PC BASED SYSTEM FOR MONITORING, CONTROLLING, ACCOUNTING, AND MEASUREMENTS

Dr.Murad Ahmed Ali Taher Al-Absi

Department of Computer Engineering "FCSE"
Vice Manager of Information Technology Center "ITC"
Hodeida University, Yemen
Dr_muradabsi@yahoo.com

ABSTRACT

The appearance of the computer and its development and widespread in all fields accompanied with the needs for using computers technique & abilities in communication to facilitate the connection process and to simplify the communication devices circuits. It is also to add features to the Computer-Based System which might not appear without the using of computers & digital technique and interface, for example ,if you want to use a powerful processor such as Z80 or microcontroller such as 8051 or 8048 for driving your system, you will face many of obstacles such as connection of RAM,ROM and I/O peripherals to the μ processor or microcontroller, such many problems that you will find will be nothing with a computer. We can say that the computer-based system can inherit all power features of Computer (Storages, Recording, Accounting, in Telecommunications etc.)

In this paper we well show the new designed System for controlling and accounting phone calls by using new designed interfacing circuit to PC via LPT port and its advantages over an expensive commercial one.

KEYWORDS: INTERFACE, DTMF, MONITORING, ACCOUNTING, CONTROLLING

1. . INTRODUCTION

The world around us becomes full of computers which have multitasks, such as PCs , laptops and Servers with its different types, due to the features that stand beyond its using which is limitless. But the using computers in the Engineering Application Fields, like controlling, and measurements are limited.

The use of digital system for controlling and measurements is expending and becoming wider and wider [4]. The use of Microprocessors or Microcontrollers-Based Digital System has a lot of benefits[1,2], but this system is very complicated in design, when comparing with PC–Based system [5]. In addition the PC-Based system has a lot of advantages and features, such as capability of storages, Data Base Management, and in Telecommunications etc. interfacing to PC may accomplished via PC slots (ISA, EISA MCA, PCI, AGP etc) or external Ports: COM, GAME, LPT, and USP [7,10,13]. To connect via expansion slots (design ISA or PCI card), the circuit will be complicated, also the connection via serial ports (COM and USP) the circuit will needed additional IC's.

The interfacing circuit via parallel port LPT is simple and effective. Sending and receiving information to and from the PC using parallel port is easily done,

there is no need for special circuitry to achieve this operation. PC parallel port is very easy to use and can be very useful I/O channel for connecting your own circuits to PC Programs can access the external devices via a software interrupt, data transfer speeds standard for LPT about 40,000 reads/writes per second are achieved this speed for a lot of events and peripherals is so satisfied, whether for to perform some very amusing hardware interfacing experiments or industries,

2.THE PC-BASED SYSTEM EXAMPLE:
" DESIGN MULTIMODE SYSTEM FOR ACCOUNTING, RECORDING, AND CONTROLLING TELEPHONE CALLS"

2.1 OBJECTIVES, USAGES, AND DEFINITION OF THE DESIGNED SYSTEM:

1. Monitoring and controlling phone lines (multiline), via powerful and comfortable user interface.
2. Recording phone-call time (time interval), and phone cost.
3. Recording in Data-Base of all calls and events
4. Generating different reports for all events (called numbers, time and data for calls, time intervals, cost, etc)
5. Demonstrating for how the PC-based designed system, inherit all powerful features of PC (Storages, Recording, Accounting, Data Base Managements, In telecommunications etc.)

3. SYSTEM HARDWARE & OPERATION
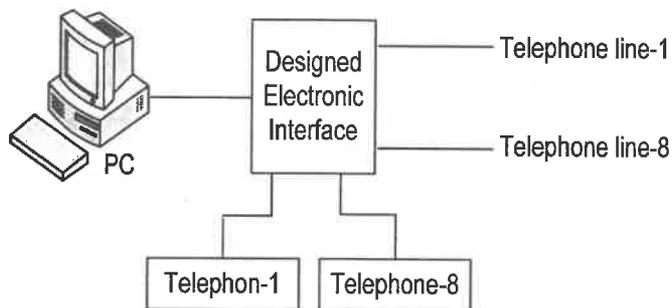The Simplified System Block Diagram Shown in Fig.1.

Fig.1

As shown in Fig.1 via PC we can fully monitor and control the 8-telehpone line, and we can add decoders to Electronic interface circuit if we want to control n-telephone lines. In Fig.2 shown the PC parallel port. The LPT port is composed of 4 control lines C0..C3,   5 status lines S3..S7 and 8 data lines D0..D7. It is on the back of a PC as a D-Type 25 Pin female connector. This port allows the input of up to 9 bits or the output of 12 bits at any given time [5,13], thus requiring minimal external circuitry to implement many simpler tasks.
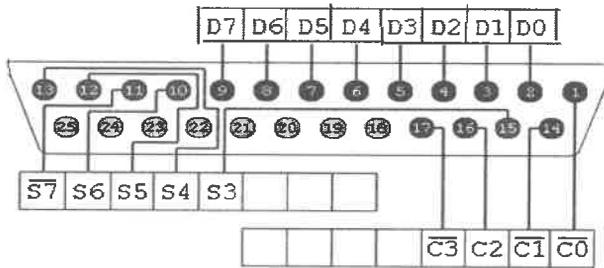
Fig. 2. LPT port connection diagram

The general block diagram for the system is shown in Fig.3, for each telephone line the system checks for handset (customer starts using the telephone – off-hook) via HOC-ON circuit (Hn-signals is active), if so the system checks STB signal, that's come from the determined DTMF Decoder Circuit and the dialed number will be detected. When the person on the other side responds to the customer call the Polarization circuit will activate Pn signal, and the system starts counting and accounting. The function of 4 to 16 DECODER to select the determined BUFFER (To Enable one of the BUFFERs [7x2=14 buffers (4-bits buffers)], for transfer the required Data Digital Signals to computer via LPT-Port) [6,7]. D0..D3 of LPT port (output) connected to 4 to 16 Decoder and S3..S5 of LPT (input) is connected to the output of each buffers
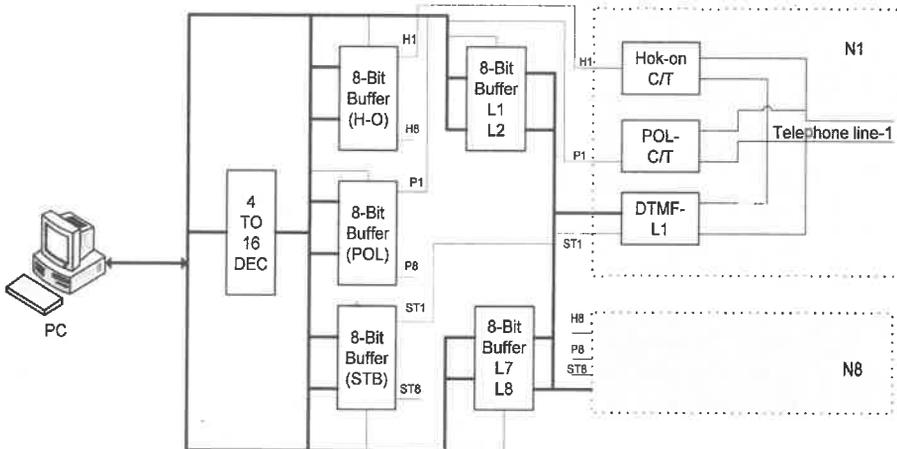

Fig.3

3.1 HOOK-ON CIRCUIT:

This circuit Shown In Fig.4, when the telephone is handset the OPTOTRANSISOR will operate due to the conduction of photo diode D2, and the output signal Vo (Hn) well be activated by going low. Where the Tip and the Ring in Fig.4 is the telephone line
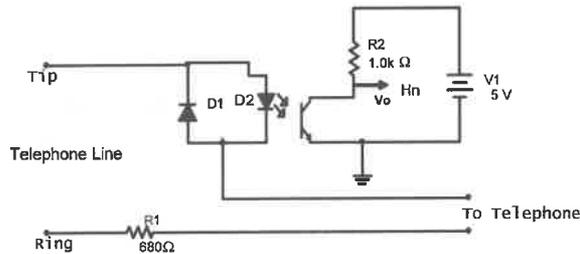
Fig.4

3.2 POLARIZATION CIRCUIT:

This circuit is shown in Fig.5. When there is a response for the telephone call (Telephone handset on the other side) the OPTOTRANSISOR will operate due to the conduction of photo diode D, and the output signal Vo (Pn) well be activated by going low. The required values for elements shown in the circuit of Fig.5.
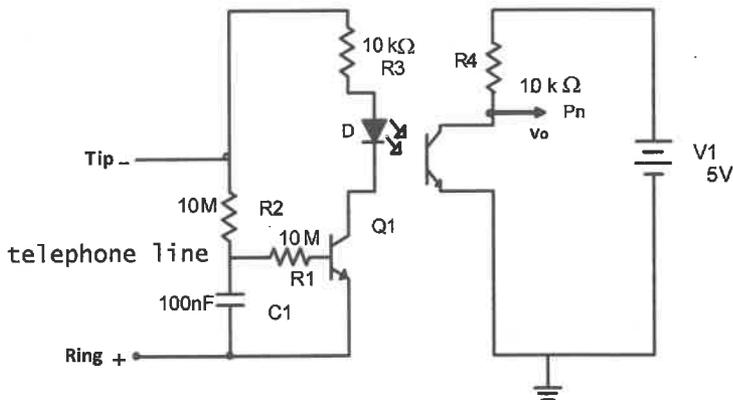
Fig.5

3.3 THE DTMF DECODER CIRCUIT:

This circuit is shown in Fig.6, this circuit detects DTMF tone (see table1) due to pries any key (number) and decodes it into binary number and also activates the signal STB (STn-signal) by going high [11]. The function of the STB signal is to tell, that the binary number of the pressed key is ready at the output (Q1-Q4). The DTMF IC uses the 3.579545 MHZ Crystal. The coupling of the DC component accomplished by the capacitor C2. The required values for elements of DTMF circuit shown in the Fig.6
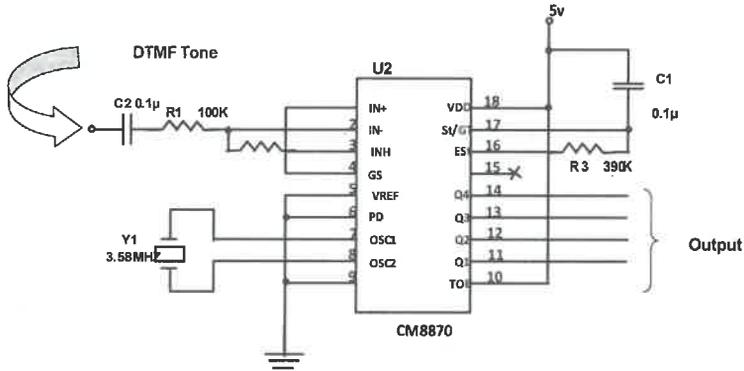
Fig.6.

Table-1

Low Hz	High Hz	KEY	TOW	Q4	Q3	Q2	Q1
697	1209	1	H	0	0	0	1
697	1336	2	H	0	0	1	0
697	1477	3	H	0	0	1	1
770	1209	4	H	0	1	0	0
770	1336	5	H	0	1	0	1
770	1477	6	H	0	1	1	0
852	1209	7	H	0	1	1	1
852	1336	8	H	1	0	0	0
852	1477	9	H	1	0	0	1
941	1336	0	H	1	0	1	0
941	1209	.	H	1	0	1	1
941	1477	#	H	1	1	0	0
697	1633	A	H	1	1	0	1
770	1633	B	H	1	1	1	0
852	1633	C	H	1	1	1	1
941	1633	D	H	0	0	0	0
		ANY	L	z	z	z	z
—	—						
L logic low, H=logic, z=High Impedance							
For example number 3 low and High frequency well be 697, and 1477Hz.							

4. SOFTWARE IMPLEMENTATION:

The main tasks of the software were to: --

1. Drive the parallel port for obtaining data from the designed circuit and detecting dialing numbers, type of phone calls (mobile, land, local or not etc).

2. Provide an easy and comfortable user interface for monitoring, controlling and accounting the cost of the phone calls. (see the user interface in Fig.7)

The Flowchart Algorithms for the system is shown in the Fig.6, where the system is beginning to check for hook-off (starting use the telephone), if so the system check for STB signal to record and fixing the pressed number (key). After that the system check for handset (the responding person in the other side), if so the system begin counting, accounting and recording in Data Base all events needed for reports. Each number dialed the system knows the distance (location) and the fee for accounting the cost via DTAT BASE in the system. The software to drive the system is written in VB [8]. In addition we can control and monitor our system remotely (via net).by using C++[3,12], or dot NET[9], these programming languages well suited to designing software and user interface that's work in conjunction with the Internet.

The main user interface of the system shown inFig.7, that's allows fully monitoring, controlling, counting and accounting each of phone cabinets.

The reset button to clear and begin anew session, and by checkbox the user able or disable any cabinet (telephone line)..
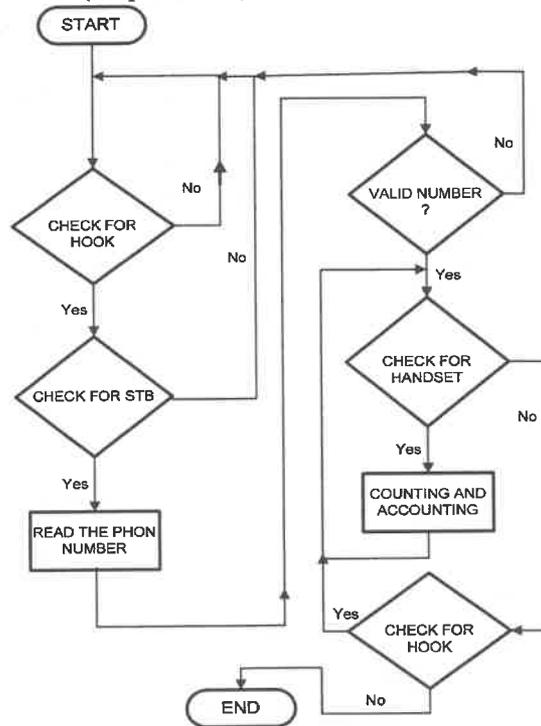

Fig.6

Fig.7. The main user interface.

CONCLUSION

The designed system has major advantages over expensive commercial one, specially that's serves only one telephone line. This design was assembled (hardware & software- source code in VB) and successfully tested. The system gives the user all comfort to control and monitor all events via easy and comfortable programming interface. This work show how easy the interface application integrated with PC, and how the PC –Based system inherit all major features of Computer (Storages, Recording, Accounting, in Telecommunications etc.). The flexibility and simplicity of the PC- Based system makes this deign extremely efficient, reliable and by a little modification we can update and improve our system. It is also by a little modification we can have another interesting system for example Buildings or Establishments Security System that's has a very powerful properties and features.

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