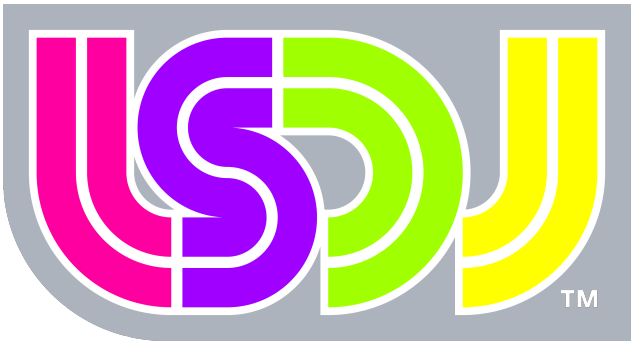


Little Sound Dj v9.2.6

Operating Manual

May 9, 2021

Hi!

First of all, thanks for trying out Little Sound Dj!

Years of effort has been put into making this program as powerful and fast-worked as possible. I hope you will enjoy.

If you don't have previous experience from similar "tracker"-like music editors, the amount of new concepts may seem a bit overwhelming at first. Try not to stress about it. Learn step by step, keep it fun and progress at your own pace. Within days, you should know enough about the program to make your own first songs.

About the structure of this manual: Chapter 1 helps you get started with the basics, while chapter 2 gives a high-level walkthrough of the entire program. These first two chapters should be enough to successfully use Little Sound Dj. Remaining chapters are advanced topics or reference material, and can be read at your own leisure, or skipped entirely if you so wish.

There is a lot of information that will not fit into a manual like this. For links to further resources, check out the user-maintained Wiki site at `https://wiki.littlesounddj.com` - it contains material like tutorials, tips and tricks, and hardware related DIY projects. Also, the Facebook group at `https://www.facebook.com/groups/LittleSoundDJ/` is useful for getting in touch with other users.

If you have questions, ideas or bug reports related to Little Sound Dj or this manual, I would be delighted if you reach out by e-mailing info@littlesounddj.com.

Happy tracking!

/Johan

Contents

Chapter 1

Getting Started

1.1 Game Boy Sound

The Game Boy sound chip has four channels, each with 4-bit resolution.

Pulse Channel 1 Square wave with envelope and sweep functions.

Pulse Channel 2 Square wave with envelope function.

Wave Channel Soft synthesizer, sample playback and speech synthesis.

Noise Channel Noise with envelope and shape functions.

1.2 Key Presses

In this documentation, key presses are marked up in this fashion:

A A button

B B button

START start button

SELECT select button

CURSOR any direction of the plus-shaped D-pad

LEFT D-pad left

RIGHT D-pad right

UP D-pad up

DOWN D-pad down

LEFT/RIGHT D-pad left or right

UP/DOWN D-pad up or down

SELECT+A pressing A while holding SELECT

SELECT+(B,B) pressing B twice, while holding SELECT

1.3 Navigating the Program

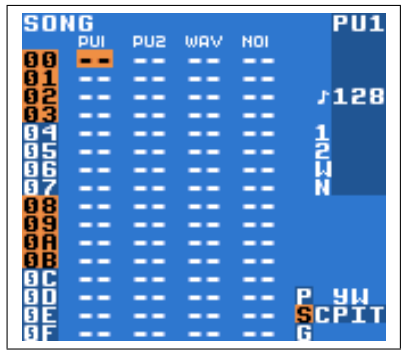


Figure 1.1: Song Screen

Little Sound Dj starts up in the song screen. The four columns PU1, PU2, WAV and NOI represent the four Game Boy sound channels. There are two pulse wave channels, one custom wave channel and one noise channel. Use the D-pad to move the cursor from channel to channel.

Little Sound Dj has nine screens, arranged in a map shown in the bottom right of the screen (figure 1.2).

The most useful screens are placed in the middle row, ordered by level of detail. The song, chain and phrase screens are used for sequencing, and

Figure 1.2: Screen Map

work together in a tree-structure fashion. The song contains chains, each chain contains phrases, and each phrase contains notes. They are followed by the instrument and table screens, which are used to create sounds.

To move between the screens, press SELECT+CURSOR.

1.4 Online Help

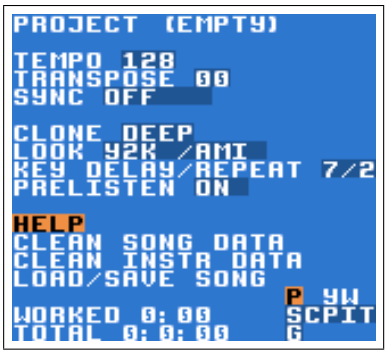


Figure 1.3: Project Screen Help

To find the in-built help, move to project screen (above song screen) and tap A on HELP. The help screen lists button presses for the different screens, as well as a command list.

1.5 Making Your First Sounds

Navigate to the song screen, and move the cursor to the PU1 column. Tap the A button, and a new chain "00" will appear. Edit the chain by pressing

SELECT+RIGHT to enter the chain screen. There, tap A to insert a new phrase, then press SELECT+RIGHT to go to the phrase screen.

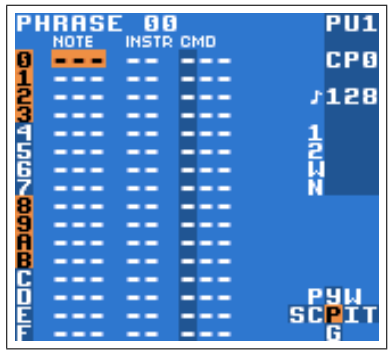


Figure 1.4: Phrase Screen

In the phrase screen, you can enter notes to be played back. Move the cursor to the note column and press A to enter a note. The text C-2 will appear: C being the note, and 2 the octave. Press START to play the phrase. Notice how the phrase is played back from top to bottom. You can change the note by holding A and pressing the D-pad. A+LEFT/RIGHT changes the note, and A+UP/DOWN changes octave.

Now, try to move the cursor and insert notes on other steps. To delete a note, press A while holding B. When you have finished listening, press START again to stop the phrase.

The clean pulse sound might get dull after while. Let's move on to the instrument screen by pressing SELECT+RIGHT.

In the instrument screen, we can make the sound a little bit more interesting. Try changing the ENV. and WAVE fields by moving the cursor there and pressing A+LEFT/RIGHT. As an example, changing the ENV. setting to 83 should make the sound shorter. Press START again to hear the changes as you make them!

The TYPE field sets the instrument type. Instrument types are specific for channels – PULSE instruments should only be played back in the pulse channels, WAVE and KIT instruments in the wave channel, and NOISE instruments in the noise channel.

Let's try out the sampled drum kits. Now, we have to change channel to the wave channel. Go back to the song screen, move the cursor over to the wave channel, and create a new chain and a new phrase by tapping A. Enter

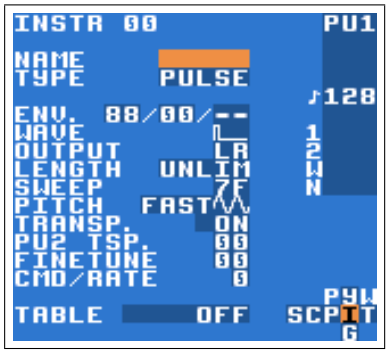


Figure 1.5: Instrument Screen

a note by tapping A, then SELECT+RIGHT to edit the instrument. Change the instrument type to KIT by pressing A+RIGHT on the type field, then go back to the phrase screen. Now, you should be able to enter drum sounds the same way you entered notes before.

To create new chains and phrases, move the cursor to an empty step in song or chain screen and tap A twice.

1.6 Hexadecimal Number System

Little Sound Dj uses hexadecimal numbers. While the usual decimal number system uses ten digits, 0-9, hexadecimal has 16 unique symbols: the digits 0 to 9, followed by the letters A to F. As an example, let's print a table of numbers – first with decimal digits, then with hexadecimal digits...

Decimal	1	2	3	4	5	6	7	8	9	10
Hexadecimal	1	2	3	4	5	6	7	8	9	A
Decimal	11	12	13	14	15	16	17	18	19	20
Hexadecimal	B	C	D	E	F	10	11	12	13	14

Note that the hexadecimal and decimal values are really equal; just the representations differ. The main reason to use hexadecimal is to save screen space; with hexadecimal numbers, it is possible to represent every byte value using no more than two digits. (The byte value range is 0 to 255 – that is, 0 to FF.)

Representing negative numbers with two digits only can be tricky. In Little Sound Dj, the numbers are wrapping. That means, when subtracting one from the smallest possible number (0), it will jump to the highest possible value (FF). So FF can represent -1 as well as 255, depending on the situation.

If this does not make sense – please don't worry too much – it will become clear as you spend time with the program.

1.7 Initial Troubleshooting

Does your cartridge not start, crash, or act strange in other ways? Here are some things to try.

- To avoid losing songs, always use fresh batteries. Replace as soon as the red light on your Game Boy gets faint, or the screen gets dim.
- Clean cartridge pins using a cotton swab and alcohol.
- Re-insert the cartridge a couple of times to remove oxide.
- Make sure that the cartridge is firmly plugged in. Sometimes it can help to put a piece of tape on the cartridge to give it a snug fit.
- Do a full reset of the cartridge memory. This is done by pressing SELECT+A+B on the LOAD/SAVE FILE button in project screen.
- Certain Game Boy Advance/Nintendo DS cartridges do not work with Little Sound Dj. If you have problems with such a cartridge, try one of the Little Sound Dj builds named "Goomba".
- Search for help on the Little Sound Dj Wiki (https://wiki.littlesounddj.com) or ask in the Facebook group.

Chapter 2

The Screens

Little Sound Dj has nine screens, laid out in a 5×3 screen map.

2.1 Screen Map

<table>
<tr><td colspan="2">Project</td><td colspan="2">Synth</td><td>Wave</td></tr>
<tr><td>Song</td><td>Chain</td><td>Phrase</td><td>Instr.</td><td>Table</td></tr>
<tr><td colspan="5">Groove</td></tr>
</table>

The song, chain and phrase screens are used for composing music. The wave, synth, instrument and table screens are used for making sounds. Project screen contains project settings, and groove screen controls sequencer timing. [1]

Most time is usually spent in the middle row, as that is where the composing is done.

[1] There are also three hidden screens, not shown on the map: The file, word and help screens. We will get back to these later.

Move between the screens using SELECT+CURSOR. Synth and wave screens are overlaid; switch between them by pressing SELECT+RIGHT.

2.2 Starting and Stopping

When pressing START in the song screen, Little Sound Dj plays all four channels. When pressing START in other screens, Little Sound Dj plays the channel that is being edited. To start all four channels from some other screen than the song screen, press SELECT+START.

2.3 Song Screen

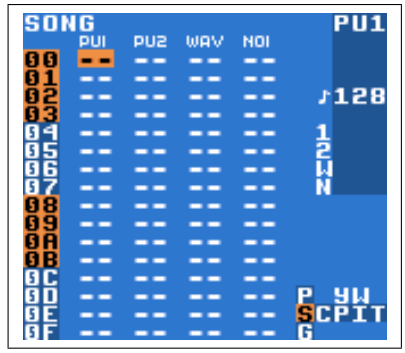


Figure 2.1: Song Screen

The song screen is the highest level of the sequencer. This is where songs are arranged. It has four columns, one for each channel. The columns contain lists of chains to be played top-down.

A list of button presses can be found in the help screen.


TIP!

- *Press* B+A *on an empty step to pull up down-below chains.*
- *To quickly jump between rows, mark them with* B,B,B *then jump with* B+UP / DOWN.

2.4 Chain Screen

A chain holds a list of phrases to be played back. It can represent for example a melody or a bass line. Each phrase has an optional transpose.

Chains can be reused freely between channels. It is particularly useful to play a chain in both pulse channels.

A list of button presses can be found in the help screen.

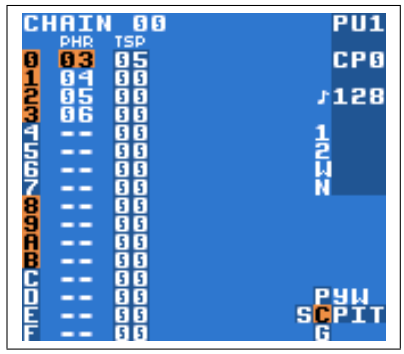


Figure 2.2: This chain plays phrase 3 transposed by 5 semitones, followed by phrases 4-6 without transpose.

2.5 Phrase Screen

The phrase screen is where you enter notes. It has four columns: note, instrument, command and command value.

Phrases are shared between channels; that is, any phrase may be played back on any channel. A phrase might however sound very different depending on which channel it is played back on. As an example, if a phrase plays a melody using a pulse instrument, it will probably sound good in the pulse channels but strange in the other channels.

The note column looks different depending on instrument. Usually it shows note and octave, but instruments that play back samples (KIT, SPEECH) show sample names instead. Noise instruments show either a byte value (for 15-bit noise) or note and octave (for 7-bit noise).

The instrument column selects instrument. Press SELECT+RIGHT to edit an instrument in the instrument screen.

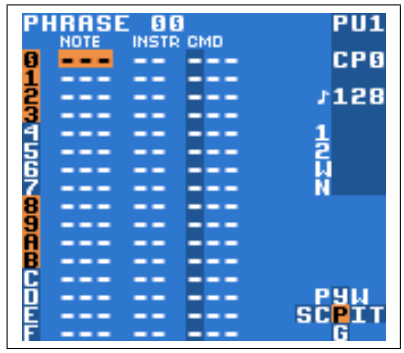


Figure 2.3: Phrase Screen

The command column is used to add commands. Each command has a special functionality. For example, the H command hops to next phrase. Tap A,A on any command for quick-help on what it does.

TIP!

- *To change note without retrig, cut the instrument with* B+A.
- *Mute kit note columns by pressing* A+RIGHT *until* OFF *appears. (Only works for kits with fewer than 15 samples.)*

2.6 Instrument Screen

There are five instrument types:

PULSE Makes pulse waves. Used in pulse channels 1 and 2.

WAVE Plays waves from the synth and wave screens. Used in the wave channel.

KIT Plays samples from ROM. Used in the wave channel.

NOISE Makes pitched 7-bit or 15-bit noise. Used in the noise channel.

SPEECH Instrument 40 is for speech and is used in the wave channel.

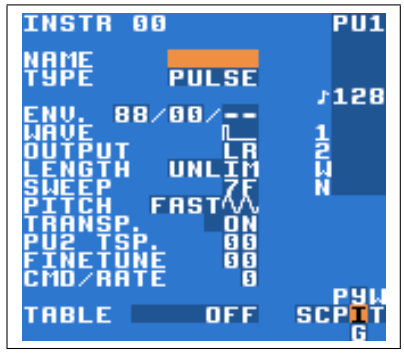


Figure 2.4: Instrument Screen

Change instrument type by pressing A+CURSOR on the TYPE field.

Instruments don't automatically play in a matching channel. You have to make sure the instrument type matches the channel you are using. For example, to use the kit instrument, first make sure that you are in the wave channel.

2.6.1 Instrument Parameters

These parameters are used in most instrument types:

NAME Tap A to name the instrument. Useful for keeping instruments organized. When selecting instrument in phrase screen, this name is shown in the border.

TYPE Instrument type.

LENGTH Sound length.

OUTPUT Send the sound to left/right/both/none speakers. (Use the headphone output to hear the difference!)

PITCH Controls the behavior of P, L and V commands. A+U/D switches pitch update speed: FAST updates pitch at 360 Hz; TICK updates pitch every tick; STEP is like FAST except that P does pitch change instead of pitch bend; DRUM is like FAST with logarithmic fall-off, useful for P kicks. A+L/R changes vibrato shape between downwards triangle, saw and square, and upwards triangle, saw and square.

TRANSP. When ON, the pitch may be affected by project and chain transposes.

CMD/RATE Slows down C and R commands. Also affects P and V commands when PITCH is set to TICK. 0=fastest, F=slowest.

TABLE Selects a table to run when playing notes. To edit the table, press SELECT+RIGHT. To create a new table, press A,A. To clone the table, press SELECT+(B,A). Changing TICK to STEP makes Little Sound Dj step through the table, advancing one step every time the instrument is triggered.


TIP!

- *In the instrument screen, tap* A,A *on any parameter for quick-help on what it does.*

2.6.2 Pulse Instrument Parameters

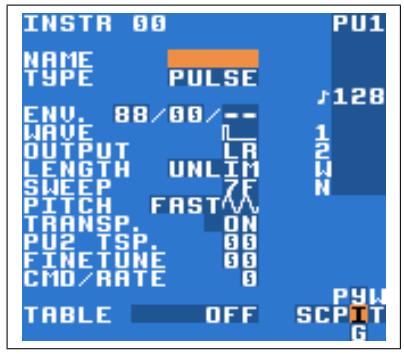


Figure 2.5: Pulse Instrument Screen

ENV. Three amplitude envelope control values. For each value, first digit sets amplitude, and second digit sets the speed to rise or fall to the next amplitude. Speed 1 is fastest, F is slowest, 0 means hold. As an example, ENV. 32/AD/10 creates an envelope with fast attack from amplitude 3 to A, slow decay to amplitude 1, then infinite sustain, as shown in figure 2.6.

WAVE Wave type.

SWEEP Frequency sweep, useful for bass drum and percussion. The first digit sets time, the second sets pitch increase/decrease. Only works on the first pulse channel.

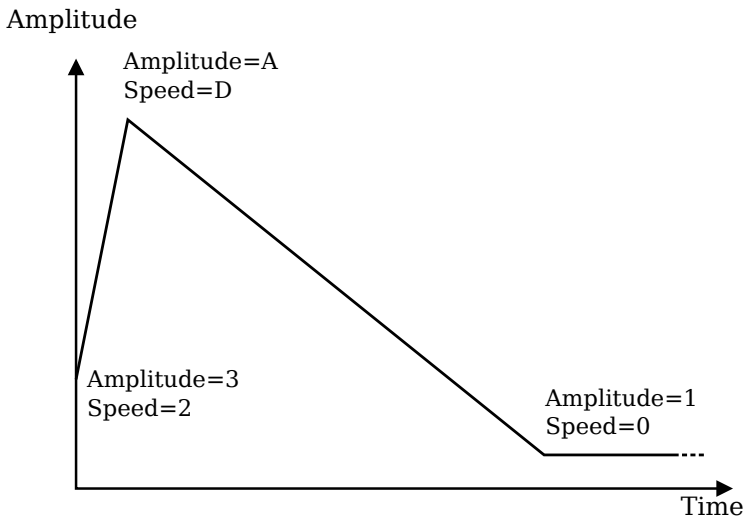


Figure 2.6: Amplitude envelope example. ENV.=32/AD/10.

The detune settings create interesting phase effects when the same phrase is played on both pulse channels:

PU2 TSP. Transpose pulse channel 2.

FINETUNE Detune pulse channel 1 downwards, channel 2 upwards.

2.6.3 Wave Instrument Parameters

The wave instrument plays back synth sounds generated in the SYNTH screen.

VOLUME Set amplitude (0=0%, 1=25%, 2=50%, 3=100%) and left/right output.

FINETUNE Detune the sound.

Figure 2.7: Wave Instrument Screen

WAVE Select the wave to play back. Waves are edited in the WAVE screen. When PLAY is set to some other value than MANUAL, this parameter is replaced by SYNTH.

SYNTH Select the synth sound to play back. To edit the synth sound being used, press SELECT+UP to go to the SYNTH screen. To use a new synth, tap A twice. To clone the synth, press SELECT+(B,A).

PLAY How to play back synth sounds: MANUAL, ONCE, LOOP, or PINGPONG. With MANUAL, only a single wave is played. To play through a synth sound in MANUAL mode, use the F command to step through its waves.

SPEED How fast the synth sound should be played back.

LENGTH Controls the length of the synth sound.

LOOP POS Sets the loop point of the synth sound.

2.6.4 Kit Instrument Parameters

KIT Choose the sample kits to use. The first kit will be used in the left note column in the phrase screen; the second kit will be used in the right note column in the phrase screen.

VOLUME Set amplitude (0=0%, 1=25%, 2=50%, 3=100%) and output (left/right/both/off).

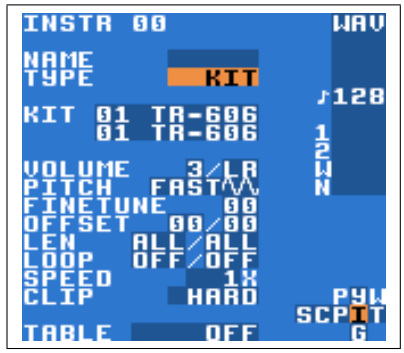


Figure 2.8: Kit Instrument Screen

FINETUNE Pitch shift.

OFFSET Set the start loop point. If LOOP is OFF, this value can be used for skipping the initial part of a sound.

LEN Sound length. ALL plays the sample to its end.

LOOP Loop control. OFF=don't loop, ON=loop sound and start playing from OFFSET, ATK=loop sample and start playing from the beginning.

SPEED Full speed or half speed.

CLIP Selects what to do when the signal overshoots while mixing two kits. HARD is the default: Hard clamp the signal to the allowed 0-F range. SOFT attenuates the signal to reduce distortion, giving a tape-like effect. FOLD and WRAP add digital distortion by folding or wrapping the signal around the 0 and F limits. Press A+(LEFT, LEFT) while HARD is selected to mix the kits using raw memory contents.


TIP!

- *To replace the default sample kits, use the lsdpatcher program.* https://littlesounddj.com/lsd/latest/lsd-patcher/

2.6.5 Noise Instrument Parameters

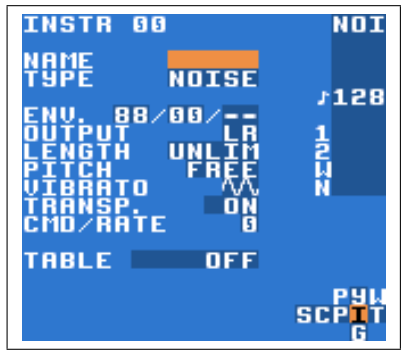


Figure 2.9: Noise Instrument Screen

ENV. See description of pulse envelope (2.6.2).

PITCH When set to FREE, pitch changes can randomly mute the sound. SAFE avoids random mutes by restarting sound after any pitch change.

2.6.6 Speech Instrument

LSDj has 59 speech sounds called allophones. By combining these sounds, it is possible to create any English word or phrase. [2]

The speech instrument is locked to instrument number 40 and can only be used in the wave channel. It contains 14 word slots, by default named W-0 to W-D.

To edit a word, press SELECT+RIGHT to get to the word screen. The left column contains the allophones to be played, the right column sets their duration. The word in figure 2.11 is supposed to say "Little Sound Dj."

To make the words easy to remember, rename them by tapping A in the speech instrument screen.

[2] A full list of allophones can be found in appendix B.

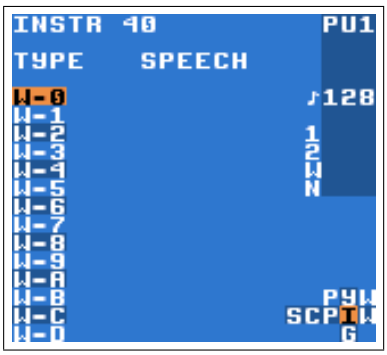


Figure 2.10: Speech Instrument Screen

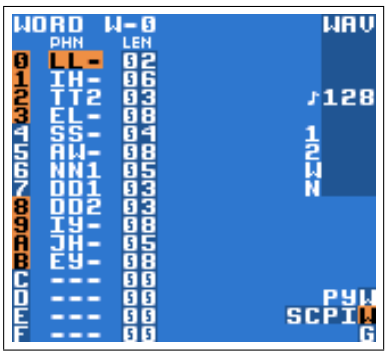


Figure 2.11: Example Word

TIP!

- When selecting allophones, care about how they sound, not how they are spelled.
- A sound may be different depending on its position within a word. For example, the K in “coop” will sound different from the K’s in “keep” and “speak”.

2.7 Table Screen

Tables are sequences of transposes, commands and amplitude changes which can be run at any speed and applied to any channel. By setting a table in the instrument screen, the table will start every time you play the instrument. This allows you to create more interesting sounds than would be possible using the instrument screen alone.

Tables contain six columns. The first column is the envelope column, used to create custom amplitude envelopes. Next is the transpose column, used to transpose the played note by a number of semitones. The other columns are command columns like the one in the phrase screen.

The default table speed of one tick per step can be changed using the G command. To view different tables, press B+CURSOR.


TIP!

- *Press* SELECT+RIGHT *on an A command in the phrase screen to edit that table. To jump back, press* SELECT+LEFT.

2.7.1 Envelope Example

The first digit in the envelope column sets the amplitude; the second digit sets for how many ticks the amplitude lasts. To create an loop, set the first digit to the step you want to hop to, and the second digit to H.

The table in figure 2.12 creates a tremolo effect.

2.7.2 Arpeggio Example

A typical use for tables is to make arpeggios, which is a musical term for playing notes fast enough to sound like a chord. The table in figure 2.13 would form a major chord. Shorter arpeggios can also be made using the C command (see 4.3).

2.8 Groove Screen

Grooves control the speed by which your phrases and tables are played back. When used well, grooves can make your music more lively.

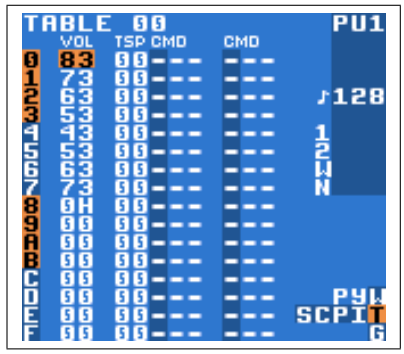


Figure 2.12: Table Envelope with Tremolo Effect

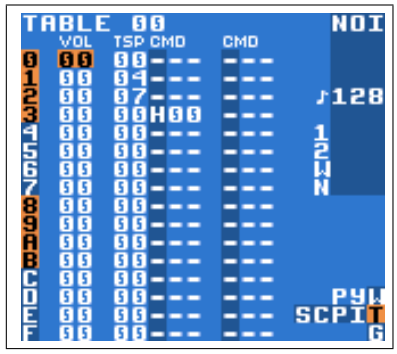


Figure 2.13: Table Transpose with Major Arpeggio

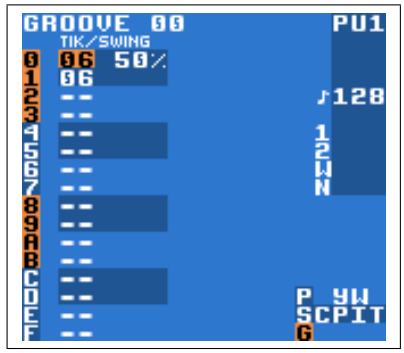


Figure 2.14: Groove Screen

The sequencer is based on a time period called *tick*, which is controlled by song tempo. Ticks are very short: at 125 BPM, there are 50 ticks per second. Higher tempo means faster ticks, and the other way around. In the groove screen, you can control for how many ticks phrase or table steps should last. The groove in figure 2.14 would make the sequencer spend 6 ticks on every step.

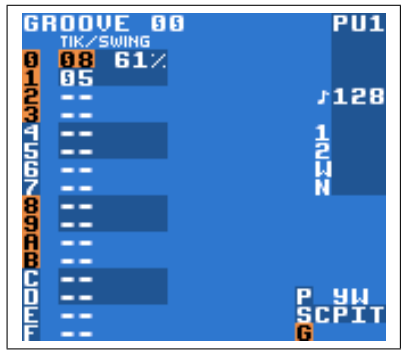


Figure 2.15: Swing Example

You can also use grooves to create custom rhythms. The groove in figure 2.15 would make even note steps last 8 ticks, and odd note steps last 5 ticks, creating a swing effect. Grooves can also be used to create triplets and other complex

rhythms.

Groove 0 is the default groove for all phrases, but it is possible to switch to another groove using the G command. This command also works in tables.

In the groove screen, select the groove you wish to edit by pressing B+CURSOR.

TIP!

- A+UP/DOWN *changes the swing percentage, while keeping the total number of ticks – and thus, the resulting song speed – constant. (Example: Original value is 6/6 = 50%. Press* A+UP*. Now the value changes to 7/5 = 58%!)*

- *Press* SELECT+DOWN *on* G *commands to edit that groove.*

2.9 Synth Screen

The synth screen features a soft synthesizer that generates sounds to be played back by the wave instruments. Each synth sound uses 10 waves. Synth sound 0 uses waves 00-0F, synth sound 1 uses waves 10-1F, and so on. The generated synth sounds can be viewed in the wave screen (Section 2.10).

In total, there are 16 synth sounds. Choose which one to edit by pressing B+CURSOR.

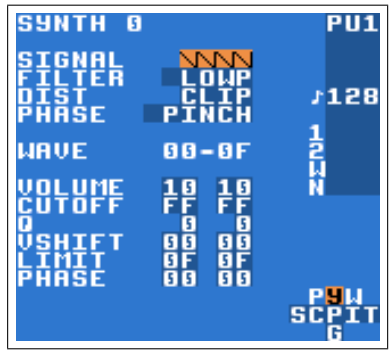


Figure 2.16: Synth Screen

2.9.1 Fixed Synth Settings

SIGNAL Square, saw tooth, triangle or custom wave. W.FX uses a wave in range F0-FF as signal.

FILTER Low-pass, high-pass, band-pass or all-pass.

DIST Distortion mode. CLIP truncates the wave to LIMIT, FOLD mirrors the wave around LIMIT, WRAP wraps around vertically.

PHASE Compress the waveform horizontally. See figure 2.17 for examples.

2.9.2 Variable Synth Settings

These settings control the first and last wave of the sound, with a smooth in-between fade.

VOLUME Signal volume.

CUTOFF Filter cutoff frequency.

Q Resonance control. Boosts the signal around the cutoff frequency, to change how bright or dull the wave sounds.

VSHIFT Shifts the signal vertically. See figure 2.18 for examples.

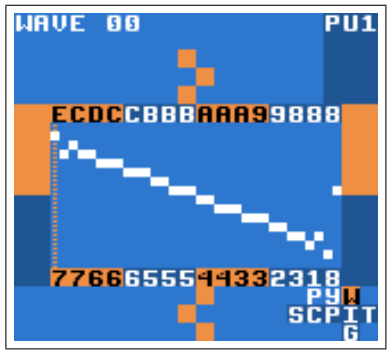
LIMIT Limits the signal vertically using the DIST mode. 0-F lowers the volume, 10-FF allows wrapping and adds interesting overtones to loud signals.

PHASE Compresses the signal horizontally. See figure 2.17 for examples.

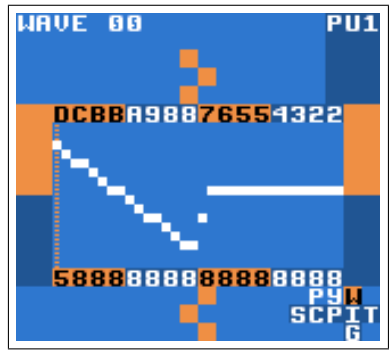
2.10 Wave Screen

In the wave screen, you can view and edit the individual waveforms of the synth sounds. There are 16 synth sounds with 16 waves each. This means that synth sound 0 uses waves 0-F, synth sound 1 uses waves 10-1F, and so on.

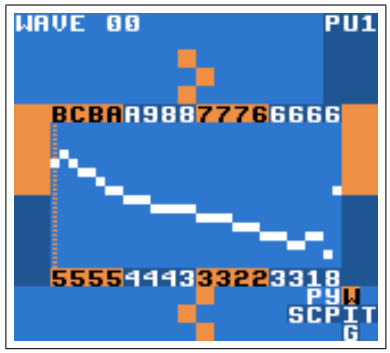
A list of button presses can be found in the help screen.



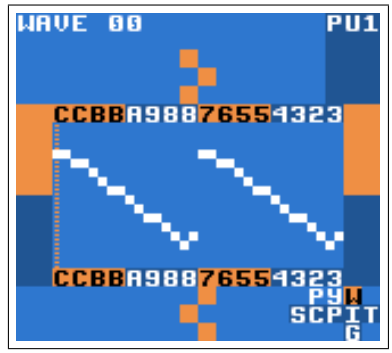
(a) Phase example. Original wave.



(b) PINCH phasing.

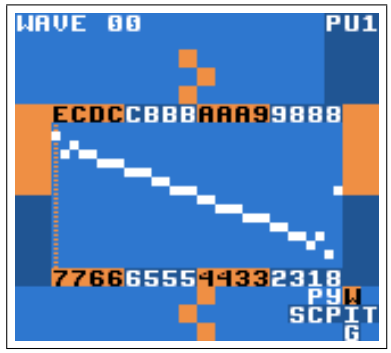


(c) WARP phasing.

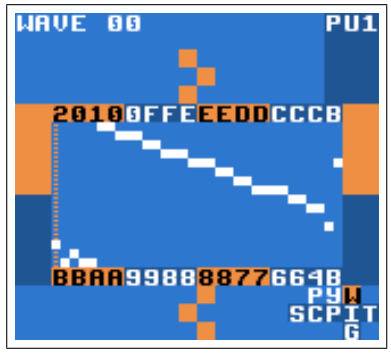


(d) RESYNC phasing. RESYN2 is same, but without anti-aliasing.

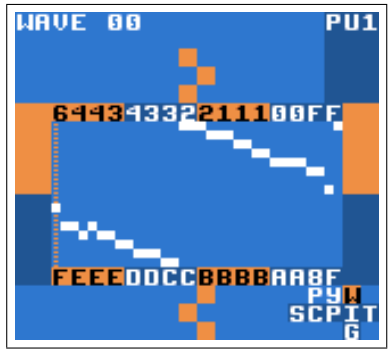
Figure 2.17: Phase Examples



(a) Vshift example. Original wave.



(b) Vshifted signal. Vshift = 40, clip = wrap.



(c) Vshifted signal. Vshift = 80, clip = wrap.

Figure 2.18: Vshift Examples

Figure 2.19: Project Screen

2.11 Project Screen

The project screen (figure 2.19) contains settings that affect the entire program.

TEMPO Song tempo in BPM. It is possible to change the tempo either by pressing A+CURSOR, or by tapping the A button in pace with the desired tempo. When being a follower in sync mode, you can nudge the tempo by pressing A+LEFT/RIGHT, something which can be useful if devices have drifted out of sync.

TRANSPOSE Adjust the pitch of the pulse and wave instruments by the given number of semitones.

SYNC Connects to other devices using the link port. Read all about sync settings in chapter 5!

CLONE Deep or slim chain cloning. Deep chain cloning will clone a chain's phrases, whereas slim cloning will re-use the old phrases. Read all about cloning in section 3.2!

LOOK Change the font and color set.

KEY DELAY/REPEAT Set repeat delay and repeat rate of the Game Boy buttons.

PRELISTEN Play notes and instruments while entering them.

HELP Enter help screen. The help screen contains a reference for button presses and a command list.

CLEAN SONG DATA Merge duplicate chains and phrases and clear unused ones.

CLEAN INSTR DATA Merge duplicate tables and clear unused instruments, tables, synths and waves.

LOAD/SAVE SONG Enter file screen. [3]

The project screen also has two clocks. The WORKED clock displays the time spent making the current song, in hours and minutes. When playing, it is replaced by the PLAY clock, which shows for how long the song has been playing. The TOTAL clock shows how long the cartridge has been used in total, in days, hours and minutes.


TIP!

- *To replace the default fonts and palettes, use the lsdpatcher program.* https://littlesounddj.com/lsd/latest/lsd-patcher/

2.11.1 Total Memory Reset

Press SELECT+A+B on LOAD/SAVE FILE to erase all songs and bring back the cartridge to its default state. Generally, this is only useful if the cartridge got scrambled.

2.12 File Screen

The file screen (figure 2.20) is entered by pressing the LOAD/SAVE FILE button in the project screen. It is used for saving the song you are working on to the storage memory. It can also be used to load songs from the storage memory to the work memory. The file screen allows you to keep up to 32 songs on one cartridge.

The file screen is only available for cartridges that have 64 kb SRAM or more.

[3] The file screen is only available for cartridges that have 1 Mbit SRAM or more. In case your cartridge doesn't have 1 Mbit SRAM, this button will be replaced with a RESET MEMORY button.

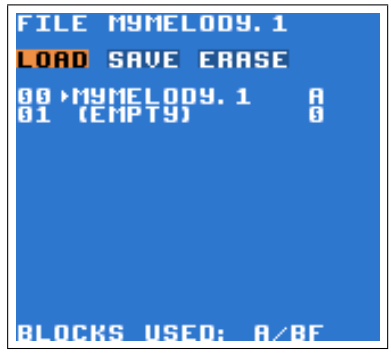


Figure 2.20: File Screen

FILE Shows the file name of the song you are working on. The exclamation mark (!) indicates when changes have been made to a song.

LOAD Load a song. Press A, select the file to load and press A again.

SAVE Save song. Press A, select the slot to save to and enter the file name.

ERASE Erase a song. Press A, select the file to erase and press A again.

BLOCKS USED Shows how much of the storage memory that is used. One block equals 512 bytes. The digits on the bottom are hexadecimal, meaning there is a total of BF * 512 = 97,792 available bytes.

Press B to return to the project screen.


TIP!

- *To manage songs, use the lsdpatcher program.* https://littlesounddj.com/lsd/latest/lsd-patcher/

2.12.1 Song List

The song list presents song name, version number and file size. When saving, the song is compressed, so the resulting file size will vary with different songs. To start working on a new song, load from the (EMPTY) slot.


TIP!

- While in the song list, press SELECT+A to load a song without switching to the song screen, and START to start/stop songs. In this way, you can load and play songs without jumping back and forth between screens. This can be handy if you are playing a live show with prepared tracks and want fewer things to think about.

2.13 Border Information

Various useful information is displayed in the screen border.

1. Screen title. Shows what is being edited.
2. The channel being edited, that is, the selected song screen column.
3. Chain position being edited.
4. Current tempo in beats per minute (BPM).
5. Shows what is being played on the channels. MUTE appears when pressing B+SELECT or B+START.
6. The waveform being played on the wave channel.
7. The name of the instrument being selected in the phrase screen.
8. Sync status.
9. Screen map.

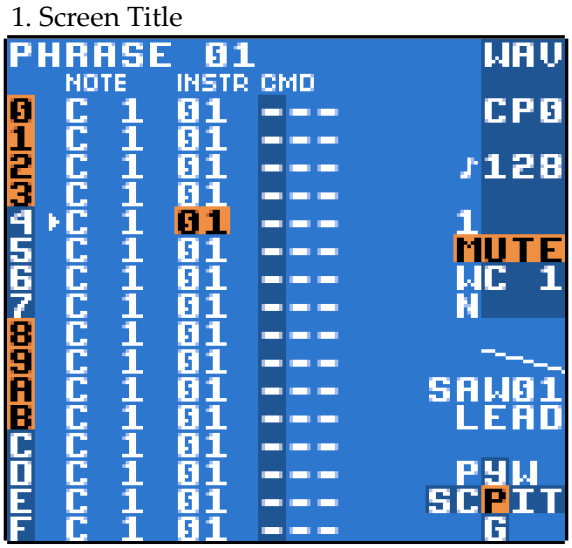


Figure 2.21: Border Information

Chapter 3

Advanced Techniques

3.1 Copy and Paste

Little Sound Dj has a clipboard for temporary data storage. Pressing B+A will cut the value under the cursor and store it on the clipboard. The value can then be pasted by pressing SELECT+A.

In most screens, it is possible to mark up blocks by pressing SELECT+B and moving around the cursor. When having marked up a block, it can be copied to the clipboard by pressing B, or cut to the clipboard by pressing SELECT+A. The clipboard contents can then be pasted by pressing SELECT+A.

Some quick-mark button presses are implemented:

- SELECT+(B, B) = quick-mark a column or row.
- SELECT+(B, B, B) = quick-mark an entire screen.

When having marked a block, you can change all data inside that block by pressing A+CURSOR. This can be used, for example, to transpose several notes quickly.

3.2 Cloning

Cloning is a shortcut that can save you much unnecessary copy and paste work. It allows you to create copies of chains, phrases, instruments and tables directly from the song, chain, phrase and instrument screens.

Let's imagine you want to make a slightly altered version of the melody in chain 0. Go to the song screen, tap A on 00 to pick the number, then tap A again on a down-below empty step so that you get:

```
00
00
```

Now, move the cursor to the second 00 and press SELECT+(B, A) to make a copy of chain 0.

3.2.1 Deep vs. Slim-Cloning

There are two different cloning modes: deep and slim cloning, selectable from the project screen.

When slim-cloning a chain, a new chain appears that contains the same phrases as the original.

When deep-cloning a chain, a new chain appears with copies of the original phrases.

The advantage of deep-cloning is that you lessen the risk of modifying old phrases by accident. The drawback is that will run out of phrases faster. Also, your songs might take up more space when saved in the file screen.

If you run out of phrases, use CLEAN SONG DATA in project screen. (Section 2.11.)

3.3 The Importance of Backups

Some words of caution from many peoples hard-earned experience: When using a Game Boy cartridge, backup your songs! Most Game Boy cartridges depend on an internal battery that will run out, losing your songs in the process. If you care about your music, do regular backups, or at least record your songs to prevent them from being lost forever.

3.4 Muting, Soloing and Panning

- Press B+SELECT in any screen to mute the channel. If the B button is released before SELECT, the channel stays muted until B is pressed again.

- Press B+START in any screen to solo the channel. If the B button is released before START, the other channels stay muted. If the START button is released first, all channels will be turned on again.
- Press B+LEFT/RIGHT in the song screen to pan a channel left or right.

3.5 Live Mode

Live mode is ideal to freely mix and match chains during a live performance.

Song screen controls:

SELECT+LEFT Switch between song and live mode

START Start selected chain(s)

SELECT+START Stop selected chain(s)

LEFT+START Start all chains in the row

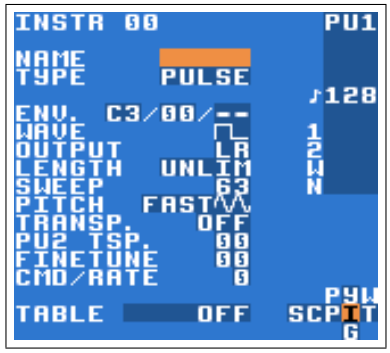
If a chain is already playing, starts and stops are queued until the chain played through. Pressing START twice speeds up the change so that it happens already when the active phrase played through.

3.6 Synthetic Drum Instruments

Creating drum instruments without using the sampled drum kits can be very useful, as it gives greater flexibility in how to make use of the channels. Here are some starting-out ideas.

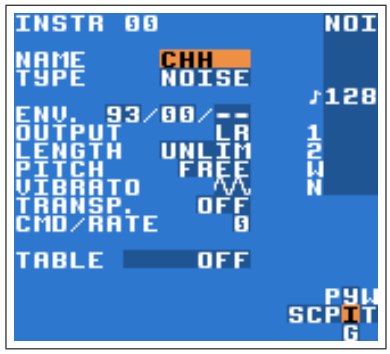
3.6.1 Pulse Bass Drum

The easiest way to create a bass drum is by using pulse channel 1. ENV. should have a strong attack and fast decay – try setting it to C3/0/0. WAVE is typically 50-50 high/low, even though other waves can be used for a more distorted sound. SWEEP should have high initial frequency and fast decay; try setting it to 63, and play the instrument at note C-6. For a snappier kick, experiment with ENV. and LENGTH parameters. Set TRANSPOSE to OFF to prevent chain transposes from changing the pitch.

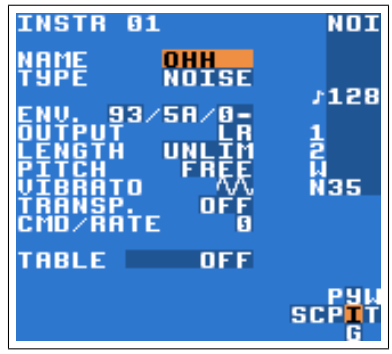


(a) Bass Drum

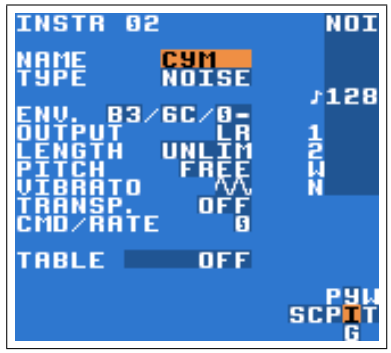
(b) Snare Drum



(c) Closed Hi-Hat



(d) Open Hi-Hat



(e) Cymbal

Figure 3.1: Synthetic Drum Instruments

3.6.2 Snare Drum

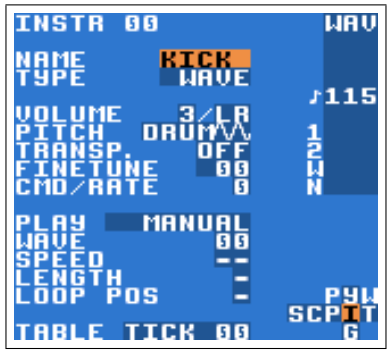
Use the noise channel for snare drum sounds. The ENV. setting should have a strong attack and fast decay – try setting it to F1/D3/0. Adjust the timbre by changing note value in phrase screen. Note values around 30 should be useful for snares. P and V commands can help making the sound more lively.

3.6.3 Hi-Hats and Cymbals

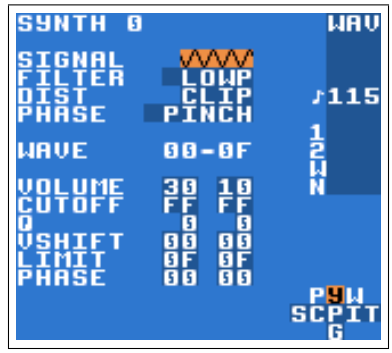
Use the noise channel for hi-hats and cymbals. Use a phrase note value around 38 for a timbre with high frequency content. Change instrument ENV. to get the desired amplitude envelope. For cymbals, lower the notes a bit for a rougher timbre.

3.6.4 Wave Bass Drum

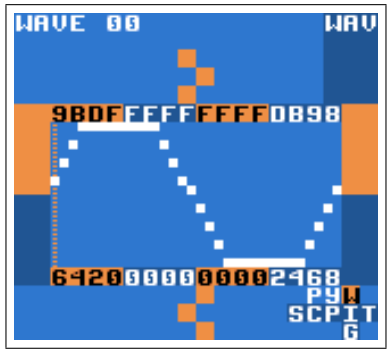
For the best sounding bass drum, use the synthesizer in the wave channel. Set the PITCH to DRUM by pressing A+UP, and set TRANSP. to OFF. On the synth screen, choose the triangle signal, and set VOLUME to 30. Set a table for the instrument. On step 0 of the table, use a fast P command such as C0. On line 1, put 80 in the TSP column and use an L command with a value such as 30. This will transpose the bass drum to the lowest possible note without wrapping to a higher pitch. Feel free to experiment with different synth parameters or different values for the P and L commands to shape the sound of the kick, as well as playing the instrument at note C-5, C-6, or above. (See figure 3.2.)



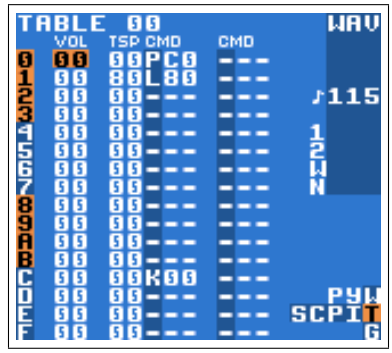
(a) Bass Drum Instrument



(b) Bass Drum Synth



(c) Bass Drum Wave



(d) Bass Drum Table

Figure 3.2: Wave Channel Bass Drum

Chapter 4

Commands

Commands can be used to do all sorts of things in phrases and tables. It is a good idea to skim through this chapter at least once, to get an idea of what they can do.


TIP!

- *Tapping* A,A *on a command shows a scrolling help text in the top of the screen.* A+L/R *can then be used to browse through the commands. Pause the scrolling text by holding* SELECT.

4.1 A: Table Start/Stop

Starts or stops tables in the current channel. Use the table number you want to start, or 20 for stopping.

A03 start table 3

A20 stop table

4.2 B: MayBe

4.2.1 In Phrases (MayBe Play Note)

Controls how likely it is that the note or sample(s) to the left will be played. First digit sets probability for left kit, second digit sets probability for notes and right kit.

B00 Never play note

B0F Always play note/right kit sample

BF0 Always play note/left kit sample

B08 Play note/right kit sample about 50% of the time

4.2.2 In Tables (MayBe Hop)

A hop that only happens sometimes. First digit sets probability, second digit sets destination row.

BF5 Hop to row 5, 15 times out of 16

B84 Hop to row 4, about 50% of the time

B03 Never hop to row 3

4.3 C: Chord

Runs an arpeggio that extends the base note with the given semitones. The speed may be slowed down using CMD/RATE in instrument screen.

C37 plays a minor chord: 0, 3, 7, 0, 3, 7, 0, 3, 7, ...

C47 plays a major chord: 0, 4, 7, 0, 4, 7, 0, 4, 7, ...

C0C plays 0, 0, C, 0, 0, C, 0, 0, C, ...

CC0 plays 0, C, 0, C, 0, C, ...

CCC plays 0, C, C, 0, C, C, 0, C, C, ...

C00 resets chord

4.4 D: Delay

Delay the triggering of a note with the given number of ticks.

4.5 E: Amplitude Envelope

4.5.1 For Pulse and Noise Instruments

The first value digit sets the initial amplitude (0=min, F=max); the second digit sets the release (0,8: no change, 1-7: decrease, 9-F: increase).

4.5.2 For Wave Instruments

E00 volume 0%

E01 volume 25%

E02 volume 50%

E03 volume 100%

4.6 F: Wave Frame/Finetune

4.6.1 For Pulse Instruments:

The first digit sets PU2 TSP., the second FINETUNE by 1/32 semitones/step. See section 2.6.2.

4.6.2 For Kit Instruments:

Modifies the sample position. 00-7F steps forward, 80-FF steps back.

4.6.3 For Wave Instruments:

Change the wave frame being played on the wave channel. This command is relative, meaning that the value is added to the current frame number. It can be used for playing through synth sounds manually.


TIP!

- *Since a synth sound contains 16 (10) waves, issuing the command* F10 *jumps to the next synth sound.*

Example:

F01 If wave frame 3 is being played, advance 1 frame and start playing frame number 4.

4.7 G: Groove Select

Select the groove to use when playing phrases or tables.

Example:

G04 select groove 4

4.8 H: Hop

H hops to a new play position. It can also be used to stop playing.

4.8.1 H in Phrases

H00-H0F Hop to next phrase. The digit sets destination phrase step.

H10-HFE Hop back within the phrase. The first digit sets number of times to hop back, the second digit sets destination step.

HFF Stop playing song (or channel, if in live mode).


TIP!

- *To compose in waltz time (3/4), put* H00 *commands on step* C *in every phrase.*

4.8.2 H in Tables

In the table screen, H is used for creating table loops. The first digit sets how many times the hop should be done before moving on; 0 means "forever." The second digit sets the table step to jump to. Loops can be nested; that is, you can have smaller loops inside bigger ones.

Example:

H21 hop twice to table position 1.

H04 hop to table position 4 forever.

4.9 K: Kill Note

K instantly stops the sound, causing an audible click. If the click is not desired, better options might be E00 for wave channel and E11 for pulse and noise channels.

Example:

K00 kill note instantly

K03 kill note after 3 ticks

4.10 L: Slide

Slides to the target note in the given duration. If the instrument's PITCH setting is TICK, the duration is given in ticks, otherwise in n/360 seconds.

Example:

```
C-4 ---
F-4 L40
--- ---
C-4 L10
```

This will result in a slide that starts with C-4, bends to F-4, and then quickly bends back to C-4.

4.10.1 L in Tables

The L command may be used in the left table command column. The transpose column will then set target note relative to the base note.

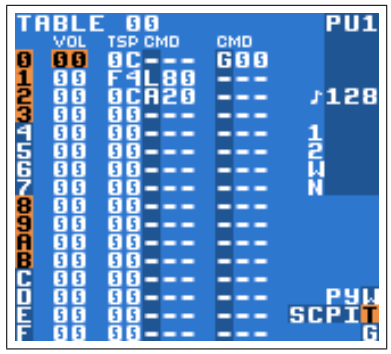


Figure 4.1: Table Slide

Transposes and slides are added together independently. In the above example, step 0 transposes one octave up. In step 1, the L command starts sliding one octave down while keeping the transpose from step 0 unchanged. In step 2, the L command is allowed to continue while the transpose stays one octave up. After some time, L will stop one octave down, canceling out the transpose and returning to the base note.

4.11 M: Master Volume

Changes the master output volume. The first digit modifies the left output, the second digit the right. The volume can either be set with an absolute value, or changed by a relative value.

Values 0-7 are used to specify absolute volumes. Values 8-F give the volume a relative change; 8 is no change, 9-B increase, D-F decrease.

Examples:

M77 maximize volume

M08 minimize left volume, leave right volume unchanged

M99 increase volume with 1 step

MFE decrease left volume with 1 step, right volume with 2 steps

4.12 O: Set Output

Pan channel to left, right, none or both outputs.

4.13 P: Pitch Bend

4.13.1 For Pulse, Wave and Kit Instruments:

Does a pitch change with the given speed. The behavior depends on the instrument's PITCH setting:

DRUM Logarithmic pitch bend that updates at 360 Hz.

FAST Linear pitch bend that updates at 360 Hz.

TICK Pitch bend that updates every tick.

STEP Immediate pitch change without bend.

Example:

P02 Pitch change up with speed 2.

PFE Pitch change down with speed 2. (FE=-2)

4.13.2 For Noise Instruments:

Applies S command with the given value every tick.

4.14 R: Retrig/Resync

Retrig plays the latest played note again. The first digit modulates the pulse and noise volume (0=no change, 1-7=increase, 9-F=decrease). The second digit sets retrig rate, 1 being the fastest and F the slowest, and 0 meaning only retrig once.

R8x means resync: With this option, the sound generator restarts at a very high rate. The pulse channels have a special quirk which makes resync slow down the sound, allowing it to go half an octave deeper.

Example:

R00 retrig once

R01 retrig the sound every tick

R80 resync the sound generator at 360 Hz

R8F stop resync

RF4 retrig the sound every fourth tick, decreasing amplitude (echo effect)

4.15 S: Sweep/Shape

This command has different effects for different instrument types.

4.15.1 Pulse Instruments

Frequency sweep, useful for bass drums and percussion. The first digit sets time, the second sets pitch increase/decrease. Only works on the first pulse channel.

4.15.2 Kit Instruments

S changes the loop points. The first digit modulates the offset value; the second digit modulates the loop length. (1-7=increase, 9-F=decrease.) Used creatively, this command can be very useful for creating a wide range of percussive and timbral effects.

4.15.3 Noise Instruments

Alters noise shape (see section 2.6.5). The command is relative, meaning that the digits are independently added to the active noise shape.

4.16 T: Tempo

Changes the tick rate to match the given beats per minute (BPM) value. The BPM is accurate only if the active groove has 6 ticks per note step. If the groove has some other number of ticks per note step, the BPM value should be adjusted according to the formula $lsdj\_bpm = (desired\_bpm \times ticks\_per\_step)/6$. T28-TFF selects 40-255 BPM, T00-T27 selects 256-295 BPM.

Example:

T80 set tempo to 128 BPM

TFF set tempo to 255 BPM

T27 set tempo to 295 BPM

4.17 V: Vibrato

Adds vibrato. The first digit sets speed, second sets depth.

The vibrato speed and shape depends on the instrument's PITCH setting. When PITCH is set to TICK, the vibrato is synced to the music (assuming a groove with on average 6 ticks/step).

Depth	0	1	2	3	4	5	6	7
Semitones	0.125	0.25	0.375	0.5	0.75	1	1.5	2

Depth	8	9	A	B	C	D	E	F
Semitones	2.5	3	3.5	4	5	6	7	8

Example:

V42 speed=4, depth=0.375 semitones

V00 reset vibrato

4.18 W: Wave

4.18.1 For Pulse Instruments:

Changes waveform. Due to a hardware oddity, the instrument LENGTH timer is reset, possibly extending the duration of the sound.

4.18.2 For Wave Instruments:

The first digit sets synth sound speed, the second sets synth sound length. 0 = no change. The synth restarts if length is changed.

4.19 Z: RandomiZe

The Z command repeats the last command that is not Z or H, adding a random number to the original command value. The Z value controls the maximum value of each digit to be added.

Example:

Z02 adds one of 0, 1, 2 to the original value.

Z20 adds one of 0, 10, 20 to the original value.

Z22 adds one of 0, 1, 2, 10, 11, 12, 20, 21, 22 to the original value.

Chapter 5

Synchronization

LSDj can synchronize with other devices through the link port, so that it is possible to run both in exactly the same tempo. Enable synchronization by changing the SYNC mode in the project screen.

IMPORTANT: When running synchronized, use a groove based on 6 ticks/step. Otherwise, the resulting speed might be wrong.

5.1 Game Boy to Game Boy Sync

It is possible to sync two Game Boys running LSDj using a Nintendo Game Link cable.

5.1.1 Activating LSDj Sync

Make sure that both Game Boys are turned off. Connect the Game Boys using the link cable. Now, turn on the Game Boys, and go to the project screens. Set the SYNC mode to LSDJ on both Game Boys.

5.1.2 Song Play

When in song mode, pressing START starts both Game Boys from the same song position. The Game Boy on which you pressed START is the one that sends sync signals; this is indicated by the text LEAD appearing in the right margin. The other Game Boy shows the text SYNC, indicating that it is receiving sync signals.

5.1.3 Live Play

Pressing START in live mode makes the Game Boy start like usual; also LEAD/SYNC texts indicate that sync signals are sent between the Game Boys. When pressing START on the following Game Boy, the text WAIT appears while it is waiting for a phrase start.

5.1.4 Clipboard Transfer

When two Game Boys are linked and not playing, copying groove, chain, phrase, instr, table, wave or synth data on one Game Boy will transfer the copied data so it can be pasted on the other Game Boy.

5.1.5 Switching Lead while Playing

In some cases, it can be useful to switch which Game Boy is the lead while playing. Do this by following steps:

1. Set Game Boys to LSDJ sync.
2. Start playing.
3. Set the following Game Boy to sync OFF.
4. Stop lead Game Boy.
5. Set the following Game Boy to sync LSDJ. It now becomes the lead.

5.2 MIDI Sync

MIDI sync requires a special MIDI sync cable for Game Boy. For information on how to build a MIDI to Game Boy adapter, please refer to the website at https://www.littlesounddj.com.

Usage: Plug in the sync device before turning on your Game Boy. Then, set LSDj to MIDI sync mode. Pressing START will now make LSDj wait for and sync with any incoming MIDI clock signals. LSDj should use grooves based on 6 ticks.

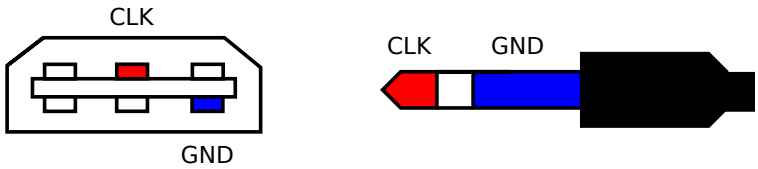

TIP!

- *When LSDj is following, it is possible to temporarily play slower or faster by pressing* A+LEFT/RIGHT *on tempo in project screen. This can be very useful when being hooked up to some external hardware that has drifted slightly out of sync.*

5.3 Analog In

LSDj can sync to music equipment that sends analog sync signals. This sync mode has been tested with the Korg Volca series, but works with other gear too; you can find a list at https://littlesounddj.wikia.com/wiki/Analog_Sync_Compatibility.

A cable should be easy to make, since no particular electronics are needed: all it takes is to splice a Nintendo Game Link Cable and a 3.5 mm mini plug cable together. The wires should be connected as shown in the below diagram: GND goes to GND, CLK goes to CLK.

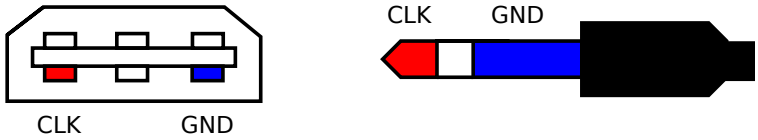


As a clarification, the above diagram is looking at the cable, and the wires are probably not red and blue in reality.

Once the cable is built, connect it to the Game Boy serial port and the SYNC OUT of your synthesizer. In project screen, set LSDj to ANALOG sync mode. The TICKS/STEP setting controls how many LSDj ticks should be generated for each incoming sync signal. Depending on the synthesizer, it may be necessary to change this setting to make LSDj run at the right speed. For Korg Monotribe, it should typically be set to 6, whereas for Korg Volca, it should be C.

5.4 Analog Out

Analog Out works similar to Analog In, except that in this mode, LSDj is responsible for sending the sync signal. The cable is different from the one used for Analog In. Build it by connecting the wires as follows:



As a clarification, the above diagram is looking at the cable, and the wires are probably not red and blue in reality. This cable should be connected to SYNC IN of your synthesizer.

5.5 Troubleshooting Cables

When making cables, double and triple check that the wires are connected to the right pins. You will need a multimeter for probing the pins. If they are not connected exactly like they should, you can get cables that nearly work, but the sync is a little off. The most common problem is flipped pins; remember that the diagrams are looking at the cable, not from it!

5.6 Keyboard Control

The KEYBD sync mode allows connecting a PS/2 keyboard to the Game Boy and playing it like a piano. This can be fun for live shows and improvisation. For information on how to build a PS/2 keyboard to Game Boy adapter, please refer to the Wiki site: https://wiki.littlesounddj.com

The keyboard must be calibrated once is plugged in. To do this, go to the project screen, set sync mode to KEYBD, and press A on the PS/2 DELAY setting. Then, press the down arrow key on your PS/2 keyboard repeatedly until LSDj says OK!

To get sound when playing the keyboard, first go to phrase screen and move cursor to note column, or press START to play the keyboard while the song is running.

5.6.1 Keyboard Note Layout

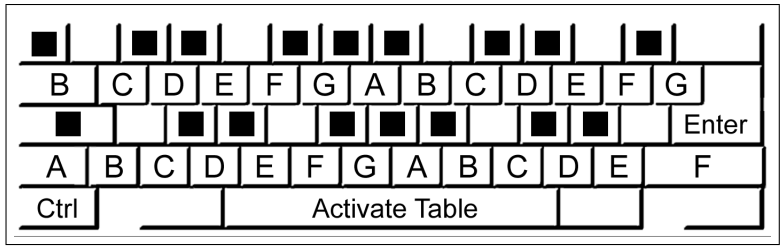


Figure 5.1: PC Keyboard Map

SPACE play using custom table

F1/F2 octave down/up

F3/F4 instrument down/up

F5/F6 select custom table to assign to SPACE

F8 change pulse instrument playback channels (PU1, PU2, PU1+2)

F9-F12 toggle channel mute (switches on key press)

CTRL+(F9-F12) tap channel mute (switches on key press and release)

CURSOR MOVEMENT KEYS move around cursor

ENTER play chain

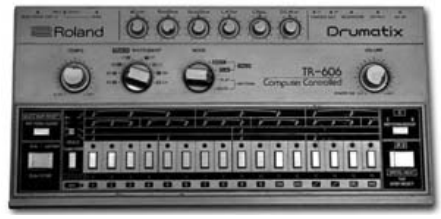
CTRL+ENTER stop chain

PAGE UP/DOWN B+UP/DOWN

Appendix A

Sample Kits

Machine	Year	Info
SP0256-AL2 General Instruments	1981	 The SP0256-AL2 Speech Processor IC contains a programmable digital filter that can be made to model a vocal tract. The 16k ROM stores both data and instructions. The pulse width modulated output can produce speech with a frequency range of 5kHz and a dynamic range of 42 dB.

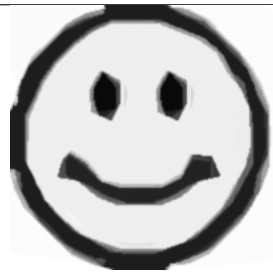
Machine	Year	Info
TR-606 Roland	1981	 The Roland TR-606 Drumatix is a programmable analogue drum machine. It was designed to couple with the TB-303 Bassline. The TR-606 has a very original sound and remains popular today.
TR-707 Roland	1984	 The Roland TR-707 has the same functions as the TR-909 with all PCM sounds. Starting with this model, Roland began using an LCD display to show the rhythm matrix and tempo.
TR-727 Roland	1985	 The Roland TR-727 is identical to the TR-707, with the exception that its sounds are Ethnic/Latin percussion. It is meant to complement a rhythm section, rather than be a main unit.

Machine	Year	Info
TR-808 Roland	1980	 The Roland TR-808 has played a defining role for the 80's Hip Hop and Electro movement. It is still highly popular, thanks to its unmistakably original sounds.
TR-909 Roland	1983	 The Roland TR-909 is one of the most popular drum machines ever. It has PCM sounds for cymbal and hi-hat, but all other instructments still come from analogue circuitry. The sounds are very useful for House and Techno music.
CR-78 Roland	1978	 The Roland CR-78 is perhaps the most luxurious rhythm machine ever made. The guiro and tambourine are still unique as of today, and bass, snare and bongos sound very soft and rich.

Machine	Year	Info
CR-8000 Roland	1981	 The Roland CR-8000 was introduced after the TR-808 – it has the same analog engine. The hi-hat sounds more realistic than older rhythm machines, but the hand clap sounds like an electric snare.
DR-55 Boss	1979	 The Boss Dr. Rhythm range of drum machines is especially designed for guitar players who need a mobile drummer. The DR-55 is a simple analogue drum machine with a very rough and direct sound.
DR-110 Boss	1983	 The DR-110, the successor of the DR-55, has analogue sound but is programmed digitally using a LCD rhythm matrix. It quite possibly has the best analogue handclap ever.

Machine	Year	Info
Drumulator E-mu	1983	 The Drumulator was the first programmable drum machine with built-in samples for under $1,000. It was the predecessor of the E-mu SP-12.
DMX Oberheim	1980	 One of the first digital drum machines. Its popularity contributed to the sound and evolution of 1980s new wave, synthpop and hip hop music.
KR-55 Korg	1979	 An advanced preset rhythm drum machine, covering genres such as Waltz, Samba, Rumba, Bossa Nova, Disco and Rock.

Machine	Year	Info
LinnDrum	1982	 The LinnDrum originally sold for $3,000 and about 5.000 units were produced. It provided the rhythm tracks of many 1980's hit records.
Rhythm Ace FR-1 Ace Tone	1965	 Ace Tone was the first company to produce electric rhythm boxes in Japan. It can be considered an early incarnation of the Roland Corporation.
Tom Sequential Circuits	1984	 The sounds are a bit dirty and harsh sounding, especially next to its older brother Drumtraks, but that also gives Tom its character. The snare sounds like nothing else on this planet - it's electric!

Machine	Year	Info
Acieed House	1990's	 This set of vocal samples was derived from a bunch of popular Acid House tracks. Can you dig it?
Animals Bud Melvin	2004	 The winner of the 2004 Animal Sample Compo. A great selection of domestic animals.

Appendix B

Allophones

Allophones marked with * loop indefinitely.

Short vowels

***IH** sitting, stranded

***EH** extent, gentlemen

***AE** extract, acting

***UH** cookie, full

***AD** talking, song

***AX** lapel, instruct

Long vowels

IY treat, people, penny

EY great, statement, tray

AY kite, sky, mighty

OI noise, toy, voice

UW1 after clusters with YY: computer

UW2 in monosyllabic words: two, food

OW zone, close, snow

AW sound, mouse, down

EL little, angle, gentlemen

R-colored vowels

ER1 letter, furniture, interrupt

ER2 monosyllables: bird, fern, burn

OR fortune, adorn, store

AR farm, alarm, garment

YR hear, earring, irresponsible

XR hair, declare, stare

Resonants

WW we, warrant, linguist

RR1 initial position: read, write, x-ray

RR2 initial clusters: brown, crane, grease

LL like, hello, steel

YY1 clusters: cute, beauty, computer

YY2 initial position: yes, yarn, yo-yo

Voiced fricatives

VV vest, prove, even

DH1 word-initial position: this, then, they

DH2 word-final and between vowels: bathe, bathing

ZZ zoo, phase

ZH beige, pleasure

Voiceless fricatives

***FF** fire, fox

***TH** this, they

***SS** sit, smile

SH shirt, leash, nation

HH1 before front vowels: YR, IY, IH, EY, EH, XR, AE

HH2 before back vowels: UW, UH, OW, OY, AO, OR, AR

WH white, whim, twenty

Voiced stops

BB1 final position: rib; between vowels: fibber, in clusters: bleed, brown

BB2 initial position before a vowel: beast

DD1 final position: played, end

DD2 initial position: down; clusters: drain

GG1 before high front vowels: YR, IY, IH, EY, EH, XR

GG2 before high back vowels: UW, UH, OW, OY, AX; and clusters: green, glue

GG3 before low vowels: AE, AW, AY, AR, AA, AO, OR, ER; and medial clusters: anger; and final position: peg

Voiceless stops

PP pleasure, ample, trip

TT1 final clusters before SS: tests, its

TT2 all other positions: test, street

KK1 before front vowels: YR, IY, IH, EY, EH, XR, AY, AE, ER, AX; initial clusters: cute, clown, scream

KK2 final position: speak; final clusters: task

KK3 before back vowels: UW, UH, OW, OY, OR, AR, AO; initial clusters: crane, quick, clown, scream

Affricates

CH church, feature

JH judge, injure

Nasal

MM milk, alarm, example

NN1 before front and central vowels: YR, IY, IH, EY, EH, XR, AE, ER, AX, AW, AY, UW; final clusters: earn

NN2 before back vowels: UH, OW, OY, OR, AR, AA

Appendix C

SRAM Memory Map

This chapter is intended for programmers. It contains information about how song data is stored in SRAM. If you use an emulator, SRAM contents are usually stored in a .sav file.

C.1 Bank Layouts

C.1.1 Bank 0

A000-AFEF phrase notes

AFF0-AFFF bookmarks

B000-B08F empty

B090-B28F grooves

B290-B58F song chains

B590-B68F empty

B690-B88F table envelopes

B890-BA4F speech instrument words

BA50-BDCF empty

BDD0-BDF9 speech instrument wordnames

BDFA-BE77 empty

BE78-BE79 mem initialized flag (set to ”rb” on init)

BE7A-BFB9 instrument names

C.1.2 Bank 1

A000-A01F empty

A020-A03F table allocation table

A040-A07F instr alloc table

A080-A87F chain phrases

A880-B07F chain transposes

B080-B47F instrument parameters

B480-B67F table transposes

B680-B87F table commands, left column

B880-BA7F table command values, left column

BA80-BC7F table commands, right column

BC80-BE7F table command values, right column

BE80-BE81 mem initialized flag (set to ”rb” on init)

BE82-BEA1 phrase allocation table

BEA2-BEB1 chain allocation table

BEB2-BFB1 softsynth params

BFB2-BFB2 clock, hours

BFB3-BFB3 clock, minutes

BFB4-BFB4 tempo

BFB5-BFB5 tune setting

BFB6-BFB6 total clock, days

BFB7-BFB7 total clock, hours

BFB8-BFB8 total clock, minutes

BFB9-BFB9 total clock

BFBA-BFBA key delay

BFBB-BFBB key repeat

BFBC-BFBC font (for cgb)

BFBD-BFBD sync mode (off/lsdj/midi/...)

BFBE-BFBE colorset

BFBF-BFBF sync parameter (e.g. analog in ticks/step)

BFC0-BFC0 clone (0=deep, 1=slim)

BFC1-BFC1 file changed?

BFC2-BFC2 power save

BFC3-BFC3 prelisten

BFC4-BFC5 synths locked?

BFC6-BFC9 last used instrument/channel

C.1.3 Bank 2

A000-AFEF phrase commands

AFF0-BFDF phrase command values

C.1.4 Bank 3

A000-AFFF waves

B000-BFEF phrase instruments

BFF0-BFF1 mem initialized flag (set to "rb" on init)

BFF2-BFFE empty

BFFF-BFFF version byte

Table C.1: Pulse Instrument SRAM Layout.

Byte	Bits	Content	Value
0	7-0	0	
1	7-0	ENV. 1	
2	7-0	PU2 TSP.	
3	6	LENGTH=UNLIM	0=yes, 1=no
	5-0	LENGTH	
4	6-0	SWEEP	
5	7	PITCH=STEP	0=no, 1=yes
	6	PITCH=DRUM	0=no, 1=yes
	5	TRANSPOSE	0=on, 1=off
	4	PITCH speed	0=fast, 1=tick
	3	TABLE speed	0=tick, 1=step
	2-1	Vibrato shape	0=sin, 1=saw, 2=sqr
	0	Vibrato direction	0=down, 1=up
6	5	Table off/on	0=off, 1=on
	4-0	Table	
7	7-6	WAVE	
	1-0	OUTPUT	
8	3-0	CMD/RATE	
9	7-0	ENV. 2	
10	7-0	ENV. 3	
11	7-0	FINETUNE	

C.2 Instrument Layouts

Tables C.1 to C.4 show the SRAM layout of the different instrument types. Each instrument takes up 16 bytes of the instrument parameter area in Bank 1.

Table C.2: Wave Instrument SRAM Layout.

Byte	Bits	Content	Value
0	7-0	1	
1	6-5	VOLUME	
2	3-0	LOOP POS	
3	7-0	WAVE	
	7-4	SYNTH	
4	-	-	
5	7	PITCH=STEP	0=no, 1=yes
	6	PITCH=DRUM	0=no, 1=yes
	5	TRANSPOSE	0=on, 1=off
	4	PITCH speed	0=fast, 1=tick
	3	TABLE speed	0=tick, 1=step
	2-1	Vibrato shape	0=sin, 1=saw, 2=sqr
	0	Vibrato direction	0=down, 1=up
6	5	Table off/on	0=off, 1=on
	4-0	Table	
7	1-0	OUTPUT	
8	3-0	CMD/RATE	
9	1-0	PLAYTYPE	0=off, 1=once, 2=loop, 3=pingpong
10	3-0	LENGTH	
11	7-0	SPEED	
12	7-0	FINETUNE	

Table C.3: Kit Instrument SRAM Layout.

Byte	Bits	Content	Value
0	7-0	2	
1	6-5	VOLUME	
2	7	LOOP 1=ATK	0=no, 1=yes
	6	SPEED=0.5X	0=no, 1=yes
	5-0	KIT	
3	7-0	LENGTH 1	0=AUTO
4	-	-	
5	7	PITCH=STEP	0=no, 1=yes
	6	LOOP 1	0=off, 1=on
	5	LOOP 2	0=off, 1=on
	4	PITCH speed	0=fast, 1=tick
	3	TABLE speed	0=tick, 1=step
	2-1	Vibrato shape	0=sin, 1=saw, 2=sqr
	0	Vibrato direction	0=down, 1=up
6	5	Table off/on	0=off, 1=on
	4-0	Table	
7	1-0	OUTPUT	
8	7-0	FINETUNE	
9	7	LOOP 2=ATK	0=no, 1=yes
	5-0	KIT	
10	7-0	DIST	d0-d3=CLIP, SHAPE, SHAP2, WRAP
11	7-0	LENGTH 2	0=AUTO
12	7-0	OFFSET 1	
13	7-0	OFFSET 2	

Table C.4: Noise Instrument SRAM Layout.

Byte	Bits	Content	Value
0	7-0	3	
1	7-0	ENV. 1	
2	0	PITCH	0=free, 1=safe
3	6	LENGTH=UNLIM	0=yes, 1=no
	5-0	LENGTH	
4	7-0	Last entered note	
5	5	TRANSPOSE	0=on, 1=off
	3	TABLE speed	0=tick, 1=step
	2-1	Vibrato shape	0=sin, 1=saw, 2=sqr
	0	Vibrato direction	0=down, 1=up
6	5	Table off/on	0=off, 1=on
	4-0	Table	
7	1-0	OUTPUT	
8	3-0	CMD/RATE	
9	7-0	ENV. 2	
10	7-0	ENV. 3	