# Exploring DB25 as an Interface to Electronic Appliances and Automating Remotely with SMS

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***Abstract - Personal computers are playing a vital role in the society with people depending on them for most of the activities from business to entertainment. One of the important component in personal computer is the parallel port, found on the back of IBM compatible computers. A parallel port is an interface that allows a personal computer to transmit and receive data to peripheral device such as a printer. The most common parallel port is a 25-pin computer interface known as the centronics port or DB25. The parallel port also can be used to control the electronic gadgets through programmatic access. Most of the programming languages provide the possibility to control the parallel port. This paper explores the parallel port and analyzes the possibility of connecting electronic devices through parallel port and controlling them remotely with SMS.***

***Keywords – DB25, parallel port, home automation, SMS controlled system, centronics port.***

## I. INTRODUCTION

As the world is getting changed, people are turning towards automation. The possibility of controlling and automating the home appliances is provided to us with the help of the parallel port in the personal computer. Parallel port is a simple and inexpensive tool for building computer controlled devices. The simplicity and ease of programming makes parallel port popular in electronics world. The parallel port consists of three registers, namely data register, status register, control register. Data register is connected to data lines, control register is connected to control lines and status register is connected to status lines. So whatever data that is written to these registers, will appear in corresponding lines as voltage and it can be measured using a multimeter. These voltages can be used to activate or deactivate the electronic devices through designing an electrical circuit.

As the electronic devices are connected to the system through a circuit, it can be also controlled through a SMS. Manipulation of SMS is made easy through freely available ozeki message server. The ozeki message server can be configured with the GSM modem. Once, it is configured, the messages are received and stored by the ozeki message server. The ozeki message server also provides the possibility of storing the messages in the data base and accessing them from programming languages.

This paper is organized as follows: section II describes the related work, section III presents the study on DB25 and Ozeki message server. Section IV explains the proposed method for remotely controlling the electronic gadgets. Section V consists of experimental study and section VI describes conclusion.

## II. RELATED WORK

Prateek Sharma, Kapil Kumar and Ajay Kumar Singh[1] have discussed the method to connect 220v appliances to the personal computer through parallel port. They have provided the circuit design for interfacing with the 220v appliances using relay, MCT2E opto-coupler, resistor and transistor 2222. The system is designed to control home appliances by switching on and switching off. They have also discussed the methodology of bluejacking, by which, system connected with the home appliances is controlled by the bluetooth enabled mobile phones.

O.T. Arulogun, O.M. Olaniyi, and A.A. Ipadeola[2] have presented a prototyped computer controlled security gate system. The developed system has electromechanically controlled barricades, a digital camera-based remote surveillance system, an interface circuit, and a control software written in Borland Delphi 6 Programming Language. The system was interfaced for control purposes to the computer through the digital computer's parallel port. The input to the computer are sensor signals that signify presence and absence of automobile. The output of the computer will be used to activate and deactivate the electromechanical devices. The digital computer was isolated through electrical isolation with the use of a buffer control circuit to drive the improvised high voltage/current barricade control circuit.

Jia-Ren Chang Chien, Cheng-Chi Tai[3] have proposed a system of controlling home appliances using bluetooth based remote control to access the control of home appliances within home. The system consists of a remote control with a Keypad which is interfaced to a microcontroller. This device is interfaced to Bluetooth module to provide wireless interface for the remote to communicate with the appliances control module. When the key is pressed, the controller passes the information regarding what key is presses through bluetooth device. At the other end, the receiver receives the command and apply the corresponding action.

## III. A STUDY ON DB25 AND OZEKI MESSAGE SERVER

The parallel port also called as DB25 or line printer terminal is found commonly on the back of a PC as a D-Type 25 pin female connector. The port consists of 4 control lines, 5 status lines and 8 data lines. The original parallel port is a wad of three ports namely, data port, status port, and control port. These three ports have specific addresses assigned to them. These addresses are in sequential order. That is, if the data port is at address 0x0378, the corresponding status port is at



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0x0379 and the control port is at 0x037a. Pins 2 through 9 form the 8-bit data output port. This port is a write-only port. It is used only to output some data through it. Pins 1, 14, 16, and 17 form the control port and they are capable of reading as well as writing. Pins 10 through 13 and pin 15 together form the status port. The status port is a read-only port. Whatever input is given to parallel port as voltages can be read from these registers. For example, if '1' is written to data register, the line Data0 will be driven to +5v. Just like this, we can programmatically turn on and off any of the data lines and control lines.

The pin outs of DB25 connector is shown in figure 1.

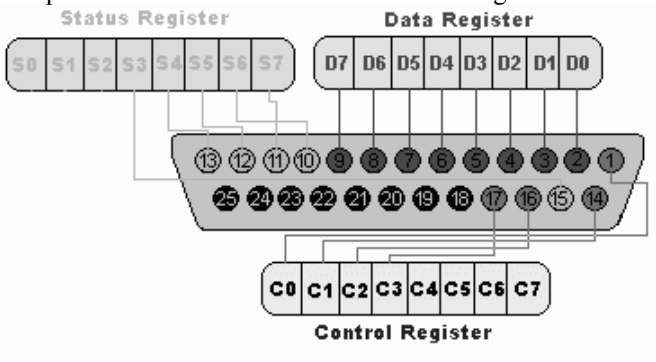


Figure 1- Pin outs of DB25

The details of parallel port signal lines are shown in table 1.

| Pin No (DB25) | Signal name | Direction | Register - bit | Inverted |
|---|---|---|---|---|
| 1 | nStrobe | Out | Control-0 | Yes |
| 2 | Data0 | In/Out | Data-0 | No |
| 3 | Data1 | In/Out | Data-1 | No |
| 4 | Data2 | In/Out | Data-2 | No |
| 5 | Data3 | In/Out | Data-3 | No |
| 6 | Data4 | In/Out | Data-4 | No |
| 7 | Data5 | In/Out | Data-5 | No |
| 8 | Data6 | In/Out | Data-6 | No |
| 9 | Data7 | In/Out | Data-7 | No |
| 10 | nAck | In | Status-6 | No |
| 11 | Busy | In | Status-7 | Yes |
| 12 | Paper-Out | In | Status-5 | No |
| 13 | Select | In | Status-4 | No |
| 14 | Linefeed | Out | Control-1 | Yes |
| 15 | nError | In | Status-3 | No |
| 16 | nInitialize | Out | Control-2 | No |
| 17 | nSelect-Printer | Out | Control-3 | Yes |
| 18-25 | Ground | - | - | - |

Table 1 - DB25 signal Lines

Ozeki message server is a powerful, flexible application that provides the possibility of sending and receiving SMS messages to mobile devices with computer. It has an easy to use user interface, and an excellent internal architecture. The application can use a GSM mobile phone attached to the PC with a phone-to-PC data cable or IP SMS technology to transmit and receive the messages.

Figure2 depicts the environment of ozeki message server. It enables the user to connect the GSM modem or mobile phones. Once the modem or the phone is configured, the messages that are sent and received can be managed from the ozeki environment. It provides the plugin option to connect the data base. Various options such as, MS-Access, Oracle, MySQL are available to store the messages. When the data base is configured, the messages can be manipulated through programmatic access.

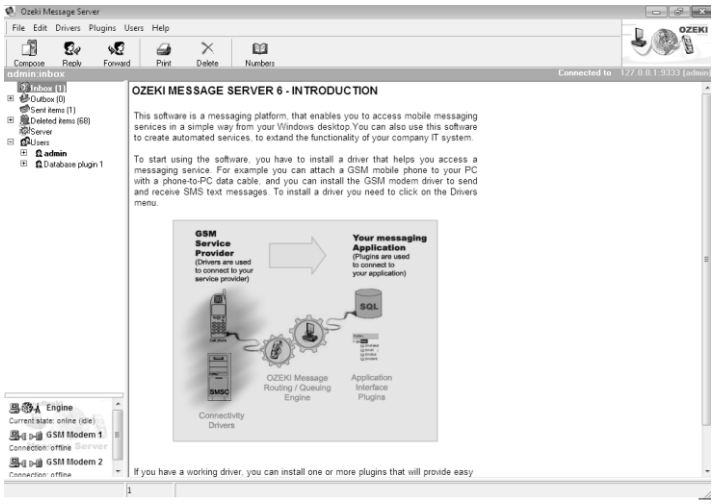


Figure 2 – Ozeki Message Server

## IV. Proposed Method

The proposed system consists of three facets, namely hardware interface circuit, software module and Ozeki message server. The design of the proposed system is depicted in the figure 3. As the message is received, the message is analyzed by the software module, and hardware interface circuit is accessed.

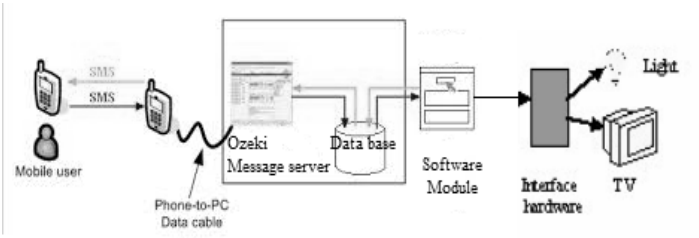


Figure 3 – Design of Remotely Controlled System

### *A. Hardware Interface Circuit*

The hardware circuit is designed, so that 220v home appliances can be interfaced with 5v parallel port. The hardware circuit is designed with the following components.

Resistor: A resistor is a two-terminal electronic component that produces a voltage across its terminals that is proportional to the electric current through it in accordance with Ohm's law: $V = IR$

Opto-Coupler: The Opto-Coupler is an Integrated Circuit. The IC used is MCT2E. An opto-coupler is a combination of a light source and a photosensitive detector. In the opto-coupler, or photon coupled pair, the coupling is achieved by light being generated on one side of a transparent insulating gap and being detected on the other side of the gap without an electrical connection between the two sides.

Relay: A relay is an electromechanical switch. A relay operates based on the principals of electromagnetic. Inside a relay, there is an inductor that, 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 contacts of the switch.



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Diode: A PN junction is known as a semiconductor or crystal diode. The outstanding property of a crystal diode to conduct current in one direction only permits it to be used as a rectifier.

Transistor: A bipolar transistor (BJT) is a three-terminal electronic device constructed of doped semiconductor material and may be used in amplifying or switching applications.

Printed Circuit Board: A printed circuit board, or PCB, is used to mechanically support and electrically connect electronic components using conductive pathways, tracks, or traces, etched from copper sheets laminated onto a non-conductive substrate.

Circuit Design

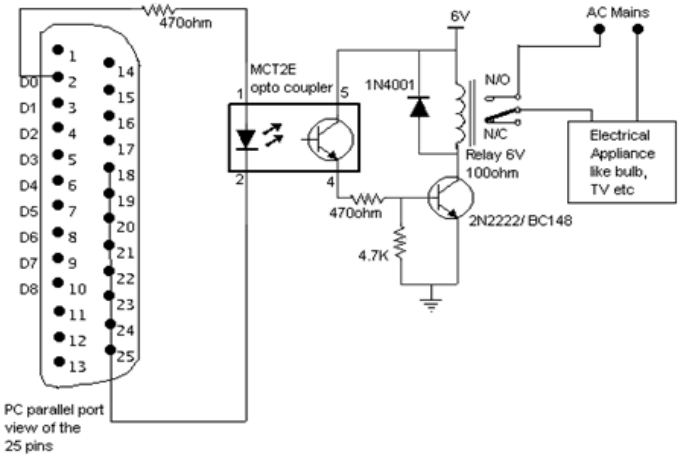


Figure 4 – Circuit Design of Hardware Components

The interface circuit shown in the figure 4 is drawn for only one device, being controlled by D0 bit at pin 2 of the 25-pin parallel port. Identical circuits for the remaining data bits D1 through D7 (available at pins 3 through 9) can be similarly wired. The use of opto-coupler ensures complete isolation of the PC from the relay driver circuitry [1].

*B. Software Module*

A software module is necessary to read the message as it is received by the Ozeki message server and analyze the control words in the message. The software is designed to accept the message only from the authorized user by specifying the user name. The message format can be "user-name device-name control-work". For example, when a message "Jack light1 on" is received, the software analyses the message and looks for the authorized user. If 'Jack" is an authorized user then the software looks for the device name. If the specified device is configured in the system, then the control word is analyzed. If the control word is 'on' then the particular port is activated in the parallel port. If 'light1' is connected to the D0 of the data register through the hardware interface, then data '1' will be written at D0. Data '1' produces voltage 5v at D0. Voltage 5 will be observed by the hardware interface and specified electronic appliance is switched on. The following is the procedure of software module function.

Step1: Start
Step2: Read the message from the database
Step3: If the message contains the proper user name
    1. Accept the message
    Else
    1. Reject the message
Step4: If the control word is 'status'
    1. Send a reply message, mentioning the device on/off status
Step5: If the control word is 'ON'
    1. Switch on the specified device
Step6: If the control word is 'OFF'
    1. Switch off the specified device
Step7: Stop

The table 2 provides the list of accepted control words in the message and the associated action.

| S.No | Control Word | Action |
|---|---|---|
| 1 | status | Find on/off status of all the attached devices and send it via reply message. |
| 2 | on | Switch on the specified device. |
| 3 | off | Switch off the specified device. |

Table 2 – Control Word Definition

*C. Ozeki Message Server*

The Ozeki message server is used for receiving SMS messages and storing it in the data base. A modem or a GPS enabled mobile phone is configured with the Ozeki message server so that the messages are collected by the server. The plug-in option enables to connect the data base, so that the messages are stored and accessed from the software module.

## V. EXPERIMENTAL STUDY

The proposed method is experimented and demonstrated by designing a hardware circuit and a software program. The hardware is designed with relay, MCT2E opto-coupler, resistor and transistor. The electronic devices are connected to the hardware interface circuit. Ozeki message server is installed and configured with a modem. Figure 5 portrays the hardware interface circuit designed for two electronic devices.

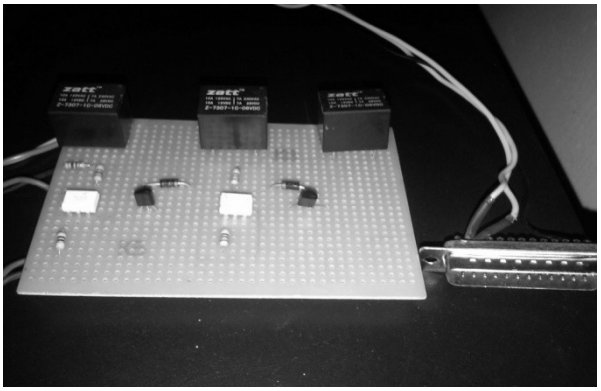

Figure 5 – Hardware Interface Circuit

The software is developed using VB.Net. The VB.Net provides the possibility of controlling the parallel port. The following are two important functions which are used to access the parallel port.

Inp(port address)
Out(portaddress,( Hexadecimal Value))



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The software analyses the message, when received by ozeki message server. The software looks for the control words and switches on or switches off the associated device. If the control word is 'status', the `on/off' status of all the device connected to the hardware interface circuit is sent back as a message. Figure 6 shows the light burning as the message is received to turn on the light.

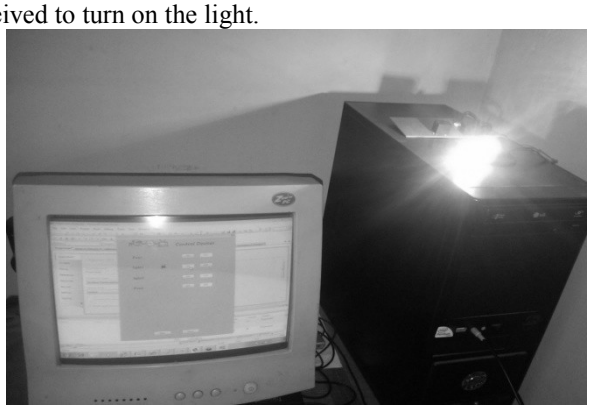

Figure 6 – Switching on the light through SMS

## VI. Conclusion

The DB25 is explored and the ports available in the DB25 are studied. The proposed system is simple and user-friendly, which provides the mechanism of controlling the electronic gadgets remotely through SMS. Let us consider a scenario, where a user may be getting ready to go to office in hurry and may not notice the power cut at that time, and forget to switch off the lights, fans and other electronic gadgets. When he reaches the office, he may recall that he forgot to switch off the gadgets. Using the prosed system, the user now can know the status as well as switch off the devices using SMS. Even, using the proposed methodology, the lights could be switched on remotely, before entering in to the house. The proposed system can also be used in computer labs, to switch on and switch off all the systems from a single control.

## VII. Future Enhancements

As the home automation system is becoming familiar, the DB25 port could be used for providing more features in home automation system. A motion sensor could be used with the parallel port and it can serve as a surveillance system. Apart from SMS, accessing the system remotely with GPRS could be another option, which will provide additional feature.

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