

PROJECT NAME

ASTRA

BASED ON

Astrotone Fuzz

EFFECT TYPE

Silicon fuzz

BUILD DIFFICULTY

■□□□□ Beginner

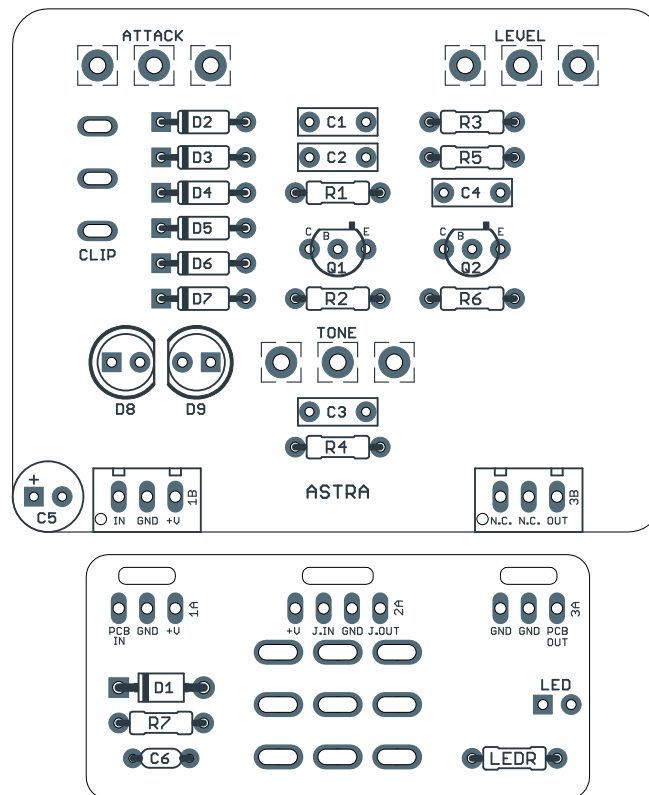
DOCUMENT VERSION

1.0.1 (2021-04-27)



PROJECT SUMMARY

An early silicon fuzz from 1966 that was also sold as the Sam Ash Fuzzz Boxx. One of the first drive circuits to include a tone control.



Actual size is 2.3" x 1.86" (main board) and 1.78" x 0.86" (bypass board).

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INTRODUCTION

The Astra Silicon Fuzz is a clone of the Astrotone Fuzz, also released as the Sam Ash Fuzz Boxx (yes, there are three Z's and two X's!). It was manufactured by the Universal Amplifier Company in New York City from 1966-1968.

The Astrotone was one of the first silicon fuzz units, developed in an era when germanium transistors were still widely used. It's also one of the first effects pedals to feature a tone knob, although it's not particularly effective in this circuit (at least not without some modifications) and later fuzz pedals such as the 3-knob Tone Bender greatly improved upon the concept.

Analogman released his version of the Astrotone, conveniently also called the Astrotone since the original trademark had expired. It has the exact same topology, but has several component values changed out to round out the tone and remove the thinness of the original. It's not an exact clone, but it's still very highly regarded. A parts list for the Analogman version is provided in the documentation alongside the original version.

The updated version of the Astra includes a toggle switch to select between three different sets of clipping diodes. Since the circuit uses hard clipping with no volume recovery stage afterward, the clipping diodes will directly impact the maximum available volume.

USAGE

The Astra has the following controls:

- **Attack** is an input volume control that reduces the gain before the transistor amplification stage, acting as a drive control.
- **Tone** cuts the treble after the clipping stage.
- **Level** controls the overall output of the effect.
- **Clip** (toggle switch) selects between three sets of diodes: 1x silicon (stock), 2x silicon, and LEDs.

PARTS LIST

This parts list is also available in a spreadsheet format which can be imported directly into Mouser for easy parts ordering. Mouser doesn't carry all the parts (most notably potentiometers) so the second tab lists all the non-Mouser parts as well as sources for each.

[View parts list spreadsheet](#) →

PART	VALUE	TYPE	NOTES
R1	1M	Metal film resistor, 1/4W	Analogman version uses 1.2M here.
R2	22k	Metal film resistor, 1/4W	
R3	470k	Metal film resistor, 1/4W	
R4	1M	Metal film resistor, 1/4W	Analogman version uses 1.2M here.
R5	1k8	Metal film resistor, 1/4W	
R6	1k8	Metal film resistor, 1/4W	Analogman version uses 470R here.
R7	100R	Metal film resistor, 1/4W	Power supply filter resistor (not on original unit)
LEDR	4k7	Metal film resistor, 1/4W	LED current-limiting resistor. Adjust value to change LED brightness.
C1	47n	Film capacitor, 7.2 x 2.5mm	Analogman version uses 470n here.
C2	47n	Film capacitor, 7.2 x 2.5mm	
C3	47n	Film capacitor, 7.2 x 2.5mm	
C4	47n	Film capacitor, 7.2 x 2.5mm	Analogman version uses 470n here.
C5	100uF	Electrolytic capacitor, 6.3mm	Power supply filter capacitor.
C6	100n	MLCC capacitor, X7R	Power supply filter capacitor.
D1	1N5817	Schottky diode, DO-41	
D2	1N914	Fast-switching diode, DO-35	
D3	1N914	Fast-switching diode, DO-35	
D4	1N914	Fast-switching diode, DO-35	
D5	1N914	Fast-switching diode, DO-35	
D6	1N914	Fast-switching diode, DO-35	
D7	1N914	Fast-switching diode, DO-35	
D8	5mm	LED, 5mm, red diffused	Can also use 3mm LEDs.
D9	5mm	LED, 5mm, red diffused	Can also use 3mm LEDs.
Q1	2N3904	BJT transistor, NPN, TO-92	Original uses 2N3565. 2N3904 is an exact substitute.
Q2	2N3904	BJT transistor, NPN, TO-92	Original uses 2N3565. 2N3904 is an exact substitute.

PARTS LIST, CONT.

PART	VALUE	TYPE	NOTES
ATTACK	100kB	16mm right-angle PCB mount pot	
TONE	10kB	16mm right-angle PCB mount pot	
LEVEL	10kB	16mm right-angle PCB mount pot	
CLIP	SPDT cntr off	Toggle switch, SPDT on-off-on	
LED	5mm	LED, 5mm, red diffused	
IN	1/4" stereo	1/4" phone jack, closed frame	Switchcraft 112BX or equivalent.
OUT	1/4" mono	1/4" phone jack, closed frame	Switchcraft 111X or equivalent.
DC	2.1mm	DC jack, 2.1mm panel mount	Mouser 163-4302-E or equivalent.
BATT	Battery snap	9V battery snap	Optional. Use the soft plastic type—the hard-shell type will not fit.
FSW	3PDT	Stomp switch, 3PDT	
ENC	125B	Enclosure, die-cast aluminum	Can also use a Hammond 1590N1.

BUILD NOTES

Transistor selection

The original Astrotone used 2N3565 transistors, which varied widely in gain. Some batches were in the 180-220 range, similar to the 2N3904, and others were more like 400-500, similar to the 2N5088. The lower-gain ones were more prevalent.

The exact gain characteristics of the 2N3565 transistors used in the original Astrotone are not known, but it doesn't matter too much. The important thing to know is that there is nothing special about the original vintage transistors. The **2N3904** will sound exactly the same.

Diode selection

Photos of original Astrotone units show that it used DO-7 glass case diodes, which are usually associated with germanium. However, the [original manual for the Astrotone](#) claims it uses all silicon semiconductors (which includes diodes)—and in the 1960's when small-signal silicon diodes were first coming on the market, there were a lot of them in the DO-7 case, since that was the format used by most diodes. Therefore, while DO-7 silicon diodes are rare today, this would not be uncommon to see in 1966.

The other evidence in favor of them being silicon is more practical: since they're hard clippers with no gain recovery afterward, they would directly impact the max volume level. At ~0.3V forward voltage (typical for germanium), it would clamp the maximum volume at unity or lower, and the original units would have a hard time achieving unity gain if they were in fact germanium diodes.

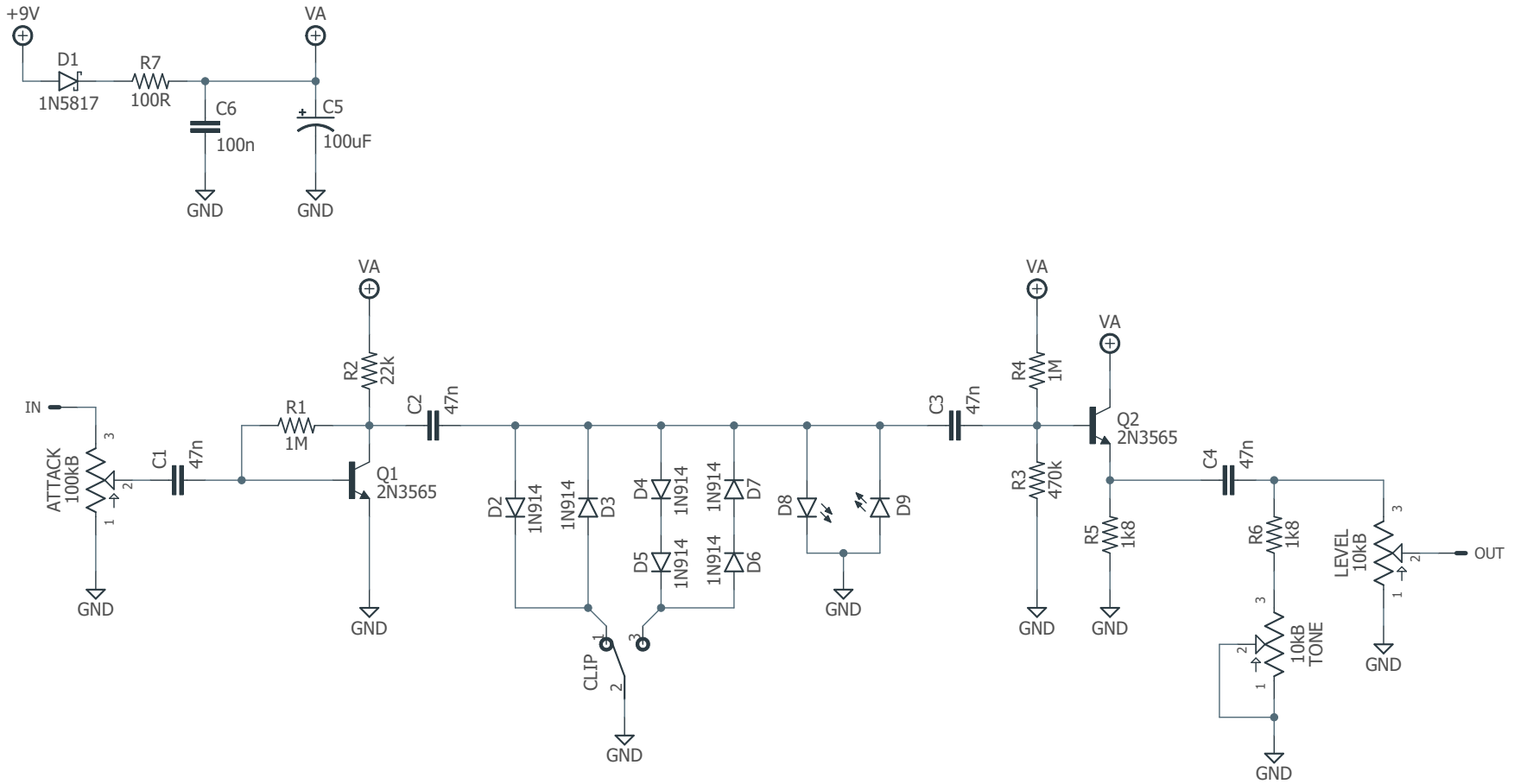
So, on balance, we'd conclude that despite looking like germanium diodes, the Astrotone was an early adopter of silicon diodes. And allowing that they are in fact silicon, the standard **1N914** would be an exact replacement.

Analogman mods

The Analogman version of the Astrotone uses **1M2** for R1 and R4, **470R** for R6, and **470n** for C1 and C4. The vintage version is very thin-sounding, lacking in bass, and these modifications help to round it out.

Even if you stick with the original vintage circuit, you may find it worthwhile to use Analogman's tone control modification, which reduces R6 to **470R**. All the tones of the original unit are still present except at the very extreme end of the range.

SCHEMATIC



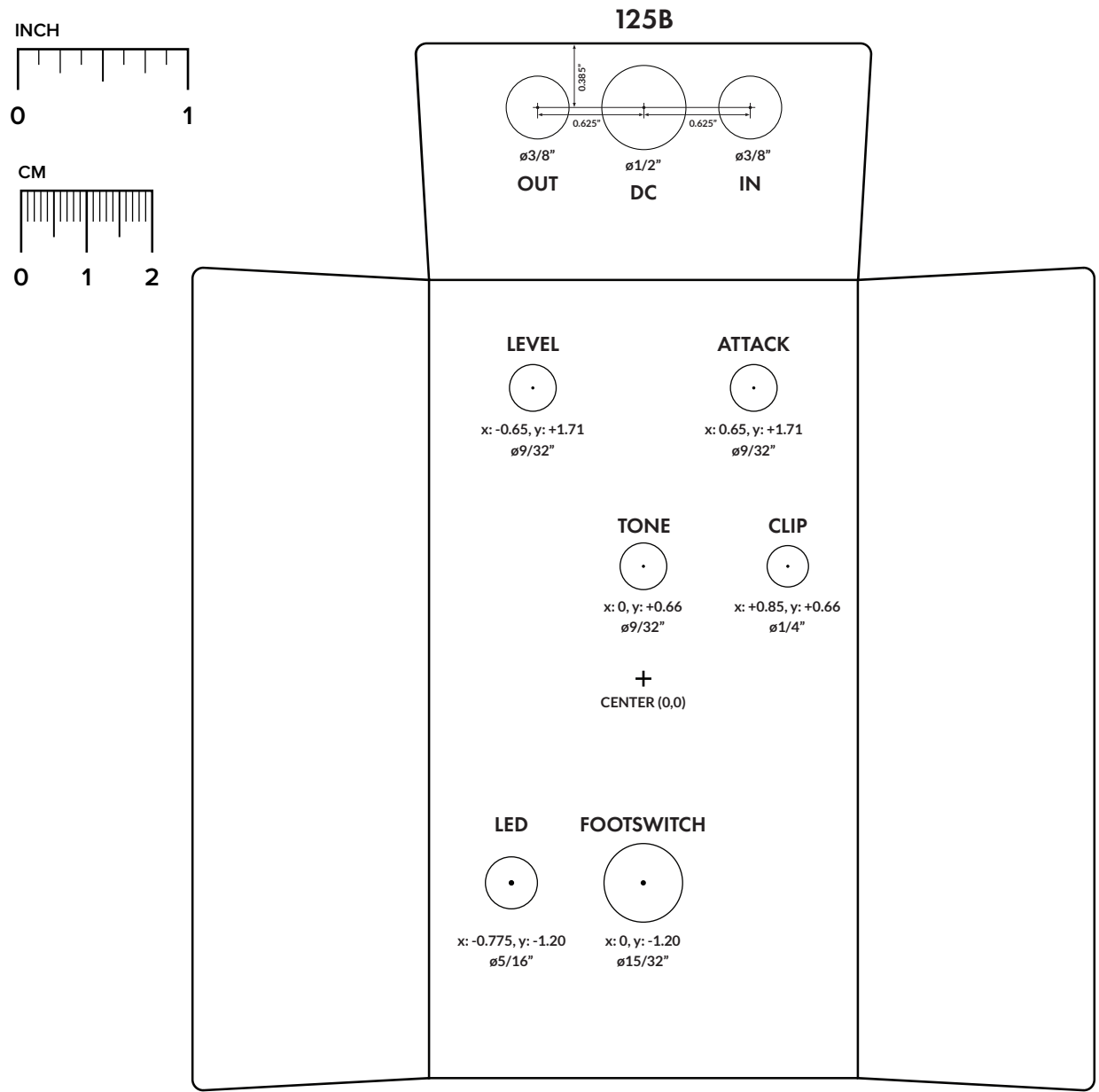
DRILL TEMPLATE

Cut out this drill template, fold the edges and tape it to the enclosure. Before drilling, it's recommended to first use a center punch for each of the holes to help guide the drill bit.

Ensure that this template is printed at 100% or "Actual Size". You can double-check this by measuring the scale on the printed page.

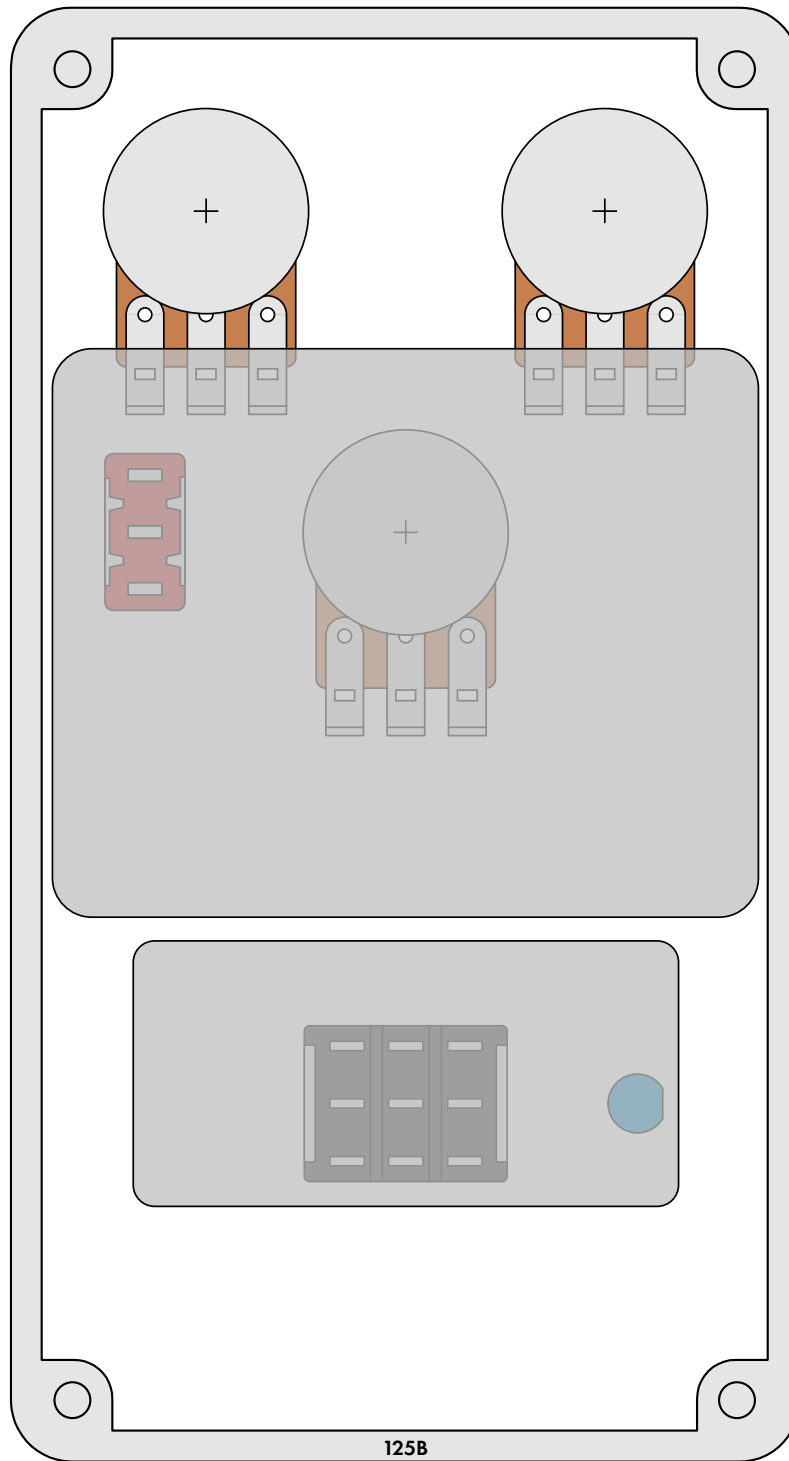
Top jack layout assumes the use of closed-frame jacks like the [Switchcraft 111X](#). If you'd rather use open-frame jacks, please refer to the [Open-Frame Jack Drill Template](#) for the top side.

LED hole drill size assumes the use of a [5mm LED bezel](#), available from several parts suppliers. Adjust size accordingly if using something different, such as a 3mm bezel, a plastic bezel, or just a plain LED.



ENCLOSURE LAYOUT

Enclosure is shown without jacks. See next page for jack layout and wiring.



WIRING DIAGRAM



*Shown with optional 9V battery. If battery is omitted, both jacks can be mono rather than one being stereo.
Leave the far-right lug of the DC jack unconnected.*

LICENSE & USAGE

No direct support is offered for these projects beyond the provided documentation. It's assumed that you have at least some experience building pedals before starting one of these. Replacements and refunds cannot be offered unless it can be shown that the circuit or documentation are in error.

All of these circuits have been tested in good faith in their base configurations. However, not all the modifications or variations have necessarily been tested. These are offered only as suggestions based on the experience and opinions of others.

Projects may be used for commercial endeavors in any quantity unless specifically noted. No attribution is necessary, though a link back is always greatly appreciated. The only usage restrictions are that **(1) you cannot resell the PCB as part of a kit without prior arrangement, and (2) you cannot “goop” the circuit, scratch off the screenprint, or otherwise obfuscate the circuit to disguise its source.** (In other words: you don't have to go out of your way to advertise the fact that you use these PCBs, but please don't go out of your way to hide it. The guitar effects industry needs more transparency, not less!)

DOCUMENT REVISIONS

1.0.1 (2021-04-27)

Removed RPD from parts list which was included by mistake. The schematic and Mouser spreadsheet were correct.

1.0.0 (2021-03-19)

Initial release.