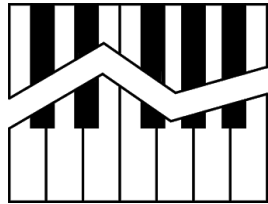


Sonoclast: Plastic Pitch Plus User Manual v1.0

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Introduction

The Plastic Pitch Plus is a device for experimenting with microtonality. It uses MIDI to map keys to microtonal pitches.

My primary design goal was to create a physical interface that gives immediate and independent control of pitches in a scale. One way of doing microtonality involves generating lists of frequencies or ratios. In contrast, I wanted something that would naturally engage my ear and provide an intuitive way to experiment with pitches.

Specifications

- Two basic scale modes are available: 1) a twelve-tone scale mode in which the twelve knobs are used to tune up or down each of the twelve notes in a scale; and 2) an equal divisions per octave mode in which the keys of a MIDI keyboard are remapped to an integer number of equal divisions per octave between 5 and 53.
- The two basic scale modes are implemented in two ways: 1) using MIDI pitch bend; and 2) using the MIDI Tuning Standard. The MIDI pitch bend way is backwards compatible and designed to work with all MIDI synthesizers. Whereas the MIDI Tuning Standard is the future of doing microtonality with MIDI but currently only supported by half a dozen newer hardware synthesizers.
- MIDI input is via the IN DIN connector. MIDI output is user selectable between the OUT DIN connector and the micro-USB port for use with a computer.
- Power is supplied via the micro-USB port.

Caveats

- When using the MIDI pitch bend way (as opposed to the MIDI Tuning Standard) a polyphonic synthesizer must also be multitimbral in order to play polyphonically using the selected microtonal scale. This is because multiple MIDI channels are required to have multiple pitch bend values being used at the same time. A polyphonic synthesizer that is not multitimbral can still be played monophonically per the PPP tuning.
- When using MIDI pitch bend (as opposed to the MIDI Tuning Standard) monophonic mode might result in unexpected tunings when holding down multiple keys and playing with a “last-note priority” technique. This is because there is no standard way for synthesizers to handle last-note priority in conjunction with the combination of multiple MIDI note and pitch bend messages. (Depending on one’s musical goals, this might be a feature.) The workaround is to play only one key at a time.
- I have found that some software synths--specifically Propellerhead Reason ones--have noticeable latency in their MIDI pitch bend implementation. This results in swooping pitch at the attack when playing thru the Plastic Pitch Plus. Other software synths work correctly.

Bonus (for deeper experimentation and customization)

- A [Teensy LC](#) is at the heart of the Plastic Pitch Plus. The Teensy LC power pins and unused I/O pins are broken out and labeled on the left side of the PCB.
- The code is open source and available on [my GitHub](#). Some parameters that could be easily customized in the code are the pitch bend range, the number of MIDI channels to use in polyphonic mode, and the (single) MIDI channel to use in monophonic mode.

Setup Instructions

Following are setup instructions for the six distinct operating modes of the Plastic Pitch Plus (PPP). Choose the one that matches your setup.

Monophonic Twelve Notes Per Octave MIDI Pitch Bend Mode

This mode listens for incoming MIDI notes and outputs corresponding MIDI notes and pitch bends on the first channel only. Also, this mode attempts to retrigger per last-note priority (see caveat above).

1. If using a keyboard synthesizer, disable local control so that the synth can be controlled only by the MIDI input. (See your synthesizer manual for how to do this.)
2. Connect the MIDI output from the keyboard to the MIDI input on the PPP. Set the MIDI keyboard to output any MIDI channel you like.
3. Connect the MIDI output from the PPP to the synthesizer MIDI input. For a hardware synthesizer use the DIN connector, and select DIN with the second switch. For a software synthesizer use the USB cable, and select USB with the second switch. For a software synthesizer select "Teensy MIDI" as the controlling device.
4. Set the synthesizer to receive on the first MIDI channel. Also, set the pitch bend range to the range you want the PPP knobs to indicate.
5. Set the first, third, and fourth switches as follows: MONO, 0, 0.
6. If the USB cable is not already plugged in, plug it into a USB port or USB power supply to power up the PPP. The LED flashes three times when powered on.
7. Play. Turn the 12 knobs to tune each of the corresponding notes.

Polyphonic Twelve Notes Per Octave MIDI Pitch Bend Mode

This mode listens for incoming MIDI notes and outputs corresponding MIDI notes and pitch bends on the first twelve MIDI channels with no limit imposed on polyphony.

1. If using a keyboard synthesizer, disable local control so that the synth can be controlled only by the MIDI input. (See your synthesizer manual for how to do this.)
2. Connect the MIDI output from the keyboard to the MIDI input on the PPP. Set the MIDI keyboard to output any MIDI channel you like.
3. Connect the MIDI output from the PPP to the synthesizer MIDI input. For a hardware synthesizer use the DIN connector, and select DIN with the second switch. For a software synthesizer use the USB cable, and select USB with the second switch. For a software synthesizer select "Teensy MIDI" as the controlling device.
4. Set the synthesizer to receive on at least the first twelve MIDI channels. Also, set the pitch bend range to the range you want the PPP knobs to indicate.
5. Set the first, third, and fourth switches as follows: POLY, 0, 0.
6. If the USB cable is not already plugged in, plug it into a USB port or USB power supply to power up the PPP. The LED flashes three times when powered on.
7. Play. Turn the 12 knobs to tune each of the corresponding notes.

Monophonic n-Equal Divisions Per Octave MIDI Pitch Bend Mode

This mode listens for incoming MIDI notes and outputs corresponding MIDI notes and pitch bends on the first channel only. Also, this mode attempts to retrigger per last-note priority (see caveat above).

1. If using a keyboard synthesizer, disable local control so that the synth can be controlled only by the MIDI input. (See your synthesizer manual for how to do this.)
2. Connect the MIDI output from the keyboard to the MIDI input on the PPP. Set the MIDI keyboard to output any MIDI channel you like.
3. Connect the MIDI output from the PPP to the synthesizer MIDI input. For a hardware synthesizer use the DIN connector, and select DIN with the second switch. For a software synthesizer use the USB cable, and select USB with the second switch. For a software synthesizer select "Teensy MIDI" as the controlling device.
4. Set the synthesizer to receive on the first MIDI channel. Also, set the pitch bend range to 2 semitones.
5. Set the first, third, and fourth switches as follows: MONO, 0, 1.
6. If the USB cable is not already plugged in, plug it into a USB port or USB power supply to power up the PPP. The LED flashes three times when powered on.
7. Play. Turn the Bb knob to select between 5- and 53-EDO. Turn the Ab knob to select the reference MIDI note. The LED flashes when a value changes.

Polyphonic n-Equal Divisions Per Octave MIDI Pitch Bend Mode

This mode listens for incoming MIDI notes and outputs corresponding MIDI notes and pitch bends on all sixteen MIDI channels. This results in support for fifteen notes of polyphony.

1. If using a keyboard synthesizer, disable local control so that the synth can be controlled only by the MIDI input. (See your synthesizer manual for how to do this.)
2. Connect the MIDI output from the keyboard to the MIDI input on the PPP. Set the MIDI keyboard to output any MIDI channel you like.
3. Connect the MIDI output from the PPP to the synthesizer MIDI input. For a hardware synthesizer use the DIN connector, and select DIN with the second switch. For a software synthesizer use the USB cable, and select USB with the second switch. For a software synthesizer select "Teensy MIDI" as the controlling device.
4. Set the synthesizer to receive on all (sixteen) MIDI channels. Also, set the pitch bend range to 2 semitones.
5. Set the first, third, and fourth switches as follows: POLY, 0, 1.
6. If the USB cable is not already plugged in, plug it into a USB port or USB power supply to power up the PPP. The LED flashes three times when powered on.
7. Play. Turn the Bb knob to select between 5- and 53-EDO. Turn the Ab knob to select the reference MIDI note. The LED flashes when a value changes.

Twelve Notes Per Octave MIDI Tuning Standard Mode

This mode outputs MIDI SysEx and echoes any notes sent in. (No limits are placed on polyphony.)

1. Verify that your synthesizer supports the MIDI Tuning Standard. (Wikipedia currently lists the following hardware synthesizers as supporting MTS: Dave Smith Instruments (DSI) Rev-2, Prophet-12, Prophet-6, and Oberheim OB-6, and the Moog Sub37 and Minitaur.)
2. (It is not necessary to connect anything to the MIDI input of the PPP in this mode.)
3. Connect the MIDI output from the PPP to the synthesizer MIDI input. For a hardware synthesizer use the DIN connector, and select DIN with the second switch.
4. Set the first, third, and fourth switches as follows: MONO or POLY (does not matter), 1, 0.
5. If the USB cable is not already plugged in, plug it into a USB port or USB power supply to power up the PPP. The LED flashes three times when powered on.
6. Play. Turn the 12 knobs to tune each of the corresponding notes.
7. Optional: Connect the output of a MIDI controller to the MIDI input of the PPP. (Only notes are passed through.)

n-Equal Divisions Per Octave MIDI Tuning Standard Mode

This mode outputs MIDI SysEx and echoes any notes sent in. (No limits are placed on polyphony.)

1. Verify that your synthesizer supports the MIDI Tuning Standard. (Wikipedia currently lists the following hardware synthesizers as supporting MTS: Dave Smith Instruments (DSI) Rev-2, Prophet-12, Prophet-6, and Oberheim OB-6, and the Moog Sub37 and Minitaur.)
2. (It is not necessary to connect anything to the MIDI input of the PPP in this mode.)
3. Connect the MIDI output from the PPP to the synthesizer MIDI input. For a hardware synthesizer use the DIN connector, and select DIN with the second switch.
4. Set the first, third, and fourth switches as follows: MONO or POLY (does not matter), 1, 1.
5. If the USB cable is not already plugged in, plug it into a USB port or USB power supply to power up the PPP. The LED flashes three times when powered on.
6. Play. Turn the Bb knob to select between 5- and 53-EDO. Turn the Ab knob to select the reference MIDI note. The LED flashes when a value changes.
7. Optional: Connect the output of a MIDI controller to the MIDI input of the PPP. (Only notes are passed through.)

