
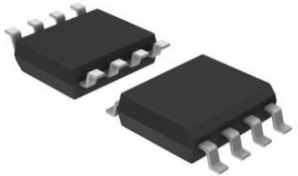


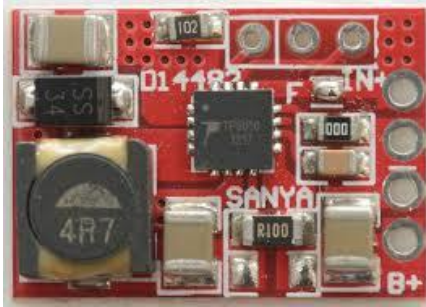








Caveatron SV Bill of Materials
Hardware Revision: C
Date: 2024-09-07

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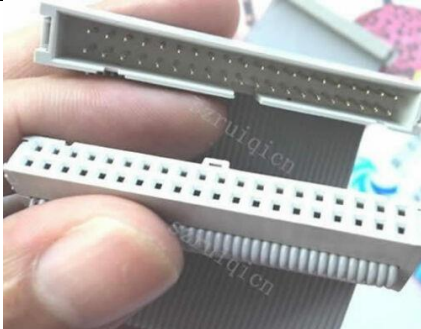
Item	Qty	Manufacturer	Mfr. P/N	Description	Suggested Vendor Link	Photo
Laser Rangefinder	1	JRT Meter Tech., Co, Ltd.	Unknown	40m – 60m Laser Distance Sensor Module	Egismos (HEX) Ebay (ASCII) Alibaba (HEX) Alibaba (HEX) Alibaba (probably HEX) Availability changes frequently. Sites linked above has availability as of the date of this BOM	
Notes: <i>Used for station distance measurements.</i> There are several variants of this module including those that use ASCII or HEX-based commands both of which are supported by the Caveatron. Based on the datasheets I have reviewed I think any variant of this style should work.						
Font/Graphics IC	1	Winbond	W25Q128JVSIM	W25Q128 SPI flash memory IC, 128 Mbit, quad 8-SOIC	Digikey and many other source	
Notes: <i>Contains the fonts and graphics used for the GUI.</i> You must use the 128Mbit 8-SOIC package version – other sizes may not work. It is soldered to the pad location on the underside of the Teensy 4.1 that is directly under the micro-SD slot and farther from the edge (adjacent to the cross row of pins).						




Item	Qty	Manufacturer	Mfr. P/N	Description	Suggested Vendor Link	Photo
Compass Module Optional but HIGHLY RECOMMENDED	1	Witmotion	RM3100	WitMotion High-Precision RM3100 Military-grade Magnetometer Sensor	Amazon or Witmotion	
Notes: <i>Used to determine the azimuth angle of the Caveatron.</i> This is the best currently available low-cost magnetometer module option. This magnetometer has proven more accurate, reliable and with less drift than another other tested. It is optional since the Pololu IMU module below also includes a magnetometer but the Pololu magnetometer is much more noisy and less accurate, so it is highly recommended that you use this module.						
IMU Module Required for accelerometer but magnetometer portion can be used instead of RM3100 (not as good as RM3100)	1	Pololu	MinIMU-9 v5 (#2738)	MinIMU-9 v5 Gyro, Accelerometer, Compass (LSM6DS33, and LIS3MDL Carrier)	Pololu	
Notes: <i>Used to determine orientation of the Caveatron and measure inclination.</i>						

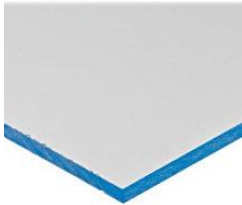



Item	Qty	Manufacturer	Mfr. P/N	Description	Suggested Vendor Link	Photo
Battery Charger Module	1	Unknown	TP5000	Lithium Ion 3.7V Charger Module	Amazon	
Notes: <i>Battery charging module.</i> There are several sources for this module and at least 2 variants. Be sure to get the variant with the 4 power pins all on the same side. A solder bridge is required to make it functional and a 0.2 ohm resistor can be added to increase the charge current above 1 Amp. These are usually on a red PCB but can also be green from other sources.						
10k resistor	2	Various	Various	SMD resistor, 10k-ohm, 1%, 1206 package	Digikey	
Notes: <i>Resistor for battery monitor voltage divider and for IMU power input.</i> Available from numerous manufacturers and vendors - the above is only 1 example. ¼ watt or less is fine since this carries no significant current.						
3.3k resistor	1	Various	Various	SMD resistor, 3.3k-ohm, 1%, 1206 package	Digikey	
Notes: <i>Resistor for battery monitor voltage divider.</i> Available from numerous manufacturers and vendors - the above is only 1 example. ¼ watt or less is fine since this carries no significant current.						

Item	Qty	Manufacturer	Mfr. P/N	Description	Suggested Vendor Link	Photo
Battery Pack OPTION 1	1	Dantona	L37A26-1-0-2WX	18650 Lithium-Ion Battery Rechargeable (Secondary) 2.6Ah	Digikey	
Notes: <i>Primary system battery.</i> This version comes with a 2-pin JST connector. A similar battery is available from Tenergy (PN 30011) but is not connectorized: Tenergy						
Battery Pack OPTION 2	1	Adafruit	1781	Lithium Ion Cylindrical Battery - 3.7v 2200mAh	Adafruit	
Notes: <i>Primary system battery.</i> This option is a lower capacity battery but might be an option if you are unable to obtain the higher capacity option above.						
Voltage Regulator – 5V	1	Pololu	2119	5V Step-Up/Step-Down Voltage Regulator S7V7F5	Pololu	
Notes: <i>Power supply for Teensy.</i>						
LRF Voltage Regulator	1	Pololu	2118	Pololu Adjustable Step-Up/Step-Down Voltage Regulator S7V8A	Pololu	
Notes: <i>Power supply for Laser Rangefinder.</i> Output needs to be set to 3.0V.						

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MicroSD Card	1	Various	Various	SanDisk 32GB Ultra microSDHC UHS-I Memory Card	Amazon and many other sources	
Notes: <i>Storage for Caveatron data.</i> Numerous brands and sources available. MicroSD card must be SDHC type not larger than 32 GB (smaller capacities are fine as well). SanDisk brand is preferred as they are generally the most reliable.						
Item	Qty	Manufacturer	Mfr. P/N	Description	Suggested Vendor Link	Photo
Teensy USB connector	1	N/A	N/A	Micro USB Male Solder Connector	Amazon and many other sources	
Notes: <i>For the cable to connect the exterior USB jack to the Teensy.</i> Wires are soldered between this part and the USB jack connector pins. Note that only the D+, D-, and GND are connected on this plug. The USB power (and a second GND wire) goes from the USB jack to a plug on the main PCB.						
LCD Connector Cable	1	N/A	N/A	40 pin IDE Male to Female Extension Cable, 4" (10 cm) or 6" (15 cm)	Ebay and other sources	
Notes: <i>Cable to connect to LCD Touchscreen from the Caveatron main board.</i> Cables longer than 6" would take up too much space in the enclosure while those shorter than 4" are not long enough. These are available from multiple vendors. Note that some of these connectors do not include one of the middle pins, however those are fine since that pin is not used.						

Item	Qty	Manufacturer	Mfr. P/N	Description	Suggested Vendor Link	Photo
Screen Protector	1	Supershieldz	N/A	iPhone SE and iPhone 5 Screen Protector	Amazon	
Notes: Protection film for touchscreen. Needs to be cut to length. Most any PET screen protector film for iPhone 4, 4S, 5, 5s, or SE should work as they have the same screen width as the 3.5” LCD. Multiple vendors produce a similar product.						
Threaded Inserts for Enclosure	4	Initeq		#6-32 Threaded Heat Set Inserts for 3D Printing (Long)	Ebay	
Notes: Heat set threaded inserts used in 3D printed enclosure.						
Threaded Inserts for external mounting (Optional)	1	Initeq		#1/4-20 1/4" Threaded Heat Set Inserts for 3D Printing (Short)	Ebay	
Notes: Heat set threaded inserts used in 3D printed enclosure for external mounting. This is an optional part if you plan to attach something external to the Caveatron (like a handle) or mount it to a tripod.						

Item	Qty	Manufacturer	Mfr. P/N	Description	Suggested Vendor Link	Photo
LRF Window Material	1	Sibe Polymers	5064981212	Clear Acrylic Plexiglass 12" x 12" - 3/32" (.090)	Amazon	
Notes: <i>Transparent acrylic sheet for LRF window on Main Body.</i>						
Wrist Strap Lanyard	1	Hukado	N/A	Hukado Adjustable Hand Wrist Straps Lanyard, (6 Pack) 9.5 inches Nylon Lanyard	Amazon	
Notes: <i>Wrist Strap.</i> This wrist strap works well, but other options are available in various lengths depending on your preference.						
O-Ring Seals	4 feet	The O-Ring Store	N50.103	0.103" (2.62mm) Buna-N 50 O-Ring Cord Stock, Black	O-Ring Store	
Notes: <i>O-Ring material for seals in main enclosure and LIDAR module.</i> This 50 durometer material is preferred over more readily available 70 durometer since it is softer and can make a tighter seal. Must cut to length and glue ends (this vendor also sells O-ring glue in small quantities.) Other vendors sell similar material.						
RTC Battery Holder NOT RECOMMENDED Only used with PCB SV Rev C.1	1	MPD and others	BC501SM	Coin Cell Battery Holder - 12mm (for CR1220 batteries)	Digikey Amazon	
Notes: <i>Holds a CR1220 battery to provide power to maintain the Real-time clock on the Teensy.</i> The CR1220 batteries can only run the real-time clock for 6 weeks so require frequent replacement. A mod has been implemented to replace this part with a regulator and this part has been removed from PCB C.3 and C.4. Identical holders are available from many sources with differing part numbers.						

Other Required Items:

Caveatron SV Rev C Printed Circuit Board

Single row male headers, 2.54 mm (0.1") pitch

Double row female headers 2x20 (for 40 pin LCD Connector), 2.54 mm (0.1") pitch

Soldering supplies

6-32 x 1/2" Flat Head Screws (4x)

4-20 x 1/2" thread rolling screws (3x)

4-20 x 1/4" thread rolling screws (10x)

2-28 x 1/4" thread rolling screws (15x)

PETG filament for 3D printed parts

O-Ring grease

O-Ring epoxy

Flexible waterproof epoxy sealant

Adhesive-backed foam

Tape (Kapton or cellophane)

Notes: *For assembly and electrical interconnections between boards.*