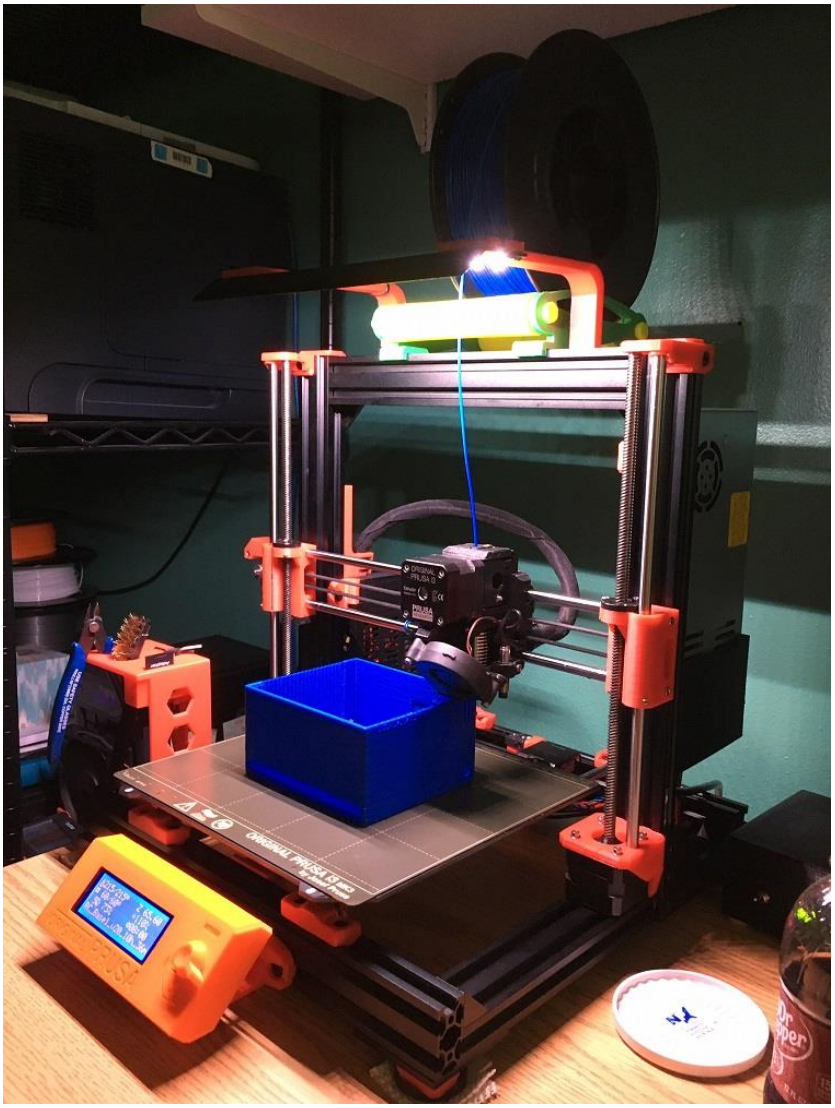
The SC126 Compact Case Kit

The SC126 Compact case is manufactured using 3D printer technology.

Autodesk® Fusion360 (Personal) was used to design and generate STL files (an abbreviation of "stereo lithography") representing a 3D model of the case's individual components, which were subsequently "sliced" into many layers to be 3D printed.

The STL files were post-processed using Simplify3D™. Simplify3D™ "sliced" the STL files into G-code instructions compatible with the 3D printer in use. G-code (also known as RS-274) is the name of the most prevalent programming language for computer numerical control (CNC) in computer-aided design and manufacturing.

The parts are manufactured using a highly modified Prusa i3 MK2.5S printer. The baseline printer kit was produced by Prusa Research a.s. in the Czech Republic.



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About this Document

This document was prepared to increase the probability of success when assembling the SC126 Compact Case and also as a guide for those that are looking at the case as a potential new project for housing their SC126 Motherboard.

This document is placed into the public domain. Please feel free to share and distribute.

Cheers

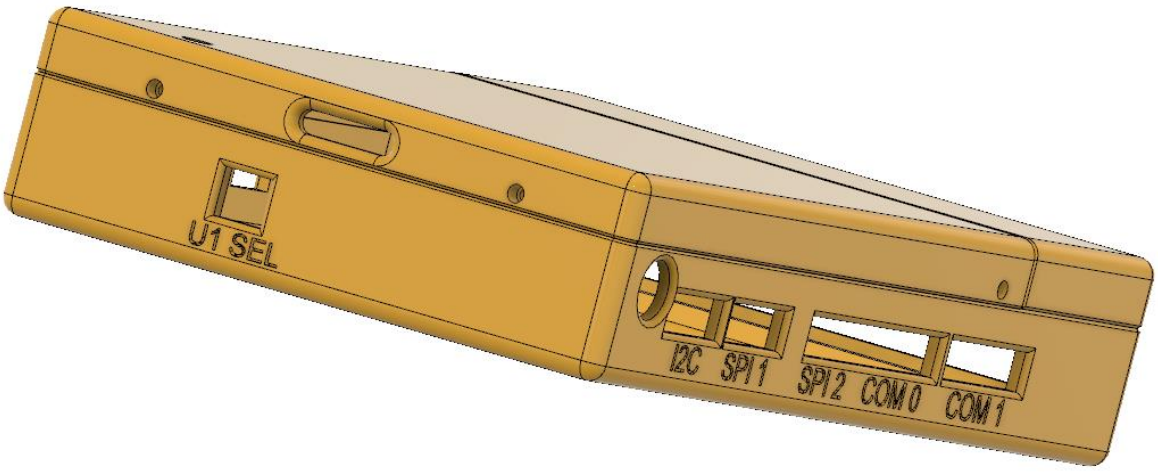
-Jim McGinnis

For information regarding kit availability and pricing, please send inquiries to the following email address. florida321surf@gmail.com

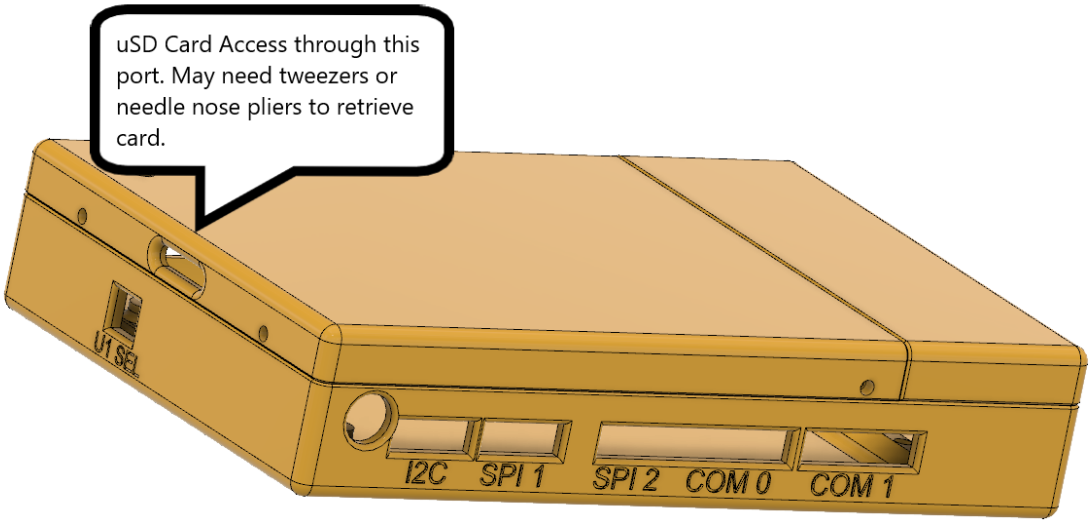
Features

The case is designed to encapsulate the SC126 Z-180 Motherboard V1.0 designed and kitted by Steve Cousins. [https://smallcomputercentral.wordpress.com/sc126-z180-motherboard-rc2014/]

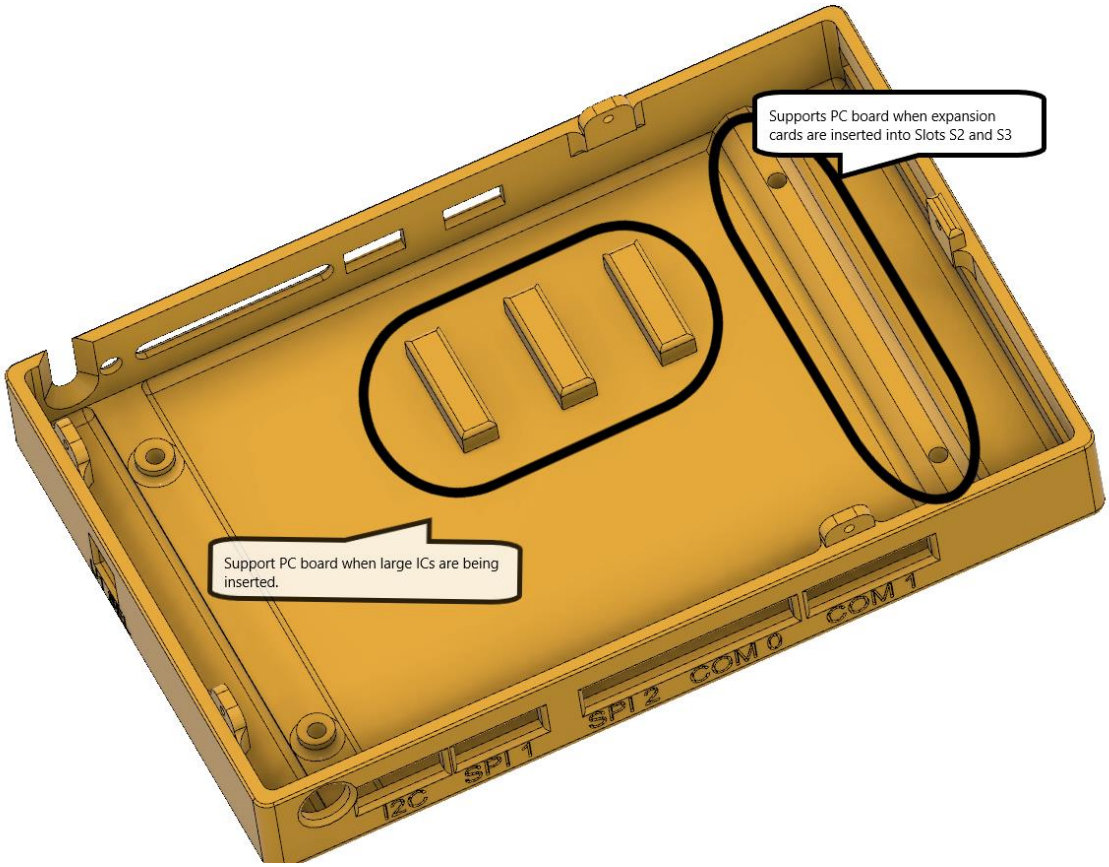
- Clearances around the board are tight to keep the volume of the case as small as possible while still allowing assembly with little or no difficulty.
    - In order to make installation and assembly as pain-free as possible, the installation of SC126 headers must conform to the specifications in "SC126 Construction" beginning on page 11.
- External access is provided to all of the Jumpers, Headers, Receptacles, and Switches located near the "edge" of the Motherboard.
    - Power Receptacle (Rear)
    - I2C Header (Rear)
    - SPI1 Header (Rear)
    - SPI2 Header (Rear)
    - COM0 Header and Power Select Header (Rear)
    - COM1 Header and Power Select Header (Rear)
    - U1 Select Header (Right)
    - uSD Card Access (see below)
    - Power Switch
    - FLASH Write Protect 1 and 2 Headers (Front)
    - RC80 Expansion Header (Left)



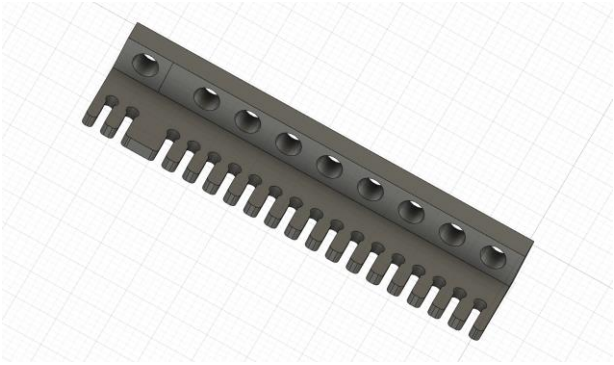
- Micro-SD card access is provided via a uSD Breakout Card (not provided) mounted to the lid and an extension cable (provided) for breakout card connection to the SC126 SPI 1 SD Card header.



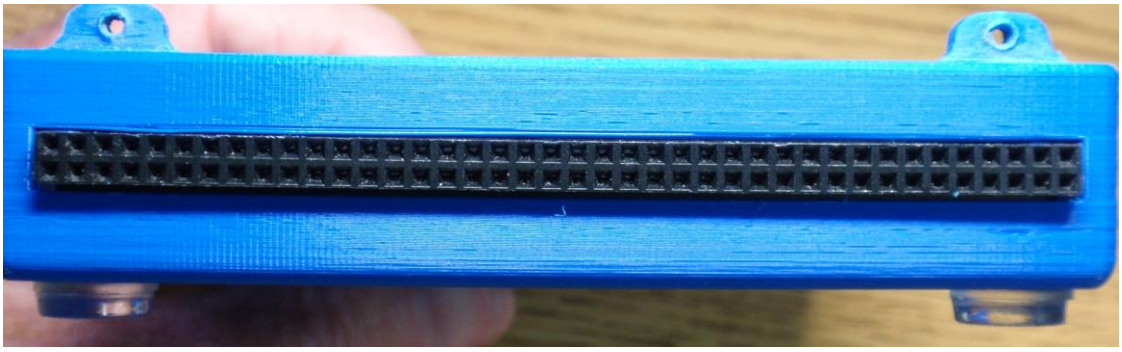
- The base has built-in support for critical contact areas of the SC126 Motherboard where extra support is required for insertion of chips and expansion cards.



- Special accommodation has been provided for viewing the LEDs from the front face.
    - A custom designed LED Bench allows the LEDs to be inserted in a right-angle formation.
    - Note that the current-limiting resistors may need to be changed to higher values – the Blue LEDs are very bright.
    - Installation of the LED Bench requires removal of existing LEDs (if already installed) and installation of 3mm LEDs (provided) using the instructions in this document. See SC126 Board LED Options beginning on page 16.

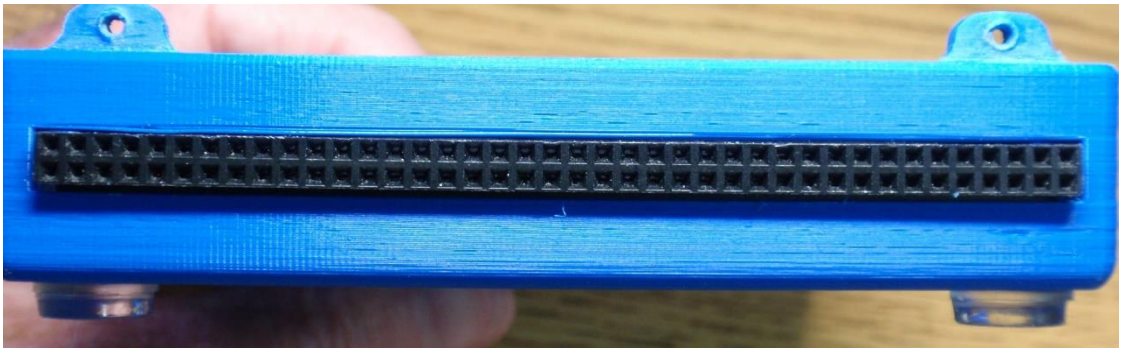


- All three (3) SC126 Motherboard expansion connectors are accessible.
    - The SC126 Motherboard horizontal expansion connector is exposed on the left side of the case.
    - Two SC126 vertical expansion connectors are accessible by removing the case “trunk lid.” The trunk lid is detached by removing two screws on the left side.



- The addition of an SC113 Expansion Modular Backplane is possible using the included 3D printed support part. (Steve Cousins – [https://smallcomputercentral.wordpress.com/sc113-modular-backplane-rc2014/]
    - The support part is of minimal size. It provides the necessary height for aligning the expansion connectors without sag or stress.
    - Note that the screw holes for installing the SC126 Motherboard and the SC113 expansion card are recessed. The bottom of the SC126 Compact Case and the SC113 3D printer support part are smooth and without protrusions.

- Self-adhesive rubber feet are provided for both the case and the SC113 support.



SC126 Assembly Specifications

The SC126 Motherboard construction (or modification, if already built) must meet the specifications in this section. Failure to conform to these specifications may make assembly of the SC126 Motherboard into the SC126 Compact Case an impossible task.

The areas encircled in the images below indicate critical areas of construction that will affect the ability of the SC126 Motherboard to be installed into the case.

General Rule 1:
The SC126 Motherboard headers configured for **outside-the-case** access must be **right-angle** type. Male type is also recommended.

General Rule 2:
The headers should be installed in the "in-board" position, where both "in-board" and "out-board" positions are provided. The "out-board" position is nearest the edge of the SC126 circuit card. The "in-board" position is farthest from the edge.

SC126 Board – Rear Headers

Referring to the circuit card image below, the area bounded by the yellow box contains headers that are exposed via openings in the rear of the case.

Install right-angle male 6 pin headers using the "**in-board**" set of holes for the following connectors:

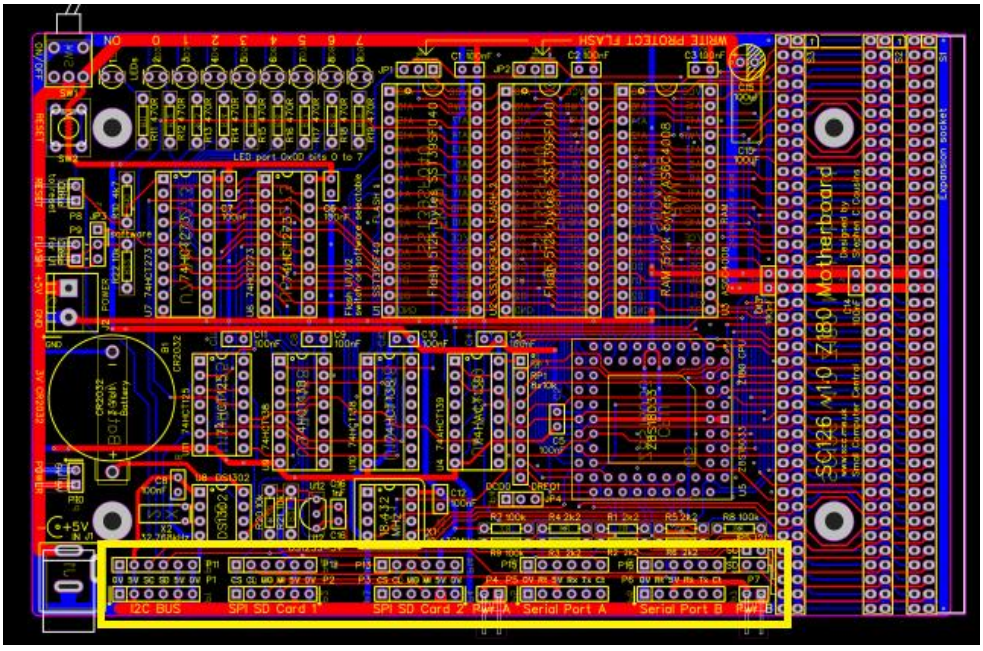
- I2C BUS
- SPI SD Card 2
- Serial Port A
- Serial Port B

Install right-angle male 2 pin headers using the individual set of holes for the following jumpers:

- Pwr A
- Pwr B

Install a straight male 6 pin header using the "**in-board**" set of holes for the following connectors:

- SPI SD Card 1



[Image source : https://easyeda.com/sccousins/sc126-v1-0-z180-processor-for-z50bus] [sic]

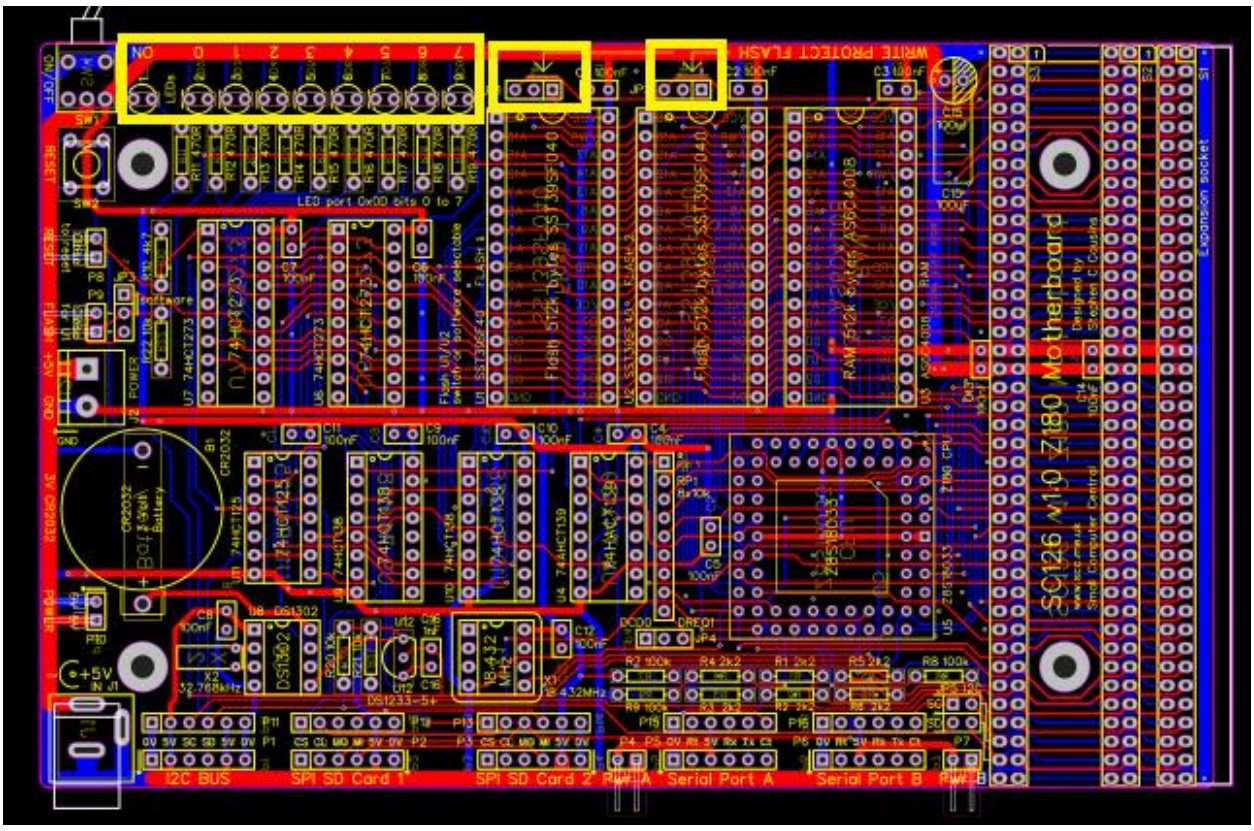
SC126 Board – Front Headers

Referring to the circuit card image below, the areas bounded by the yellow boxes contain headers that are exposed via openings in the front of the case.

Install right-angle male 3 pin headers using the available set of holes for the following connectors:

- Write Protect Flash (2 places)

Remove the existing LEDs if already installed. New 3mm LEDs are provided in the kit. See SC126 Board LED Options beginning on page 16.



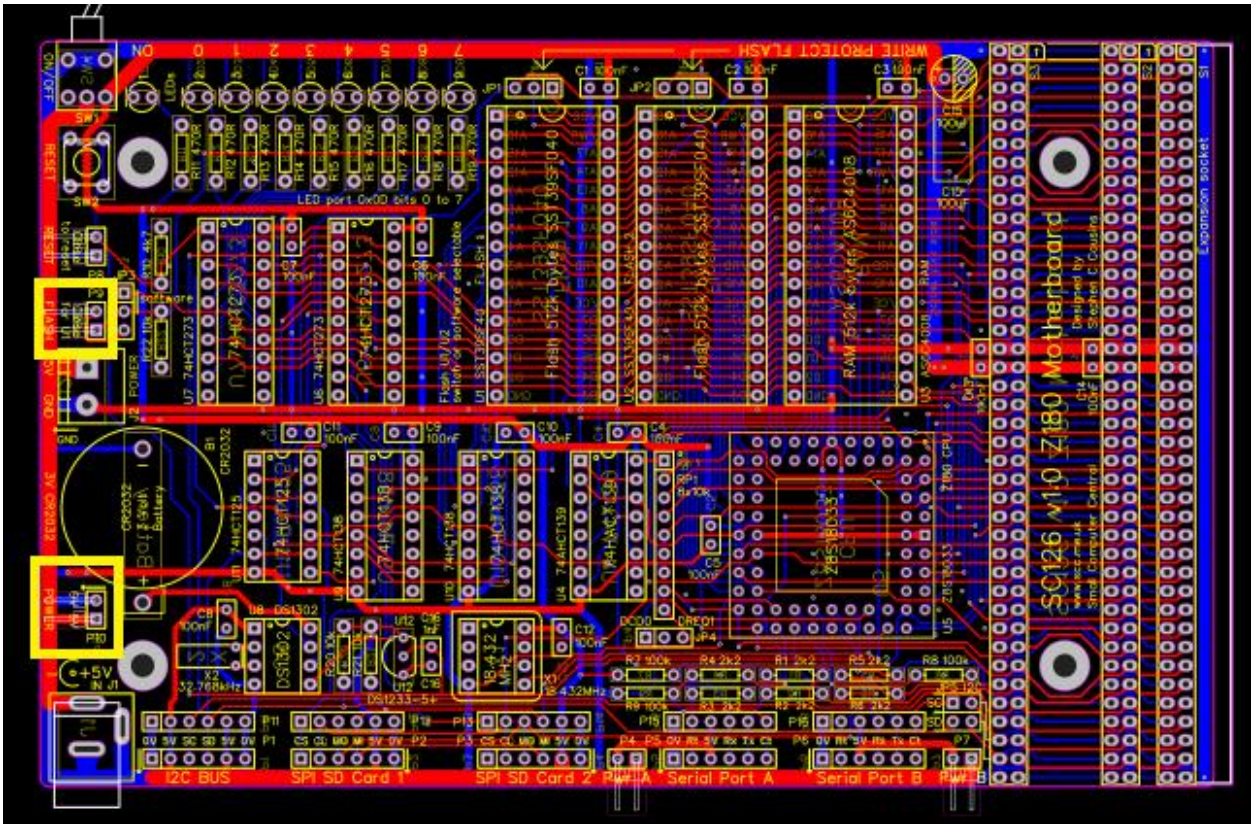
SC126 Board – Right Headers

Referring to the circuit card image below, the area bounded by the top yellow box contains a header that is exposed via an opening in the right side of the case. The lower yellow box contains a header that **cannot** be exposed – no opening is provided for external access to the accessory male power pins.

Install a right-angle male 2 pin header using the available set of holes for the following connector:

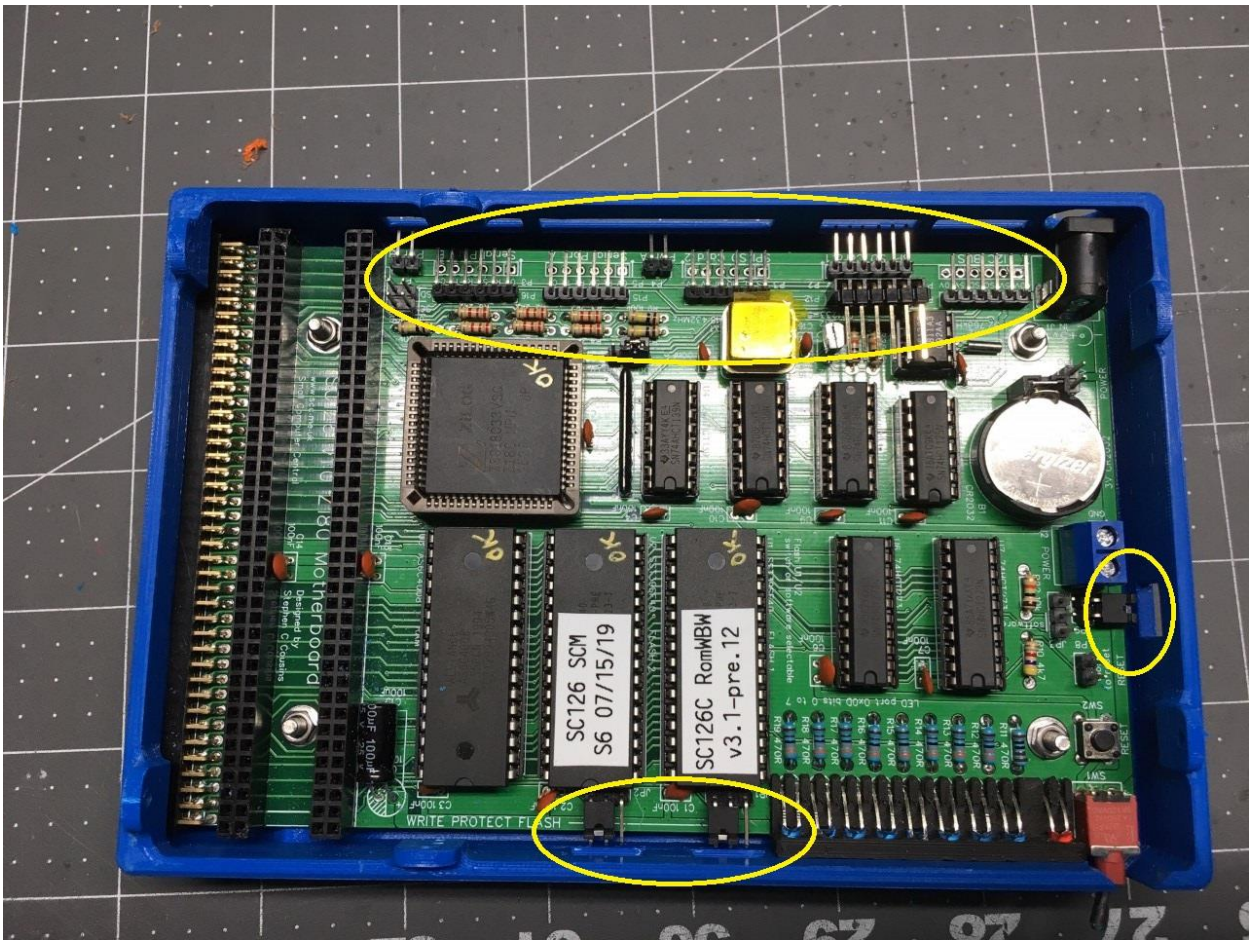
- Flash for U1 Select

Install a normal straight male 2 pin header for the power connector – see lower yellow box.



WARNING: Note that the image below does not conform to the specifications which resulted in significant difficulty during installation. This is due to the extra right angle 6-pin male header installed at the "SPI SD Card 1" **outboard** position. Avoid this mistake. Either install the angled connector for external access (omitting the uSD card in the lid) or install a straight connector –**in the "in-board" position only.**

Notice in the image that the "in-board" header for "SPI SD Card1" is a female type. Early prototypes utilized an add-on 90 degree male-male 6 pin angled connector (not provided) to change the orientation to horizontal for the uSD card cable supplied in the kit. This header configuration and 90 degree male-male angled connector are not necessary as the clearance for the cable plug is sufficient to mate with the straight male 6 pin "SPI SD Card 1" header installed as described in the instructions. (Thanks Steve!)



SC126 Board LED Options

Nine (9) LEDs have been provided in the kit [8xBlue, 1xRed]. These parts will help both those builders who have already installed LEDs, likely in a board-flush position or those just building the SC126 Motherboard. The LEDs are known to be the correct size for the included LED Bench. They snugly fit into the bench openings.

There are two options for LED positioning:

Option 1: LEDs are mounted 90 degrees to the board

This option requires the use of the LED Bench and open SC126 Motherboard through-holes for all nine (9) LEDs. Removal of previously installed LEDs can be accomplished easily by heating both holes simultaneously, using a removal device such as Hakko FR-301 or 858D hot air tool, or by simply "destroying" the old LEDs and removing each LED lead separately. New LEDs are included.

Option 2: Leave the existing LEDs installed "close to the board."

The LEDs will not be as visible as option 1. The LED Bench will not be required and the LEDs provided in the kit will be surplus. This option works, but is less "polished." It avoids the risk of LED removal – which may be attractive to some hobbyists.

Advice: Those are Bright LEDS!

Since the Blue LEDS can be blindingly bright, the LED current-setting resistors need to be larger than provided in the original SC126 kit. The following R values were determined experimentally; the values were higher than expected, but are very effective.

Blue LEDs: 3.3K

Red Led: 1K

Removing the resistors can be facilitated using the same "destroy, divide, and conquer" method described earlier without damaging the SC126 Motherboard.

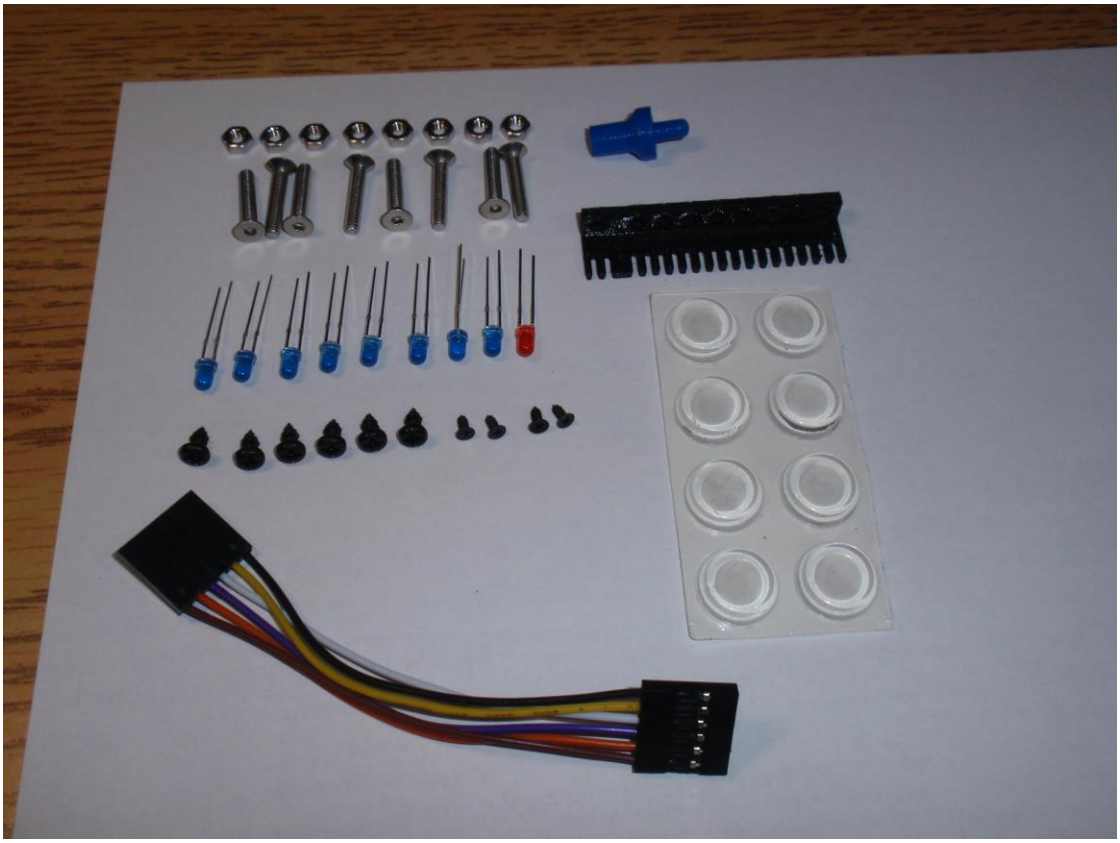
Do you need resistors?

Please request a resistor set when you order the case kit and they will be added without additional expense.

Parts Details

The following section provides details regarding the parts provided in the kit.

The following image illustrates the relative sizes for the parts provided in the kit:

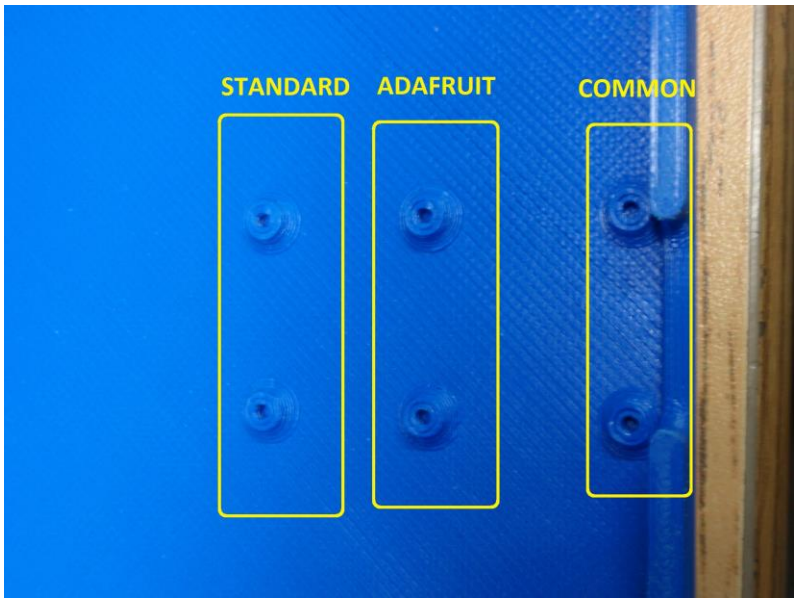


Fasteners: Mounting the SC126 and SC113 boards.
There are eight (8) M3x16 Screws and eight (8) M3 nuts for mounting the SC126 Motherboard into the SC126 Compact Case base and the SC113 Expansion Modular Backplane to its support. The bases have recessed holes for accepting the heads of these screws. Four fasteners can be used for securing each board. (M3x14 may work just as well.)

Fasteners: Attaching the Micro-SD Breakout Card
Use four (4) #1 x 3/16" Flat Head Screws for attaching the uSD Breakout Card to the Lid. These are the smallest screws in the kit.

Do not over-tighten!

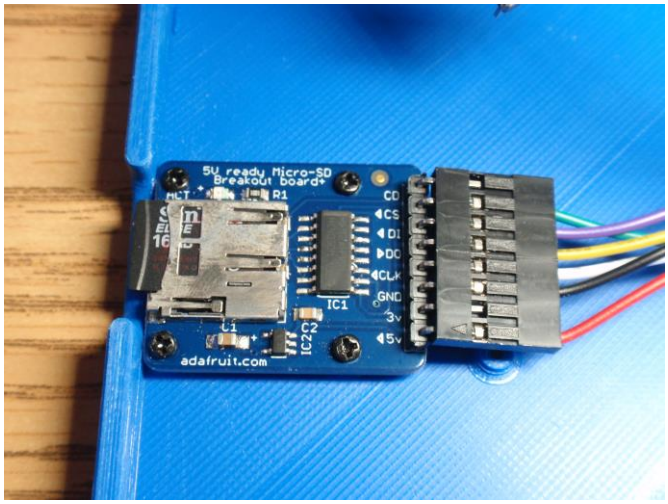
The case lid has six (6) mounting holes for securing the uSD Card Breakout board. Normally, you will only use four (4) of the holes.



The holes provided accommodate at least three different manufacture of uSD Card Breakout boards. Mount the board as close to the outside edge of the lid using the “COMMON” holes adjacent to the edge of the lid. This position allows easier external access to the uSD card.

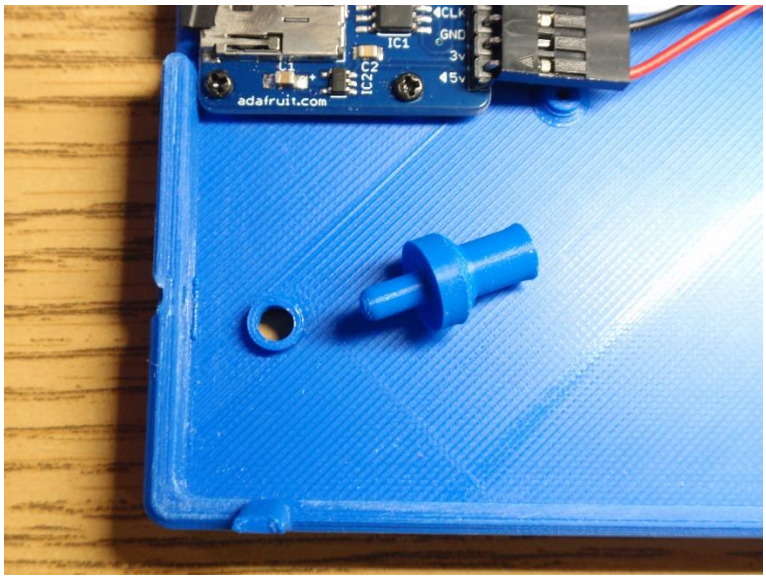
The stock uSD Breakout Card from Steve is long and will require using the “COMMON” edge holes as well as the “STANDARD” holes that are the furthest from the lid edge.

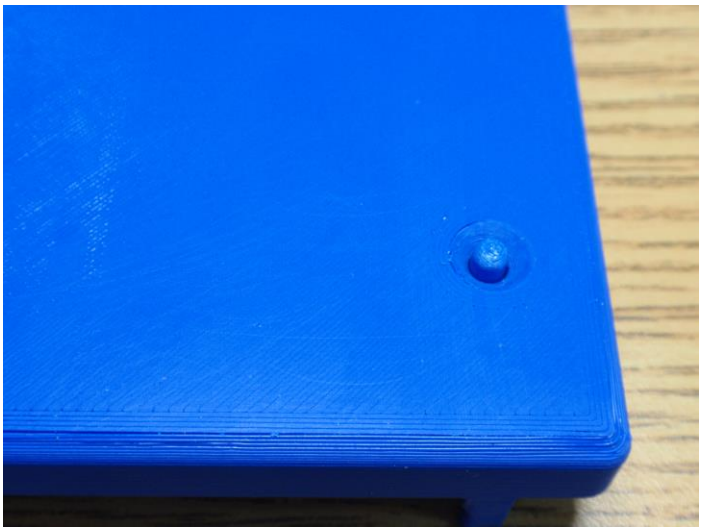
The Adafruit #254 uSD Breakout Card and some other available cards use the “COMMON” edge holes along with the middle “ADAFRUIT” holes.



Reset Pin Installation

The reset pin is installed with the narrow diameter end inserted into the hole from the bottom side of the lid. By inverting the lid (top down), the base may be brought into position to close the case without dropping the pin. The lid top pin access is recessed and can be activated with a deep finger press or tool press.

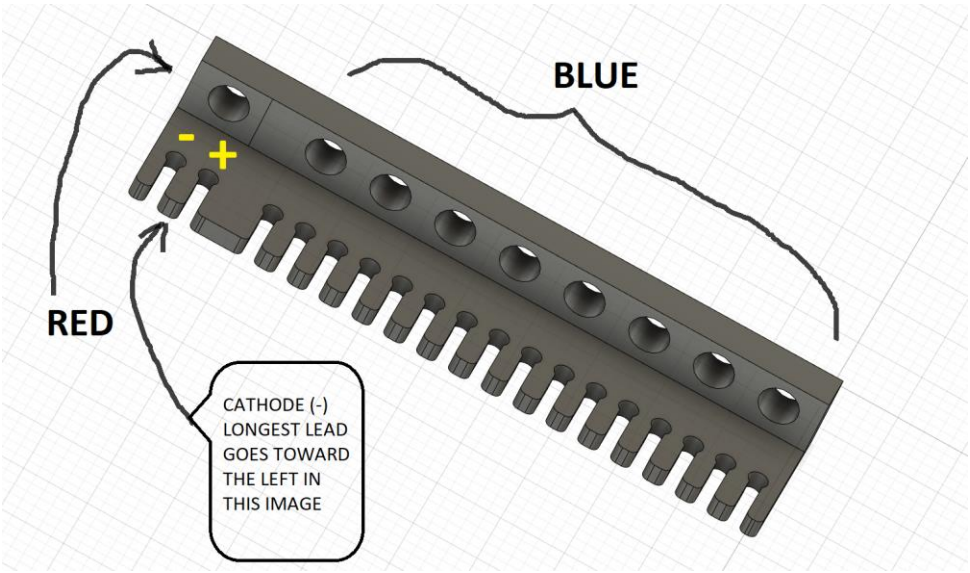




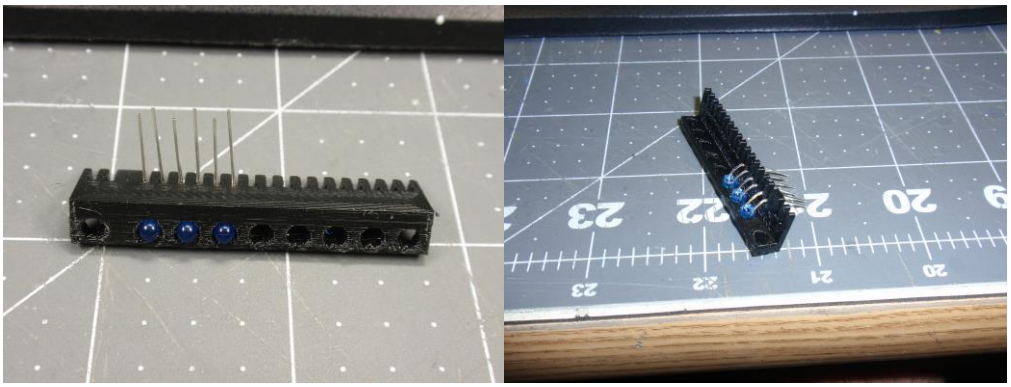
LED Bench Construction

The LED bench is constructed by first inserting LEDs into each opening noting the orientation of the leads to match the holes in the circuit card assembly. It is normal that some pressure may be required to enable the LEDs to seat fully into the bench. The LED holes are deliberately under-sized. The bench is printed using PETG filament and is quite robust and is hard to damage. So, feel free to press with some force.

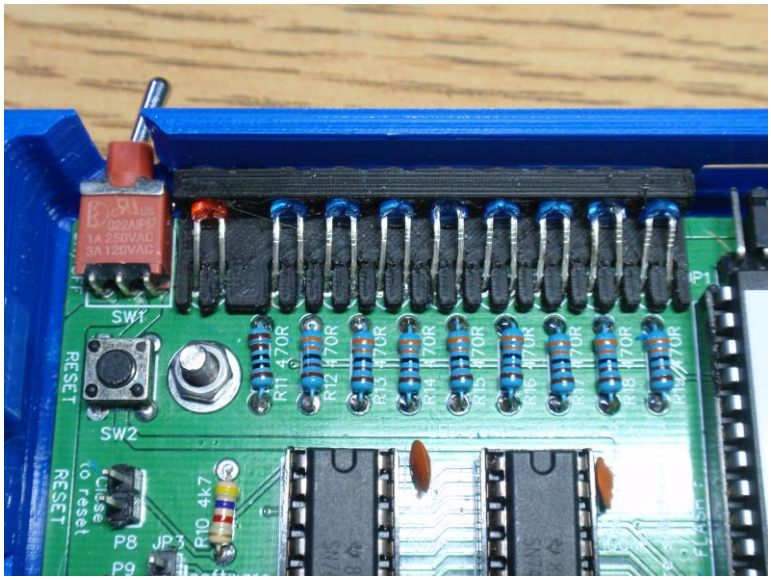
Note the asymmetric organization of the LED holes in the bench – the power LED opening is separated by 0.2” from the row of 8 Blue LEDs.



Bend the leads downward into the bench slots. BE SURE to double check the orientation of the anodes and cathodes before you solder the bridge into place. The LED orientation is consistent across the bench.

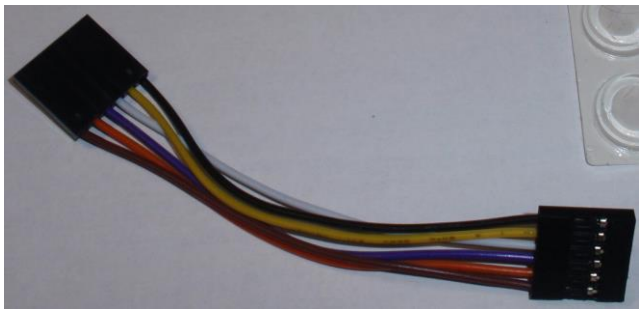


The single Red LED opening is on the left in this picture. The LED Flat Side is on the left of each LED in this picture.

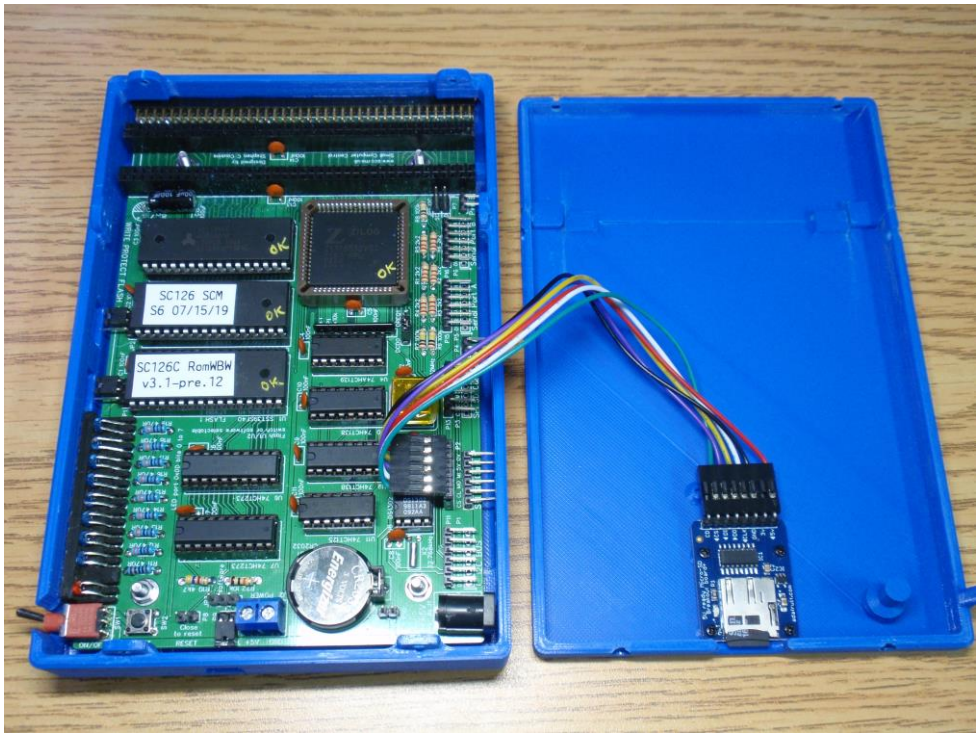

SW1
SW2
RESET
R11 470R
R12 470R
R13 470R
R14 470R
R15 470R
R16 470R
R10 4k7
P8
JP3
P9

Wiring Harness: uSD Breakout Card

Regardless of which cable is requested at the time of ordering (6-6 Pin Standard or 6-8 Pin Adafruit Cable) the cable may come with various colored wires. The only "constant" about the cable assembly provided in these kits is that on each end of the cable you will find a single black wire – GND. Use the black wire as the guide for orienting the cable when connecting to the SC126 board (0V=GND) and the uSD Breakout Card connector.



The following image illustrates the Adafruit™ uSD Breakout Card cable connector setup. On the 6-pin end (SC126 end) the GND is connected to the header top pin (0V) and on the Adafruit Breakout Card 8-pin end, pin 3 from the right is GND.



Fasteners: Closing the Case

Use six (6) M3x8 Pan Head Screws for attaching the lids to the case base.

Do not over-tighten!

Tools

The following image contains the tools used most frequently when post-processing the 3D printed parts. The blue handled tool is a countersinking/deburring tool used in Aircraft Sheet Metal fabrication.

You may find that you want to polish some rough edges. Treat the material as if it is wood-like.