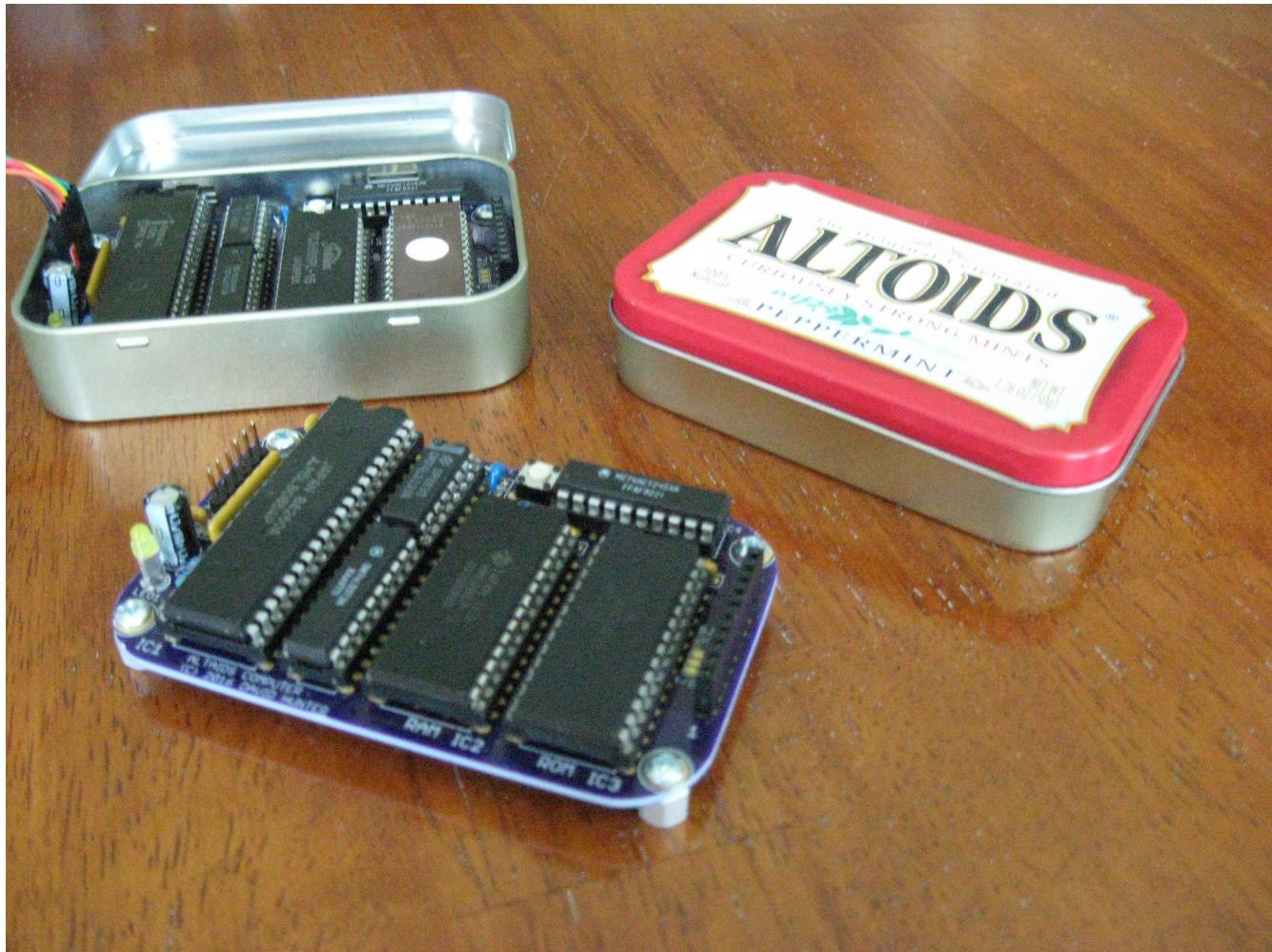


Altaids Computer



Build Instructions

(c) 2019 David Hunter

Introduction

The Altaids computer is a basic computer kit. It is assumed that you have some experience building electronic kits and soldering prior to assembly. All parts are through-hole for ease of assembly.

To power and communicate with the computer, an FTDI USB to TTL cable (P/N: TTL-232R-5V) or equivalent is needed. Note, this needs to be the +5V version.

Recommended Tools

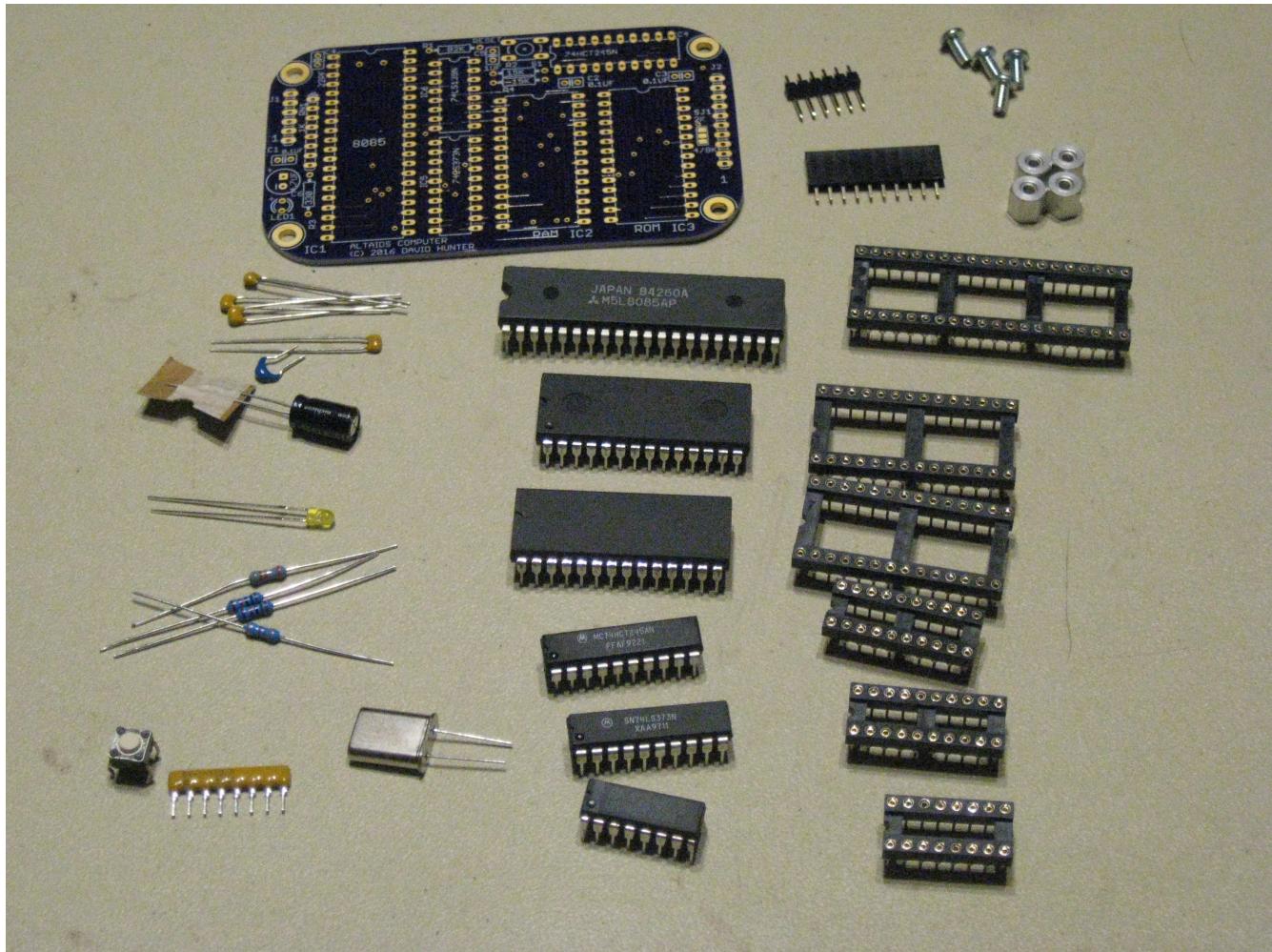
- A good soldering iron with a fine tip for electronics work
- Solder (0.032" or 0.020" rosin core recommended)
- Phillips Screwdriver
- 1/4" nutdriver or small wrench
- Needle Nose pliers
- Side cutters or small diagonal cutters
- Multimeter

Parts List

Qty.	REF DES	Part Number / Marking	Description
3	C1,C2,C3	104	CAPACITOR, CER, 0.1UF
1	C4	22J	CAPACITOR, CER, 22PF
1	C5	105	CAPACITOR, CER, 1UF
1	C6	4.7uF 160V	CAPACITOR, ELECT, 4.7uF, 160V
1	IC1	8085	MICROPROCESSOR, 8085
1	IC2	TC5565PL-15 or 6264	SRAM, 8K x 8
1	IC3	X28C64A-15	EEPROM, 8K x 8
1	IC4	74HCT245N	OCTAL BIDIRECTIONAL BUFFER
1	IC5	74LS373N	OCTAL D-LATCH
1	IC6	74LS139N	DUAL 2:4 DECODER
1	J1	153700	MALE HEADER, 1X6
1	J2	2172560	FEMALE HEADER, 1X10
1	LED1	2155241	LED3MM
1	R1	GREY-RED-ORANGE	RESISTOR, 82K, 1/4W
2	R2,R4	BROWN-GREEN-BLACK-RED	RESISTOR, 15K, 1/4W
1	R3	ORANGE-ORANGE-BROWN	RESISTOR, 330, 1/4W
1	RN1	8X1-102LF	RESISTOR NETWORK, SIP, 7POS, 1K
1	SW1	162886	PUSHBUTTON, SPST, 4P
1	X1	774-MP042	CRYSTAL, 4.9152MHz, HC49U
1	IC1-S	41136	Socket, 40P 0.6" DIP
2	IC2-S,IC3-S	40328	Socket, 28P 0.6" DIP
2	IC4-S,IC5-S	38623	Socket, 20P 0.3" DIP
1	IC6-S	37402	Socket, 16P 0.3" DIP
4	H1,H2,H3,H4	133613	Hex Female Standoff, 0.25", 4-40
4	H1,H2,H3,H4	534-9900	Screw, Pan Head, Phillips, 0.25", 4-40
1	PCB		

Building the kit

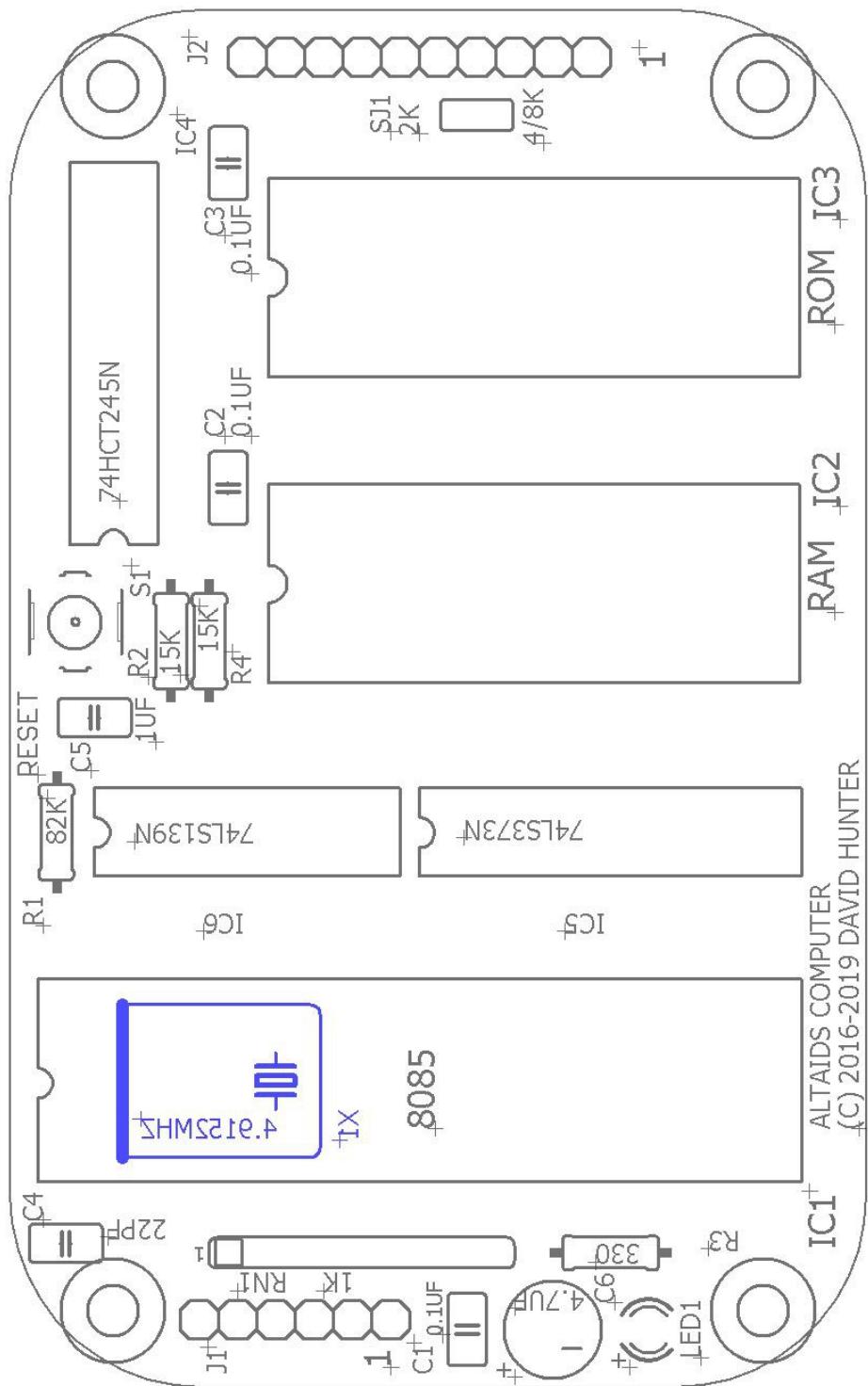
First gather all the parts on a clean work surface. An ESD mat is recommended.



Part Placement

Below is a reference diagram showing the location of parts.

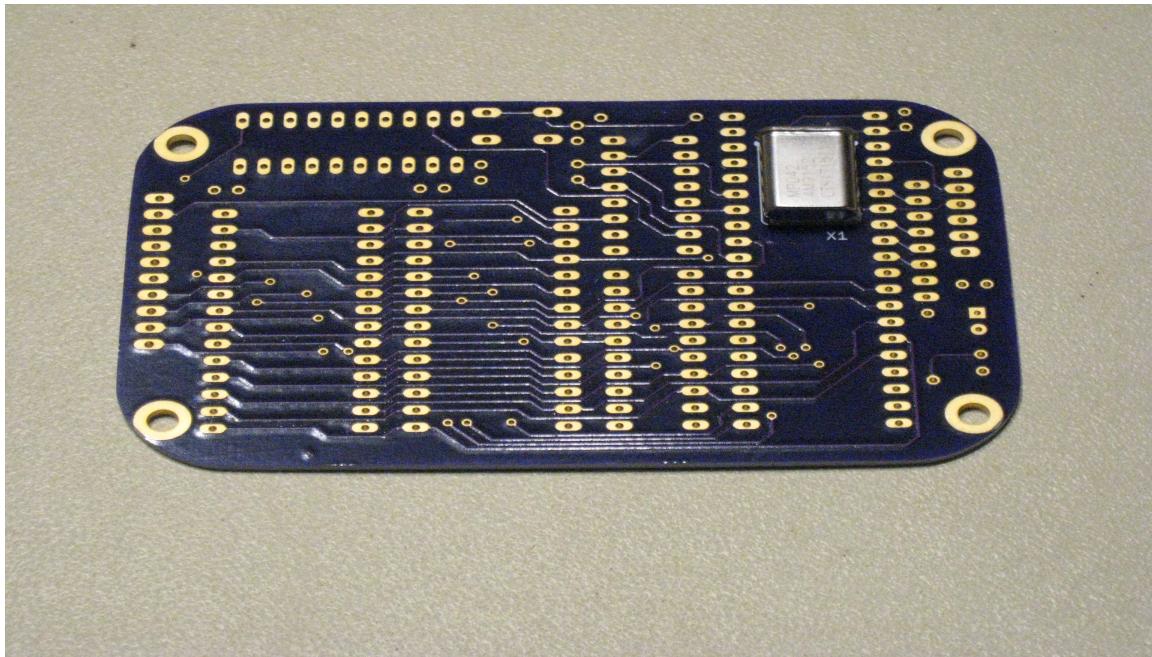
Note, X1 is on the bottom side.



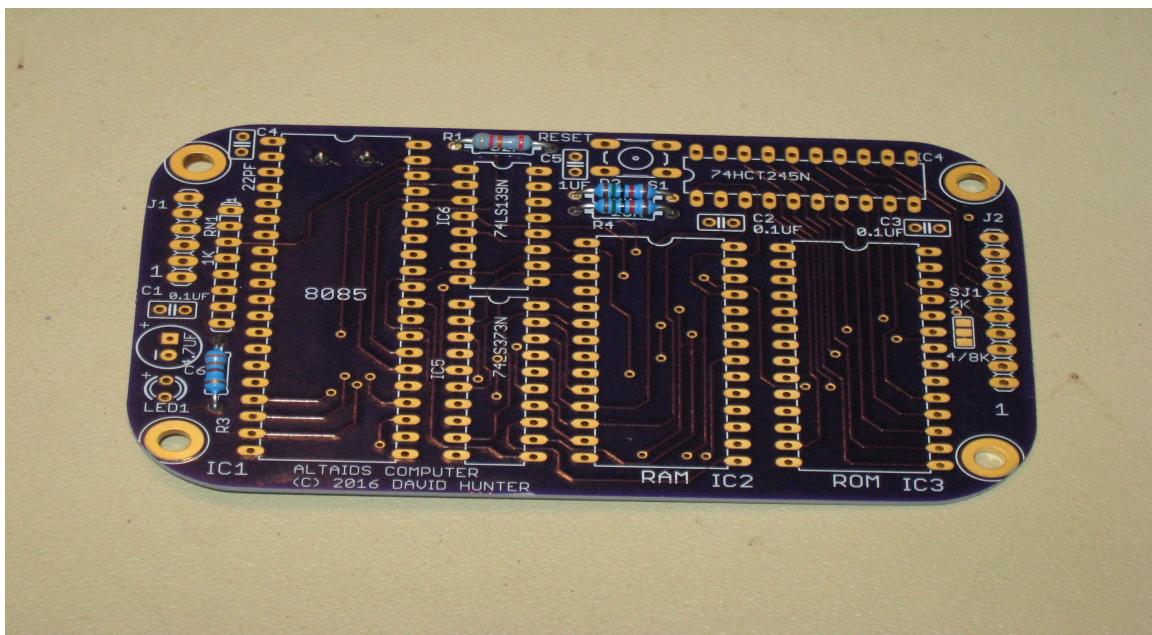
Install the crystal (X1) on the solder side of the board.

A piece of double sided foam tape on the crystal helps to hold it in place.

After soldering the leads should be trimmed off.



Next, flip the board over and on the component side install the resistors R1 (82K), R2 (15K), R3 (330Ω) and R4 (15K). After soldering the leads should be trimmed off.



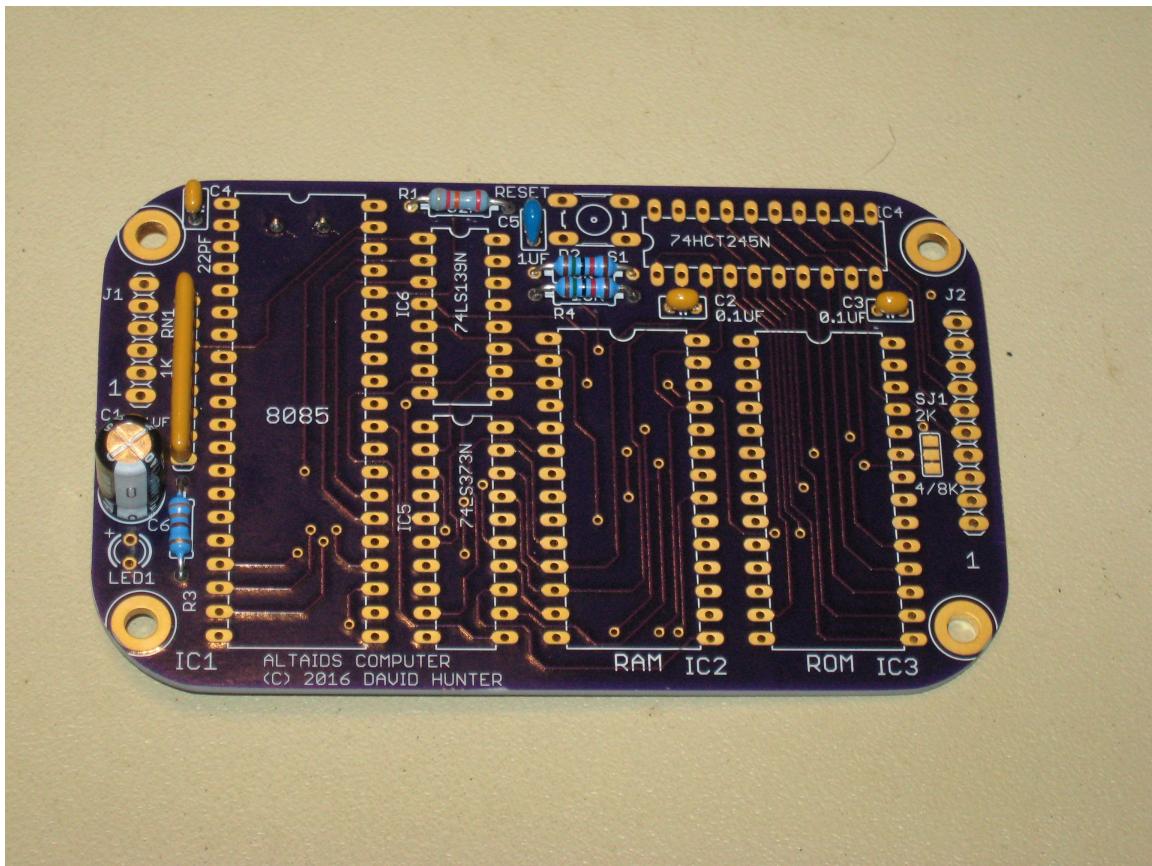
Next, install the capacitors C1,C2,C3 (0.1uF [104]), C4 (22pF [22J]), C5 (1uF [105]) and C6 (4.7uF).

After soldering the leads should be trimmed off.

Note the polarity of C6 with the stripe (which is negative) is opposite the + sign marked on the silkscreen above the part.

Also install the resistor network RN1.

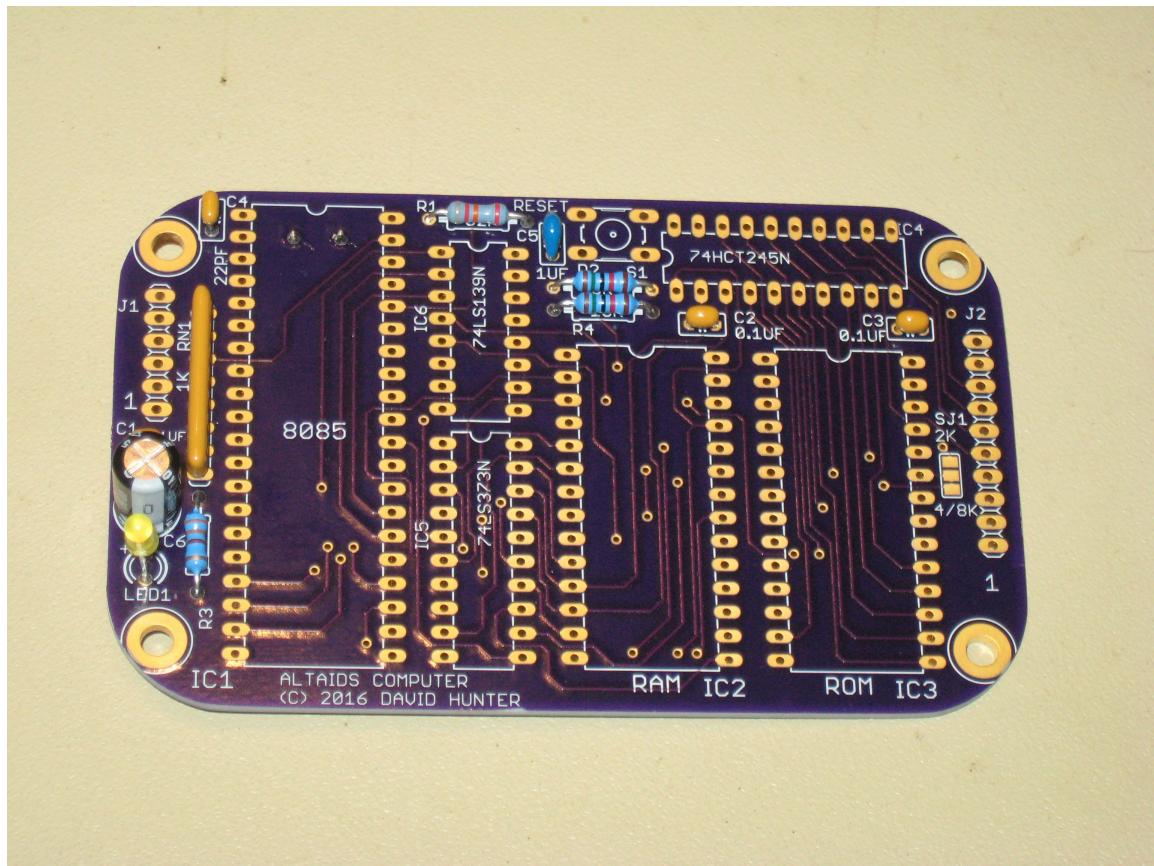
Note, pin 1 of RN1 is indicated by a dot on the side which should be toward the mounting hole. There is a pin 1 marking on the silkscreen.



Next, install LED1.

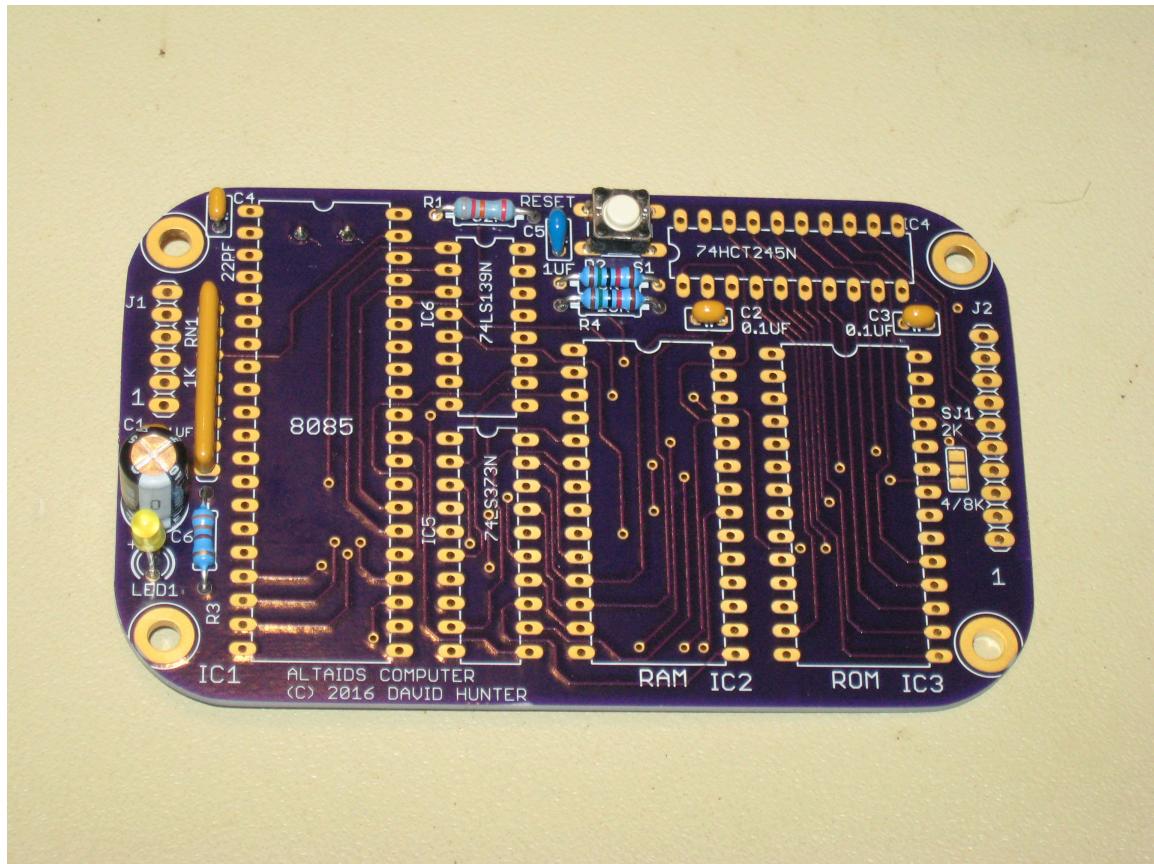
The LED can be placed down on the board or raised up depending on your preference. After soldering the leads should be trimmed off.

Note that the LED has a flattened side (short lead) which is the cathode. The LED should be installed so that long lead goes into the hole marked + on the silkscreen.



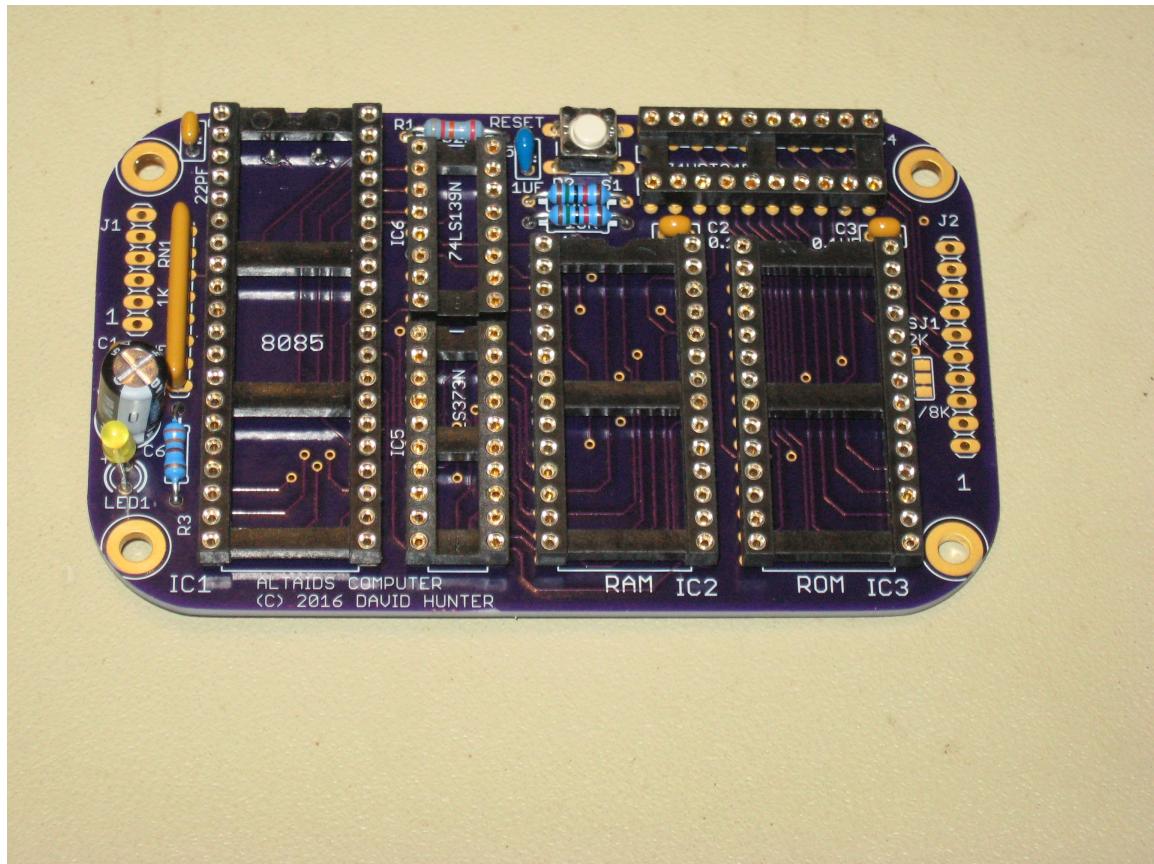
Next install reset push button S1.

Note that the leads of the switch should be towards the left and the right of the board and not up and down.



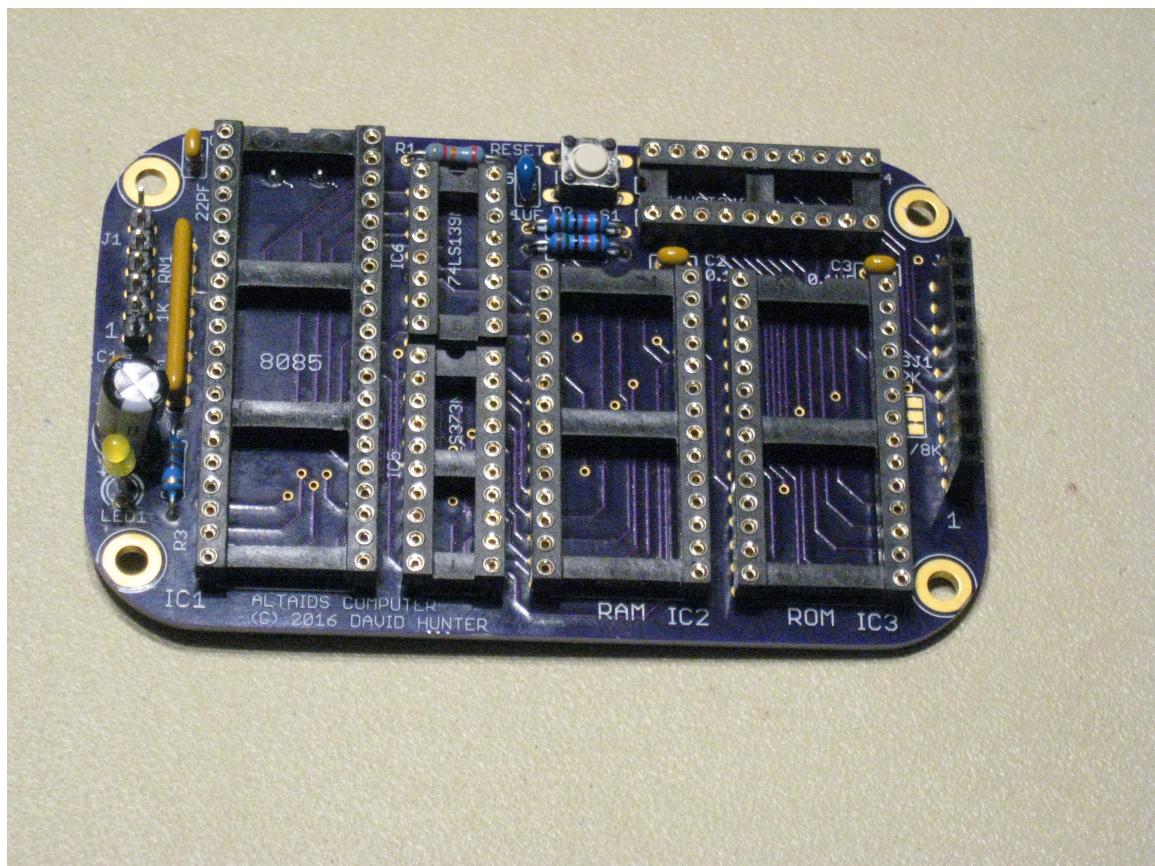
Next install the sockets.

The notches of the sockets should line up with the notches (half-circles) on the board silkscreen.

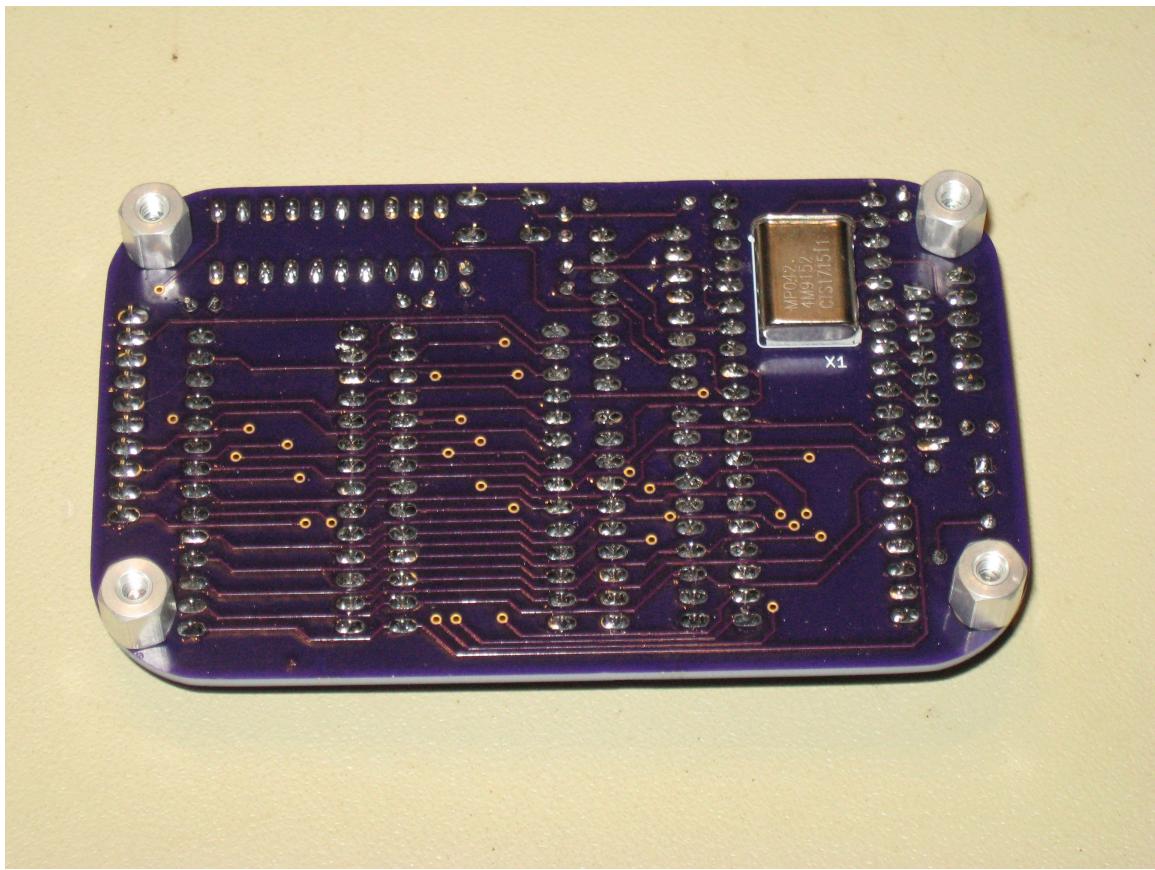


Next install the connectors.

The connectors should be flat against the board and vertical (not tilted). The male header is at J1 and the female header is at J2. The connectors do not have a polarity. After soldering the leads should be trimmed off.



Now install the standoffs on the solder side of the board using 1/4" screws from the component side.



At this point, the Altaids computer is ready for initial testing.

1. Inspect all of the solder joints to make sure they are proper. Look for unsoldered pins or solder bridges.
2. With the multimeter set to resistance (ohms) measure the resistance between pin 10 and 20 of IC4. The resistance should be fairly high ($> 1K$) if the resistance is low, check for solder bridges.
3. Measure the resistance from IC1 pin 36 to IC1 pin 20. The resistance should also be high. Press S1. When S1 is pressed, the resistance should drop to a very low value (<10 ohms).
4. Plug the FTDI cable into the board at J1. Pin 1 (BLK) should be lined up with Pin 1 of J1 as shown by the silkscreen. Plug the USB cable into a PC.
5. With the multimeter set to DC voltage, measure that $+5V (\pm 10\%)$ is present on the IC socket power pins relative to ground (IC1 pin 20) as listed below:

IC1: pin 40
IC2: pin 28
IC3: pin 28
IC4: pin 20
IC5: pin 20
IC6: pin 16

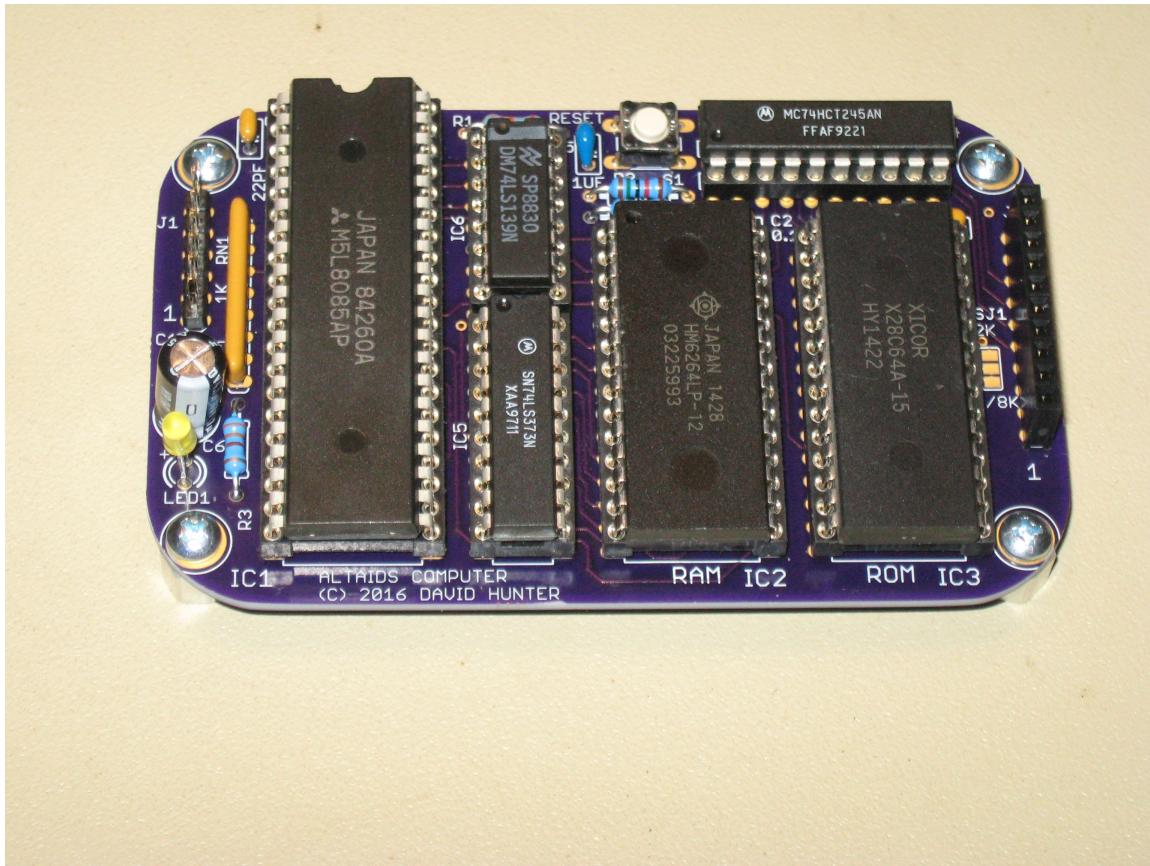
6. Disconnect the FTDI cable from the board.

If the tests passed, install the ICs in their sockets. Align the notches of the part with the socket as shown below. Some parts have dots indicating pin 1. These should be placed toward the notch of the socket.

Note, the leads of the ICs may have to be bent in slightly before placing them in the socket. Make sure the leads are aligned before pressing the IC into the socket. Double check to make sure there are no bent pins.

Be sure to put the correct IC in the correct socket:

- IC1: 8085
- IC2: SRAM (TC5565 or 6264)
- IC3: ROM (28C64)
- IC4: 74HCT245
- IC5: 74LS373
- IC6: 74LS139



The Altaids computer is now ready for operation. The board may be put inside a mint tin. It may take some "fiddling" to get it into the tin. Some tins may be slightly bent or bowed on the sides. A piece of insulating foam on the inside cover will keep the board from moving around when the lid is closed.

NOTES:

1. For 2K 2716 EEPROM / 2816 EEPROM
Cut trace from SJ1-1 to SJ2-2
Solder from SJ1-2 to SJ2-3
Insert part so pin 12 is at IC3-14 (GND)
2. (E)PROMs that may be used:
2K: 2716, 2816
4K: 2732, 2764, 28C64
8K: 2764, 27664, 28C64

ADD[0..12]

+5V

