Smart Energy Meter with Payment Facility

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Abstract: *The Internet of Things technology the future has begun to affect our Shomes. Here is the IOT Energy meter proposed with the current system, electricity and cost monitoring using a Node MCU that uses a power meter with microcontroller system to monitor energy meter IoT learning. The proposed program contains of the circuit based on the current microcontroller sensor, energy meter and load connected to it and an LCD display connected to the Node MCU. This program works with online IoT a program that THINGS TALK is a free web interface a live streaming of this read above to easily. After connecting with THING Show data in allows the user to easily check units used, estimated costs, line power and current consumed live from any destination place. The circuit receives more instructions IoT by connecting to the circuit and then the Node the MCU processor processes these instructions. After this, the processor is now processing those user access instructions commands. Then it is displays those on the LCD display. In this way the energy meter monitoring framework empowers the client to adequately check the power meter readings.*

Keywords: Current Sensor, Voltage Sensor, Razer Payment Gateway, Node MCU, Energy Meter

I. INTRODUCTION

In recent years, due to the development of in Internet technology is computer-generated electricity bill and online bill payment have become it is possible. However, radiation testing learning is still conducted by hand. This it requires great staff. In addition, the inaccuracies in testing lead to overheating loss of income. AMR (Automated Meter Learning) integrating technology automatic usage check analysis of tested billing data as well payment [1]. To gain AMR, a share of IP address per power meter it is important. This is the technology to deliver anywhere device online and connect it to The Internet is called the Internet of Things [2]. based on the communication method used data delivery, existing AMR systems they can be divided into two categories namely wired systems and wireless systems [3]. In a cable system, data transfer is performed either by PLC (Power Line Manager) or HFC (Hybrid Fiber-Coaxial). In the case of wireless, operated using GPRS (Standard Packet Radio Service), ZigBee or Wi-Fi (Wireless Fidelity) [4]. Both programs have four their pros and cons. Power telephone measurement is as expensive as it is requires infrastructure changes. What compared to other wireless modules, Wi-Fi is most suitable for this type of application as it has become one of the most common facilities at every residence.

II. LITERATURE SURVEY

Anitha et al., [1] proposed "Intelligent energy monitoring using IoT" in relation to IoT, the internet of things as a emerging platform and IoT-based devices have created a revolution in electricity and IT. The main purpose of this project is to create awareness about the use of power as well. efficient use of the home energy-saving machines. Due to handicrafts, which are available the electricity billing system has serious problems. This program will provide meter reading information, power disconnection there power consumption exceeds the applicable limit. . IoT. Arduino mini controller esp8266 configured above make objectives with the help of the GSM module. Icon proposed to overcome all the problems that already exist existing energy meter. All details are sent to the buyer mobile via IoT and GSM module and so on shown on LCD. It is time-saving and helpful to eliminate human interference using IoT.

Devadhanhini et al., [2] "Guarding Intelligent Power to Use IoT that Power consumption is also very important a challenging issue. Automatic Electrical Energy meter is used in a large power distribution system. Integration of Arduino WIFI and SMS offers a system like Smart Power Monitoring system. Smart energy meter provides data for efficiency and

reduction of energy consumption. This program too includes a sensor of movement that when no one is in the house or in the house will automatically turn off the power supply. Mohammed Hussain et al., [3] presented a paper entitled "Designing and using smart meters using IoT" describing the growth of IoT and digital technology. The future the power grid should be applied to the distributed topology unable to dynamically absorb different energy sources. IoT can be used in a variety of intelligent grid systems including power consumption, intelligent meter, side of power demand management and various power generation facilities. In this paper, Smart Energy Metering (SEM) is defined as the main purpose of SEM is required for data collection on electrical appliances and monitoring environmental boundaries and the provision of necessary services for home users. Himanshu K Patel et al., [4] demonstrated "Arduino based a clever power meter" that removes human interference from the meter reading and producing a bill thus minimizing that error usually causes in India. The program contains a provision for send an SMS to the user to review the use of force and the production of the final bill and the freedom to reload via SMS check the amount of energy used by our electrical appliances. The energy system has led to a total reduction in energy consumption and costs.

How to save energy on Smart Grids using Smart-In this paper, the growing global demand for electricity is described and that is why the necessary steps need to be taken to reduce the loss of electricity through proper metering systems in buildings. The Arduino UNO uses the ATMEGA-328P microcontroller and this controller will be pre-loaded with the Arduino UNO bootloader [6]. The purpose of this activity is to determine prices in real time. This is the solution economical and eco-friendly. Currently the power measurement is constantly changing the existing technology of electric meters especially in China and India. In 2004, digital meters began to replace electricity meters in Singapore. A wireless digital energy meter can provide great comfort in the work of reading the meter. Wi-Fi technology is preferred as a possible wireless solution to an existing issue. In this paper, we introduce the design, design and use of Wi-Fi-enabled power meters and also overcome issues with traditional power meters. The energy reader can compile a study of the energy consumption of a power meter without a cable

III. CIRCUIT DIAGRAM & HARDWARE SETUP

Now let us see the circuit diagram of IoT Based Electricity Energy Meter using ESP32. The circuit has been designed using Fritzing software.
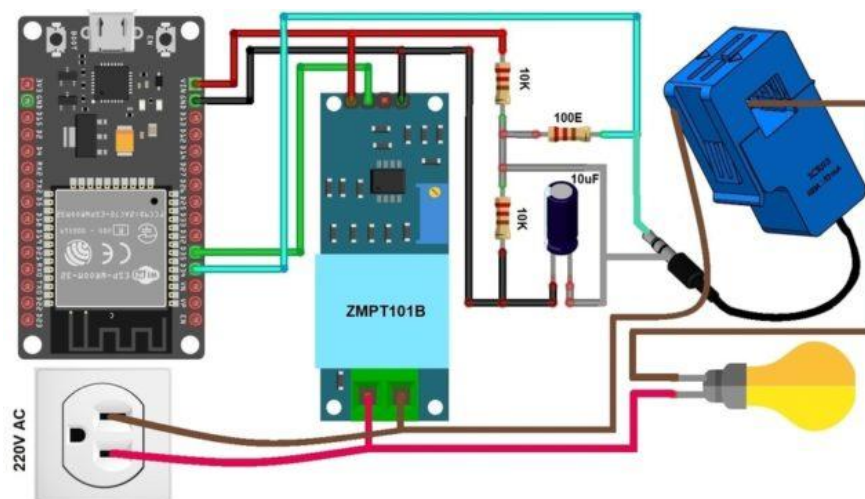

The connection diagram is simple. Both the Sensor, i.e. SCT-013 Current Sensor & ZMPT101B Voltage Sensor VCC is connected to Vin of ESP32 which is a 5V Supply. The GND pin of both the modules is connected to the GND of ESP32. The output analog pin of the ZMPT101B Voltage Sensor is connected to GPIO35 of ESP32. Similarly, the output analog pin of SCT-013 Current Sensor is connected to GPIO34 of ESP32. You need a two resistor of **10K** & a single resistor of 100 ohms connected along with a 10uF Capacitor.

Apart from the circuit part, the AC wires where the current and voltage needs to measured are connected to the **input AC Terminal** of Voltage Sensor. Similarly, the **current sensor clip** doesn't have any connection and a single live wire or neutral wire is inserted inside the clip part as shown in the above circuit.
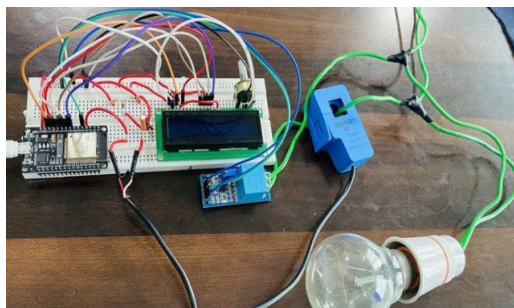
3.1 Circuit PCB BOARD
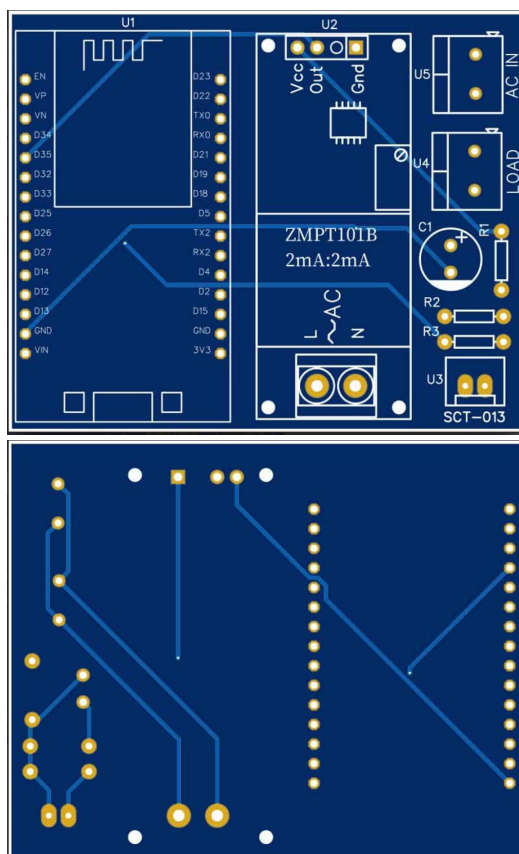
The energy meter monitoring system is shown in Figure 1. The block diagram

3.2 SCT-013 Current Sensor

The SCT-013 is a Non-invasive AC Current Sensor Split Core Type Clamp Meter Sensor that can be used to measure AC current up to 100 amperes. Current transformers (CTs) are sensors are for measuring alternating current. They are particularly useful for measuring whole building electricity consumption. The SCT-013 current sensors can be clipped straight either to the live or neutral wire without having to do any high voltage electrical work.
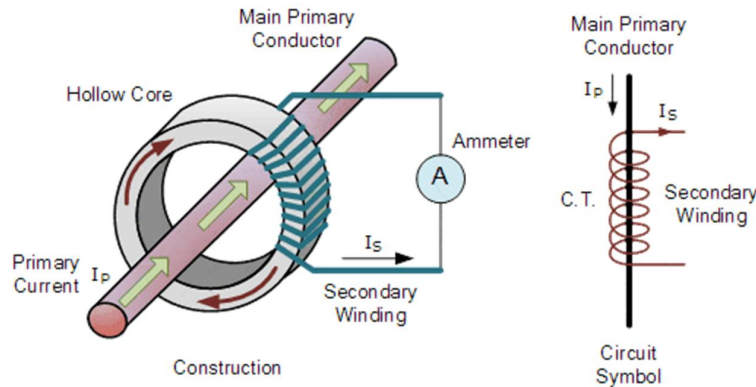
Like any other transformer, a current transformer has a primary winding, a magnetic core, and a secondary winding. The secondary winding comprises many turns of fine wire housed within the casing of the transformer.

A. Specifications

1. Input Current: 0-30A AC
2. Output Signal: DC 0-1 V
3. Non-linearity: 2-3 %
4. Build-in sampling resistance (RL): 62 Ω
5. Turn Ratio: 1800:1
6. Resistance Grade: Grade B
7. Work Temperature: -25 °C~+70 °C
8. Dielectric Strength (between shell and output): 1000 V AC / 1 min 5 mA

3.3 ZMPT101B AC Single Phase Voltage Sensor

The ZMPT101B AC Single Phase voltage sensor module is based on a high precision ZMPT101B voltage Transformer used to measure the accurate AC voltage with a voltage transformer. This is an ideal choice to measure the AC voltage using Arduino or ESP32.

The Modules can measure voltage within 250V AC voltage & the corresponding analog output can be adjusted. The module is simple to use and comes with a multi-turn trim potentiometer for adjusting and calibrating the ADC output.
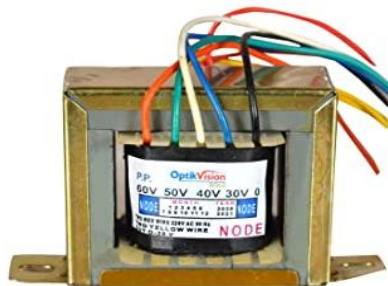
A. Specifications

1. Voltage up to 250 volts can be measured
2. Lightweight with on-board micro-precision voltage transformer
3. High precision on-board op-amp circuit

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4. Operating temperature: 40ºC ~ + 70ºC
5. Supply voltage 5 volts to 30 volts

contains Arduino, power meter, WIFI and IoT module, Relay and transformer. Fig.2 Arduino uno The power meter used here is clamp energy meter .230V AC the main is the input provided by the transformer and the AC mains converted to low voltage. Power meter measures current, voltage and power in terms of KWh. Microcontroller reads these parameters again sent to the cloud. Node MCU is a Wi-Fi device with microcontroller on it. This connects the local router via the IoT. The status of these limits can be determined by mobile or laptop. WIFI is used for data communication. WIFI is suspended by Arduino. Data from the energy meter is sent to Arduino as well WIFI module also reaches mobile phone users. In this the system the user can turn on / off the main plumbing or electrical appliances from their Android smart phone app. WIFI trans module and retrieves data from the cloud and sends it to Arduino and Arduino controls the transmission to open and close the circuit of home [8-9].

A Transformer Choosing the right transformer is very important. I current measurement and secondary voltage of the transformer is key feature. The current Transformer rating is based on required for load to be driven. Input voltage to the 7805 IC must be at least 2 volts larger than the required 2 volt output; therefore requires the input voltage to at least shut down for 7v. Therefore, a 6-0-6V transformer with a current rating of 500mA is used.

3.4 Relay

The Relay has three high voltage (NC, C and NO) devices connected to control. The Relay also has three pins low voltage (ground VCC and signal) connecting to Arduino. Relay is a 120-240 switch connected internally electromagnetic magnet.

3.5 ESP-8266 Wi-Fi Module

Wi-Fi module delivers highly integrated WI-FI solution to meet users for continuous demand of efficient power usage.ESP-8266 is a wi-fi enabled system on chip (soc)module development of IoT (Internet of things) embedded aplications.it employs a 32-bit RISC CPU supported by the ten silica Extensa L106 running at 80MHz .to communicate with the ESP8266 module, the microcontroller communicate with the ESPS266-01 module using UART having specified Baud rate.

3.6 Internet of Things

Internet of Things (IoT) links anything from anywhere in the universe. It communicates with almost everything around the world. The communication can be a control signal or identified data from this world. It is a common internet data communication and is communicated in different ways. The Internet of Things (IoT) collects the data of automated objects and helps the machine learn where it needs. The data is stored in cloud and sends to the energy meter to switch on/off objects

IV. CONCLUSION

This program helps control energy use and is based on Node MCU and using a power meter IoT. It avoids human involvement, provides competent meter reading and avoidance payment error and personal intervention. Big profits need a young man power, cost and units are shown in website. Easy access to information for consumer from power meter with IoT. The LCD displays power consumption units as well temperature. It makes the cut of service from remote server. It helps to power consumption control and to avoid wastage of energy. It plays an important role continuous monitoring of meter readings and transfer the reading to the central server. This data can be accessed anywhere.

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