an existing instrument event.
- **Adjust volume** adds -15 to +15 only to existing volume events, clamped to **0-F**. Empty fields stay empty and continue inheriting the channel's most recent volume.
- **Fill current column** fills the field selected when the dialog was opened. Notes, instruments, envelope, ornament, volume, command, and either effect parameter byte are supported.
- **Interpolate column** creates a linear transition between the first and last selected row, independently in every selected channel. Both endpoint values must be valid. For an effect parameter, the high or low byte is selected by the original cursor column. There is no manually adjustable amount: the two endpoints determine the result automatically.

KEY IN THE DIALOG	ACTION
CS+6 / CS+7	next / previous operation
CS+5 / CS+8	decrease / increase by one step
SS+5 / SS+8	coarse step; one octave for note transposition
0-9 , A-F	directly enter an instrument or Fill value
SS+SPACE (TAB)	next preview channel
ENTER	commit the preview to the pattern
CS+SPACE (BREAK) or EXT.MODE+T	cancel without changing the pattern

The pattern is not modified until **ENTER** is pressed. Cancelling leaves it untouched, and the block-copy clipboard is restored to its previous contents when the dialog closes. Operations can also be selected by clicking or with the wheel. Left/right clicks on the value row increment/decrement it, and the **APPLY** and **CANCEL** buttons complete the dialog with the mouse.

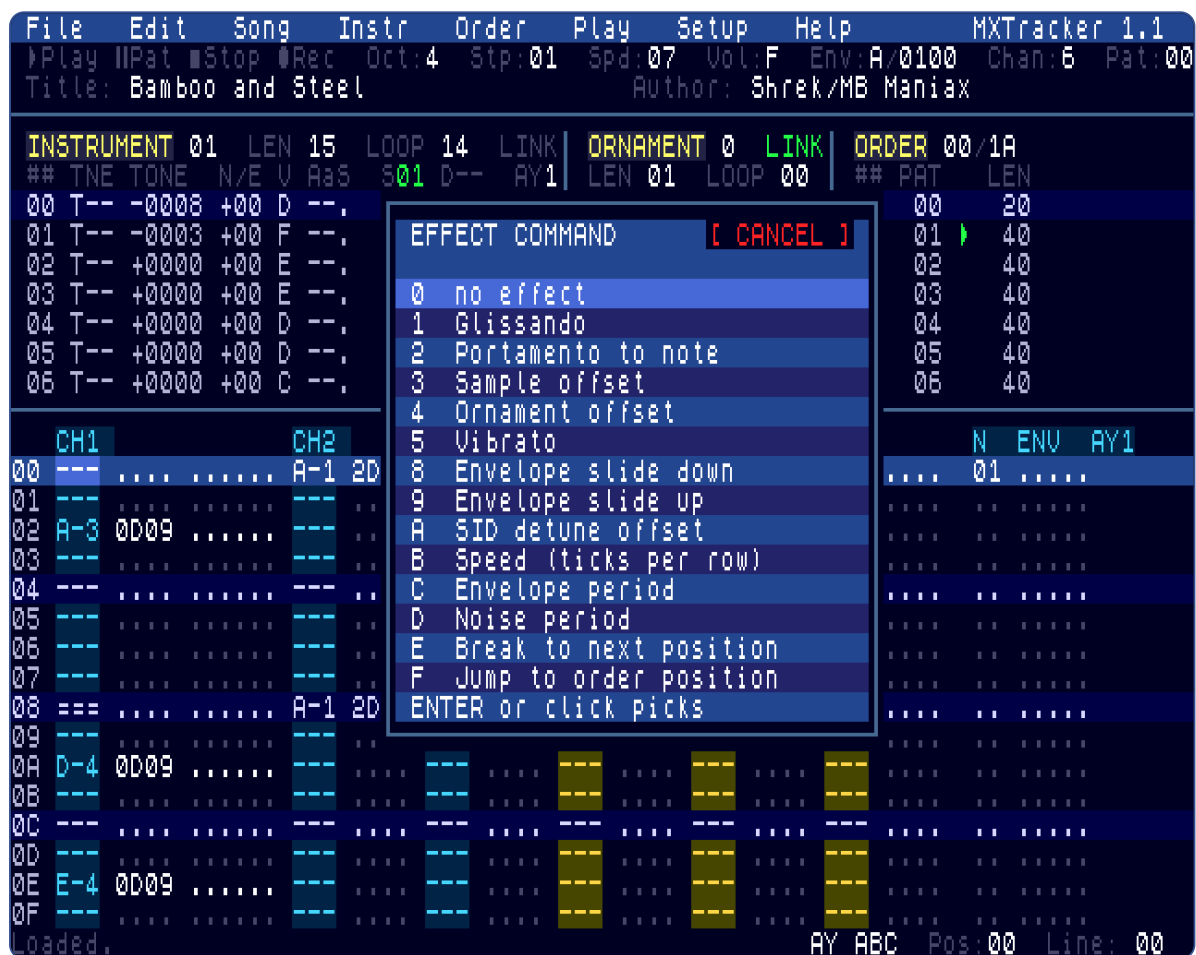
06 Effect commands

A command takes two hex digits and the four digits after them are its parameter. The second digit is the command number, the first is its delay. The delay sets how often the effect steps: a glissando with step 8 and delay 3 moves the tone by 8 every third tick. Zero does not mean "no delay", it stops the effect entirely, so glissando, portamento and envelope slide do nothing with a zero. The exception is glissando in songs with ProTracker version 7 or newer, where zero behaves as one.

The delay has its own cursor column to the left of the command number and takes a hex digit just like it. PT3 import fills it in from the module and export writes it back.

The command list

`EXT.MODE+F`, `Edit / Effect List`, or a second click on the command column of the selected cell opens a list of every command by name:



The effect picker (`EXT.MODE+F`) lists the commands by name.

COMMAND	MEANING
1	glissando
2	portamento to note
3	sample (instrument) offset
4	ornament offset
5	vibrato
6, 7	unused
8	envelope slide down
9	envelope slide up
A	SID shape detune offset (MXM and MXC only)
B	speed — ticks per row
C	envelope period
D	noise period
E	break to the next position
F	jump to an order position

Up/down and **ENTER** pick, a hex digit picks straight away, **BREAK** or a click outside the window leaves the cell alone, and **no effect** clears the command. Picking a command leaves the cursor on the first digit of the parameter, so the value can be typed right away; **no effect** leaves it on the command itself. In narrow cells, which do not draw the command at all, the cursor stays put. The digits **6** and **7** are unused. Typing the digit into the column by hand works as before. Playback stops while the list is open.

Typing the parameter needs record mode: **SPACE** toggles it and **Rec** in the transport row lights up. Without it the keys only preview notes, so a digit in a hex field would do nothing - the status line says so instead of staying silent. The list itself writes the command either way, the same as **Edit / Clear cell** or the block transformations.

Per-pattern speed

B is how a song gets a different speed per pattern: put **B** with parameter **0006** on the first row of a pattern and it plays at six ticks per row from there on, across pattern boundaries, until another **B**. **Spd:** in the transport row is only the speed the song starts with. PT3 import and export both carry this command, so imported modules keep their per-pattern speed.

Command A and SID

Command **A00xx** adds the signed value **xx** to the detune of the channel's SID shape (**A0000** clears it) and holds until the next **A** in the channel, so every note can have its own PWM speed. MXM keeps it, MXC export writes it to the A table (so **.mxpLay** plays it too), PT3 export leaves it out.

07 AY global track: noise and envelope

Open **Song / Edit AY globals** or click the **N ENV AYx** strip beside the pattern. The strip follows the AY containing the current channel.

Channels **CH1-CH3** select AY1, **CH4-CH6** select AY2 and **CH7-CH9** select AY3. You can therefore switch the displayed global lane by selecting a channel of that AY. Alternatively click the global strip (or its header) and use **SS+5** / **SS+8** to cycle directly through the active AY chips. The mouse wheel over the global strip cycles AY chips as well; over the rest of the pattern it continues to move through pattern rows.

The display is **NN EPPPP**: two hexadecimal digits for the shared noise period, envelope shape **E** and its four-digit period. **=** instead of a shape means “change period without retriggering the envelope”.

Keys

KEY	ACTION
CS+6 / CS+7	row down / up
CS+5 / CS+8	previous / next global field
SS+5 / SS+8	previous / next AY chip
0-9 , A-F	enter noise, envelope shape or a period nibble
EXT.MODE+M	toggle <i>envelope as note</i> mode (also Setup / Env as note)
SPACE	clear the selected noise/envelope event
EXT.MODE + arrows	select a block in the strip (rows and fields)
EXT.MODE+A	select the whole strip of the current AY
CS+0	clear the selection, or the complete cell on the current row
EXT.MODE+C / EXT.MODE+X	copy / cut the selection
EXT.MODE+V	paste from the row under the cursor
CS+SPACE	return to the normal channel pattern

Blocks in the strip

Selecting inside the strip works like it does in the grid: the first **EXT.MODE** + arrow anchors a selection, further ones stretch it over rows and fields, and **CS+0** clears what is selected. Which side of the strip the selection touches decides what gets cleared — picking noise alone leaves the envelope be, and the other way round. Any other key cancels the selection. The mouse selects by dragging with the left button held, but the block starts on the first real move, so an ordinary click does not draw a rectangle; dragging across the border between the grid and the strip ends the block.

The strip has a clipboard of its own, so it never collides with the pattern one — a block of notes and a block of envelopes can sit in store at the same time. Whole cells are stored, but the clipboard remembers which fields the selection covered and a paste touches only those: copying noise alone will not overwrite the envelope at the destination. A paste stops at the end of the pattern.

Envelope shapes

The envelope shape belongs to the **whole AY chip** — it has a single envelope generator shared by all three voices. It is therefore set here in the global bar, not per channel. A voice's **ENV** column has three explicit states: **E** enables the envelope, **D** disables it, and **0** clears the event. They are displayed as **E**, **D** and **0**; other hexadecimal keys are ignored in this column. The pitch comes from the envelope period, not from the note that is played.

EXT.MODE+F, or a second click on the shape field, opens a list of shapes with a sketch of each waveform. It works like the command list: arrows and **ENTER** pick, a hex digit picks straight away, **BREAK** or a click outside leaves the field alone. Only the repeating shapes hold a tone — the one-shot ones fall silent or stop after a single run, which sounds like a click.

SHAPE	WAVEFORM	BEHAVIOUR
8	saw down	repeats — holds a tone
C	saw up	repeats — holds a tone
A	triangle, down first	repeats — holds a tone
E	triangle, up first	repeats — holds a tone
9	decay, then silent	fires once
4	attack, then silent	fires once
B	decay, holds maximum	fires once
D	attack, holds maximum	fires once

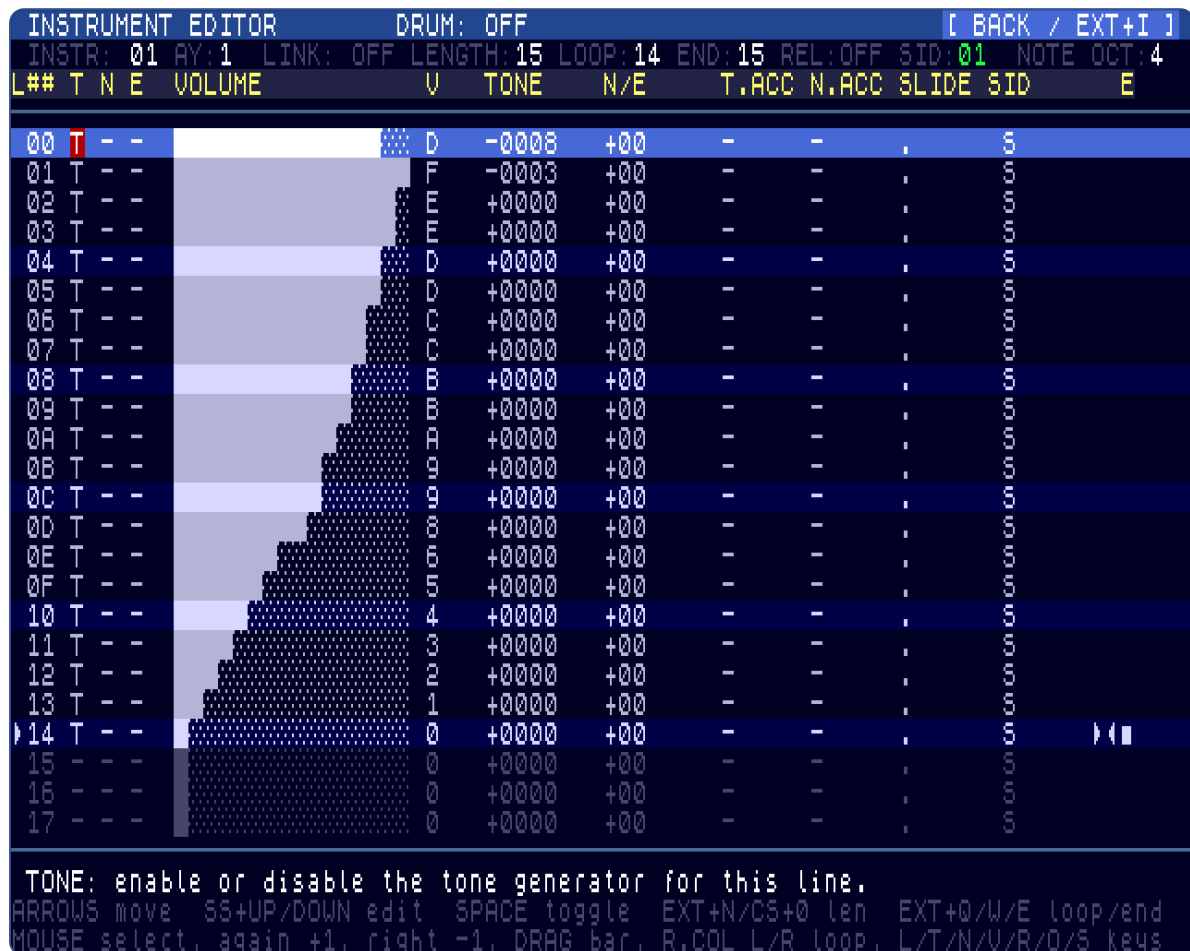
Shapes **0–3** sound the same as **9** and **4–7** the same as **F**, so the list does not repeat them. Shape **F** is offered as the identical **4**.

Envelope as note

Envelope as note mode (**EXT.MODE+M** or **Setup / Env as note**); the strip header shows **NOTE** treats the period the way Vortex Tracker does: in the period column the piano keys enter a note in the current octave and store the tone period divided by 16, i.e. the pitch that envelope shapes 8, A, C and E really produce. A period that matches a note exactly is then drawn as its name (**C-4**); any other period stays in hex. The display also covers octave 0 (**A-0**, twice the period of octave 1), where envelope bass often sits; the keyboard enters octaves 1 to 7 only. Rounding to a whole number still leaves the envelope out of tune in the higher octaves - the mode just shows which note you actually get. The noise and shape columns keep taking hex digits.

08 Instruments

The seven-row editor on the main screen remains the quick editor. Click its **INSTRUMENT** title, choose **Instr / Full editor**, or press **EXT.MODE+I** for a 24-row detailed view with fixed columns, a pseudographic volume bar, exact hex values, and loop/end markers: the arrow on the left marks the loop start, ◀ in the right-hand column the loop end and ■ the last line of the instrument. **EXT.MODE+I** or BREAK returns to the tracker.



The full instrument editor with the volume graph; the markers on the right show the loop and the end of the instrument.

Keys

The keyboard controls are the same in the quick panel and in the full-screen editor:

KEY	ACTION
CS+6 / CS+7	instrument line down / up
CS+5 / CS+8	previous / next field
SS+6 / SS+7	decrease / increase the selected value
SPACE	toggle the selected flag or cycle the volume slide
CS+T / CS+N / CS+V	direct tone/noise toggle / volume-slide cycle
CS+L	toggle LINK for this instrument across all AY banks
CS+R	toggle REL - the tail played after R-- (full editor only)
CS+S	open the SID shape editor (full editor only)
CS+P	open the preset library (full editor only)
CS+0	SID on / off for this line (full editor only)
Z S X V G H N J M , Q W R T Y U I O P	preview the current instrument at the corresponding piano notes
0-9 , A-F	type the selected value in hex
EXT.MODE+N / CS+0	extend / shorten the instrument
EXT.MODE+Q / EXT.MODE+W / EXT.MODE+E	set the loop start / loop end / instrument end at the current line

In value editors, **0-9** and **A-F** always take priority as hexadecimal input, so values such as **1C** can be typed directly. Consequently **B**, **C**, **D**, and **E** do not preview notes there; the remaining piano keys still do. On the switch columns of the instrument editor (**T**, **N**, **E**, **T.ACC**, **N.ACC**) there is no hex value, so every piano key plays. Preview uses the current instrument, ornament, volume, octave, and channel.

Mouse control

- The first click selects a row and the nearest field. Another left click on the same field adds **+1** (or toggles a flag), a right click subtracts **-1**. The quick panel works the same way.
- Clicking the volume bar sets its value directly. The mouse wheel moves between rows.
- Left/right-clicking the **INSTR** number selects the next/previous instrument. Likewise, clicking **AY** switches to the next/previous chip: the pattern cursor jumps to the same channel of that AY and the editor shows its instruments.
- Clicking the marker column on the right sets the loop: the left button puts its start on that line, the right button its end.
- **LENGTH**, **LOOP** and **END** in the header change by **+1** on a left click and **-1** on a right click; clicking **REL** toggles the tail.
- Clicking **SID** selects the instrument's SID shape (**OFF** = no SID); a click on the **SID** label itself opens the shape editor (see SID shapes and BUZZ).
- The **SID** column on the right of the lines shows which lines play with SID (**S**) and which without (**-**); a click on it or **CS+0** toggles it - for example an attack with a plain tone and SID after it.

Loop and tail (REL)

The loop runs from **LOOP** to **END** inclusive; **END** normally equals the end of the instrument. Lines between **END** and **LENGTH** form the **tail**: they play only for an instrument with **REL** switched on, and only after an **R--** in the pattern. At that moment the player cancels the loop for that note, plays the rest of the shape up to **LENGTH** and silences the channel afterwards. An instrument without **REL** stops immediately on **R--** and its tail never plays. PT3 has no tail, so the export writes a plain release; **File / Export MXC** keeps it (see Files and export).

LINK between chips

The **L** in the panel title is dim for an independent instrument and green when LINK is active. Enabling it copies the complete current instrument from the AY of the selected channel to all three AY banks. Later edits are mirrored. Turning LINK off keeps the copies but lets them diverge again.

Drum and SID in the header

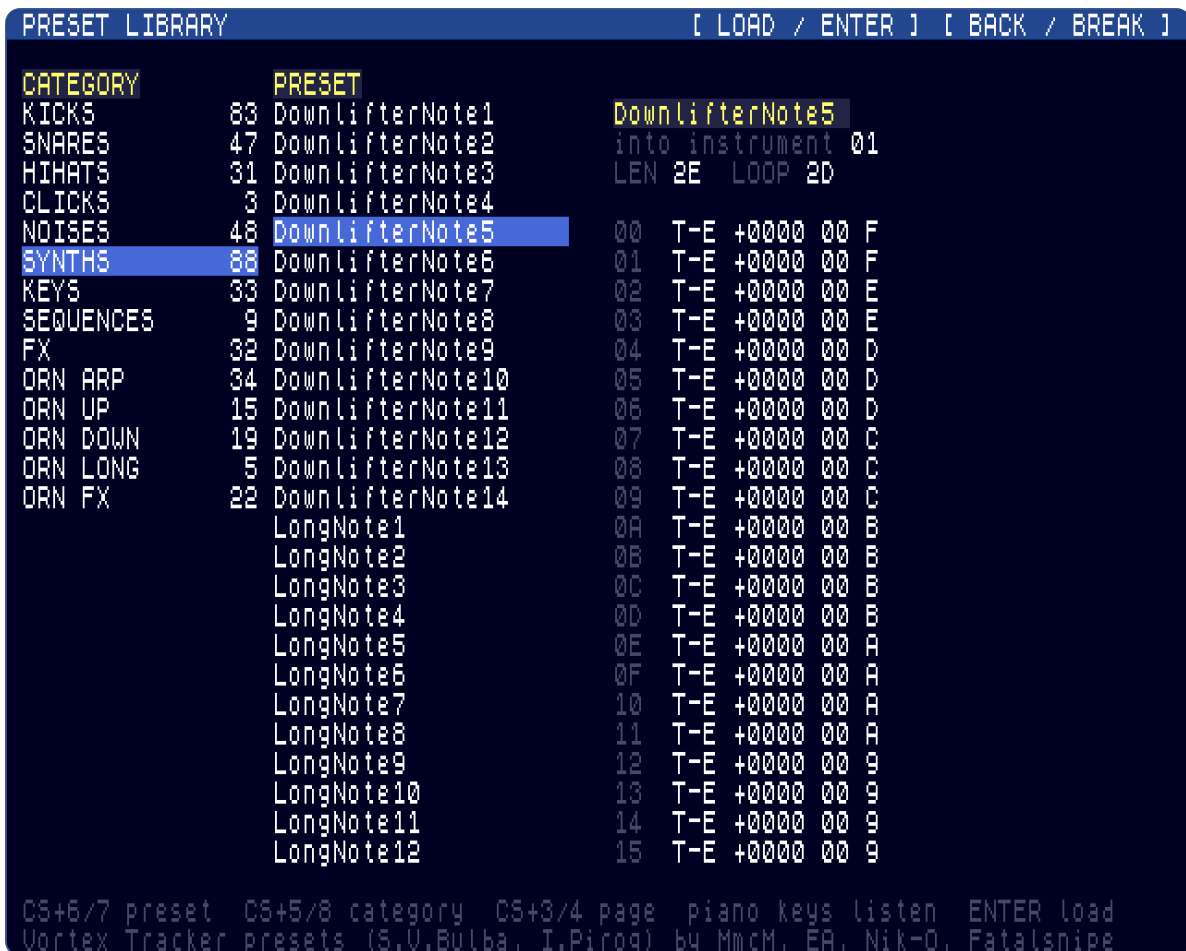


Instrument panel on the main screen: **S01** = the instrument has SID shape 01, **D01** = it triggers drum 01.

You can see what an instrument uses without opening the editor: the header of the **INSTRUMENT** panel on the main screen shows **S** with the SID shape number and **D** with the drum number, **--** means none; **~** after the drum number = tuned by note.

Preset library

A ready-made instrument or ornament can be picked from a list, as in Vortex Tracker. Open the library with **Instr / Preset library** or **CS+P** in the full-screen instrument or ornament editor. It holds 374 instruments in the categories **KICKS**, **SNARES**, **HIHATS**, **CLICKS**, **NOISES**, **SYNTHS**, **KEYS**, **SEQUENCES** and **FX**, and 95 ornaments (**ORN ARP**, **UP**, **DOWN**, **LONG**, **FX**). From the ornament editor it starts in the ornaments.



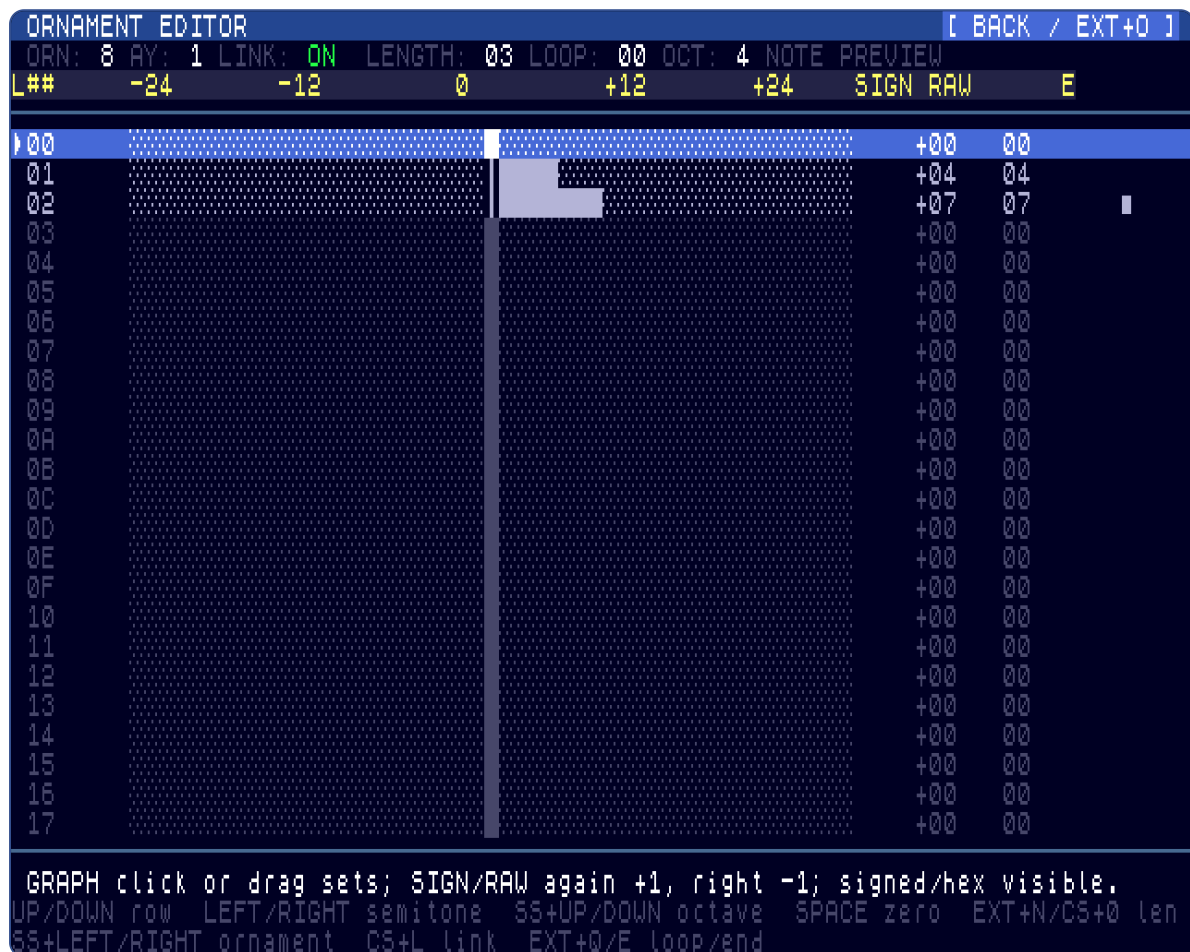
The preset library: categories with counts on the left, presets in the middle, target, length, loop and lines of the selected preset on the right.

The selected preset is loaded into the current instrument (or ornament) on trial right away, so the piano keys play it. **ENTER** or a second click on the selected preset keeps it and closes the library — one Undo step, copied to every AY when LINK is on. **BREAK** restores the original instrument and ornament untouched. **CS+6** / **CS+7** select the preset, **CS+5** / **CS+8** the category, **CS+3** / **CS+4** page by 16 and the mouse wheel scrolls the list.

Presets set the lines, length and loop; the SID shape and the **REL** tail are cleared and the assigned drum stays. Longer Vortex instruments (13 of 374) are cut to 46 lines and 8 ornaments to 32 values, just as on PT3 import. The library was collected for Vortex Tracker 2.5 by MmcM, EA, Nik-O and FatalSnipe; the source is [assets/presets/vortex_presets.txt](#) and [tools/make_presets.py](#) builds the pack.

09 Ornaments

The quick ornament panel remains on the main screen. Click its **ORNAMENT** title, choose **Instr / Full ornament**, or press **EXT.MODE+0** for a 24-row view with a **-24...0...+24** semitone axis. Negative values extend left and positive values right. Exact signed and raw hex values remain visible; an edge arrow marks values outside the graph. Clicking the graph sets the corresponding semitone. Another left click on the selected signed/raw value adds **+1**; a right click subtracts **-1**, with the same behavior in the quick panel. Left/right-clicking the **ORN** number selects the next/previous ornament, clicking **AY** the next/previous chip. **EXT.MODE+0** or **BREAK** closes the editor.



The ornament editor with a major chord 0, +4, +7.

Keys

KEY	ACTION
CS+6 / CS+7	line down / up
CS+5 / CS+8	value -1 / +1
SS+6 / SS+7	value -12 / +12
SS+5 / SS+8	previous / next ornament
CS+L	toggle LINK for this ornament across all AY banks
CS+P	open the preset library, starting in the ornaments (full editor only)
Z S X V G H N J M, Q W R T Y U I O P	preview the current instrument and ornament
0-9, A-F	enter the raw signed byte in hex
SPACE	set the current offset to zero
EXT.MODE+N / CS+0	extend / shorten the ornament
EXT.MODE+Q / EXT.MODE+E	set the loop / end at the current line

Here too a left click in the right-hand column sets the loop start and a right click the end of the ornament.

LINK

The ornament title uses the same dim/green **L** indicator and the same copy-on- enable, mirror-while-enabled behaviour as instruments. Each instrument and ornament number has an independent LINK flag.

10 SID shapes and BUZZ

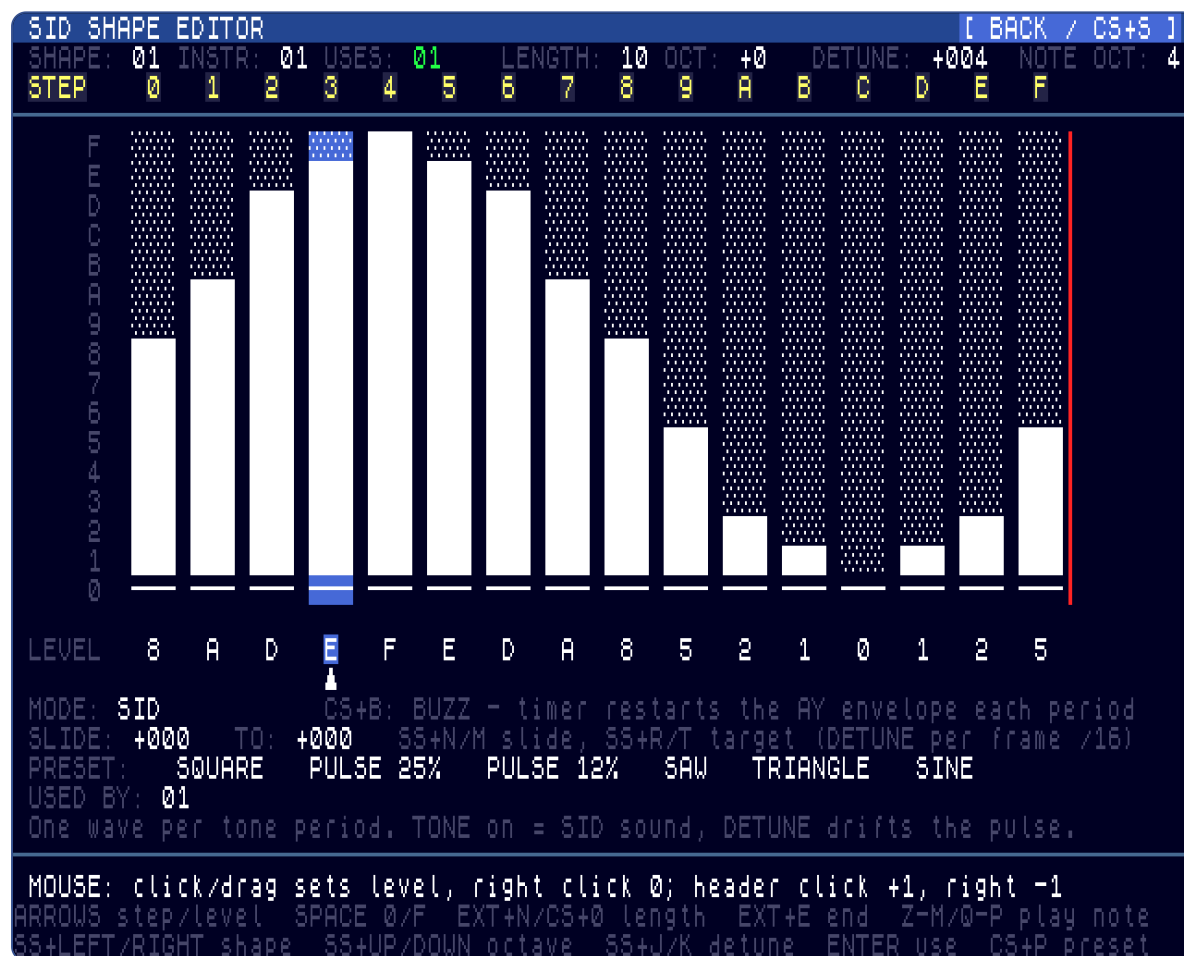
What a SID shape is, is explained in Basic concepts. An instrument points at a shape with the **SID** field in the header of the full-screen instrument editor:

```
INSTRUMENT EDITOR          DRUM: OFF          [ BACK / EXT+I ]
INSTR: 01 AY:1  LINK: OFF LENGTH:15 LOOP:14 END:15 REL:OFF SID:01 NOTE OCT:4
L## T N E  VOLUME          V  TONE          N/E  T.ACC N.ACC SLIDE SID  E
```

The header of the full instrument editor: the **SID** field holds the shape number (**OFF** = no SID).

SID shape editor

CS+S in the full instrument editor opens the shape editor on the instrument's shape (or on the last edited one). Every column of the graph is one step of the wave with a level **0-F**. The wave plays once per tone period and uses only the first **LENGTH** steps; the rest is dim and a red line marks the end. **OCT** runs the wave up to three octaves above or below the tone and **DETUNE** makes every step longer (+) or shorter (-) by $n/1024$ - with the tone on, the pulse width slowly wanders. With **DETUNE** 0 the pulse stays where the note started and sounds much like the plain tone, so a new shape starts at **+3**. Levels scale the instrument volume, **F** = full.



The SID shape editor with the sine preset. The blue column and the arrow mark the step under the cursor, the red line the end of the wave.

The header shows the edited shape, the current instrument and the shape that instrument uses (**USES**, green when it is the edited one). **USED BY** lists the instruments of the current AY that use the shape. Note preview plays the current instrument with the edited shape even before it is assigned; SID is heard in the preview even when the song is not playing. BREAK, **CS+S** or **[BACK]** returns to the instrument editor.

Clicking or dragging in the graph sets levels, a right click sets a step to **0**. Header values **SHAPE**, **INSTR**, **LENGTH**, **OCT** and **DETUNE** change by **+1** on a left click and **-1** on a right click; clicking **USES** assigns the shape. Clicking a name in the **PRESET** row loads that wave.

The **SLIDE** / **TO** row below the graph changes the detune during a note: every new note starts at **DETUNE**, and each frame it moves by **SLIDE** sixteenths until it reaches **TO**. The PWM can thus speed up or slow down. A **TO** behind the slide does not stop it, and the detune runs to its limit.

Unlike the other value editors there is no hex input here: every piano key plays a note, so the sound of the shape can be tried at once. Levels are set with the arrows, **SPACE**, the mouse or a preset.

KEY	ACTION
CS+5 / CS+8	previous / next step
CS+6 / CS+7	level -1 / +1
SPACE	level 0 / F
SS+5 / SS+8	previous / next shape
SS+6 / SS+7	octave down / up (-3..+3)
SS+J / SS+K	detune -1 / +1 (-128..+127)
EXT.MODE+N / CS+0	longer / shorter wave (2..16 steps)
EXT.MODE+E	the wave ends at the cursor step
SS+N / SS+M	detune slide -1 / +1 (sixteenths per frame)
SS+R / SS+T	slide target -1 / +1
ENTER	the current instrument uses this shape / stops using it
CS+P	next preset: square, pulse 25 %, pulse 12 %, saw, triangle, sine
Z S X V G H N J M , Q W R T Y U I O P	play a note: the current instrument with this shape

At most four channels play SID at once, see How many voices play at once below. Shape edits and assigning a shape to an instrument can be undone.

How the instrument shapes the SID

A SID shape has no pitch or volume of its own - it only adds the fast volume "chopping". Everything else is taken every frame (50 times a second) from what the instrument has just computed, so every instrument line shows in the SID sound:

IN THE INSTRUMENT	EFFECT ON SID
volume (V), volume slide, pattern volume	scales the whole wave: level F of the shape = the current instrument volume, so a decaying volume fades the SID smoothly; volume 0 switches SID off
tone (T) on	the tone multiplied by the wave - a pulse whose width DETUNE moves
tone (T) off	the wave itself sounds as the oscillator; instrument lines may switch T , e.g. an attack with tone and then the pure wave
noise (N)	noise is chopped by the same wave; noise without tone thus gets the pitch of the note
envelope (E)	lines using the hardware envelope play without SID and the voice is freed; after the envelope the wave starts again from the beginning
tone offset, accumulation, ornament, vibrato, portamento, slides	the wave always lasts one period of the current tone, so it follows the pitch and keeps running smoothly
the line's SID column (CS+0)	a line marked - plays without SID and frees the voice; the next line with SID starts the wave again - for example an attack with a plain tone and SID after it
slide (the shape's SLIDE / T0)	every note puts the detune back to DETUNE , then it travels towards T0 , so the PWM speeds up or slows down during the note
pattern command A	adds an offset to the channel's detune until the next A ; every note can have its own PWM speed (MXM only)
loop and END	nothing special - SID plays while the channel has a non-zero volume without envelope
REL and R--	the tail keeps playing with SID on the same voice, the wave does not restart; the voice ends after the tail. Without REL , R-- stops SID at once

High notes get fewer wave steps: when a step would be shorter than the timer can manage, every second step is read (16 → 8 → 4 → 2) and if even two steps are too fast the channel plays that frame without SID. It shows first with **OCT** +2/+3 and a short wave.

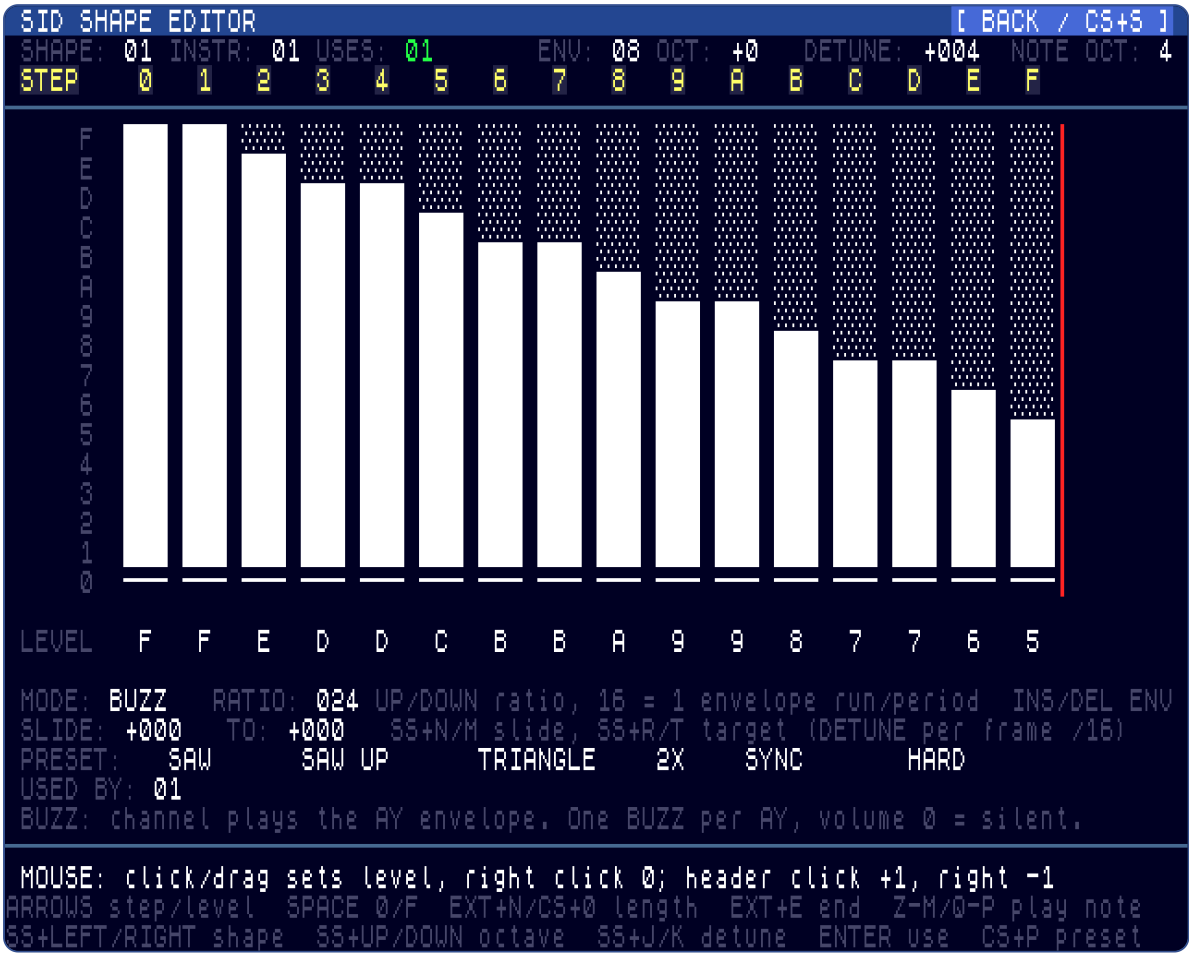
Note preview runs through the instrument and ornament in time just as playback does, even when the song is stopped - while the key is held, the lines, the loop and SID all run. Wave edits in the shape editor are heard live.

How many voices play at once

At most **four channels** can play SID at the same time: every voice needs a timer of its own and the tracker uses CTC channels 0-3. Voices are handed out in channel order (A, B, C of the first AY, then the second and third) and a channel keeps its voice while it plays a SID instrument. A fifth such channel plays as a plain instrument until a voice is free again. A channel currently playing the hardware envelope does not use SID. The tracker and **.mxpLay** behave the same.

Buzzer (BUZZ)

A SID shape has a second mode: BUZZ, the Atari sync-buzzer. **CS+B** or a click on **MODE** switches it. Instead of a volume wave, the timer writes the envelope shape to the AY once per tone period, which restarts the envelope. The channel then plays the envelope: the envelope shape becomes the waveform and its pitch is the pitch of the note. It sounds like a sharp saw, a triangle or a "sync" lead and bass that the AY cannot do otherwise.



BUZZ mode with the SYNC preset: saw (envelope 08), ratio 24 - the envelope is cut off two thirds of the way down. The graph shows the resulting wave of one tone period.

The header shows **ENV** instead of **LENGTH**: the envelope shape **08-0F** (**EXT.MODE+N** / **CS+0**). **RATIO** is the envelope period relative to the tone: at **16** one envelope run (16 steps) lasts exactly one tone period, a smaller number speeds the envelope up (more runs per period, a higher harmonic comes through), a larger one cuts it off before it finishes - the typical sharp "sync". **OCT**, **DETUNE**, **SLIDE** / **T0** and command **A** work as with SID. Presets: **SAW** (08, 16), **SAW UP** (0C, 16), **TRIANGLE** (0A, 8), **2X** (08, 8, an octave up), **SYNC** (08, 24) and **HARD** (08, 40).

KEY	ACTION IN BUZZ MODE
CS+B	switch SID / BUZZ (BUZZ starts as a saw: envelope 08, ratio 16)
CS+6 / CS+7 , wheel	ratio -1 / +1 (1..255)
EXT.MODE+N / CS+0	next / previous envelope shape (08..0F)
CS+P , click on a preset	buzzer preset

Each AY has only one envelope, so BUZZ plays on at most one channel per chip (the first in A, B, C order); another channel with a BUZZ shape on the same AY plays as a plain instrument. A channel playing the envelope is always at full volume - the instrument volume only decides whether it sounds (0 = silent). Channels of the same AY that play the hardware envelope from the pattern hear the buzzer's envelope. A BUZZ voice counts towards the four SID voices. MXC and `.mxpLay` carry and play BUZZ just like SID; an older player plays the instrument as a plain one.

11 Digidrums

Instead of (or on top of) its AY sound, an instrument can trigger a **digidrum**: a short 8-bit sample played by the Next DAC at 11 kHz. Samples are prepared in the converter <docs/wav2mxd.html> (it opens in a browser, even offline): drop WAV files on it, listen to the 8-bit result and download [.MXD](#) files. Drums are loaded and managed in the **drum manager** ([Instr / Drum manager](#); in the instrument editor [CS+D](#) or a click on the [DRUM:](#) label).

A ready-made library of 28 drums (kicks, snares, claps, hi-hats, cymbals, toms, percussion and a few effects) is in the [assets/drums](#) folder of the repository; [assets/drums/README.md](#) lists them with their lengths, [wav/](#) holds WAV masters and [tools/make_drum_kit.py](#) regenerates them.

The drum manager

```
DRUM MANAGER [ BACK / BREAK ]

## NAME          LENGTH  BYTES  USED BY (AY: INSTR, ~ = NOTE)
01 KICK 909      00318 MS 03500 B  1:01
02 SNARE        00136 MS 01500 B  1:02
03 -
04 -
05 -
06 -
07 -
08 -
09 -
0A -
0B -
0C -
0D -
0E -
0F -
10 -

MEMORY: 05000 / 65535 B
INSTRUMENT: 01 AY: 1 DRUM: 01

Convert WAV to .MXD in docs/wav2mxd.html (11 kHz 8-bit, mono, DMA).

UP/DOWN select SPACE or click play ENTER use for instrument
L load .MXD into slot DEL twice delete BREAK / CS+D back
MOUSE: click selects, click again or right click plays
```

Drum manager: 16 slots with the sample name, length and size; the [USED BY](#) column shows which instruments trigger the drum ([1:01](#) = AY1, instrument 01; [~](#) = tuned by note). Below the list: sample memory usage and the current instrument.

In the manager [UP](#)/[DOWN](#) selects a slot, [SPACE](#) (or a second click, a right click) plays the drum, [ENTER](#) assigns it to the current instrument and [L](#) loads an [.MXD](#) file into the selected slot - if the slot already held a drum it is replaced, and instruments using it play the new one. [DEL](#) twice in a row deletes the drum: the sample is removed, memory is compacted and instruments that used it lose the drum. [BREAK](#) (or [CS+D](#), the [BACK](#) button) closes the manager.

A drum in an instrument



The screenshot shows the 'INSTRUMENT EDITOR' header with the following settings: DRUM: 01 KICK 909, FIX, [BACK / EXT+I], INSTR: 01 AY: 1, LINK: OFF, LENGTH: 15, LOOP: 14, END: 15, REL: OFF, SID: 01, NOTE OCT: 4.

Instrument editor title: instrument 01 triggers drum 01 named "KICK 909".

The instrument editor title shows the **DRUM** field with the drum number and name. A left click picks the next loaded drum, a right click the previous one, and **OFF** turns the drum off (the sample stays in the song). Clicking **FIX** / **NOTE** after the name switches tuning: **FIX** plays every note at the original pitch (kick, snare), **NOTE** follows the note - C-4 is the original pitch, an octave up plays twice as fast and short, the range is +-3 octaves (toms, melodic samples).

The header of the **INSTRUMENT** panel on the main screen also shows which drum an instrument triggers, see Instruments.

Playback

The drum sounds with every new note of the instrument, in the pattern and in note preview; on any channel. It plays in mono, in the middle: the Next DMA sends it to the SpecDrum DAC, so it costs neither CPU time nor SID timers. Two drums at once are mixed, a third cuts the one with less left to play.

Memory and files

A song has at most 16 drums and 64 KB of samples (about 6 s); they take memory from the same pool as patterns.

An MXM with drums is saved as MXMD, which older MXTracker versions cannot load. The MXC export carries the drums (a byte at the instrument's sample and the samples at the end of the file) and **.mxplay** plays them through the DMA just like the tracker - in the foreground and with a module up to 24 KB; in the background (**-bg**) and in older players only the AY sounds. The MXC import loads the drums back, including their instrument assignment.

12 Order list and patterns

The order list (the ORDER panel) sets the order in which patterns play. Get into the panel with a click or **Order / Edit order list**.

Keys

KEY	ACTION
CS+6 / CS+7	position down / up
CS+5 / CS+8	selected PAT or LEN field -1 / +1
0-9 , A-F	type the selected PAT or LEN in hex
K	clone the pattern into the first free number
EXT.MODE+7 / EXT.MODE+6	move the position up / down in the song
EXT.MODE+5 / EXT.MODE+8	pattern one row shorter / longer
EXT.MODE+N	insert position
CS+0	delete position

Clicking the pattern number or the length picks the matching **PAT** / **LEN** field; the picked field gets the red backing of every active edit field and its two hex digits can then be typed over directly — **PAT** takes **00** - **3F** and **LEN** takes **01** - **60**. A right click in the order list is swallowed so it cannot extend the song by accident. Clicking a dim position activates it; newly created rows receive patterns **01**, **02**, ... in sequence and the grid below switches immediately. **Order / Delete position** removes a row from the song list, while **Order / Clear pattern** erases the current pattern data. The mandatory final position cannot be removed, so DELETE clears its pattern instead.

Pattern length

New patterns are **40h** (64 rows) long and may grow up to **60h** (96 rows); the grid wraps at their end. The **LEN** column of the order list shows each pattern's length. Click it to select direct two-digit hexadecimal entry; **Order / Pat length -** / **+** and **EXT.MODE+5** / **EXT.MODE+8** still change it one row at a time. The pattern manager changes the same value with left/right on the selected row.

Shortening never erases anything - the rows below simply stop being shown. When they still hold notes or AY events, the status line says **Shorter - hidden rows still hold data**, so nothing is lost silently. Make the pattern longer again and the rows come back untouched.

Moving, cloning and copying a pattern

EXT.MODE+7 / **EXT.MODE+6** swap the current entry with the one above or below and take the cursor with it, so the same pattern can be walked through the song with repeated presses. Only positions inside the song take part; the dim rows past its end hold no pattern. The loop marker points at a position rather than at a pattern, so it stays where it was.

One pattern number may sit at several order positions, so editing it changes all of them at once. **K** or **Order / Clone pattern** copies the pattern of the current position — data and length — into the first number that no position references and that owns no data page yet, and assigns that number to this position. Everything else in the song keeps the original, so further edits here no longer reach the other positions. **C** in the pattern manager does the same job from the pattern list. (**C** is a hexadecimal digit in the order list, which is why the clone lives on **K** here.)

In the **ORDER** panel, **EXT.MODE+C** and **EXT.MODE+V** operate on the whole pattern. Copy stores a complete snapshot, including its length, all nine channels, and the global AY tracks. Move to another pattern and paste to replace it completely. Cell and block copying in the pattern grid is unchanged.

The pattern manager

Order / Pattern manager opens a full-screen overview of all 64 patterns. It shows the number of ORDER references, pattern length, and whether a data page is allocated. Controls:

KEY	ACTION
up/down, CS+3 / CS+4 , CS+9 / CS+2	select a pattern
left/right	change pattern length
ENTER	assign the selected pattern to the current ORDER position and open it
C	make an independent clone in the first safely free pattern number
CS+0 twice	clear the selected pattern while keeping ORDER references
U twice	release data pages belonging to every pattern unused by ORDER
CS+SPACE	return without changing the assignment

PATTERN MANAGER				[BACK / BREAK]
ORDER POS: 00 CURRENT PAT: 00 SELECTED PAT: 00 TOTAL: 40				
PATTERN	USES	LENGTH	DATA	
00	01	20	ALLOCATED	
01	01	40	ALLOCATED	
02	01	40	ALLOCATED	
03	01	40	ALLOCATED	
04	01	40	ALLOCATED	
05	01	40	ALLOCATED	
06	01	40	ALLOCATED	
07	01	40	ALLOCATED	
08	01	40	ALLOCATED	
09	01	30	ALLOCATED	
0A	01	30	ALLOCATED	
0B	01	30	ALLOCATED	
0C	01	30	ALLOCATED	
0D	01	40	ALLOCATED	
0E	01	40	ALLOCATED	
0F	01	30	ALLOCATED	
10	01	30	ALLOCATED	
11	01	30	ALLOCATED	
12	01	40	ALLOCATED	
13	01	40	ALLOCATED	
14	01	20	ALLOCATED	
15	01	40	ALLOCATED	
16	01	40	ALLOCATED	
17	01	40	ALLOCATED	

Patterns are data; ORDER positions may reference the same pattern repeatedly.
UP/DOWN/PG/CS+9/CS+2 select LEFT/RIGHT length ENTER assign/open C clone
MOUSE select; again open CS+0 twice clear U twice purge unused

The pattern manager: ORDER references, length and data state of every pattern.

A click selects a row; clicking the same row again assigns and opens it. The mouse wheel scrolls the list. A clone is independent, so later source edits do not affect it.

Song loop

The small green triangle on the right marks the song loop point; it is not the playback cursor. After reaching the end of the order list, playback continues from this position. Select the required row and use **Order / Set loop point** to move it. In contrast, the row with a full green background is the position currently being played. The loop position is saved in MXM files and retained when importing PT3 modules.

13 Files and export

Song title and author

Song / Edit title and **Song / Edit author** open the text editor in the status row with the current value pre-filled. Character keys append text, **CS+0** removes the last character, **ENTER** accepts the change, and **CS+SPACE** (**ESC**) cancels it. Both fields are limited to 32 characters.

The values appear in the song-information row and are written both to native MXM files and to the header of exported PT3 modules.

Saving and loading

SS+S (**File / Save MXM**) saves the song in the native MXM format with all patterns, instruments, ornaments, SID shapes and drums. First the NextZXOS file browser opens: go to the target directory and confirm it with **SPACE** (**BREAK** cancels). Then type the file name in the status row.

A name typed for saving (MXM, MXC, PT3) that does not end with the right extension gets it (in lower case when the name has lower-case letters).

SS+L (**File / Load MXM**) opens the browser with MXM songs: **ENTER** loads the file, **SPACE** or **BREAK** cancels. **File / New song** starts an empty song. Both ask first when the current song has unsaved changes.

A song with drums is saved as MXMD, which older MXTracker versions cannot load.

Importing PT3 and MXC

File / Import PT3/MXC loads a ProTracker 3 module, including multi-chip TurboSound modules, or an MXC file exported from MXTracker — which brings back the instrument tails, SID shapes and drums too. A window reports the import result; **Help / PT3 import info** reopens it. Importing starts a fresh Undo history.

Exporting PT3 and MXC

FORMAT	WHAT IT CARRIES	PLAYED BY
Export PT3	standard PT3 (TurboSound for 6 and 9 channels); instrument tails become a plain release, SID, command A and drums are lost	any PT3 player
Export MXC	PT3 extended with tails, SID shapes, BUZZ, command A and drums	.mxplay , ptx3play

The import takes PT3 and MXC (including SID shapes); **File / Export MXC** writes PT3 with the instrument tails and SID shapes (header **MXTracker v3.x compilation of**, two bytes before every sample, plus a 20-byte shape for a SID instrument), which the standalone **ptx3play** player and the **.mxplay** DOT command play; the ordinary **Export PT3** loses the tail and SID.

The .mxplay player

The `.mxplay` DOT command plays PT3 and MXC straight from NextZXOS, in the foreground with an analyser or in the background (`.mxplay -bg song.mxc`). Drums play only in the foreground and with a module up to 24 KB. The full guide is in `docs/MXPLAY.html`.

Quitting

`File / Quit` returns to NextZXOS at once, without asking — save the song first.

14 Song, setup and diagnostics

Channel count and speed

Song / 3 channels, **6 channels** and **9 channels** set how many AY chips the song uses (one, two or three). A click on **Chan:** in the transport row does the same. **Song / Speed +** and **Speed -** change the starting speed **Spd:**.

Swapping two voices

Song / Swap channels A-B, **B-C** and **A-C** swap a pair of voices across the whole song, that is in every pattern at once. They work inside the AY the cursor sits in, so with six or nine channels the other chips are left alone. The global AY lane stays put — it carries the noise and envelope of the whole chip, not of individual voices. Applying the same swap twice restores the original.

Display and editor

ITEM	WHAT IT DOES
Setup / Full pattern (SS+4)	pattern across the whole screen without the panels; again restores the split view
Setup / Narrow cells	hides the delay, command and parameter columns; the cursor visits only note, instrument, envelope, ornament and volume. Command data stay
Setup / Octave +	next keyboard octave (cycling 1–7)
Setup / Step +	larger cursor step after writing (cycling 0–16)
Setup / Env as note	enter the envelope period as a note, see AY global track

Sound chip and stereo

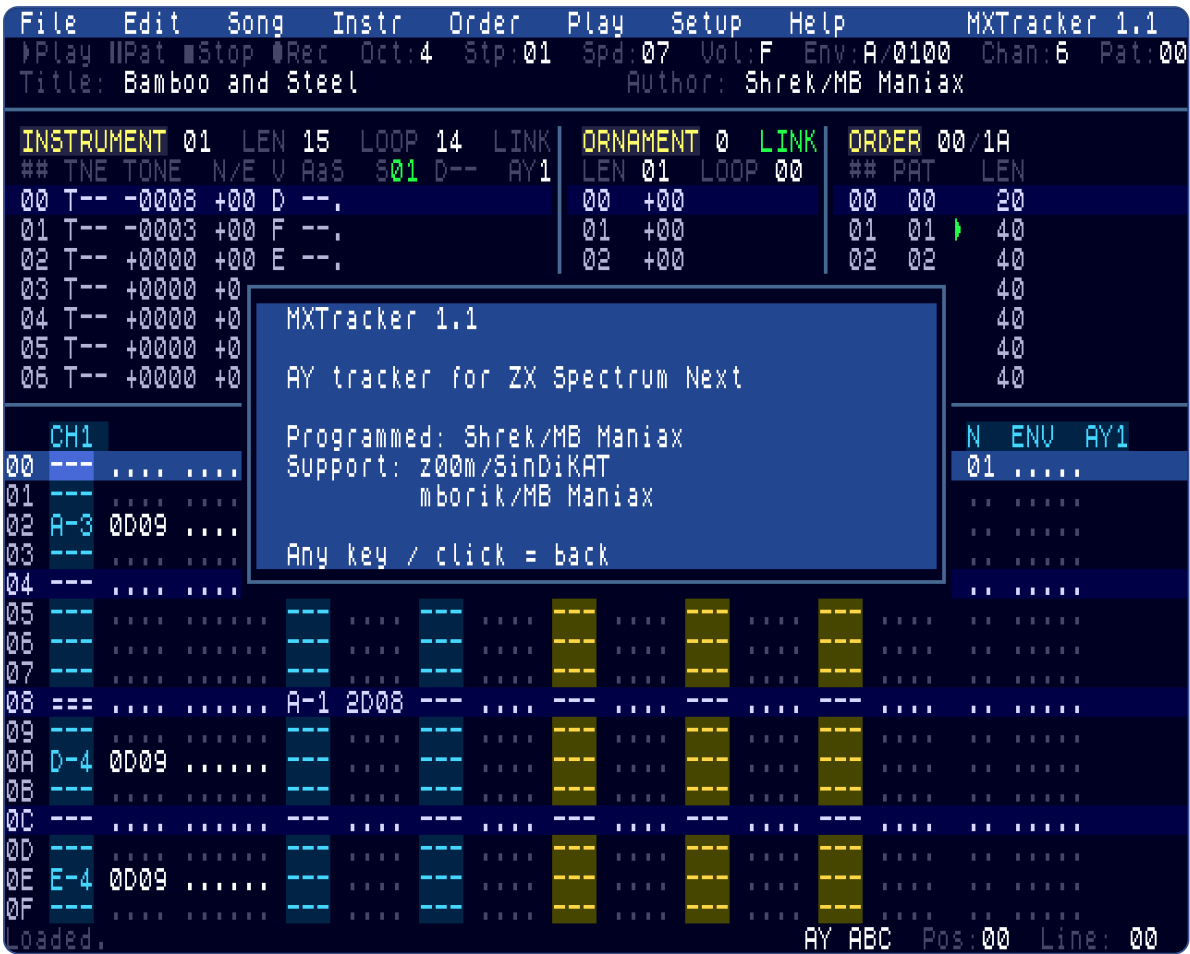
Setup / Sound chip AY/YM switches between the AY and the YM, and **Setup / Stereo ABC/ACB** between the two channel layouts. Both apply immediately and are shown permanently in the status row, to the left of **Pos:**. The chip is a property of the machine and always starts out as **AY**. The stereo layout belongs to the song as well (in ACB the middle voice is channel C), so it is stored in the MXM and loading a song restores it; after start-up and for older files it is **ABC**.

Diagnostics

Setup / AY monitor on/off shows the live AY register dump in row 2, and **Help / PT3 import info** reopens the import result window.

About

Help / About opens a program-information and credits window; any key or a new mouse click closes it. The mouse also remains active in the PT3 import information window.



The **Help / About** window with the version and credits.

15 Mouse (K-Mouse)

The cursor is a hardware sprite, so it does not cover up the tilemap content.

- clicking row 0 opens / closes the menu
- **dragging with the left button held** selects a block in the grid: pressing anchors at the cell under the pointer and dragging moves the other end, by rows and by columns just like **EXT.MODE** + arrows. Releasing ends the drag; dragging onto the **N ENV AYx** strip moves the focus there and stops the selection. Inside the strip itself dragging selects the same way, only with a clipboard of its own.
- clicking the **AY/YM** or **ABC/ACB** indicator in the status row toggles it straight away, without opening the menu.
- clicking the transport row triggers Play / Pat / Stop / Rec; on octave, step, speed and channel count the left button increases and the right button decreases the value, wrapping at either end
- clicking a panel moves the focus there and selects a row; clicking the **INSTRUMENT xx** or **ORNAMENT x** heading selects the next item with the left button and the previous one with the right button; seven data rows remain visible below the separate column heading
- left-clicking the **L** in an instrument or ornament title enables LINK and immediately copies that item to all AY banks; right-clicking it disables LINK
- left-clicking a **CH1-CH9** title selects the channel and toggles its mute; right-clicking solos that channel, and right-clicking the same channel again restores the exact previous mute state. Right-clicking **AY1-AY3** similarly solos the complete three-channel AY group. In the adaptive 6/9-channel view the selected channel is also expanded; muted channel titles are red and marked **M**
- in the order list, left-clicking the pattern number or its length picks the **PAT** / **LEN** field; its two hex digits can then be typed over directly and **CS+5** / **CS+8** change whichever field is picked. A right click is swallowed so it cannot extend the song by accident
- clicking the grid puts the cursor on that row, channel and column
- in the global **AYx** header, the left button selects the next AY; the right button toggles solo for the displayed AY
- the wheel over the instrument, ornament or order panel focuses that panel and scrolls its selected row
- the wheel over the pattern focuses the pattern and scrolls its current row