Objective:

The Objective of this project is to build a Mobile controlled Home Appliances System. The target is to build a system that can turn ON/OFF home appliances via Bluetooth.

Equipment:

(Control Module)

- Pic-16f877A (Micro-controller)
- HC-06 (Bluetooth Module)
- 4 Channel Relay Board
- 5V DC Supply
- Vero Board
- Crystal Oscillator (8 MHz)
- Capacitors (22pF)
- Terminal Blocks
- Connecting Wires

(AC Circuit)

- Blubs
- Bulb Holders
- 2-pin Sockets
- 2-pin Plugs
- Wire (3/29)

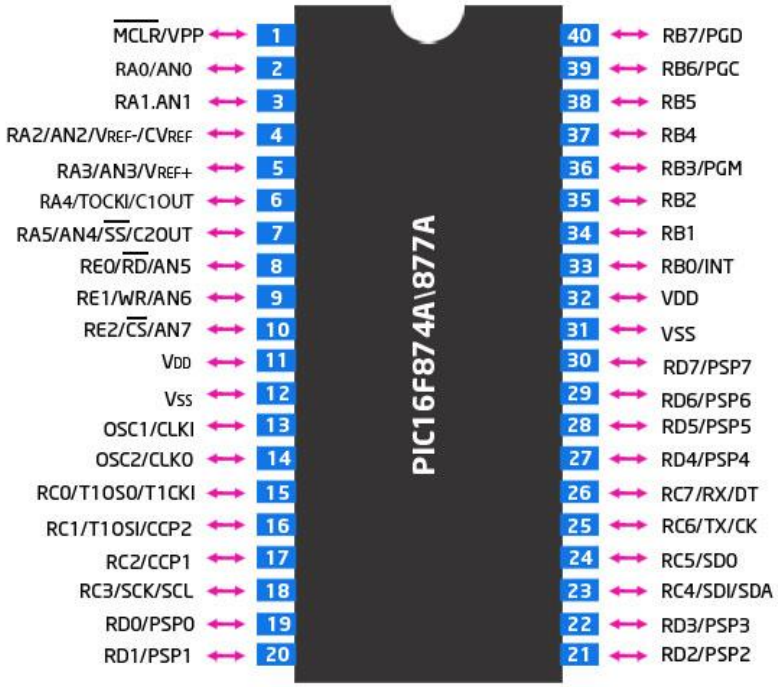
(Others)

- Hard Board & Card Board
- Nuts, Bolts & Screws
- Electric Tape

Theory:

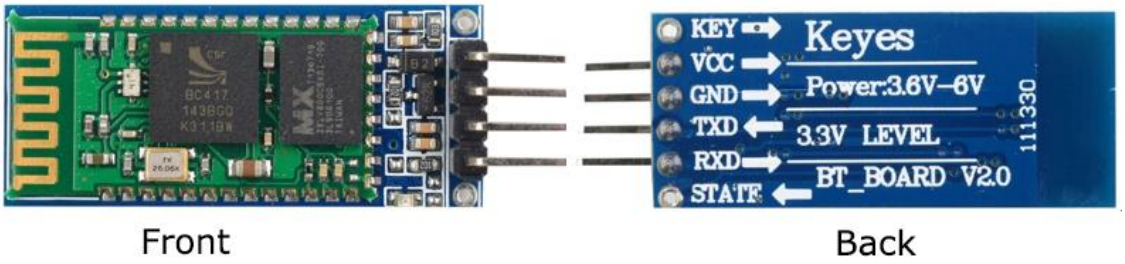
(Pic-16f877A)

The PIC16F877A is a 40-pin (DIP) microcontroller which Microchip describes as powerful based on having a 200 nanosecond instruction speed. It's old and Microchip itself is not recommending it for new designs but its features and price make it still a popular microcontroller. PIC16F877A has 40 pins by 33 paths of I/O. The 40 pins make it easier to use the peripherals as the functions are spread out over the pins. This makes it easier to decide what external devices to attach without worrying too much if there are enough pins to do the job.



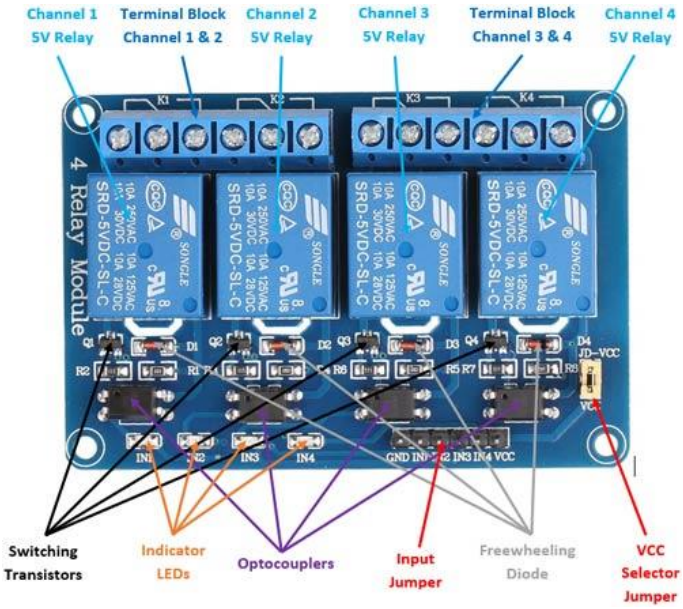
(HC-06 Bluetooth)

HM-06 is a Bluetooth module designed for establishing short range wireless data communication between two microcontrollers or systems. The module works on Bluetooth 2.0 communication protocol and it can only act as a slave device. This is cheapest method for wireless data transmission and more flexible compared to other methods and it even can transmit files at speed up to 2.1Mb/s. HC-06 module has six pins as shown in the pinout.



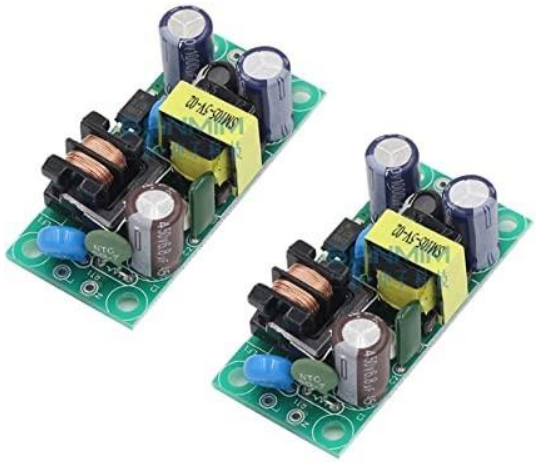
(Relay Board)

Relay boards are computer boards with an array of relays and switches. They have input and output terminals and are designed to control the voltage supply. Relay boards provide independently programmable, real-time control for each of several onboard relay channels. A power relay module is an electrical switch that is operated by an electromagnet. The electromagnet is activated by a separate low-power signal from a micro controller. When activated, the electromagnet pulls to either open or close an electrical circuit.



(DC Supply)

In order to create a circuit (DC power supply) that could output a usable DC power; the circuit was built in three different parts. The first part of the circuit was two full-wave rectifiers, the second part of the circuit was the filter capacitor, and the third part of the circuit was the voltage regulator followed by H-Bridge Construction was fairly simple as the project had many ties to the previous lab.



(Vero Board)

Veroboard is a brand of stripboard, a pre-formed circuit board material of copper strips on an insulating bonded paper board which was originated and developed in the early 1960s by the Electronics Department of Vero Precision Engineering Ltd (VPE). It was introduced as a general-purpose material for use in constructing electronic circuits - differing from purpose-designed printed circuit boards (PCBs) in that a variety of electronics circuits may be constructed using a standard wiring board.

(Crystal Oscillator)

Crystal oscillators (resonators) are made from high-quality quartz crystal wafers. These wafers serve as the reference oscillator in microcontrollers. A crystal oscillator can vary in size, but thinner crystal cuts offer higher frequency operation. For example, 0.15 mm thick quartz crystal may operate at 15 MHz.

(Capacitors)

A capacitor is a device that is used to store charges in an electrical circuit. A capacitor works on the principle that the capacitance of a conductor increases appreciably when an earthed conductor is brought near it. Hence, a capacitor has two plates separated by a distance having equal and opposite charges.

(Terminal Blocks)

A terminal block is a modular, insulated block that secures two or more wires together. Factories use terminal blocks to secure and/or terminate wires. In their most basic form, terminal blocks consist of several individual terminals which are arranged in a long strip.

(Connecting Wires)

Wires are used for establishing electrical conductivity between two devices of an electrical circuit. They possess negligible resistance to the passage of current.

(Blubs)

A bulb gives out (emits) light. There are different types of bulb. The filament bulb is used, for example, in a car headlight or for lighting in houses. There are also fluorescent lights which are energy saving.

(Bulb Holders)

A lightbulb socket, lightbulb holder, light socket, lamp socket or lamp holder is a device which mechanically supports and provides electrical connections for a compatible electric lamp. Sockets allow lamps to be safely and conveniently replaced (re-lamping).

(2-pin Sockets)

2 pin socket is used to plug 2 pole devices. 2-pole means that the device plug is not earthed and it normally has two pins that transmit electricity. Originally, all electrical devices were fitted with 2-pole plugs, which means that the devices were not earthed and that all mains sockets were constructed for 2-pole plugs.

(2-pin Plugs)

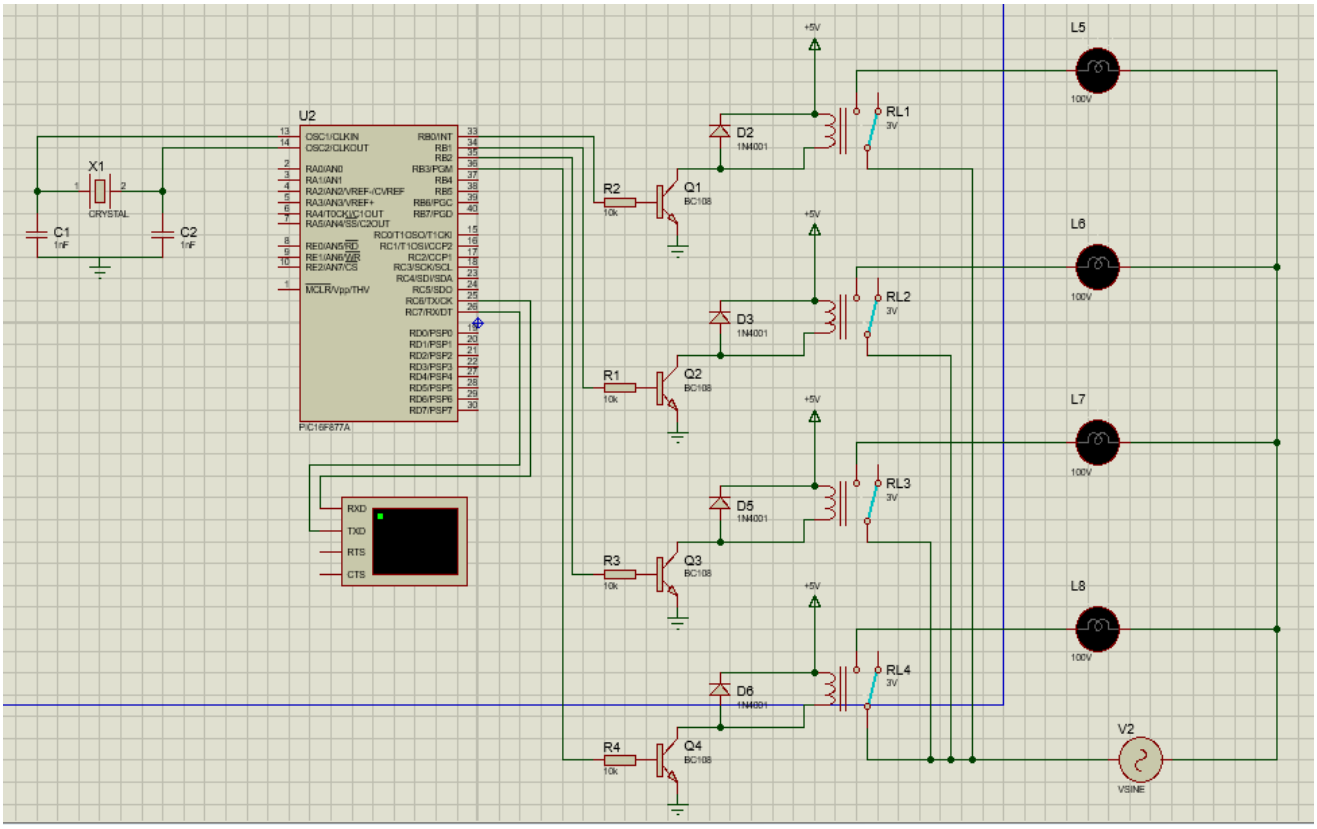
A plug is a device that has two pins for inserting into a socket. Two pin plugs are generally use for smaller electrical appliances such as DVD players. Buy 3 Pin Plugs to Ensure Long Life of Electrical Appliances. Sudden power surges and spikes are called voltage fluctuations.

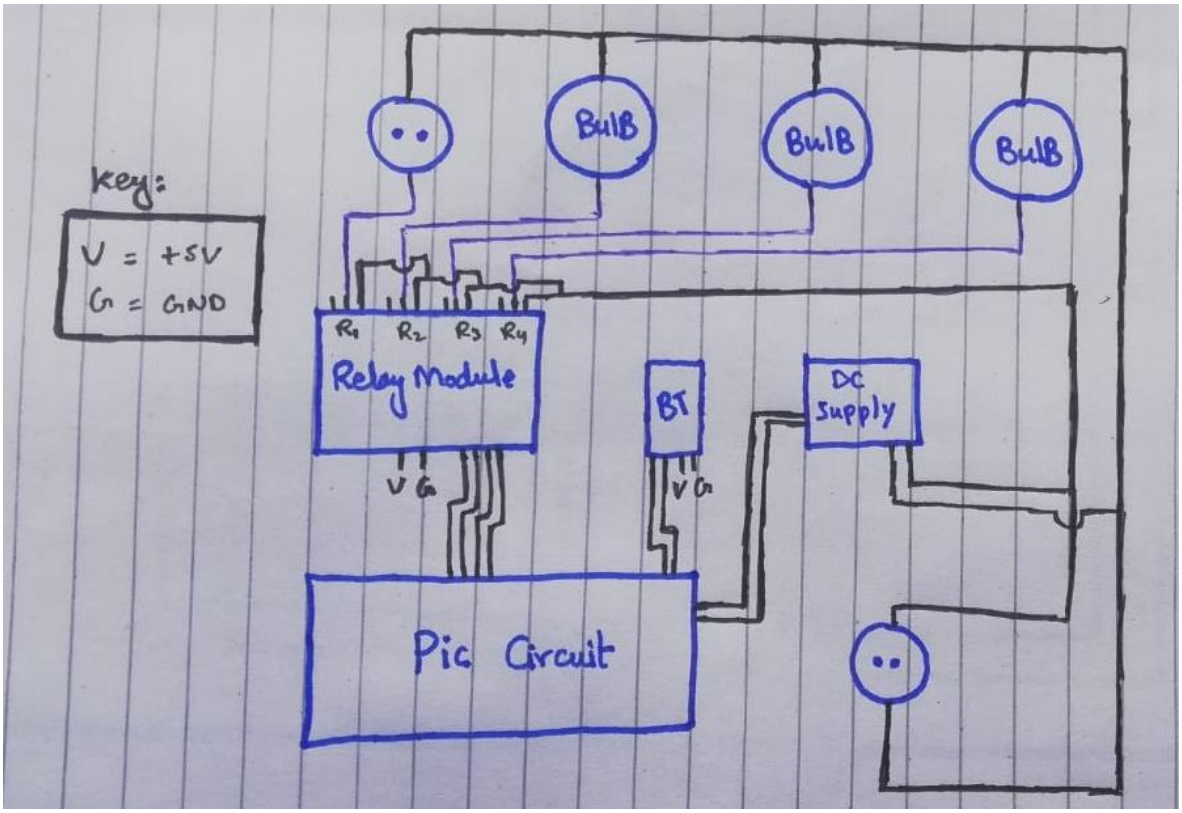
(Wire (3/29)

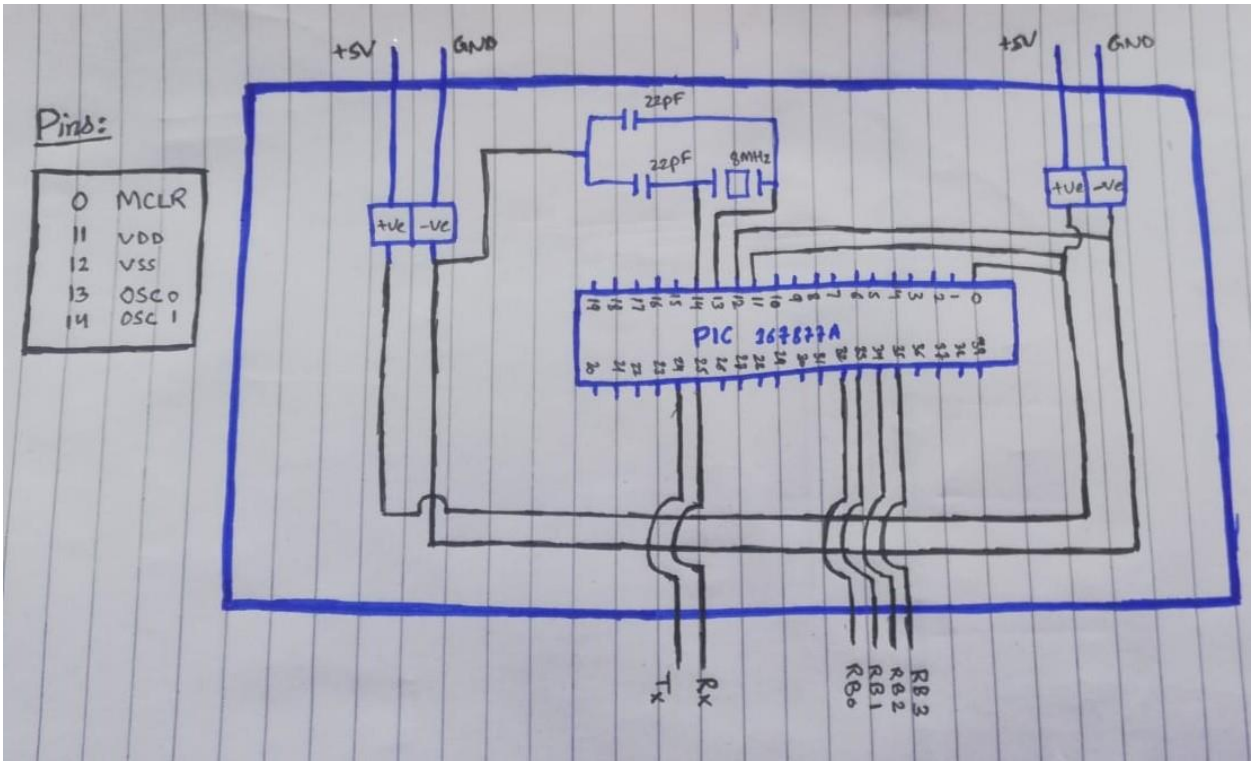
A wire is a long thin piece of metal that is used to fasten things or to carry electric current. Where 3 indicates number of copper conductors inside the insulation and . 029 indicates diameter in inches of each conductor. 3/. 029 wire is used to supply current to all low voltage appliances and devices.

Construction:

The Project is actually divided into two parts. One is simple wiring for different Home Appliances. The differences is that instead of switch we are using relays. So there is a relay board in our circuit. Every Appliances heave a relay between in path with AC source. These Appliances are in parallel with one another. These relays will work as switch which will be controlled by mobile phone. For this purpose there is another circuit. This control circuit is powered by 5V DC supply. The main component of this control circuit is Pic-16f877a MCU. The control pins of Relay Board is connected with the four pins (RB0 – RB3) of Port B of our MCU. Relay Board is also powered by 5V DC supply. Bluetooth module (HC-06) is another component of this control circuit. The Rx and Tx pins of the Bluetooth module are connected to Tx and Rx pins of MCU. Bluetooth module is powered by 5V DC supply. A crystal oscillator of frequency 8 MHz with two capacitors (22pf) are also connected to the OSC pins of MCU. The Proteus circuit diagram is shown below.


U2
X1
CRYSTAL
C1
1nF
C2
1nF
PIC16F877A
RXD
TXD
RTS
CTS
R1
R2
R3
R4
10k
Q1
Q2
Q3
Q4
BC108
D2
D3
D5
D6
1N4001
RL1
RL2
RL3
RL4
3V
+5V
L5
L6
L7
L8
100V
V2
VSINE


Key:
V = +5V
G = GND
Bulb
Bulb
Bulb
R1 R2 R3 R4
Relay Module
V G
BT
V G
DC Supply
Pic Circuit



Code:

```
char input = 0;
void main() {

    TRISB = 0X00;
    PORTB = 0X00;
```

```
    UART1_Init(9600);
    Delay_ms(100);

    UART1_Write_Text("Input: ");
```

```
while(1){
        if(UART1_Data_Ready()){
        input = UART1_Read();
        UART1_Write(input);
        }

switch(input){

            case 'A':
                 PORTB.F0 = 1;
                 break;

            case 'a':
                 PORTB.F0 = 0;
                 break;
```

```
            case 'B':
                 PORTB.F1 = 1;
                 break;

            case 'b':
                 PORTB.F1 = 0;
                 break;

            case 'C':
                 PORTB.F2 = 1;
                 break;

            case 'c':
                 PORTB.F2 = 0;
                 break;
```

```
            case 'D':
                PORTB.F3 = 1;
                break;

            case 'd':
                PORTB.F3 = 0;
                break;

            default:
                    break;
            }
        }
}
```

Working:

The Bluetooth module (HC-06) is first paired with mobile phone. Then we open Bluetooth Terminal App in mobile phone. The Code above code is burned in the Pic-16f877a microcontroller. We send the required Characters to Bluetooth Module (HC-06) using mobile App. After receiving character the Bluetooth Module transmit these characters serially to the Pic-16f877a microcontroller. Now the uploaded code does it part and give control signal to the relay board according to the characters received. The control signal turn ON/OFF the relays. Different home appliances are connected in parallel to the AC source with relay in between the path instead of switch just like in homes.

Conclusion:

We made a module which can control the home appliances through mobile phone. You can simply give input from your mobile phone to switch ON/OFF the lights, fans and other home appliances using this system.