



Little Sound Dj v1.2

Operation Manual

Little Sound Dj Operation Manual

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This program was developed using The Game Boy Developer's Kit (GBDK).

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1. Introduction

1.1. Welcome!

Thank you and congratulations for purchasing Little Sound Dj! A lot of effort has been put into this release, to make the program as fast-worked and powerful as possible. The amount of new concepts might seem overwhelming at first, especially if you've had no prior experience with the "tracker" type of music programs. I can only advise you not to panic, and to go through this documentation in an easy pace. Try to experiment and have fun in the process. Within a few days, you should have learned how to operate one of the most competent portable composing systems available! Good luck!

/Johan Kotlinski (johan@littlesounddj.com)

1.2. Important Message

Turning off the Game Boy while playing music might corrupt your song data. Remember to stop playing before turning off your Game Boy!

1.3. Game Boy Sound

The Game Boy sound chip has four channels.

Pulse Channel 1: Quadrangular wave with envelope and sweep functions.

Pulse Channel 2: Quadrangular wave with envelope function.

Wave Channel: Voluntary waveforms + pre-defined sample kits.

Noise Channel: Noise with envelope and sweep functions.

When using Little Sound Dj, you might notice some background hum. Most of it is caused by a power saving mode, and will disappear when Little Sound Dj starts playing.

1.4. Hexadecimal Number System

In order to save CPU power and screen space, Little Sound Dj uses the hexadecimal number system. It consists of 16 unique symbols: the numbers 0 to 9 and the letters A to F. For example, the decimal number 15 is represented as F in the hexadecimal numbering system. The hexadecimal system is useful, since it can represent every byte using no more than two digits.

1.5. 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

LEFT – left arrow

RIGHT – right arrow

UP – up arrow

DOWN – down arrow

LEFT/RIGHT – pressing left or right arrow

UP/DOWN – pressing up or down arrow

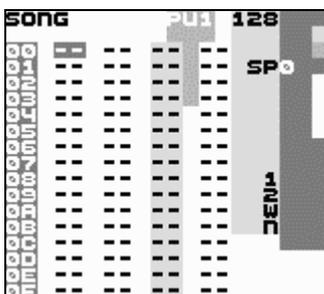
CURSOR – pressing any arrow key

SELECT + A – pressing A while holding SELECT

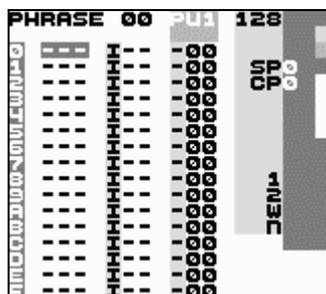
SELECT + (B, B) – pressing B twice, while holding SELECT

1.6. Getting Started

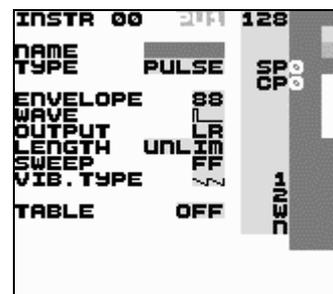
When starting up Little Sound Dj at the first time, you will be presented to the song sequencer screen. It contains four editable columns, one for each channel. At this time, all steps will contain the symbol "--", indicating that all song sequencer steps are empty. Now, let's leave the song screen for a while; press SELECT + RIGHT for entering the chain editor screen, then press SELECT + RIGHT again for entering the phrase editor screen.



The Song Screen



The Phrase Editor Screen



The Instrument Screen

The phrase editor is the most basic sequencing screen in Little Sound Dj. This is where to enter the note data to play, in an up-to-down piano roll style. Try pressing A when the cursor is on an empty step. You'll see that the empty step changes from "--" to the note

“C-3” (note C, third octave). You can adjust that note value by pressing any arrow key while holding A. Now, try to move around the cursor with the arrow keys and edit some other note values.

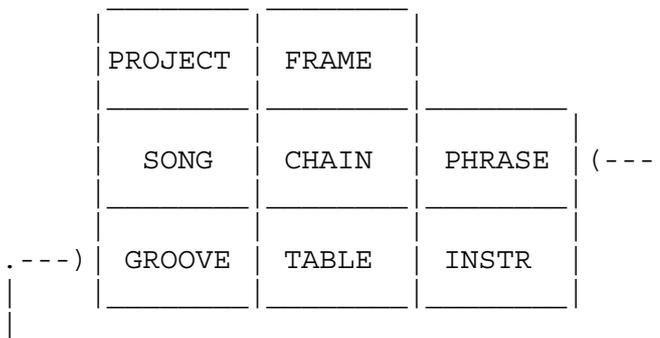
If you want to listen to the phrase, you can start and stop playing it by pressing START. You’ll probably notice that the sound is very monotonous. If you want to, you can change the parameters of the sound in the instrument screen, which can be reached by pressing SELECT + DOWN while standing in the phrase screen. Try changing the envelope and wave settings for quick results. (You can change a parameter by moving the cursor to it, and then pressing A + CURSOR.)

Note the order of which we went to the different screens: SONG->CHAIN->PHRASE->INSTRUMENT. We went to the screens in this order, because songs are built of chains, which are built of phrases, which are built of instruments. In the following chapter, we will learn more about this structure, and about the different screens in Little Sound Dj.

2. The Screens

Little Sound Dj has several screens. You can navigate between the screens by pressing SELECT + CURSOR.

2.1. Screen Map

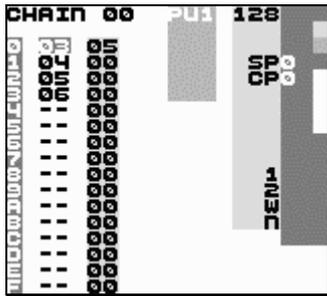


2.2. Starting And Stopping

When pressing START in the song screen, Little Sound Dj will always try to play all four channels. When pressing START in the other screens, Little Sound Dj will only try to play the channel that's indicated in the three-letter field at the top of the screen (“PU1”, “PU2”, “WAV” or “NOI”).

If you want to start playing all four channels from some other screen than the song screen, you can do that by pressing SELECT + START.

Example:



This chain would play phrase 3, adding 5 half-notes to each note, and then play each of the phrases 4, 5, 6, without transposing.

To create a chain, go to the song screen and press A twice on an empty step. Then, press SELECT + RIGHT to edit the chain you just created. To add a phrase to the chain, move the cursor to an empty step and press A. If you want to add a new phrase, press A twice.

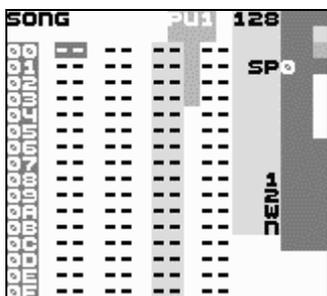
To edit a phrase, move the cursor to the phrase number and press SELECT + RIGHT.

If editing a chain, you can go to the next most chain in a neighboring channel by pressing B + LEFT/RIGHT. This channel switching method works well in the phrase screen, too.

If editing a phrase inside a chain with several phrases, you can scroll between the different phrases in the chain by pressing B + UP/DOWN, or by simply moving the cursor up or down. In this way, editing four phrases placed after each other will be much like editing a virtual 64-step phrase.

The different channels all share the same set of chains; that is, no chain is ever assigned to a specific channel. The number of chains is limited to 128 (hexadecimal: 80).

2.5. Song Screen



The song screen is the highest level of the sequencer. It contains 4 columns, one for each channel. The columns contain lists of chains, which will be played in piano-roll style, up to down. The number of rows in the song screen is limited to 256 (hexadecimal: 100).

To add a chain, move the cursor to an empty step and press A. If you want to add a chain that hasn't been used before, press A twice.

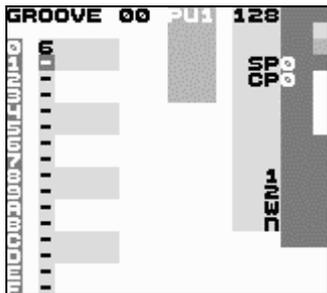
To edit a chain, move the cursor to the chain number and press SELECT + RIGHT.

2.6. Groove Screen

The groove screen allows you to edit grooves. Grooves define the rhythms with which phrases or tables should be played. The different sound channels do not necessarily have to be synchronized to each other; this means that you can use a separate groove for each phrase and table.

For understanding the groove concept, you need to know that the sequencer's time handling is based on an abstract time period called "tick". One tick is approximately 1/60th of a second (this can be changed by using the Tempo ("T") command). In the groove screen, you can specify for how many ticks each note step should be played.

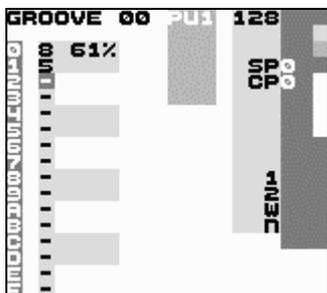
Example:



This groove would make the sequencer spend 6/60th of a second on each note step.

You can also use the groove screen to create custom rhythms.

Example:



This groove would make the sequencer spend 8/60th of a second on even note steps, and 5/60th of a second on odd note steps. This would create a swing feeling, described by the percentage value, which is calculated by the formula (first step ticks)/(first step ticks + second

step ticks). With thoughtful programming, grooves can also be used to create triplets, and other complex rhythm structures.

Groove 0 is the default groove for all phrases. If you want to, you can easily switch to another groove by using the Groove ("G") command.

You can select the groove you wish to edit by pressing B + CURSOR.

Tip: Pressing A + UP/DOWN will change the swing percentage, while keeping the total number of ticks – and thus, the resulting song speed – constant. (Example: 7/6 58% => A + UP => 8/5 66%)

Tip 2: If you switch to the groove screen when the cursor is standing on a groove command in the phrase or table screens, Little Sound Dj will display the groove that is selected with the groove command.

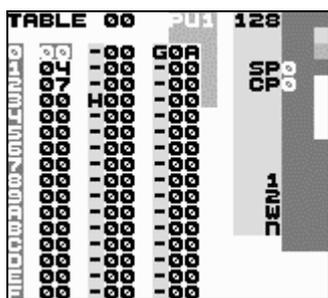
The number of grooves is limited to 32 (hexadecimal: 20).

2.7. Arpeggiator Table Screen

The arpeggiator table screen contains five columns. First out the transpose column, which contains the numbers of half notes with which the notes being played should be transposed. The other columns are command columns, just like the one in the phrase screen.

A typical use for the arpeggiator is to create chords, by changing the transpose values rapidly.

Example:



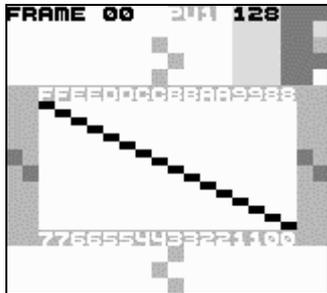
This arpeggiator would emulate striking a C major, provided that the groove number A is very fast. (As a default, the A groove is set to 1, the fastest possible setting.)

The arpeggiator can also be used as a kind of micro-sequencer, since it implements all of the commands found in the phrase screen. It allows for creating complex instruments, envelopes and effects.

To view a different table, press B + CURSOR.

The number of arpeggiator tables is limited to 32 (hexadecimal: 20).

2.8. Wave Screen



In this screen, you can edit the 256 (0-FF) wave frames, by using the cursors. The wave frames are used in the WAVE instrument type, and can be selected in the instrument screen or by using the SET WAVE FRAME ("F") command.

Copy and paste works well in this screen. A useful trick is drawing the first half of the wave, marking and copying it, and then pasting to the other half. You can then mark the other half and press A + UP/DOWN in order to flip it vertically. Pressing A + LEFT/RIGHT would flip the marked portion of the wave frame horizontally.

By default, the wave frames are filled with filtered square and saw tooth waves, divided into 16 sets. The first digit of the frame number chooses a set:

- 0-3: low-pass filtered saw tooth waves, 4 levels of resonance
- 4-7: low-pass filtered square waves, 4 levels of resonance
- 8-B: high-pass filtered saw tooth waves, 4 levels of resonance
- C-F: high-pass filtered square waves, 4 levels of resonance

The second digit of the frame number sets cutoff.

To view a different wave frame, press B + CURSOR.

2.9. Instrument Screen



Here, you can edit the instrument parameters. It's possible to copy and paste entire instruments, by pressing B while holding SELECT for copy and pressing A while holding SELECT for paste.

There are four types of instruments available:

- PULSE. This instrument type produces quadrangular waves, and is used in pulse channels 1 and 2.
- WAVE. This instrument type produces custom waveforms, and is used in the wave channel. (These waveforms can be edited in the frame screen.)
- KIT. This instrument type plays sampled kits, stored in ROM. (The samples are stored in 4 bits, 11.468 kHz.) This instrument is used in the wave channel.
- NOISE. This instrument type produces different kinds of pitched noise, and is used in the noise channel.

General Instrument Parameters

These parameters are used in all kinds of instruments.

NAME – name the instrument by pressing A.

TYPE – use this to specify the instrument type. Different parameters will be listed, depending on your choice.

LENGTH - change the sound length.

PAN - pan the sound to left/right/both/none speakers. (Use the headphone output to hear the difference!)

TABLE - if not "OFF", Little Sound Dj will start running the specified table when a note is played. If you want to edit the table, move the cursor to this parameter and press SELECT + LEFT.

Pulse Instrument Parameters



These parameters are special for pulse instruments:

ENVELOPE - first digit is initial amplitude (0-F); second digit is release (0,8: none, 1-7: decrease amplitude, 9-F: increase amplitude).

WAVE - choose the wave type to be used.

SWEEP - modulate the frequency. This only works on channel 0. See Sweep ('S') command documentation for further information.

VIB. TYPE - change the effect of the Vibrato ('V') command.

The PU2 detune settings can be used to create interesting phase effects, when the same melody is played on both pulse channels:

PU2 TUNE – detune channel 2 in half tones.

PU2 FINE – detune channel 2 in small steps.

Wave Instrument Parameters



These parameters are special for wave instruments:

VOLUME - set amplitude (0=0%, 1=25%, 2=50%, 3=100%)

FRAME - set wave frame (Wave frames can be edited in the frame screen.)

VIB. TYPE - change the effect of the Vibrato ('V') command.

Kit Instrument Parameters



These parameters are special for kit instruments:

KIT – choose the kit to use.

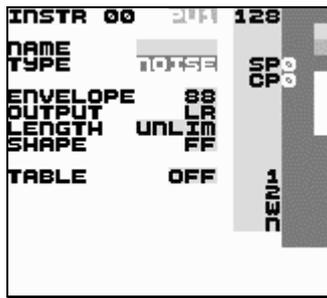
LOOP – loop the sample. (OFF=don't loop, ON=loop sound and start playing from OFFSET, ATK=loop sample and start playing from the beginning.)

SPEED – select full speed or half speed.

OFFSET – this parameter sets the loop start. If LOOP is set to OFF, this value can be used for skipping the initial part of a sound.

VIB. TYPE – change the effect of the Vibrato ('V') command.

Noise Instrument Parameters



These parameters are special for noise instruments:

ENVELOPE - first digit is initial amplitude (0-F); second digit is release (0,8: none, 1-7: decrease amplitude, 9-F: increase amplitude).

SWEEP - modulate the frequency. See Sweep ('S') command for further information.

The number of instruments is limited to 32 (hexadecimal: 20).

2.10. Project Screen



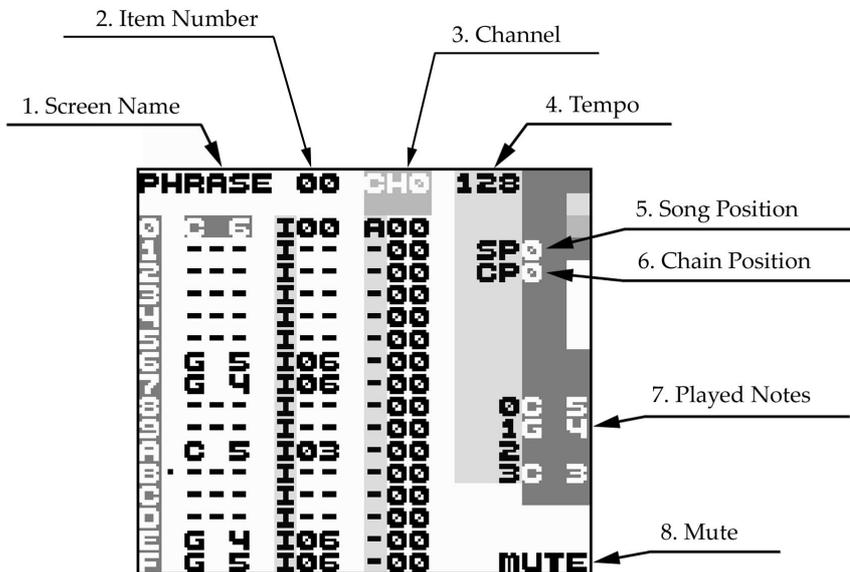
The project screen contains settings that affect the entire program.

- TEMPO – change the tempo.
- TUNE – adjust the pitch of the pulse and wave channels, by a given number of half notes.
- SYNC – activate Game Boy to Game Boy synchronization. (Read more about this in chapter 5!)
- KEY DELAY – set the delay time before key repeat is activated.
- KEY REPEAT – set the period of the key repeat.
- PURGE SEQUENCER – clear all phrases and chains that are not used in the song.
- PURGE INSTRUMENT – clear all instruments that are not used in the song.
- RESET ALL MEMORY – obvious.

This screen also contains two clocks. The “TIME USED” clock displays the time Little Sound Dj has been used since the last memory reset, in hours and minutes. The “TOTAL” clock displays the time Little Sound Dj has been used in total, in days, hours and minutes.

2.11. Border Information

A lot of useful data is displayed in the screen border.



1. Screen name.
2. Frame/groove/phrase/chain/instrument/table number.
3. The active channel, or, horizontal song position.
4. The current tempo, in BPM.
5. SP - Song Position.
6. CP - Chain Position.
7. Played notes.
8. Mute. (Will be lit when pressing B + SELECT.)

3. Advanced Editing

3.1. Copying And Pasting

Little Sound Dj has a RAM clipboard for temporary data storage. Pressing B + A will cut a single value 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 the cursor around. 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 row

SELECT + (B, B, B) - quick-mark an entire screen

When having marked a block, you can often change all data inside that block by pressing A + CURSOR.

3.2. Live Mode

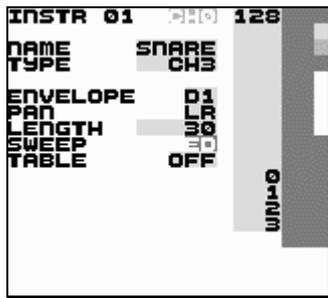
The live mode is a special flavor of the song screen. It can be reached by pressing B + LEFT/RIGHT while standing in the song screen. In the live mode, it is possible to start and stop playing chains one by one. In contrast to the usual song screen, the different channels can be started and stopped independently. It is also possible to jump between different song positions while playing, without causing audio glitches or lost synchronization.

To begin playing a channel at a specific song position, go to the channel and song position you want to play, and press START. To stop playing a channel, go to the channel and press SELECT + START. To "solo" a channel, go to the channel and press B + START.

3.3. Micro-Loops

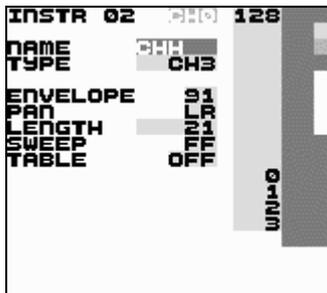
Micro-loop building is a useful live mode technique. This technique is based on the fact that the song sequencer (when being in the live mode) won't rewind the song position all the way up to the first song sequencer step when encountering end of track; instead, it stops rewinding as soon as it encounters an empty step.

Snare



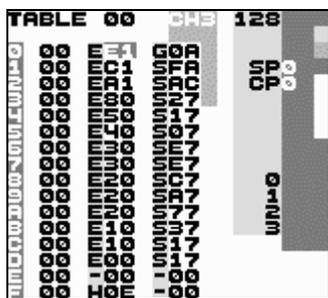
Use the noise channel for creating snare drum sounds. The amplitude envelope should have a strong attack and fast decay – try setting it to C1. Use the length parameter to create more snappy sounding snares. The sweep parameter can be used for adjusting the timbre – sweep values close to EC might prove useful.

Hi-Hats And Cymbals



Hi-hats are created using the noise channel. Use a sweep value of FF for selecting a timbre with high frequency content. Change the envelope and length parameters for creating the desired amplitude envelope. For emulating cymbals, use a sweep value near EE to create a somewhat rougher timbre.

Taking Advantage Of Tables



For adding that extra punch to percussive instruments, you can use the table parameter in the instrument screen in order to auto-run a table that executes a sequence of envelope (“E”) and sweep (“S”) commands rapidly.

4. Speech Programming

Introduction

Little Sound Dj contains fifty-nine discrete speech sounds (called allophones), stored in the first four kit banks. By combining these sounds, it is possible to create any English word or phrase.

Linguistics

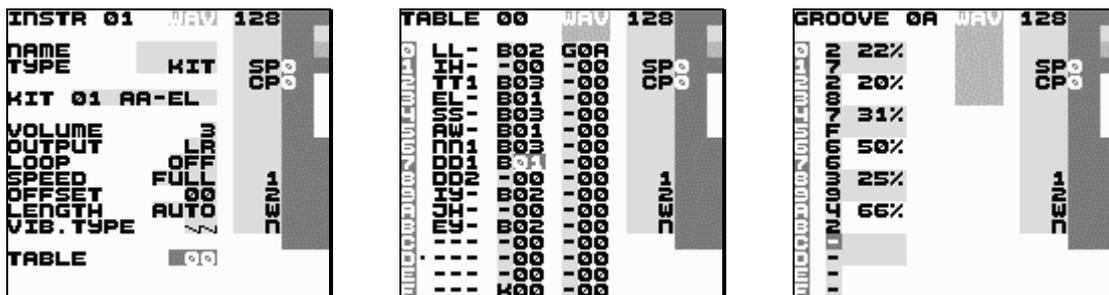
A few basic linguistic concepts will help you create your own library of words. First, there is no one-to-one correspondence between written letters and speech sounds; secondly, speech sounds are acoustically different depending on their position within a word.

The first problem compares to the problem that a child encounters when it learns to read. Each sound in a language may be represented by more than one letter, and conversely, each letter may represent more than one sound. Because of these spelling irregularities, it is necessary to think in terms of sounds, not letters, when using allophones.

The second, and equally important, point to understand is that the acoustic signal of a speech sound may differ depending on its position within a word. For example, the initial **K** sound in **coop** will be acoustically different from the **K**'s in **keep** and **speak**.

Programming Words

So, we want Little Sound Dj to say a word or a phrase. The phrase sequencer is (ironically enough) not ideal for this, since it's difficult to get precise timing using phrases. We will instead create a new kit instrument, and allocate a fresh table for that instrument. Like this:



This example instrument is now programmed to say "Little Sound Dj." Note the use of the 'B' command for switching between the vocal kit banks and allowing for allophone triggering in the table sequencer. In order to get the timing right, it is also necessary to create a custom groove for the table, as we have done here.

4.1. Guidelines for using the allophones

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

* These allophones can be repeated.

5. Game Boy To Game Boy Sync

Little Sound Dj implements Game Boy to Game Boy sync, starting with v1.0B. This requires two Game Boys, two Little Sound Dj cartridges and one Game Boy link cable. (Link cables can be purchased in most toy stores.)

Important!

You must never plug or unplug the link cable to a Game Boy that is turned on. You must also make sure that the SYNC mode is set to OFF before turning off your Game Boys. Doing otherwise might cause song data corruption.

Activating 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.

In the PROJECT screen, you'll find a SYNC parameter, which can be adjusted by pressing A + LEFT or A + RIGHT. Set the first Game Boy to MASTER and the second Game Boy to SLAVE. Now, the second Game Boy will receive ticks from the first Game Boy through the link cable, ensuring that they will play at the same tempo.

The sync works in two different ways, depending on whether the sequencer is in live mode or not...

Using sync with both carts in song play mode

Press START on the slave Game Boy. It will display the text "WAIT" in the bottom right corner, indicating that it is waiting for tick signals from the master Game Boy. Now, press START on the master Game Boy, and the slave Game Boy will start playing on the same song position as the master Game Boy.

Pressing START again on the master Game Boy will stop both Game Boys, putting the slave Game Boy in WAIT mode.

Using sync with both carts in live play mode

Both Game Boys are operated as usual, the difference being that they stay synced.

Sync will be lost on one occasion only: when the master Game Boy is stopped, and the slave Game Boy is still playing. Then, stop the slave Game Boy and start again.

MIDI sync

MIDI sync requires the MIDI->GB cable produced by Daniel Viksporre (digitales@altavista.com).

Plug in the MIDI->GB cable before turning on your Game Boy. Then, set Little Sound Dj to "MIDI" slave sync mode. Pressing START will now make Little Sound Dj wait for and sync with any incoming MIDI clock signals. Little Sound Dj should use phrase grooves based on 6 ticks.

Nanoloop sync

Nanoloop is a Game Boy music program that can be found on <http://www.nanoloop.de>. Nanoloop can sync to Little Sound Dj using a normal Game Boy link cable.

Set Little Sound Dj to "NANO" master sync mode, and set Nanoloop to MIDI slave mode. Little Sound Dj should use grooves based on 6 ticks.

6. Commands

Commands can be used in phrases and tables. Tip: Simply tapping A on a command letter will display a scrolling help text in the lower right corner!

A: Run Arpeggiator Table

Run a table. This command can be used inside a table, for jumping to another table.

Example:

A03 - run table 3

B: Bank Select

Select kit bank. This command is used for sequencing kit sounds in tables. It transforms the transpose column into a column that can be used for triggering sounds in the selected kit.

E: Amplitude Envelope

For pulse and noise channels:

The first value digit sets the initial amplitude (0=min, F=max); the second digit sets the release (0,8: off, 1-7: decrease, 9-F: increase).

For the wave channel:

E00 - volume 0%
E01 - volume 25%
E02 - volume 50%
E03 - volume 100%

F: Wave Frame (wave channel only)

Select the wave frame for the wave channel.

Example:

F02 - start using wave frame 2 for wave sounds

G: Groove Select

Select the groove to use when playing phrases or tables in this channel. If selecting a groove that's already being used for playing, this command will have no effect.

Example:

G04 - select groove 4

H: Hop

This command has two different functions, depending on whether it is used in the phrase or the table screen.

In the phrase screen, it is used for jumping to the next phrase, without playing the current phrase to its end.

Example:

H00 - hop to next phrase

H03 - hop to next phrase and start play at phrase row 3

In the table screen, it is used for creating loops.

Example:

H21 - hop to table position 1, 2 times.

H04 - hop to table position 4 forever.

K: Kill note

Example:

K00 - kill note instantly

K03 - kill note after 3 ticks

M: Set Master Volume

Example:

M77 - max volume

M35 - medium, panned slightly to the right

M00 - very quiet

O: Set Output

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

P: Pitch Bend/Pitch Shift (pulse and wave channels only)

Bend the pitch. When this command is used on "kit" instruments, it sounds more like a pitch shifter (very useful).

Example:

P02 - bend up pitch with speed 2

PFE - bend down pitch with speed 2 (hexadecimal FE=-2)

R: Re-trig the latest played note

Play the latest played note again. The first digit modulates the volume (0=no change, 1-7=increase, 8-F=decrease). The second digit sets a period for the re-triggering. If a value larger than zero is given, the re-triggering will be repeated with a period of n ticks. On some drum-machines, this effect is called "flam".

Example:

R00 - re-trig note once

RF3 - medium speed flam, decreasing amplitude (echo effect)

R01 - very fast flam

S: Sweep/Shape (pulse 1, kit and noise instruments only)

This command has different effects for different channels.

On pulse channel 1, 'S' modulates the pitch, using the Game Boy hardware. It is useful for creating bass drums and percussion.

On the kit channel, '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.)

On the noise channel, 'S' works like a filter.

It's difficult to understand this command by pure logic; the best idea is to experiment and see what you can come up with.

This information is taken from the Pan of ATX Game Boy hardware documentation:

---8<---

FOR PULSE CHANNEL 1:

Bit 6-4 - Sweep Time
Bit 3 - Sweep Increase/Decrease
0: Subtraction (frequency decreases)
1: Addition (frequency increases)
Bit 2-0 - Number of sweep shift (n: 0-7)

Sweep Time: 111: sweep off - no freq change
110: 7.8 ms (1/128Hz)
101: 15.6 ms (2/128Hz)
100: 23.4 ms (3/128Hz)
011: 31.3 ms (4/128Hz)
010: 39.1 ms (5/128Hz)
001: 46.9 ms (6/128Hz)
000: 54.7 ms (7/128Hz)

The change of frequency (NR13, NR14) at each shift is calculated by the following formula where X(0) is initial freq & X(t-1) is last freq:

$$X(t) = X(t-1) +/- X(t-1)/2^n$$

FOR NOISE CHANNEL:

Bit 7-4 - Selection of the shift clock frequency of the polynomial counter
Bit 3 - Selection of the polynomial counter's step
Bit 2-0 - Selection of the dividing ratio of frequencies

Selection of the dividing ratio of frequencies:

111: $f * 1/2^3 * 2$
110: $f * 1/2^3 * 1$
101: $f * 1/2^3 * 1/2$
100: $f * 1/2^3 * 1/3$
011: $f * 1/2^3 * 1/4$
010: $f * 1/2^3 * 1/5$
001: $f * 1/2^3 * 1/6$
000: $f * 1/2^3 * 1/7$ $f = 4.194304 \text{ MHz}$

Selection of the polynomial counter step:

0: 7 steps
1: 15 steps

Selection of the shift clock frequency of the polynomial counter:

1111: dividing ratio of frequencies * $1/2$
1110: dividing ratio of frequencies * $1/2^2$
1101: dividing ratio of frequencies * $1/2^3$
1100: dividing ratio of frequencies * $1/2^4$
:
:
:
:
1010: dividing ratio of frequencies * $1/2^{14}$
0001: prohibited code
0000: prohibited code

T: Tempo

Change the tick frequency so that the given BPM will be produced. The BPM setting will be 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 $LSDJ_BPM=(DESIRED_BPM*TICKS_PER_STEP)/6$.

Example:

T80 - tempo = 80 hexadecimal BPM = 128 decimal BPM

V: Vibrato (pulse and wave channels only)

Example:

V42 - period=4, depth=2

W: Wave (pulse channels only)

Select one of the four different waveforms available for the pulse channels.

7. Overview Of Key Presses

This is an overview of key presses valid in the phrase screen. The key pressing philosophy expressed here is used as consequently as possible throughout the entire program.

A: insert note on empty step

A + RIGHT: note up

A + LEFT: note down

A + UP: octave/+10 up

A + DOWN: octave/-10 down

B + A: cut note to clipboard

SELECT + B: start marking

SELECT + (B, B): mark row

SELECT + (B, B, B): mark all

| [When having marked a block...]

+--A + RIGHT: all marked up

+--A + LEFT: all marked down

+--A + DOWN: all marked octave/-10 down

+--A + UP: all marked octave/+10 up

+--SELECT + A: cut the marked block to the clipboard

SELECT + (B, B, B, B): copy the entire screen to the clipboard

SELECT + A: paste from the clipboard

B + RIGHT: view the phrase in the rightmost channel

B + LEFT: view the phrase in the leftmost channel

B + UP: view previous phrase in chain

B + DOWN: view next phrase in chain

[SONG MODE] START: start/stop playing this phrase

[SONG MODE] SELECT + START: start/stop playing all channels

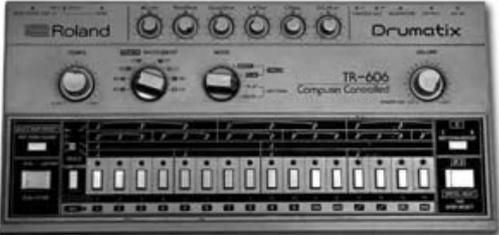
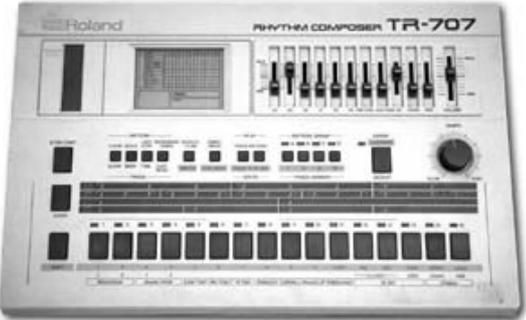
[LIVE MODE] START: start playing this channel

[LIVE MODE] SELECT + START: stop playing this channel

B + SELECT: mute all channels temporarily

[LIVE MODE] B + START: solo this channel

8. The Sample Kits

Kit	Origin	Year	Info	Sounds
Speech	General Instruments	1981	 <p>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.</p>	59
TR-606	Roland	1981	 <p>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.</p>	8
TR-707	Roland	1984	 <p>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.</p>	15
TR-727	Roland	1985	<p>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.</p>	16

TR-808	Roland	1980	 <p>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.</p>	16
TR-909	Roland	1983	 <p>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 instruments still come from analogue circuitry. The sounds are very useful for House and Techno music.</p>	11
CR-78	Roland	1978	 <p>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 are very soft and rich sound.</p>	14

CR-8000	Roland	1981	 <p>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.</p>	16
DR-55	Boss	1979	 <p>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.</p>	5
DR-110	Boss	1983	 <p>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.</p>	6

Drumulator	E-mu	1983	 <p>The Drumulator was the first sample based drum machine to sell for less than \$1000. It's known for its classic and gritty lo-fi sound, and the machine can be heard in several 80's Electro tracks.</p>	12
DMX	Oberheim	1984	 <p>The Oberheim DMX is less realistic than the Linn, but slightly more powerful. The sounds are very 80's pop, but it was also used in early Hip Hop and Electro.</p>	10
KR-55	Korg	1979	 <p>The Korg KR-55 was designed as an organ-top rhythm box.</p>	10

LinnDrum	Linn	1982	 <p>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.</p>	16
Rhythm Ace	Ace Tone	1973	 <p>Ace Tone was the first company to produce electric rhythm boxes in Japan. In the UK, Bentley Pianos (who put stickers on all their products) distributed Ace Tone, and thus the machine is also known as the Bentley Rhythm Ace.</p>	16
Sequential Circuits	Tom	1984	 <p>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!</p>	8
Acieed	House	1990's	 <p>This set of vocal samples was derived from a bunch of popular Acid House tracks. Can you dig it?</p>	14