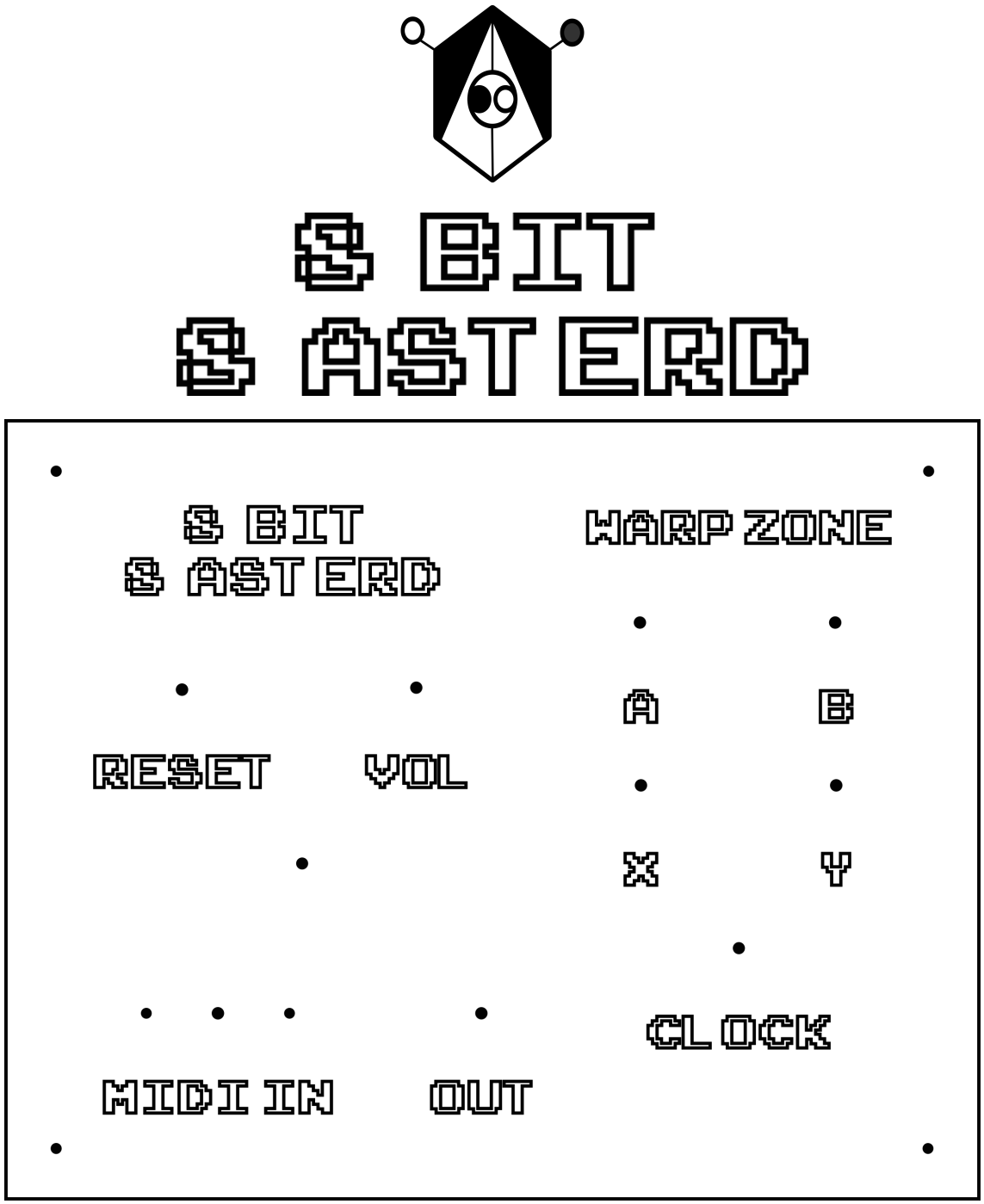
8-Bit 8asterd (8B8) Owner's Manual



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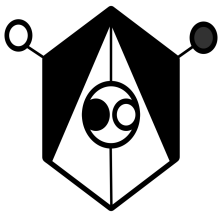

1 Introduction

Hi! Thanks for your purchase of the 8-Bit 8asterd (8B8) – a project forged in love and steeped in nostalgia for the sounds of 1980's Arcade games and early 8-bit console games.

This little standalone MIDI module gives you all of the glory of those 80's Arcade sounds right at the tip of your fingers. It's like playing your original Nintendo as an instrument! Sweet, sweet chiptune heaven.

Based on authentic arcade sound chips used in actual arcade cabinets, the printed circuit board (PCB) was designed by me and manufactured in a professional facility. All other assembly is performed in-house by me.

Plug in your favorite MIDI controller via the 5-pin MIDI input, or simply plug into your computer with a microUSB cable to send MIDI information from your favorite sequencers and DAW software. You can even play back MIDI files from your favorite arcade games for use as an easy chiptune player.

2 Design and Function

2.1 AY-3-8910 Programmable Sound Generator (PSG)

The actual music-making element of your 8B8 revolves around (3) AY-3-8910A Programmable Sound Generators (PSG), a microchip which was produced in 1978 by General Instruments and re-branded by a few companies, including Yamaha (YM2149F). A single chip boasts (3) separate Square Wave voices (shaped by selectable envelope filters) and a noise channel. The 8B8 utilizes (3) chips to achieve 9-voice polyphony.

2.1.1 Synthesizer Channels

There are (3) pre-defined "patches" comprised of a square wave filtered through (3) different envelopes.

These patches are accessed by sending MIDI information either over **Channel 1, 2, or 3**.

Channel 1 produces a moderate attack and moderate decay. Channel 2 produces a short attack and short decay. Channel 3 produces a short attack and long decay. Each has a unique place in the sonic pallete of Arcade timbres.

2.1.2 Drum Channel

The Drum Channel is accessed by sending MIDI information over **Channel 10**. You'll find the sounds assigned to the octave below middle C so make sure you're looking in the right place. Most MIDI controllers with drumpads *should* correspond to the sounds out-of-the-box, but your mileage may vary.

2.2 Arduino Leonardo

The microcontroller platform responsible for receiving MIDI information and dictating which notes go to which chip is none other than the Arduino Leonardo (Pro Micro). This module is an open-source development platform which allows for a high-degree of control over the firmware code so that technically-inclined users can make edits to note tunings, envelopes, and other parameters.

2.2.1 Powering the 8B8

The entire 8B8 is powered by the Arduino, the micro-USB port of which can be accessed on the back of the unit. Thus, the 8B8 only accepts 5V DC input from a micro-USB cable. The hope is that most users will have an easier time finding a USB phone charger and micro-USB cable than tracking down some kind of proprietary cable. You can also power the 8B8 from a phone-charger battery bank when you're out and about.

Alternately, the 8B8 can be powered from a computer or a laptop. Of course, in this configuration, you also have access to the Arduino itself, as well as the capability to send MIDI information directly to the 8B8 from your computer.

2.3 "Warp Zone"

The 8B8 takes advantage of a phenomenon known as "circuit-bending", albeit in a somewhat more controlled fashion than its reputation might grant. Each of the (4) buttons (labeled A, B, X, and Y) is linked to a specific point in the circuit which interferes with the audio output of the chips when pressed. The resulting audio is pleasantly warped for the duration of time the button is pressed.

Each button has a predictable effect, though they are strangely generative depending on when they are pressed (during a drum sequence, perhaps). Try different cominations of buttons pressed simultaneously.

The "Warp Zone" is ultimately best used with the Drum Channel, though the Synthesizer channel will also respond to the warp buttons.

Try pressing one button before a different button, you'll often hear a slightly different impact.

The **A button** functions as a sort of High-Pass-Filter (HPF) and beat-repeater.

The **B button** functions as a sort of modulator for other buttons as well as a pseudo-trigger for white-noise depending on the sequence being played (i.e. a high-hat sound will tend towards white-noise when warped).

The **X button** functions as a "bit-crusher" or distortion effect that produces some really excellent arcade-like tones, especially in combination with other buttons.

The **Y button** is a bit of a wild-card and only activates after pressing the B button at least once after a reset. It works to modulate other buttons, as well as acting as an interesting modulator somewhere between bit-crushing and beat-repeating.

Sometimes the press and release of a button leaves behind some subtle lingering effects, these are most easily heard through headphones. All lingering effects can be cancelled by pressing the Reset button.

2.4 Clock and Reset

The Clock button is a latching button – it doesn't have to be held down like the other buttons. Pressing the button will halve the clock time of the chips, which practically amounts to a drop in pitch by an octave for all audio. Press the button again to return to normal clock time.

You may find from time to time that you'd like to return to your original sounds and "clear the slate", so to speak. This is where the Reset button comes in – it cancels out any lingering effects created by the Warp Zone. The Reset button can also act as a momentary mute button which can be very useful in performance.

2.5 MIDI and USB

The 8B8 can accept MIDI messages either from the 5-pin MIDI port on the faceplate, or via the micro-USB port on the back of the unit. It can also handle simultaneous MIDI messages from both ports at once! Just remember, after 9-voice polyphony has been reached, you may experience some drop-out in your notes.

3 Troubleshooting

3.1 No power light, no sound

Check that your USB cable is able to charge or power other devices.

Check that your wall-charger is rated for 4-5V, most USB-chargers should work. Ensure that the wall-charger is able to charge other devices, or otherwise confirm that it is generating 5V DC.

The micro-USB port mounted in the unit may be faulty or broken. Contact for repair service.

3.2 Power light is on, but no sound

Check your cables, blah blah. You've probably done this.

The internal audio connection may have come dettached. Open the unit (4 corner screws) and ensure that the faceplate cables are well-seated in their appropriate screw blocks.

The internal connection to the Arduino may have come dettached. Open the unit (4 corner screws) and ensure that the Arduino

3.3 One or more buttons not working

Some internal connections may have come dettached. Open the unit (4 corner screws) and ensure that the faceplate cables are well-seated in their appropriate screw blocks.

The "Y" button does not trigger until the B button has been pressed at least one time. Additionally, some sounds are lost during warping, and this is normal behavior.

3.4 MIDI not working (5-Pin port)

Check that your MIDI cable is able to pass information between other devices.

The internal MIDI connection may have come dettached. Open the unit (4 corner screws) and ensure that the faceplate cables are well-seated in their appropriate screw blocks. If it still doesn't work, reverse the two cables' postitions in their respective screw block.

3.5 MIDI not working (microUSB)

Check that your USB cable is capable of passing data in addition to power. Some microUSB cables contain only (2) wires for power, others contain multiple wires for data transmission, as well. Confirm that the cable can be used to pass data between other devices.

Depending on your computer operating system, you may need to install drivers or supporting software to interface with the Arduino. Check out Arduino.cc for more details.

4 Contact

If you have any questions, comments, repair requests, or any problems of any kind, please contact me via e-mail at greg@semioticsounds.com. I'll do anything in my power to ensure that you're able to enjoy this little 8asterd for years to come!

5 Dedications

I greatly appreciate your support of this project, and I hope that you come to love having this little 8asterd as a part of your music-making rig. I've designed the interface to have a real "game"-type feel and I think you'll find that, no matter your musical acumen, the 8B8 will bring a smile to your face. Thank you for caring about music and caring about vintage technology.

I am humbled by the great many Titans of intellect and technical expertise who have come before me and made this project possible. There will never be enough space to list the many influences behind the 8B8, but thank you to them all.

Thanks to the many arcade manufacturers and game developers of the 70's, 80's and 90's, and to Nintendo for producing the NES, my first video-game console. My musical memory is forever stamped with the sound effects and scores of these early games; I credit much of my musical appreciation to the composers behind the title screens.

The majority of the code in the firmware comes from a module built by DogeMicrosystems, which was inspired by an Instructable by TheSpodShed, and so on. Pay these Titans a visit sometime and show your appreciation.

And thanks to my incredible wife for wading through the waters of my convoluted ideas and childish sense of humor and coming out alive. Her encouragement and love (and coffee) are the gasoline which fuel my daily engine. My love to her always and forever.♡