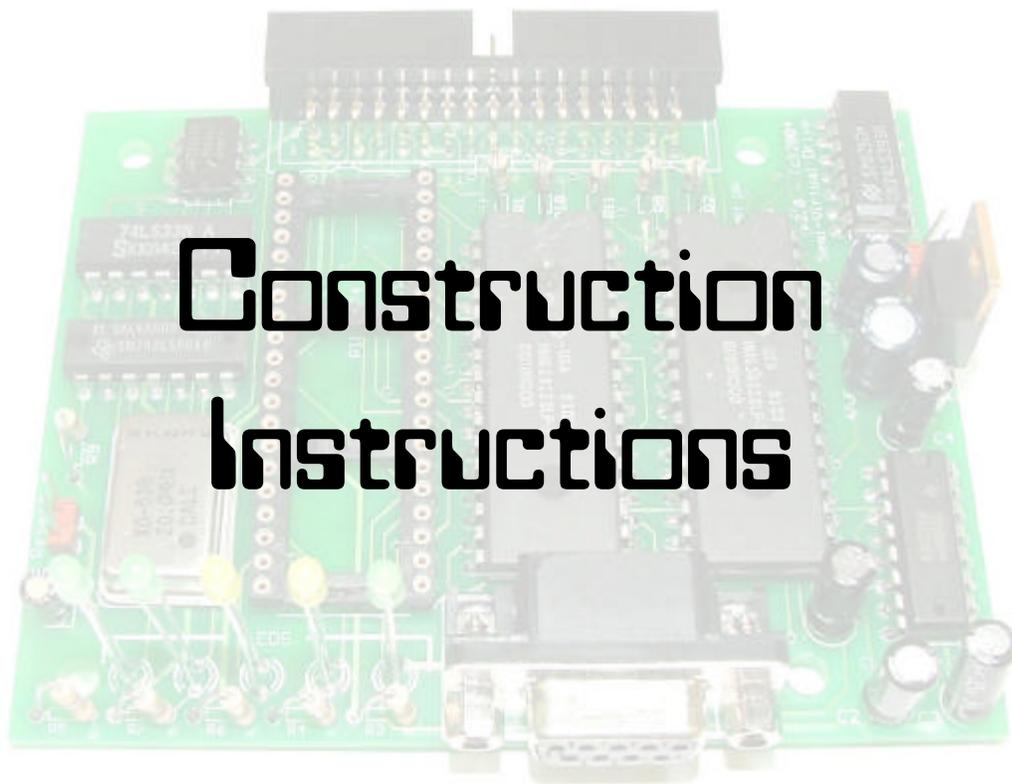


# Semi-Virtual Diskette SVD



## Construction Instructions

PCB version 2.0  
September 2004  
Eric J. Rothfus



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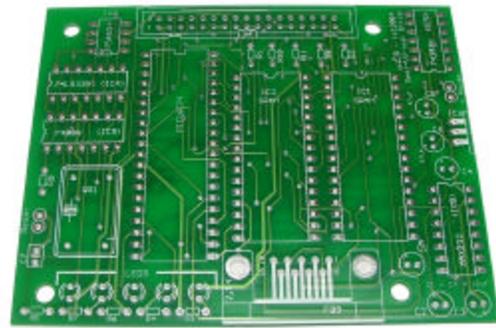
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## Parts List

### Printed Circuit Board (PCB)

This is a double-sided PCB with solder-mask on both sides, and plated-through holes. All components are mounted on the “top” side (the side with the silk-screen). You only need to solder on the bottom of the board.



### Parts with “wires”

**R1-2, 8-11** – (6) 10k – 15k ohm resistors. These are pull-ups so their exact value isn't critical to the function of the circuit.

**R3-7** – (5) 470 ohm resistors – for the LEDs

**C1-4** – (4) 10 uF capacitors

**C5-6** – (2) 47 uF capacitors

**C7** – (1) 1 uF capacitor. This is a filter capacitor and may actually range between .1 uF and 5 uF... just look for the one capacitor that is different.

**LEDs** – (5) 2 yellow, and 3 green

**IC6** – (1) 7805 5-volt regulator

### “Small” ICs

**IC9** – (1) 7400 quad NAND

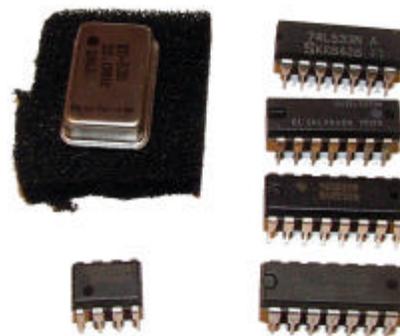
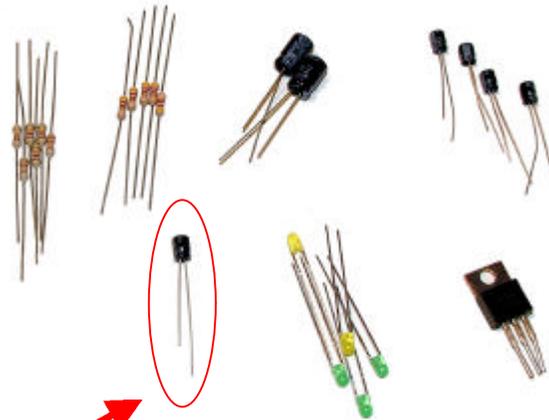
**IC5** – (1) 74393 dual counter

**IC4** – (1) 7433 quad OC NOR

**IC7** – (1) 75452 line driver – note that the schematic and PCB shows this as a 75453

**IC3** – (1) MAX232 – this may be of different brands, but always MAX232 compatible

**QG1** – (1) 20MHz oscillator



## ***“Big” ICs***

**IC8** – (1) PIC with label – this is a pre-programmed PIC 16C65b or 16C74b of either the one-time programmable (OTP) or windowed Cerdip

**IC1-2** – (2) 128kx8 SRAM – this can be of many different brands and part numbers, though they are all compatible with TC551001CP

**SOCKET** – (1) this 40-pin socket should be used to mount the PIC, allowing future firmware upgrades.



## ***“Big” Hardware***

**X1** – (1) Female DB9 right angle

**SV1** – (1) 34-pin box header, right angle



## ***“Small” Hardware***

**SW1** – (1) momentary pushbutton (for reset)

**SW2** – (1) SPST toggle (for power)

**POW** – (1) Power jack – 2.5mm X 2.1mm

**JMP1,3** – (2) .1” 2-pin Molex-style headers

**HDR** – (2) .1” 2-pin Molex-style connectors

**CLP** – (6) clips for mounting in headers (4 needed, 2 extra)



## Case

The case is a SERPAC #251 without the battery holder option. The top is smooth, just perfect for mounting the provided sticky-bottom SVD label.

Note that you'll need to drill the case for the switches, power jack, and LEDs. Further, you'll need to cut appropriate holes for the 34-pin header and RS232 jack. Instructions are provided below.

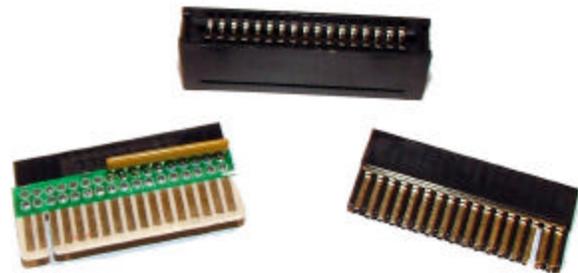


## Floppy Connectors

The 34-pin header on the SVD must be connected to either the "terminated" edge-card adapter or the "un-terminated" edge-card adapter.

**IMPORTANT NOTE – you must use one of these provided adapters!** Do **not** plug something directly into the 34-pin header in that + 5V is supplied on the 34-pin header and would undoubtedly damage equipment directly connected to it.

In addition to the edge-card adapters, a 34-pin ribbon-cable connector is supplied to make using the SVD easier.



## Power and Cables

Included with the SVD is a 9-pin serial cable.

Also included is a 9 to 12 volt power supply. These were procured from the local GoodWill Computer Store for very low cost (\$2.00 for the cable and \$5.00 for the power supply). They are included because they are necessary and were so cheap. □ (as opposed to you trying to get them yourself).

One important note – with the 9-volt supply, the voltage regulator gets warm. With the 12-volt supply, it gets rather hot...it is not really a *problem*, but you may want to put a heat-sink on it (not included, sorry). Your call.



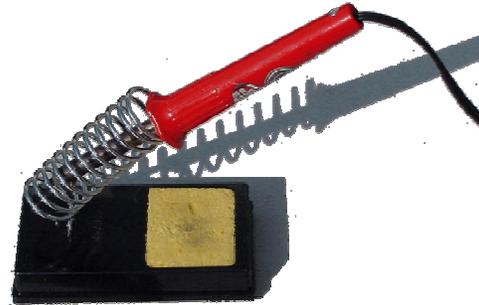
**Things NOT included...that you'll need...**

**Wire** – you will need standard wire to connect the power switch, power jack, and reset switch to the headers for connection to the PCB.

**Soldering iron and solder** – kinda' goes without saying...

**Drill** – for LED, power, and switch holes.

**Dremel** (or like) cutting tool – to machine the plastic case





**IMPORTANT**

**NOTE:** Construction of the SVD is easy for an experienced hobbyist, however, there are few important instructions in this document that you should be aware of. Please read this document to ensure that you catch them!

These important instructions will be highlighted in a box like this so they'll be hard to miss.



**TIP**

**TIP:** These instructions contain some useful tips for a successful construction of the SVD. These tips can safely be ignored, though may be helpful! These tips will be highlighted in a box like this so that they'll be hard to miss.

There are 3 main tasks for constructing the SVD:

**PCB Construction** – this section details populating the PCB. This includes soldering ICs and other components to the board. It also includes preparing the external connectors.

**Case Construction** – this section shows you how to prepare the case that will hold the PCB. It also shows how to mount the switches and power jack to the case along with their wiring.

**Final Assembly** – a very short section showing how to put the whole thing together.

## PCB Construction

Mount the PIC socket (SOCKET).  
There is no need to insert the PIC into the socket at this time, however.

Mount the two memory chips (IC1-2).  
Be sure to observe the proper orientation of the chips.



Mount the MAX 232 (IC3)

Mount the 74393 (IC5)

Mount the 7400 (IC9)

Mount the 7433 (IC4)

Mount the 75452 (IC7)

Mount the oscillator (QG1)

Mount the 34-pin connector

Mount the RS232 DB-9



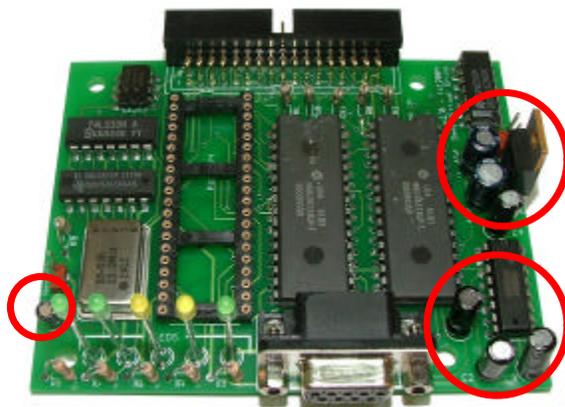
*Note that the 75452 is shown as a 75453 on the silk-screen.  
Ignore this misprint! □*

Mount the power regulator 7805 (IC6).  
Observe the appropriate orientation of the 7805 with the “all flat side” facing the edge of the PCB.

Mount the two 47 uF power capacitors (C5-6) next to the 7805. Be careful to observe the appropriate polarity of the capacitors as marked on the silk-screen.

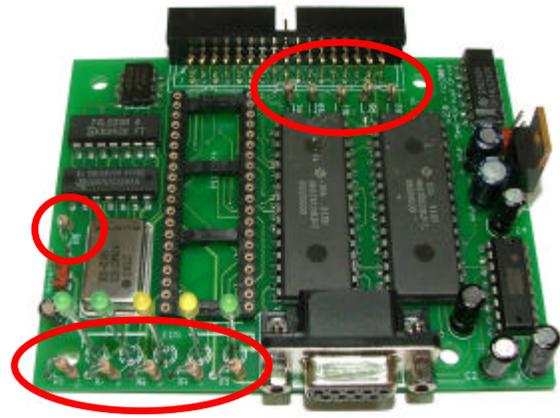
Mount the four 10 uF capacitors (C1-4) around the MAX232, observing polarity.

Mount the 1 uF filter capacitor (C7)



Mount the top six 10k (or 11k) pull-up resistors (R1-2, 8-11). Five are mounted above the memories and one to the left of the oscillator.

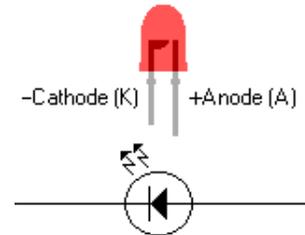
Mount the five 470 ohm resistors (R3-7) at the lower left of the board, next to where the LEDs will be mounted.



**TIP**

When mounting the LEDs, you must pay attention to two important things: their orientation and the height that they rise above the PCB.

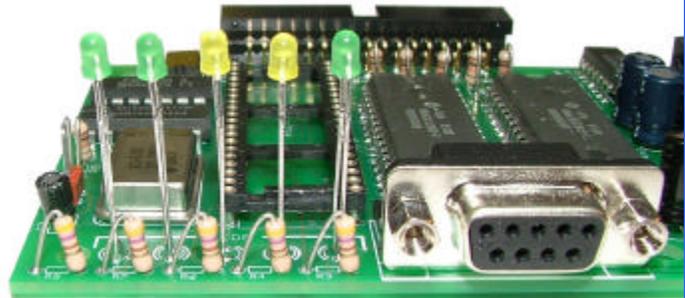
*Orientation* – They should be mounted “pointing down” to the bottom of the PCB (with the RS232 jack at the bottom of the PCB). This is easily recognized by finding the **long lead** of the LED and putting it in the **top hole**. Or, if the leads are the same length, look inside the LED to identify the Anode, which should have the longer lead



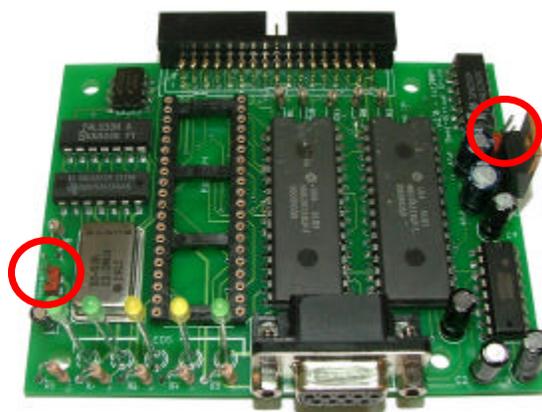
*Height* – the LEDs need to “show through” the holes that will be drilled in the case. With the supplied case, the base of the LED should  $\frac{3}{4}$ ” above the top of the PCB. The easiest way I have found to do this is to make a bend in the long lead of the LED  $\frac{7}{8}$ ” from the base of the LED. Mostly straighten the bend, and insert the LED into the PCB. Re-bend the lead so that the LED will “hang” upside down. Solder the other lead in place. Then return to the top side of the PCB, ensure that the LED is oriented straight up, then straighten and solder the previously bent lead.



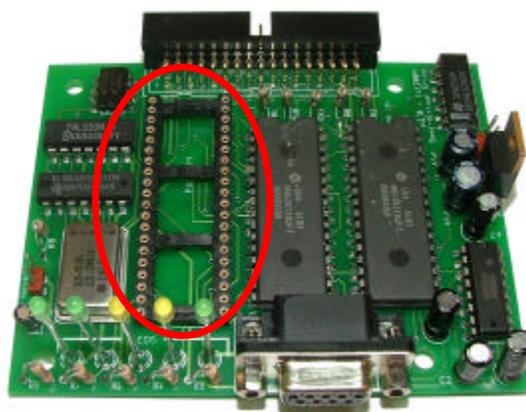
Mount the six LEDs as shown. See the above TIP for information about the best way to mount them.



Mount two 2-pin headers, one for power and the other for reset.



Insert the PIC (IC8) into the socket. Be VERY careful not to allow the pins to bend while inserting it.



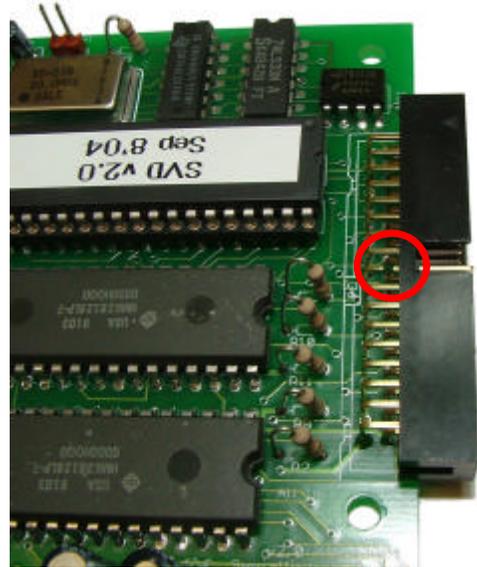
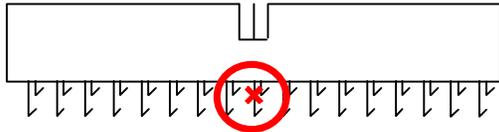


**IMPORTANT**

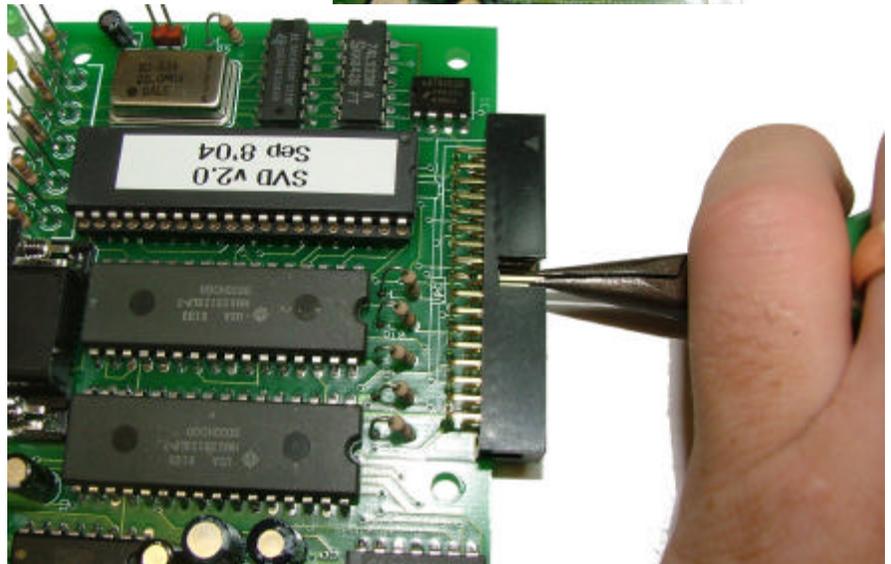
The following instructions describe how to remove a pin from the 34-pin connector. This pin must be removed to allow the edge-card adapters to fit into the connector. If you don't remove this pin, the connectors won't fit!

This was done because +5V is supplied to the edge card connectors to allow for termination as well as adapters such as that needed for the Apple II. The missing pin ensures that the edge-card adapters can be inserted in only one way.

Snip the middle pin at the top of the 34-pin connector.



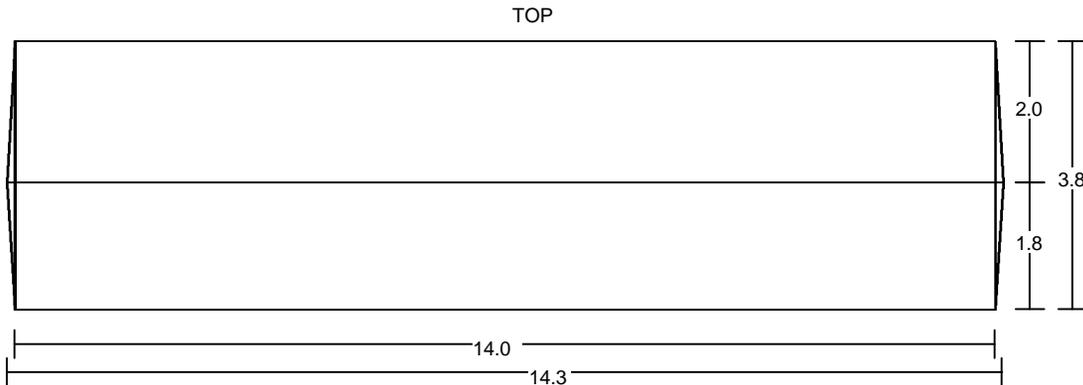
Pull the snipped pin out of the connector.



## Case Construction

The SVD PCB was created to fit the SERPAC #251 case, included in the complete SVD kit. Outside dimensions of this case are as follows (in cm):

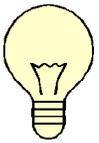
To allow mounting of the PCB within this case, holes must be drilled for the LEDs, the power switch, the reset switch, and the power jack. Also, two rectangular holes must be “machined” into each side of the case.



**TIP**

Drilling the holes for the LEDs, power switch, reset switch, and power jack can be done rather informally.

The best method I've found is to mount the SVD label on the top of the case, and drill the holes where they are indicated by the label. This assures good alignment for both the internal LEDs and the label.



**TIP**

It will work much better for the Reset and Power switches if you chose the best end of the case. One end of the top half of the case has tabs where the holes for the switches go. The other end doesn't. Find the best end, you'll thank me later.



Cut the indicated notches out of the SVD label.

Mount the label on the smooth top side of the case.

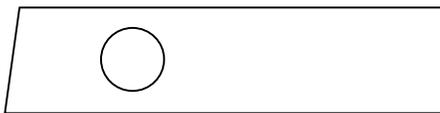


Working on the top half of the case:

Drill 5 holes for the LEDs using a 1/8" bit. Try to keep them straight – as in this example :-).

Drill a hole for the Reset button and for the Power switch. Use a 3/16" bit. Note that this bit is just a tad small. I'd use a 13/64" if I had one.

Drill a large hole for the power jack about 3/4" from the side below the "9 – 12V" part of the label. I don't have a drill bit big enough, so I will "ream" it out as needed. The hole should be centered from between the top and bottom of the side of the case.

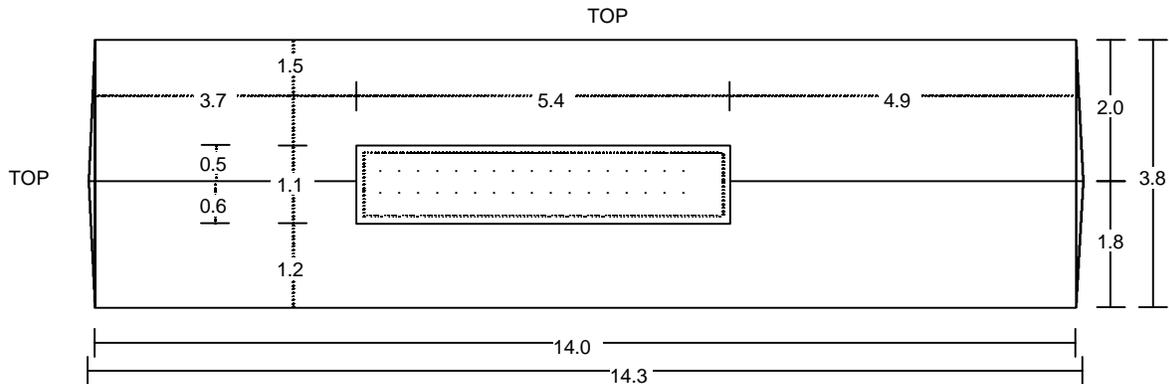


Now cut the notches in the case for the two connectors. Try to get them to line up as well as possible. All measurements below are in cm.

*NOTE – that the measurements below are NOT to the “pointy” end of the case. Instead they are to the square edge...as if the end of the case was square.*

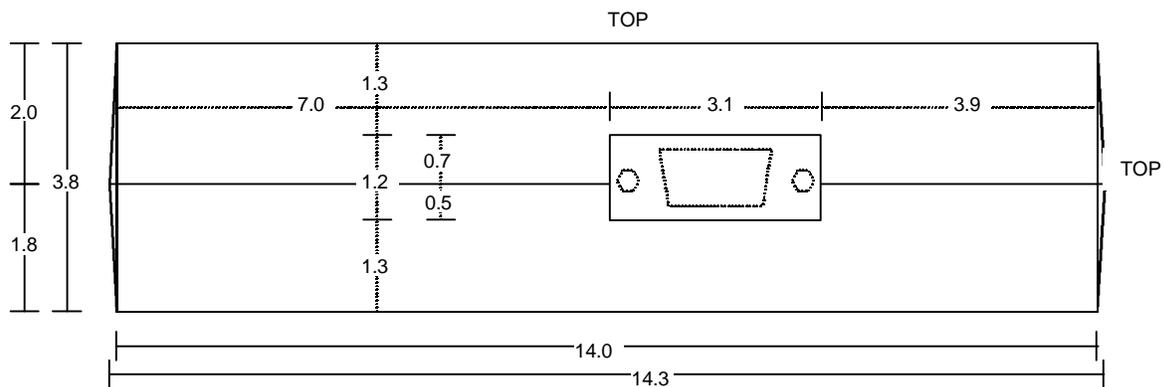
Cut the notch for the 34-pin connector on the left side of the top of the case.

Cut the notch for the 34-pin connector on the left side of the bottom of the case.



Cut the notch for the RS232 DB-9 connector on the right side of the top of the case.

Cut a notch for the DB-9 connector on the right side of the bottom of the case.



## Final Assembly

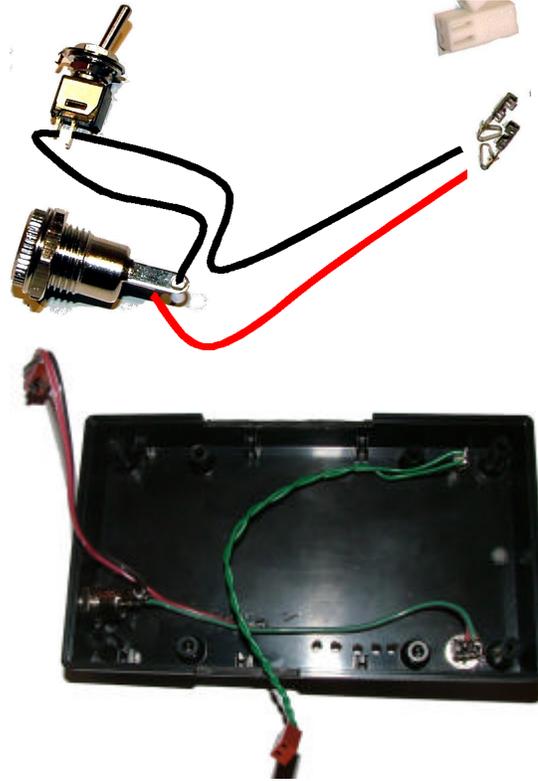
Mount the Reset switch.

Mount the Power Switch. Note that since this is a SPST switch, there is only one set of contacts. The contacts go toward the bottom of the case – that is, they are opposite of the direction of “on” for the switch.

Mount the Power jack.

Wire the Power switch and jack together, crimping clips on the ends and attaching a connector. *Note that the power adapter supplied is “center positive”. So wire the red/positive lead to the center of the jack.*

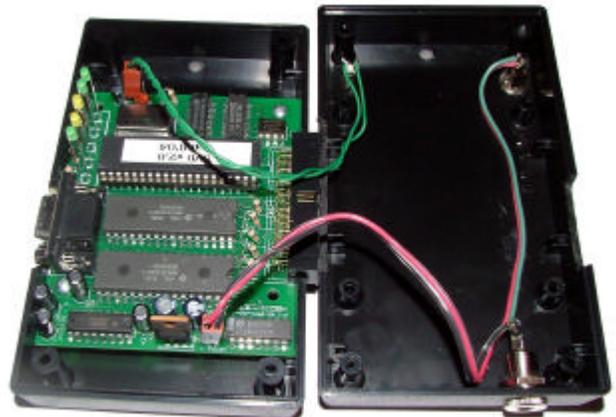
Attach wires to the Reset switch, crimping clips on the ends and attaching a connector.



Install the PCB into the bottom of the case. Note that the case only comes with 4 screws, so use two to attach the PCB, and keep 2 for securing the two halves of the case.

Attach the power connector to the power header. **IMPORTANT** – make sure the red wire (attached to the center pin of the power jack) goes to the positive + side of the header.

Attach the reset connector to the reset header. The direction of this connector doesn't matter.



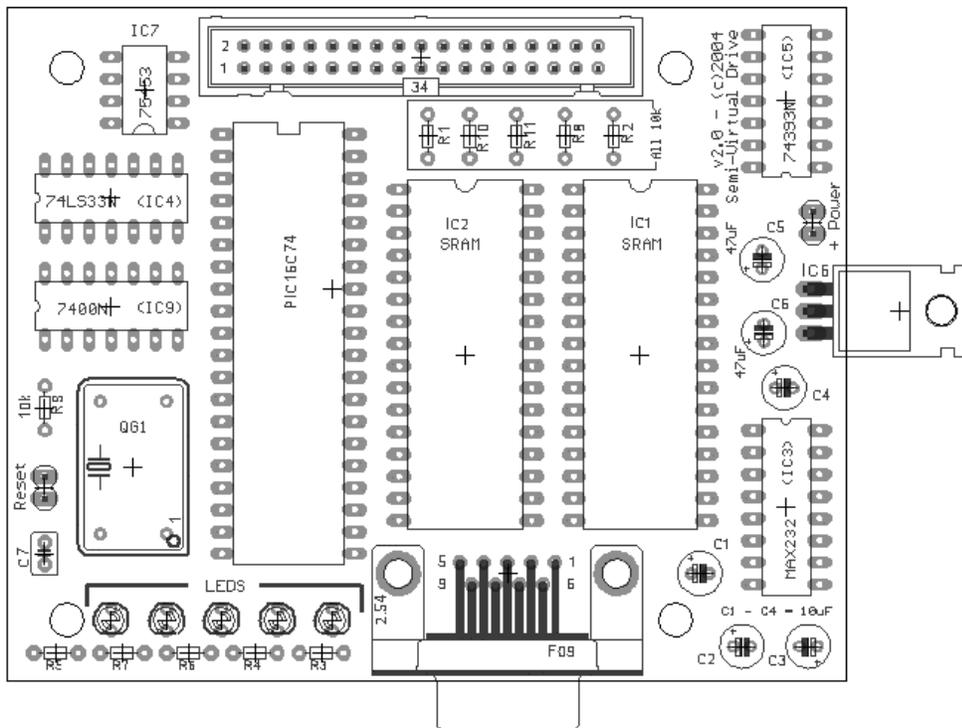
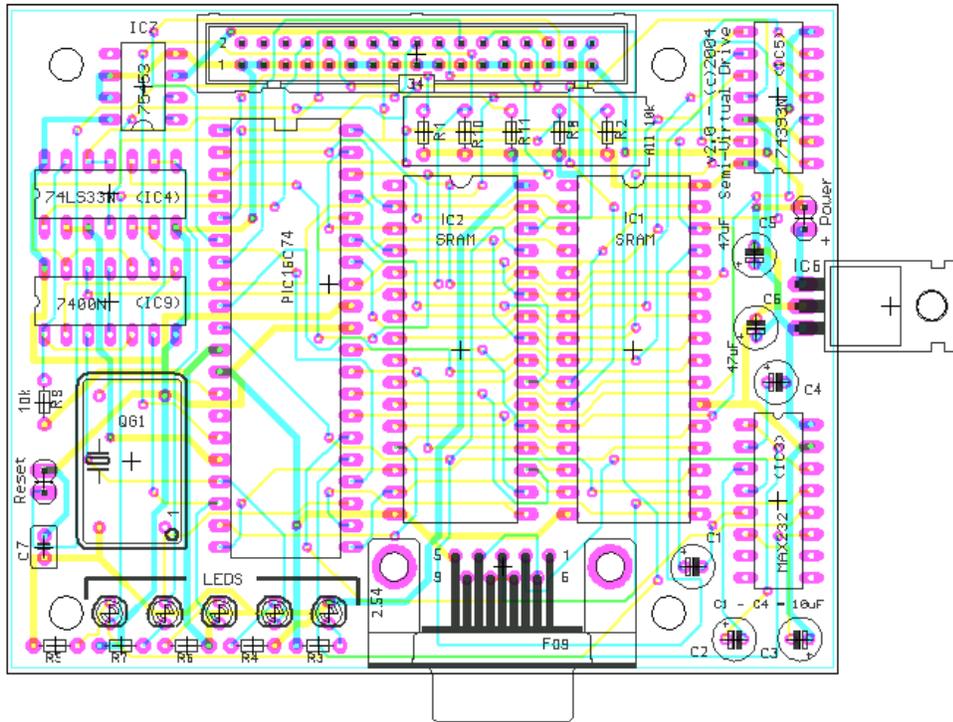
Bring the two halves together, taking care that the LEDs go into their holes.

Use the two screws left over from the case, securing opposite corners from the bottom of the case.

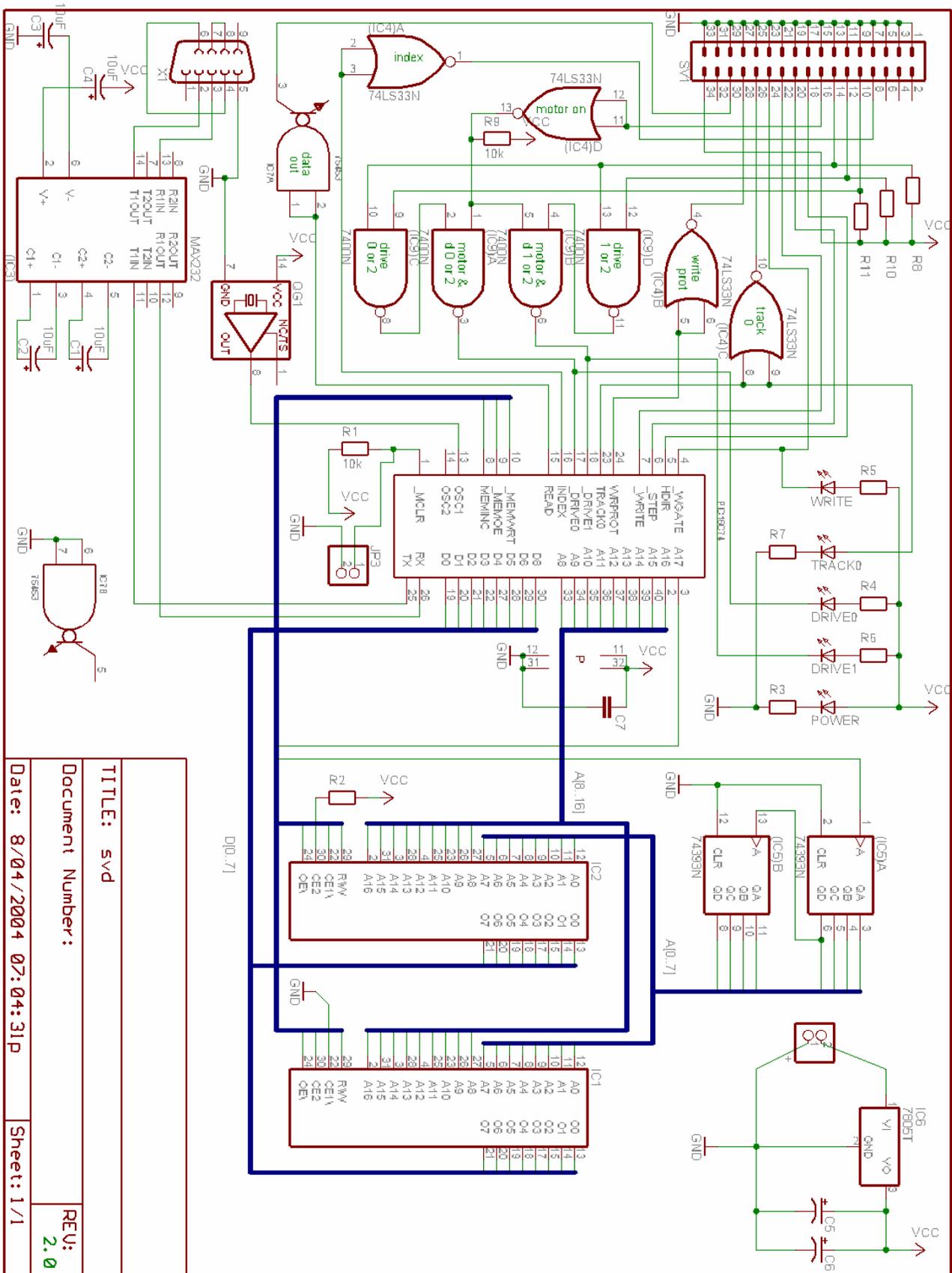
**DONE !**



# Parts Layout



# Schematic



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 Document Number:  
 Date: 8/04/2004 07:04:31P  
 Sheet: 1/1  
 REV: 2.0