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IOT Based Power Monitoring Device (Distribution Box)

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Abstract: The main idea of IOT Based Power Monitoring Device (Distribution Box) is fixed on the distribution box to let users know on how much the current they used. Besides that, the device system is installed on every Miniature Circuit Breaker (MCB) because different MCB have different output in the house. Moreover, this device can save much more time for electrical bill rather than waiting for the bill from Tenaga Nasional Berhad (TNB). The type system used in the in the power monitoring device is 5VDC power supply, Arduino NodeMCU and IOT which uses Blynk App. This App can notify users about the usage of current in the house and also covers the safety from Overcurrent (OC), Overvoltage (OV) and Overload (OL) throughout some notifications in the smartphone.

Keywords: NodeMCU(ESP 8266), Blynk Mobile App, Power Monitoring Device, Energy meter

1. Introduction

Power monitoring device had been utilized since 1883 by Dr Hermann Aron. Since then, power meter had been established with their respective usages. Nowadays, IoT have been conqured all monitoring instruments which is much easier and convenient with mobile controllable. Clarification will likewise cover on estimation strategy and estimating instrument used to contrast information from estimating instrument and information from venture model. Moreover, lack of power monitoring device leads to overusage of electrical power in domestics and in industries as well. In this point, creating an IoT based power monitoring device will helps out users to save more electrical usages and can determine the percentage of errors according to output loads used in certain home or even in industries.

1.1 What is IoT?

IOT is the system of interrelate of hardware, coding, connectivity and use interface. The Internet of Things have the ability to transmit information from a network without human aid or interaction to computer. The Internet of Things is actually a pretty simple concept, it means taking all the things in the world and connecting them to the internet. Users of IoT must have the knowledge of software uses such as Blynk, Thingspeak, and also MQTT.

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1.2 IoT Based Power Monitoring

The IoT Based Power Monitoring uses NodeMCU Wi-Fi module which can access the through mobile or smartphone to obtain or monitor the values of power, current, voltage or even costs. Nowadays, IoT become most useful to our daily lives and so power monitor too. Mainly the power monitor is used in heavy industries to monitor the usages of electrical energy in every machines used. And the power monitor is used in domestic and came up with IoT. This ensures that overconsuming of electrical energy can be controlled by the users to maintain their electrical bills and cut down their daily uses.

2. Materials and Methods

2.1 Materials

The materials needed and used in this project where the NodeMCU or ESP8266 is used as the main unit as a power monitor. This project consists of ACS712 current sensor used to take the readings of the current values. 3.3 V voltage regulator is fixed to provide voltage source to the ESP 8266 Wi-Fi Module. Last and foremost, the energy monitor IEC 62053-21 is used in this project so the readings of current, voltage and power gan be gained.

- Power Monitor based kits :
- NodeMCU (ESP 8266)
- Act as brain and control the whole process in this project.
- Power supply parts :
- 5V DC power supply
- 3.3V DC Converter unit.
- Electronic Components :
- Current sensor unit (ACS712)
  - Takes or read current value
- Energy monitor IEC 62053-21
  - Reads the current, voltage and Power in the MCB.
- Software used:
- Blynk Mobile App
  - Data from the NodeMCU is shown in smart phone.
- Arduino IDE
  - Software used to do coding and programmed into NodeMCU.

2.2 Methods

Process of IoT Based Power Monitoring Device

Firstly, the energy monitor IEC 62053-21 is connected to the main power supply. The power supply of 5 VDC is connected together with energy monitor to power up the NodeMCU (ESP-12E). Before the supply enter to the module, the power regulator is installed to make sure the voltage is regulated into 5 V and also 3.3 V. The current sensor ACS712 is installed to measure the value of current pass by from input and to the output. The output Of ACS712 is connected to MCB and the output of the MCB is connected to the output electrical appliances or household uses such as lights, fan, aircond , water heater and socket outlets. The results is then transferred to the mobile through Blynk Mobile App and been monitored the usages with cost time to time.

Figure 1 :Block diagram of IOT Based power monitoring device

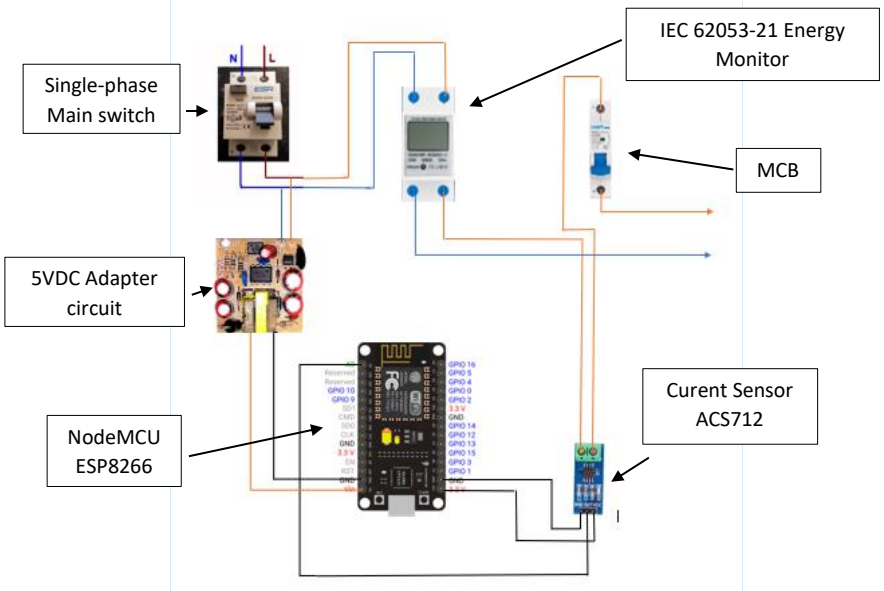

Figure 2: Schematic Diagram of IoT Based Monitoring Device in Distribution Box

Operational flow chart IOT Based Power Monitoring Device (Distrubution Box)

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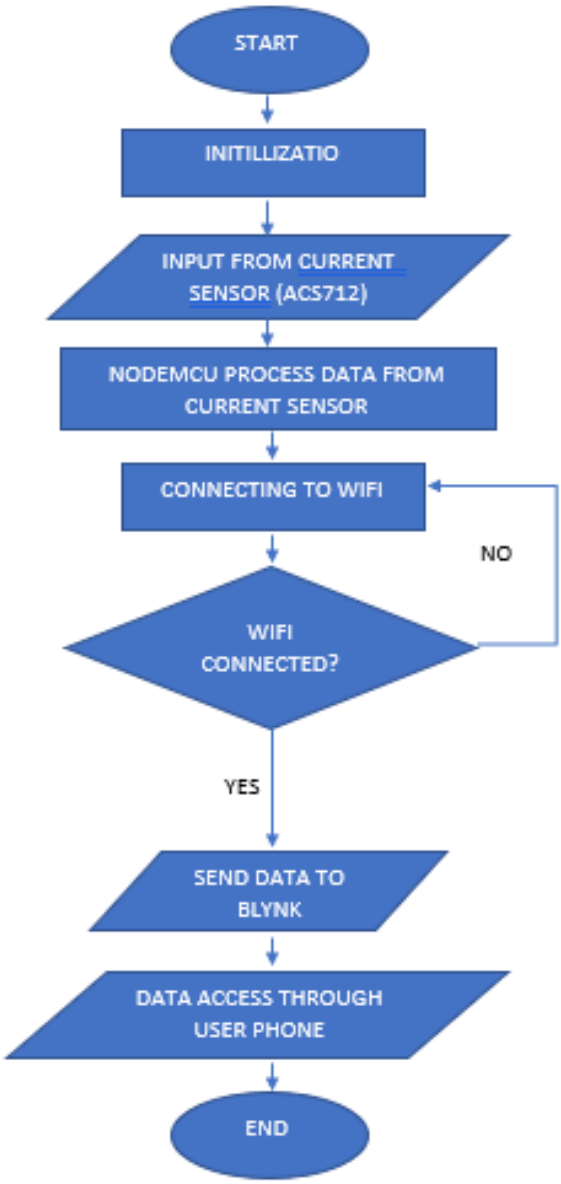

Figure 3: Flow chart of IoT Based Power Monitoring Device

3. Results and Discussion

Firstly, the hardware had been set up according to the schematic diagram. Blynk Mobile App is connected with same WiFi address. The value of current, voltage and power were gained via ACS712, NodeMCU ESP 12E and IEC 62053-21 to Blynk which shown in Figure 4 and Figure 5.

3.1 Results

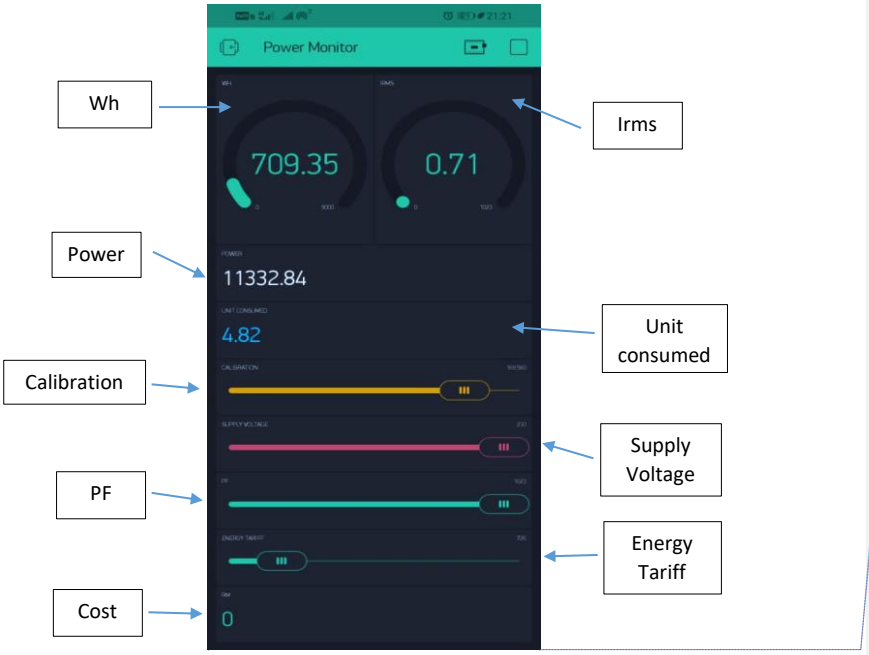

Figure 4: Results shown in Blynk Mobile App

Figure 5: Results shown in Energy Monitor IEC62053-21

3.2 Discussions

From the this fundamental, the live and impartial wires were associated with the principle switch. The yield of the mainswitch will be the Energy Monitor IEC 620153-21. The current will enter upon the energy screen to the current sensor ACS 712. The current will enter upon the energy monitor to the current sensor ACS 712. The wire out from current sensor is then connected to the MCB which the output of the MCB will have the load such as lights, fans, air-conditioner, water heater and etc. but in this project, the data carried out with four type of load output, LED downlights, fluorescent lights,

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refrigerator and kitchen electrical appliances which is water purifier and rice cooker. The results then taken down from the readings in IEC 62053-21 and also in the device (power monitor) through smartphone with the help of Blynk Mobile App. The results have different type percentage of error between low power consumption appliances and high power consumption appliances. The low power consumption have the biggest percentage of error compare to the high power.

3.3 Figures

Figures 6: Prototype of IoT Based Power Monitoring Device (Distribution Box)

This Figures 6 above shows the exact project model. The casing of this project is PVC enclosure box which has the same type of material with exact distributuion box. This is to ensure there is no electricity leakage touching either with neutral line or ground line. The input and output of the device will be single-phase which is 220 V – 240 V. The operating instruments inside device will be using 5 VDC and the power adapter being used. The MCB of the output is 20 A for the purpose of installation low and low power consumption appliances. The data from the NodeMCU can be monitored in smartphone with the guide of Blynk Mobile App.

4. Conclusion

We started the project with the objectives mentioned in the problem statement and achieved all of them. We have implemented the interfacing of single-phase voltage with Internet of Things. After doing this project and having hand experience of IoT, we have become a good familiar with the use of Internet of Things. It is concluded that IoT conquers its usages for minor and major projects all over the world. The affordable price of the project with its installations can take to the higher level in building usages.

Acknowledgement

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