



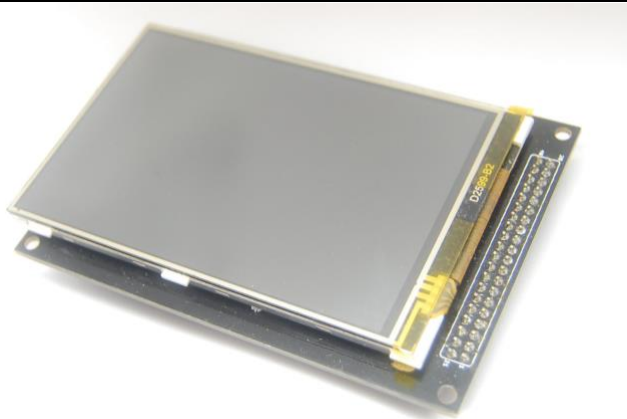

## Caveatron Bill of Materials

**Hardware Revision: B**

**Date: 2020-02-18**

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

Item	Qty	Manufacturer	Mfr. P/N	Description	Suggested Vendor Link	Photo
Main Processor	1	PJRC Electronics	Teensy 3.6	Teensy 3.6	<a href="#">PJRC Store</a>	
<b>Notes:</b> <i>The main system processor.</i> Available from multiple vendors. Versions with and without the pins pre-installed are available (link above is with pins).						
Touchscreen LCD  <b>OPTION 1</b>	1	Coldtears Electronics	N/A	3.5 inch TFT LCD module w/Font IC 480x320 full angle Arduino DUE MEGA 3.2 4.3	<a href="#">Ebay</a>	
<b>Notes:</b> <i>The display and user interface.</i> Although slightly smaller, the contrast and viewing angle make this the preferred choice.						

Item	Qty	Manufacturer	Mfr. P/N	Description	Suggested Vendor Link	Photo
Touchscreen LCD  OPTION 2	1	Coldtears Electronics	N/A	4.0" inch TFT LCD module w/Font IC 480x320 ILI arduino DUE MEGA 3.2 2.5 STM32	<a href="#">Ebay</a>	
<b>Notes:</b> Alternate display. Same resolution as the 3.5" but in a larger size. The angle viewing contrast is not as good as the 3.5" display.						
Graphics Module (SPI Flash Memory)	1	Multiple (Winbond IC)	W25Q64 or similar	W25Q64 64Mbit 8MByte Flash Memory Module Data Flash SPI Interface	<a href="#">Amazon</a>	
<b>Notes:</b> Storage for fonts and graphics used in the GUI. SPI Flash memory must be Winbond W25Q32, W25Q64, or W25Q128 (memory size should be 32Mbit or higher.) Winbond W25Q16 (16 Mbit) could be used, but will only hold the fonts and not support the graphics.						

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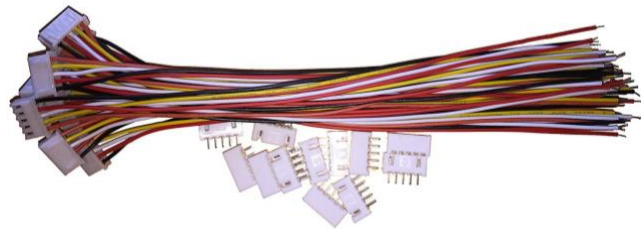


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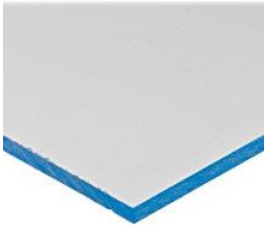
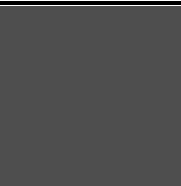


Item	Qty	Manufacturer	Mfr. P/N	Description	Suggested Vendor Link	Photo
USB Jack	1	GT Contact	GT114200-50	Waterproof USB Connector - Mini-B Female to Mini-B Female	<a href="http://USBFirewire.com">USBFirewire.com</a>	
<b>Notes:</b> Mini-USB jack for data download, battery charging, and loading of software and calibration parameters. The connector on the back plugs into the Teensy micro-USB port using the adapter cable below. The RR-114200-10 version with solder pins on the back could also be used if you have a micro-usb that terminates in bare leads.						
USB Cap	1	GT Contact	GT1C522122	Seal Cap	<a href="http://USBFirewire.com">USBFirewire.com</a>	
<b>Notes:</b> Waterproof cap for USB jack.						
Teensy USB interface cable	1	Seismic Audio	SA-USBM8i	Micro USB Male to Mini USB Male Adapter Cable	<a href="https://www.amazon.com">Amazon</a>	
<b>Notes:</b> Connects the micro-USB connector on the Teensy to the external waterproof mini-USB jack shown above.						
RTC Battery Holder	1	Unknown	PRT-00783	Coin Cell Battery Holder - 20mm (PTH)	<a href="http://Sparkfun.com">Sparkfun</a>	
<b>Notes:</b> Holds a CR2032 battery to provide power to maintain the Real-time clock on the Teensy 3.6. Similar holders are available from many sources. So long as they can hold a CR2032 and the pins have a 20 mm spacing, it should work.						




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Item	Qty	Manufacturer	Mfr. P/N	Description	Suggested Vendor Link	Photo
JST Connector 5-pin	3	Various	JST-XH	JST 2.54mm pitch, 5 pin, male connector	Amazon, Ebay and others	
<b>Notes:</b> Connector for LRF, LIDAR, and power switch. If you order them prewired as in the photo, be sure they are at least 150 mm in length.						
JST Connector 2-pin	2	Various	JST-XH	JST 2.54mm pitch, 2 pin, male connector	Amazon, Ebay and others	
<b>Notes:</b> Connector used for battery and piezo buzzer. If you order them prewired as in the photo, be sure they are at least 150 mm in length.						
MicroSD Card	1	Various	Various	SanDisk 16GB Ultra microSDHC UHS-I Memory Card	<a href="#">Amazon</a>	
<b>Notes:</b> Storage for Caveatron data. Numerous brands and sources available. MicroSD card must be SDHC type not larger than 32 GB. SanDisk brand is preferred as they are generally the most reliable.						


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Item	Qty	Manufacturer	Mfr. P/N	Description	Suggested Vendor Link	Photo
2-28 Thread Rolling Screws	14	Small Parts		410 Stainless Steel Thread Rolling Screw for Plastic, Passivated Finish, Pan Head, Phillips Drive, #2-28 Thread Size, 1/4" Length	<a href="#">Amazon</a>	
<b>Notes:</b> Screws for threading directly into 3D printed holes						
4-20 Thread Rolling Screws	10	Small Parts		410 Stainless Steel Thread Rolling Screw for Plastic, Passivated Finish, Pan Head, Phillips Drive, #4-20 Thread Size, 1/4" Length	<a href="#">Amazon</a>	
<b>Notes:</b> Screws for threading directly into 3D printed holes						
Window Material	1	Small Parts	5064981212	Acrylic Sheet, Transparent Clear, 0.06" Thickness, 12" Width, 12" Length	<a href="#">Amazon</a>	
<b>Notes:</b> 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 getting good LIDAR and rangefinder readings.						
Laser Rangefinder Optical Filter	1	Rosco	299	Roscolux 1.2 Neutral Density Filter, 20x24"	<a href="#">Adorama</a>	

**Notes:** Filters rangefinder receiver to only accept readings from the retroreflective card.

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> 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.						
Strap Attachment Hardware	1	122317	Hillman Group	D-Ring Hangers	<a href="#">Lowes</a>	
<b>Notes:</b> Small D-rings for attaching neck strap. Available from multiple sources and similar parts likely available from other vendors.						
Neck Strap	1	DOROM	N/A	DOROM Universal Adjustable Slim Shoulder Sling Neck Strap for All Camera DSLR SLR	<a href="#">Amazon</a>	

**Notes:** *Neck Strap.* This neck strap works well, but other options are available. Recommend a nylon camera strap of 52-60" in length and about 3/8" wide in the ends.

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>	
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**Notes:** *O-Ring material for seals in main enclosure and LIDAR module.* 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:

PETG Filament for 3D Printing  
 Caveatron Printed Circuit Board  
 CR2032 Battery  
 Single row male headers  
 Single row female headers  
 Double row female headers 2x20 (for 40 pin LCD Connector)  
 6-32 x 1/2" Flat Head Screws (8x)  
 6-32 x 1/2" Pan Head Screws (2x)  
 6-32 x 3/8" Pan Head Screws (2x)  
 6-32 x 9/16" Pan Head Screw (1x)  
 6-32 Nut (3x)  
 O-Ring Glue  
 Epoxy  
 Single sided foam tape  
 Tape (Kapton or electrical)  
 Heat shrink tubing  
 Solder

**Notes:** *For assembly and electrical interconnections between boards.* Several sizes of standard hardware required. More information in assembly instructions.



**Date: 2019-11-07**

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