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SMART ENERGY METER USING IOT

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***Abstract*- In this paper the idea of smart energy meter using IoT and Microcontroller have been introduced. In this method we are using Microcontroller because it is energy efficient i.e. it consume less power, it is fastest and has two UARTS. In this paper, energy meters which is already installed at our houses are not replaced, but a small modification on the already installed meters can change the existing meters into smart meters. The use of GSM module provides a feature of notification through SMS. One can easily access the meter working through web page that we designed.**

Keywords—Pic controller; Transformer; GSM module; bone conduction; IOT Kit

1 INTRODUCTION

The new era of Internet of Things (IoT) which was refer to uniquely identifiable objects and represent in an “internet-like” structure has played major role of our daily life in terms of intelligence and automation as convenience ways.
As the technology is advancing, the IoT’s aut omation management system is applied in many basic infrastructures such as electricity, gas, and water management systems in order to make it more convenient for individual and organizations

The system can provide data communication between digital energy meters and web server gateway, so that it can monitor for the energy management system.By creating connectivity, IoT, as intelligent system, connect things like universal global neutral network, as a result of this process, there are huge volume of data are being generated which need to management and control.Potential transformer is a voltage step-down transformer which reduces the voltage of a high voltage circuit to a lower level for the purpose of measurement. These are connected across or parallel to the line which is to be monitored.The basic principle of operation and construction of this transformer is similar to the standard power transformer. In common, the potential transformers are abbreviated as PT

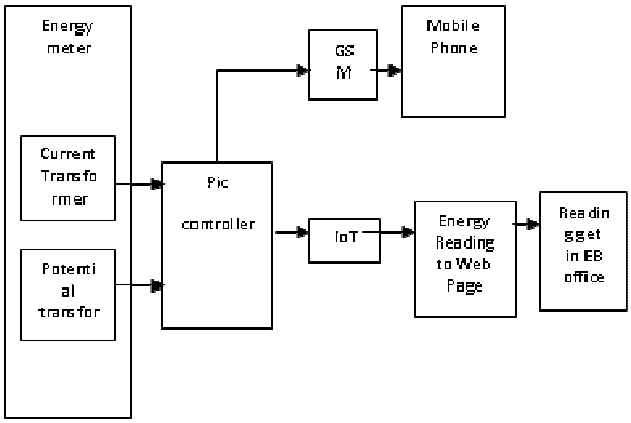
System Architecture

We have made the system architecture to be simple in order reduce the cost of this prototype. In case of original

device the system design and architecture varies depending on the quality and features of the user requirements and emerging technology. There are different segments present in our system design, each one of them to perform their assigned task through the embedded system program coding techniques.

A. Block Diagram

The block diagram shows the diagrammatic representation of our proposed system effectively for clear cut overview and for understanding purpose



Potential transformer

It is not an easy way to measure the high voltage and currents associated with power transmission and distribution systems, hence instrument transformers are often used to step-down these values to a safer level to measure. This is because measuring meters or instruments and

protective relays are low voltage devices, thereby cannot be connected directly to high voltage circuit for the purpose of measurement and protection of the system. In addition to the reduction of voltage and current levels, these transformers isolate the measuring or protective circuit from the main circuit which is operating at high power levels. The current transformers reduce the level of current to the instrument or relay operating range, whereas potential transformers transforms the high voltage to a circuit operating low voltage. In this article we are going to discuss in detail about the potential transformers.

Current transformer

A **current transformer** (**CT**) is a type of transformer that is used to measure alternating current(AC). It produces a current in its secondary which is proportional to the current in its primary Current transformers, along with voltage or potential transformers, are instrument transformer. Instrument transformers scale the large values of voltage or current to small, standardized values that are easy to handle for instruments and productive relays. The instrument transformers isolate measurement or protection circuits from the high voltage of the primary system. A current transformer provides a secondary current that is accurately proportional to the current flowing in its primary. The current transformer presents a negligible load to the primary circuit.

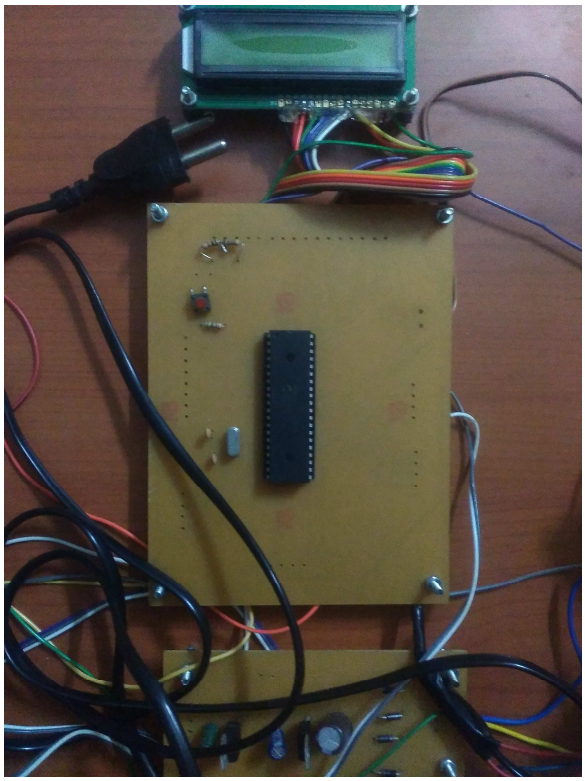
Current transformers are the current-sensing units of the power system and are used at generating stations, electrical substations, and in industrial and commercial electric power distribution.

Like any transformer, a current transformer has a primary winding, a core and a secondary winding, although some transformers, including current transformers, use an air core. In principle, the only difference between a current transformer and a voltage transformer (normal type) is that the former is fed with a 'constant' current while the latter is fed with a 'constant' voltage, where 'constant' has the strict circuit theory meaning.

***PIC** assembled **PCB**:*

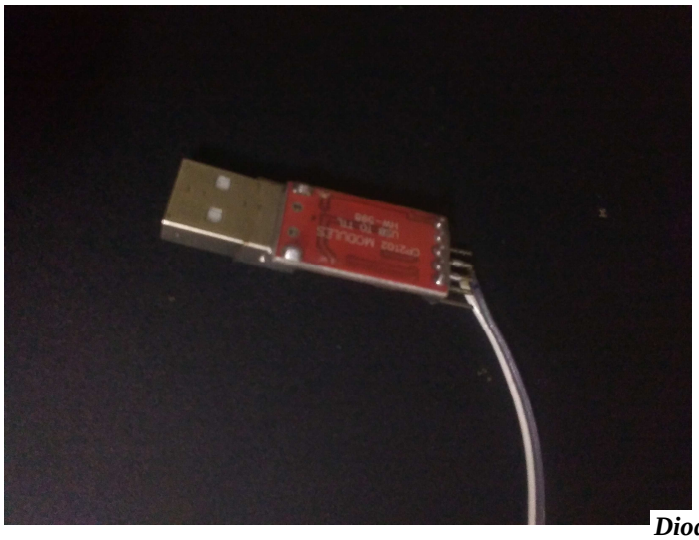
Further information on this family of microcontrollers: PIC instruction listings § Mid-range core devices (14 bit), and PIC instruction listings § Enhanced mid-range core devices (14 bit)These devices feature a 14-bit wide code memory, and an improved 8-level deep call stack. The instruction set differs very little from the baseline devices, but the two additional opcode bits allow 128 registers and 2048 words of code to be directly addressed. There are a few additional miscellaneous instructions, and two additional 8-bit literal instructions, add and subtract. The mid-range core is available in the majority of devices labeled PIC12 and PIC16.

The first 32 bytes of the register space are allocated to special-purpose registers; the remaining 96 bytes are used for general-purpose RAM. If banked RAM is used, the high 16 registers (0x70–0x7F) are global, as are a few of the most important special-purpose registers, including the STATUS register which holds the RAM bank select bits.



GSM MODEM:

This GSM Modem can accept any GSM network act as SIM card and just like a mobile phone with its own unique phone number. Advantage of using this modem will be that you can use its RS232 port to communicate and develop embedded applications. The SIM800C is a complete Dual-band GSM/GPRS solution in a SMT module featuring an industry-standard interface, the SIM800CS is a quad-band GSM/GPRS module that works on frequencies GSM850MHz, delivers performance for voice, SMS, Data, and Fax in a small form factor and with low power consumption.



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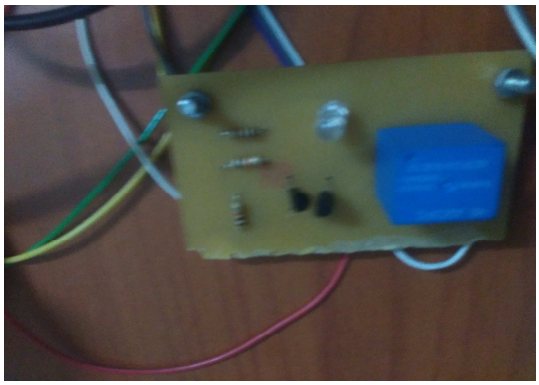


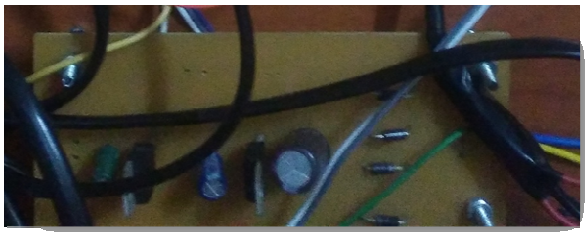
Diode Bridge

A **diode bridge** is an arrangement of four (or more) diodes in a bridge circuit configuration that provides the same polarity of output for either polarity of input.When used in its most common application, for conversion of an alternating-current (AC) input into a direct-current (DC) output, it is known as a **bridge rectifier**. A bridge rectifier provides full-wave rectification from a two-wire AC input, resulting in lower cost and weight as compared to a rectifier with a 3-wire input from a transformer with a center-tapped secondary winding**.**

Relay system:

A relay is an **electrically operated switch**. Current flowing through the coil of the relay creates a magnetic field which attracts a lever and changes the switch contacts. The coil current can be on or off so relays have two switch positions and they are **double throw** (**changeover**) switches.Relays allow one circuit to switch a second circuit which can be completely separate from the first. For example a low voltage battery circuit can use a relay to switch a 230V AC mains circuit. There is no electrical connection inside the relay between the two circuits; the link is magnetic and mechanical.

The coil of a relay passes a relatively large current, typically 30mA for a 12V relay, but it can be as much as 100mA for relays designed to operate from lower voltages. Most ICs (chips) cannot provide this current and a transistor is usually used to amplify the small IC current to the larger value required for the relay coil. The maximum output current for the popular 555 timer IC is 200mA so these devices can supply relay coils directly without amplification. Relays are usually SPDT or DPDT but they can have many more sets of switch contacts, for example relays with 4 sets of changeover contacts are readily available. For further information about switch contacts and the terms used to describe them please see the page on switches.



Embedded system

An embedded system is a computer system with a dedicated function within a larger mechanical or electrical system, often with real-time computing constraints. It is embedded as part of a complete device often including hardware and mechanical parts. Embedded systems control many devices in common use today. Ninety-eight percent of all microprocessors are manufactured as components of embedded systems

Since the embedded system is dedicated to specific tasks, design engineers can optimize it to reduce

the size and cost of the product and increase the reliability and performance.

Software

In our proposed system, we have used Micrisoft visual studio. It is a proprietary freeware integrated development environment for the development of embedded applications on PIC and dsPIC microcontrollers.

Microsoft Visual Studio is an integrated development environment (IDE) from Microsoft. It is used to develop computer programs, as well as web sites, web apps, web services and mobile apps. Visual Studio uses Microsoft software development platforms such as Windows API, Windows Forms, Windows Presentation Foundation, Windows Store and Microsoft Silver light. It can produce both native code and managed code

Visual Studio includes a code editor supporting IntelliSense as well as code refactoring. The integrated debugger works both as a source-level debugger and a machine-level debugger. Other built-in tools include a code profiler, forms designer for building GUI applications, web designer, class designer, and database schema designer. It accepts plug-ins that enhance the functionality at almost every level—including adding support for source control systems (like Subversion) and adding new toolsets like editors and visual designers for domain-specific languages or toolsets for other aspects of the software development lifecycle

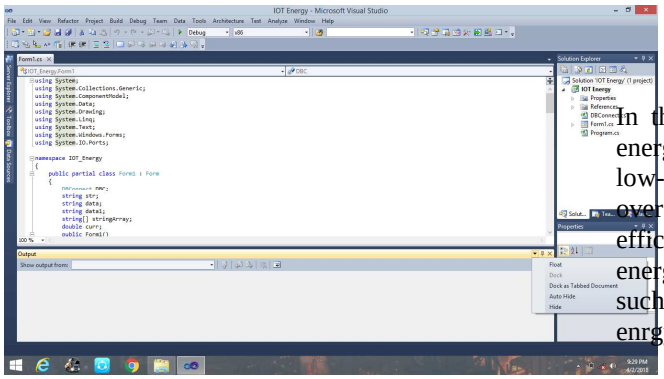


Fig. 6. Microsoft visual studio

Hardware

In our proposed system, we have implemented a simple hardware structure to ensure low cost and efficiency since, it acts as a prototype model. The overall hardware module of our proposed system is given as follows:

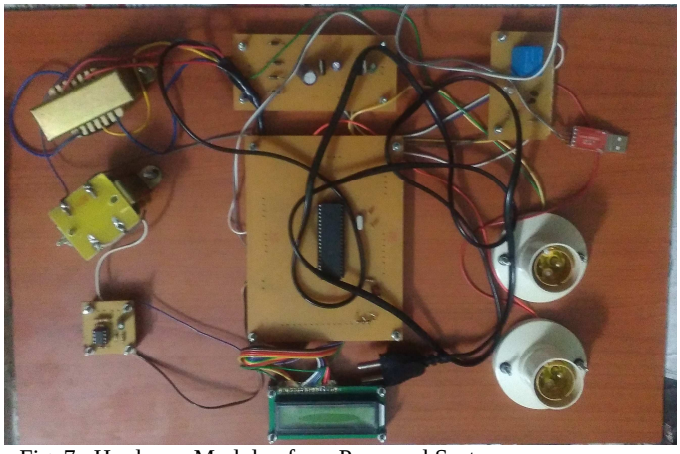


Fig. 7. Hardware Module of our Proposed System

III WORKING PRINCIPLE

With the advancement of telecommunication and computer technology, most of the power utilities are implementing many levels of automation power management system across the network.

The smart energy meter can takes a reading from the used power with flourascent lamp.

In the Microsoft visual studio has the two parts.One for receiving the readings from the IOT kit and another one is for send the EB bill to the consumer mobiles.

The message consists of the amount,used power and last date of paying bill.

IV CONCLUSION

In this paper, we have proposed the WiFi-based energy meter for internet of things (IoT) with the low-cost implementation. The proposed system can overcome and improve the challenges of energy efficiency and manageability. The parameters of energy meter can be read correctly and reliably, such as load profile, demand value, and the total enrgy consumption

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