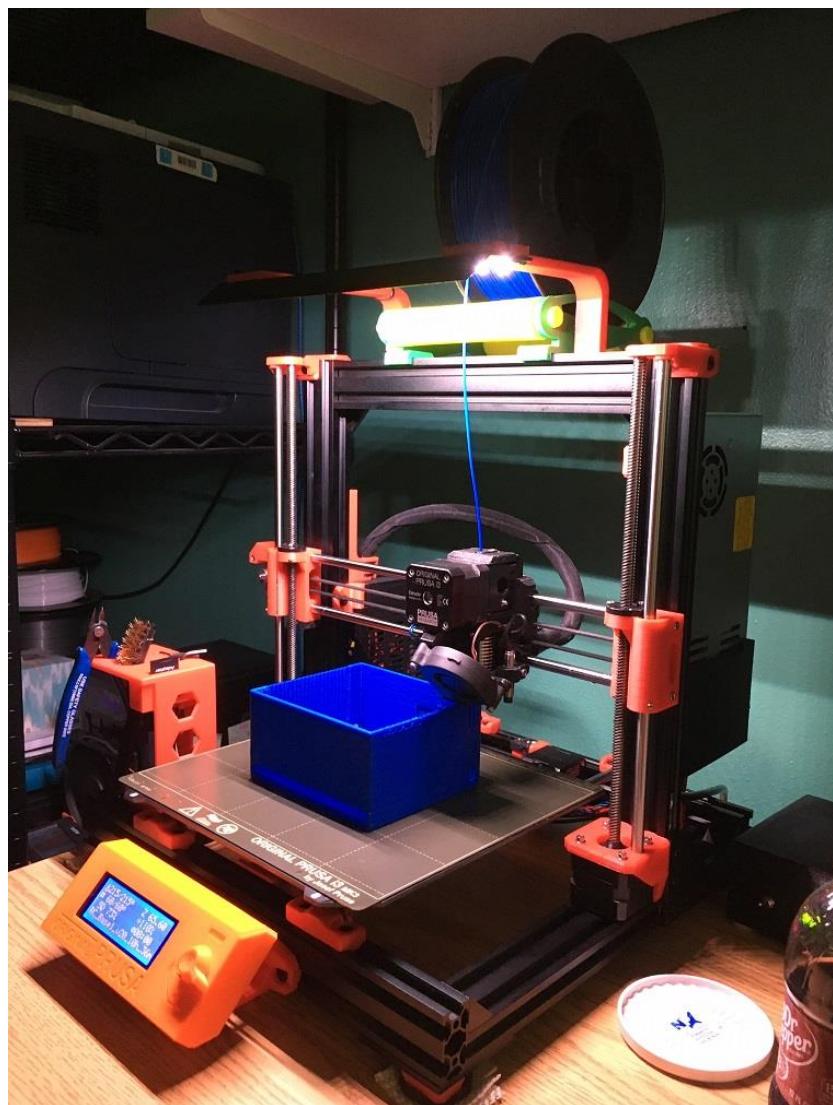


The SC126 Stacked Case V2



The SC126 Stacked 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 Stacker V2 Case and also as a guide for those that are looking at the case as a potential new project for housing their SC126 Motherboard. Most guidance here is accurate. However, there are tasks and planning activities remaining for the builder. The SC126 Stacked V2 has been used extensively as a "Main development platform. Most of the configuration options were built (not just designed) and work as expected.

Notes at EasyEDA will document the status of each board and should be checked before embarking on your own build.

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

I am usually available on Google Groups: retro computer and RC2014. Please feel free to ask questions and provide comments as needed.

I may also have a few board "spares" (at cost) that I can offer to interested parties.

Cheers

-Jim McGinnis

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/>]

The “stacked” concept involves the addition of one or two additional “mezzanine” cards that extend the capabilities of the SC126 Z180 motherboard.

Objectives

- Incorporate TTL to USB modules “inside” the case
- Add two more Serial ports, one with DE-9 connector and RS-232 signal levels
- Incorporate two (2) uSD Card modules “inside” the case
- Add flexible Hard Disk and Floppy Disk accommodations “inside” the case

The design files for the cards can be located on EasyEDA by searching for designer: “trawlergeek” or by searching for the specific boards.

The boards that are referenced in this document include the following:

Motherboard: SC126 Z180 Motherboard

Card1 (Middle): JM002 Expansion Serial IO Mezzanine Board [v2.0] for SC126 V1.0

Card2 (Top): (pick one based on desired interfaces)
JM003 Expansion Disk IO Mezzanine Board [v1.0] for SC126 V1.0
JM005A IDE DOM and Floppy Mezzanine Board [v1.0] for SC126 V1.0
JM005B IDE DOM and Floppy Mezzanine Board [v1.0] for SC126 V1.0
JM006 IDE and Floppy Mezzanine Board [v1.0] for SC126 V1.0
JM007 IDE and Floppy Mezzanine Board [v1.0] for SC126 V1.0

Adapters: (pick as needed)
JM004-3 Elevated Dual IDE 2.5" 90 Degree Riser V2.0
RC80 90 Degree Adapter (see text)

Most of the hardware involves 3mm tapered head screws and hex nuts. Most of the nuts are received by press fit recesses in the 3D printed material.

A BOM is available and should be referenced for a few uncommon parts – specifically, the “top” board requires a special board-to-board mezzanine male header strip from Samtec. This header sets the correct height of the “top” mezzanine cards relative to the SC126 Motherboard and the JM002 “middle” mezzanine card.

Configuration

The stacked set of boards involves a specifically configured SC126 Motherboard with strategically configured header placement. Additionally, one or two additional mezzanine cards are constructed which interface with the SC126 via headers and RC80 expansion connectors.

- The JM002 card is the only possible selection for the middle mezzanine card.
- One (1) card from the JM005-JM007 set of disk expansion cards can be selected based on your interface needs.

Be sure to check the status notes at EasyEDA for each board you intend to use. For example: as a special request, the JM007 card design was designed with a 40 pin IDE connector and was derived from a known tested card (JM006) but was not manufactured and tested.

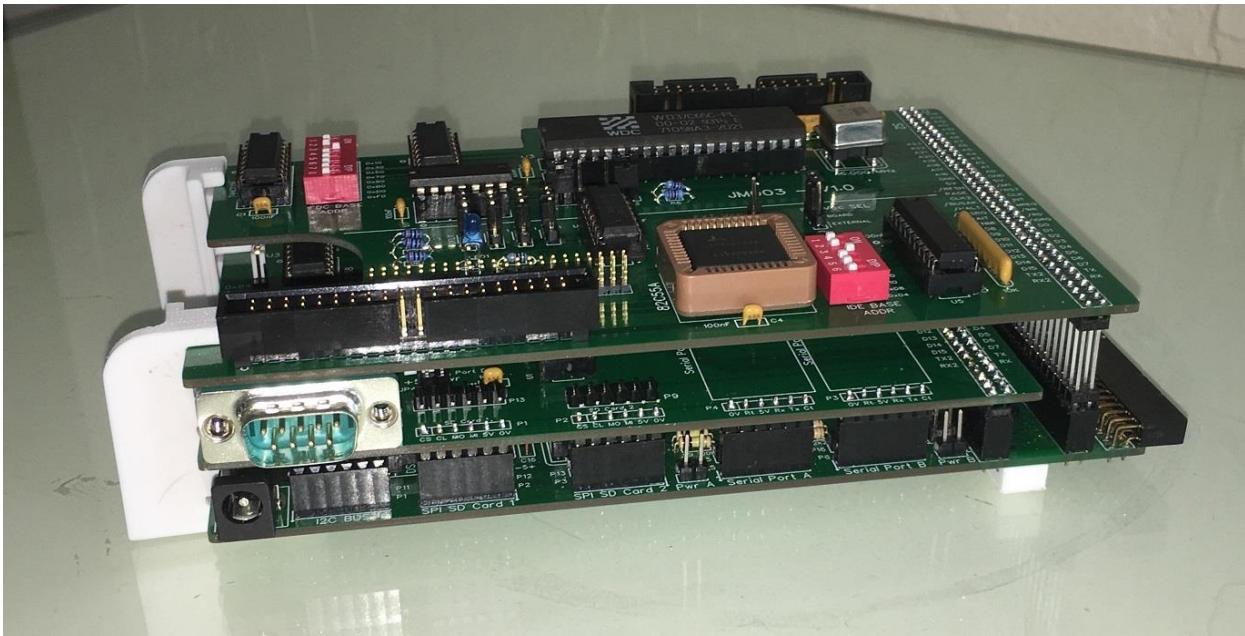
The example image below shows two mezzanine cards “layered” on top of the SC126 Z180 motherboard. The card closest to the SC126, the “middle card”, is designed to accommodate two TTL to USB modules and provides two new Serial Ports (SIO/0 or SIO/2 + CTC) with one port brought out as an RS-232 via DE-9 connector. Additionally, the card allows one (1) or two (2) uSD card modules to extend out the front. This card is a JM002 card. The view is of the rear of a typical stack-up.

The second mezzanine card, the “top” card, provides an IDE interface (both 44 pin IDE and shrouded 40 pin IDE connectors on the JM003) as well as the WD37C65 floppy controller interface and Floppy shrouded 37 pin connector. The top card is a JM003 card.

Both of the SC126 Z180 vertical RC80 expansion connectors are utilized for the connections to the two mezzanine cards. Additional connections from the SC126 card to the JM002 card are provided by SC126 individual headers along the rear edge.

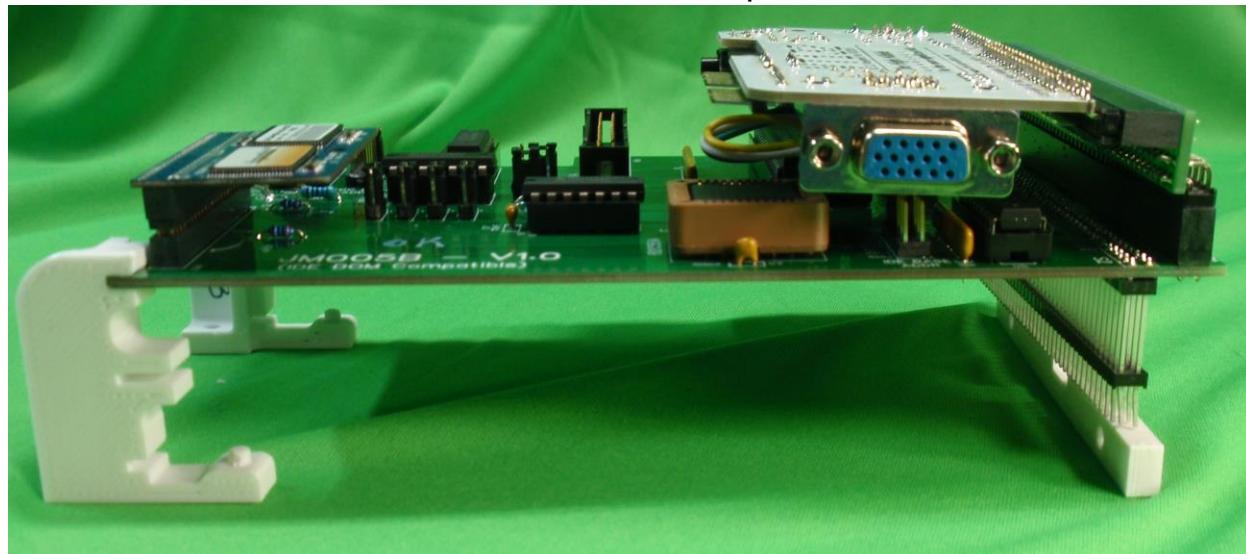
Either card may be eliminated. They are electrically and mechanically independent.

Both cards are fully supported by RomWBW (version 3.0 or higher). The RomWBW *mode.com* command can be used to set port speeds of Serial 0 through Serial 3.



Design Characteristics

- Clearances around the boards 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 mate the JM002 board to the SC126 motherboard, the installation of SC126 headers must conform to the specifications in “



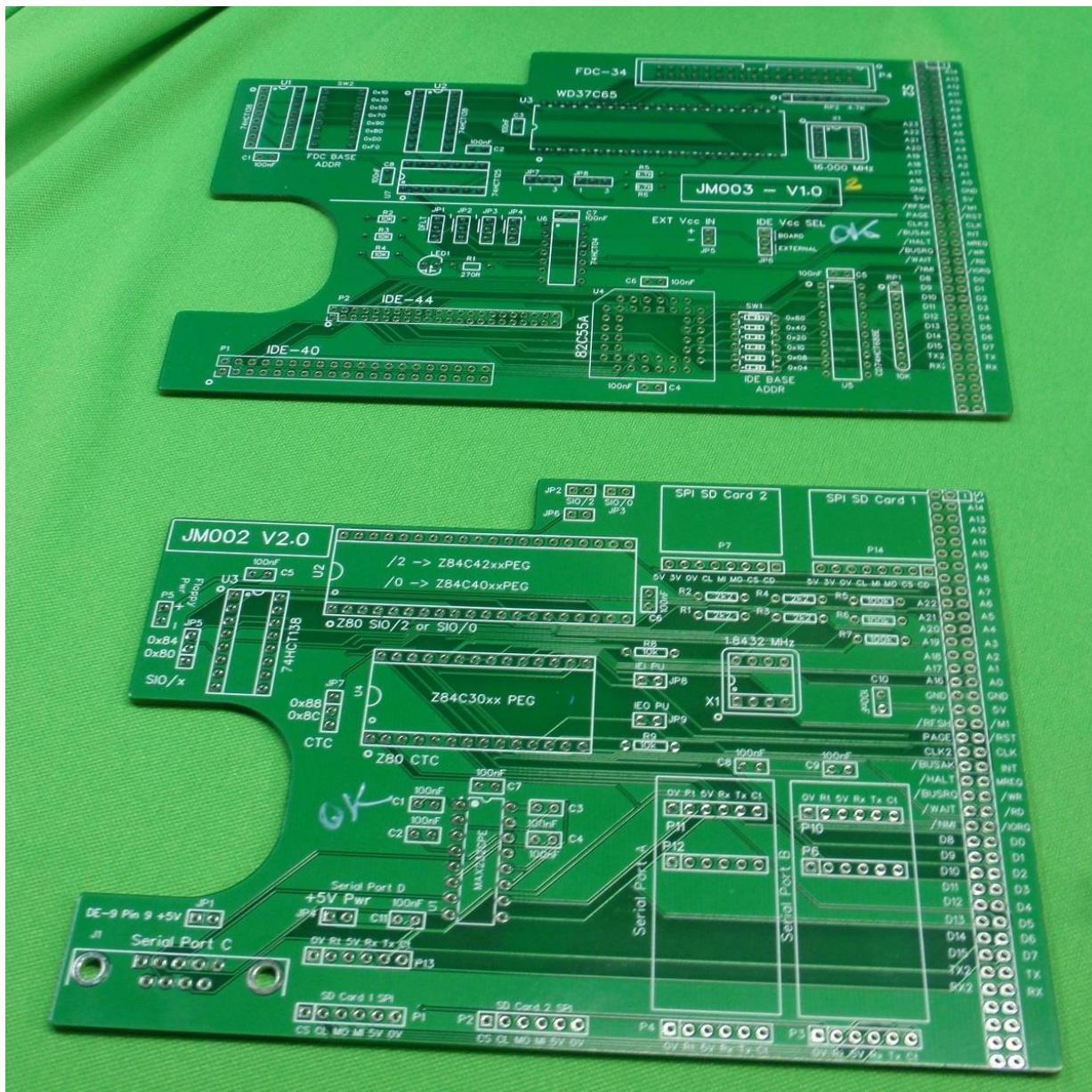
Note that the VT132 card will require additional openings in the case. They are not in the current design. But other cards can be laid on their side.

Example Bare Cards

JM003 Expansion Disk IO Mezzanine Board [v1.0] for SC126 V1.0
(Generally, drives cannot be directly attached, cables are required)

JM002 Expansion Serial IO Mezzanine Board [v2.0] for SC126 V1.0

- The uSD card headers are 8 pin using Adafruit Part interface
- The Serial Ports A and B from SC126 have two header pin locations depending on the length of your TTL-to-USB cards. Most cards fit well in one position or the other.

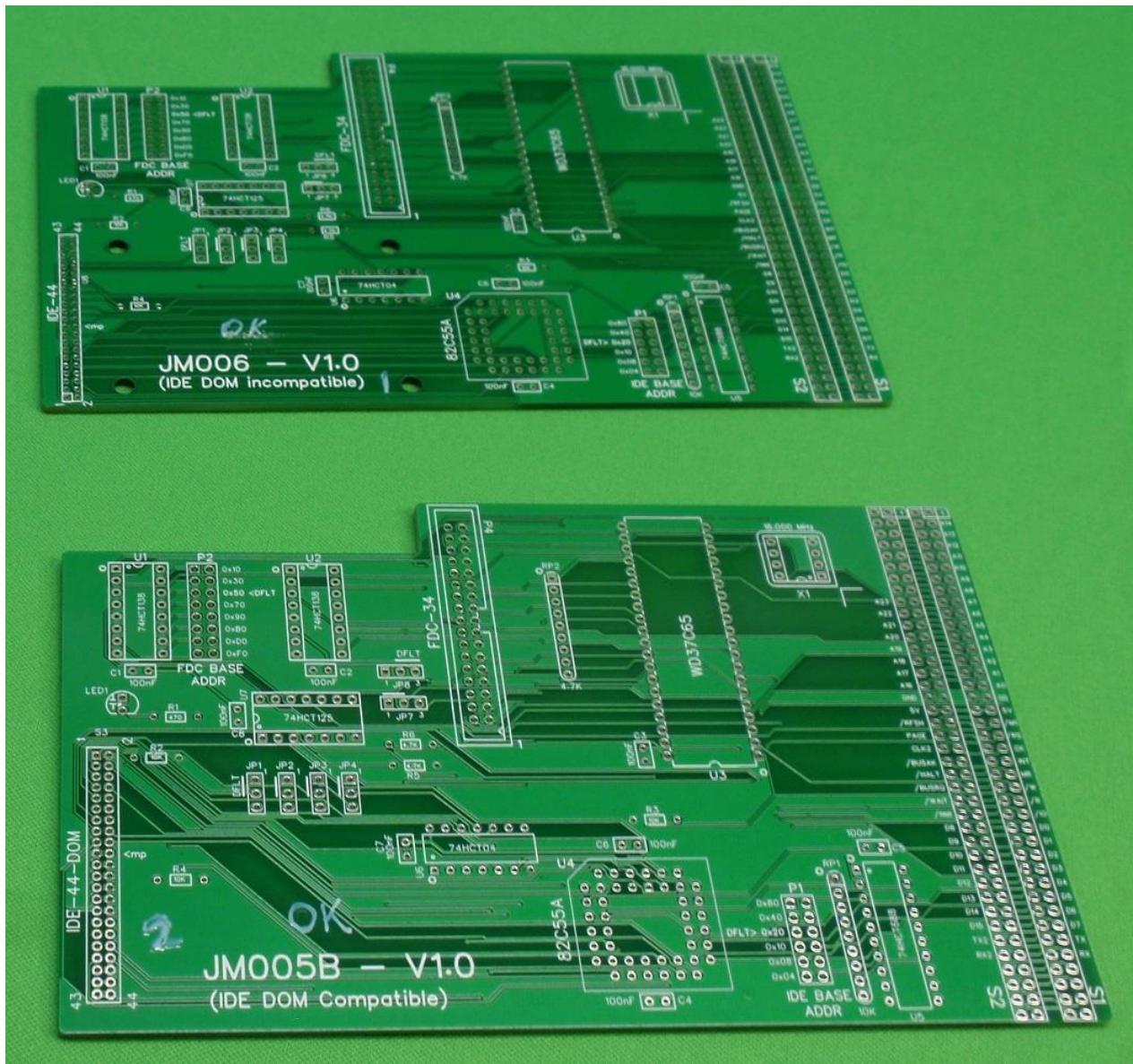


JM005B IDE DOM and Floppy Mezzanine Board [v1.0] for SC126 V1.0

- Electrically accepts some DOM modules – depending on DOM pinout. JM005A may be more appropriate for some DOM modules.

JM006 IDE and Floppy Mezzanine Board [v1.0] for SC126 V1.0

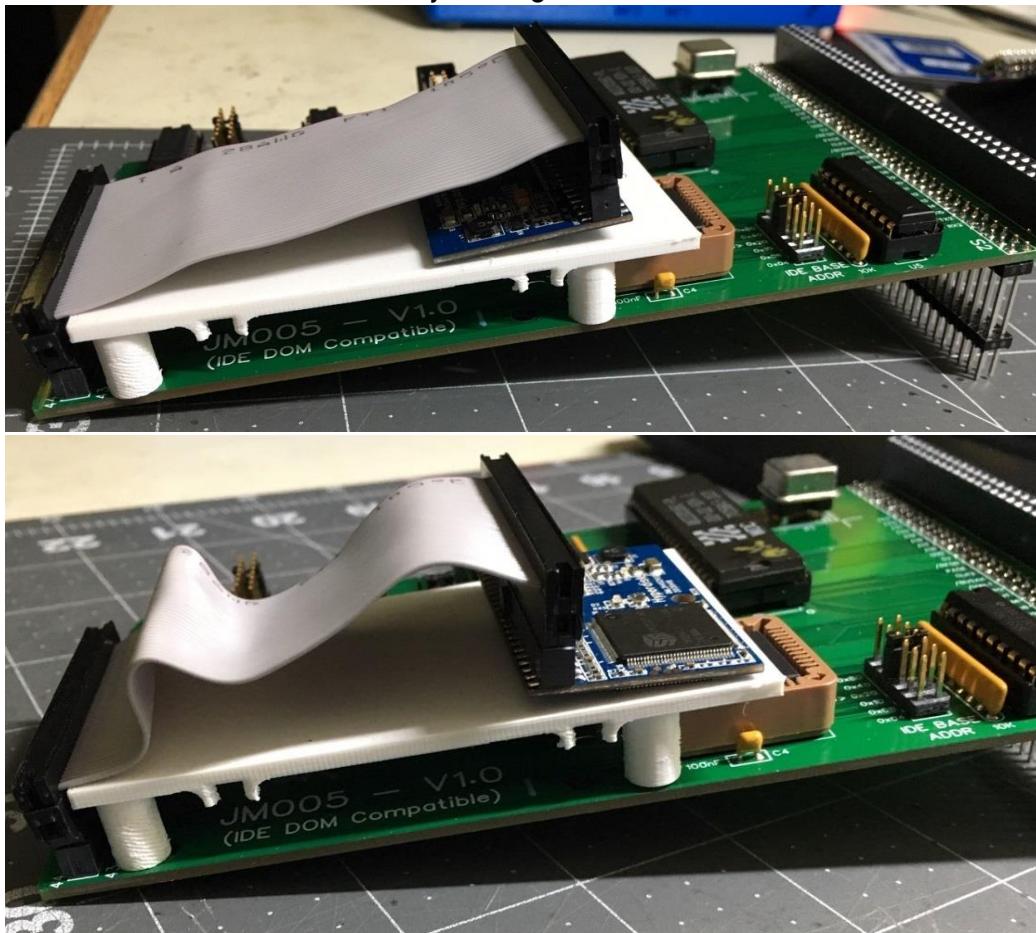
- Accepts standard IDE 44 pin devices; use with a riser board or short cable.



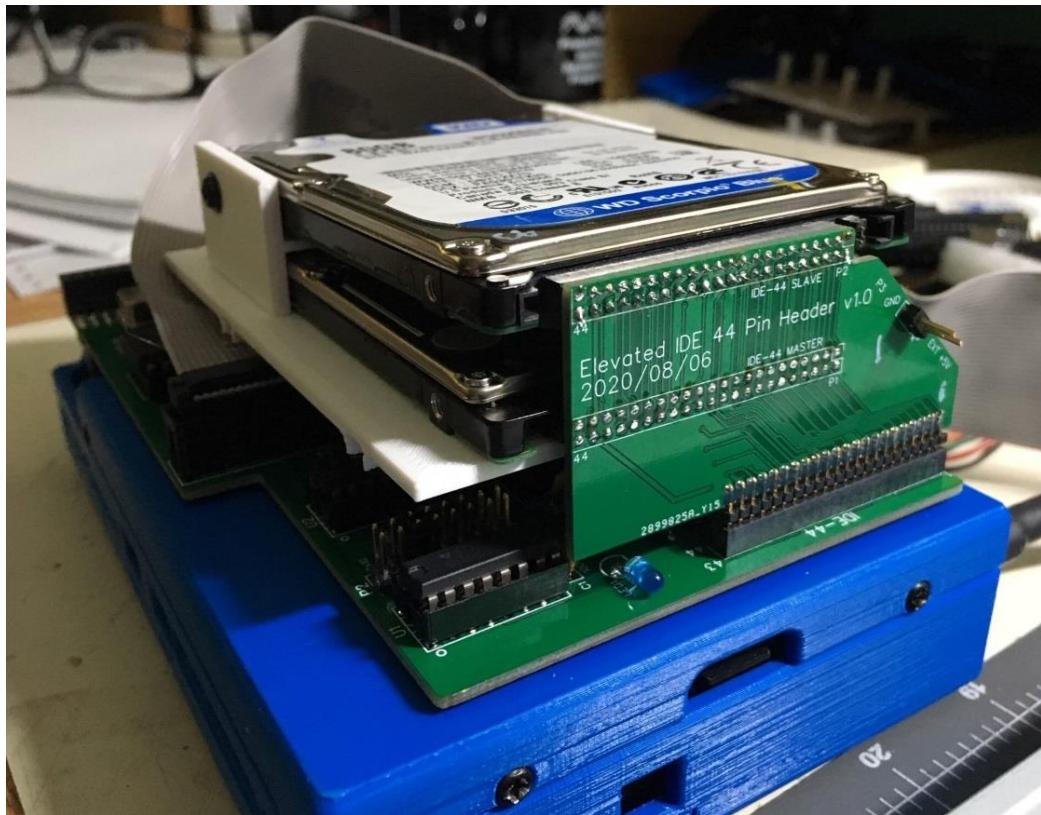
Use JM005A or JM005B – as is mechanically/electrically appropriate for your DOM module.



Some DOMs can be accommodated by adding a short cable.



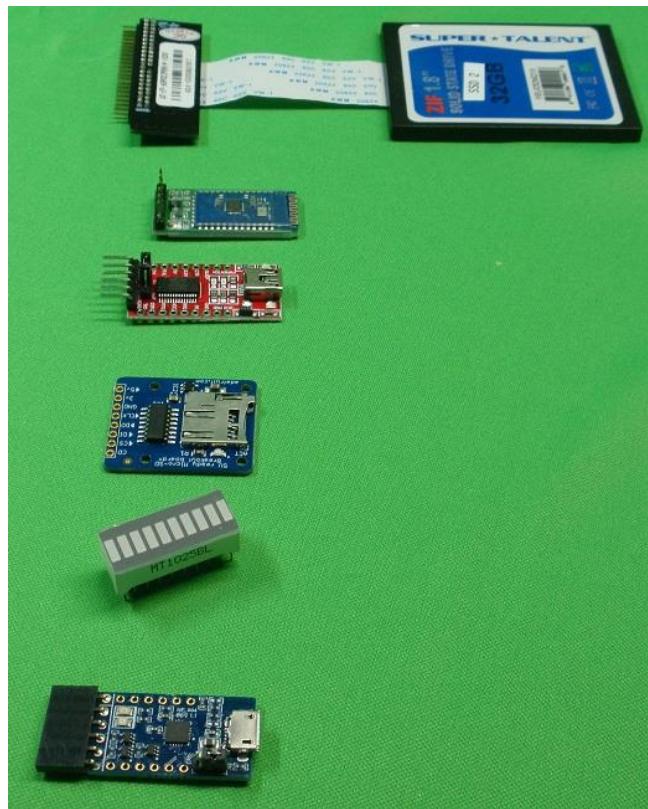
Prototyping 3D parts: SC126 Compact with JM006 mezzanine card and the JM004-3 Elevated Dual IDE 2.5" 90 Degree Riser V2.0)



Additional images of parts used in assembling various mezzanine card configurations.



A ZIF SSD drive with an IDE 44 pin adapter, a WiFi Serial Module, the Adafruit uSD card, example LED Bar with 10 LEDs, TTL-to-USB adapter module.

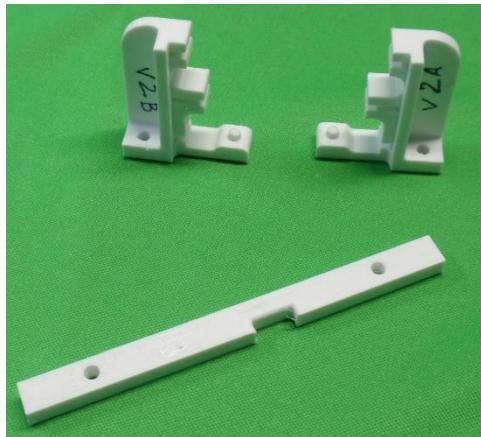


Prototype Card Testing

Here we are testing boards using the expansion “trunk” of the SC126 Compact. The JM006 mezzanine card and the JM004-3 Elevated Dual IDE 2.5" 90 Degree Riser V2.0 and the High Nibble Pty Ltd© VT132 card in the JM006 extra RC80 expansion slot are integrated and working..



- SC126 Assembly Specifications" beginning on page 20.
- Several 3D printed parts (one base bar, two symmetric supports) are required for supporting the SC126 motherboard at the expansion connector end as well as to support the stack of cards at the opposite end. These parts are printed in PETG material for both flexibility and toughness. PLA will not tolerate the flexing during installation.



- External access is not provided for all of the Jumpers, Headers, Receptacles, and Switches located near the "edge" of the SC126 Motherboard.

The following is a list of accessible features:

- Power Receptacle (Rear)
- COM0 via internal TTL to USB module (reuse standard SC126 module)
- COM1 via internal TTL to USB module (reuse standard SC126 module)
- COM2 via DE-9 RS-232 male connector
- COM3 via TTL pin header – requires cable and external TTL-to-USB module
- Dual uSD Card Access (see below)
- Power Switch (wired to motherboard)
- Reset Switch (wired to Motherboard)
- RC80 Expansion Header exposed on left side of case
- 10 LEDs (LED Bar) for power indication boot status, and drive activity.
- Micro-SD card access is provided via one or two uSD Breakout Cards (not provided) mounted to the JM002 V2.0 mezzanine card and exposed through the front of the case. Note that to use two uSD cards, the cards must respect the CS as managed by the SC126, not hard wired. The Adafruit® uSD expansion card

(Product Id 254, Mouser, Adafruit® direct) is a direct-wire application for the second mezzanine card. Many uSD card modules cannot be fitted due to pinout differences.

- Accommodation has been provided for remote viewing the LEDs from the front face.
 - The case will receive a common 10 LED bar graph part for external viewing of the LED states. One bar LED is not used. One bar LED provides power indication. The remaining LED bars tie to the SC126 LED wiring header – see below. A wiring harness must be constructed between the LED bar elements and SC126 Motherboard LED male pin headers. Direct wiring is possible.
 - Note that the current-limiting resistors may need to be changed to higher values – the Blue LEDs used in the prototype were very bright.
 - Installation of the SC126 LED male headers requires removal of existing LEDs (if already installed) and installation of 2.54mm-spaced male header pins using the instructions in this document. See **Error! Reference source not found.** beginning on page **Error! Bookmark not defined..**
- SC126 Motherboard RC80 expansion connectors:
 - The SC126 Motherboard “horizontal” expansion connector is exposed to the exterior through an opening in the left side of the case.
 - Up to two (2) SC126 vertical expansion connectors are consumed by the mezzanine cards.
 - JM005A, JM005B, JM006, and JM007 provide an “additional” RC80 expansion connector that is inside the case. The application of the “RC80 90 Degree Adapter” allows many RC2014 cards to be laid on top of the “top” mezzanine card.
- Self-adhesive rubber feet may be installed or rubber feet with mounting holes can be secured using the SC126 board mounting screws (4).

Power Considerations

The various disk drive and floppy drive power requirements **rarely** can be met simply by pulling power through the RC80 bus. The Floppy power should be supplied via a more direct route. The SC126 Motherboard has a +5V and GND male pin header near the RTC Backup Battery. This is not switched power, but it has been sufficient for powering several floppy drives. The Floppy is powered down when the external power is removed.

The dual IDE 2.5" disk configuration requires the use of JM004-3 Elevated Dual IDE 2.5" 90 Degree Riser V2.0 for connecting the IDE drives together and to the JM006 IDE and Floppy Mezzanine Board [v1.0] for SC126 V1.0. The riser card has a two (2) pin power header for directly powering the dual IDE drives. The system will, in all likelihood, fail to boot or will cycle through boot without the direct application of external power to the drives. A single IDE drive has been successfully powered directly from the mezzanine cards – but it is not assured that this will be a stable configuration for all loads.

Finally, the coaxial barrel connector requires the right match for the power plug or else it may be intermittent when disturbed. Choose the right barrel connector for your power source or bypass the barrel connector (leave it off) and route a hard wire connection to the two SC126 Power screw terminals and back out through the hole allocated for the coaxial power connector.

Example Built-up Cards

SC126 Stacked V2 (top, left)

JM002 Expansion Serial IO Mezzanine Board [v1.1] for SC126 V1.0 (middle, left)

- Example only – replaced by JM002 V2.0

JM006 IDE and Floppy Mezzanine Board [v1.0] for SC126 V1.0 (top, right)

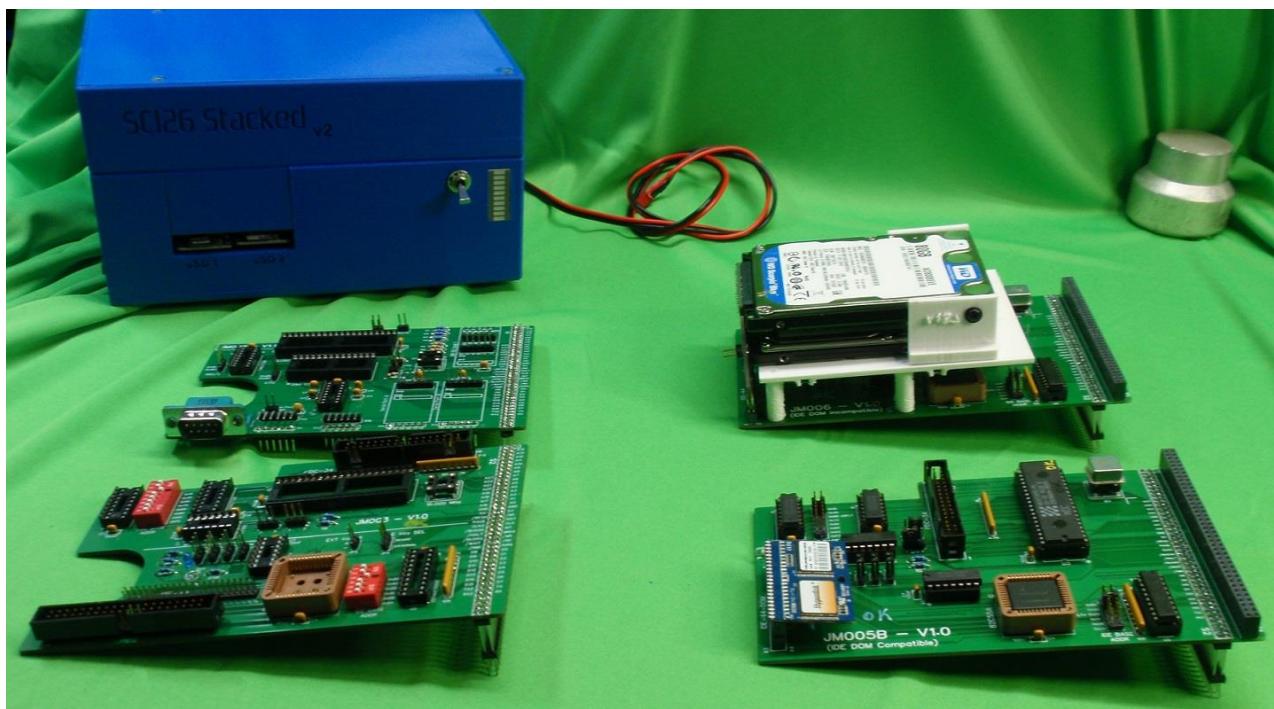
- Dual 2.5" IDE rotary drives installed with 3D printed bench and JM004-3 Elevated Dual IDE 2.5" 90 Degree Riser V2.0

JM005B IDE DOM and Floppy Mezzanine Board [v1.0] for SC126 V1.0 (bottom, right)

- DOM is a version that mates with the IDE pinout using JM005B

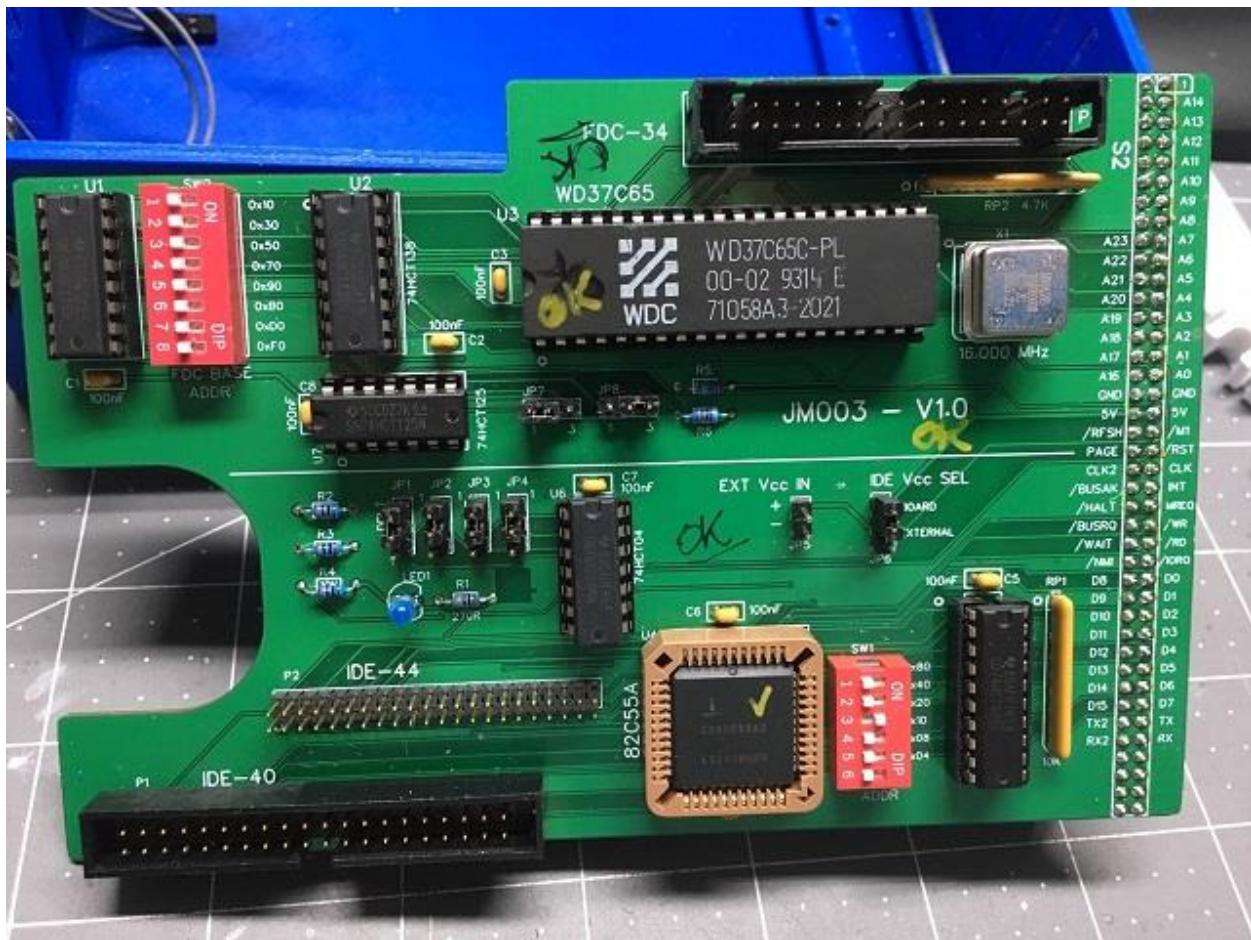
JM003 Expansion Disk IO Mezzanine Board [v1.0] for SC126 V1.0 (bottom, left)

- Original design with IDE 44 and IDE 40 pin connectors

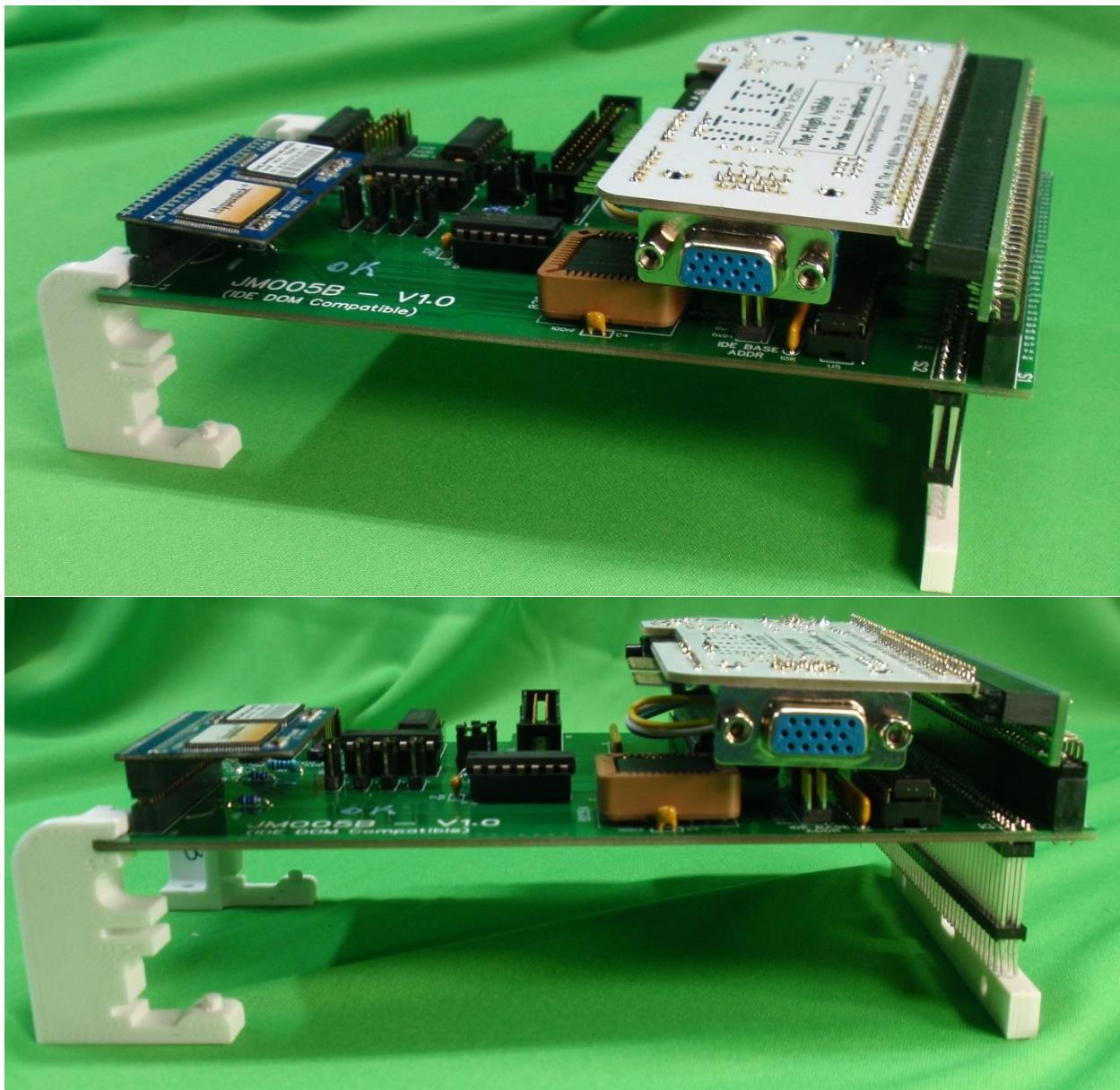


JM003 Expansion Disk IO Mezzanine Board [v1.0] for SC126 V1.0 (bottom, left)

- Original design with both IDE 44 and IDE 40 pin connectors and Floppy Disk 37 pin connector.



JM005B IDE DOM and Floppy Mezzanine Board [v1.0] for SC126 V1.0 with RC80 90 Degree Adapter and the High Nibble Pty Ltd© VT132 card.



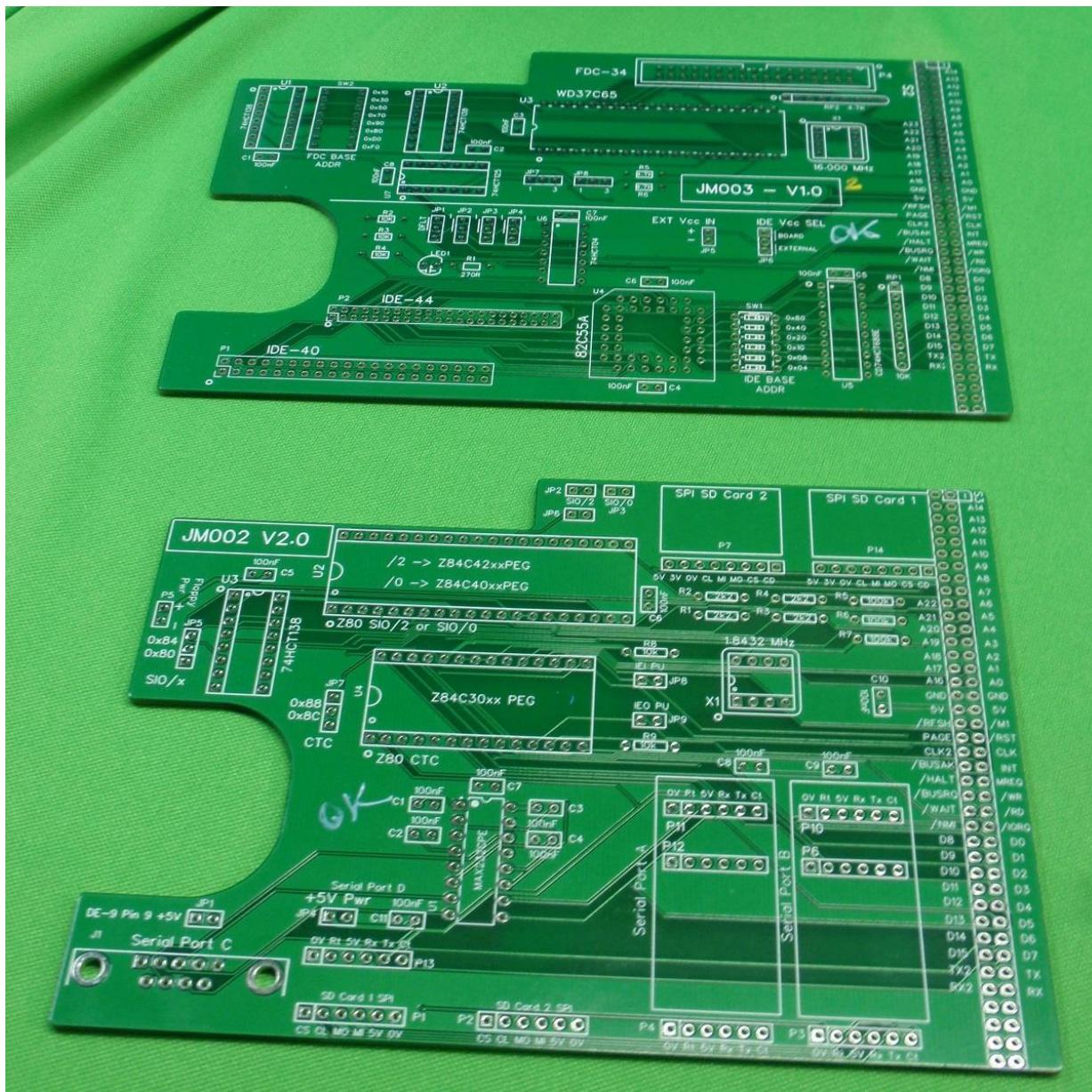
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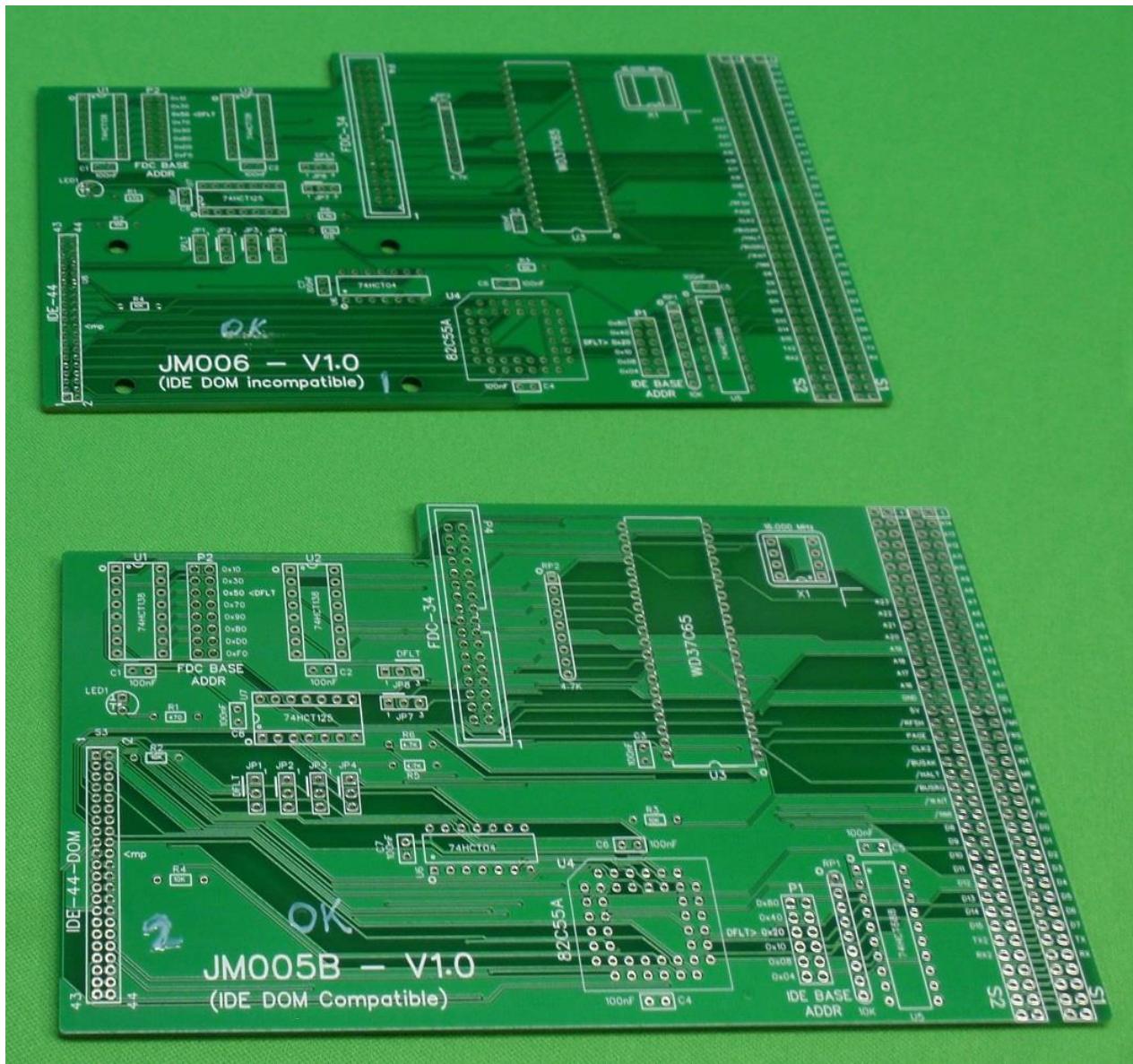


JM005B IDE DOM and Floppy Mezzanine Board [v1.0] for SC126 V1.0

- Electrically accepts some DOM modules – depending on DOM pinout. JM005A may be more appropriate for some DOM modules.

JM006 IDE and Floppy Mezzanine Board [v1.0] for SC126 V1.0

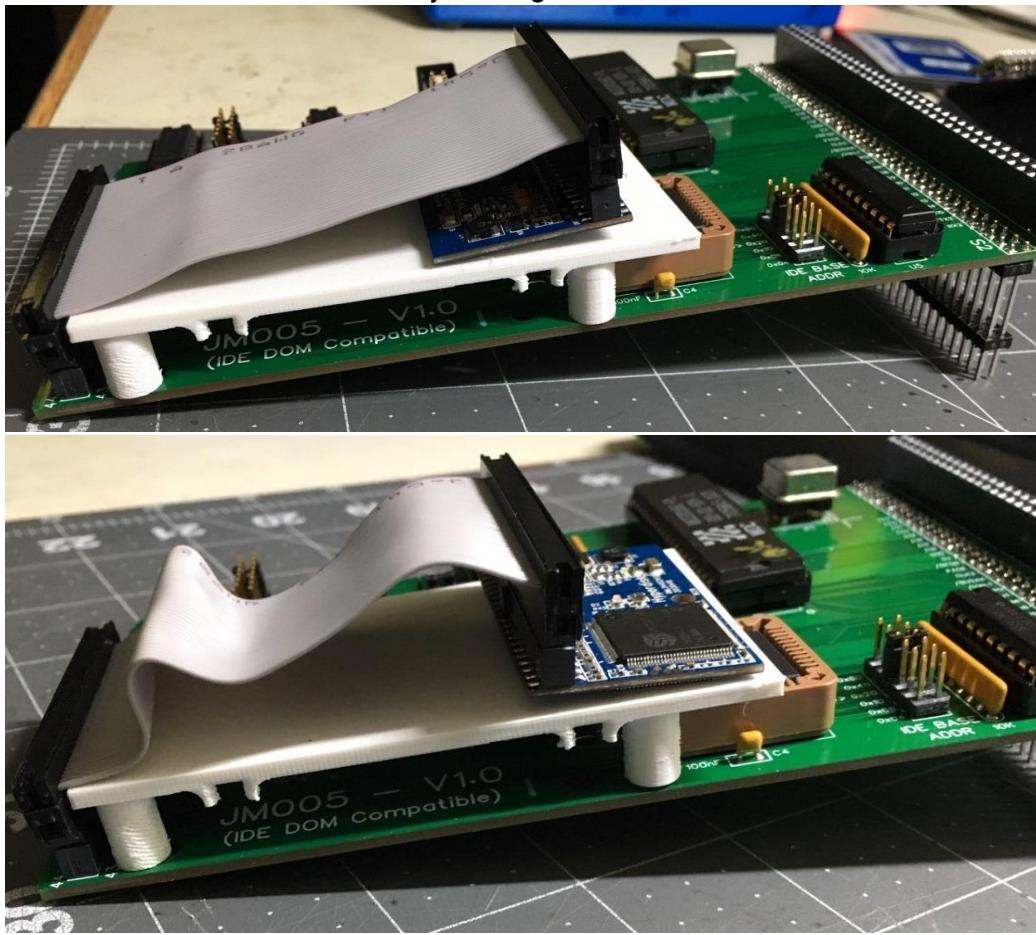
- Accepts standard IDE 44 pin devices; use with a riser board or short cable.



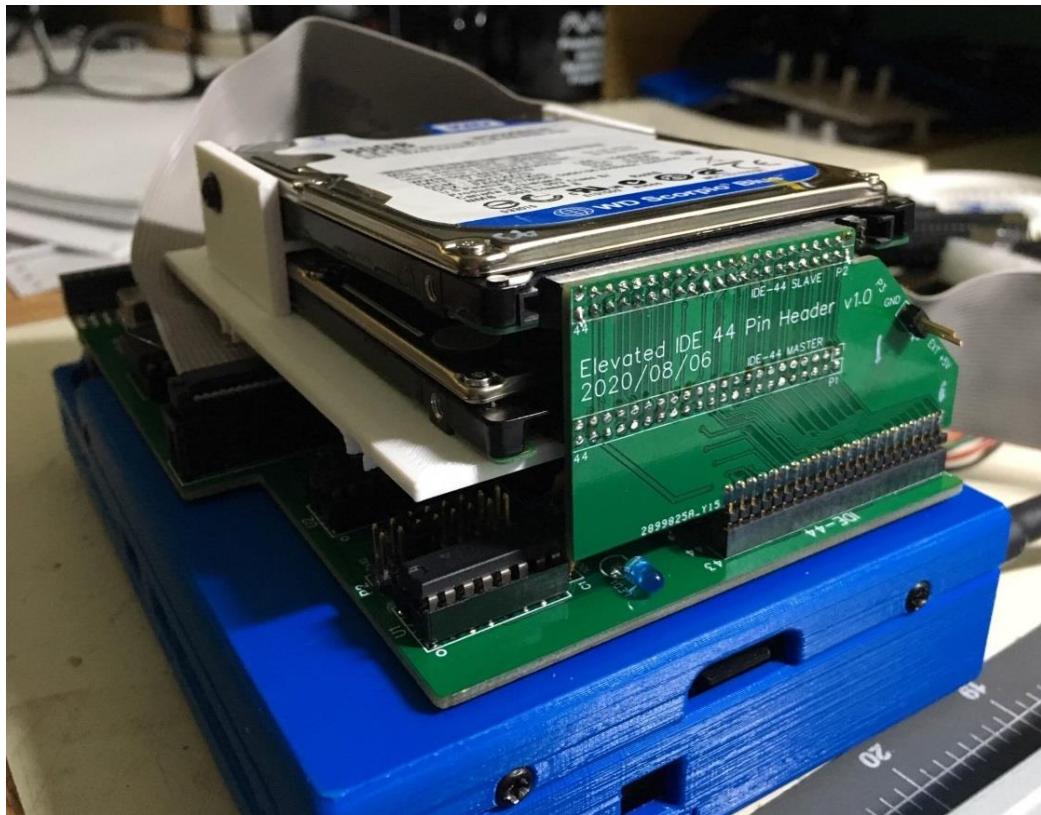
Use JM005A or JM005B – as is mechanically/electrically appropriate for your DOM module.



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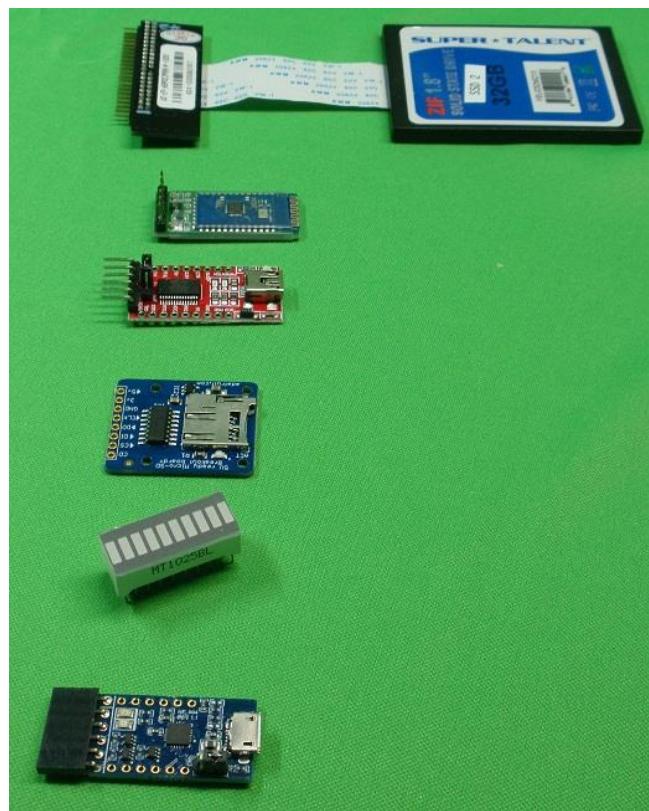
Prototyping 3D parts: SC126 Compact with JM006 mezzanine card and the JM004-3 Elevated Dual IDE 2.5" 90 Degree Riser V2.0)



Additional images of parts used in assembling various mezzanine card configurations.



A ZIF SSD drive with an IDE 44 pin adapter, a WiFi Serial Module, the Adafruit uSD card, example LED Bar with 10 LEDs, TTL-to-USB adapter module.



Prototype Card Testing

Here we are testing boards using the expansion “trunk” of the SC126 Compact. The JM006 mezzanine card and the JM004-3 Elevated Dual IDE 2.5" 90 Degree Riser V2.0 and the High Nibble Pty Ltd© VT132 card in the JM006 extra RC80 expansion slot are integrated and working..



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 Stacked V2 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 mated with the JM002 mezzanine card as well as for bringing out various signals to the case.

General Rule 1

The SC126 Motherboard headers configured for **inside-the-case** access must be **straight type**. Male type is also recommended.

General Rule 2

The JM002 interface headers should be installed in the “out-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

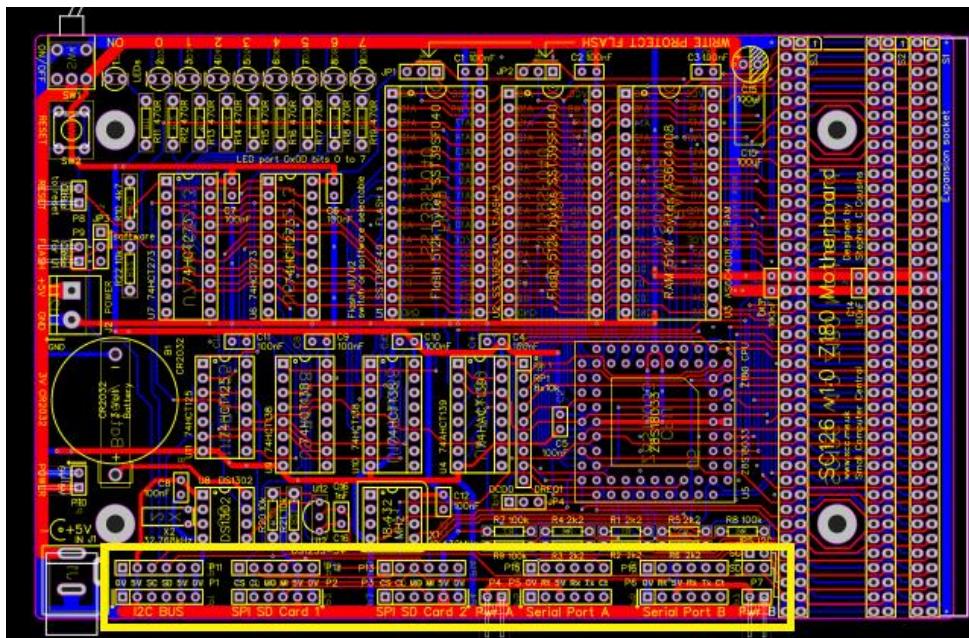
Referring to the circuit card image below, the area bounded by the yellow box contains female headers that are configured to mate with the JM002 male headers. It is possible to reverse the male-female headers such that the male headers are on the SC126 Motherboard and the female type are installed on the bottom of the JM002 mezzanine board. Either configuration will work satisfactorily.

Install female 6 pin headers using the “out-board” set of holes for the following connectors:

- I2C BUS
- SPI SD Card 1
- SPI SD Card 2
- Serial Port A
- Serial Port B

Install vertical male or female 2 pin headers using the individual set of holes for the following jumpers:

- Pwr A
- Pwr B



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

SC126 Board – Front Headers

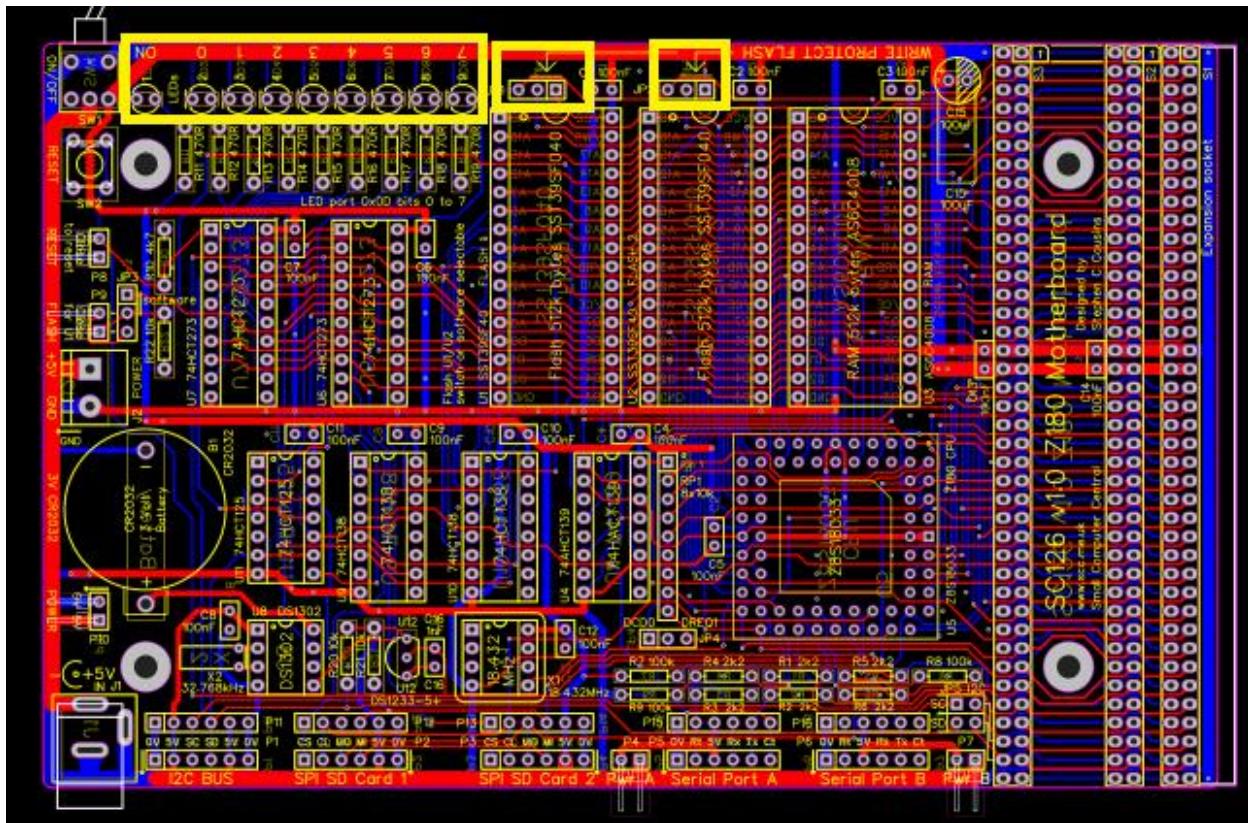
Referring to the circuit card image below, the areas bounded by the yellow boxes contain headers that are not exposed via openings in the front of the case.

Install vertical 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. Install 2.54mm/0.1" pitch male headers in nine (9) places. Remove and update the LED current limiting resistors as needed for your LED choice.

ADVICE: The power switch cannot be installed on the board. It will not clear the case front face. Instead, a male header, switch and wire harness are installed in its place.

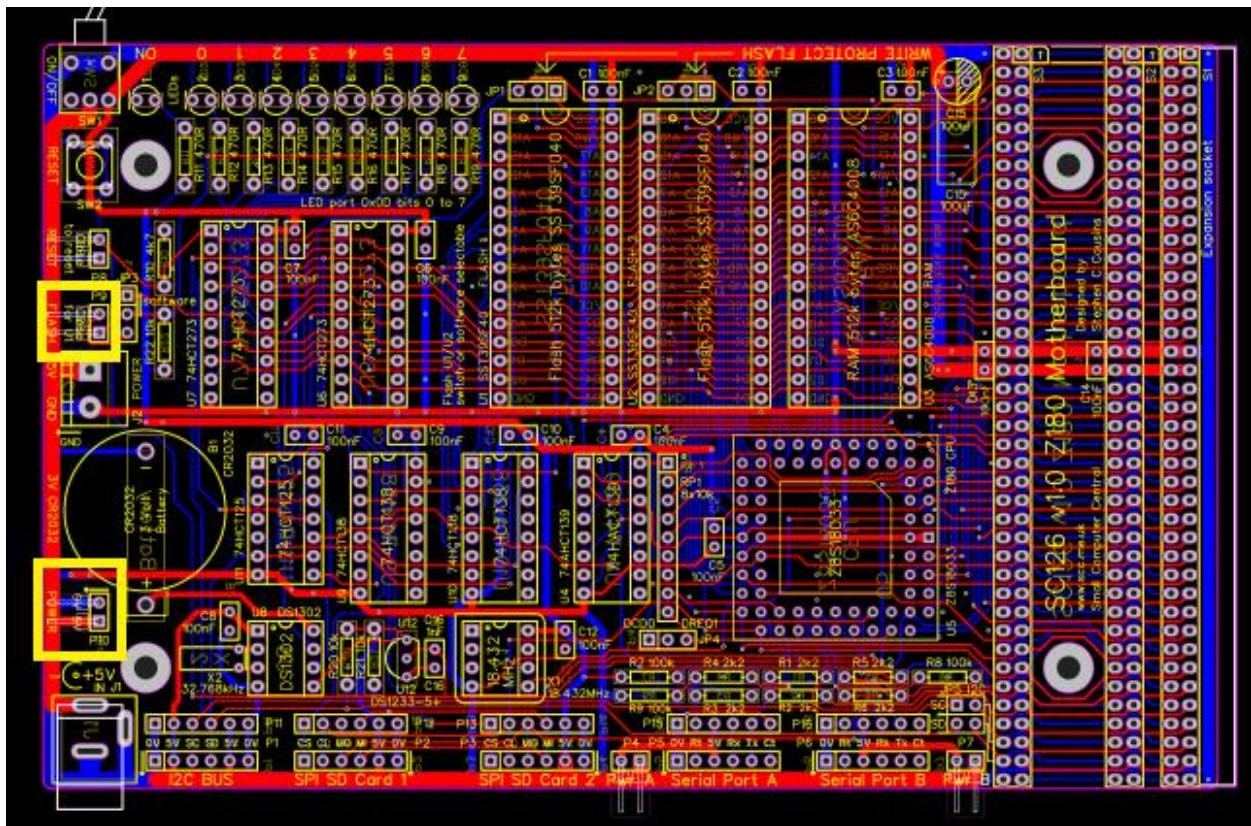


SC126 Board – Right Headers

Referring to the circuit card image below, the area bounded by the yellow boxes contain headers that are not exposed via an opening in the case. Install vertical male 2 pin headers using the available set of holes for the following connector:

- Flash for U1 Select
- Power Connector

ADVICE: The momentary contact “reset” switch is installed with a wire hardness and female connector that is installed on the SC126 Motherboard at the “reset” male header on the side of the board.

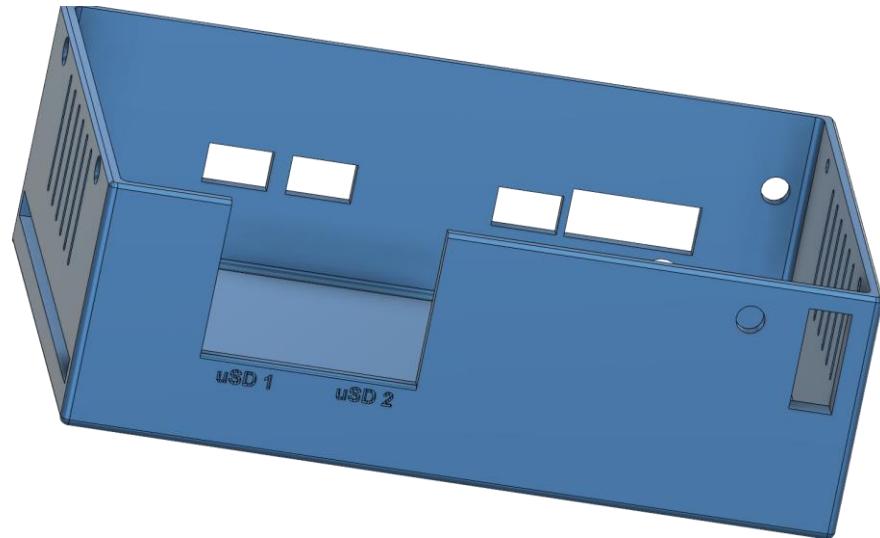


Assembled Unit Pictures and Design Drawings

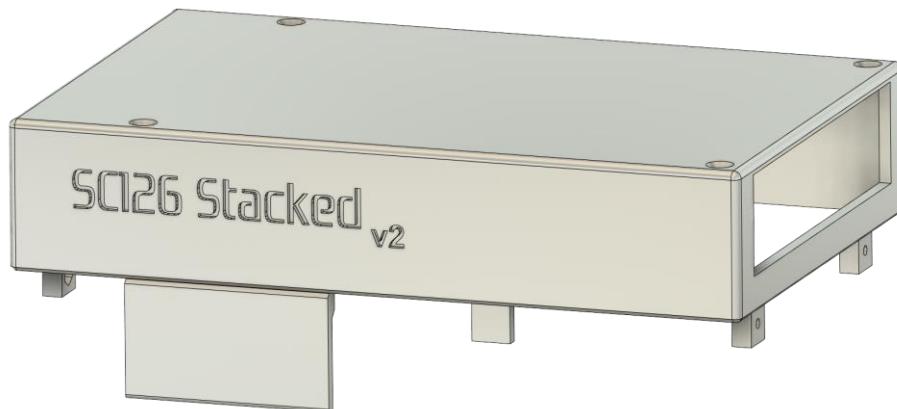




3D Design: SC126 Stacker Base

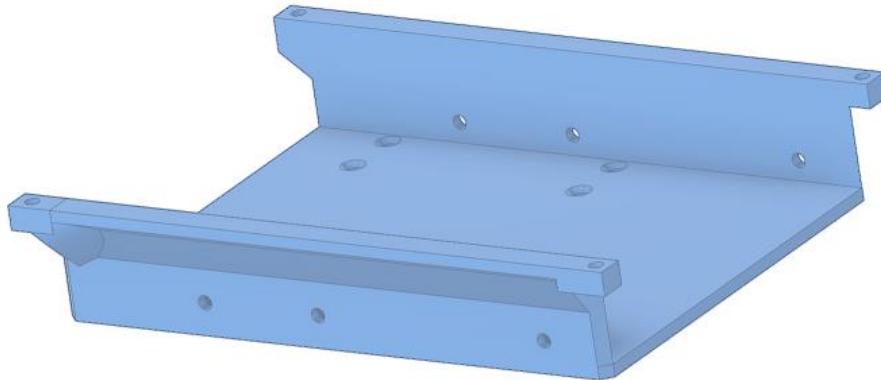


3D Design: SC126 Stacker Top w/FD Accommodation



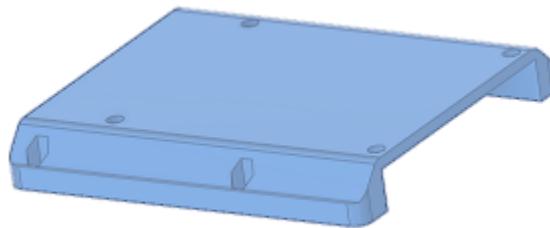
3D Design: SC126 Stacker FD Drive Shell

This shell is installed into the SC126 Stacker V2 Top. There are screw holes for securing the FD Drive into the Shell. And the Shell has attachment screw holes for fitting to the Top.



3D Design: SC126 Stacker 2.5" HD Drive Shell

This shell is used to secure a 2.5" HD "below" the FD Shell. Only one shell can be attached to the FD Shell at a time.



3D Design: SC126 Stacker 1.8" SSD Drive Shell

This shell is used to secure a 1.8" SSD HD "below" the FD Shell. Only one shell can be attached to the FD Shell at a time.

