Parts of a circuit board

Some acronyms you should know:

1. **IC**: Integrated circuit; an electronic circuit manufactured by different stuff (elements to be specific) to carry out a job.

2. **PCB**: Printed Circuit Board; the green board with the gold/yellow lines. These lines are the pathways for the electrons in the circuit board.

- **Ferrite Beads**
  - Fixed Choke RF Hash 500UH 20% **Ferrite**: (The wire with a bronze clump in the middle of it) This is a part to a circuit that suppresses RF EMI (radio frequencies electromagnetic interference) that are usually generated or received by a device. This piece is laid aboard the circuit to reduce "distractions."
  - **A real life ferrite bead you’ve probably seen:**

- **IC Sockets** (they can be Dual In-line Package (DIP/DIL), single in line (SIP/SIL), and quad in line (QIP/QIL).)
  - **Conn IC Socket vert. 8POS Tin**: (little black rectangle with 8 legs; DIP8) This is a little removable chip (yes for you un-savy solders, there's no soldering to be done here!) that is popularly used for prototyping in circuitry because of how easy they are to replace. The purpose of this little guy is that he's the bridge between the IC package (the program) and the system circuit board (the board itself).
  - **Conn IC Socket vert. 20POS Tin**: (Little black rectangle with 20 legs) He’s the same thing as his 8-legged cousin, but he’s got 20 legs.
  - **Conn IC Socket vert. 28POS Tin**: (Little black rectangle with 28 legs) He’s the same thing as his 8 and 10 legged cousin, but with 28 legs.
    - **BE CAREFUL!** These little chips are very sensitive to heat and shock (as in dropping too).
    - Generally the more legs (correct terminology, the lead frame) it has, the more powerful the IC socket is, but here we only deal with DIPs, sorry!

*Here is the 8, 14, and 16 version of the IC socket.*  
*Here is the 64 lead frame version:*
• **Transistors:** this guy amplifies the signal throughout the circuit allowing the size of a circuit dramatically smaller. Because of this guy, you have nice little gadgets such as your smartphone and car radio today. They also have the job to open or close a circuit too.
  o Bipolar junction transistors: 3 legs on the bottom his head is in the shape of a black box, but looking at it from top it's a semi circle.
    - Transistor NPN GP 40V TO92: This NPN (negative/positive/negative) transistor specifically sinks the input, which allows current to flow out of the sensor.
    - Transistor PNP GP 40V TO92: Same thing as his NPN other cousin, except this one is a PNP (positive/negative/positive) and sources the output, which means the current flows into the sensor.
    - Transistor GP SS NPN LP 40V TO96: This one has a SS, but that's the only (unknown) difference
  o MOSFET: “metal-oxide-semiconductor field-effect transistor” which are the most common type of transistors out today. They have 3 legs, a black box with a silver rectangle with a circular hole up top.
    - MOSFET N-CH 500V 2.5A TO-220AB: a negative channel MOSFET transistor
    - MOSFET P-CH 60V 280MA TO92-3: same thing but a positive MOSFET transistor

Here is the common example of a BJT

Here is the common example of a MOSFET

• **Diodes:** blocks current in one direction while letting current flow in another direction. For example, batteries contain diodes that protect the device you plug them into if you were to insert them in different directions.
  o Diode Rectifier 1A 1000V DO-41: wire with a cylindrical black box
  o Diode SGLJUNC 100V 4.0NS DO-35: wire with a clear cylindrical box, with two red beads inside of it.

A 3D model of a diode that's bent into a PCB.

3 regular diodes

• **Crystals:** or a crystal oscillator is a part of the circuit that resonates (emits) an electrical signal with a precise frequency. They commonly help keep track of time in circuits such as a wristwatch or a cellphone.
  o Crystal 32.768khz 12.5PF CYL: a silver cylindrical box with two legs
  o Crystal 16.000312mhz 18PF SMD: Has a black plate on the bottom with a silver looking tub that's upside down on top of the black plate.
• **IC Regulators**: they regulate and stabilize the circuit’s direct/alternate current. Basically keeps the electrons that move through the PCB from going haywire.
  - IC Regulators LDO 5V 1.5A TO-220-3: these guys look exactly like the MOSFET transistors.
  - IC Regulators LDO ADJ 1.5A TO-220-3: this is the adjustable version of the IC regulator up top. It can adjust the stabilization of the current by a potentiometer. (a little black box with a screw that you can turn clock wise or counter clock wise)

• **LED 5mm red CLEAR 624nm 30DEG**: Red LED light, kind of obvious. They got a red bulb with two legs that stem from the bottom of it.

• **Connectors**: they bridge together other parts of a circuit and many times bridges different PCB or other devices.
  - Connectors HDR BRKWAY .100 40POS vert.: 40 legged connector with 40 holes on top of it.
  - Connectors HDR BRKWAY .100 40POS R/A: 40 legged connector with 40 holes on top of it.
  - Connectors Header FMALE 36POS .1” gold: 36 legs but are made out of gold. It’s a faster connector since gold is one of the best conductors.
  - Connectors Female 40POS DL .1” R/A TIN: 40 legs made out of tin. Still good, but not as good as gold.

  Here’s some real life examples of an everyday connector.

  ![Apple's lighting USB connector](image1)
  ![the connectors that we’ll be using](image2)

• **LED 7-SEG .56 QUAD S-RED CA MULT**: has four number slots that light up 4 different numbers in the color red.

• **LED MATRIX 5x7 0.7” GREEN**: 5x7 of Green LED lights to program whatever your heart desires, or at least whatever to what your knowledge you can program.

• **Microcontrollers**: (or a MCU) a small computer on a single IC that contains the processing core (where all the info is processed around), memory (more specifically, FLASH memory), and programmable input/output peripherals (organizes the program to other devices or parts of the circuit).
  - IC AVR MCU 8k 20mhz 8DIP: has 8 legs with 8k memory
  - IC MCU AVR 2k FLASH 20mhz 20DIP: has 20 legs with 2k memory
  - IC MCU AVR 32k FLASH 28PDIP: has 28 legs with 32k memory
  - MCU AVR 128k ISP FLASH 40-PDIP: has 40 legs with 128k memory
  - IC MCU 16bit 14DIP: has 14 legs
  - IC MCU 16bit 8kb FLASH 20PDIP: has 20 legs with 8kb memory

  ![One of the more Advanced MCU’s.](image3)
  ![The one's we'll dealing in HackR Space.](image4)
• IC OSC mono timing 500khz 8-DIP:
• Optocoupler w/base 6-DIP: these guys prevent high voltages, or rapidly changing voltages on one side of the circuit from damaging the other parts of the PCB or distorting transitions on the other side. They look almost exactly like the MCU's.
• IC RTC Serial 512k 8-DIP: this is a computer clock that keeps track of the time in an IC. They look exactly like the MCU's.
• IC 8bit Shift register 16-DIP: