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THE MAXIMUM EXPANSION LEVEL OF THE SECURED REMOTE CONTROL SYSTEM

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ABSTRACT

The system control processes are increasing continuously as the system is capable of interfacing more devices according to the developed requirement. So, the interfaced devices can be increased to the some extend. The paper highlighted the possible controlled devices and it increasing according to the interfaced circuits. The decoders are the main factor that playing a fundamental role together with codes in expanding the devices. The paper also shows the gradual expansion of devices by using different types of decoders that enable the system to control the devices up to 128.

Keywords: Decoder, DTMF, Devices, Mobile Station.

I. INTRODUCTION

The remote control of the devices nowadays is a crucial area particularly in the industrial so as to be as platform for automation and reduce the overall initial and running cost as well as operating time. The use of microcontroller in remote control is going to growing rapidly with tremendous devices to some extent. But using PC would probably overcome such difficulty. The PC is used in order to expand the controlled devices up to maximum as it regarded as aided tool to assist in controlling the relevant devices [1]. Therefore, the PC received the controlling signal from mobile station 1 across mobile station 2 and DTMF. The PC output is passed to the devices by means of DB25 male connector through data register which is consisting of only 8 busses [3]. So, the decoders are used to help in addressing and controlling the related devices. The paper is going to show the expansion possibility by using 2:4 and 3:8 decoders. The 2:4 decoders are used to build 4:16 decoder, whereas the 3:8 to build 6:64 decoder [5], [6].

II. THE SYSTELM PARTS LIST

The system components that affect the state transition through the different stages are principally categorized into hardware and software as listed below:

1. **Wireless system**: is where the signal initiated by means of mobile stations (MS) to remotely control the devices. The wireless system aid in expanding the span of control as well as user movement. It can also provide the user with digital signal processor, radio transceiver, air interface to core network, and DTMF

generator. In addition, the wireless system is also preventing interferences phenomenon and other highly important features [2], [3].

2. **M-8880 DTMF Transceiver**: is a complete DTMF transmitter/receiver that features adjustable guard time, automatic tone burst mode, call progress mode, and a fully compatible microprocessor interface. The receiver portion is based on the industry standard M-8870 DTMF Receiver, while the transmitter uses a switched-capacitor digital-to-analog converter for low-distortion, highly accurate DTMF signaling. Tone bursts can be transmitted with precise timing by making use of the automatic tone burst mode. To analyze call progress tones, a call progress filter can be selected by an external microprocessor. The M-8880 uses a microprocessor interface that allows precise control of transmitter and receiver functions. Five internal registers are associated with the microprocessor interface, which can be subdivided into three categories: data transfer, transceiver control, and transceiver status. Two registers are associated with data transfer operations. The receive data, read-only, contains the output code of the last valid DTMF tone pair to be decoded. The data entered in the transmit data register determines which tone pair is to be generated relevant to received signal.
3. **PC**: Both new interface devices and code modifications of the controlling software can be carried out within PC to improve the security feature in addition to the security issues in wireless system when control process took place. The controlling software acts as beating heart of the system as well as developing tool to strengthen the way of controlling [8].
4. **The DB-25 male connector**: is used for device control and communication through software program. It consists of data, control, and status lines to be used as input/output buses.
5. **HCF4069**: is monolithic integrated circuit consists of six COS/MOS inverter circuits. This device is intended for all general purpose inverter applications where the medium power TTL drive and logic level conversion capabilities of circuits such as decoders
6. **MM74HC138**: is a 3:8 lines decoder utilizes advanced silicon-gate CMOS technology and is well suited to memory address decoding or data routing applications. The circuit features high noise immunity and low power consumption usually associated with CMOS circuitry, yet has speeds comparable to low power TTL logic. The MM74HC138 has an Enable terminal (É) that determines which one of the eight normally HIGH outputs will go LOW. The Enable terminal is also provided to ease the cascading of decoders. The decoder's outputs can drive low power TTL equivalent loads with inputs protected from damage due to static discharge by diodes to VCC and ground.
7. **Devices**: The controlled devices can be any low current devices or any heavy current devices through relays.

III. PERFORMANCE THEORY

The exploiting of decoders in system expansion results in gradual growing of devices. Both 2:4 and 3:8 decoders are the most available in multi-different applications. So, 4:16 and 6:64 can be constructed by means of 2:4 and 3:8 decoders respectively. Whereas, the 5:32 can be also build by using a combination of 2:4 and 3:8 decoders [7]. The DB25 connector related to the PC data register (ox378) with 8-buses. The paper focused on

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only the maximum expansion level that deal with 6-lines as address to the 6:64 decoders and 2-lines as enabling terminals (É). Table 1 shows the expansion levels.

Table 1 Shows the Expansion Level

Decoder Type	No of Decoders	No of Controlled Devices	Decoder Type	No of Decoders	No of Controlled Devices
1:2	7	14	4:16	4	64
2:4	6	24	5:32	3	96
3:8	5	40	6:64	2	128

The system performance can be explained through the signal transmission from mobile station 1 (MS1) that operated by the remote user via the wireless system up to the controlled devices as depicted in fig 1. So, the system operation can be divided into different stages according to the system parts list. The controlling signal is generated by the remote user who carries MS1 in all the wireless coverage area to assure all the required security features such as authentication, integrity, and ciphering [6].

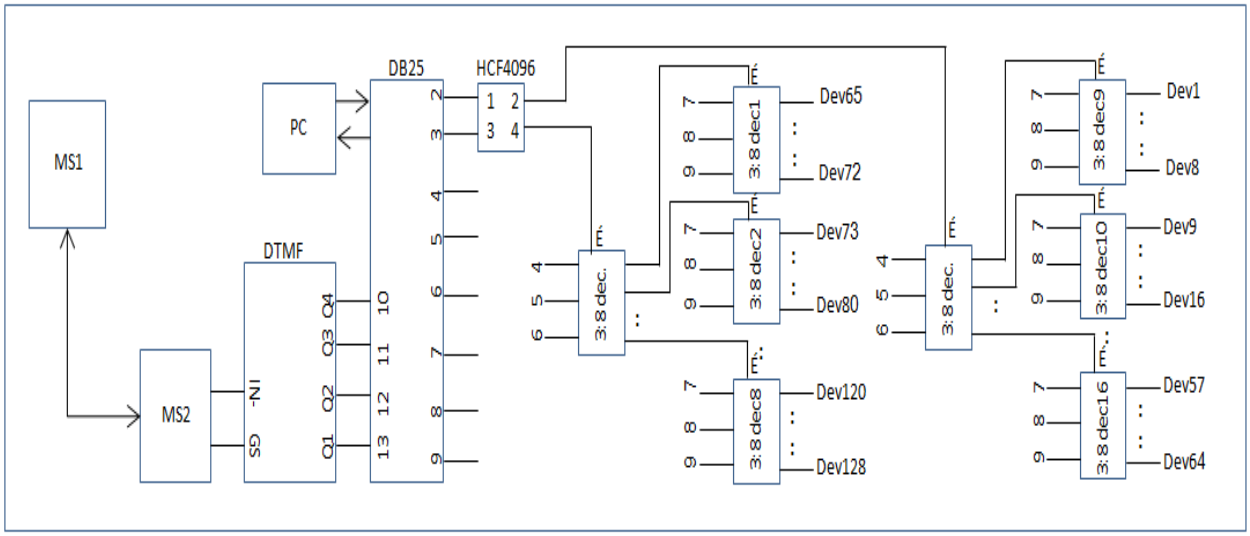

Fig 1 Shows the Block Diagram of the System

The controlling signal is captured by the mobile station 2 (MS2) that attached to the DTMF. DTMF decoder extracts the controlling signal and converted into equivalent binary values and then transmitted to the PC through DB25 connector. The related PC codes react to the incoming controlling signal and processed to provide an appropriate decision to switch the relevant device. Selecting the relevant device is depending upon the addressing by 3:8 decoders. The 3:8 decoder is the basic element of building 8:128 decoder. It consists of two groups of 6:64 decoder. Every group is controlled by the Enable terminal (É) [4], [5]. The Enable terminal is selected and generated through the DB25 connector (2 and 3). When the terminal 2 is selected, it can activate the devices that belonged to the group 1 (dev1 up to dev65). And the terminal 3 can also activate the devices of group 2 (dev66 up to dev128). The HCF4069 is exploited to invert the values of output 2 and 3 of DB25 connector, because 3:8 decoder is enabled with low logic level. Whereas the rest of DB25 pins (9,8,7,6,5, and 4) are used as address to activate the relevant device.

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IV. THE SOFTWARE

The PC code is a beating heart of the system performance and makes the appropriate decision of which devices must be switched. Accordingly, the code has a certain sequences to activate the related devices. The following scenario is carried out when the system switched on to perform the control processes. The scenario is to control only 16 out of 128 devices as an example and as shown in fig 2.

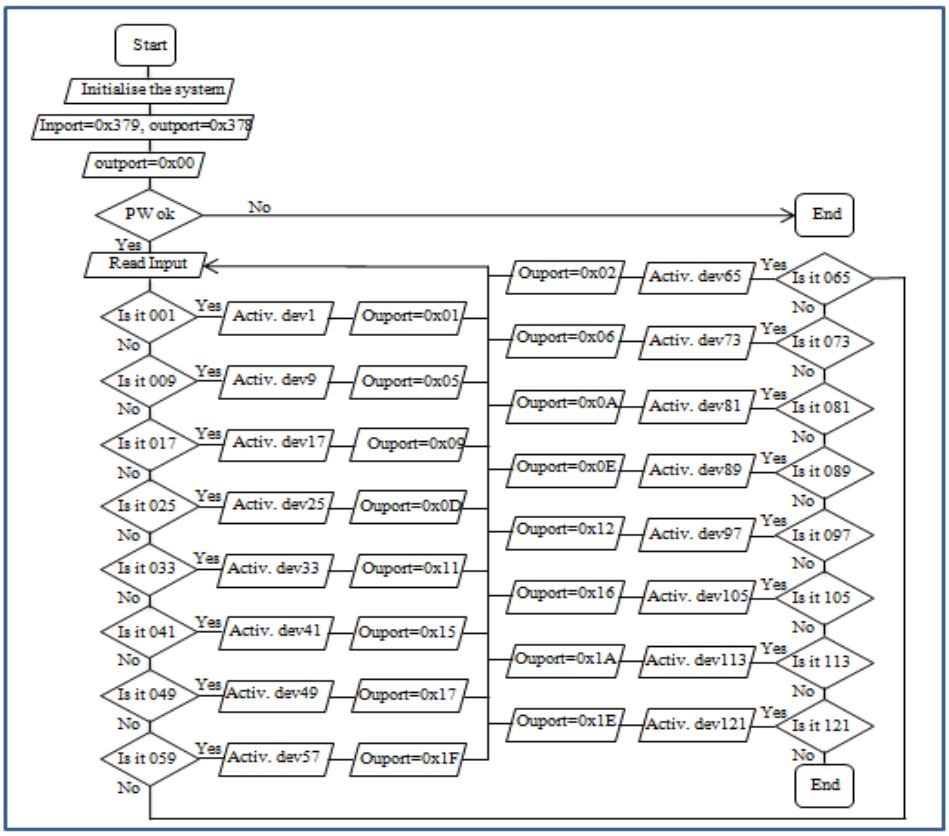

Fig 2shows the system flowchart

- The code firstly put all the controlled devices in an idle state when starting.
- The code received only the correct password and initialized the system, otherwise the system will disconnect after only three attempts.
- Reading the received signal from the MS1 via DTMF as an output of the DTMF at the relevant address of DB25 connector.
- Reacting to the incoming signal as appropriate decision to switch the device.
- Showing the device states to show the right decision [1], [2].

V. THE RESULTS

According to the predefined scenario, the system is tested under certain conditions that include the addressing and controlling of some devices that related to the decoders. The test shows that every 3:8 decoder in the system is addressed and respond to the controlling signal because the scenario is made to at least address and control one device to assure that any device in the system can be involved in the system control processes. The table 2 shows the operation and result that obtained when performed.

Table 2 Shows the Results of the System

Pressed Key	DB25 O/P (HEX)	Controlled Device	Pressed Key	DB25 O/P (HEX)	Controlled Device
001	0x01	Dev1	065	0x02	Dev65
009	0x05	Dev9	073	0x06	Dev73
017	0x09	Dev17	081	0x0A	Dev81
025	0x0D	Dev25	089	0x0E	Dev89
033	0x11	Dev33	097	0x12	Dev97
041	0x15	Dev41	105	0x16	Dev105
049	0x17	Dev49	113	0x1A	Dev113
057	0x1F	Dev57	121	0x1E	Dev121

VI. CONCLUSION

The maximum system expansion is designed and tested to address and control the devices through decoders. It provides precise results that made it so reliable to be applicable in different area such as industrial. The results are related to all input that in three digits. The system is tested to control only 16 devices, but it is valid for all the possible combination (1 to 128 devices) by just editing the code to suit the maximum expansion.

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