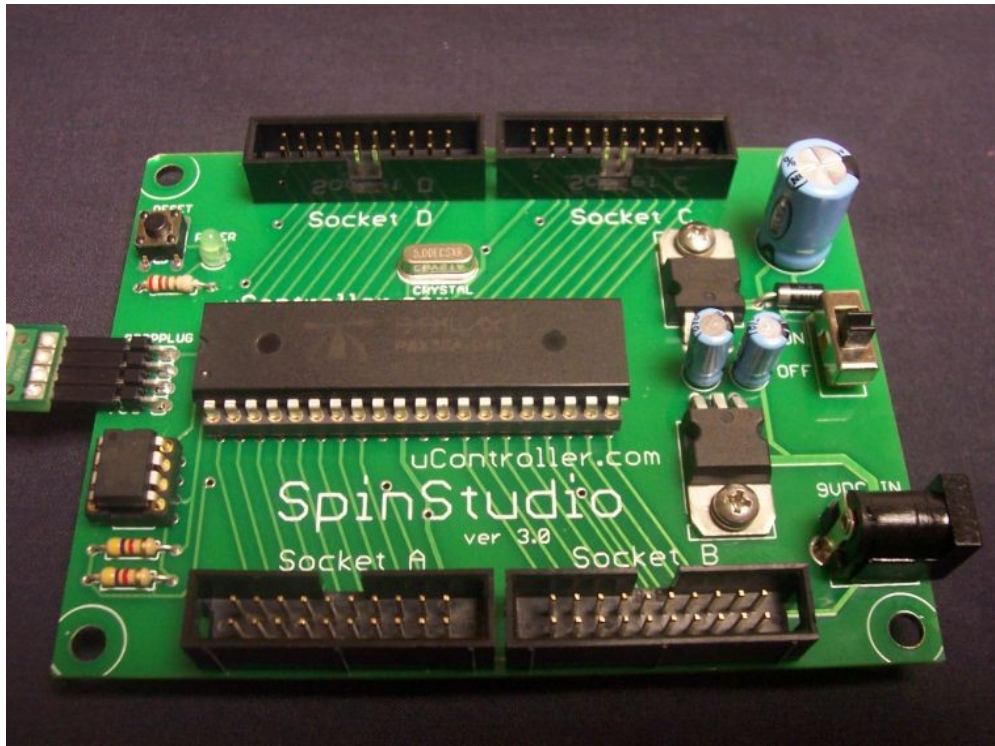# SpinStudio MainBoard

The SpinStudio Mainboard is the base to which the peripheral boards are attached. It consists of...

- A socket for a DIP propeller and EEPROM
- 5 volt and 3.3 volt regulators
- necessary pullup resistors, power filtering/bypass capacitors, reset button, power switch and power indicator LED
- 4 pin right angle programming header, for the connection of a PropPlug
- 4 sockets for peripheral boards

The Mainboard can be compared to a motherboard inside a computer. It contains the processor, memory and necessary support circuitry. There are sockets for expansion. The expansion boards provide

- input - such as keyboard, mouse and Joystick
- output - such as composite video, VGA, audio and servo control
- combined input and output - PropNIC Ethernet Adapter, SD card adapter, and the general IO/servo board can provide direct access to the Propeller's IO pins both with and without current limiting resistors

Each peripheral socket has connections for the following

- Power - 3.3V, 5V and ground
- I2C - SCL and SDA
- 8 IO lines from the Propeller
    - Socket A provides access to P0-P7
    - Socket B provides access to P8-P15
    - Socket C provides access to P16-P23
    - Socket D provides access to P24-P27

*P28-31 are reserved as EEPROM and programming connections*

Assembly

Assembly is easiest when done in order of the height of the component, starting with the smallest. Each step can be done one component at a time, or to can insert all parts for that step, turn board over and solder all the parts at the same time. then progressing to the next step. These directions assume the assembler is proficient at soldering and has appropriate equipment and tools. There are various soldering tutorials available online, but I suggest you practice on other circuit boards before attempting a project of this nature. After each step, Clip the excess leads of the components that you just soldered.

- Start by inserting the resistors, The yellow A's in the photo above mark the 4.7K resistors (color codes yellow-violet-red) The Yellow B is a 220 ohm resistor (color code red-red-brown) bend the leads outward slightly and solder into place.
- Next insert the diode (orange C) next to the power switch (must be inserted with white stripe to the left, closest to the voltage regulator) and the Crystal and solder.
- There are 2 - 0.1 uF epoxy dipped ceramic capacitors located under the Propeller Chip Socket(blue A's in the photo above), they are not visible when the Propeller is in it's socket, insert these now (polarity is un-important with this type of capacitor) , along with the 4 pin programming header(green A) and solder in place.
- Time to solder both the 40 pin Propeller socket, and the 8 pin EEPROM socket. The indexing notch on the Propeller socket should be on the left side, indicating that pin 1 of the chip be in the lower left when the board is held as shown above. The reference notch on the EEPROM should be toward the top of the board.
- Voltage Regulators. The 5 volt regulator(marked 7805CV) is positioned toward the top (red A in the above photo). While the 3.3 Volt regulator (marked LF33ABV) extends toward bottom of the board (red B) when held as pictured above. Before inserting in the board, hold the leads of each regulator at the point at which the lead narrows (approx 1/4 inch from the plastic body) with a pair of pliers and bend to a 90 degree angle. Insert the regulators. The Regulators can be secured by a screw and nut, with or without a heatsink (optional and not included) now is the time to insert it, before soldering. Firm, careful pressure may be needed to line up the hole in the PCB and the hole in the heatsink. Now is also the time to insert and solder the Power indicator LED, the short lead of the LED (the cathode, also indicated by a flat side) should be on the right side.

- Time for the 4 - 20 pin peripheral Sockets. The notched side of the boxed header should be toward the center of the PCB. The reset button can be snapped into place now and soldered .
- The power switch can be inserted and soldered first in this step, then add the 2 - 10 uF electrolytic capacitors (blue B's in the diagram above). Polarity is indicated on the circuit board. The negative lead (black stripe on the capacitor body) will be to the right when holding the circuit board as shown above. The DC power jack is next, followed by the 1000 uF electrolytic capacitor (Blue C), the negative (black stripe) will also be to the right on this capacitor.
- Before inserting the Propeller and EEPROM ICs, Plug your Power supply into the MainBoard and turn it on. Confirm that the green power indicator LED glows brightly.
- With a Multi-meter – Measure the voltage at Pins 9 and 12 of the Propeller socket. The Red lead of the multimeter should be placed on pin 12, black to pin 9. You should read approximately 3.3 Volts.
- Turn off the Power Switch and insert the Propeller and EEPROM.
- Plug your PropPlug into the Programming header, Badge facing up. Open the Propeller Tool software on your computer. Turn the Mainboard on and press F7 to "Identify hardware". You should see an indication that the Propeller was found
- Your SpinStudio MainBoard is ready for use.

Optional finishing touches.....
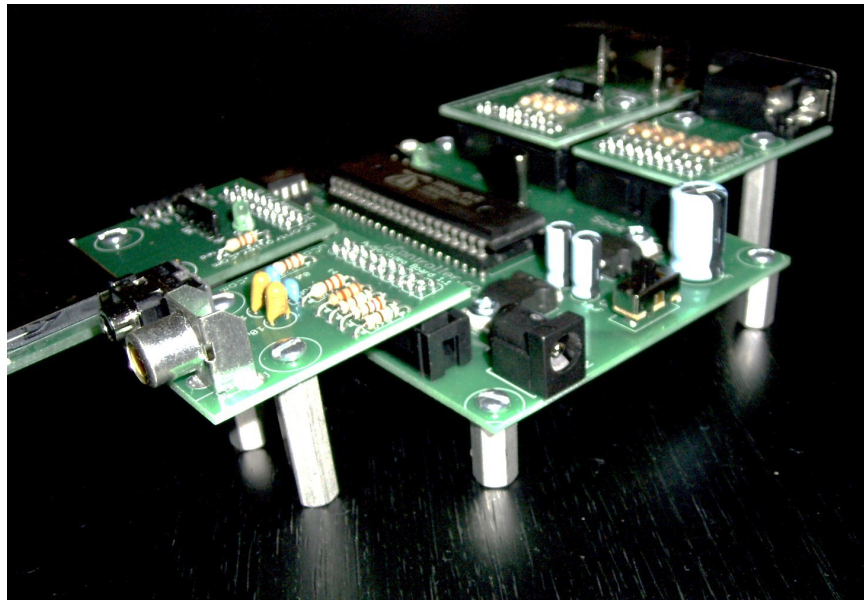
Mounting holes are provided on most SpinStudio boards. Standoffs can be used as pictured above to elevate your boards off your work area, it also increases the stability of the peripheral modules. Half inch spacers should be used on the MainBoard, and 1 inch spacers on the Peripheral modules will hold the boards in perfect alignment.

The mounting holes on the MainBoard are spaced so that it will fit a Boe-Bot chassis.

Other comments and ideas.....

A 20 pin IDC connector and ribbon cable can be used to connect your own circuit boards to SpinStudio. Or a Ribbon cable with an IDC connector on both ends can be used when it's not possible to plug a peripheral module directly into the mainboard (such as when mounted inside a project box or mounted to a Boe-Bot Chassis. Simply substitute a Male 20 pin connector in place of the female on the modules you want to plug into your "extension" cables.

The diagram on the following page will assist you with the pinout of the SpinStudio connectors. This will allow you to create your own add on boards for SpinStudio.

The SpinStudio Connector
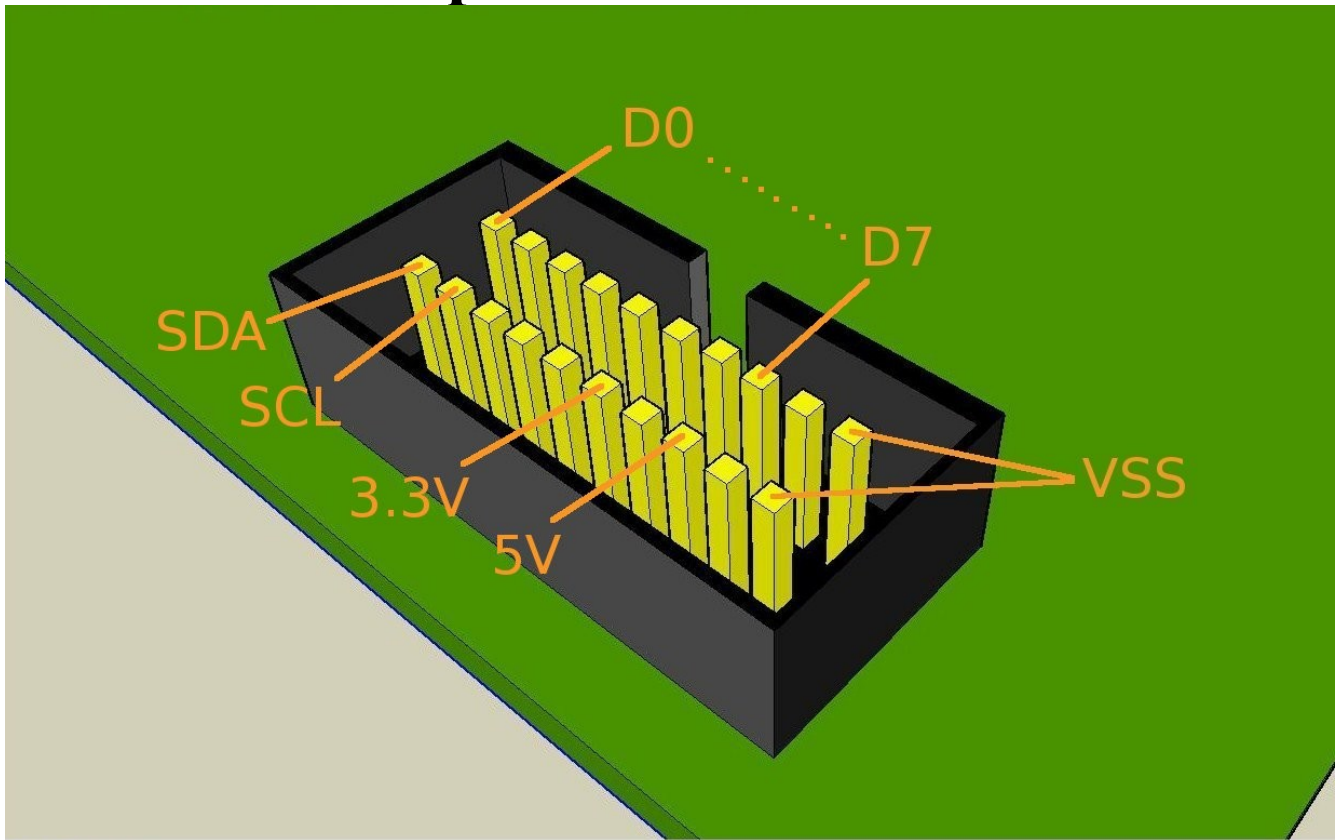
Note the position of the notch on the inboard side of the connector.

The 2 I2c lines SDA & SCL are available in all 4 sockets of the MainBoard.

D0 – D7 supply access to the 8 IO pins contained within the socket in which it is plugged into. Refer to the chart below.

SpinStudio Socket "A"		SpinStudio Socket "B"		SpinStudio Socket "C"		SpinStudio Socket "D"	
D	Propeller IO	D	Propeller IO	D	Propeller IO	D	Propeller IO
0	0	0	8	0	16	0	24
1	1	1	9	1	17	1	25
2	2	2	10	2	18	2	26
3	3	3	11	3	19	3	27
4	4	4	12	4	20	4	*
5	5	5	13	5	21	5	*
6	6	6	14	6	22	6	30 **
7	7	7	15	7	23	7	31 **

P28 & P29 are not connected to D4 & D5 in Socket D, access is however provided in all 4 sockets as SCL and SDA
P30 & P31 can be used with care after the Propeller boots