

# Prepaid Energy Meter with GSM Modem using pic microcontroller

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**Abstract:** The outdated way for deposition of a bill of energy consumption results in unwanted fault and wastage of time. Thus this paper imposes a completely new idea of "Prepaid Energy Meter with GSM Modem using pic microcontroller" to facilitate power utility and minimize the labor work. Proposed system is good for electricity distribution board, non-public companies, IT parks & in residential areas also. The motive of this paper is to develop and design a Prepaid Energy Meter based on SMS technology using GSM. In this technique some threshold data is set for unit consumption and it stops the energy supply when amount of unit consumption goes below the threshold value. After it reaches the threshold limit an alert message is sent via GSM i.e. as it reaches the subsidy unit. After it reaches it's monthly limit, it gives an alert message which indicates the bill amount. If the bill amount is not reimbursed then electricity will automatically be shut down after a period of time. Here only registered SIM card number is used to get information about the bill. If the consumer changes the mobile number and fails to register that changed number then the information won't reach the consumer

**Keywords:** Transformer, Bridge Rectifier, Voltage Regulator, LCD Display, Microcontroller Pic 18F452, Energy Meter, Max 232, GSM Modem

## 1. INTRODUCTION

**Prepaid Energy Meter with GSM Modem using pic microcontroller:** The interfacing of prepaid energy meter with GSM (Global system for mobile) modem is very credible for both consumer and energy supply company. Basically, this is the concept of electronic energy meter for records the consumer billing, the minimization of energy theft and reducing the energy losses as compared to the conventional electromechanical energy meter. In this prepaid energy meter system, the consumer can pay the home billing through smart card or any other electronic resource such as mobile phone and save the time. Here we would be interface the energy meter with GSM module for prepaid energy meter billing, sending or receiving the messages or data to the supply company automatically. This interfacing system would be made with the help microcontroller 18 F452 belongs to pic family, energy meter, LCD display and GSM modem for sending or receiving the message or data automatically through mobile phone.

### 1. Transformer

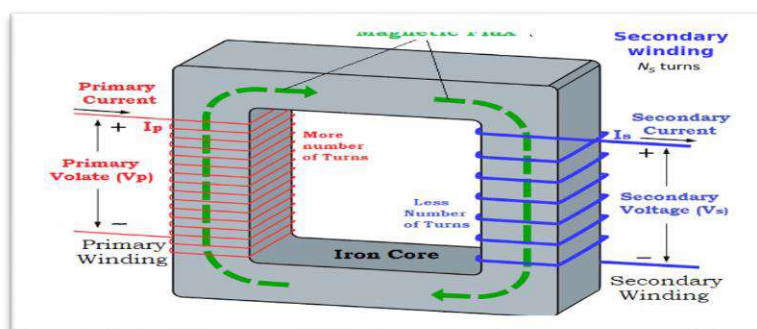
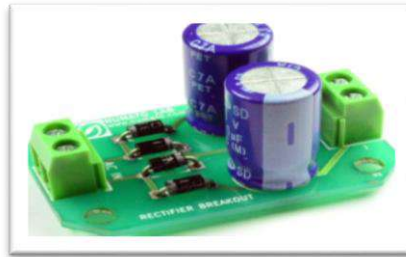


Fig- Transformer

For connecting, the interfacing of prepaid energy meter with GSM modem system to the wapda power supply a step-down transformer is required for step down the 220 V ac into 12 V ac. The transformer works on the principle of mutual induction and consists of two windings, primary and secondary.

**2. Bridge Rectifier**



**Fig- Bridge Rectifier**

The interfacing of prepaid energy meter with GSM modem system consists of electronics components, which are dc operated components therefore, a bridge rectifier is required which converts the ac voltages into dc voltages. This is connected at of transformer output.

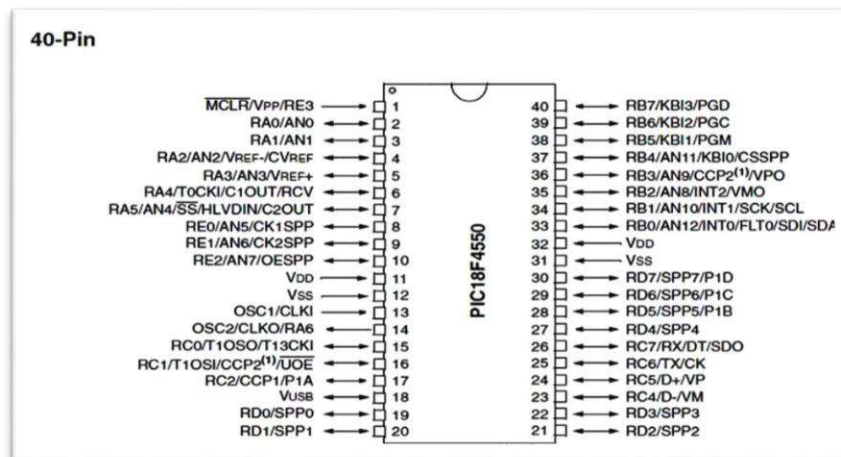
**3. Voltage Regulator**



**Fig- Voltage Regulator**

This interfacing of prepaid energy meter with GSM modem system consists of microcontroller LDC display, GSM modem and max 232, which are operated at 5 V dc. For supplying the 5 V dc a voltage regulator is used in this system at output of bridge rectifier. LM 7805 voltage regulator is used in this system.

**4. Microcontroller Pic 18F452**



**Fig- Microcontroller Pic 18F452**

In this interfacing of prepaid energy meter with GSM modem system the Pic 18F452 microcontroller has been used here for the intelligent control of this system. The microcontroller consists of 40 pins and is interfaced with LCD display and GSM modem. This controller is programmed in c language through the micko c software. It collects the data or message, which is sends by the consumer mobile phone or supply company from GSM modem through the max232 and works accordingly to this data or message. It also collects the energy meter reading and display this on-LCD display.

## 5. Energy Meter



**Fig- Energy Meter**

There are two types of energy meters available in market one is the conventional energy meter, which works on the principle of mutual induction. This meter has rotating aluminum wheel that is called free wheel but this meter has so much energy losses. The second one is the electronics digital energy meter, which one is we are using here and is interfaced with the microcontroller. This meter has no moving parts and has low energy losses.

## 6. LCD DISPLAY



**Fig-LCD display**

A liquid crystal display is a flat-panel display or optical device that makes use of liquid crystal's light modulating characteristics. LCDs do not directly emit light; instead, they use a background illumination or reflector to produce shading or monochromatic images. Computer monitors, televisions, instrument panels, aircraft displays, and indoor and outdoor signage are all examples of LCD applications. Mobile phones with small LCD screens, including smart phones. In this interfacing of prepaid energy meter with GSM modem system the LCD display is used for displaying the energy meter reading, consumer billing and the data which is sends by the consumer or supply company.

## 7. Max 232:



**Fig- Max 232:**

This is 16-pins integrated circuit IC which is powered up by 5 V dc supply. In this interfacing of prepaid energy meter with GSM modem system, this IC is only used for communication purposes between the microcontroller and GSM

modem. This is dual channel IC, means it can receive or send the data or message to microcontroller. This is basically the serial communication IC.

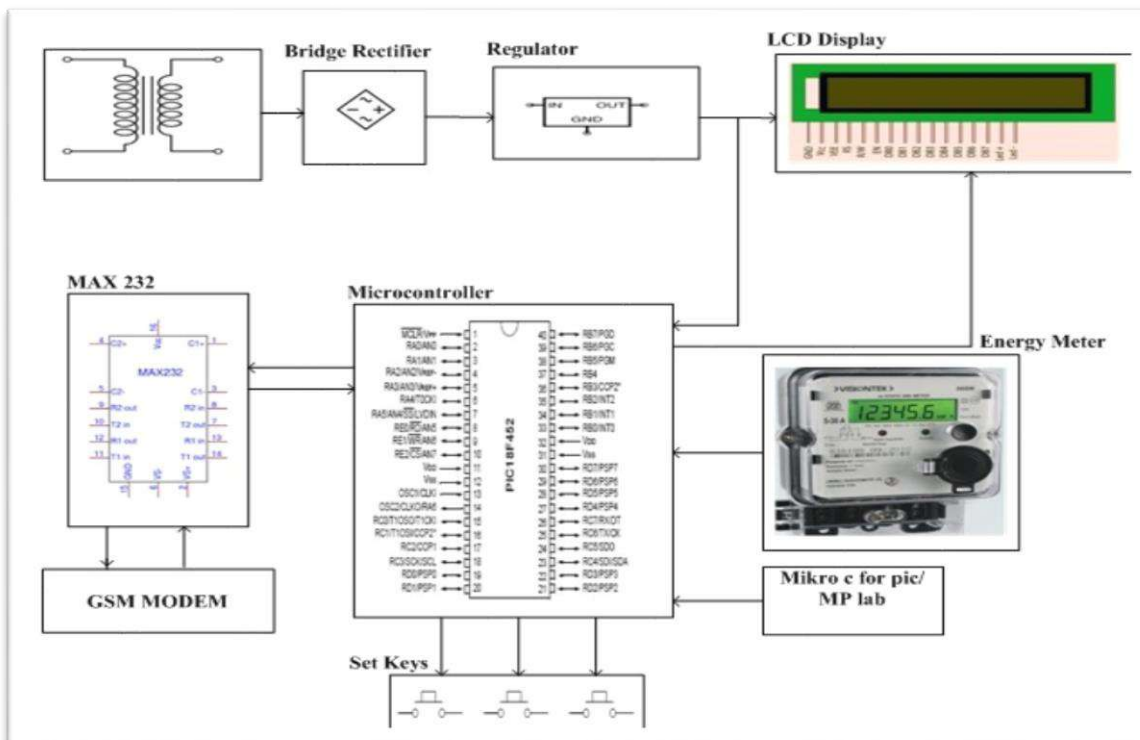
### 8. GSM Modem:



**Fig- GSM Modem:**

The GSM modem is wireless base modem, which accepts the sim card and works on the principle of user mobile phone subscription. In the interfacing of prepaid energy meter with GSM modem system this is only used for communication purpose between the user mobile phone and this system.

### 9. RESULT



The working of this interfacing of prepaid energy meter with GSM modem system would be explain by connecting the lamp as a load at the output side of the energy meter. First, when we would be switch on this system then this would be asking for modem initialization. For modem initialization, we would dial the modem no. from any mobile phone and send the message to the system. By doing this the system has registered the mobile no. After this the system tells us kindly swipe the card. For card swiping we use the press button and set the cost. The cost setting is basically the pulse setting of the energy meter. Let's suppose we set the cost 20 rupees and say the cost of 1 pulse is 2 rupees then actually we have settled 10 pulses. Now we switch on the output load that we have connected a lamp. When the lamp is on then the microcontroller, which is interfaced with the energy meter, counts the pulses of the energy meter and wait till for 10

pulses. When the 10 pulses have gone, then the microcontroller switch off the output load and sends the message to the user mobile phone through the GSM modem, that your balance has expired kindly recharge your card. This system also sends the reminder or warn message to the user mobile before the balance expired.

### 10. ADVANTAGES

- By using this interfacing of prepaid energy meter with GSM system we can manage our loads through mobile phone, by checking the load status.
- By using this system we can easily reduce the billing of our homes
- By using this system we can reduce the energy losses.
- By using this system we can switch on or off the home loads through mobile phone.
- By using this system we can save the energy from theft.

### 11. CONCLUSION

In this paper the PIC control section controls and co-ordinates all the activities of the energy meter, which is designed to continuously monitor the energy meter reading and to disconnect the power connection remotely whenever fails to pay the bill after warning period is lapsed and power reconnect after bill payments. It avoids the human intervention, provides efficient meter reading, avoid the billing error and reduce the maintenance cost. It display the corresponding information on LCD for user notification. The generated bill can also be sent to the consumer by GSM. Thus the complete process of monitoring of energy meter, bill calculation, notification of due date, meter disconnection or reconnection can be automated efficiently with better performance and less manpower.

### 12. REFERENCE

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