

## Caveatron Bill of Materials – Base Unit


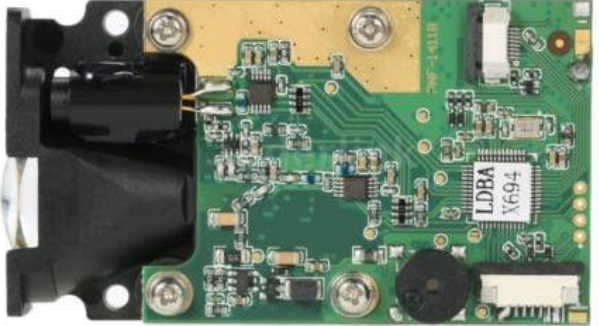
## Hardware Revision: A

**Date: 2019-11-06**

All the parts in this list have been tested with the Caveatron and integrated into the code. For some parts, alternate options are available.

[illegible]

[illegible]

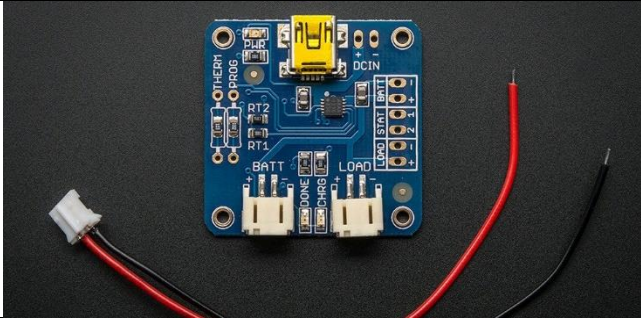
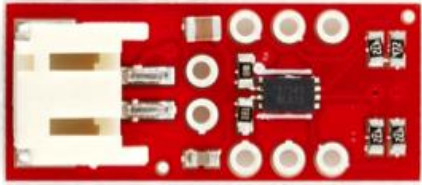

Item	Qty	Manufacturer	Mfr. P/N	Description	Suggested Vendor Link	Photo
Laser Rangefinder  OPTION 1	1	Uni-T	UT390B	Laser Distance Meter	Ebay, Amazon, or other sources. Availability changes frequently.	
<b>Notes:</b> Used for station distance measurements. This item is long since discontinued but can still be found online from a few sources. Do not confuse this with the UT390B+, which is widely available but does not have an accessible serial port, so is not useable. The UT390B+ has a bubble level in the upper left which the UT390B does not. The UT390B must be disassembled and the LCD removed to access the electronics board. The JRT rangefinder (OPTION 2) has wider availability and is easier to assemble into the enclosure, but has operational disadvantages. The UT390B remains the preferred rangefinder if you can find one.						
Laser Rangefinder  OPTION 2	1	JRT Meter Tech., Co. Ltd.	Unknown	100m Laser Distance Sensor Module	Ebay Availability changes frequently.	
<b>Notes:</b> Used for station distance measurements. This rangefinder module is very similar in size to Option 1 above, is easier to mount due to the presence of mounting holes, however, it's method of operation is less well suited to the Caveatron since it has a variable measurement time (rather than the UT390B's fixed 1 sec measurement time) and can take up to 3 sec to acquire a reading or timeout. This means that when scanning in Passage mode, you can end up with fewer reference points and a less accurate scan.						

Item	Qty	Manufacturer	Mfr. P/N	Description	Suggested Vendor Link	Photo
Compass Module	1	Pololu	LSM303D (#2127)	LSM303D 3D Compass and Accelerometer Carrier with Voltage Regulator	<a href="#">Pololu</a>	

**Notes:** Used to measure azimuth and inclination. The orientation of this component is important and needs to be mounted with the side pictured facing up and the x-axis toward the front of the unit.











Item	Qty	Manufacturer	Mfr. P/N	Description	Suggested Vendor Link	Photo
Battery Charging Module  <b>OPTION 1</b>	1	Adafruit	259	USB Lilon/LiPoly charger - v1.2	<a href="#">Adafruit</a>	
<b>Notes:</b> Controls the charging of the LI-Ion battery pack and provides charge indication to power switch LED. Default charge current is 500 mA, but can be increased to 1200 mA by adding appropriate resistor (see assembly instruction.) An alternate part is available with a combined battery charger and fuel gauge module, but is more problematic in several ways, so this part is still the preferred option.						
Battery Gauge Module  <b>OPTION 1</b>	1	Sparkfun	TOL-10617	LiPo Fuel Gauge	<a href="#">Sparkfun</a>	
<b>Notes:</b> Monitors battery level. Contains a MAX17043 battery fuel gauge IC. It is highly recommended to purchase this directly from Sparkfun. These can be found at other, cheaper sites, but often use a counterfeit Maxim IC that does not function properly. An alternate part is available with a combined battery charger and fuel gauge module, but is more problematic in several ways, so this part is still the preferred option.						
Battery Charger and Fuel Gauge  <b>OPTION 2</b>	1	Sparkfun	PRT-13777	Battery Babysitter - LiPo Battery Manager	<a href="#">Sparkfun</a>	
<b>Notes:</b> Battery charge controller and fuel gauge. This is an alternative to both the separate charger and fuel gauge modules listed above. It is capable of 1.5A charging current and provides a more accurate method for monitoring battery charge level. However, it is more challenging to mount inside the enclosure, it causes a 5-10 sec delay when booting the Caveatron, draws a small amount of power even when turned off, and does not provide an easy way to connect the charging LED on the power switch, so you never know when charging is completed.						

[illegible]


[illegible]




Item	Qty	Manufacturer	Mfr. P/N	Description	Suggested Vendor Link	Photo
USB Jack	1	GT Contact	GT114200-10	Mini USB-B C2 size Plastic Panel Mount	<a href="http://USBFireWire.com">USBFireWire.com</a>	
<b>Notes:</b> Mini-USB jack for data download, battery charging, and loading of software and calibration parameters.						
USB Cap	1	GT Contact	GT1C5221-22	Seal Cap	<a href="http://USBFireWire.com">USBFireWire.com</a>	
<b>Notes:</b> Waterproof cap for USB jack.						
LIDAR Interface Jack	1	Conxall/ Switchcraft	17982-6SG-300	Micro-Con-X 6 Position Circular Connector Receptacle, Female Sockets Solder Cup Gold	<a href="http://Digikey">Digikey</a>	
<b>Notes:</b> Jack for LIDAR interface cable. Available from multiple vendors.						

LIDAR Interface Cap	1	Conxall/ Switchcraft	16295	Micro-Con-X Receptacle Dust Cap	<a href="#">Digikey</a>	
<b>Notes:</b> Cap for LIDAR interface jack. Available from multiple vendors.						
Item	Qty	Manufacturer	Mfr. P/N	Description	Suggested Vendor Link	Photo
LCD Connector Cable	1	N/A	N/A	40 pin IDE Male to Female Extension Cable, 6" (15 cm) or 4" (10 cm)	Ebay or Amazon	
<b>Notes:</b> Cable to interface Due LCD Interface Shield and LCD Touchscreen. Be certain that the connector you order has all 40 pins! Some IDE connector cables only have 39 pins with one missing near the center. The preferred length is 6" (15 cm). Longer cables would take up too much space in the enclosure. A 4" (10 cm) cable can work as well, but is a bit of a stretch to get it to reach. These are available from multiple vendors.						
Base Unit Enclosure	1	Bud Industries	PN-1324-DG	NEMA ABS NEMA 4x Enclosure, Dark Gray	<a href="#">Amazon</a>	

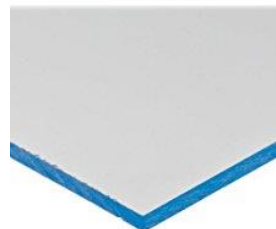
**Notes:** *Enclosure box for main body.* Requires machining of base to add cutouts for USB jack and front window and machining of the cover to add screw holes for the LIDAR Mounting Rail, LCD Touchscreen, Strap Attachment Hardware, and cutouts for the Touchscreen LCD, and LIDAR Interface Jack. Available from many vendors.

LIDAR Mounting Rail	1	Weaver	TO-9M	Tip-Off Aluminum Base	<a href="#">Amazon</a>	
---------------------	---	--------	-------	-----------------------	------------------------	---

**Notes:** *Rail for mounting LIDAR module.* Weaver TO-9 rail is identical but with a shiny finish. Available from multiple vendors

Item	Qty	Manufacturer	Mfr. P/N	Description	Suggested Vendor Link	Photo
Plastic Base Material	1	Small Parts	STPVC-0093-F	PVC Sheet, Opaque Gray, 0.093" Thickness, 12" Width, 24" Length	<a href="#">Amazon</a>	

**Notes:** *Plastic sheet for mounting internal components in Main Body Enclosure and 4m LIDAR Enclosure.* Requires cutting to size and drilling mounting holes. Other thicknesses and materials could be used as well.

Window Material	1	Small Parts	50649812 12	Acrylic Sheet, Transparent Clear, 0.06" Thickness, 12" Width, 12" Length	<a href="#">Amazon</a>	
-----------------	---	-------------	-------------	--	------------------------	--

**Notes:** *Transparent acrylic sheet for Rangefinder window on Main Body.* The 0.118" transparent acrylic sheets used for the 12m RP LIDAR module windows could be used as well if you don't want to order this thinner sheet. Requires cutting to size. Acrylic seems to be the most transparent with the least distortion and defects of the various clear plastics tested, which is important for not interfering with the LIDAR and rangefinder readings.





**Date: 2017-09-11**

**Date: 2017-09-11**

[illegible]