*How to play and maintain your*

# *Soundplane*

*version 0.9 by*

MADRONA LABS

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# Introduction

First, a heartfelt thanks to all of you intrepid Soundplane owners, whose support and whose patience made building this new instrument possible.

Second, congratulations on your purchase. Based on a solid foundation in open research, and made with a consistent devotion to both technical and aesthetic details, the Soundplane is one of the most intimate and expressive interfaces for computer music available at any price. We hope that it inspires you and opens up new worlds of sonic expression for you.

The typesetting may look nice, thanks to TEX, but this is a very hasty first draft of the Soundplane manual, written just well enough to give the first lucky owners a start. I'm going to put all my notes into this document and gradually shape them up in order to get the information out as quickly as possible. So you'll see some unfinished sentences and misspellings and whatnot. Please bear with me.

# 1 The hardware

Simplicity was a main design goal for the Soundplane. so a tour of the hardware is quick. The alder body looks great and holds everything in place. The aluminum bottom and back panel allow the instrument to be lighter and thinner than wood alone would. The USB jack provides both data transport and power. Because the Soundplane runs on a custom, low-power DSP board, any laptop computer should be able to provide sufficient current.

On the front is a power light with a walnut surround. This light goes on when contact with the Soundplane has been established by its client software. It doesn't go on if the software is not running.

## The surface

The Soundplane's playing surface is a hybrid between a keyed instrument like a piano, and a fretless instrument like a violin, equally playable in either mode with the right software. It's a uniquely flexible setup but also potentially confusing. The top of the surface is divided into 150 keys in five rows of 30, 13 of them with inlaid fret markings

that serve as visual cues for orienting your fingers. The Soundplane can send out a different MIDI note or OSC message for each key.

The keys are very thin, and attached to a thick piece of rubber that allows each one a small amount of independent motion. Under the rubber is a continuous sensing surface that detects the applied pressure at a higher resolution than the keys, 64 by 8 sensing elements. By calculating the centroids of pressure data, the positions of applied touches can be calculated to a resolution much finer than the sensor grid.

## Setup

The Soundplane senses all the forces applied to its surface, including gravity and the acceleration of the whole instrument, and the playing context needs to be set up with this in mind. Designed to be played lying flat on a fixed surface such as a table, with its six little rubber feet (LRFs) in contact with the surface, is how it will be most sensitive.

However, the dynamic software calibration also attempts to separate finger pressure from pressure due to gravity or motion. So, it's possible to play in other orientations besides the horizontal, or on an unstable surface like one's lap. It's probably best to learn basic techniques on a flat surface and then experiment with other playing positions.

## How it works, briefly

The Soundplane is a capacitive sensor, but unlike inflexible touchscreen sensors, it doesn't measure capacitance between your hand

and a fixed surface. Instead, it measures capacitance between two sets of internal plates, one fixed and one that you move by pressing on the surface. One advantage of this approach is that you get tactile feedback because you are actually moving a sensor element through space. It's a small amount of motion, around 1mm, but it makes a big difference in how the instrument feels as opposed to a solid glass surface. Another advantage is that anything that can press on the surface can be used to play. I have had good luck with soft yarn mallets.

# 2 The software

None of the standard USB device classes were really sufficient to convey all the data that Soundplane has to offer. So we wrote a custom software application, the Soundplane client, that reads raw pressure data and translates it into OSC (Open Sound Control) and MIDI data.

## Break in and first playing

The Soundplane's surface needs to lie flat against its internal sensors in order to have a consistent response. After being moved significantly, such as in shipping, the surface may ride up on its supports a bit. So, after any major motion and before playing, I recommend a short break-in to get the response consistent. Press all over the surface with a kneading motion, like a massage. Just ten seconds or so should be enough. Then press the recalibrate button in the Soundplane application to lock in the new rest position.

This break-in process will make the response more uniform across the surface. I have also found that as the rubber stretches and

wears over time, the response becomes gradually more smooth.

The break-in massage is purely physical and can be done without the Soundplane plugged in.

Plug in a USB cable and launch the Soundplane app to begin playing.

## Calibrating

When first launched, the client shows the Touches page and calibrates the Soundplane by grabbing pressure readings and averaging these over several seconds. This is just like taring a scale. A progress bar is shown. *Do not touch the surface during this time!* Pressing the recalibrate button at any time will clear the current touches and redo this process.

## Preset menu

On top is a preset button marked "continuous pitch x" that currently does nothing. Nothing!

## Grid view

On the top, this is where the pressure data can be viewed, as raw data directly from the sensors, calibrated data, or recognized touches (cooked). the menu in the lower right selects these modes.

## Touch view

Under the grid view is the touch timeline view, showing a short history of pressure data for each touch.

The *touches* dial sets the maximum number of possible touches. If more touches are applied to the surface, the touches with the greatest force will be selected.

Setting *touches* to 1 will give this view the most resolution.

The *thresh* dial sets the force required to activate a touch. The default of 0.020 is quite conservative, and should not result in any false touches. Bringing this value down will make the instrument more sensitive.

The *max force* dial sets the maximum absolute force that will be output.

The *z curve* dial, just like on MIDI performance keyboards, sets the curve that will be applied to the touch pressure data between the sensors and the data output. The results of this control can be seen in the touch timeline.

## The footer

The footer is where the device serial number, firmware version and status are shown.

## Zones page

Clicking the right/left arrows changes from one page in the app to another. To the right of the Touches page is the Zones page.

The big display area does nothing yet. Here you will be able to

turn all of the keys into different zones for notes or controllers as soon as I finish writing that software.

The *data freq* dial controls how many times per second the Soundplane client outputs MIDI and OSC data. Note-ons (and their equivalents over OSC) will always be output ASAP, but everything else (x, y and pressure for each touch) will only be sent at this frequency.

MIDI area: pick a MIDI device, or turn MIDI on / off entirely.

OSC area: turn OSC on / off entirely. The accompanying Max/MSP patch shows how to receive OSC data. Always sent on port 3333 for now.

Zones output note numbers, not pitches. It's up to any application that receives the MIDI or OSC data to decide what pitches to play.

## Expert page

Another page with some dials you may not want to mess with.

# 3 Putting it together

## Playing technique

Threshold : sensitivity vs. position / false touches. A tradeoff. Light touches are less definite as to position. A harder touch will track a finger more accurately and lighter touches may wander more.

## Hysteresis

Since the Surface takes some time to return to its resting state after a finger's pressure is removed, a smaller threshold will also increase the release time for touches, making them linger more after a finger is released.

Likewise, a very hard touch will always take a lot longer to return to the resting state. You can set the ***max force*** dial to get the tradeoff between response and firmness you want.

We recommend you get to know your Soundplane using the default threshold of 0.02, which is a light but definitely intentional touch. You can then reduce the threshold as your own taste dictates, and your radio frequency noise environment permits.

## Touch speed and dynamic calibration

The Soundplane dynamically calibrates all of the areas on its surface that are not currently being touched, by collecting the current pressure data through a very slow filter and setting the result as the new zero reference. This approach does a good job of eliminating long-term shifts in the force values like the changes when the Soundplane is tilted. It means ,however, that any touch applied more slowly than the filter's response speed will be itself regarded as background noise. This speed is about equal to a ten second movement from no pressure to the heaviest possible pressure—a very slow touch. It's possible to fool the filter, but you need a very steady hand and the intent to do so.

The Soundplane is playable with many objects BUT the software is optimized for detecting finger touches. You could try soft mallets.

THe soundplane's surface is calibrated dynamically to separate forces due to gravity. This calibration nulls out slow changes in the data while allowing quicker changes, such as touches, to pass through. It means, however, that there is a slowness threshold under which a touch will be interpreted as background noise. It's kind of like sneaking past a motion detector: if you press down very very slowly on the surface, your touch will not appear. Any more typical musical gesture, though, even down to a pppp, should be recognized.

# 4 Care and feeding

The alder body is finished with ProFin, a permanent polymerized oil finish made by the Daly's company in Seattle. Over this is a coat of furniture wax for durability. If the wax eventually becomes dull due to handling, repair with any standard furniture wax is possible. We use "Black Bison" from Liberon.

The walnut playing surface is finished with a product called Howard's Butcher Block conditioner. This is just wax and mineral spirits and is food-safe. If the surface becomes too dull or dry, rub on a small amount of this or any butcher block finish, wait 5–10 minutes for it to dry and wipe off the excess with a clean cloth.

Small bit of dust and gunk may get in the cracks between keys. Though they don't really do any harm, an African porcupine quill is an ideal tool from removing them. A sharp stick works too.

# A Frequently asked questions

*Question*

Answer