
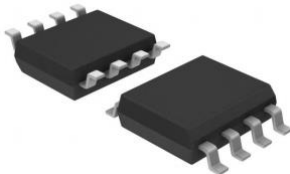

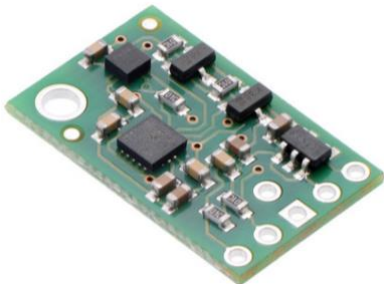






**Caveatron SV Bill of Materials**  
**Hardware Revision: C**  
**Date: 2023-02-19**

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Item	Qty	Manufacturer	Mfr. P/N	Description	Suggested Vendor Link	Photo
Laser Rangefinder  <b>OPTION 1</b>	1	JRT Meter Tech., Co, Ltd.	Unknown	40m – 60m Laser Distance Sensor Module	<a href="#">Ebay</a> <a href="#">Ebay</a> <a href="#">Ebay</a>  <a href="#">Alibaba</a> <a href="#">Alibaba</a> <a href="#">Alibaba</a>  Availability changes frequently. Sites linked above has availability as of the date of this BOM	
<b>Notes:</b> <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	
<b>Notes:</b> <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 closest to the edge.						

Item	Qty	Manufacturer	Mfr. P/N	Description	Suggested Vendor Link	Photo
Compass Module  <b>OPTIONAL BUT HIGHLY RECOMMENED</b>	1	Witmotion	RM3100	WitMotion High-Precision RM3100 Military-grade Magnetometer Sensor	<a href="#">Amazon</a> or <a href="#">Witmotion</a>	
<b>Notes:</b> <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	1	Pololu	MinIMU-9 v5 (#2738)  Or  AltIMU-10 v5 (#2739)	MinIMU-9 v5 Gyro, Accelerometer, Compass (LSM6DS33, and LIS3MDL Carrier)	<a href="#">Pololu</a>	
<b>Notes:</b> <i>Used to determine orientation of the Caveatron and measure inclination.</i> The AltIMU-10 v5 is an equivalent part and can also be used (the altitude sensor is not used). The MinIMU-9 and AltIMU-10 v3 and v4 are still supported by the code and electronics but are no longer available.						

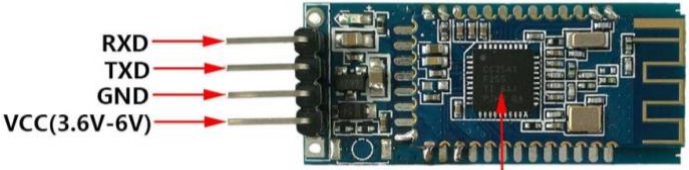
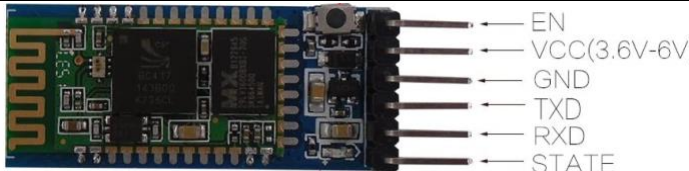
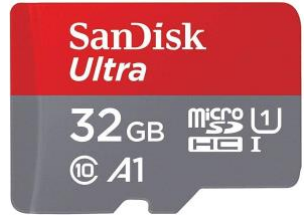
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Item	Qty	Manufacturer	Mfr. P/N	Description	Suggested Vendor Link	Photo
Battery Pack <b>OPTION 1</b>	1	Dantona	L37A26-1-0-2WX	18650 Lithium-Ion Battery Rechargeable (Secondary) 2.6Ah	<a href="#">Digikey</a>	
<b>Notes:</b> <i>Primary system battery.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

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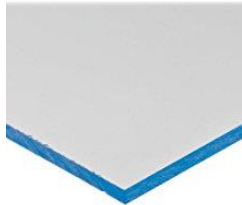


Item	Qty	Manufacturer	Mfr. P/N	Description	Suggested Vendor Link	Photo
Bluetooth Module  <b>OPTIONAL (OPTION 1)</b>	1	Various	HM-10	HM-10 Bluetooth Serial Module	<a href="#">Amazon</a>	 <p>RXD TXD GND VCC(3.6V-6V)</p>
<b>Notes:</b> <i>Bluetooth communications module.</i> This component is intended for future interfacing with TopoDroid or similar software running on an Android tablet but this function has not yet been added. The HM-10 is a Bluetooth 4.0 LE device so is only compatible with newer tablets and draws less power. Multiple variants and vendors are available for this component and so long as it is an HM-10 and operates on +5V, it should work.						
Bluetooth Module  <b>OPTIONAL (OPTION 2)</b>	1	Various	HC-05	HC-05 Bluetooth Serial Module	<a href="#">Amazon</a>	 <p>EN VCC(3.6V-6V) GND TXD RXD STATE</p>
<b>Notes:</b> <i>Bluetooth communications module.</i> This component is intended for future interfacing with TopoDroid or similar software running on an Android tablet but this function has not yet been added. The HC-05 is a Bluetooth 2.0 device so is compatible with older tablets but draws more power. Multiple variants and vendors are available for this component and so long as it is an HC-05 and operates on +5V, it should work.						
MicroSD Card	1	Various	Various	SanDisk 32GB Ultra microSDHC UHS-I Memory Card	<a href="#">Amazon</a> and many other sources	
<b>Notes:</b> <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
Tee nsy USB connector	1	N/A	N/A	Micro USB Male Solder Connector	<a href="#">Amazon</a> and many other sources	
<b>Notes:</b> For the cable to connect the exterior USB jack to the Teensy. 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 or Amazon	
<b>Notes:</b> Cable to connect to LCD Touchscreen from the Caveatron main board. 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.						

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Item	Qty	Manufacturer	Mfr. P/N	Description	Suggested Vendor Link	Photo
Screen Protector	1	Supershieldz	N/A	iPhone SE and iPhone 5 Screen Protector	<a href="#">Amazon</a>	
<b>Notes:</b> <i>Protection film for touchscreen.</i> 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)	<a href="#">Ebay</a>	
<b>Notes:</b> <i>Heat set threaded inserts used in 3D printed enclosure.</i>						
Threaded Inserts for external mounting (Optional)	1	Initeq		#1/4-20 1/4" Threaded Heat Set Inserts for 3D Printing (Short)	<a href="#">Ebay</a>	
<b>Notes:</b> <i>Heat set threaded inserts used in 3D printed enclosure for external mounting.</i> 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)	<a href="#">Amazon</a>	
<b>Notes:</b> <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	<a href="#">Amazon</a>	
<b>Notes:</b> <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 ft	The O-Ring Store	N50.103/10	0.103" (2.62mm) Buna-N 50 O-Ring Cord Stock, 10' Piece, Black	<a href="#">O-Ring Store</a>	
<b>Notes:</b> <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.						

**Other Required Items:**

Caveatron SV Rev C Printed Circuit Board

CR1220 Battery

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.*