

# Trilo Tracker

## Tips, Tricks and Articulations

A short guide written by

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Trilo Tracker (c) 2014 by Trilobyte Soft.  
SCC (c) 1987 by Konami/Yamaha.



I. Introduction

Talking about SCC (Sound Custom Chip) is talking about KONAMI. There were near 20 *official* releases including MSX games (cartridges, disks and collections) and a few coin-op arcade games. It was in the late eighties when Nemesis II came to Europe to bring that magic, spectacular sound to the MSX. “New 8 voice polyphonic LSI Custom Sound Chip Mounted”, said the back cover of the box.

Since that moment, a new generation of sound took all of us by surprise, and even today we can recognize its genuine tone and remember those incredible pieces and soundtracks. Artists like Masahiro Ikariko, Mutsuhiko Izumi, Kazuhiko Uehara, Tomoya Tomita, Yuko Kurahashi, Yuji Takenouchi, Tsuyoshi Sekito, Michiru Yamane, etc were the true magicians behind the games.

Nowdays, an active MSX scene dare to preserve this legacy. We can find several SCC software and games (taken from [www.MSX.org](http://www.MSX.org)):

- SCC Blaffer (NT) - TeddyWareZ
- SCC Musixx - Tyfoon Soft
- Trilo Tracker - Music tracker for PSG+SCC by Trilobyte
- Super Music Editor 3.0 - XelaSoft
- Fony’s Demo Disk 1 - Fony
- SCC Musix disk - Fuzzy Logic
- Lilo (Ninjinkun 1) by KAI
- SCC Musix disk #1 - Impact
- MuSICA - Japanese music composer (released long time ago, during the MSX era)
- Konmouse, a Mouse controlled Konami SCC music player
- All kinds of Konami-music (SCC) on Takamichi Suzukawa’s pages
- The Monster Hunter (Arthur’s Quest) - Nerlaska Studio (Needs external SCC or SCC+ )
- The Goonies ´r´ good enough - Kralizec
- Manbow 2 - Norakomi
- The best of Hamaraja night (Cartridge version)
- Montana John and the Templar’s Treasure - Infinite
- Dr. Pill - Infinite

So, the MSX and SCC sound seem to be more alive than ever.

Trilo Tracker is the ultimate tool for creating music with the MSX. It has plenty of professional features and can arrange the most complex pieces without any shadow of doubt.

But, what is *exactly* SCC and how it operates? Let’s have a look...

II. Contents

This tutorial is intended to be an attachment to the official manual:

[http://trilobyte-msx.com/TriloTracker/index.php/Main\\_Page](http://trilobyte-msx.com/TriloTracker/index.php/Main_Page)  
(online wiki manual and main program to download)

Please read carefully the official manual to become familiar with the basic operation and usage of Trilo Tracker. This package comes with a \*.PDF file (this tutorial), a little app (Nezplug++) and two \*.DSK images (MSX floppys):

-DISK1 (example songs):

TITLE	COMMENTS
1. SOLIDSNK.TMU (*)	A medley with three famous ‘Metal Gear’ themes: Solid Snake intro/MGS theme for PSX/Theme of Tara
2. PARACOVE.TMU	Just a version of ‘Paradise Cove’ by Tangerine Dreams (1989, Lily on the Beach album)
3. SDSNATCH.TMU	‘Difficult Move’, the awesome intro of SD-Snatcher
4. JUDAGEAR.TMU	A mix between Judas Priest’s ‘Painkiller’ and action theme for Metal Gear (MSX2)
5. USASST1.TMU	Usas stage 1 arranged for SCC
6. WILDARMS.TMU	This superb song written by Michiko Naruke is like a ‘Spaghetti Western’ piece for a PSX RPG game
7. ANDROGY.TMU	The Androgynus Stage 1 theme converted with SCC sound
8. NEM2INTR.TMU	A trial by fire for testing the incredible ‘wave morphing’ effect.

(\*)-Extra RAM is needed to run this song with all patterns.

-DISK2 (instrument sets, waveforms and macros): This floppy contains all instruments of the previous songs. This could be useful to start a new song with all instruments loaded. It also contains all waveforms and macros (amplitude envelopes). With these elements you can create your own set of instruments. Since you can only load 16 waveforms at the same time, you can choose from more than 40 waveforms.

CAUTION!: Make sure to save a BACKUP of every disk before you start the workshop session. It is a good practice to make a backup just after the session too. This could save a lot of hours and effort.



### III. Configuration

You can run Trilo Tracker on real MSX2 computers or higher (MSX2+, Turbo-R). Nevertheless, you can use an emulator (Open MSX/Blue MSX or similar). As a matter of choice, I use Blue MSX for the ease to load/create/usage of virtual floppys and double disk deck. These are the settings:

- MSX Turbo-R mode (at 60Hz)
- 4 mbit RAM extension on cartridge slot 1 (extra RAM = extra patterns)
- Normal SCC on cartridge slot 2
- Trilotracker DSK on disk slot 1
- Songs/Waveforms/Instruments DSK on disk slot 2

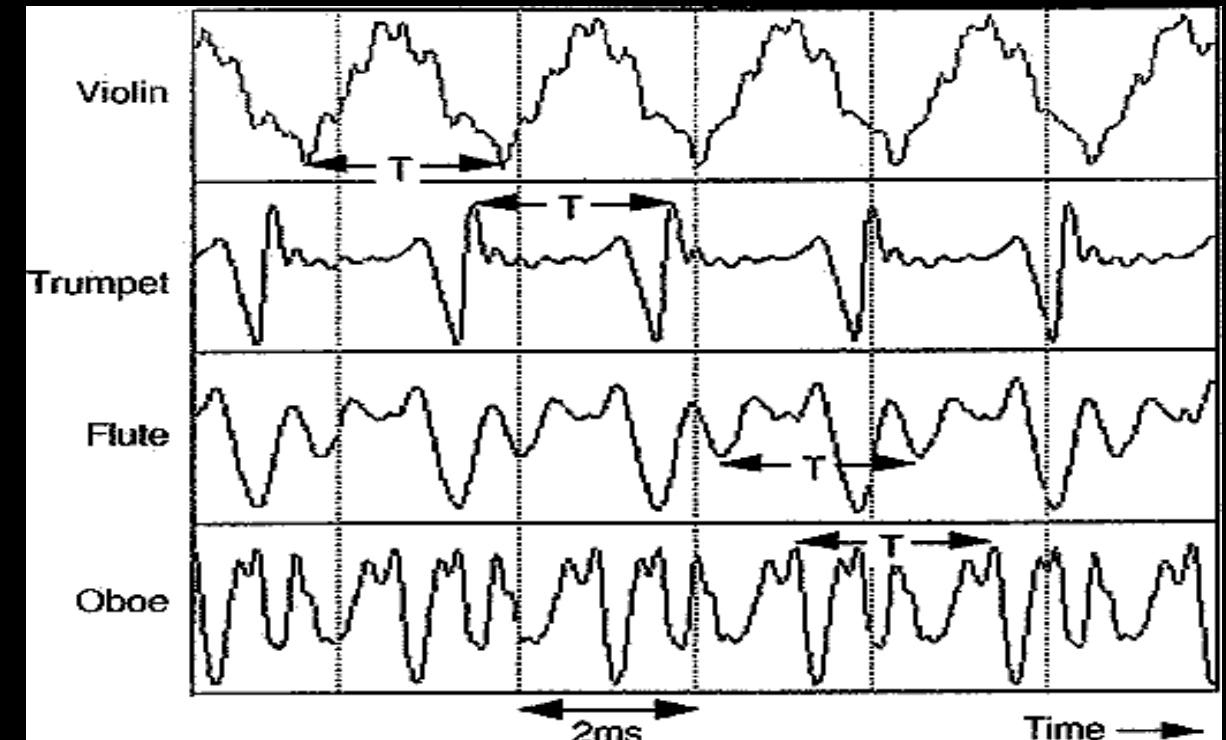
If you are going to render the songs to a \*.wav/ogg/MP3 file, you can adjust the speed/tempo with the % emulation speed knob (Blue MSX) and get just the perfect tempo.



Trilo Tracker running on Blue MSX. The behaviour of the sound is different depending on the hardware. Especially the balance between PSG/SCC volumes. Make sure to test every machine before you are comfortable with the sound/results. You can adjust the balance between PSG/SCC with [ctrl]+m, and then use the cursor left or right.

### IV. Waveforms

Each music instrument has its own timbre or resonant character. If we analyze the pulses we find something like this:



The SCC was designed to emulate this through 32-byte wavetable. Thus, we can enter an hexadecimal number of two digits (from 00 to FF) in each byte. We can define  $256 \text{ values} \times 32 \text{ bytes} = 115792089237316195423570985008687907853269984665640564039457584007913129639936$  waveforms!:

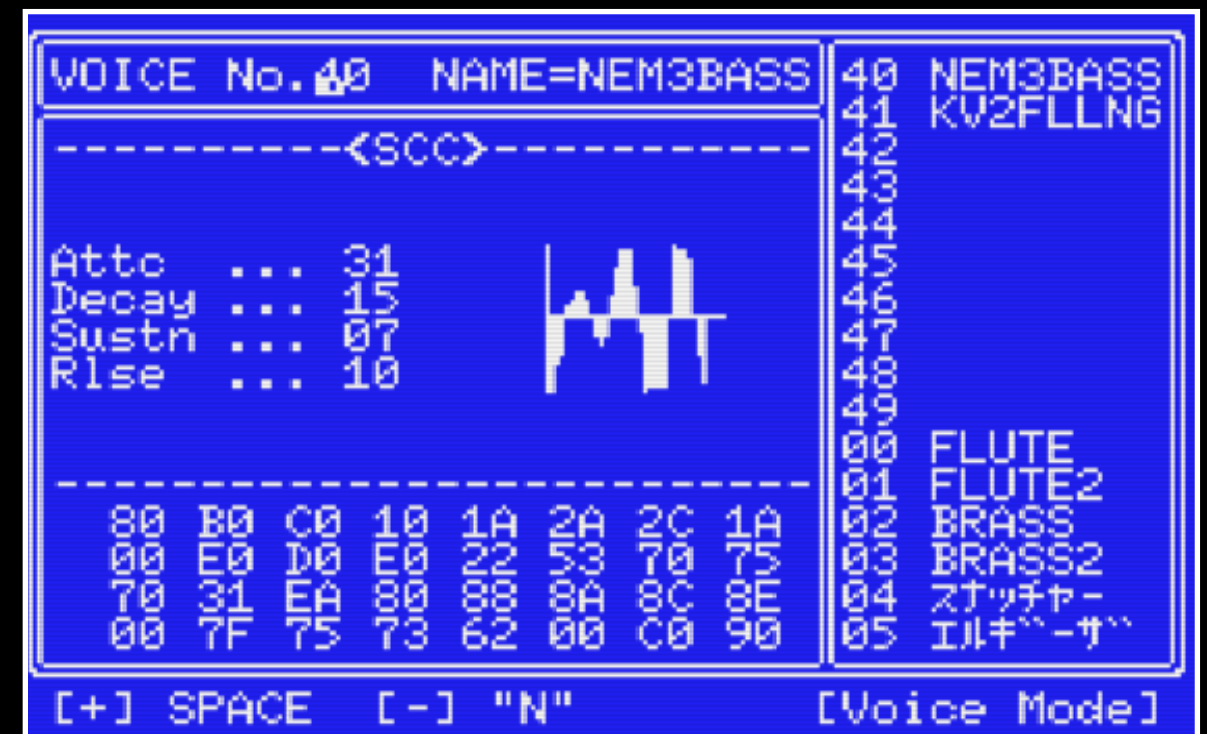
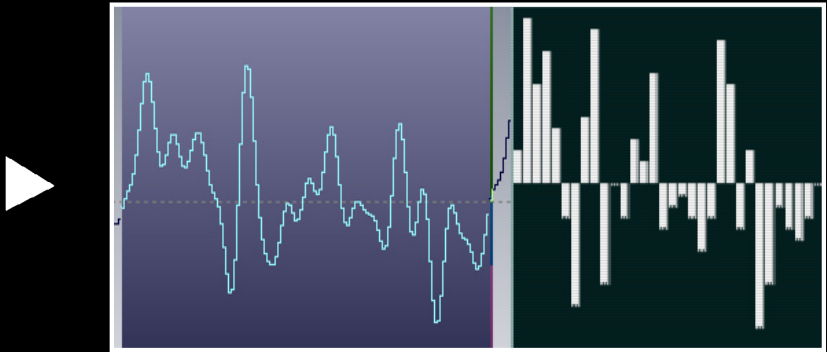


Image taken from MuSICA software

V. Hands on: SCC waveforms

Although we can define up to 115792089237316195423570985008687907853269984665640564039457584007913129639936 waveforms, but obviously most of them are unusable because they haven't any musical value. On the other hand, we can create a full collection by our own. I have made a simply test:

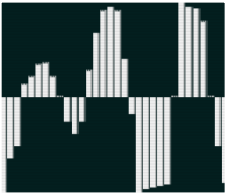
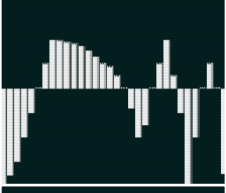
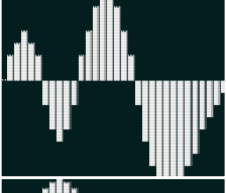
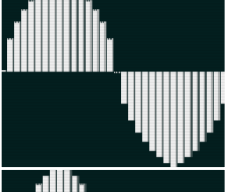
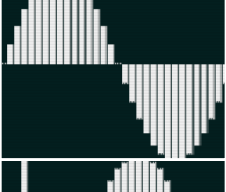
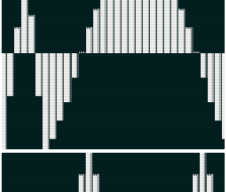
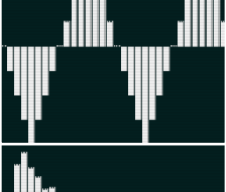
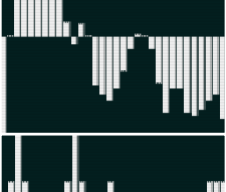
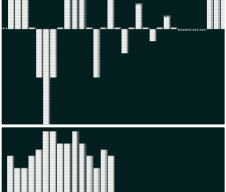
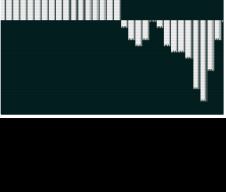
From a true waveform of an overdriven guitar (left) I have drawn -by eye- the wavetable in Trilo Tracker (right). I can assure you it rocks! (if you listen to JUDAGEAR song you will notice of those sounds)

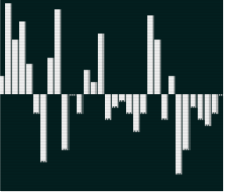
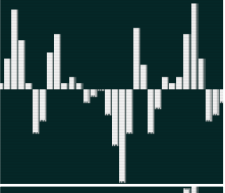
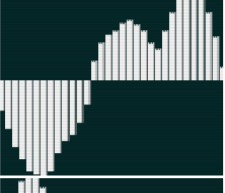
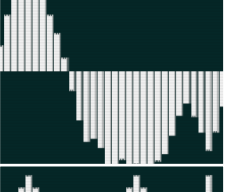
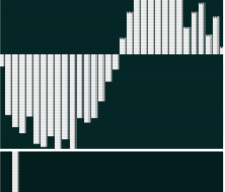
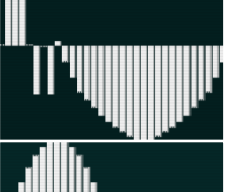
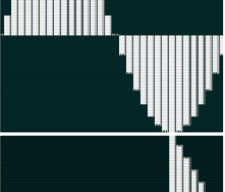
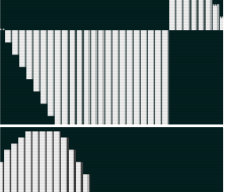


This method gives us multiple possibilities of creating sounds from real sources, but talking about SCC and KONAMI, we may want the original sets too. Never mind! I have prepared a full collection of *official waveforms*. Let's arrange a table with shapes, names and most common uses for your pleasure:

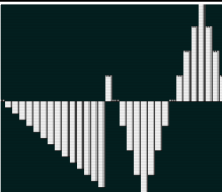
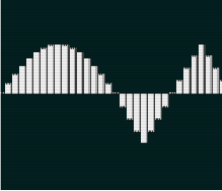

waveform	name	notes
	SQUARE	Good when coupled with PSG tones (it has the same squarewave). Depending on the <i>Macro</i> (ADS), we can have different shapes for flutes, leads or pianos
	DOUBLE SQUARE	It sounds one octave higher than the previous. It can be coupled with the previous one for morphing (see <i>wave morphing on page 23</i> )
	SAW	Good for synth sounds like leads or pads
	DOUBLE SAW	It sounds one octave higher than the previous. It can be coupled with the previous one for morphing (see <i>wave morphing on page 23</i> )
	PIANOBELL	Good for piano and/or bell sound, even it is used as a flute (King's Valley II)

waveform	name	notes
	SAW UP	Suitable for synth sounds like leads or pads
	SAW DOUBLE	It sounds -more or less- one octave higher than the previous. It can be coupled with the previous one for morphing (see <i>wave morphing</i> )
	FLUTE	For a dark, warm flute
	FLUTLOUD	Same of above, but louder
	DOUBLE	This sound has double octave effect
	LEAD	For synth lead
	BELL	Bell sound with a very high sound register
	CLAVI	For harpsichords, clavinets and instruments with aggressive attack
	ORGUE	This is the <i>church organ</i> wave. A very gently attack is needed
	PIANOKV2	The name says it all: perfectly suitable for piano

waveform	name	notes
	N3BASS	Electric and punchy bass used in Nemesis III
	BASS1	Another bass
	BASS	Another one
	TOM	With the right <i>macro</i> (tone drop) it sounds very cool
	XYLOPH	For xylophone
	STRINGS	For String section at low or high register
	PIANO3	For pianos or bells
	ATTACKSN	Certain sounds can be modeled by waveform changes. This one can be placed in the very beginning of the note and then we change (see <i>waveform change</i> )
	VENOMBASS	“Dr. Venom attempted a Coup d’etat”. This is the bass sound used of Nemesis II ‘Air Battle’ (pre-bonus stage)
	VIOLIN/ PIANO2	Modeled after a real violin waveform. It <i>really</i> works. It also can be used as piano, depending on the <i>macro</i>

waveform	name	notes
	ODGTR1	I have built this from a real overdriven guitar. It works fine. It it used on ‘Judagear’ song
	ODGTR2	This can be coupled with the previous to get interesting double tracks
	NYLONGTR	Modeled after a nylon guitar. Used in ‘WildArms’ song
	NYLONLOW	This can be coupled with the previous to get interesting double tracks
	SD INTRO	Used on SD-Snatcher intro and Nemesis II intro
	SC BASS	Another bass sound
	TAIL	Used on tails for long notes
	WHISTLE	Perfect for a whistle sound. Used in ‘WildArms’
	TRUMPET	For brass intruments like trumpets
	LOUD1	Kind of sinusoid. Powerful and deep for leads and melodies



waveform	name	notes
	PIANO4	Another piano to choose from
	PIANOBEL2	Pianobell with lower volume. Suitable for delay track
	...	[Experiment yourself!]

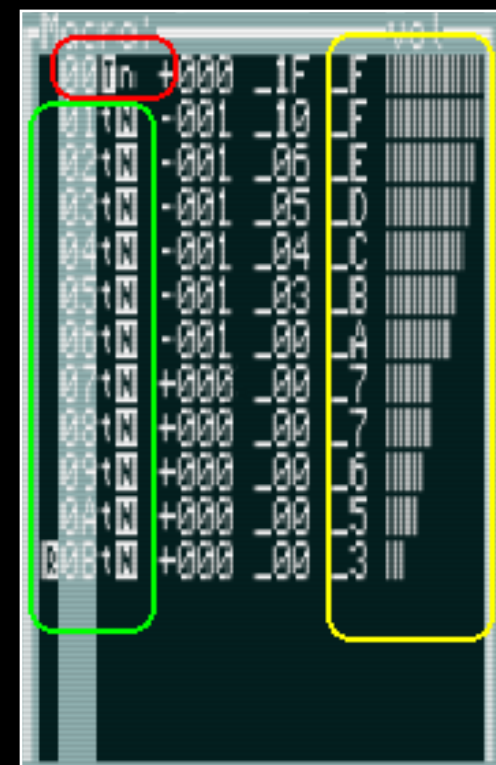
All the previous waveforms are included in the \*.dsk image attached. Of course there are more and more waveforms to discover and to create. So, experiment yourself and build a wav-lab with Trilo Tracker in order to get just the sound you are looking for. At the end of this tutorial there is an appendix explaining how to get the exact waveform from Konami's SCC games.



This is the back cover of Nemesis II, the first videogame with SCC in Europe (I have read that F1-Spirit was the first in Japan)

## VI. PSG sound

Basically, the PSG sound is generated by the AY-3-8910 chip, and it is based on three channels with single square waveform (see waveform table). We have one more channel of noise, which can be coupled to any of the previous three. For this reason we can create some nice drum sounds if treated properly. In the instruments disk there are several PSG sounds, including a complete drum set. For example, the snare drum is achieved this way:



We start with a very short but punchy sound (red frame) and then we switch quickly from *tone to noise* (green frame) and gradually lower a few steps the frequency of the noise. Of course we have to give the overall sound a right shape (yellow fame). In fact, a real snare drum sounds pretty similar: It has two sources of sound: the drum itself (A) and the snares (B). With PSG we can emulate both parts of the sound (attack+body/tail).



Along with the snare we have several sounds for *bassdrum*, *hi-hats* (open and close), *ride cymbal*, *toms* and a few melodic tones to complete the PSG set. It is important to find the right note for them. For example the snare can be tuned with the bass notes of the song, and depending on the octave chosen, we can have more punch or a subtle hit like jazz snaredrums. In the included song 'SOLIDSNK.TMU', I chose these notes for each drumset element since the song's main note is F#:

- F#2 for bassdrum
- B8 for hi-hats
- F#3 for the snare
- G3 to E4 range for toms

We can say that *Hi-Hat* sounds are available with *noise+tone* or *noise* only. This is a matter of taste, of course. We have to offer variety throughout the soundtrack. This is the key.

With PSG sound (squarewave tones and noise) we can create plenty of soundtrack pieces. The most part of the MSX BGMs were written exclusively with PSG sound.

Since the *noise* can only sound on one channel, we may suggest this track management for optimal efficiency:

- PSG Channel 1: Drums, Bass and noisy sounds
- PSG Channel 2: Bass, melody
- PSG Channel 3: Melody, ornaments, delays, melody harmony

When it comes to deal with music tones, we only find these noisy sounds in:

- Snare
- Hi-Hats
- Some cymbals or percussion effects like shakers

On the other hand, the following sounds don't need to have noise:

- Bassdrum
- Toms
- Ride
- Melodic tone sounds (of course)

With this in mind, on large SCC arrangements we can place drum elements on either PSG channels 1 & 2 (noise/tone) simultaneously. In the attached song named JUDAGEAR.TMU we can find on pattern 006 the drum elements on channel 1 (snare and Hi-Hats) and channel 2 (bassdrum). On pattern 014 there is a common triplet-rhythm section with snare+ride (Ch.1) and bassdrums (Ch.2).

Another example can be found in PARACOVE.TMU song. If we locate pattern 016 we can listen to some toms on channel 3 to reinforce the channel 1 or fill this section as well.

Very often, a melodic PSG channel can be coupled to a main SCC melody, with lower volume and slight detune (*E68/E69* command). This is placed a few steps forward to create some delay+chorus effect with the melody and raise it up as lead role in the piece. In the song PARACOVE.TMU we can find this several times:

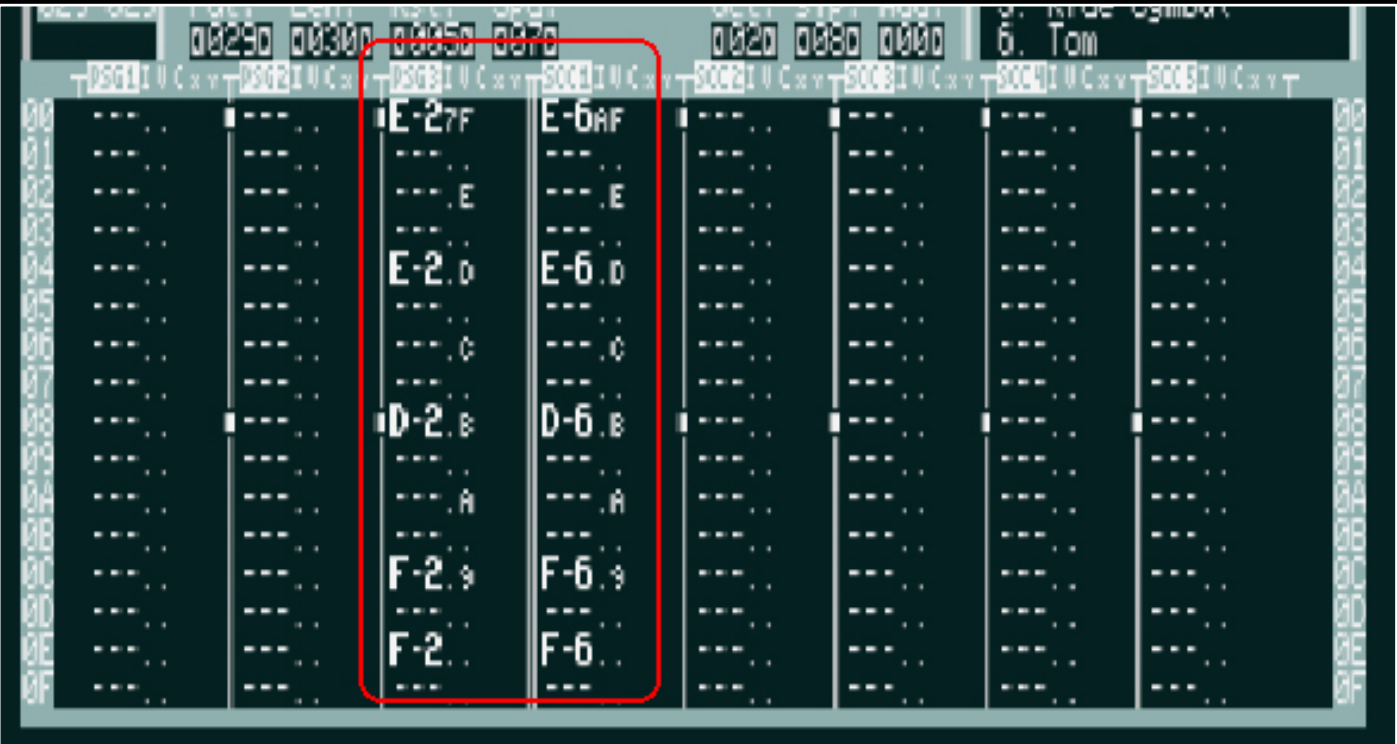
- Pattern 009 to 015, or Pattern 022 to 026

In the song NEM2INTR.TMU we have a perfect chorus+delay. You can set those channels on solo mode and test different pair of values (*E61/E68*, *E62/E69*, *etc,..*):

- Pattern 003 to 006 (on channel 5/6), or Pattern 012 (on channel 5/6)

Of course we can arrange the main melody with PSG sound, and place secondary tracks (chords/ornaments/arpeggios/etc) with SCC channels. Try out yourself with different sounds/envelopes. Sometimes the simpler arrangements are the more effective ones.

There is one important thing about volume. PSG has non linear-logarithmic volume, and SCC has linear volume. You can hear the difference when lower or raise a few values. For example: you start with a melody (SCC) and a bass (PSG) at volume *F* (the highest). Then you lower both this way: *F>E>D>C>B>A>9* and you will notice the PSG bass is almost inaudible:



We have to balance by ear the volumes of the entire mix. The following table indicates how to achieve the best results when it comes to deal with normal sections of the piece (taken from Pxtone manual):

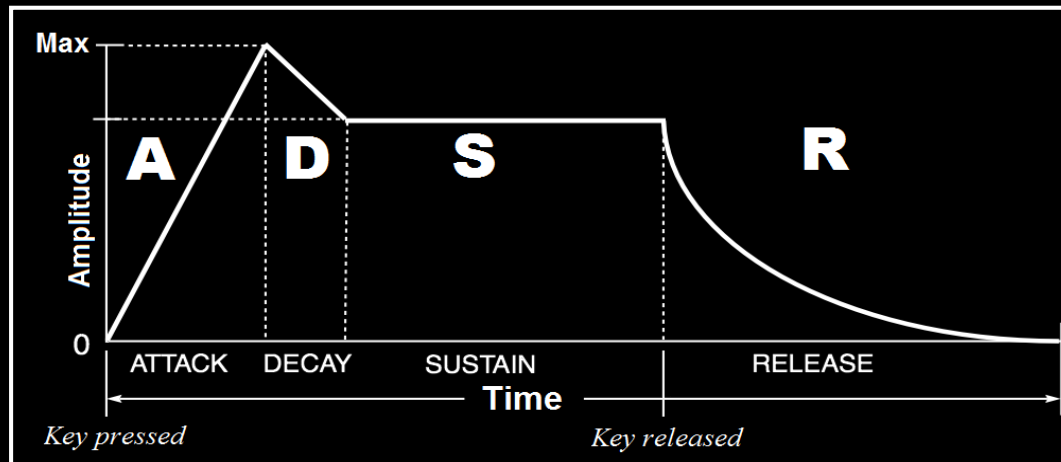
SECTION	RELEVANCE (in volume)	COMMENTS (NOTES)
1. DRUMS	80%	-They must sound clear and present, with the bass.
2. BASS	80%	-It must sound clear and present, with the drums. Very often, we have both PSG+SCC bass track (doubled)
3. MAIN MELODY	90%	-It has to sound over all parts. Also a chord phrase or arpeggio could be the main melody in certain parts.
4. SIDE TRACKS (CHORDS, RHYTHM LINES, ORNAMENTS, FX)	50-70%	-They must support the body of the piece in the mid-range and highest range occasionally.

The main target is the overall sensation of balance. Every part has its own role in the piece and thus, we have to give them the right place.

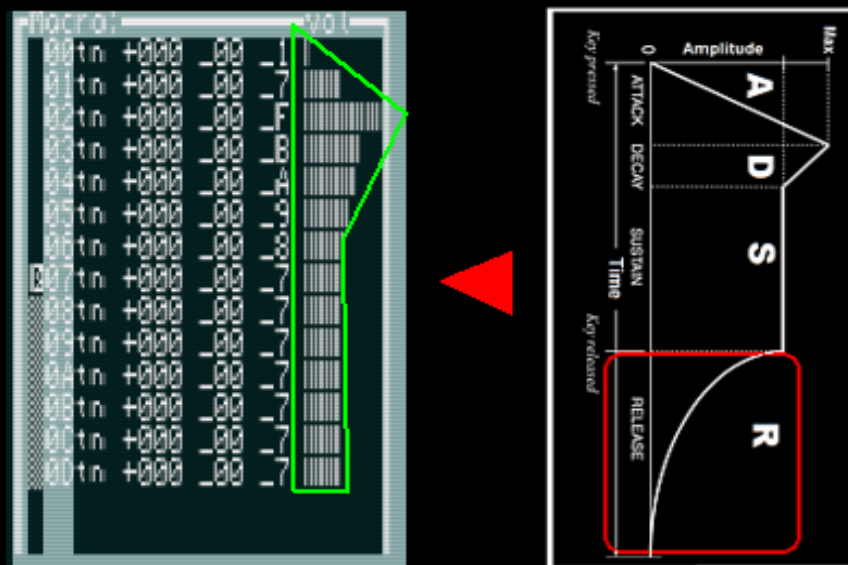


## VII. ADSR: The Macro section

Once we have our waveform defined, we have to deal with the shape or amplitude envelope. This means one step more to the desired sound goal. The following graphic shows the general case: we have to set the *attack* or how the sounds starts, Then we have the *decay*, a subtle decreasing in the volume (optional). The looping part is the *sustain*, or the volume of the sound while a key is hold. This sustain can be programmed as a volume slope if we want a long (or short) decay effect. Then we have the *release*, or the volume fadeout when a key is off:

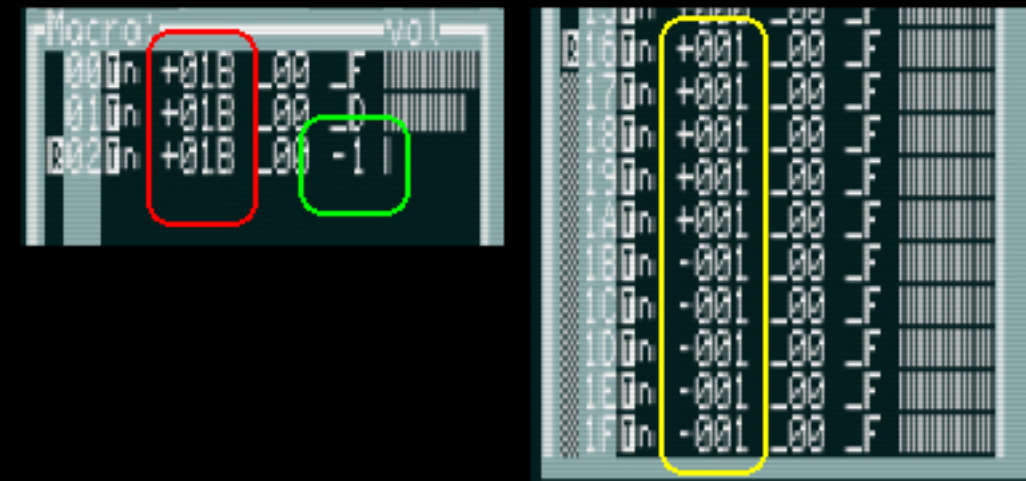


Trilo tracker is capable of doing this and it adds some extra features. We can introduce some variations on tone sound, noise frequency, turn on/off the tone/noise for each step and finally creating a loop region for the sustain. The following image shows the correspondence between the ADSR and the Macro:



The Macro section is like the vertical version of the ADSR diagram. The time runs from up to down. The very first column shows the loop area (R to end), then we have the tone/noise switches. The three digit column operates the tone deviation. This is useful to create 'vibrato loops' or interesting attacks. The two digit column has the same effect over the noise frequency (hi/low) and finally the last column shows the volume (from 0 to F). We can achieve all ADS (green lines) but not the release (red frame). Instead we can use the command `Axx`. In the `fx` section we will explain how to do it.

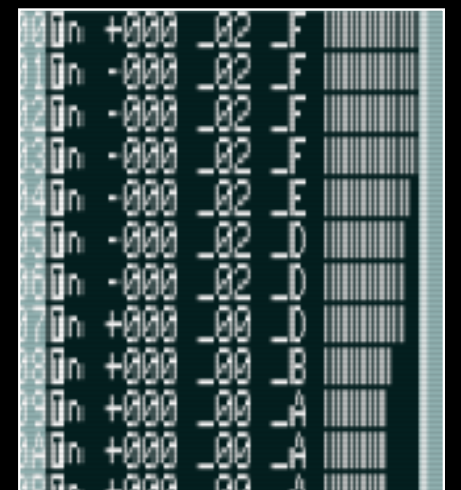
Below we can see two examples of the *Macro* usage. On the left we have a ‘tom shape’, with descending volume (green) and tone (red). On the right we have a looped section (yellow) with tone oscillation to create a deep vibrato when a note is hold (sustained):



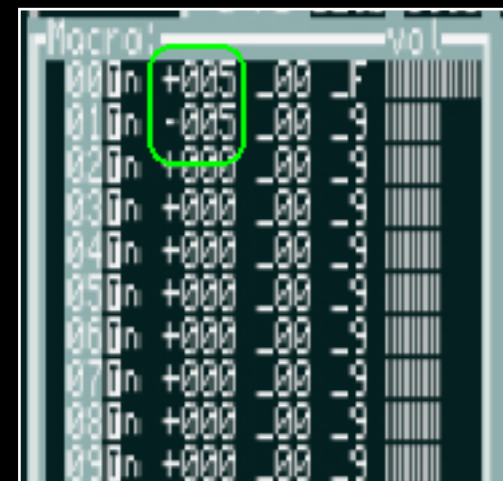
No need to say -again- that it is strongly recommended to read the on-line manual for Trilo Tracker, especially the *controls*, *effects* and *instrument editor* sections:

[http://trilobyte-msx.com/TriloTracker/index.php/Main\\_Page](http://trilobyte-msx.com/TriloTracker/index.php/Main_Page)

The following image shows the macro parameters for a ride cymbal envelope. It starts loud and then the volume gradually decreases (of course the view is not complete, but you can imagine the further values 9,9,8,8,7,7,6,6,5,5,etc):



Sometimes we can introduce some quick values at the very beginning of the sound. Two opposite values(+/-) in order to give the attack a strong and percussive punch. The higher values, the more punch.



I recommend to adjust the parameters testing the sound at the same time, toggling with the space bar between data entry and keyjazz mode, which enables a music keyboard to play the sounds while tweaking values. Please keep in mind that a *waveform+macro=instrument*. Combining both you can create a full palette of sounds. You can use the same *macro* either for PGS/SCC, like 'tom' for example. In the disk provided there are tons of macros (envelope or amplitude shapes): leads, pads, guitars, pianos, bells, strings, toms, complete drum set, PSG instruments, etc.

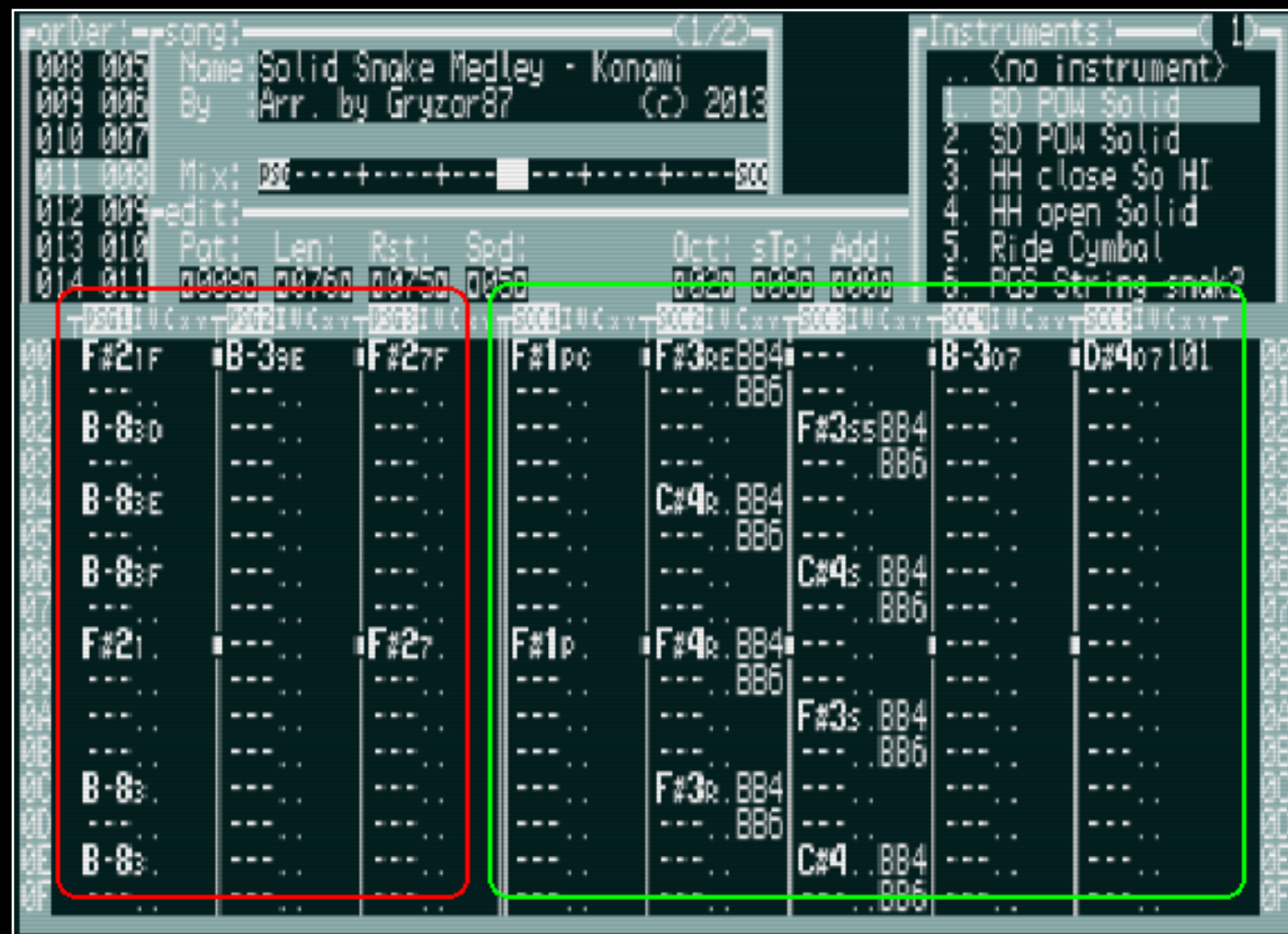


## VIII. Overview of pattern area

Let's write some notes and play music! Within the pattern area (image below) the first three columns (red frame) are reserved to PSG sound and columns 4 to 8 are for SCC (green frame). Please keep in mind that channels 7 and 8 share the same waveform. This is due to the chip specifications. After reading the Trilo Tracker on line manual, we are ready to create music. In general terms, we can give the channels different tasks:

- PSG channel 1: for drums
- PSG channel 2: bass reinforcement/melody
- PSG channel 3: melody delay/arpeggios
- SCC channel 1: bass
- SCC channel 2,3: side tracks like chords or arpeggios
- SCC channel 4,5: melodies with delay/chorus

Of course this is only a suggestion. There are very complex arrangements made of continuous changes and tricks. For the following sections, I will take some examples mainly from the song 'SOLIDSNK.TMU' to explain the articulations and tips.

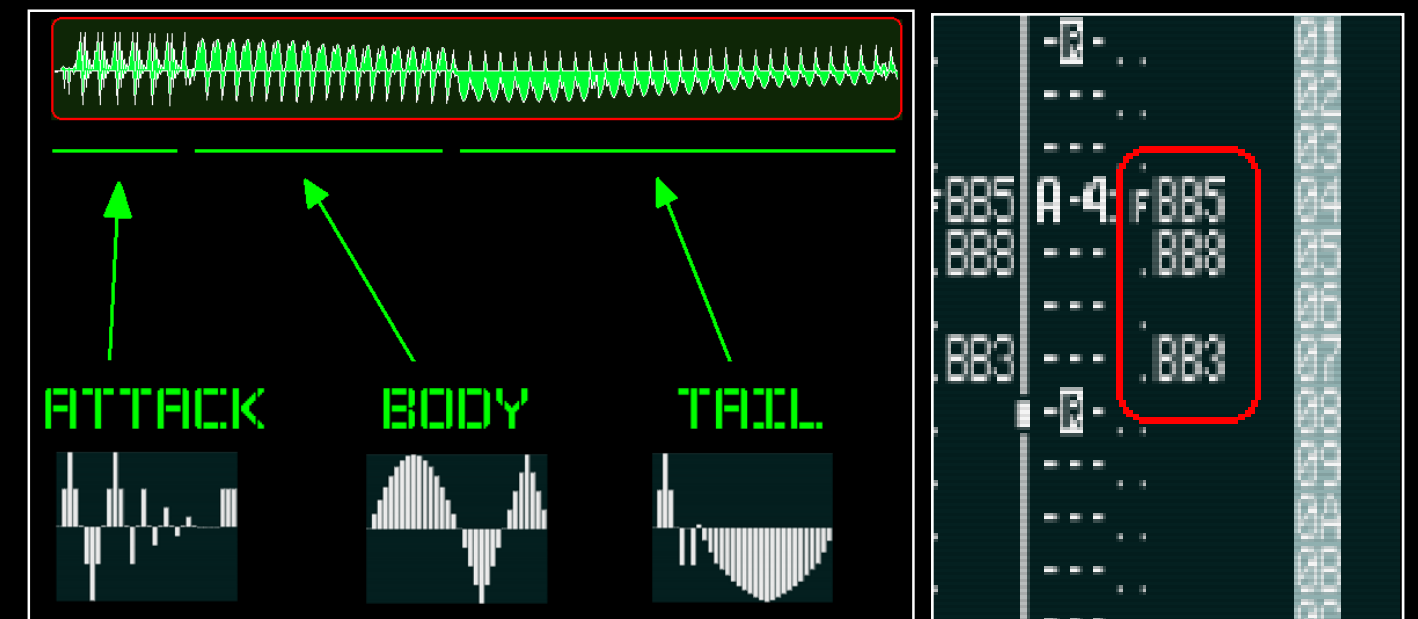


## IX. Tips, tricks and articulations

For this section, please load the song (SOLIDSNK.TMU) and have a look at pattern area when required. With [Ctrl]+cursor left or right we can move among the patterns. With [ENTER] we can play the selected pattern in loop mode. Also with numbers 1,2,...,8 we can disable/enable the channels 1 to 8 during playback. This is very useful to listen carefully to one specific melody/effect/drum pattern/etc. We can change the volume, instrument and note for each row, but can we change the waveform? Yes! of course. Let's start!

### A) WAVEFORM CHANGES

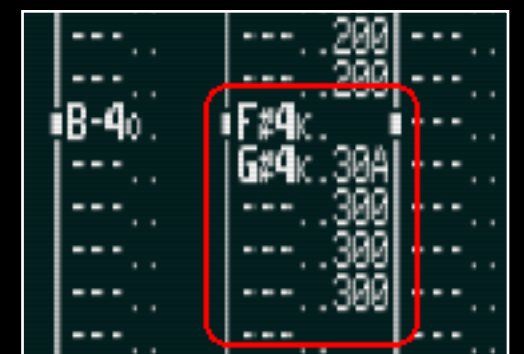
Sometimes we can build cool sounds just by changing the waveform at strategic points:



Depending on the song speed (tempo) we can place a wavechange command (BBx, red frame) in order to get interesting sounds. In the pattern No. 13 there are a sound with this effect in channels 7 and 8. Experiment yourself and create hybrid sounds with this technique.

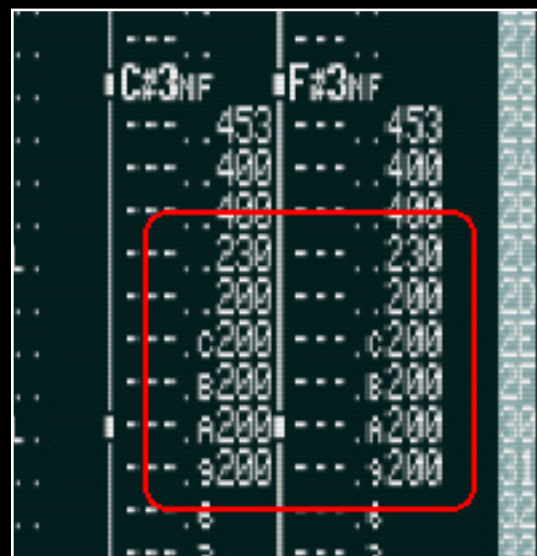
### B) NOTE SLIDES

It's very common in melodies to slide certain notes from close ones. To achieve this, write the target note just below the origin note and place a 3xx command on the right. Add a few lines below with '300' to continue the slide until it is completed. By trial-error you have to test which is the best *slide speed* for the effect. There is an example in pattern No. 11, channel 6 of the song.



### C) NOTE DROPS

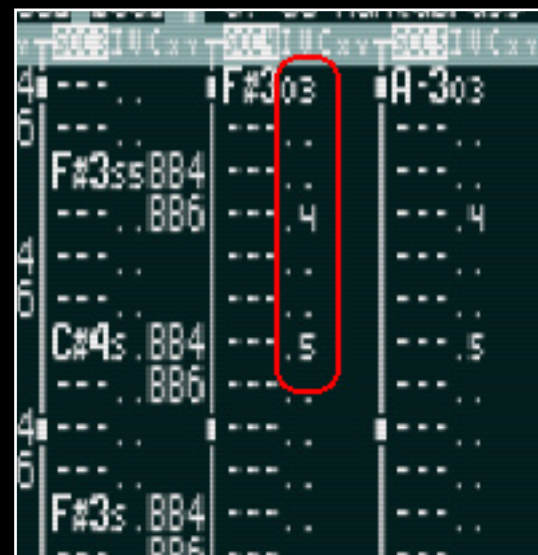
Some sounds add an interesting tail when they are dropped to low register. With 2xx command we can drop the note just at right speed. It's a good idea to drop notes after a long vibrato, or simply alternate them every a few measures, but do not abuse on them. Use with caution:



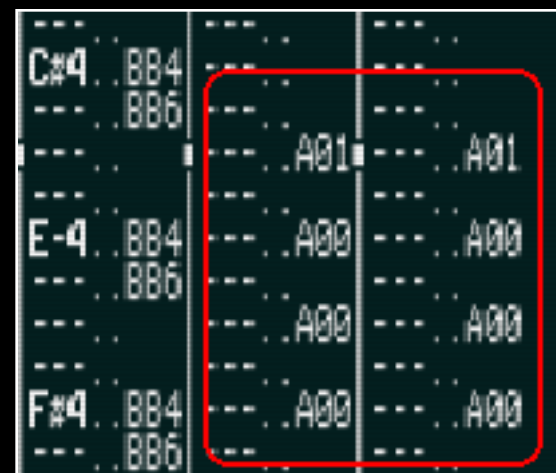
In pattern No. 13 we find this note drop just after a short vibrato, to create the chord effect guitar which is dropped down when executed. Please notice of the volume decreasing (C,B,A,9,6,3,...).

### D) VOLUME DYNAMICS AND FADE OUT

Volume control is **essential** when it comes to get the best results. We must watch out the volume values for all tracks in all patterns and sometimes it is needed a dynamic curve for certain events. We can change the volume value just by enter an hexadecimal number (0 to F) to the right of instrument number. In pattern No.5 we introduce the chords in channels 7 and 8 with a gently increasing of volume (values: 3, 4 and 5)



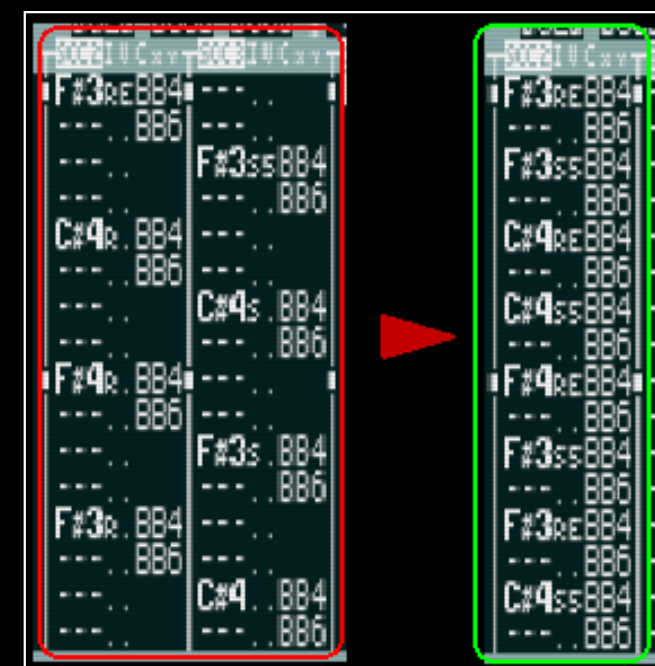
We can also perform a volume fadeout with Axx command. This can replace the *Release* section on the ADSR shaping system. In pattern No. 5 (end) there are one example.



### E) FAKE DELAY

This technique is a well-known one in the chiptune music. Simply by copying one melody or track from one channel to another, placing it 1/2 part, 3/4 part, 1 part or 2 parts below (you have to set the timing and listen). It is very important to set the volume low for the delay track.

Sometimes we can do an economy operation: two tracks (the main melody and its delay track) are joint into one single track, if the gaps allow us to do it. Look for pattern No. 8, channels 5 and 6 (red frame). Please listen and then go to pattern No.9, channel 5 (green frame). We put two into one, and nobody can say they sound different. This is because of the masked frequencies of the rest of channels. Of course two channels are not the same than one single channel, but dealing with the same instrument and some delay, it is almost indistinguishable. Pay attention to constant volume changes (E,5,E,5,E,5,...)



### F) VIBRATOS AND DETUNES

This is one of the most important effects. But we have to use it wisely, or we will have an exaggerated piece full of hard-to-listen melodies. The ear perception is very sensitive to tone changes. The vibrato has to arrive just in the right moment. I use it on the melodies -mainly on long notes-, but rarely in the beginning of the note. We have to give the note a breath (see image), and then, unleash the captivating power of the vibrato with 4xy command:




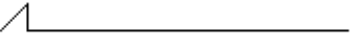


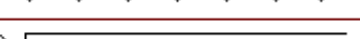
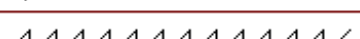



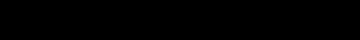
We have also the commands *E40*, *E41* and *E42*, which sets the shape of the vibrato wave for all tracks (triangular/sinusoid/squared). I prefer *E41* (sinusoid) because of its behaviour, but this is a matter of taste.

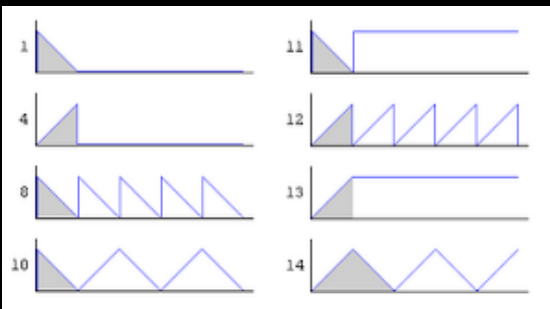




I) HARDWARE ENVELOPE (only for PSG)

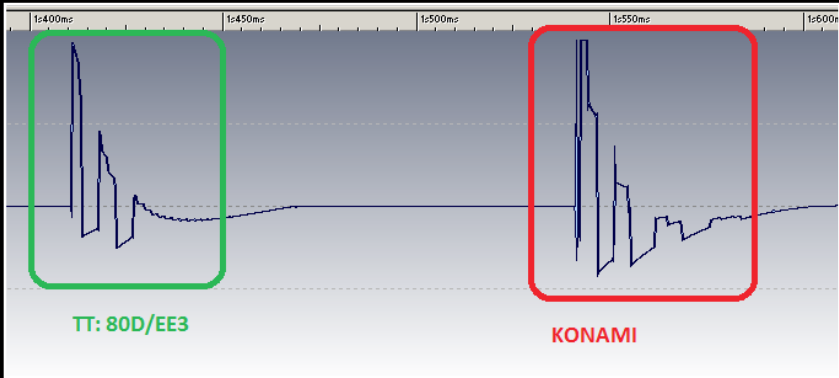
We can take advantage of this fantastic feature in many cases. The AY-3-8910 soundchip provides us a collection of amplitude envelopes and we can call them automatically by commands `8xy` (frequency) and `EEx` (type). When a Hardware Envelope is called, the Macro is bypassed for that note. Please notice when you trigger a `EEx` command, you have to add `EE0` to continue the envelope effect on the note(s). The normal procedure is first setting the frequency (valid for all notes on that channel) and then trigger the `EEx` command. Let's show some nice tables:

0,1,2,3	
4,5,6,7	
8	
9	
10	
11	
12	
13	
14	
15	



On the left we have the envelope shapes, from 1 to 15. We have to enter them with hex code (`EE1` to `EEF`). Above we have the frequency period (grey). We have to enter it from `801` to `8FF`.

The example on the right shows the analysis of a bassdrum (BD) wave created with the macro section (red frame) in comparison with another one created by Konami (green frame). If you pay attention you will notice the macro section is not capable of building this type of sudden decay. This is what musicians/engineers call 'transient': a shape with high attack level and sudden volume decreasing. To achieve this, the `EEx` command is the solution:

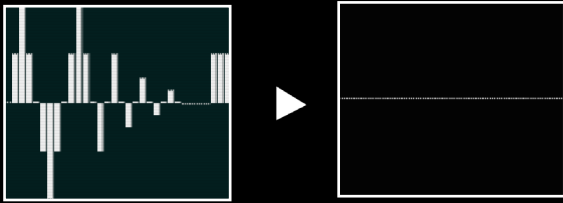


If we choose the commands `80D` and `EE3` on the note A-2, we achieve a clean, transient bassdrum sound just like Konami. But please keep in mind that hardware envelopes can create a high variety of effects and sounds. Just experiment yourself with the values and envelopes.

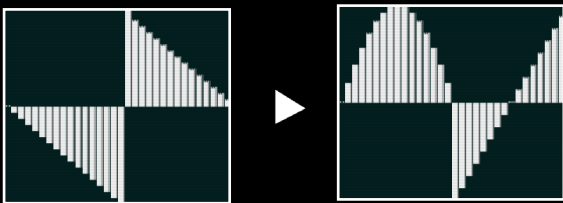
J) WAVE MORPHING

This is the jewel in the crown of the effects. Wave Morphing (`Cxy`) lets you change gradually from one waveform to another. `x` value sets the target waveform number (from 1 to F) and `y` value sets the speed of change (from: 1=fast to F=slow). With this command you can:


1. Create fade out/in effect. Simply set the target to a blank waveform (or viceversa):



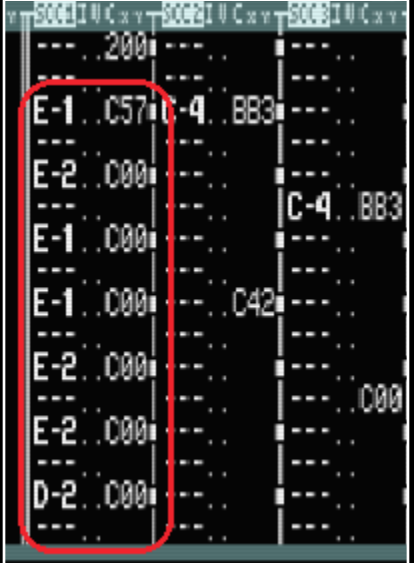
2. Create some sweep effect. Simply set the target to another waveform and you will transform from A to B or viceversa. If you add `Cx0` every few rows, you can get endless multi-morphing:



3. Create slave morphing on parallel channels. Simply set `C00` on these channels and you will have a complete morphing chord simultaneously:



4. Create morphing phrases for a melody. Simply set `C00` on every note and the morphing will go through the full phrase, solo or melody:

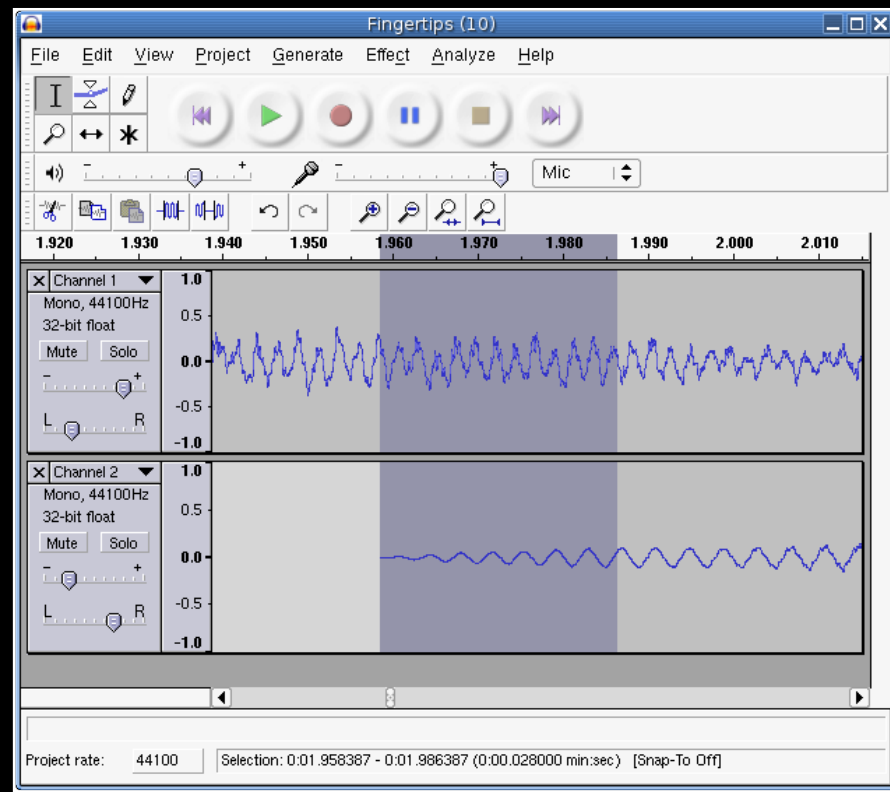


If you load the piece `NEM2INTR.TMU` from the sample disk, you will notice of the many uses of this spectacular effect: we got sounds which are transformed from saw to square, from double to simple, from treble to bass...there are tons of combinations and you can always achieve interesting morphings. You can also stop the effect with desired waveform simply by adding the `BBx` command (set waveform). Only *Solid Snake* and *Space Manbow* had this superb effect. And now Trilo Tracker too!

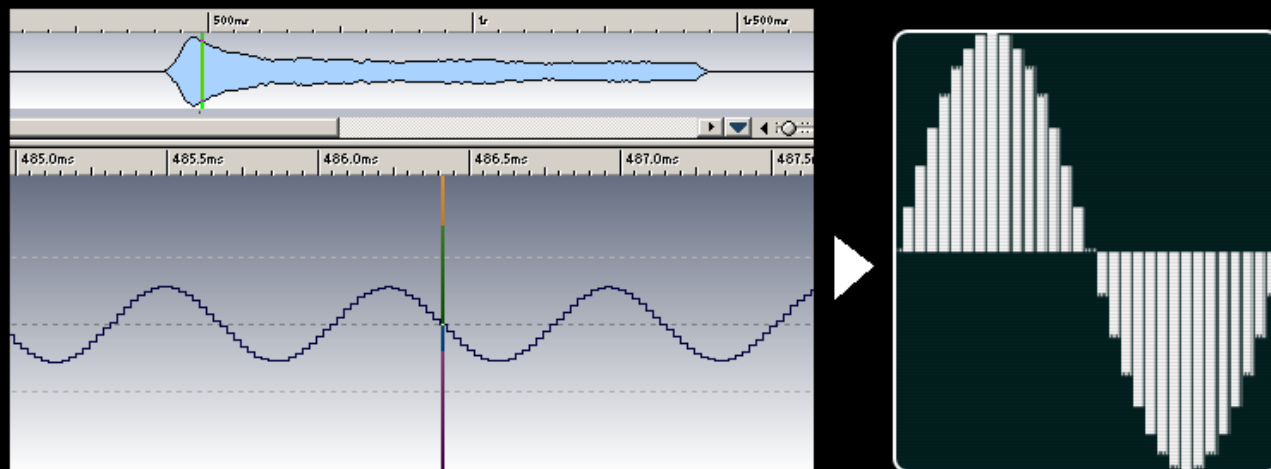


## X. Appendix 1: How to study digital waveforms

There are plenty of possibilities on the internet just to get a good software (freeware or not) to process and treat the audio pieces. One of the best is Audacity:



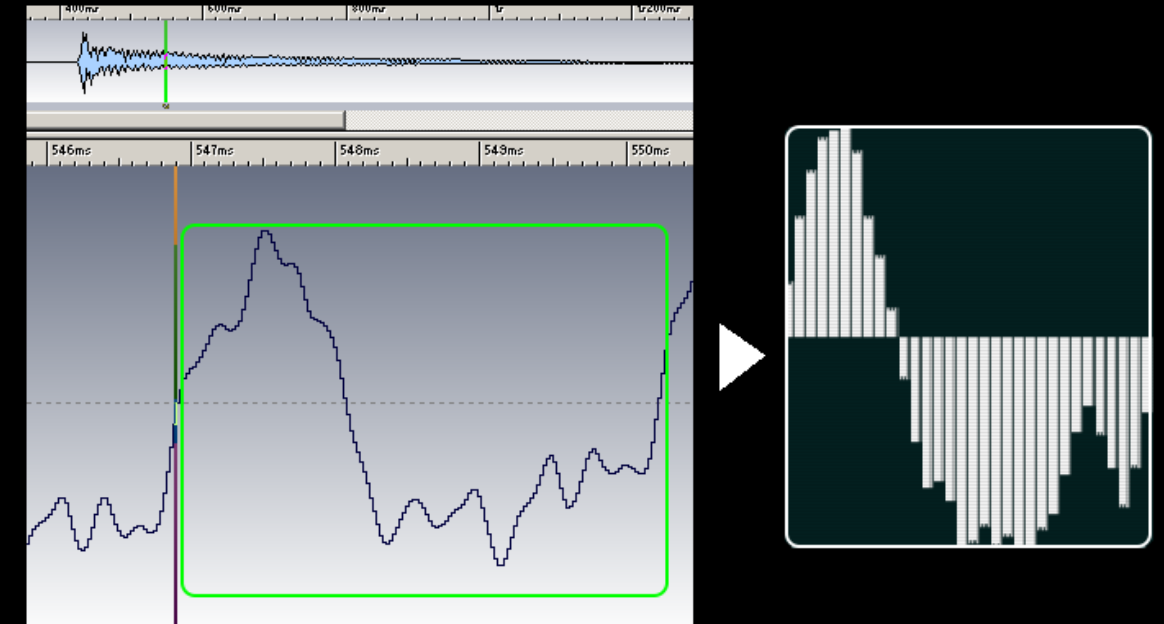
With this program you can record/import/open different pieces of audio (\*.wav) and analyze their waveforms carefully. For example we can record a whistle. Then we have to locate one period (repetition) of the wave and translate it to Trilo Tracker values:



Real whistle (left) and SCC modeled one (right)

If we study the shape (ADSR) and zoom in the waveform, we can make a model for SCC wavetable -a sinusoid- and give it the correct *macro*. Now we have the whistle sound (in the WILDARMS.TMU example song, we include a complete whistle sound with a nice delay).

Another example could be a nylon guitar taken from a real one. It is very important to set the wave period when it crosses by zero (the green frame contains one period):



Try to record/collect and analyze as many sounds as you may be interested in. On this way you can increase your collection of timbres and waveforms.

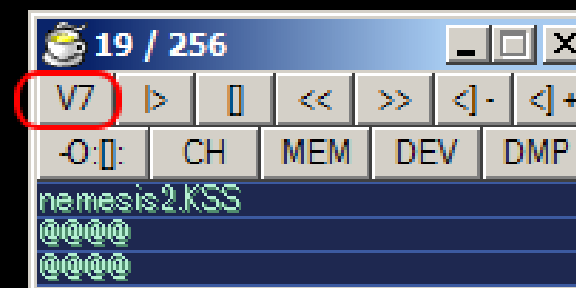
## XI. Appendix 2: How to get the exact Konami's waveforms

In the package we have included a nice tool called 'Nezplug++' (for Pc/Windows). This little program is capable of play \*.KSS files (some of these files are extracted from Konami games with SCC or MSX games). More information on the following links:

<http://offgao.no-ip.org/program/> (NEZPLUG++ site, Japanese)

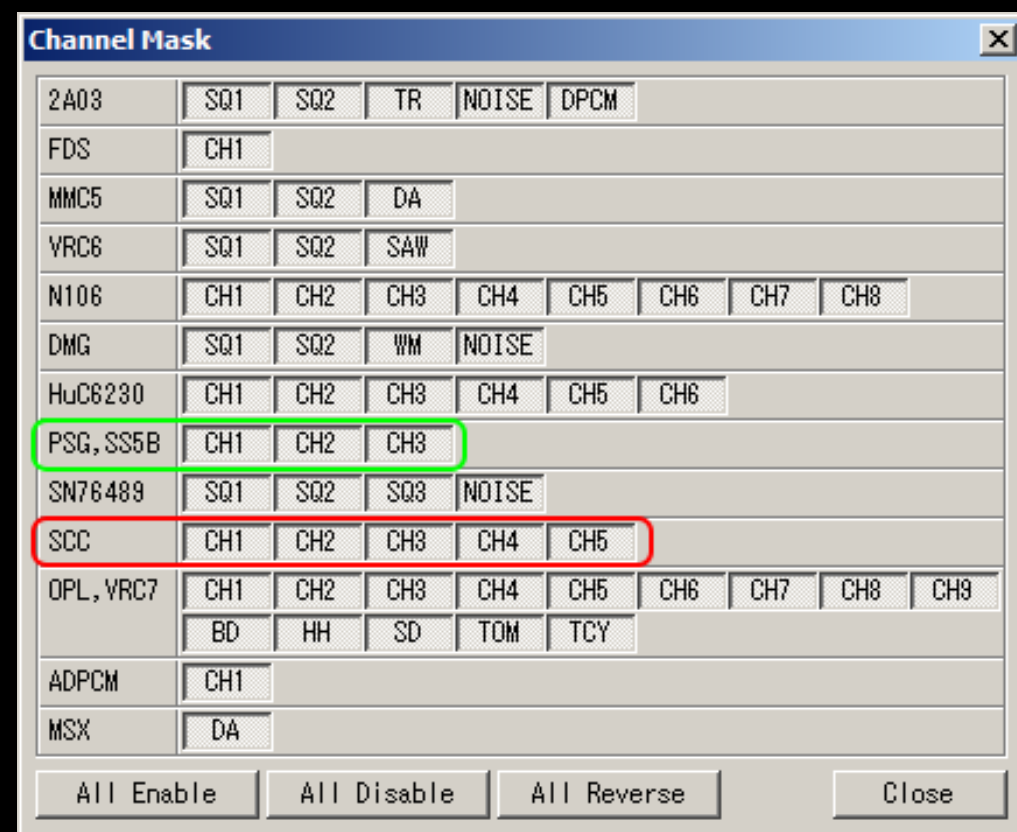
<http://anon48.f-m.fm/kss/> (KSS files site)

<http://home.hccnet.nl/s.v.nimwegen/kss/> (KSS files site)

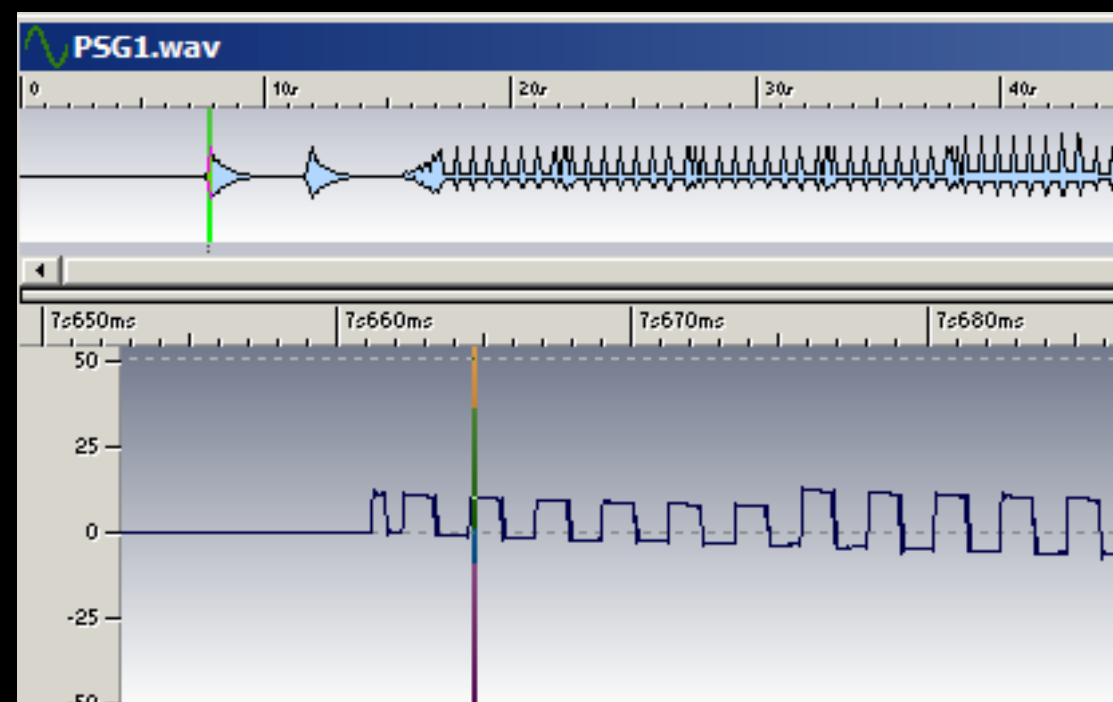


Simply open the Nezplug++ by double click on the 'cup icon' and load any \*.KSS file by clicking on the red button

Now you can select the song by number and monitorize each channel separately by clicking on 'CH' button. This window will appear:



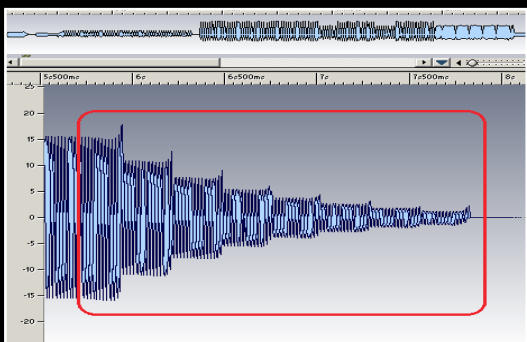
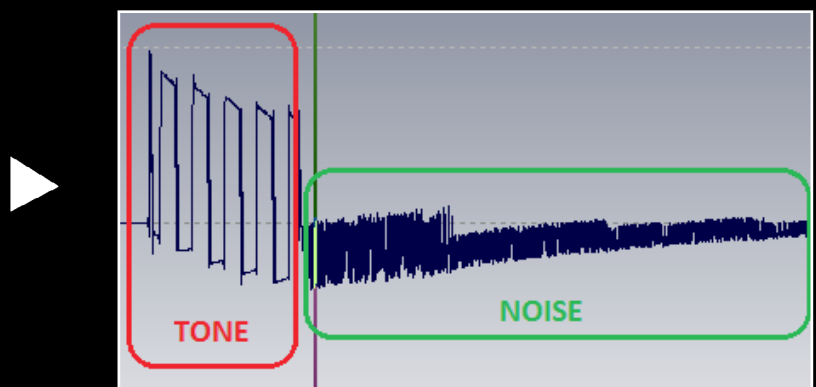
By clicking on each 'CH' button (green for PSG or red for SCC) you can select which channels will be played. For example you can play them separately and record the waves internally for further study. Here we have a typical PSG waveform (square shaped):



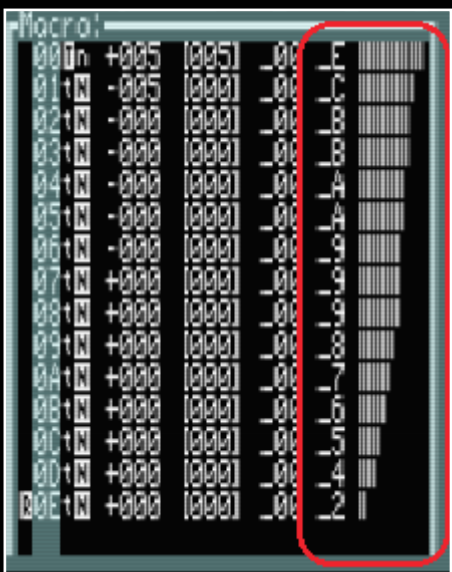
You can notice of the shapes, durations, tones, vibratos and more.

With internal recording (via *audacity* or any other audio editing software) you can get any clues to find out how to build your own waveforms, macros and instruments:

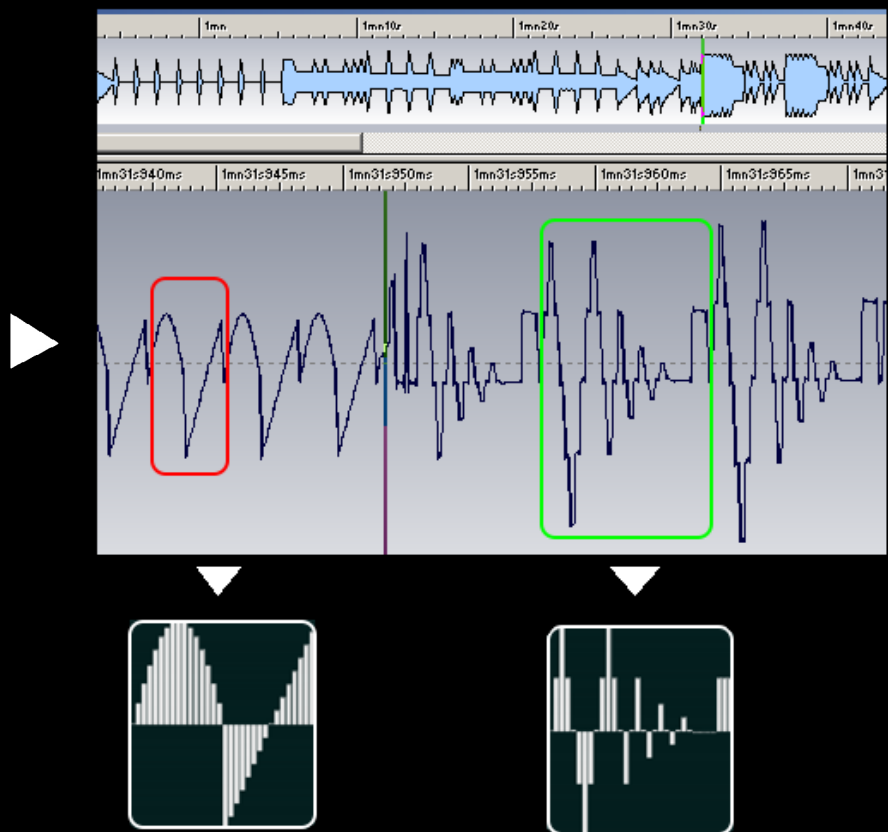
TIP#1: You can see the differences between tone (red) and noise (green). This is a PSG snare drum sample wave.



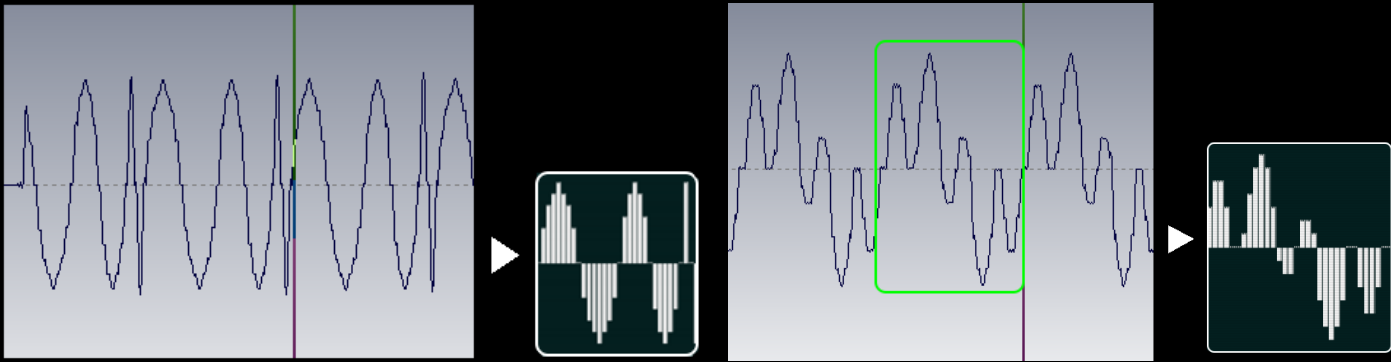
TIP#2: This PSG wave gives us the clue of volume decreasing. We can achieve this in the macro section.



TIP#3: Get familiar with SCC shapes and recognize them by eye. If you see the page 7-8, you can notice which are these two waves (DOUBLE and VENOMBASS)

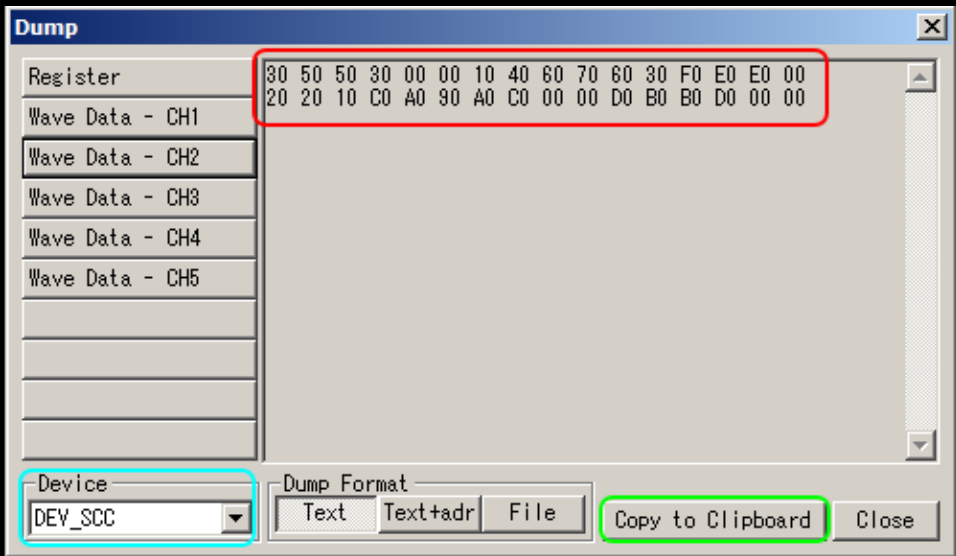






Two more waveforms recognized by eye: the SDINTRO waveform (left) and the fantastic King's Valley II piano wave (right).

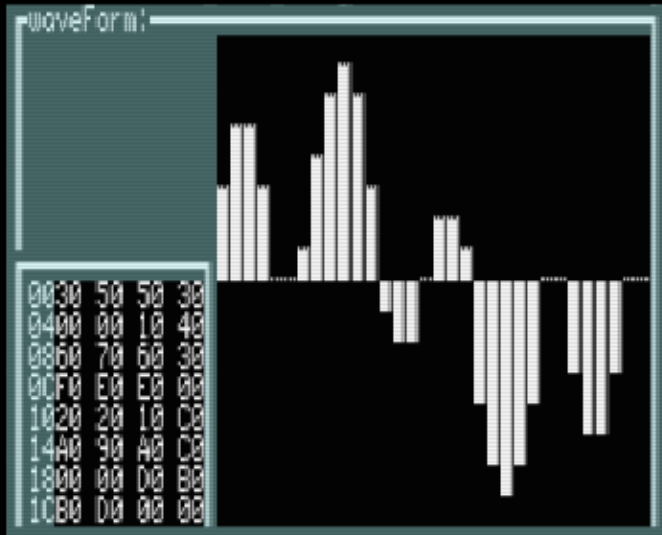
But, How to get *exactly* the values from those SCC waveforms?  
 If you click on 'DMP' button (on Nezplug++ main window), this new window will appear. Please select DEV\_SCC on blue tab (down left corner). Then we follow three easy steps:



Step 1: after pressing play, click on the desired channel and capture the 32 hexadecimal values which define the waveform in that moment. The waveform can change throughout the piece.

Step 2: copy the values to a txt blank document and sort them in eight rows of four values

```
30 50 50 30
00 00 10 40
60 70 60 30
F0 E0 E0 00
20 20 10 C0
A0 90 A0 C0
00 00 D0 B0
B0 D0 00 00
```



Step 3: Go to Trilo Tracker and select the instrument editor (pressing F2), then press [ctrl]+f to enter the values and...  
*Voilà!* here is the exact waveform.

## XII. Appendix 3: Song guide

At first glance we are going to listen to the example songs and notice of diverse kind of sounds and articulations used on them. Let's comment one by one:

TITLE	COMMENTS
1. SOLIDSNK	This piece has three parts and is taken as the main example for all explanations in this tutorial. It is very complex and has extra patterns (extra RAM is needed). A good amount of articulations are used in this song, which contains a huge collection of elements. Most of them have been explained in the 'Tips & Tricks' section. There are fake delays, tempo changes, waveform changes, choruses and plenty of chords. There are also 'economy' saving of channels, and we gain one extra channel to include some ornaments. With no doubt, the Solid Snake OST is top-notch among the SCC videogames.
2. PARACOVE	Just a version to test chords, electronic rhythm, arpeggios and nice solo sounds with delay (measures 009/011/022)
3. SDSNATCH	I tried be as faithful as the original and studied carefully all tracks separately and waveforms as well (see previous appendix). I added all articulations and built special macros with quick detunes in the attack section for certain instruments like brasses, just like the original. No need to say that SD-Snatcher soundtrack is the top AAA within the SCC catalog. Pure awesomeness.
4. JUDAGEAR	This strange mix between Metal Gear and Judas Priest gives us the chance to test how hard the sound can be. I doubled the PSG drum channel to reinforce the power. I have also created a special distortion guitar waveform -two types- to gain extra wall of sound. It starts with the 'Game Over' of Metal Gear in three PSG channels, and then we unleash the SCC force. Yes, Heavy Metal is also possible with Trilo Tracker! Thanks to Rob Halford and his bandmates. Judas Priest rules forever!

TITLE	COMMENTS
5. USASST1	This is only a fast experiment with 8 channels since the original piece was written only for PSG (AY-3-8010 soundchip). That game has one of the best PSG soundtrack of all time for MSX. I kept the original notes and added some arrangements with nice waveforms taken from Kings Valley II. This piece has only 6 measures!
6. WILDARMS	This piece is dedicated to Huey, the main programmer and author of Trilo Tracker. This videogame is one of his favourites. I had to create and study new waveforms (see p. 5-8) like the nylon guitar or the whistle. There are nice chorused melodies with a gently amount of delay. In comparison with the original, this SCC+PSG version sounds pretty nice. Please notice of the <i>ritardando</i> at the end.
7. ANDOROXY	This is the game's stage 1 music converted for full SCC sound. It starts with normal 3 PSG channels and then we complete up to 8 channels. Just an arrangement without any major articulations but vibratos and drops. Please notice the drum sounds are very simple (like the original). Only Konami and Micro Cabin (and maybe Compile) were able to achieve AAA drum sound with the PSG. Of course Trilo Tracker is capable of that and more!
8. NEM2INTR	This is the most perfect piece when it comes to deal with Trilo Tracker features. It adds the last implementations: Wave morphing (see p.23) and hardware PSG envelopes (see p.22). We got a perfect drum sound and a full palette of complex and rich SCC sounds, with the morph feature. Only 'Space Manbow' and 'Solid Snake' had this incredible effect. Just like synthesizers, the wave morphing lets you transform gradually one sound into another (fast or slow). You will be delighted with the spectacular results!

### XIII. Final Advice

Try to get a *balanced piece* from the beggining to the end. Watch out the volumes, melodies, instruments, transitions and effects. Try to give the piece to life with variations and the right amount of ornaments: a few ones make the piece flat and boring, and too much are overwhelming and bombastic.

Listen to as many songs and pieces of the style you are looking for as you can. You will learn a lot from them and may capture an inspiration, arrangement, transition, chord or articulation. Use the example songs of this tutorial as starting points. You can load the instrument sets, or the entire pieces to start from.

Judge the piece by yourself listening again and again and ask another musicians or people to listen for their opinions and suggestions.

### XIV. Recommended stuff

These links are related to chiptune music:

<http://woolyss.com/>  
(incredible site with tons of trackers and plugins)

<http://mmltalks.appspot.com/>  
(interesting site with SCC tracks and code available)

<http://shiru.undergrund.net/software.shtml>  
(some chiptune stuff here)

<http://bifi.msxnet.org/msxnet/tech/>  
(about SCC specs)

<http://www.msx.org/wiki/SCC>  
(more SCC specs and list of Konami SCC games)

[http://www.gr87.com/?page\\_id=64&lang=en](http://www.gr87.com/?page_id=64&lang=en)  
(a couple of years ago I wrote this little book about Pxtone and chiptune)

### XV. Thanks

-First, I would like to thanks Huey and Trilobyte soft for creating this amazing tool and for letting me test it. The SCC power is reborn.

-Thanks to Locomalito for counting on me for his projects.

-Thanks to good old Konami, when the golden era of videogames made us dream.



