xOxbOx

Bass line Synthesizer

User Manual

Get the latest version of this manual at:

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http://forums.ladyada.net/index.php?c=2

Note: This manual is for version 1.9.1 of the SokkOS firmware.
Other firmwares have important differences.

TABLE OF CONTENTS

Introduction

This manual is intended to teach you the various functions of the synthesizer. The manual is divided up into 3 sections. The first section describes all of the buttons, switches and ports individually. You should at least skim this section first so you know what we mean when we refer to the 'bank knob.' The second section is divided up by function and describes each function in detail and also provides examples for how to peform common tasks. The third section describes how to use the optional control software.

Since the x0xb0x is a 'living project,' there may be new versions of this document describing new functions. Be sure to check that this manual corresponds to the hardware, firmware and software version you have. The hardware version is written on the mainboard PCB. The firmware and software version can be verified through the computer control software.

This manual is written for:

x0xb0x 1.0 Hardware

SokkOS 1.9.1 Firmware

x0xb0x 1.0 Software

No manual is perfect, but we can strive for completeness. If you feel like there's something amiss (whether it be poor spelling, obfuscated language, or confusing pictures) send your suggestions and corrections to support@x0xsource.com. Chances are, you're not the only one.

We hope you enjoy using your x0xb0x to make hardcore acid tracks.

Feature Overview

Synthesizer capabilites:

- Monophonic, 4 octave VCO
- Saw and square waveform
- Adjustable cutoff frequency, resonance, envelope modulation, decay, and accent

Sequencer capabilites:

- Easy-to-use sequencer allows for quick pattern & track entry and editing with combined pitch and time
- Intuitive track and pattern play with 2 octaves of pitch shift, rest, accent and slide override, as well dynamic chaining of up to 16 patterns or tracks
- Syncing with MIDI and Roland DIN (DINSYNC)
- MIDI, DINSYNC, and CV/Gate output
- EEPROM memory (no lithium battery)
  - Up to 128 patterns of up to 16 notes each
  - Up to 64 tracks of up to 16 patterns each
- Upgradable firmware (additional features possible)

Input/Output interfaces:

- Headphone output (¼")
- Line-level output (¼")
- Line-level input (¼")
- MIDI-in/out/thru
- DINSYNC-in/out
- CV-out (⅛"), Gate-out (⅛")
- USB for computer interface and control

Section 1
Switches, Knobs, and I/O
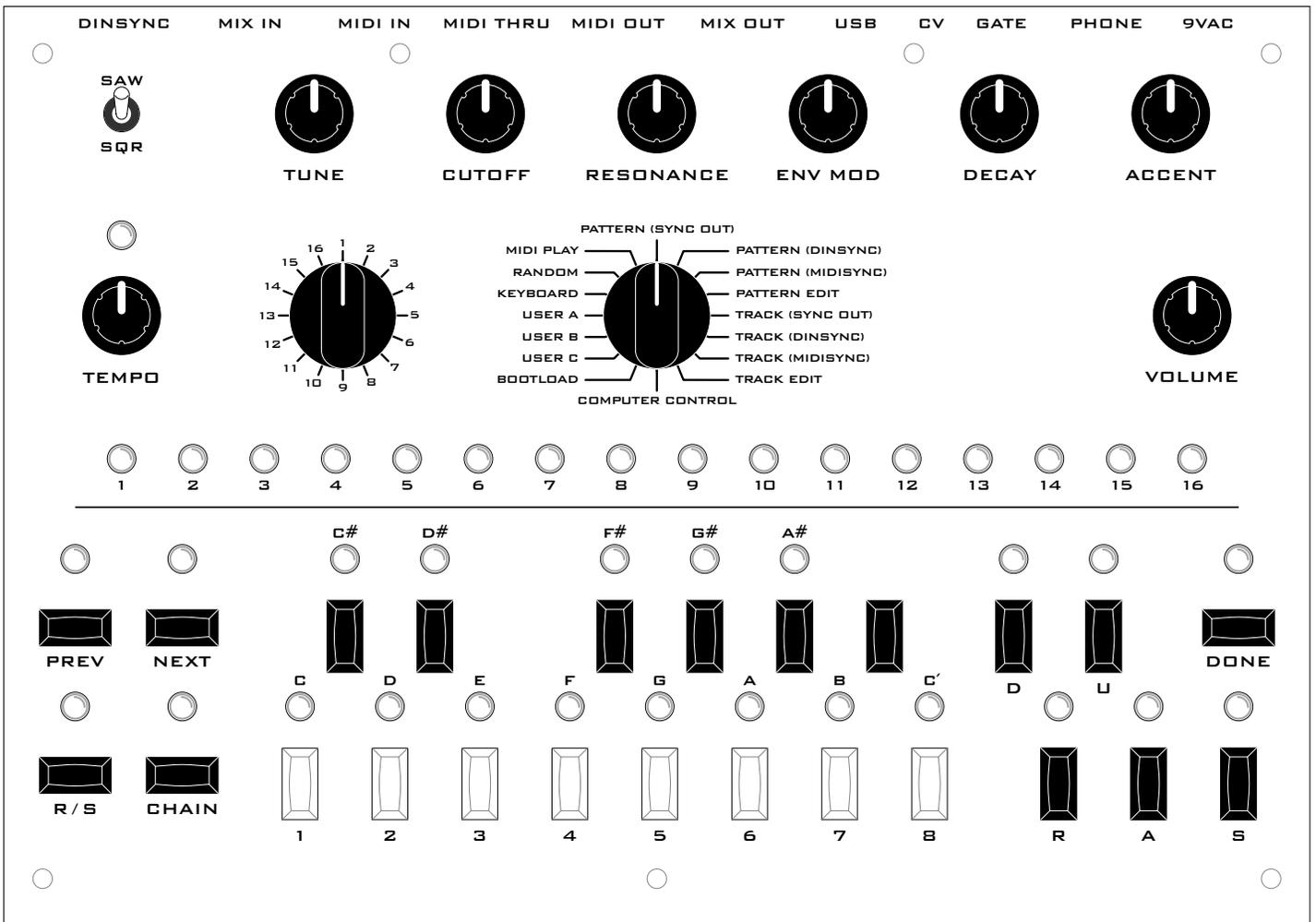
Sequencer Controls

The great thing about the x0xb0x is that it's not just a synthesizer, it also has a sequencer. Most of the buttons, except the seven analog potentiometers, are dedicated to interfacing with the sequencer. In fact, the sequencer cannot read or control the analog sound parameters, such as resonance, cutoff, and env. mod. This means that although the x0xb0x plays pre-recorded patterns, it is a live musical instrument.

Function Knob
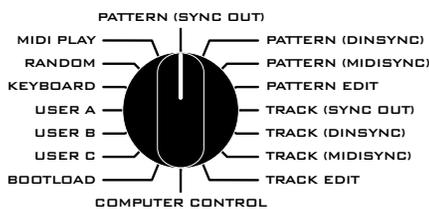
The **function knob** sets the mode of the synthesizer. It's functionality is the same in every mode: the x0xb0x is in the mode indicated by the knob. If the knob is changed, the current mode will be exited and all modifications (such as unsaved patterns or tracks, chains, pitch shifts, etc.) will be discarded. The only exception to this rule is *Bootload Mode* which is only active if the x0xb0x is powered on with the **function knob** in this position.

Each mode is described in detail in section II.

Bank Knob
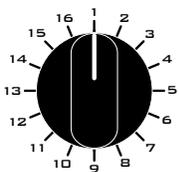
The **bank knob** has many uses. Its primary use is to select between banks of memory when writing or reading patterns and tracks. When addressing patterns, there are 16 banks and so all positions address a seperate bank. When addressing tracks, however, there are 8 banks. Therefore, bank position 9-16 are equivalent to positions 1-8 (respectively).

Another use of the **bank knob** is to change the MIDI address of the device in *MIDI Play* or *Keyboard* mode.

Tempo Knob & LED

The tempo knob is a rotary encoder, not a potentiometer. This means that tempo is adjusted by turning it left (down) or right (up) but that the particular location of the knob is irrelevant. (That is, turning the knob while the x0xb0x is powered off will not affect the tempo.)

The tempo is stored in internal memory on the microcontroller and can be precisely set using the x0xb0x control software.

The tempo is incremented or decremented one BPM per detent. The minimum tempo is 20BPM, the maximum is 300BPM. The current tempo is indicated by the tempo LED which sits above the tempo knob.

It is also used as the *tap-tempo* button in *pattern play* and *track play* modes.

The tempo knob is not functional when syncing with external signals such as DINSYNC or MIDI Sync. However, the tempo LED will always indicate the current tempo, even when sync'd to an external signal.

Prev/Next Keys & LEDs

The **next key** and **prev key** are used in the *track edit* and *pattern edit* modes to index through patterns and tracks.

In addition, the next key is used to start step-write editing method in both *pattern edit* and *track edit* in which case the **next LED** will be lit
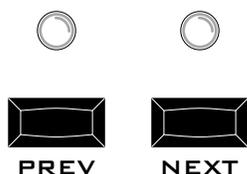
Run/Stop Key & LED

The **run/stop key** is used to start and stop the sequencer. In *pattern edit* and *track edit* modes, pressing **run/stop** will start or stop either run or run-edit. In *pattern play* and *track play* with sync out, it will start or stop playing the selected patterns and tracks. The **R/S LED** indicates when the sequencer is running.

In *pattern play* and *track play* modes with external sync (such as MIDI clock or DINSYNC), the button doesn't do anything, but the **R/S LED** will still light up when the sequencer receives the proper external start command.
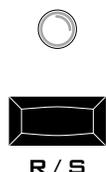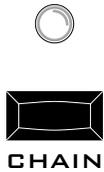
Chain Key & LED

The **chain key** is primarily used to create pattern and track chains in *pattern play* and *track play*: the button is held down while the desired chain is entered.

It is also used to create random patterns in *pattern edit* mode.

Bank LEDs

The strip of 16 numbered LEDs is used as visual feedback in many of the different x0xb0x modes. In general, it is used to indicate the currently selected bank or the current position in a pattern or track.

In *MIDI Play* and *Keyboard* mode, it indicates the current MIDI address.

Numbered Keys and LEDs

The 8 white keys as a group are sometimes referred to as the **numbered keys.** (These keys are also used and referred to as as **note keys** when used as a one-octave keyboard.)

The numbered keys are used to address patterns and tracks in a bank while playing and editing.

The LEDs indicate the current pattern or track selected. In pattern play and track play modes, a blinking LED indicates the currently playing pattern or track and lit LEDs indicate patterns and tracks "waiting to be played."

Note Keys and LEDs

These 13 keys as a group are referred to as the **note keys.** They are also sometimes individually referred to by their label (i.e. "press the **C'** key"). The note keys are used to enter musical information.

In *pattern edit* mode, they are used to edit notes in a pattern.
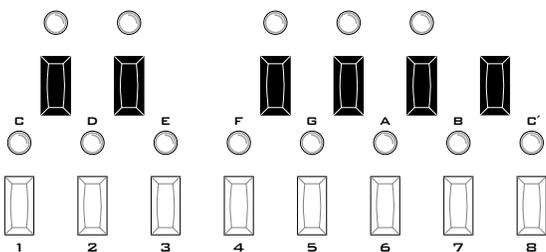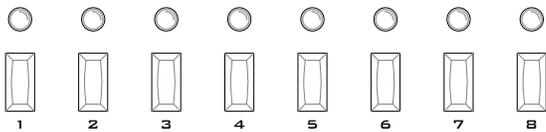
In *track edit* and *track/pattern play* mode, they are also used to enter in the desired pitch shift.

In *keyboard mode*, they are used as a one octave keyboard.

In some case the octave can be changed with the **Up** and **Down** keys.

Done Key & LED
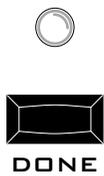
The **done key** is used to save tracks and patterns in *pattern edit* and *track edit* mode.

The **done LED** often indicates the end of a pattern or track (in *pattern edit* and *track edit* mode) or that a pattern or track is empty (in *pattern play* and *track play* modes)

Down/Up Keys & LEDs
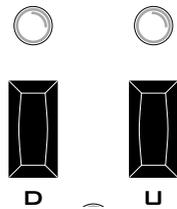
The **up key** and **down key** are used to extend the range of the single-octave keyboard. In *pattern edit* and *keyboard* mode, pressing the **down key** will lower the octave (no lower than the lowest octave) and pressing the **up key** will raise the octave (no higher than the 3rd octave). The LEDs will also indicate which octave is in use.

lowest octave   *second octave*   *third octave*
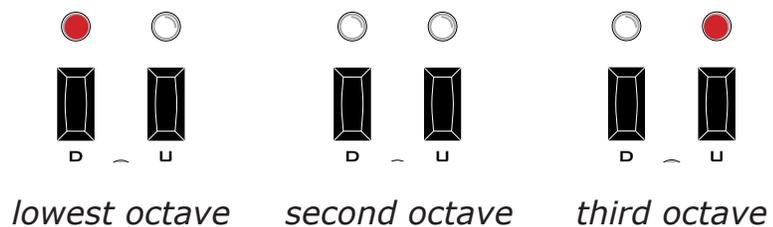
In *track edit* and *track play* mode, the **up/down keys** are used to transpose patterns and tracks. Patterns can be transposed either up (one octave) or down (one octave). Pressing the relavent button will display the amount of transpose in that direction on the **note keys**. the LEDs will also indicate if the pattern/track is transposed and in which direction.

Rest/Accent/Slide Keys & LEDs
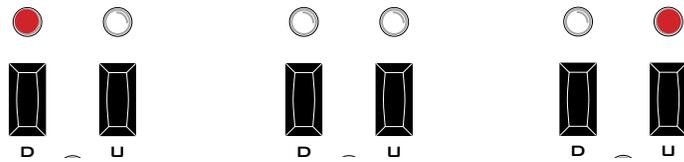
transposed down   *no transpose*   *transposed up*

The **rest key**, **accent key**, and **slide key** (and leds) are used to apply and indicate mute, accenting and portamento. Since they are often used as a group, they are sometimes referred to as the **RAS** keys and leds. While they have different effects in each mode, the overall meaning of their use is the same:
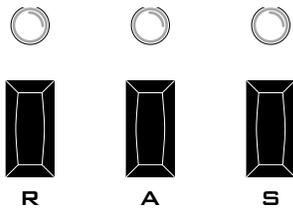
In *pattern edit* mode, they are use to create rest notes, accented notes and slides between notes. In *track edit* mode, they are used to mute patterns, accent entire patterns, and portamento entire patterns.

In *pattern play* and *track play* mode, they provide 'instantanous'/temporary over-riding mute, accent and slide.

In *keyboard mode*, only accent is used (sliding between notes occurs automatically when multiple keys are pressed).

Lit **RAS LEDs** indicate that the effect is currently active.

Section II

Methods of Operation

PATTERN (SYNC OUT)

MIDI PLAY —————— PATTERN (DINSYNC)

RANDOM —————— PATTERN (MIDISYNC)

KEYBOARD —————— PATTERN EDIT

USER A —————— TRACK (SYNC OUT)

USER B —————— TRACK (DINSYNC)

USER C —————— TRACK (MIDISYNC)

BOOTLOAD —————— TRACK EDIT

COMPUTER CONTROL
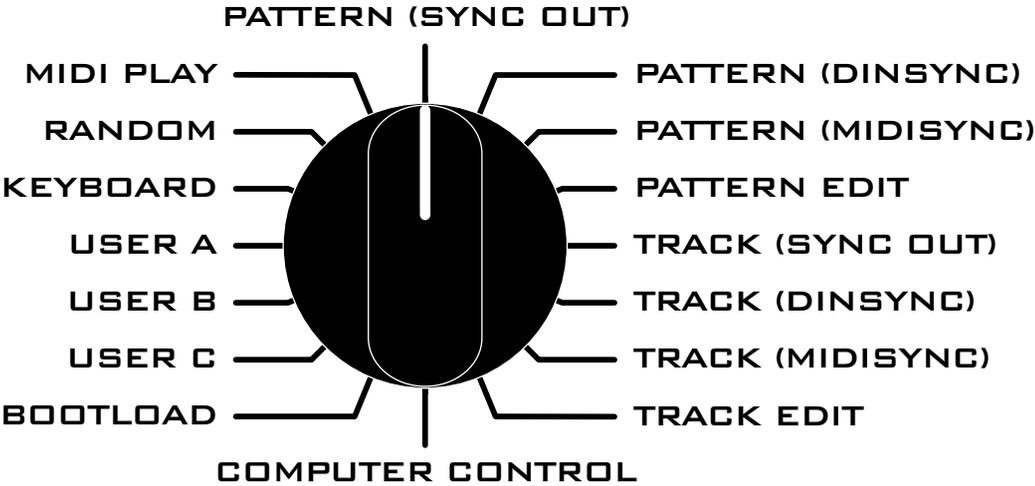
Keyboard Mode

Introduction

Keyboard mode is the quickest way to get sound out of the x0x-b0x.

In keyboard mode, the x0xb0x acts like a monophonic MIDI keyboard. Use it to try out pattern ideas or to test the electronics.

Mode Inputs:

Sound on *Mix-In*

Mode Outputs:

Sound on *Mix-Out* and *Headphone*

MIDI information on *MIDI-Out*

CV/Gate analog information on *CV* and *Gate*

Playing the keyboard

To enter keyboard mode, turn the **function knob** to Keyboard

Play notes by using the 13 notekeys. Each notekey's LED will turn on when the key is pressed.

You can slide between notes by pressing a new notekey without releasing the old one.

You can change octaves by pressing the UP or DOWN keys. The x0xb0x is capable of four octaves. The first octave is active when the DOWN LED is lit. The second is active when no LEDs are lit (the default octave). The third when UP LED is lit. The fourth when UP LED is flashing. The lowest note is 32.7 Hz C, and the highest is 523 Hz C.

Notes can be accented by pressing the ACCENT key. When accent is on, the accent LED will be lit.

Every time a notekey is pressed, a corresponding MIDI "Note On" signal is sent. Every time a notekey is released, the corresponding "Note Off" message is sent. Accented notes have the maximum **MIDI velocity** value.

The current **MIDI address** (1 through 15) is displayed on the **strip of 16 LEDs**. You can change the MIDI address by turning the **bank knob**.

Whenever the x0xb0x is generating sound, its **CV** and **Gate** outputs are active. Use them to drive an analog synth like the SH-101. The CV voltage can be tuned with TM6, although TM5 and TM4 will then have to be retuned.

MIDI Play Mode

Introduction

MIDI Play mode is the most common way to connect the x0xb0x to a computer or external sequencer.

The x0xb0x is a monophonic synthesizer, so it can only play MIDI tracks created with that in mind. Tracks with overlapping notes will sound incorrect.

This mode doesn't allow playing patterns or tracks while sync'd to MIDI. Instead, use Pattern Play (MIDISYNC) or Track Play (MIDI-SYNC) modes.

Mode Inputs:

     Sound on ***Mix-In***

     MIDI information on ***MIDI-In*** and ***MIDI-Thru***

Mode Outputs:

     Sound on ***Mix-Out*** and ***Headphone***

     MIDI information on ***MIDI-Out***

     Tempo information on ***DINSYNC***

     CV/Gate analog information on ***CV*** and ***Gate***

Using MIDI

To enter MIDI play mode, turn the **Function knob** to MIDI play.

The current MIDI address (1-15) is displayed on the strip of 16 LEDs. To change the MIDI address, turn the Bank knob.

To accent notes, make the MIDI velocity value larger than 100 (0x64 decimal).

Pattern Edit Mode

Introduction

The x0xb0x contains a sequencer that can play patterns and tracks, and drive other synthesizers. Patterns are sequences of notes. Tracks are sequences of patterns.

A patterns can contain up to 16 elements. Each element is either a note, an accented note, a rest, or a slide.

There are 16 'banks' and 8 'sub-banks' per bank, allowing the storage of 128 patterns.

Mode Inputs:

> Sound on **Mix-In**

Mode Outputs:

> Sound on **Mix-Out** and **Headphone**
>
> MIDI information on **MIDI-Out**
>
> Tempo information on **DINSYNC**
>
> CV/Gate analog information on **CV** and **Gate**

Comparison with TB-303

The original TB-303 saved patterns in volatile RAM. If the internal lithium battery failed, the patterns would be lost. In the x0xb0x, patterns are saved on an EEPROM chip.

The The Roland TB-303 used a strange method of programming which required entering notes and timebases separately. It was difficult to use, although it would sometimes lead to "interesting patterns." The x0xb0x sequencer features a simplified pattern-entry. If one desires "interesting patterns," one may drink heavily.

CREATING PATTERNS

To enter pattern edit mode, turn the **Function knob** to Pattern Edit

The basic method by which one programs patterns is:

1. Load pattern from permanent memory into a 'scratch pad.'

2. Use either step-write (go though each note one at a time, adding or changing notes) or run-write (play the pattern repeatedly and change notes as buttons are pressed) mode to modify the scratch pad

3. Save the scratch pad to permanent memory.

SELECTING THE PATTERN BANK

Begin by rotating the bank knob. Note: scratchpad memory will be cleared and unsaved changes will be lost!

Specify the bank by turning the bank knob. Specify the sub-bank by pressing one of the notekeys labeled '1' through '8'. A corresponding LED will turn on.

The scratchpad is now loaded with previously saved data. At this point, you can start editing the scratch pad using either run-write or step-write mode.

EDITING PATTERNS IN STEP-WRITE MODE

Step-write mode is the comprehensive way to write new patterns or edit existing patterns. To enter step-write mode, press the NEXT key.

The strip of 16 LEDs indicates the current note, and the other LEDs display its parameters.

Press a notekey to change the note's pitch. Press NEXT to edit the next note. Press PREV to change a previous note (this LED doesn't turn on). Press DONE twice to save the new pattern.

Press R/S to hear it play.

Each note has a pitch, but can also have additional parameters. UP and DOWN specify the octave (see: Octaves). ACCENT creates an accented note (see: Accent). SLIDE continues or bends the previous note instead of "plucking the string." Use SLIDE to create longer notes. REST deletes note data and inserts a pause (a skipped note).

If the DONE LED is lit, the current note is the last note in the pattern. If NEXT is pressed, the note location will be reset back to 1. To add notes to the pattern, press one of the notekeys.

The active pattern can be rotated (note 1 becomes note 2, note 2 becomes note 3, and the last note becomes note 1). Hold PREV and press NEXT to rotate one step forward. Hold NEXT and press PREV to rotate one step backward.

To save the scratch pad into permanent memory at the current bank/location (and exit step-write mode), the DONE key must be pressed twice on the last note of the pattern. For example, if the pattern is 4 notes long, the DONE key must be pressed when the LED #4 is lit.

You can save to a different bank/location by pressing DONE once, selecting the bank using the BANK knob, selecting the location using a numbered key, and pressing DONE again to save to that bank/location.

To listen to the pattern in the scratch pad, press R/S to enter run-write mode. Save the scratch pad before doing this or it will be erased!

Pressing CHAIN doesn't do anything in step-write mode.

Pressing the NEXT key while in run-write mode will allow you to edit in step-write mode while the sequencer continues to play in the background.

Editing Patterns in Run-write Mode

Run-write mode allows you to listen to the pattern and modify it as it plays. New notes cannot be added in run-write mode, nor can the pattern be shortened. The tempo at which the pattern is 'run' is set by the tempo knob (no other syncs are available).

To enter run-write mode, press R/S. The R/S key should light up. Unsaved scratch pad data will be erased.

The pattern will now loop in time with the tempo. Each note location (out of 16) is indicated on the light-strip. The current note data (rest, accent, slide, octave, note) is indicated using the LEDs.

The current note data can be changed by pressing REST (turns note into a rest note), ACCENT & SLIDE (toggles accent and slide on that note), octave UP (raises note one octave, no higher than 'high' octave), octave DOWN (lowers note one octave, no lower than 'low' octave) or any of the 13 note keys, changing to the note in the same octave as the previous.

The active pattern can be rotated backward or forward one step at a time. Hold PREV and press NEXT to rotate one step forward. Hold NEXT and press PREV to rotate one step backward.

To erase the pattern in the scratch pad hold CHAIN and press the TEMPO knob. To erase the pattern from permanent memory, the now empty scratch pad should be saved using the DONE key.

Pressing the DONE key twice at any time saves the entire scratch pad back into permanent memory in the original bank/location, effectively replacing the previous pattern. To save into a different bank/location, press DONE once and use the BANK knob and numbered keys to choose the bank and location. Press DONE again to save it to that bank/location. The DONE LED should blink, and the pattern will continue looping.

To leave run-write mode (retaining the scratch pad data but not saving it to permanent memory) press the R/S key again at any time.

Run-write mode outputs MIDI note data while playing.

Pressing CHAIN during run-write mode will reshuffle the current pattern in the scratch pad in the following way:

[1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16] -->

[7 8 9 12 13 14 15 16 2 3 4 5 6 1 10 11]

Pattern Play Mode

Introduction

Pattern play mode is used to play various patterns programmed into the x0xb0x memory in an arbitrary order. Theres a lot of functionality in pattern-play mode, allowing for looping multiple patterns together, changing pitch, tap-tempo, different syncs, all-rest, all-slide and all-accent modes, etc.

There are 3 different pattern play modes - SYNC OUT, MIDISYNC, and DINSYNC. The difference between the modes is the tempo. In SYNCOUT mode, the tempo is internally generated by the microcontroller, and adjusted by the tempo knob or by tap-tempo, and MIDI sync & DINSYNC signals are sent out to control other synthesizers or drum machines. In MIDISYNC, the tempo comes from MIDI Clock messages on the MIDI IN port. In DINSYNC, the tempo comes from the DINSYNC port. Otherwise, all three modes have the same functionality.

Mode Inputs:

    Sound on ***Mix-In***

    MIDI tempo information on ***MIDI-In*** and ***MIDI-Thru***

    Tempo information on ***DINSYNC***

Mode Outputs:

    Sound on ***Mix-Out*** and ***Headphone***

    MIDI information on ***MIDI-Out***

    Tempo information on ***DINSYNC***

    CV/Gate analog information on ***CV*** and ***Gate***

Selecting single patterns to play

There are 16 banks and 8 sub-banks for storing patterns, for a total of 128 total possible patterns to play.

To select the pattern bank, turn the pattern BANK knob to the desired bank. The pattern location will be set to 1 by default.

To select the pattern location, press one of the 8 numbered keys.

If the x0xb0x is not playing a pattern, the selected pattern location LED will be lit and this pattern will be immediately played when it receives a start signal (from internal or external sync)

If the x0xb0x is playing a pattern, the newly selected pattern location LED will start blinking and this pattern will be played after the current pattern is finished.

To play multiple patterns, use pattern chaning, descibed below.

Chaining patterns

Patterns within one bank can be chained together, in arbitrary order, up to 32 patterns in a row. In this way, repetitions of patterns can be programmed, either for playing or for trying out possible tracks.

Press and hold down the CHAIN key. The CHAIN LED will light up and the numbered key LEDs will be cleared, showing that a new chain is ready to be entered.

While still holding down the CHAIN key, select the patterns to be put in the chain by pressing the 8 numbered keys, one at a time. The patterns will be entered in order of selection. The same pattern can be entered multiple times. Chains can be 1 to 32 patterns long. Patterns in the chain will light up solid as they are selected.

Once the chain has been decided on, release the CHAIN key. The chain will start playing at the end of the next pattern.

While a chain is playing, the patterns in the chain will light up solid, the current pattern playing will be blinking

Essentially, selecting a single pattern is the same as creating a 1-pattern-long chain.

Using Sync Out

When using Pattern Play (sync out) the tempo is created by the x0xb0x using either the TEMPO knob or tap-tempo. Whenever the tempo is changed, it is displayed via the TEMPO LED.

Turning the TEMPO knob clockwise increases the tempo by 1 BPM per 'click.' Turning the TEMPO knob counter-clockwise decreases the tempo by 1 BPM per 'click.'

Tap-tempo allows the tempo to be set by measuring the time between button presses. To set the tempo via tap-tempo, press the TEMPO knob two or more times. The tempo will be set by measuring the delay between the last two knob presses.

In sync out mode, the x0xb0x can be used to control other synthesizers via MIDI out or DINSYNC by generating clocking signals. By default the sync rate is 24 DINSYNC pulses and 24 MIDI clocks per quarter note. Start signals (MIDI start and DINSYNC start line high) are generated when the pattern starts playing (by pressing the RUN/STOP key) and stop signals (MIDI stop and DINSYNC start line low) are generated when the pattern stops (pressing RUN/STOP again, or changing out of pattern play.)

To start playing patterns, press the RUN/STOP key. The pattern will always start playing at note step #1. This will also send DINSYNC and MIDI start signals.

The pattern(s) will continue playing until the RUN/STOP key is pressed again, or the FUNCTION knob is changed to a different function. This will also send DINSYNC and MIDI stop signals.

Using MIDI Sync

MIDI sync allows the x0xb0x tempo, start/stop and pattern selection to be controlled via another computer or synthesizer. Make sure the MIDI cable is plugged into the MIDI IN jack. The x0xb0x listens for "MIDI Start," "MIDI Continue," "MIDI Stop," and "MIDI Clock" messages. These messages do not use the MIDI address specification.

To start playing the current pattern, send a MIDI Start message.

There should be 24 MIDI Clock messages per quarter note.

To stop playing the current pattern, send a MIDI Stop message

DINSYNC

Older (pre-MIDI) synths and drum machines such as the Roland TR-606/808/909 used a proprietary sync signal that made use of a DIN connector and MIDI-like cables. The DINSYNC port can both output and input tempo and pattern start/stop information.

Pitch Shifting

Pitch-shifting allows the current pattern to be played at a higher or lower scale than was originally programmed in. The pitch can be shifted in either direction, in 1/2 note increments, up to one octave. Pitch-shifting is available in all three modes.

To shift the pitch up, hold down the UP key. The current pitch shift is displayed as a blinking light on the note keys. A pitch shift of 0 is displayed as low C, a pitch shift of +1/2 note is displayed as C#, A pitch shift of +1 octave is displayed as high C. If no LEDs light, the current pitch shift is negative. To select a new pitch shift, press a note key while the UP key is held down. The new pitch shift value will light up solid and will become effective at the start of the next pattern.

To shift the pitch down, hold down the DOWN key. The current pitch shift is displayed as a blinking light on the note keys. A pitch shift of 0 is displayed as high C, a pitch shift of -1/2 note is displayed as B, etc. If no LEDs light, the current pitch shift is positive. To select a new pitch shift, press a note key while the DOWN key is held down. The new pitch shift value will light solid and will become effective at the start of the next pattern.

Pitch shifts are cleared when a new chain is started.

Rest, Accent & Slide

The REST, ACCENT, and SLIDE keys can be used to turn on all-rest (treat all notes as rests), all-accent (accent all notes), and all-slide (slide all notes).

To turn on all-rest, press and hold the REST key. The REST LED will light up and no new notes will be gated while the REST key is pressed.

To turn on all-accent, press and hold the ACCENT key. The AC-CENT LED will light up and all notes will be accented while the ACCENT key is pressed.

To turn on all-slide, press and hold the SLIDE key. The SLIDE LED will light up and all notes will be slid while the SLIDE key is pressed.

Swing Timing

Swing timing creates an inconsistent, syncopated tempo. (Some notes are delayed, while others played too soon.)

Press NEXT or PREV while the pattern is playing to increment or decrement the amount of swing. There are five levels of swing available.

The swing tempo is output on DINSYNC and MIDI, and will cause other synthesizers to swing.

Loop Mode

Loop mode allows a portion of a patern to be repeated indefinitely.

To enter loop mode, hold the DONE key, and choose the start and end points of the loop using the 13 note keys and the three RAS keys (together, these represent the 16 notes in the pattern). Release DONE. To exit loop mode, press and release DONE.

Loop mode can be used to play a pattern backwards by choosing a later note first.

To restart a loop from the first step, hold CHAIN and press PREV.

Note Nudge

While a pattern is playing, a note may be nudged so that it is skipped or repeated.

To skip a step, hold PREV and press NEXT. To repeat a step, hold NEXT and press PREV.

Half Tempo

For a currently playing pattern, the tempo can be halved by holding DONE and pressing the TEMPO knob. This will keep everything in sync and will affect the whole pattern. Hold DONE and press the TEMPO knob again to return to the normal tempo.

Track Edit

Introduction

Tracks are composed of patterns. Once you have written a few patterns you like, you can string them together into patterns. There are 16 different tracks, and each track can be 16 patterns long. Tracks, like patterns, are stored in the EEPROM.

Each pattern in a track also has, associated with it, a 'rest' flag, an 'accent' flag, a 'slide' flag, and 5 bits of pitch-shift. These allow the pattern to be completely muted, accented, slid, or shifted up or down a little more than an octave.

To enter track edit mode, turn the Function knob to Track Edit

Like Pattern Edit mode, tracks are loaded from EEPROM into a scratch pad which is then modified by the user. When you feel like the scratch pad contains the track you want, it can be saved back into the EEPROM.

Mode Inputs:

> Sound on ***Mix-In***

Mode Outputs:

> Sound on ***Mix-Out*** and ***Headphone***

> CV/Gate analog information on ***CV*** and ***Gate***

Selecting the track

While not in step-write or run mode, one can select the track to be edited.

Make sure you're not in run or step-write mode, the R/S and STEP LEDs should not be lit.

The current track being edited (#1-16) is displayed on the strip of 16 LEDs by a blinking LED.

To change the track, turn the Bank knob. This will throw out the current scratch-pad and load the newly selected track from EE-PROM.

Step-write mode

Unlike pattern edit mode, there is no 'run-write' method to modifying tracks. Therefore you must use step-write mode, which goes through the 16 patterns in a track and individually select the pattern, pitch shift, and RAS flags.

To begin step-write, press the NEXT button (you can do this from track-selection or run mode).

The current location (1-16) in the track is indicated by a blinking light in the light strip.

The bank and location of the current pattern in the track location is indicated by a solid light in the light strip, and a solid light in the numbered keys. The current pattern will also play in a loop.

To set the pattern in the current track location: turn the BANK knob (to set the bank) and press the one of the numbered keys (to set the location in the bank).

To set the all-rest, all-accent or all-slilde flags for that track location, press any of the RAS keys. The current flag status is displayed by the LED above the corresponding button.

To shift the pitch up, hold down the UP key. The current pitch shift is displayed as a blinking light on the note keys. A pitch shift of 0 is displayed as low C, a pitch shift of +1/2 note is displayed as C#, A pitch shift of +1 octave is displayed as high C. If no LEDs light, the current pitch shift is negative. To select a new pitch shift, press a note key while the UP key is held down. The new pitch shift value will start blinking

To shift the pitch down, hold down the DOWN key. The current pitch shift is displayed as a blinking light on the note keys. A pitch shift of 0 is displayed as high C, a pitch shift of -1/2 note is displayed as B, A pitch shift of -1 octave is displayed as low C. If no LEDs light, the current pitch shift is positive. To select a new pitch shift, press a note key while the DOWN key is held down. The new pitch shift value will start blinking.

To advance to the next track location, press the NEXT key.

To save the track to EEPROM, press the DONE key while at the last location of the track. This will also exit step-write mode.

Track Play

Introduction

Track play mode is used to play various tracks programmed into the x0xb0x memory in an arbitrary order. Theres a lot of functionality in track-play mode, allowing for multiple tracks to be looped together, changing pitch, tap-tempo, different syncs, all-rest, all-slide and all-accent modes, etc.

There are 3 different pattern play modes - SYNC OUT, MIDISYNC, and DINSYNC. The difference between the modes is the tempo. In SYNCOUT mode, the tempo is internally generated by the microcontroller, and adjusted by the tempo knob or by tap-tempo, and MIDI sync & DINSYNC signals are sent out to control other synthesizers or drum machines. In MIDISYNC, the tempo comes from MIDI Clock messages on the MIDI IN port. In DINSYNC, the tempo comes from the DINSYNC port. Otherwise, all three modes have the same functionality.

Mode Inputs:

    Sound on ***Mix-In***

    MIDI tempo information on ***MIDI-In*** and ***MIDI-Thru***

    Tempo information on ***DINSYNC***

Mode Outputs:

    Sound on ***Mix-Out*** and ***Headphone***

    MIDI information on ***MIDI-Out***

    Tempo information on ***DINSYNC***

    CV/Gate analog information on ***CV*** and ***Gate***

Selecting single tracks to play

There are 8 banks and 8 locations per bank for storing tracks, for a total of 64 total possible tracks to play. Tracks are selected this way for all three modes. In addition, tracks can be chained together as described later.

To select the track bank, turn the track BANK knob to the desired bank. Since there are only 8 banks, the knob will 'repeat' twice (e.g. bank #13 is the same as #5) The track location will be set to 1 by default.

To select the track location, press one of the 8 numbered keys.

If the x0xb0x is not playing a track, the selected track location LED will be lit and this track will be immediately played when it receives a start signal (from internal or external sync)

If the x0xb0x is playing a track, the newly selected track location LED will start blinking and this track will be played after the current track is finished.

To play multiple track, use track changing, described below.

Chaining tracks

Tracks within one bank can be chained together, in arbitrary order, up to 32 tracks in a row. In this way, repetitions of tracks can be programmed to make a full song.

Press and hold down the CHAIN key. The CHAIN LED will light up and the numbered key LEDs will be cleared, showing that a new chain is ready to be entered.

While still holding down the CHAIN key, select the tracks to be put in the chain by pressing the 8 numbered keys, one at a time. The tracks will be entered in order of selection. The same track can be entered multiple times. Chains can be 1 to 32 tracks long. Tracks in the chain will light up solid as they are selected.

Once the chain has been decided on, release the CHAIN key. The chain will start playing at the end of the next track.

While a chain is playing, the tracks in the chain will light up solid, the current track playing will be blinking

Essentially, selecting a single track is the same as creating a 1-track-long chain.

Using Sync Out

When using Pattern Play (sync out) the tempo is created by the x0xb0x using either the TEMPO knob or tap-tempo. Whenever the tempo is changed, it is displayed via the TEMPO LED.

Turning the TEMPO knob clockwise increases the tempo by 1 BPM per 'click.' Turning the TEMPO knob counter-clockwise decreases the tempo by 1 BPM per 'click.'

Tap-tempo allows the tempo to be set by measuring the time between button presses. To set the tempo via tap-tempo, press the TEMPO knob two or more times. The tempo will be set by measuring the delay between the last two knob presses.

In sync out mode, the x0xb0x can be used to control other synthesizers via MIDI out or DINSYNC by generating clocking signals. By default the sync rate is 24 DINSYNC pulses and 24 MIDI clocks per quarter note. Start signals (MIDI start and DINSYNC start line high) are generated when the pattern starts playing (by pressing the RUN/STOP key) and stop signals (MIDI stop and DINSYNC start line low) are generated when the pattern stops (pressing RUN/STOP again, or changing out of pattern play.)

To start playing patterns, press the RUN/STOP key. The pattern will always start playing at note step #1. This will also send DINSYNC and MIDI start signals.

The pattern(s) will continue playing until the RUN/STOP key is pressed again, or the FUNCTION knob is changed to a different function. This will also send DINSYNC and MIDI stop signals.

Using MIDI Sync

MIDI sync allows the x0xb0x tempo, start/stop and pattern selection to be controlled via another computer or synthesizer. Make sure the MIDI cable is plugged into the MIDI IN jack. The x0xb0x listens for "MIDI Start," "MIDI Continue," "MIDI Stop," and "MIDI Clock" messages. These messages do not use the MIDI address specification.

To start playing the current pattern, send a MIDI Start message.

There should be 24 MIDI Clock messages per quarter note.

To stop playing the current pattern, send a MIDI Stop message

DINSYNC

Older (pre-MIDI) synths and drum machines such as the Roland TR-606/808/909 used a proprietary sync signal that made use of a DIN connector and MIDI-like cables. The DINSYNC port can both output and input tempo and pattern start/stop information.

Pitch Shifting

Pitch-shifting allows the current pattern to be played at a higher or lower scale than was originally programmed in. The pitch can be shifted in either direction, in 1/2 note increments, up to one octave. Pitch-shifting is available in all three modes.

To shift the pitch up, hold down the UP key. The current pitch shift is displayed as a blinking light on the note keys. A pitch shift of 0 is displayed as low C, a pitch shift of +1/2 note is displayed as C#, A pitch shift of +1 octave is displayed as high C. If no LEDs light, the current pitch shift is negative. To select a new pitch shift, press a note key while the UP key is held down. The new pitch shift value will light up solid and will become effective at the start of the next pattern.

To shift the pitch down, hold down the DOWN key. The current pitch shift is displayed as a blinking light on the note keys. A pitch shift of 0 is displayed as high C, a pitch shift of -1/2 note is displayed as B, etc. If no LEDs light, the current pitch shift is positive. To select a new pitch shift, press a note key while the DOWN key is held down. The new pitch shift value will light solid and will become effective at the start of the next pattern.

Pitch shifts are cleared when a new chain is started.

Rest, Accent & Slide

The REST, ACCENT, and SLIDE keys can be used to turn on all-rest (treat all notes as rests), all-accent (accent all notes), and all-slide (slide all notes).

To turn on all-rest, press and hold the REST key. The REST LED will light up and no new notes will be gated while the REST key is pressed.

To turn on all-accent, press and hold the ACCENT key. The ACCENT LED will light up and all notes will be accented while the ACCENT key is pressed.

To turn on all-slide, press and hold the SLIDE key. The SLIDE LED will light up and all notes will be slid while the SLIDE key is pressed.

Swing Timing

Swing timing creates an inconsistent, syncopated tempo. (Some notes are delayed, while others played too soon.)

Press NEXT or PREV while the pattern is playing to increment or decrement the amount of swing. There are five levels of swing available.

The swing tempo is output on DINSYNC and MIDI, and will cause other synthesizers to swing.

Note Nudge

While a pattern is playing, a note may be nudged so that it is skipped or repeated.

To skip a step, hold PREV and press NEXT. To repeat a step, hold NEXT and press PREV.

Control Software

Introduction

The c0ntr0l software is available on the supplied CD.

The c0ntr0l software is used mainly for updating the firmware. It can also back up patterns and do a few other things.

Drivers for the x0xb0x are built into most operating systems, but can also be downloaded here: http://www.ftdichip.com/Drivers/VCP.htm

c0ntr0l is provided as a Windows .exe and as a cross-platform Python script.

Updating Firmware on Windows

1. Turn on your x0x in bootload mode.

2. Verify that the USB port was found and installed.
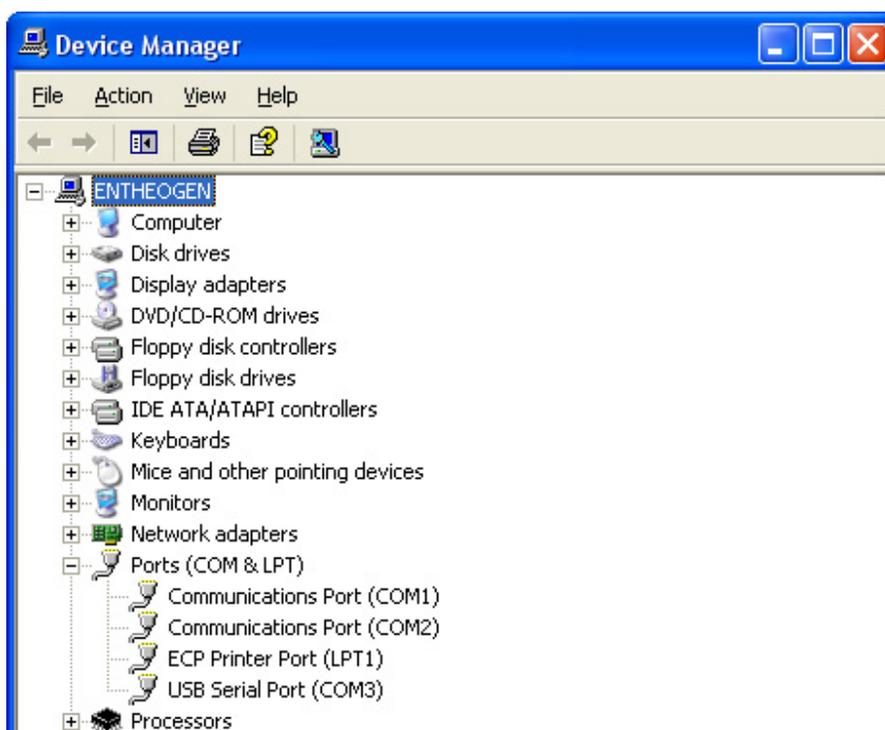
3. Start c0ntr0l software

4. Select the correct port in Serial->Port (in this case, COM3)

5. Select x0xb0x->Upload firmware..
   (Do NOT select "connect to x0xb0x")

6. Select the firmware file, press OK.

7. Wait for success response, quit the software.

8. Restart the x0x in non-bootload mode

Backing up Patterns on Windows

1. Start c0ntr0l software

2. Select the correct port in Serial->Port

1. Select Serial->Connect

2. The tempo slider should adjust, and turning the tempo knob should change the slider and vice versa

3. You can now read/write patterns from memory, back up the entire EEPROM (patterns & tracks), cut/paste patterns, rotate, etc.

4. To load a pattern, select the bank/location in the dropdown menus

5. To edit the loaded pattern, set the length with the drop down menu, then click on the top boxes and type in a note (a,b,c,d,e,f,g,h and A,C,D,F,G for sharps) click on the note symbol to change to a rest, and add accent (A), slide (S) and transpose up/down (U/D)

6. Save a pattern by clicking on Save Pattern

Developing (advanced)

Introduction

The x0xb0x firmware is responsible for all of the digital function-
ality: driving LEDs, reading switches, gating notes to the analog
synthesizer, running the sequencer, etc. The firmware is essen-
tially a compiled program that is burned into the microcontroller
chip (in this case, the ATmega162). The x0xb0x firmware is writ-
ten in C and can be (re)-compiled using the ubiquitous and free
avr-gcc compiler. You are encouraged to add functionality to the
x0xb0x, fix any bugs, etc. and exchange firmware updates with
others!

You may eventually decide that you want to write firmware modi-
fications for the x0xb0x. Since x0xb0x is an open source platform
and the code is written using free tools in a well-known language,
it's pretty easy to get started with writing new code.

Normally, upgrading the firmware is performed by placing the mi-
crocontroller into a special device that programs it. However, to
make it easier to upload new firmware the microcontroller that
ships with the x0xb0x contains a bootloader. The bootloader is
a small piece of code (.5K) that is separate from the main firm-
ware and is executed first. The bootloader checks to see if the
FUNCTION knob is turned to Bootload mode. If it is, it proceeds
to download the new firmware, and if it isn't, it executes the rest
of the firmware. (See previous section of the manual.) The maxi-
mum size of user firmware is 15.5KB. (Check avr-gcc output for
size.)

Installing Dev Tools

The AVR microcontroller has a wide variety of development tools
available. On Windows, AVR Studio is the free, easy-to-use IDE.

1. Download and install AVR Studio. This includes avr-gcc.

2. Download the latest x0xb0x firmware source code distribution from SourceForge. (Or the source code to an alternate community firmware, such as SokkOS.) Unzip the code.

3. The x0xb0x source code does not come with an AVR Studio project file, but includes a WinAVR makefile. To create a project from the makefile:
   - Open AVR Studio.
   - Create New Project
     - Project type: AVR GCC
     - Project name: x0xb0x
     - Uncheck "create initial file"
     - Change Location to the folder containing the source code
     - Click Finish
   - Go to Project menu > Configuration Options
     - Check "Use External Makefile" and select "Makefile.txt" in the source code directory
     - Click OK
   - Right-click on "x0xb0x (default)" in main project treeview on the lefthand side.
     - Select "Add Existing File(s)..."
     - In the new dialog box select all .c and .h files. (For convenience, use ctrl-click and sort by file type.)
   - Save the new AVR Studio Project to the source code directory. (The project file will be called 'x0xb0x.aps')

4. Open the project file in AVR Studio.

5. Go to Build menu > Rebuild All

6. Verify that build completes successfully. Check that you can program the new x0xb0x.hex file. (See previous instructions.)

7. Make changes to the source code and see if they work!