Home Appliances Control with the Help of Pc

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Abstract:*In Today`S Modern World, Everybody Is Becoming Dependent On High Technology And Equipments To Make One`S Life Easier. The Aim Of This Project Is To Control The Electrical Appliances Through A Personal Computer (Pc). For Example, Theatre Lighting Can Be Centrally Controlled Form The Pc For Better Stage Management. Presently, They Are Manually Managed Which Makes It Difficult To Coordinate The Lighting With The Respective Scene. With This System, One Can Control The Electrical Appliances On/Off By Just Being Seated At One Place Using A Pc. This System Is Integrated With The Electrical Loads And Also Connected To The Pc Where Centralized Control Takes Place. It Uses An Rs-232 Protocol From The Microcontroller To Communicate With The Pc. To Turn On/Off The Appliances, We Use Hyper Terminal On Pc. Once The Connection Is Established With The Pc, Then The System Starts Working.*
Keywords: *Embedded System, Home Automation, Hyperterminal, Microcontroller, Personal Communication, Serial Communication.*

I. Introduction:

A Personal Computer (Pc) Based Home Control Appliance Is The Use Of Control Systems At Homes, In The Offices And In Industries To Reduce Human Efforts. Home Control Appliances Have Greatly Decreased The Need For Human Sensory And Mental Equipments And Plays An Important Role In The World Economy And In Daily Experience. It Is More Efficient And Stress-Free. Home And Office Appliances, Including Television, Refrigerators,, Washing Machines, Light Switches, Telephones, Can Be Control With The Help Of Personal Computer. Personal Computers Are Becoming The Choice To Design And Implement Control Algorithms Because It Is Simple To Write, Modify And Update Software Programs That Implement A Control Algorithm.

The Design Demonstrates A System That Allows One To Control Home Appliance And Turns On Or Off Any Appliance That Is Connected To A Computer. The Appliances Are Connected To The Computer Via A Microcontroller. The Power Supply For Each Appliance Is Through An Electromechanical Relay. A Number Of Relays Are Used Depending On The Number Of Appliances To Be Controlled. All The Relays Are Controlled By A Microcontroller. The Microcontroller Is Connected To The Computer Via A Usb To Rs232 Converter.

II. Material And Method:

The Design Demonstrates A System That Allows One To Control Home Appliance And Turns On Or Off Any Appliance That Is Connected To A Computer. The Appliances Are Connected To The Computer Via A Microcontroller. The Power Supply For Each Appliance Is Through An Electromechanical Relay. A Number Of Relays Are Used Depending On The Number Of Appliances To Be Controlled. All The Relays Are Controlled By A Microcontroller. The Microcontroller Is Connected To The Computer Via A Usb To Rs232 Converter. The Diagram Below In Figure 1 Shows The Block Diagram Of The System.
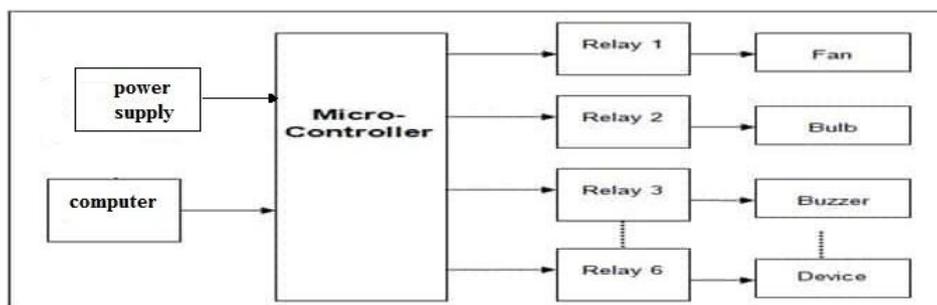
Fig:1 Block Diagram Of System

The Method Used For The Implementation Includes: Embedded System And Serial Communication. In The Implementation Of This Research, These Activities Were Carried Out For Serial Communication: A Db9 Cord Is Used To Interface The Pc To The Microcontroller Via The Level Converter (Max232), An Embedded Chip Is Used To Read Command From The Pc And Then Communicate To The Relays, As To Which Relay Should Be Activated Which In Turn Controls The Corresponding Appliances, The Pc Is Made To Communicate With The System For Automated Appliances Control. The Embedded System Method Includes The Following Sub-Units: Power Supply, Pc Interfacing, Programmable Chip Unit, And Relay Driver Unit.

III. Design Of Power Supply:

The Dc Power Supply, Shown In Fig. 2 Convert The Standard 230v, 50hz Ac Available All Walls Outlets Into A Constant Dc Voltage. The Ics And Other Component Used In This Research Run On A 5vand 12v Dc Power Supply, Hence The Supply Must Be Regulated To Prevent Fluctuation In Voltage Level. A 7805 Voltage Regulator Is Used To Produce A Constant +5v Which Powers The Microcontroller, Max232, Lcd. While A 7812 Voltage Regulator Is Used To Produce A Constant +12v To Power Its Relays And Its Driver. The Main Supply Is Stepped Down By A 220v/24v, 300ma Transformer. It Is Then Rectified By Full Wave Bridge Diode Rectifier. The Waveform At This Stage Has No Negative Component, But A Lot Of Ripples. Smoothing Capacitors Are Needed To Reduce The Ripple To An Acceptable Level.
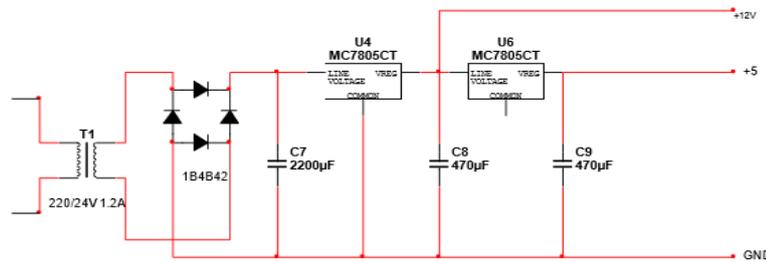
Fig. 2: Circuit diagram of the power supply

IV. Pc To Microcontroller Interfacing Unit:

This Section Allows The Pc To Interface With The Microcontroller Unit Via A Driver Ic Known As Max232. The Microcontroller Then Sends A High Or Low Signal To The Relays Telling It To Switch On Or Off Any Of The Appliances Connected To The Relay. It Uses Hyperterminal Which Is Usually Found On Most Operating Systems, But When Not Present It Can Easily Be Installed On The Pc, This Software Is A Platform Where The User Types The Message To Be Transmitted In The Form Of A Command. This Command First Flows On The Max232 Through The Db9 Cable. The Transmitter And The Receiver Of The Computer Serial Cable (Db9) Is Connected To The Receiver (Pin13) And The Transmitter (Pin14) Of The Max232. Pin 15 And 16 Are Connected To Ground And Vcc Respectively. The Vcc Is Powered By A 5v Dc Supply. Then Pin 11 And Pin 12 Which Are Another Transmitter Of The Microcontroller Respectively, Process The Received Data And Then Communicate It To The Relay.
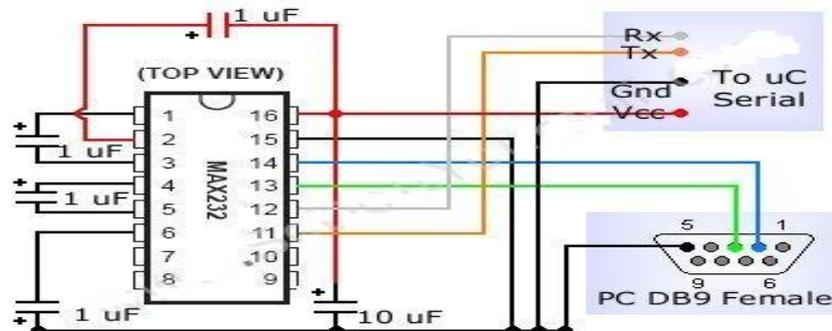
Fig.3: **Pc To Microcontroller Interfacing Device**

V. Relay Driver :

It Is An A Contactor Switch Based In Magnetic Field Produced In Coil Inside It .It Is Also Called Electromagnetic Switch .It Has Five Contacts N.C (Normally Close), N.O (Normally Open) ,Common Pin

And Two Pin For Coil. Once The Current Moved To Coil , It Changes N.C To Open Contacts And N.O To Close Contacts. The Ratings Of The Relays Used Is 12 V- 10 A. This Means The Coil Voltage For Relays Is ~12 Volts, And The Current Rating On Relay Contacts Tells How Much Current Can Be Passed Through The Contacts Without Damage Them.

This System Uses (Uln2003) As The Relay Driver, It Was Chosen Due To The High Current And High Voltage Capabilities, And It Was Selected Because Of The Industrial Application Of The System. The Pins Configuration Is As Follows; Usually, The Uln2003 Has Eight Inputs And Outputs But For This Research Only Four Of These Terminals Was Used. The Output From The Microcontroller Is Being Inputted To Pins 1, 2, 3, 4 Of The Driver (Uln2003) Then Outputted At Pins 15, 16, 17, 1 Of The Uln2003. Each Of The Outputs Is Used To Control Each Of The Relays Which In Turn Control The Respective Appliances. Pins 9 And 10 Are Connected Respectively To Ground And Vcc.
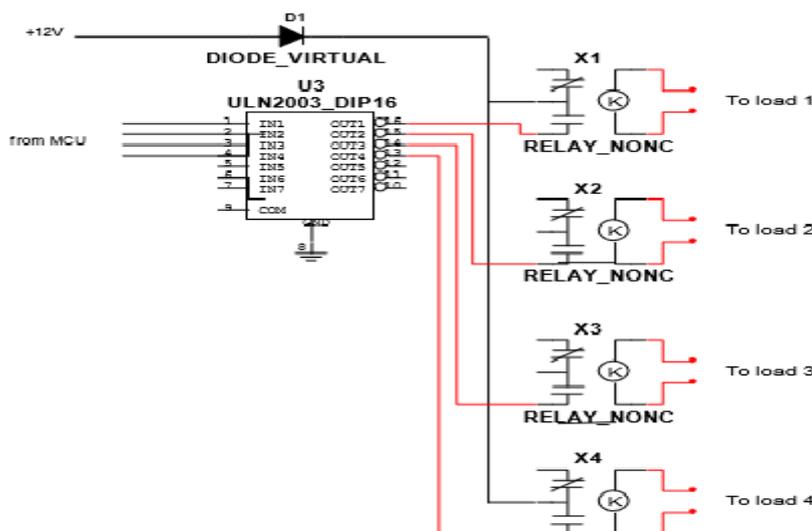
Fig : Circuit Diagram Of Relay Driver
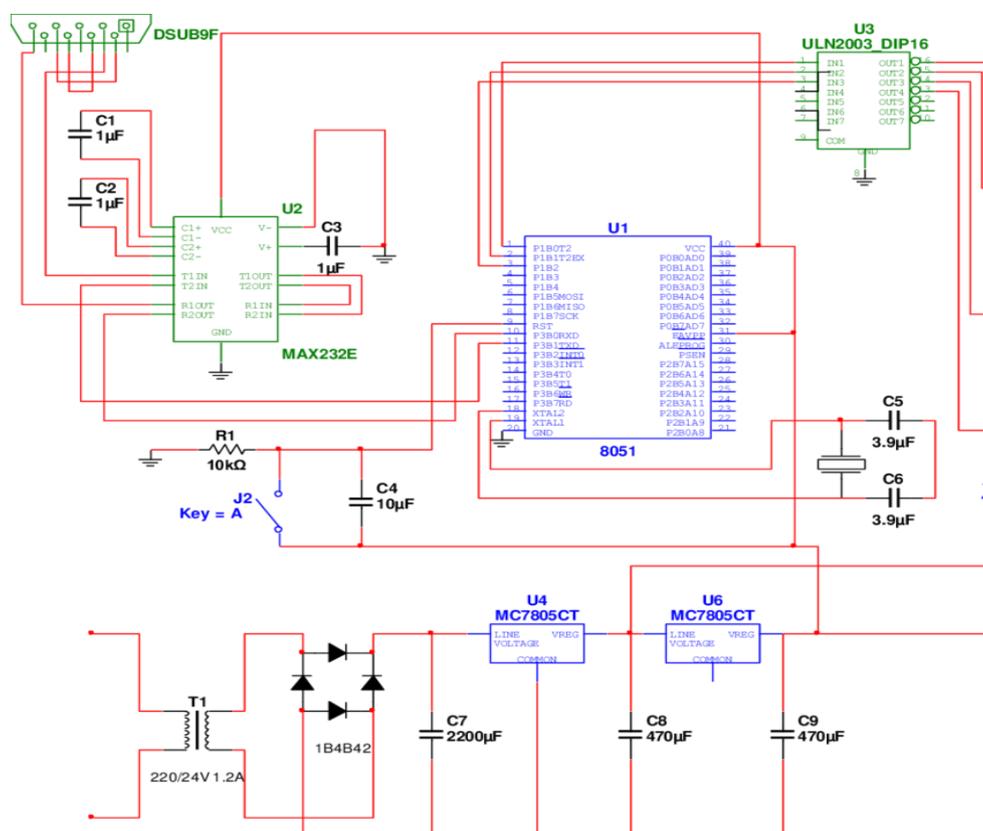
Fig : Circuit Diagram Of Pc Control Home Appliance

VI. Flow Chart Of Designed System:

Initially, All The Switches Are In The Off State. When The On Button Is Clicked In The Software Interface To Turn On The Desired Device, The Software Converts The On Command Into Hex Code Then Sends The Value To Usb Port Address. It Sends Logic 1 (3.5-5v) To The Microcontroller Through Rs232 Converter. Then The Microcontroller Sends A 1 To The Transistor. It Will Activate The Transistor Used To Energize The Relay. Inside A Relay,
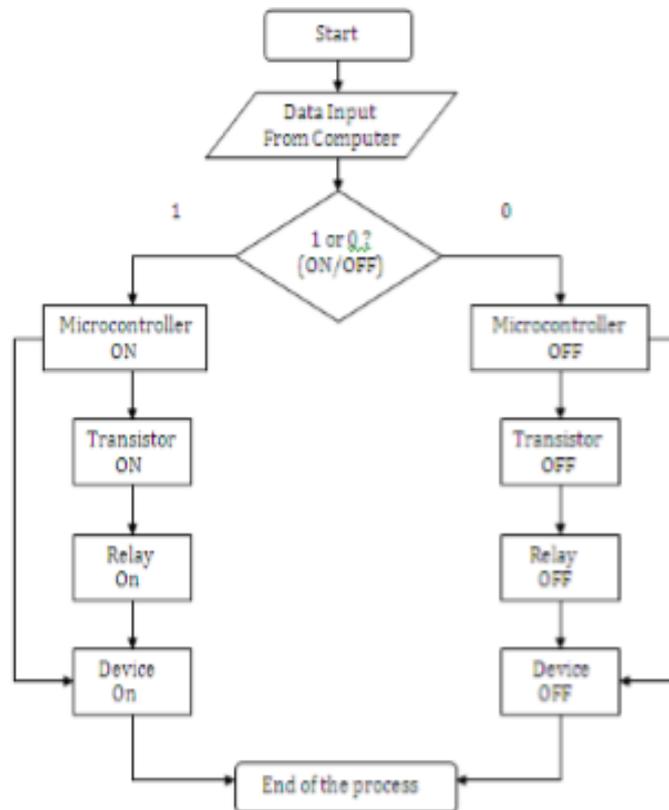
Fig : Flow Chart Of Designed System

There Is An Inductor (A Wire Coil), When Energized With An Electric Pulse, Will Generate A Magnetic Field. The Second Part Of A Relay Is A System Of Metallic Arms, Which Make Up The Physical Contact Of The Switch. When The Relay Is On, Or An Electric Pulse Is Sent To The Relay, The Swing Or Switching Arm Of The Relay Moves To Another Contact Of The Relay (The Relay We Used Has Two Contacts). The Arm Moves As The Generated Magnetic Field Pulls The Swinging Arm Toward The Inductor (Or Wire Coil). And Hence The Ac Circuit Is Completed And The Electrical Appliance Is Turned On. When The Off Button Is Clicked To Turn Off A Device, The Software Converts The Off Command Into Hex Code Then Sends The Value To Usb Port Address. It Sends Logic 0 (0-1.5v) To The Microcontroller Through The Rs232 Converter. Then The Microcontroller Sends A 0 To The Transistor. It Will Deactivate The Transistor Used To Energize The Relay. So The Arm Of The Relay Is Swing Back To Another Position, Which Makes The Path Of The Current Flow Open. And Hence Electrical Appliance Is Turned Off. The Terminal Input Of Each Appliances Is Wired Across The Common And Normally Open Terminals Of The Relays, Thus The Power To The Appliances Is Switched On Or Off Depending On Whether The Relay Is Active Or Not.

VII.   Conclusion:

The Basic Design Of The Pc Based Appliances Control System Is Primarily To Control Appliances;. It Has The Advantage Of High Current And Voltage Capabilities, Because Of The Relay Driver Used (Uln2003). Also, After Switching The Appliances, Even If The Pc Is Shutdown, The Appliances Remains On, This Is An Improvement Over Other Previous Works In This Field. The System Can Be Used With Any Pc Without Having To Configure The Pc, Provided The Pc Contains The Hyperterminal. Hyperterminal Was Chosen In This Research Because Of Its Universality. The Operations Can Include A Feedback Path To Allow The User Observes The State Of The Control Work Been Carried Out At Any Particular Time.

Future Scope:
- This Proposed System Can Modified With Iot And With The Help Of Iot Less Power Consume.
- We Will Use This System Through Mobile Based Application.

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