

Remote Power Distribution System Using GSM

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Abstract: Remote power distribution system using GSM aims to design and implement efficient and cost effective solution for replacing the manual process of power cut/load shedding from a centralized location. It consists of two GSM modems, one at the control station and the other one connected to the transformer from where the electricity is divided into certain branches in an area. Here the control station modem utilizes GSM network to turn a branch line of a transformer either on/off. It also consists of a LCD display which displays the state of the channel/branches of the transformer as either on/off. In case of network failure, a set of manual switches are also there to turn on/off the channels manually. Electromagnetic relays are used as circuit breakers.

Keywords: GSM, Digital Power Meter, LCD, Short Messaging Service (SMS), Transformer.

I. INTRODUCTION

Power cut or load shedding is a common process in countries where the production of electricity is less than the total requirement. To balance the availability and the requirement of electricity a concerned authority has to execute this process. This process is prone to human errors as an operator has to manually switch the channel on/off. If we can design an efficient and economical solution to perform this operation remotely from a centralized location, we will be able to replace the manual system with a sophisticated centralized remote system.

"Remote power distribution system using GSM" implements the emerging applications of the GSM technology which has fully covered almost all areas of the world. This helps in reducing the implementation cost and also makes it simpler and easier to install the GSM system both at the controller and transformer side. GSM is a wide area wireless communications system that uses digital radio transmission to provide voice, data, and multimedia communication services. It coordinates the communication between mobile telephones (mobile stations), base stations (cell sites), and switching systems. We have selected a GSM modem named quad band Fargo 900/1800 Hz for our use. The messages are sent from the mobile set that contain commands in written form which are then processed accordingly to perform the required task.

The proposed approach for designing this system is to implement microcontroller based control module that receives its instructions and command from a cellular phone over the GSM network. The microcontroller then will carry out the issued commands and transfer the control to electromagnetic relays which acts as a circuit breaker. First, the sent SMS is stored and polled from the control station modem. Then, the required control signal is generated and sent to the modem of the base station. This signal is interpreted by the microcontroller module and instruction is given to the hardware i.e. relays which perform the action of turning on/off of the substation channels

II. OBJECTIVE

Designing an efficient and cost effective solution for replacing the manual process of power cut i.e. all problem related to power distribution by remotely controlling from a centralized location.

To efficiently control the on/off of transformer via SMS. Minimize power and time wastage.

Eliminate the need of being physically present in any location for tasks involving the operation.

III. CIRCUIT SOLUTION

Block diagram

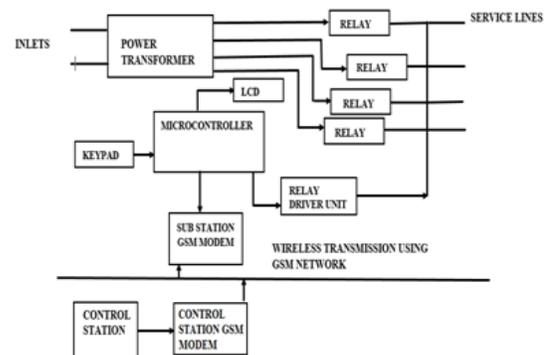


Fig1: Block Diagram

Fig1 shows the block diagram. It consists of the power supply section, the microcontroller, the GSM modem, LCD display, manual keypad, relays, relay driver unit and transformer in the substation part and a PC/Laptop and a modem in the control station part. The GSM modem in control station sends signals to the microcontroller via GSM modem that sends signals to the relays to turn on/ off the channel. The status of channel (on/off) of a particular

transformer is displayed on the LCD. The messages are the commands which is interpreted by the microcontroller and accordingly it instructs the relay driver. The microcontroller is programmed such that the channel when it is on /off the status is displayed on LCD screen. A separate set of manual keypads are also provided as a precaution in case of GSM network failure. The GSM modem is responsible for establishing communication between base station and transmission end and fetching commands.

The LCD is used to display the status of the channel of the substation. It is connected to port 0 and port 1 of the microcontroller. The register, read and write is connected to the port 1 and controls the reading and writing in the LCD. The power supply to the system is provided using a 12V/750mA transformer. It is reduced to 5V using a voltage regulator.

Circuit Diagram

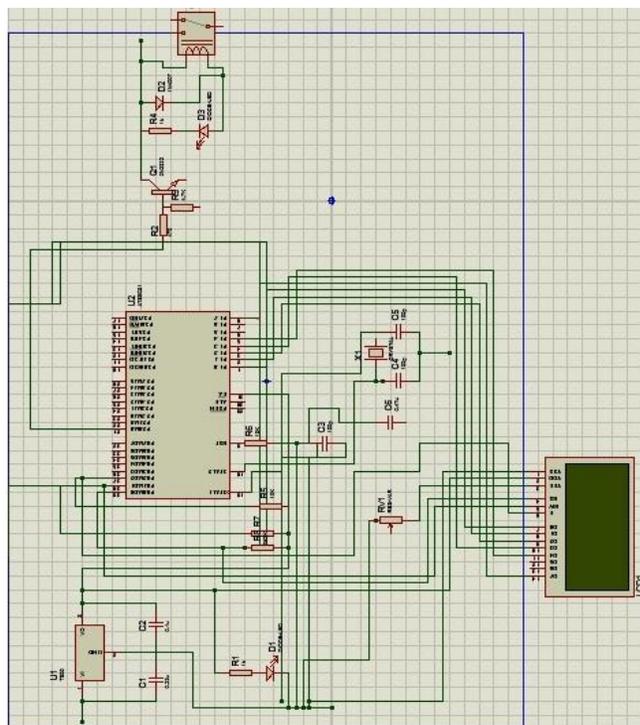


Fig2: Circuit Diagram

Fig 2 shows the circuit diagram. The main part of our circuit is the microcontroller 89S52, which is responsible for establishing the connection between GSM modem for both receiving and transmitting information and also for displaying through LCD.

The transmitter and the receiver pin of the GSM modem is connected to the receiver and transmitter pin of the microcontroller that will be used to have transmission of control messages between the two [11]. The programming is done such that the circuit reads and interprets the message sent by the control station and turns relay on /off. In addition to this, the LCD screen displays which channel is on. The controlling commands such as AT+CMGF=1 and the AT+CMGL="ALL" of the GSM is also sent from the controller. These two commands will enable the GSM modem to start, it allows the text mode to operate and allows reading of message from the sim memory of the modem.

SOFTWARE

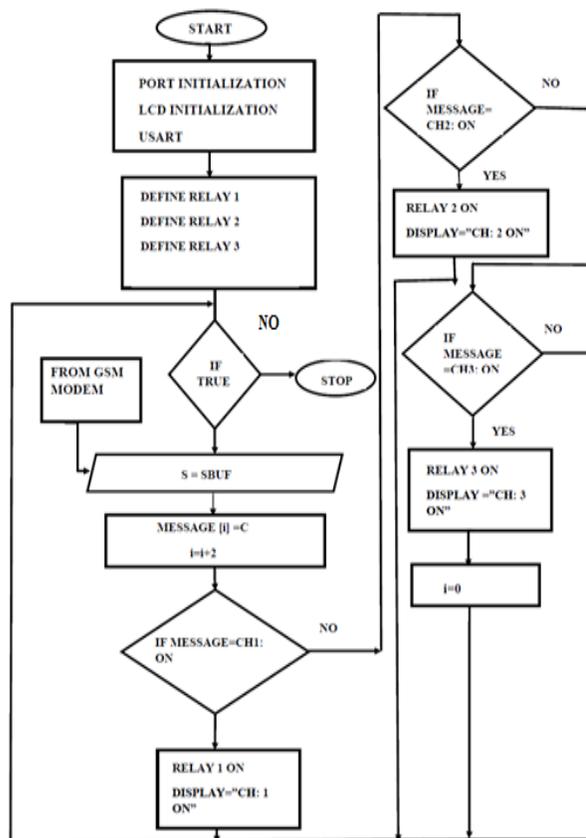
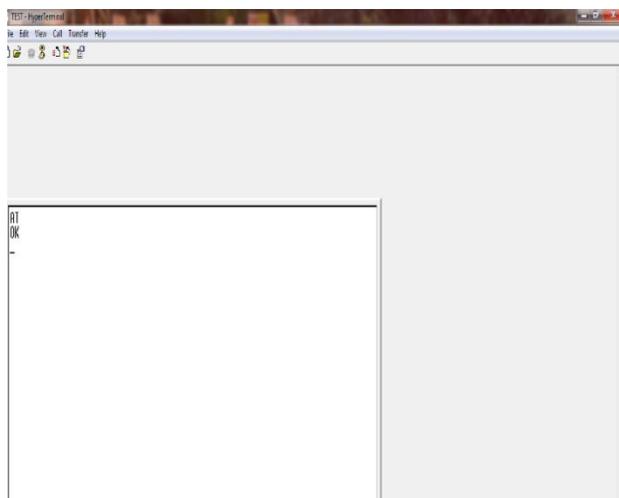
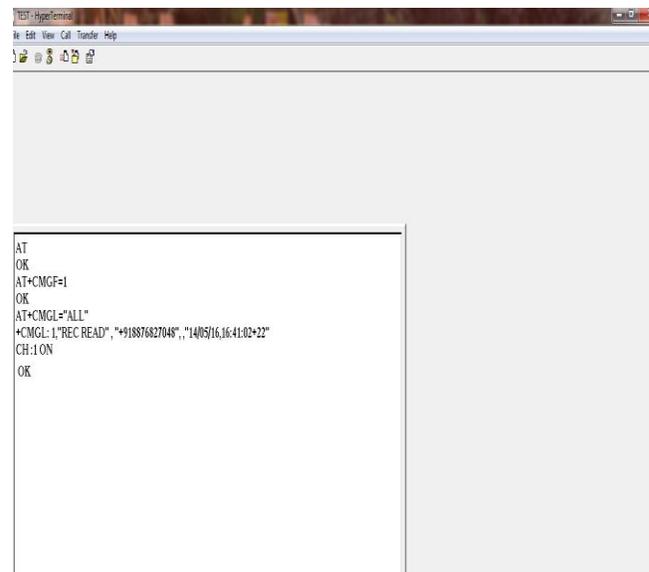
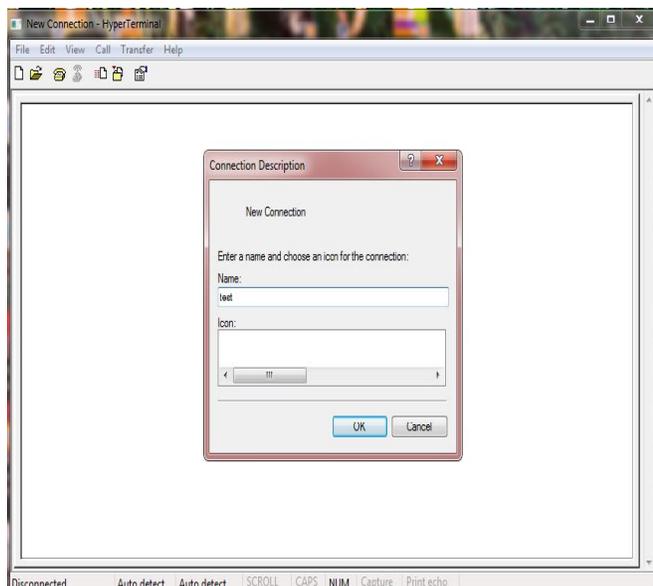


Figure 3: Flowchart

RESULT AND DISCUSSION

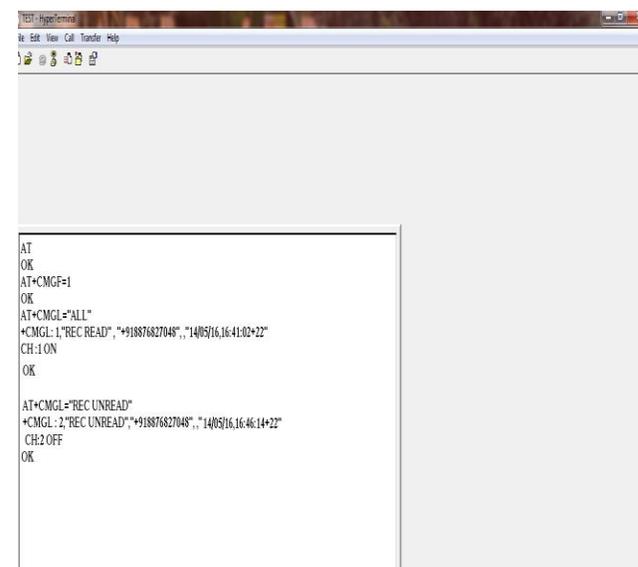
STEP1:

For interfacing the GSM modem with the computer we are using the HyperTerminal software. It is used to create the HyperTerminal window in Windows 7 OS. After installing the HyperTerminal a window appears where we can select the COM port, then select serial communication for interfacing the GSM modem. After the interfacing is done then a HyperTerminal appears in the screen. Using AT commands in this HyperTerminal we can operate the MODEM.



STEP 3:

Whenever the GSM modem gets the command message i.e. "CH:1 ON", from the control station modem it sends the command to the microcontroller and microcontroller checks with the stored mobile number if match is found it turns on the relay of channel one and then the microcontroller will display the status of the channel one as "CH:1 ON" on the LCD. If the message is "CH:2 OFF" it turns off the channel two and displays on LCD as "CH:2 OFF".



STEP 2:

At first when initializing the remote power distribution system using GSM, the microcontroller sends command to operate the GSM modem. The GSM modem will now read the immediate incoming messages. It then interprets the message and checks the incoming sim number and if a match is found with the stored number then the command is executed else no action is taken.

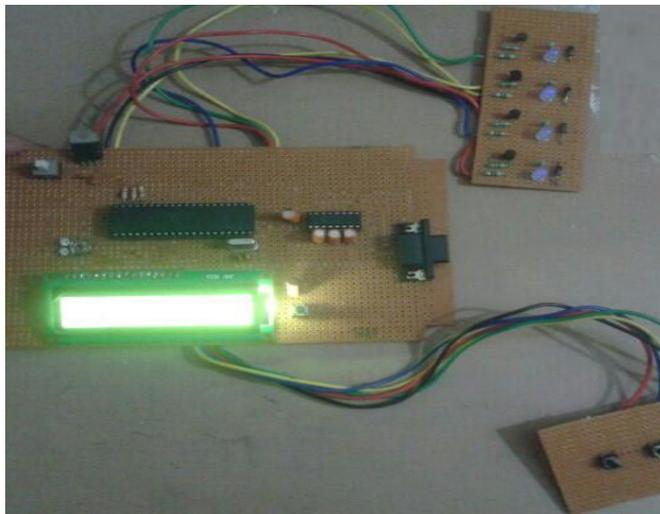


Fig 4: Hardware module

CONCLUSION

There is a lot of wastage of power due to inefficient consumption of electricity by consumers. The system we have designed has many applications in industries, schools and colleges, housing complexes where load shedding problem can be controlled remotely which saves both time and cost. Human error is also minimized. Moreover, this design can also be used to pre schedule power cut for large areas so that total load shedding hours can be reduced.

FUTURE ENHANCEMENT

The present design can be synchronized with GUI (graphical user interface) .With the use of GUI interface at the control station it will be very easy to operate. The operator at control station just needs to the select area while the substation will be stored in database. He just needs to select area and click on the channels which need to be turned on/off.

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