Mobile Controlled Unit in GSM Network

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Abstract – The controller unit is connected to a mobile phone set in GSM network. It is capable of controlling up to nine mains- powered loads with the aid of commands received via mobile phone set. Any mobile phone or tone–dialling telephone may be used to send commands to the unit, and remotely control a wide range of main applications around the world. The commands should be sent through GSM network and in talking mode. For increasing its security, it waits for receiving an access code .The unit sends a feedback in request of caller about a status of each specific load, too. Key "1" to "9" is used for specify nine loads, respectively. The "#" key is used to switch a selected load ON and "*" key to switch it OFF. Caller could be hear the status of the selected load, i.e. low frequency tone means that the selected load is ON and high frequency tone means that it is OFF.

Meanwhile "O" key is used to recognize a status of selected load, i.e. is it ON/OFF? The receiver mobile phone should be set at "automatic answer" mode to answer an incoming call after one ring automatically.

The controller unit is connected to the hand set jack of the receiver mobile phone.telephone could be used, a mobile phone should be used in receiver side on controller.

I. Introduction

Remote control is one of the interesting area in researches. Infra – Red, ultrasonic, radio waves and telephone network are used in controlling many applications remotely. Each one has its advantages and drawback for specific application. The new method to control an application remotely is using a wireless – phone, mobile. In this method a controller unit is connected to handset jack of the mobile phone and receives its commands in talking mode as DTMF tones[3].

The general overview of the method is shown in Fig. 1. It is capable of controlling up to nine main – powered loads through nine relays. In transmitter side a mobile phone or

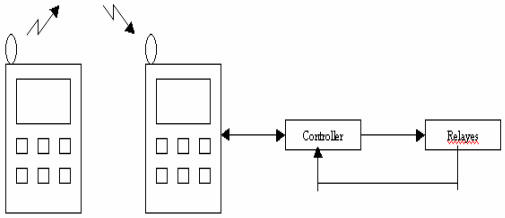

Fig.1.Block diagram

II. Controller Unit Description

In previous model of controllers [1] interface consists of a part to detect the ring signals that enables the unit to answer the incoming call virtually at the right moment. By using mobile phone, an "automatic answer" mode could be used instead, to answer an incoming call after one ring automatically. The unit is connected to handset jack of the mobile phone. Main parts of the unit are shown in Fig. 2. It is obvious that, a DTMF Decoder is need to decode a received tone.

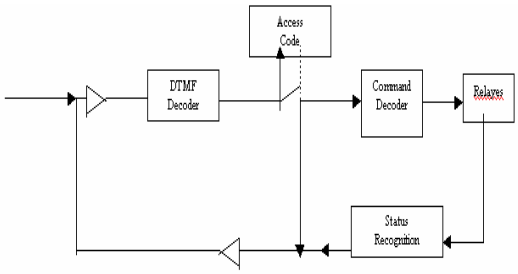

Fig.2.Controller Units

Normally, the unit is waiting for an access code, which the caller must transmit on his mobile phone. There is a 4-digit access code. After verifying the access code, the unit will be ready to receive commands. There are two keys in each commands, first key for selecting a particular load relay, and second one for switch the load ON, OFF or recognize its status. Key "*", "#" and "O" are used for switch ON, OFF and recognize the status respectively. Caller could be hear the status of the selected load, i.e. 1 kHz low frequency tone, means that the selected load is ON and 2.5 kHz high frequency tone means that it is OFF.

III. DTMF Tone Decoder

In talking mode, all DTMF tones pass through decoder. Table 1 shows relation between keys and corresponding frequencies. An integrated DTMF receiver MT8870 is used as decoder. Block diagram of the decoder is shown in Fig. 3.

Table1.DTMF

	1209	1336	1477
697	1	2	3
770	4	5	6
852	7	8	9
941	*	0	#

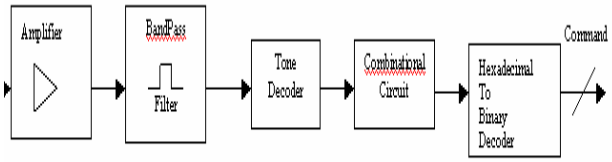

Fig .3.DTMF Decoder

Received tones are amplified, passed through filter, and tone decoder to detect two corresponding frequencies inside the tones. Finally, combinational circuits produce a corresponding 4-bit binary number as an output as shown in Table 2. The MT8870 is a complete DTMF receiver integrating both the
The filter section uses switched capacitor techniques. The decoder uses digital counting techniques to detect and decode 12 DTMF tone pairs in to a 4–bit code[2].

IV. Access Code/Command Decoder

The system access code is a kind of persona identification number (PIN) that prevent non-authorized use of the unit. The code has 4-digits.

All commands reach the unit in the form of DTMF tones generated on a mobile set with its tone dialing keypad. Command are, obviously, only accepted if the unit has answered the call and has received an correct access code.

After answering an incoming call automatically, in talking mode, controller waits for a pre-programmed system access code, which the caller must transmit with the mobile phone keypad or DTMF keypad of ordinary telephone.

A DTMF decoder, decode transmitted access code and send results to access code circuit. Whenever the correct access code is recognized, the output of DTMF decoder will be connected to command decoder and it'll be disconnected from access code circuit. These is done via a relay that is energize through output of access code circuit. This could be seen in Fig. 2.

Table 2. DTMF Output Codes as a Function of Pressed Key

Key	Q3 Q2 Q1 Q0	Function
1	0 0 0 1	Relay 1
2	0 0 1 0	Relay 2
3	0 0 1 1	Relay 3
4	0 1 0 0	Relay 4
5	0 1 0 1	Relay 5
6	0 1 1 0	Relay 6
7	0 1 1 1	Relay 7
8	1 0 0 0	Relay 8
9	1 0 0 1	Relay 9
0	1 0 1 0	Status
*	1 0 1 1	OFF
#	1 1 0 0	ON

Meanwhile, as shown in Table 2 and Fig. 4, there are two separate combinational logic circuits to detect device, relay, and its command, respectively. Device recognition circuit is a binary to decimal decoder which 9 inputs are used to select a device, …9. Command recognition circuit is a simple logic circuit that send an ON or OFF command to the selected device,ON=Q1'Q0' and OFF=Q1Q0 [4].

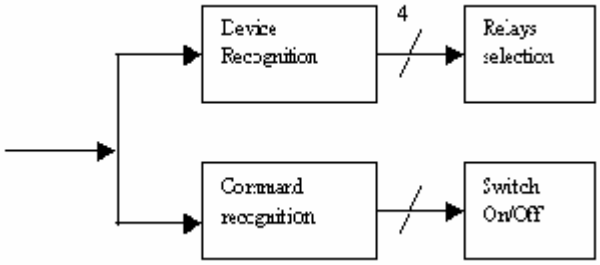

Fig.4.Command decoder

V. Device Status Detection

Whenever a "0" key is pressed after device number,1…9 , by caller, MM8870 generates "1100" as input to command decoder. This means SATUS and STATUS=Q3Q2Q1'Q0'. Therefore
as shown in Fig. 5, after detection the status, a FSK modulator is used to generate 1kHz tone for an ON device and 2.5 kHz for an OFF device. The generated tone is amplified and send to the caller through a handset jack of mobile.

VI. Conclusion

In the unit, incoming call detection circuit isn't necessary and it reduce the size an prize of the final unit. The unit could be used whereever GSM network is covered and it could be controlled in all around the world.

It is possible to increase number of devices and partly modify the unit. In future work, the control type could be change from digital to analog, for example controlling all volume of TV, Kitchen Oven and so on.

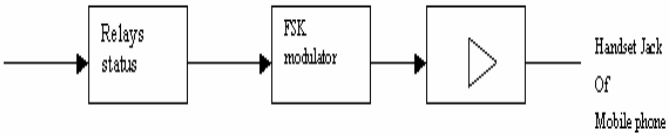

Fig.5.Status Recognition

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