Stealth Mini 1.1

Assembly and User's Guide

1 Introduction

The Stealth Mini sustainer board is a 1:1 clone of the original Sustainiac Stealth. It has had two part numbers updated for parts that are currently available but that are functional equivalents. The labeling for connections has been kept the same as the Sustainiac so that all wiring diagrams (see available wiring diagrams at https://scientificguitarist.wixsite.com/home/sustainer-reverse-engineering) are still valid.

2 Populated PCB Assembly

2-1 Additional Components

In addition to the board, the following parts/materials will be needed. These are not included in the kit due to the sheer number of possibilities for switching, control, mounting, etc.

Effect Enable Toggle Switch
The minimum requirement for an effect toggle switch is an SPST on/off toggle switch. However, this can also be wired to a push/pull potentiometer or other kind of toggle switch. Some thoughts I've had include:

- On/Off/(On) SPDT: this is a toggle switch that latches in one direction and is momentary in the other. This allows for switching the effect on for long passages, or just holding the switch in the momentary for sustaining just the odd note here and there for accent.
- On/Off DPDT: this allows for power to be supplied to the board while cutting the pickup signal from a middle pickup. This makes it so that the middle signal doesn't output anything when the sustainer is active. Keeping an active middle pickup signal with the sustainer on increases the likelihood of noise and interference in the guitar output.

Mode Toggle Switch
The minimum requirement for a mode toggle switch is an SPST on/off toggle switch. According to the makers of the Sustainiac, you can use a DPDT to wire it for three mode operation (see link above for documents showing how it's done).

Power
The traditional power source for sustainers is a 9V battery, but with the rise of compact power banks for portable electronics, it is possible to use a standard 5V battery bank with a 5-to-9V boost cable (available on Amazon or similar) for greatly improved capabilities. This also allows for the power source to be recharged and can save money over the long run compared to batteries.

Driver
A sustainer driver is required for the system to work. The Stealth Mini board will work with 2 Ohm drivers like the stock Sustainiac drivers or the DIY design I've documented at https://scientificguitarist.wixsite.com/home/sustainer-driver-coil.

Bridge Pickup
A bridge pickup is required for the system to work. Humbuckers are recommended due to less noise, but the system should also work with single coil pickups. Higher output pickups are recommended so that less amplification is required in the circuit, which will help minimize interference and noise.

Wire and Solder
You will need wire and solder for connecting the board to toggle switches and the bridge pickup.

2-2 Connection Points
The Stealth Mini board has 1 mm solder pads for all connection points. Connections can be made by soldering wire in directly, using terminal blocks, or headers. Connection points are 2.54 mm spaced.

2-3 Controls
The Stealth Mini board has one onboard controls for overall system gain and harmonic mode gain. The system gain control is a 100k trim potentiometer. Gain is increased by turning the potentiometer clockwise. The harmonic mode gain is actually an attenuation-only control for reducing the harmonic mode gain, if necessary. The commercial unit that I reverse engineered had this control omitted, resulting in zero attenuation. Further info about how to set these gains are provided in a later section.

3 System Assembly

3-1 Board Connections

The link in Section 1 above contains all the official Sustainiac wiring diagrams, but I found them to be a bit of a mess, particularly for a colorblind person. To that end, here are explanations of each connection point and how to wire them.

- +9: This is the power supply at +9V.
- X+: This is the driver + side. It doesn't matter which side of the driver is connected here, but I use red just to keep with convention.
- X-: This is the driver – side. It doesn't matter which side of the driver is connected here, but I use white. Note that if you are wiring up the mode switch to allow for three mode operation, the driver – side will not be wired directly here. See referenced documentation for details.
- JACK: This is wired to the ring terminal of a stereo input jack. This acts as a fail safe so that the battery isn't drained when the on/off switch is on but the guitar is unplugged. If the guitar remains plugged in with the on/off switch on, it will continue to drain the battery.
- +9S: This is the 9V supply for the signal path. This is connected to the on/off toggle switch, with the other connection of the toggle switch wired to +9.
- GND: This is wired to guitar system ground. This is power amp dedicated ground.
- +9R: This is 9V source for mode switching. It is wired to one side of the mode toggle switch.
- HAR: This is the mode control connection. This is wired to the mode toggle switch.
- IN: This is wired directly to the bridge pickup output (typically volume pot lug 3)
- G_GND: This is wired directly to guitar system ground. This is preamp ground.

3-2 System Connections

The overall system is comprised by (at minimum) the bridge pickup, the Stealth Mini board, and the driver. Connections to the board were discussed above, but here are some notes about making system level connections:

- IN should be connected directly to the bridge pickup out, not the output of the volume pot or pickup selector. The circuit should be driven by the full strength bridge signal so that noise from the circuit and amount of system gain are kept to a minimum. This will help reduce interference on the bridge pickup.
- The driver signal connections (X+ and X-) are made directly to the board (unless three mode wiring is used). The driver shield, however, should be connected

directly to guitar system ground (e.g., back of the volume pot). This will ensure that interference due to the driver is minimized.
- The on/off toggle switch will need to have

4 User's Guide

4-1 System Installation

System installation may vary greatly from guitar to guitar. Because the Stealth Mini board and driver are Sustainiac clones, it can be very helpful to refer to the official Sustainiac documentation, which can be found here: https://www.sustainiac.com/install.htm.

While the information at the above link is very thorough, here is a high level overview of things to keep in mind when installing.

- Install the board so that driver connections are facing the driver and the board input connection is facing the bridge pickup. This minimizes high amplitude driver signal getting coupled into the bridge output signal, which can result in interference and noise.
- If you think you may need to remove the board at some point, I recommend using headers or terminal blocks for connections to that you aren't dealing with soldering and desoldering wires multiple times.
- Keep wire lengths as short as possible. This reduces the likelihood of interference and cross talk.
- Keep the board from shorting out against anything conductive in the mounting cavity.
- The on/off switch only carries DC voltage, so its placement is not critical. The same is true for the mode switch in two mode wiring.
- If wiring the mode switch for three mode operation, the driver – side terminal will be wired to the toggle switch and the mode toggle should be mounted away from where the bridge signal wires run. This minimizes high amplitude driver signal getting coupled into the bridge output signal, which can result in interference and noise.

4-2 Tuning

Getting the system dialed in is a combination of tweaking the controls on the board, adjusting driver height, and positioning wires in the guitar cavity.

The first order of business is to raise the driver as high as possible without interfering

with the string vibrations. Check this by fretting each string at the highest fret and plucking it, making sure that the string doesn't contact the driver. Keeping the driver high minimizes circuit gain required for sustain which, in turn, results in the strongest vibrations with lowest noise in the system.

To get the sustaining performance further dialed in, plug the guitar output into an amplifier or computer interface so that you can listen to the guitar output signal. Start with the system in fundamental mode and play an open low E note, turning up the GAIN control until it sustains consistently. Now test on frets 5 and 12 and turn up if necessary. Work your way up the strings, testing open strings and frets 5 and 12.

Once you have tested all strings, check harmonic mode and adjust as necessary. Note that the harmonic mode gain control is attenuation-only, as there is a fixed boost in the circuit for harmonic mode already. In the unit I reverse engineered, there was no harmonic control and thus no attenuation.

Once all strings are sustaining well, listen for interference or noise on the output signal. Before turning system gain down, adjust the placement of wires in the cavity. This can help more than you might imagine. For a detailed procedure, see the documentation referenced above.

4-3 Troubleshooting

Rather than listing all the possible problems and their solutions, I will refer you to the thorough Sustainiac troubleshooting documentation found at the link above. You are looking for a PDF called “Troubleshooting Info”. Note that this document is for the Stealth Pro, which has some features not applicable to the original Stealth.