LSDJ™

Little Sound Dj v1.1

Operation Manual

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…And all the people on the Little Sound Dj mailing list!

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.

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 as two hexadecimal 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 twice for entering the phrase editor screen.
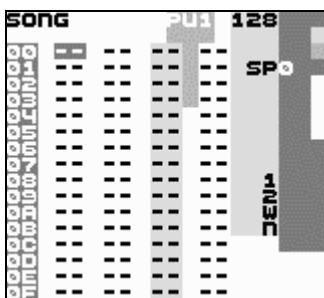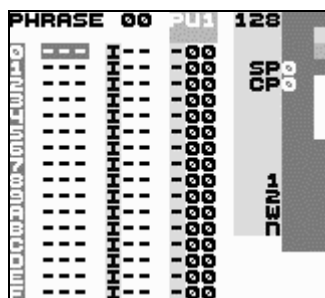
The Song Screen   *The Phrase Editor Screen*   *The Instrument Screen*
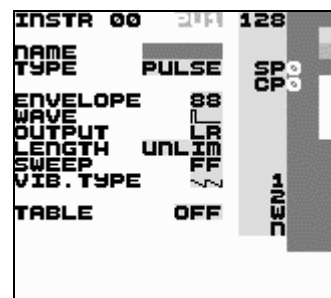
The phrase editor is the most basic sequencing screen in Little Sound Dj. This is where to enter the note data to play, in an up-to-down piano roll style. Try pressing A when the cursor is on an empty step. You'll see that the empty step changes from "---" to the note "C-3" (note C, third octave). You 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.

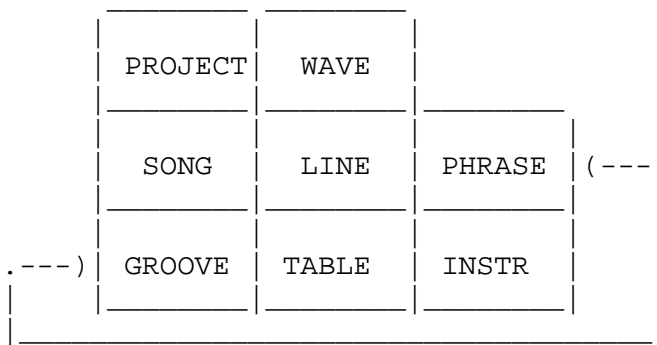If you want to listen to the phrase, you can start and stop playing it by pressing START. You'll probably notice that the sound is very monotonous. If you want to, you can change the parameters of the sound in the instrument screen, which can be reached by pressing SELECT + DOWN while standing in the 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.)

2. The Screens

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

2.1. Screen Map

```
             _____  _____
            |          |          |
            | PROJECT  |  WAVE    |
            |_____|_____|_____
            |          |          |          |
            |  SONG    |  LINE    | PHRASE   | (---.
            |_____|_____|_____|    |
            |          |          |          |    |
    .---)   | GROOVE   | TABLE    | INSTR    |    |
    |       |_____|_____|_____|    |
    |_____|
```

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 "CH" field at the top of the screen.

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.

It is always possible to mute all channels temporarily by pressing B + SELECT. If B and SELECT is released exactly at the same time, all channels will stay muted until a key is pressed.

2.3. Phrase Screen
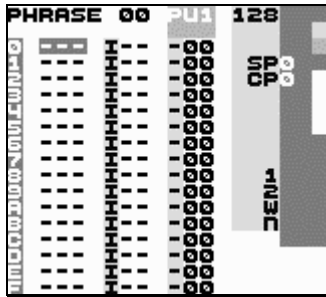
The phrase screen is the most basic part of the sequencer; this is where you enter the actual note data. The phrase screen has four columns: the note column, the instrument select column, the command column and the command value column. As a default, phrases are set to the length 16 steps.

You can enter data by pressing A + CURSOR. A + LEFT/RIGHT changes the values in small steps (+-1), A + UP/DOWN changes the values in big steps (+-10). You can delete a value by pressing B + A.

The number of phrases is limited to 255 (hexadecimal: FF). The number of the phrase that is being edited is displayed in the top left corner of the screen.

2.4. Chain Screen

Chains are used for linking together several phrases into one unity, thus creating a longer rhythm block, a melody or a bass line.

The chain screen contains two columns. The first column contains the list of phrases that are to be played by this chain, while the second column transposes the phrase that's on the same row.

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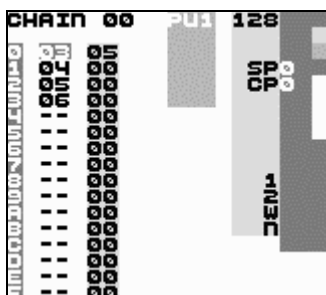
This chain would play phrase 3, adding 5 half-notes to each note, and then play each of the phrases 4, 5, 6, without transposing.

To add a phrase to the chain, move the cursor to an empty step and press A. If you want to add a phrase that hasn't been used before, 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 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 number of chains is limited to 128 (hexadecimal: 80).

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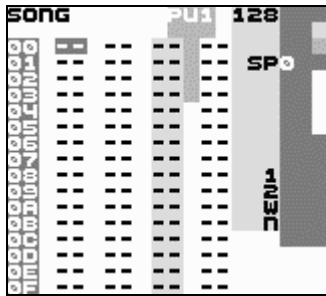
The song screen is the highest level of the sequencer. It contains 4 columns, one for each channel. The columns contain lists of chains, which will be played in piano-roll style, up to down. The number of rows in the song screen is limited to 256 (hexadecimal: 100).

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:
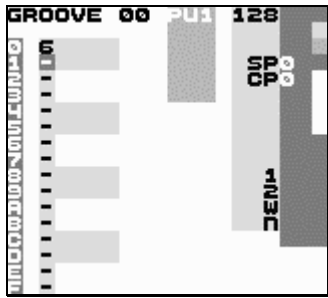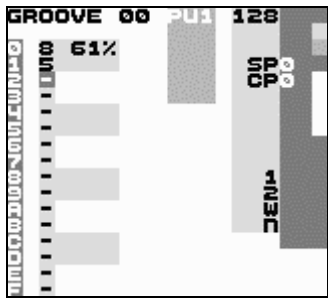

This groove would make the sequencer spend 6/60th of a second on each note step.

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 executing the Groove ("G") command.

You can select the groove you wish to edit by pressing B + CURSOR. Special feature: 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:
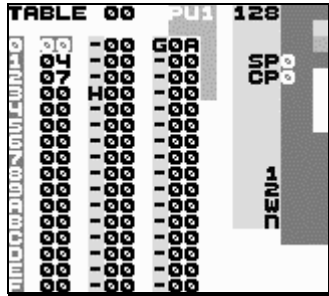
This arpeggiator would emulate striking a C major, provided that the groove number A is very fast. (As a default, the A groove is set to 1, the fastest possible setting.)

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
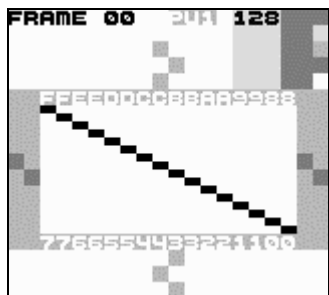
In this screen, you can edit wave frames that are supposed to be played by the wave channel, by using the cursors.

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.

When you are done editing, you can select the wave frame you wish to play, either by using the instrument editor or the SET WAVE FRAME ("F") command.

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

The number of wave frames is limited to 256 (hexadecimal: 100).

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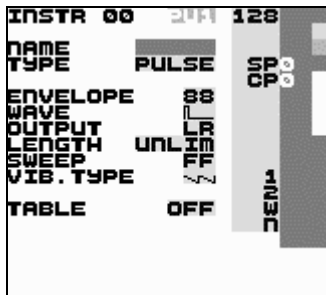
Here, you can edit the instrument parameters. It's possible to copy and paste entire instruments, by pressing B while holding SELECT for copy and pressing A while holding SELECT for paste.

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
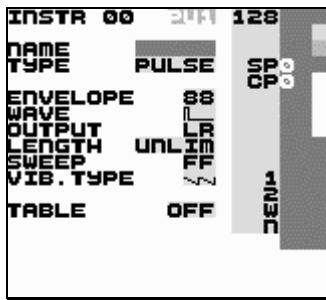
These parameters are special for pulse instruments:

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.

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

- 14 -

These parameters are special for kit instruments:

KIT – choose the kit to use.
LOOP – loop the sounds.
SPEED – select full speed or half speed.
OFFSET – this parameter modifies the starting point, and is used skip the initial part of a sound.
VIB. TYPE – change the effect of the Vibrato ('V') command.

Noise Instrument Parameters
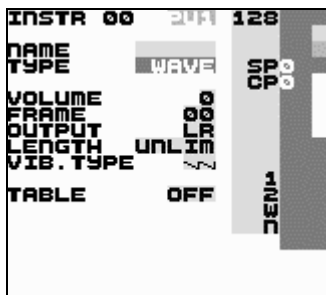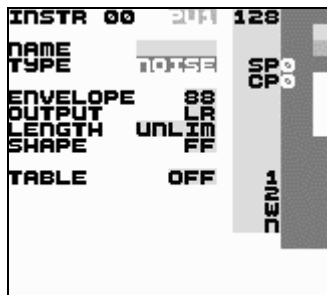

These parameters are special for noise instruments:

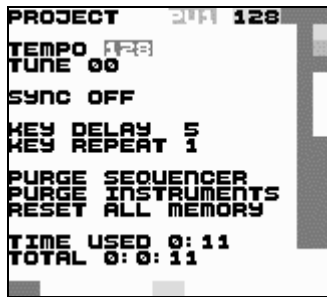ENVELOPE - first digit is initial amplitude (0-F); second digit is release (0,8: none, 1-7: decrease amplitude, 9-F: increase amplitude).
SWEEP - modulate the frequency. See Sweep ('S') command for further information.

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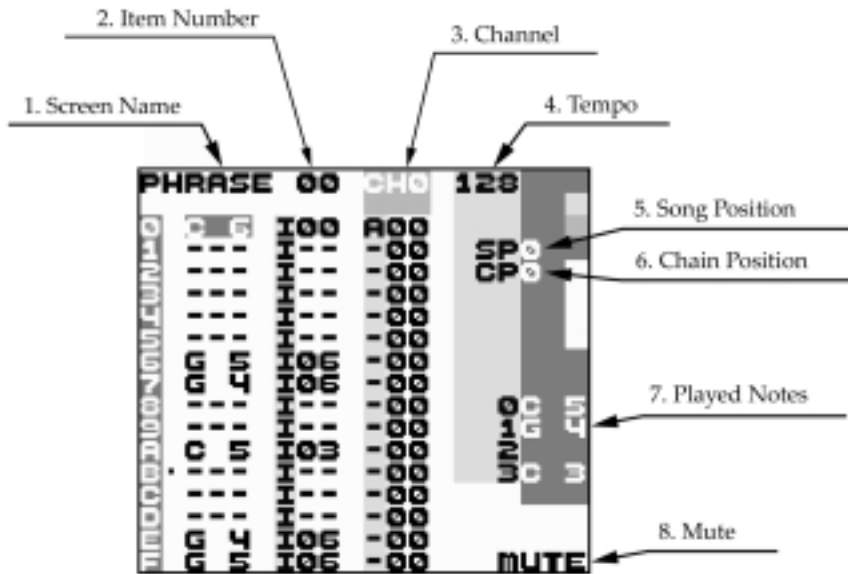
1. Screen name.
2. Frame/groove/phrase/chain/instrument/table number.
3. The active channel, or, horizontal song position.
4. The current tempo, in BPM.
5. SP - Song Position.
6. CP - Chain Position.
7. Played notes.
8. Mute. (Will be lit when pressing B + SELECT.)

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.

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.

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.

Example:

We have a setup that looks like this…
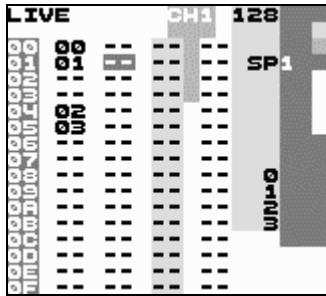
Assume that we start playing pulse channel 1 at song position 4. One could expect that the sequencer would play chains 2 and 3, and then go back to the first step for playing chains 0 and 1. This is not the case, when the live mode is activated! Instead, the player will loop chains 2 and 3. Defining a number of such micro-loops to alternate between would provide a good starting point for a live performance.

3.4. Creating Synth Drum Instruments

Creating good-sounding drum instruments without using sampled drum kits might be a bit troublesome, if you've had no prior experience with drum synthesis. Nevertheless, it is very useful to know the technique. Here are some starting-out ideas.

Kick

Use Pulse Channel 0 for creating kick drum sounds. The amplitude envelope should have a strong attack and fast decay – try setting it to C1. Wave should be 50-50 high/low, even though other waves can be used for making the instrument sound more distorted. The sweep value is maybe the most important part in creating a successful kick instrument. It should have a high initial frequency and decay. Try setting it to a value of E3. For a more snappy sounding kick, try experimenting with the envelope and length parameters.

Snare

```
INSTR 01   CH3  128
NAME       SNARE
TYPE       CH3

ENVELOPE      D1
PAN           LR
LENGTH        30
SWEEP         E0
TABLE        OFF
                   0123
```
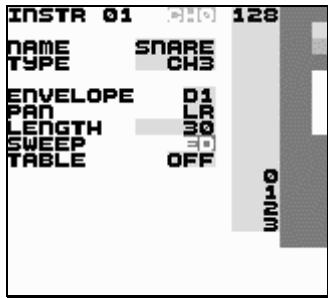
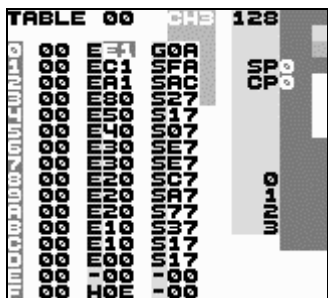Use the noise channel for creating snare drum sounds. The amplitude envelope should have a strong attack and fast decay – try setting it to C1. Use the length parameter to create more snappy sounding snares. The sweep parameter can be used for adjusting the timbre – sweep values close to EC might prove useful.

Hi-Hats And Cymbals

```
INSTR 02   CH3  128     INSTR 03   CH3  128     INSTR 04   CH3  128
NAME       CHH           NAME       OHH    SP    NAME       CYM
TYPE       CH3           TYPE       CH3           TYPE       CH3

ENVELOPE      91        ENVELOPE      A3        ENVELOPE      86
PAN           LR        PAN           LR        PAN           LR
LENGTH        21        LENGTH     UNLIM        LENGTH     UNLIM
SWEEP         FF        SWEEP         FF        SWEEP         ED
TABLE        OFF        TABLE        OFF        TABLE        OFF
                 0123                    0123                    0123
```

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

```
TABLE 00   CH3  128
0  00 EF1 G0A
1  00 EC1 SFA   SP
2  00 EA1 SAC   CP
3  00 E80 S27
4  00 E50 S17
5  00 E40 S07
6  00 E30 SE7
7  00 E30 SE7
8  00 E20 SC7
9  00 E20 SA7        0123
A  00 E20 S77
B  00 E10 S37
C  00 E10 S17
D  00 E00 S17
E  00 -00 -00
F  00 H0E -00
```

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. Game Boy To Game Boy Sync

Little Sound Dj v1.0B implements Game Boy to Game Boy sync. 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.)

4.1. 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 deactivated before turning off your Game Boys. Doing otherwise might cause song data corruption.

4.2. 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…

4.3. 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.

4.4. 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.

5. Commands

Commands can be used in phrases and tables.

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

E: Amplitude Envelope

For pulse and noise channels:

The first value digit sets the initial amplitude; 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: Retrig the latest played note

If a value larger than zero is given, repeat the triggering with a period of n ticks. On some drum-machines, this effect is called "flam".

Example:

 R00 - retrig note once
 R03 - medium speed flam
 R01 - the fastest flam

S: Sweep (pulse 1 and noise channels only)

Modulate the pitch, using the Game Boy hardware. Good for creating drum sounds. It's really difficult to understand this command by pure logic; the best idea probably is to try some different values and see what you can come up with.

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

```
---8<---
          FOR CHANNEL 0:

             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 CHANNEL 3:

        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 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
```

---8<----

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.

6. 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 all 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

START: start/stop playing this phrase
SELECT + START: start/stop playing all channels
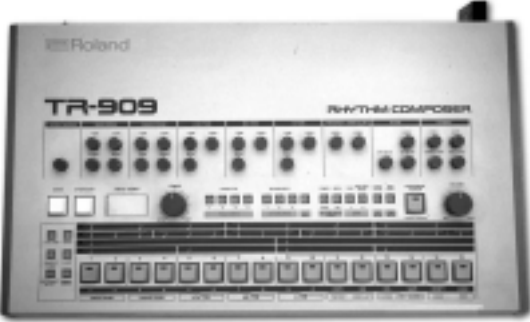
B + SELECT: mute all channels temporarily
B + START: solo this channel (when in LIVE mode)

7. The Sample Kits

Kit	Origin	Year	Info	Sounds
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.	8
TR-707	-"-	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.	9
TR-727	-"-	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.	16
TR-808	-"-	1980	The Roland TR-808 has played a defining role for the 80's Hip Hop and Electro movement. It is still highly	16

			popular, thanks to its unmistakably original sounds.	
TR-909	-"-	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 instruments still come from analogue circuitry. The sounds are very useful for House and Techno music.	11
CR-78	-"-	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 are very soft and rich sound.	14
CR-8000	-"-	1981
The Roland CR-8000 was introduced after the famous 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. | 16 |

DR-101, DR-55	Boss	1983, 1979	The Boss Dr. Rhythm range of drum machines is especially designed for guitar players that need a mobile drummer. The DR-110 is especially interesting for its handclap; the DR-55 has a more direct and rough sound.	6+5
Drumulator	E-mu	1983	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.	12
DMX	Oberheim	1984	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.	10

KR-55	Korg	1979	The Korg KR-55 was designed as an organ-top rhythm box.	10
LinnDrum	Linn	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.	16
Rhythm Ace	Ace Tone	1973	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.	16
Acieed	House	1990's	This set of vocal samples was derived from a bunch of popular Acid House tracks. Can you dig it?	14