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REAL TIME ENERGY AND POWER MEASUREMENT USING ARDUINO WITH TFT DISPLAY

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Abstract:

Background/ Objective: In modern world, electricity plays a major role in accordance with the economic. To ensure, proper and smart usage of electric power we are designing smart home automation system. Here the electricity is used among the electrical loads based on power consumption which was displayed on TFT display board. Method / statistical analysis: The Arduino microcontroller here is used to perform continuous calculation on power, voltage, cur ent and power factor consumed by the loads. The calculation result is displayed on the TFT and the loads are controlled by the priority developed in the coding language which also gives the knowledge about the threshold value. Findings: The analysis of the concept proves that the system can maintain the loads below the threshold value. The TFT display provides the real time information of power, voltage, cur ent and power factor for the consumption of the loads. Applications/ Improvements: If applied as per the concept the consumer can able to control the loads automatically without any manual interruption, results into a cool and comfort environment in addition with saving the electricity bill.

Keywords: Priority, loads, threshold value, voltage, cur ent, energy management, TFT display

Introduction:

The world is getting automated more and more day by day and hence an eco-friendly technique is essentially required .Energy usage can be estimated by monitoring and measuring the energy utilized by the load .So for the technology is much developed also there is a need for innovation. The analysis concept must provide a plan for saving the energy .Nowadays most of the industries are given rebirth with automation but the local are still backward in the automation. It also equally

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important to have low cost, robust, and simple system to monitor the energy consumption of loads in the residence. The implementing concept may differ among countries, insufficient power is a major issue among most developing nations. Since the effective low cost energy usage is always welcomed wide over the world. Energy management has an important commitment to ensure the energy consumption awareness and to avail the measurement to the consumers. Mostly, the work is limited to the power measurement. In some cases, consumer involvement is necessary to save power but the concept must results in a system that combines both measurement and monitoring without the presence orany manual interruption of the consumer. The energy consumption management is presented in this paper. The system is available to measure the power consumed. It uses current transformer and voltage transformer techniques to measure the current and voltage, which is easy to apply and effectively reliable. The outputs are processed by the Arduino for display purpose and also the priority is integrated to make the decision for reducing the loads when it exceeds the prefixed threshold values. Finally, the concept results in unique system which is capable of automatic monitoring and measuring along controlling the loads without any interruption of the consumer.The following parts of the paper is arranged as: Section 2 describes the related literatures in the field of energy power measurements, Section 3 describes the blocks of the system and analysis in section 4, Section 5 describes the conclusion.

Literature Review:

Energy Management:

To have the knowledge about the load management, the important issue is about measuring and monitoring the energy in the system. Some researchers has already worked in the area of home energy measurement using Arduino microcontroller. If it is possible to control the energy consumption, the consumer may have the plan for energy saving. T.M Chung et al5 developed a single phase power meter using Arduino microcontroller.

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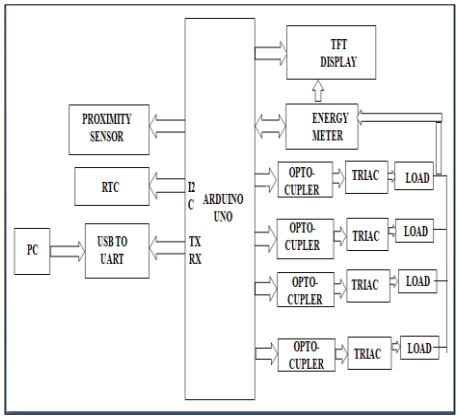
3. Block Diagram Working Principle:



4. Consumption of the loads, supply voltage, current c

The load management is the vital role of the prototype. Likewise measuring power consumption parameter of the system and displayed on the TFT display board. Loads are powered through 4 channel relay that switch off the some selected loads when the total power is greater than the threshold value. The switching off of the loads is based on priority given to the load on the relay. Each time when a load or loads are disconnects the system will required pressing a reset key.

Arduino UNO:

Arduino UNO is a microcontroller board based on the Atmega328P. It has 14 digital input/ output pin(6 pin used as PWM output), 6 analog inputs, 16 MHz, Quartz crystal, USB connection, Power jack, ICSP header and reset button. Arduino UNO is used in this paper for easy to use in designing and prototyping with simplified version of C, C++ programming language.

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Opto coupler:

An opto isolator contains source of light, which converts electrical input signal into light, a closed optical channel and photo sensor which detects incoming light and generate the electrical energy or modulates electric cur ent flowing from an external power supply. Sensor can be Photo resistor, Photo diode, Photo transistor, SCR or TRIAC.

RTC:

In earlier Micro SD cards are used, in that data can be captured and stored in Micro SD card. While using RTC, it can keep track the data with accurate time. The feature of DS3231 RTC IC has integrated crystal oscillator and temperature sensor. So there is a no need of external crystal. Use of RTC in this system: It uses I2C communication protocol which makes the connection to Arduino board easily.

Energy meter (Watt hourmeter):

It is an electrical instrument measure the electrical energy used by the load. Then energy meter measure the voltage, cur ent, calculate theirproduct and instantaneous power.

TFT Display:

TFT stands for Thin Film Transistor. It controls the element that actively controls the each individual pixel. Hence we call TFT as active matrix TFT. It utilize simple chemical and electrical properties foe visible image on the screen .By using the electrical charges that causes the liquid crystal to change their molecular structure allows various wavelength of backlight to “pass through”. The TFT panel utilizes several layers of filters sandwiched between two glass panel. Two polarizer filter, color filters and two alignment layers determine exactly how much light allowed to pass and which colors are created. TFT used here to display the information to be monitored and measured using Arduino from the loads.

5. Analysis:

The essential important thing, the programming language is very good at managing the loads by controlling, when it reaches the threshold value. There may be chances to er ors in power measurement with little significant values. The values may fluctuate sometimes. Although it can be measured.The programming language is mainly used for priority purpose to cut off the loads when it reaches the threshold value.After cutting of the loads are automatically restarted.The display provides the information about the priority and status of the loads to be cut off.The system can be reset by pressing the reset button on the Arduino board.

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6. Conclusion:

This paper defines the development and implementation of the energy consumed by the loads in a smart house. The process of developing a reliable system is achieved by measurements done through the transformer techniques. The coding built is proficient enough to manage the loads effectively by controlling the load within the threshold value ().The system is developed with automatic reconnection ability. The system efficiently monitors, measures and displays the power, voltage , cur ent consumed by the loads in the residence. The measurement made has an er or ratio of () when compared with the standard value.

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