

Embedded Based Home Control System from Mobile Phone

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ABSTRACT

Traditionally electrical appliances in a home are controlled via switches that regulate the electricity to these devices. As the world gets more and more technologically advanced, we find new technology coming in deeper and deeper into our personal lives even at home. Home automation is becoming more and more popular around the world and is becoming a common practice. The process of home automation works by making everything in the house automatically controlled using technology to control and do the jobs that we would normally do manually. Home automation takes care of a lot of different activities in the house. This project we propose a unique System for Home automation that is paired with a wireless module to provide seamless wireless control over many devices in a house. Purpose of our project is to provide the facility of on/off any eight devices of home like TV, light, AC etc. when the user pushes mobile phone keypad buttons

Introduction

The aim of the proposed system is to develop a cost effective solution that will provide controlling of home appliances remotely and enable home security against intrusion in the absence of homeowner. The system provides availability due to development of a low cost system. The home appliances control system with an affordable cost was thought to be built that should be mobile providing remote access to the appliances and allowing home security. Though devices connected as home and office appliances consume electrical power. These devices should be controlled as well as turn on/off if required. Most of the times it was done manually. Now it is a necessity to control devices more effectively and efficiently at anytime from anywhere

Why we use Mobile technology?



Mobile technology is a wireless technology, which is the major reason to make it handy and user friendly. The wide spread mobile technology now-a-days help to work even in remote areas. It is very much economical to get service of this technology, as every service provider is in race of giving best service in least charge of money. Even in the developing country like India, near about 60-70% of population is familiar to mobile technology and actually using it. This proportion is supposed to increase very drastically in this system, we are going to develop a cellular phone based home/office appliance. To active the cellular phone unit on the system a call is to be made and as the call is answered. In response the user would enter a two/three digit password to access the system to control devices. As the caller press the specific password, it results in turning ON or OFF specific device.

This device allows you keep under develop circuit diagram board to control up to 8 electrical devices simply by calling your phone from any location in the world and making a few key presses. Each channel has a main rated 5 amp relay output that can be independently controlled and an LED indicating the relays status. The relay status can also be verified over the phone line. You can use the relays to control any devices you have in your house, office or factory. 4 number user-settable access code for security. The circuit is PIC based for accuracy and reliability.

It includes matching transformer and plugs for connecting in the telephone line. Solder posts for relay and power connections. Solder provided. **Both model versions supplied with relays for 4 positions only.** Show in table technical specifications and components in following.

Technical Specifications and components

Supply Voltage	5Vdc, 1.0A
Outputs	8 (Four positions populated with SPDT Relays)
Maximum Output Load	5 Amps @ 230Vac max. per relay
Relay Connections	Common, Normally Open (the Normally Closed relay contact is present NOT brought out)
User Settings	1. Password (4 digits)
Board Dimensions	126 x 134 mm
Board Connections	Solder Posts (see text for full details)
Compatibility	This product can be connected to any analogue or broadband phone line and both

Technical Specifications and components

corded and cordless (analogue and DECT) telephone.

Phone connector	BT to RJ11 Phone Cord
IC	7805,HEF4013BP,DM74LS154,M74HCT373,HT9170B
Transistor	BC547 – 9 PIS POWER TRANSISTOR.
LED	RED-10-PIS, GREEN-1-PIS.
CRYSTAL	3.579545
CAPICTOR	1000 μ F/25V, 104-MIK-7pis.
Register	10k-10pis, 447k-10pis.
Diode	IN4007-5pis.
Transformer	0-12V-1AMP-1pis.

Table Technical Specifications and components for link control

This device allows you keep under remote control eight different devices such as thermal bulk. Water heater, air-condition, computer, alarms, etc via relays by using in you can for example water the garden of your living room or you may turn on the heater or the air condition a home form our office, so by the time you be there, it will have turned into a cool on sis...

This project uses the simple digital telephone line. With which is connected in parallel. It based an addition security advantage using a four-number access code. This ability protects the user from undesirable access and random activation. For every command that is reached and executed and executed by the device the user receiver the suitable signal.

The operation the device is simple, since the user communication with it by pressing each time the proper key in the telephone device. The only thing someone should notice is the telephone line itself. Which has already mentioned should be digital. This means that is should operate with a line (time system and not with pulse (like the old analog line).

Technical figures (characters tics)

- Count system (on-off) of eight devices through telephone.
- Sound confrontation of the device's situation
- Four –number across code.
- Power of 5 V DC /1.0 A.
- Relay output with 220V/10A contact ability.

Circuit operation:

The circuit consists of four basic sections, easily detected simply looking at the electronics diagram.

- The first section is the power supply circuit it used the voltage regulator LM7805, in order to provide a suitable regulation of +5Volts.
- The second section is the identification and pulse processing circuit of tone telephone system. All necessary function is being succeeded through the chip 4013.

- The third section, which is the heart of the circuit consists of the well known microcontroller PIC16C57 which has the whole supervision of the circuit operation and programming and saves all program data on a small memory device type 93C46.
- Finally the fourth section consists a series of eight similar circuits relays. Each one has the possibility to activate (on) or deactivate (off) the device, which is connected to the relay according to the given connection of the microcontroller.

Construction:

All the components must be placed in the proper printed circuit from the side of the silk screen.

Following that, you will place all the resistors. Paying attention to the color code. At that point the color report will be useful to you in every resistor, which is shown below at the components list.

You will proceed to the assembling the components with the DIL sockets for three of the integrated circuit. 7805, HEF4013BP, DM74LS154, M74HCT373, HT9170B the sockets are not needed. You must know that in one side of every DIL socket there is a characteristic notch. You will place every socket on the board in such a way that the notches of the socket must be placed according to the PCB serigraph topographic design.

You will continue with placement and soldering of the capacitor. As you know there are three types of capacitors electrolytic, ceramic and polyester capacitors.

In the components list you will find the type of each capacitor. The electrolytic capacitors has its capacity value and operation voltage ($C2=1000\mu\text{F}/25\text{V}$) typed on the case. Make sure that the electrolytic capacitors are correctly placed in the board, according to the polarity. The silk screen of the board always displays the positive (+) terminal for the electrolytic capacitors.

Continue with the same caution for the polarity placing the diodes. The silk screen of the board shows the cathode of the A1 the one end of the diode there's a corresponding bold line that exists also at the surface of the diode.

The transistor has three pins, which must be soldered immediately afterwards. In those components too, the figures of the silk screen will help you for their correct placement.

In the board, next to the logotype model, there are figures for the two sockets with code J2, J1. These are the next that you will place.

You will begin the assembly with the five jumpers. These are characterized with the letter J (J1, J2, J3, J4, and J5) and having as your guide the silk screen of the printing circuit, you will find:

J1 & J2 UNDER THE IC-2

J3, BETWEEN Y1 AND Y4 CRYSTAL.

J4, BETWEEN CAPACITOR C6 AND REGISTER R24

J5, BETWEEN CAPACITOR C8 AND CRYSTAL Y1. The coupling transformer T1 has special pin arrangement which helps you for correct placement continue with the placement of the diodes LED, which have also polarity. In the silk screen the photo diode (LED are being characterized with the letter L. A small segment that indicates the cathode is interrupting the circular size. The socket of the component is corresponding to the shape of the silk screen. These two must coincide with the placement of every LED onto the board.

After that place the rectification bridge. The points -, +, - onto the silk screen of the board and onto the component will assist you placing them in the correct way.

Package you will find only four relays which are enough for most of your needs. If you want to handle more devices just buy more relays and place them on the empty places on the PCB. Finally, place the relay RL9 and you are ready.

Connection:

If you want to use this device without problems please read carefully the instruction below. The telephone socket J2 must be connected to the telephone line. At the socket J1 you have the output of way there's always a telephone connection. Independently of the functioning of the circuit.

At the first relay connect one lightning lamp. At the point 1A connect the phase (L) of the mains (220VAC), in point 1B connect one end of the lamp with the neutral (N).

Caution: the connection with the 220v is maybe dangerous. Make sure you follow all the proper procedures for safety reasons. Make also sure you have a plug in the circuit of the lamp which you will connect in the wall plug of 220V, after you have finished with all the other connections on the board.

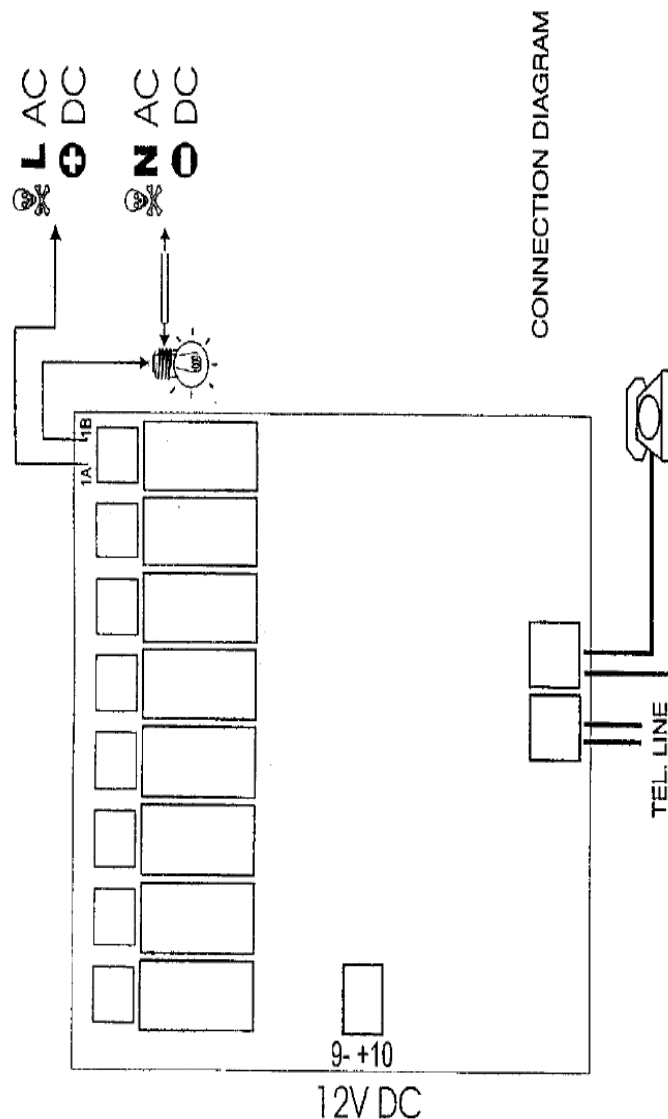


Fig - Connection diagram of link control.

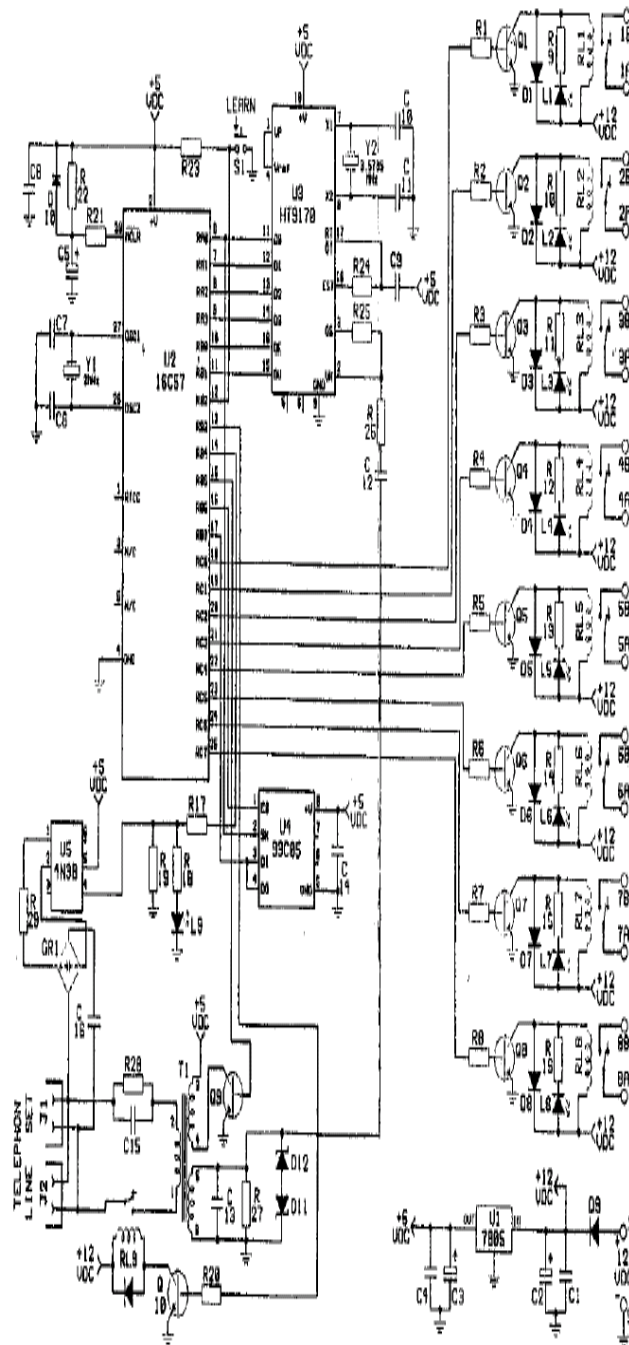


Fig Circuit diagram of link control.

In a similar way you will proceed to the connections of every other device with the relay of the circuit which act as switches for the remote devices.

Supply the circuit with 12Volts at the point of the board (+12V) and (GND).

Programming:

The programming and control of the circuit is remotely activated via telephone. To do this, follow the next steps:

- Connect the device in one digital telephone line. From another telephone unit (not in the same line), dial the telephone number that is connected to the device.
- After the third calling you will hear two short sounds (beep-beep).
- Press the key of the access code (the initial code number is 123, a number which you easy may change).
- If you have pressed the keys correctly, you will hear again two short sounds, otherwise you will hear a protected sound (beep beep).in case of a wrong entry of the access code for the third time, the device will terminal the telephone connection, as a result. This is an additional protection for you from a medico’s intervention by a third person.
- After the successful connection to the remote control device, press *1. In this way the device are actives the relay 1(in our case, the lighting lamp). If you want to deactivate this relay 1, simply press#)
- If you want to confirm the deactivation of the device, press 1. If you hint a protracted sound the device is off. If you hear two short sounds. The device is on. The table that follows below displays the situation of every remote control device in proportion with the keys that were pressed.

Change of code number:

If you want to change the original four number access code, pick up the handset of the telephone line which is parallel to the device of remote control in to the plug J1 and press the button switch LEARN (S1). When you hear four short sounds you must press the new four number access code. You will hear again four short sounds. This means that the change has been successfully materialized. You can use this type develop circuit board to control up to 8 electrical devices simply by calling your phone from any location in the world and making a few key presses. Each channel has mains rated 5 amp relay output that can be independently controlled and an LED indicating the relays status. The relay status can also be verified over the phone line. You can use the relays to control any devices you have in your house, office or factory.

EYS COMBINATION	EXPECTED FUNCTION
* 1	Activation (on) of the device 1
# 1	Deactivation (off) of the device 1
1	Situation of the device 1 -beep beep- if it is (on) -beeeeeeep- if it is (off)
* 2	Activation (on) of the device 2
# 2	Deactivation (off) of the device 2
2	Situation of the device 2 -beep beep- if it is (on) -beeeeeeep- if it is (off)
* 3	Activation (on) of the device 3
# 3	Deactivation (off) of the device 3
3	Situation of the device 3 -beep beep- if it is (on)

	-beeeeeep- if it is (off)
* 4	Activation (on) of the device 4
# 4	Deactivation (off) of the device 4
4	Situation of the device 4 -beep beep- if it is (on) -beeeeeep- if it is (off)
*5	Activation (on) of the device 5
# 5	Deactivation (off) of the device 5
5	Situation of the device 5 -beep beep- if it is (on) -beeeeeep- if it is (off)
* 6	Activation (on) of the device 6
# 6	Deactivation (off) of the device 6
6	Situation of the device 6 -beep beep- if it is (on) -beeeeeep- if it is (off)
* 7	Activation (on) of the device 7
# 7	Deactivation (off) of the device 7
7	Situation of the device 7 -beep beep- if it is (on) -beeeeeep- if it is (off)
* 8	Activation (on) of the device 8
# 8	Deactivation (off) of the device 8
8	Situation of the device 8 -beep beep- if it is (on) -beeeeeep- if it is (off)

Table User-settable access code for phone line EXPECTED FUNCTION

4 number user-settable access code for security. The circuit is PIC based for accuracy and reliability. It includes matching transformer and plugs for connecting in the telephone line. Solder posts for relay and power connections. Solder provided. **Both KT and AS versions supplied with relays for 4 positions only.** Additional relays can be purchased for populating the remaining 4 positions final circuit diagram.



Fig final circuit diagram of link control

This thesis describes an architecting method for embedded systems. Examples of embedded systems are cell phones, televisions, MRI scanners and wafer steppers. Embedded systems are systems where the computer and the accompanying software are built-in. Moreover, embedded systems are full of other technologies that are needed to perform the function in the physical world. Examples are transmission and reception technologies, display technology, optics and all kind of mechanics to position.

The core of the described method is the use of multiple viewpoints on the system and the application of the system. An embedded based home control system provides 5 viewpoints: Customer Objectives (what does the customer want to achieve), Application (how does the customer realize these objectives), Functional (what must the system do), Conceptual and Realization (how will the system be implemented). The Conceptual view contains the reusable concepts of the design, while the realization contains all the technical implementation details. These five views are related by the quality attributes, such as safety, performance and functionality.

For every an embedded based home control system viewpoint multiple sub methods are shown. A system architect makes a choice from the presented methods. Every application domain has a specific characteristic that has to be taken into account by the system architect. The choice of the methods to be used depends on the application domain.

One of the most difficult choices for the system architect is the level of abstraction. Story telling is recommended as a method to have concrete discussions. Story telling should precede the more generic specification phase. The system architect must maintain overview in the multitude of viewpoints, objectives, stakeholders, concerns, technologies and design choices. Moreover, the system architect has to make choices that fit in the bottom line goals of the system and the business. It is recommended to

iterate fast over all viewpoints and to generate a graph of relationships between objectives and technology choices.

The method is applied in retrospect on Auto mobiles. The case shows the importance of using multiple viewpoints to analyze multiple qualities. Architecting of Embedded Systems is a young discipline. There is not much literature available and the education towards system architect is rather immature still. In this thesis it is indicated how to start research in this young discipline. It is also indicated what more has to be done to develop this discipline.

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