



twisted electrons AY3 Chiptune Synth User Manual

[Home](#) » [Twisted-Electrons](#) » twisted electrons AY3 Chiptune Synth User Manual 

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Thanks! ...Overview

Thank-you for choosing the AY3! Time to take a break from HI-FI land and enjoy some good old 8-BIT nostalgia!

The AY3 features two 8912 chips boasting 6 voice polyphony. You can apply sequences, arpeggiators, noise, envelopes and pitch modulation to each voice with a click of a button.

Take the video AY3 Tour!

<https://www.youtube.com/watch?v=lcXeGEhGb5I>

About the AY-8912:

The AY-3-8912 and its variants became popular chips in many arcade games, and were used on, among others, the Intellivision and Vectrex video game consoles and the MSX, Amstrad CPC, Oric 1, Colour Genie, Elektor TV Games Computer and Sinclair ZX Spectrum 128/+2/+3 home computers as well as the Mockingboard sound card for the Apple II family.

Open source!

The AY3 Firmware is now open source on github, feel free to join the coding party

<https://github.com/orgs/twistedelectrons/repositories>

Contents

- 1 Connectivity & Power
- 2 Preset load/save
- 3 Midi implementation
- 4 Firmware updating
- 5 Documents / Resources
 - 5.1 References

Connectivity & Power

The AY3 features two 1/8" audio outputs, a 1/8" MIDI input and a power socket
The MIDI is TRS type A (same as Korg)

The AY3 is equipped with a bridge rectifier so can be powered by any AC or DC voltage source between 8v and 15v, 4 between 500mA and 2000mA.



Preset load/save

The AY3 can hold 64 presets in 8 banks of 8 presets.

Press the data wheel down to toggle between preset and bank mode (displayed above the data wheel). Roll the data wheel to load a preset.

Hold the data wheel down for 3 seconds to save a preset (count-down displayed on leds 8 thru 1).

Factory Reset

To reset your AY3 presets to factory hold the env button at startup. Beware: This will erase your custom presets

and replace with the factory ones.

Voice

Voice edit mode has 3 sub-modes to enable/disable, adjust tuning & volume of each voice.

Cycle through these sub-modes by tapping row button 1. The led matrix will announce the selected sub-mode by displaying the letters E, V or T.

Enable: Enable/disable a voice via buttons a thru f.

Volume: Select a voice via buttons a thru f. Adjust the selected voice's volume with the data wheel. Volume is displayed on leds 1 thru 8

Tune: Select a voice via buttons a thru f. Transpose the selected voice with the data wheel.

Lfo/arp

Lfo/arp mode offers 2 types of pitch modulation: lfo & arpeggiator. Tap row button 2 to enter lfo/arp mode. There are 4 modes for both lfo and arp. Enable or disable the arp/lfo on each voice by clicking the buttons a thru f. Scroll through them with the data wheel.

lfo: The icons above leds 1 thru 4 indicated the selected lfo shape. Use the speed and depth knobs to adjust the lfo accordingly

arp: The 4 arp modes are up, down, up/down & random. The speed knob will adjust the arp's rate and the depth knob changes it's range in octaves

Note: The arp loves to slave itself to midi clock!

Noise

Noise can be applied to each voice by clicking on the buttons a thru f. Click row button 3 to enter noise mode.

The overall noise frequency can be adjusted by rolling the data wheel. Noise frequency is represented by leds 1 thru 8

Env

Envelopes can be applied to control a voice's volume. Tap row button 4 to enter env mode. There are 8 envelope shapes represented by icons above led 1 thru 8. Scroll through them with the data wheel.

Adjust the speed of the envelopes via the env/seq speed knob Note: at high speeds the envelope will self-oscillate!

Sequencer

Each preset can store a 16 step sequence of 3 parameters: Note, Voice on/off and noise on/off. Tap row button 5 to enter env mode.

Apply the sequencer to a voice using buttons a thru f. Adjust the speed of the sequencer via the env/seq speed knob

Programming the sequencer:

Hold row button 5 for 3 seconds to enter sequencer program mode (countdown displayed on leds 1 thru 8).

Now simply roll the data wheel to select a step to edit (1-16 displayed on led matrix) then play a key on your midi keyboard to input the note. Tap the row 1 button to toggle the voice on and off. Tap the row 3 button the toggle the noise on and off. The led rows 1 and 3 indicate that voice and/or noise are activated for the selected step.

Hold row button 5 for 3 seconds to exit sequencer program mode (count-down displayed on leds 1 thru 8).

Note: The sequencer loves to slave itself to midi clock!

Detune/chord & glide

Detune/chord: The detune/chord knob has multiple modes:

At 0%: hold all voices to perfect unison. Between 1-50%: detune the 6 voices (Aka fatness). 51 – 99%: choose between 7 voicing chords (displayed on leds 1 thru 8). at 100% the AY3 becomes a polysynth. You can play up to 6 voices simultaneously on your midi keyboard.

Glide: The **glide** knob has multiple modes adds glide aka portamento to the synth's pitch. More glide=longer portamentos.

Note: try gliding between the chords!

Change Midi channel

To change the midi channel Ay3 responds to (default 1):

- Hold the bottom left button (seq) on startup
- You will see number 1 on the display, turn the encoder to set the desired channel then unplug the ay3 and reboot.

Midi implementation

Midi Message	Range	Result
Note On/Off CH1	1-127	Unison/Poly Voice
Note On/Off CH2	1-127	AY3#1, Voice1
Note On/Off CH3	1-127	AY3#1, Voice2
Note On/Off CH4	1-127	AY3#1, Voice3
Note On/Off CH5	1-127	AY3#2, Voice1
Note On/Off CH6	1-127	AY3#2, Voice2
Note On/Off CH7	1-127	AY3#2, Voice3
Note On/Off CH8	1-127	Polyphonic mode
Note On/Off CH9	1-127	Noise on/off AY3#1, Voice1
Note On/Off CH10	1-127	Noise on/off AY3#1, Voice2
Note On/Off CH11	1-127	Noise on/off AY3#1, Voice3

Note On/Off CH12	1-127	Noise on/off AY3#2, Voice1
Note On/Off CH13	1-127	Noise on/off AY3#2, Voice2
Note On/Off CH14	1-127	Noise on/off AY3#2, Voice3
Control CC#2	0-127	Lfo/arp speed
Control CC#3	0-127	Lfo/arp depth
Control CC#6	0-127	Detune amount
Control CC#7	0-127	Glide Amount
Control CC#8	0-127	Sequencer Speed
Control CC#9	0-127	Noise Frequency Chips 1+2
Control CC#10	0-127	Noise Frequency Chip 1
Control CC#11	0-127	Noise Frequency Chip 2
Control CC#12	0-127	Tune, Voice1
Control CC#13	0-127	Tune, Voice2
Control CC#14	0-127	Tune, Voice3
Control CC#15	0-127	Tune, Voice4
Control CC#16	0-127	Tune, Voice5
Control CC#17	0-127	Tune, Voice6
Control CC#18	0-127	Volume, Voice1
Control CC#19	0-127	Volume, Voice2
Control CC#20	0-127	Volume, Voice3
Control CC#21	0-127	Volume, Voice4
Control CC#22	0-127	Volume, Voice5
Control CC#23	0-127	Volume, Voice6
Control CC#24	0-63=off 64-127=on	Enable/Disable Voice1
Control CC#25	0-63=off 64-127=on	Enable/Disable Voice2
Control CC#26	0-63=off 64-127=on	Enable/Disable Voice3
Control CC#27	0-63=off 64-127=on	Enable/Disable Voice4
Control CC#28	0-63=off 64-127=on	Enable/Disable Voice5
Control CC#29	0-63=off 64-127=on	Enable/Disable Voice6
Control CC#30	0-63=off 64-127=on	Enable/Disable Noise1
Control CC#31	0-63=off 64-127=on	Enable/Disable Noise2
Control CC#32	0-63=off 64-127=on	Enable/Disable Noise3
Control CC#33	0-63=off 64-127=on	Enable/Disable Noise4

Control CC#34	0-63=off 64-127=on	Enable/Disable Noise5
Control CC#35	0-63=off 64-127=on	Enable/Disable Noise6
Control CC#36	0-63=off 64-127=on	Enable/Disable lfo/arp Voice1
Control CC#37	0-63=off 64-127=on	Enable/Disable lfo/arp Voice2
Control CC#38	0-63=off 64-127=on	Enable/Disable lfo/arp Voice3
Control CC#39	0-63=off 64-127=on	Enable/Disable lfo/arp Voice4
Control CC#40	0-63=off 64-127=on	Enable/Disable lfo/arp Voice5
Control CC#41	0-63=off 64-127=on	Enable/Disable lfo/arp Voice6
Control CC#42	0-63=off 64-127=on	Enable/Disable env Voice1
Control CC#43	0-63=off 64-127=on	Enable/Disable env Voice2
Control CC#44	0-63=off 64-127=on	Enable/Disable env Voice3
Control CC#45	0-63=off 64-127=on	Enable/Disable env Voice4
Control CC#46	0-63=off 64-127=on	Enable/Disable env Voice5
Control CC#47	0-63=off 64-127=on	Enable/Disable env Voice6
Control CC#48	0-63=off 64-127=on	Enable/Disable seq Voice1
Control CC#49	0-63=off 64-127=on	Enable/Disable seq Voice2
Control CC#50	0-63=off 64-127=on	Enable/Disable seq Voice3
Control CC#51	0-63=off 64-127=on	Enable/Disable seq Voice4
Control CC#52	0-63=off 64-127=on	Enable/Disable seq Voice5
Control CC#53	0-63=off 64-127=on	Enable/Disable seq Voice6
Control CC#54	0-7	LFO/ARP shape
Control CC#55	0-7	Env shape Chip1
Control CC#56	0-7	Env shape Chip2

Firmware updating

The AY3 supports firmware updates via midi system exclusive messages (sysex). To enter update mode aka bootloader: -unplug the unit's power cord. -hold the encoder button down while plugging the unit power back in.

Three bright stripes will show on the led matrix indicating that bootloader mode is active.

Now you are ready to send the sysex to the AY3 via your computer.

Pc

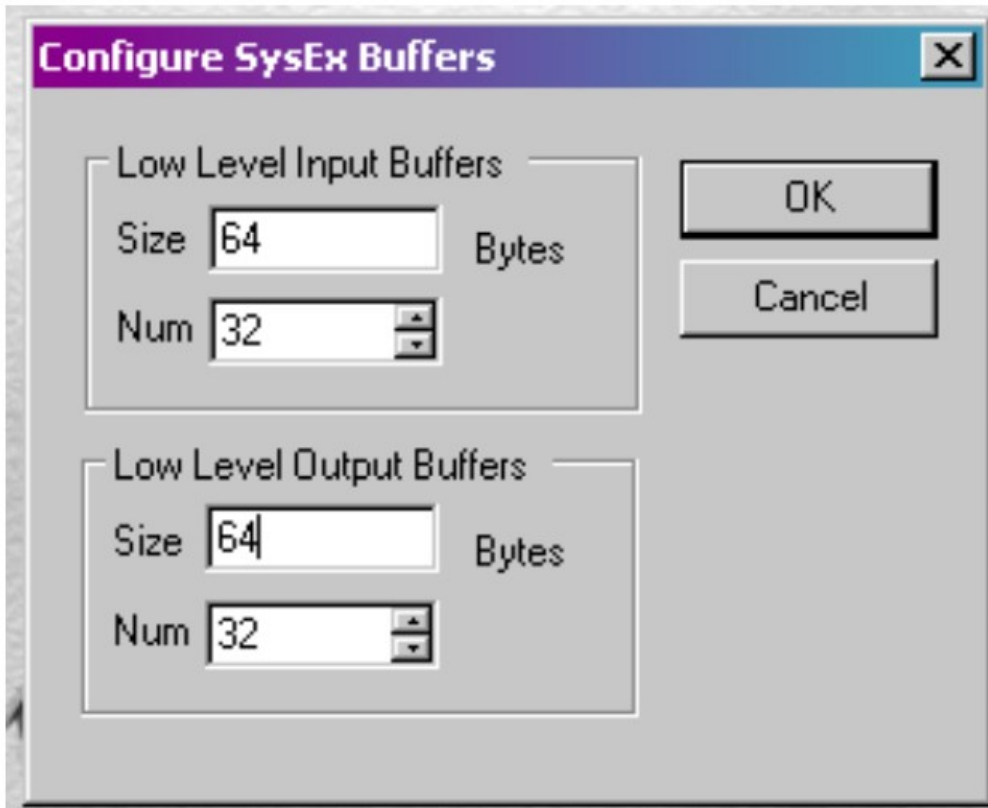
For a windows pc, we recommend MIDI-OX. It is a free and very useful app!

1. Launch MIDI-OX
2. In the Sysex window, choose Command > Window > Load File and navigate the location where you stored the

file.

3. Choose Command Window > Send Sysex

IMPORTANT: the buffer settings must be numb 32 and size 64 bytes output buffers to avoid transfer corruptions, (thanks Joel for pointing this out)



-000000-For a mac, we recommend SysEx Librarian. It is also free!

1. Launch SysEx Librarian.
2. Select your MIDI interface in the dropdown menu at the top (if it's not already selected)
3. Drag the MIDI SysEx file from the Finder into the frame of SysEx Librarian (if it's not already in there).
4. Select it with the mouse.
5. Click Play.

During upload, the led bars will flash and fill the matrix from left to right, then your AY3 will boot into the new software.

Documents / Resources

	twisted electrons AY3 Chiptune Synth [pdf] User Manual AY3 Chiptune Synth, AY3, Chiptune Synth, Synth
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References

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- ^W [Apple II series - Wikipedia](#)
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- ^W [Intellivision - Wikipedia](#)
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- ^W [MSX - Wikipedia](#)
- ^W [Oric - Wikipedia](#)
- ^W [Vectrex - Wikipedia](#)
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