

Remote Electricity Metering and Billing Using Ni Labview Software

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Abstract: Remote metering system is a state of the art technology for reading electric meter readings automatically from a remote place without any human intervention. Remote measuring system gives accurate and fast response and billing system. The main advantages of this system is real time monitoring and control is done in the web server by using NI LABVIEW. Remote electric billing is a unique concept in which the electricity board will have consumed units data of all consumers. Each consumer is provided with a unique energy meter having an NI LabVIEW SOFTWARE. Consumer can check the bill details which are updated in the web server of the consumer and electricity board. The unique features of this system is that the electricity board can disconnect or reconnect the consumer to utility from remote place through internet, as this project is on online based LABVIEW webservice. Thus, the system can be controller from any part of the world.

Key Words: NI LABVIEW software, Maker hub tool kit, Arduino interface with Labview tool kit, current sensor, Arduino UNO, Web server.

I. INTRODUCTION

The popularity of NI LABVIEW empowered by wireless technology innovation such as wireless fidelity. Embedded system, The IOT has moved out from its beginning stage and it's actually on the edge of changing the present fixed internet into a well featured upcoming internet. Currently there are almost nine billion interconnected gadgets and it is estimated to touch almost fifty billion gadgets by 2020. Today the world is facing such an environment that offers challenge. Power variations is the main problem faced by our society. A relevant system to control and monitor power usage is the one of solution for this problem one approach through which today's energy can be addressed is through the reduction of energy in household. Power management only possible if the user is aware of the quantity of power usage and the available quantity. The consumer is increasing rapidly and also burden on electricity offering division is sharply increasing. The consumer must be facilitated by giving them an ideal solution. LABVIEW refers to the ever-growing network of physical objects that features an IP address for internet connectivity and the communication that occur between these objects and other internet enabled devices and system.

II. PROPOSED SYSTEM

In the proposed system we are using internet as wireless communication medium. Here the home appliances are controlled and monitored by web server using LabVIEW web server tool. The 230V AC is step down into 12V with the help of step-down transformer. The 12V AC is given to bridge rectifier to convert it into 12V dc. This is further given to voltage regulator. The voltage regulator can produce a constant dc output, that dc output is given to the relay. Relay is normally closed (NC), when giving digital output to relay it will open (Normally Open-NO). If NO is activated in the relay the circuit gets tripped. [1] By using Arduino Uno interfaced with the LabVIEW software we can control and receiving the real time data of each consumer. The collection of billing is late procedure and so many consumers may not pay in time. Disconnecting of unpaid connection is also manual. Due to all drawbacks we implement the remote metering system through the web server.

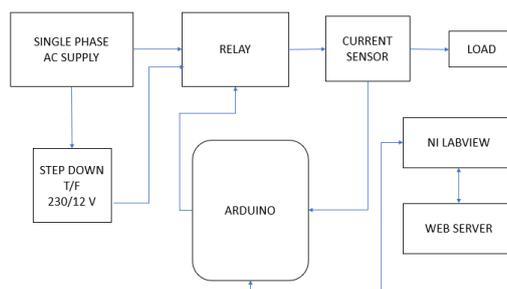


Fig.1: Block Diagram of the proposed system

III. INTRODUCTION TO EMBEDDED SYSTEM

An embedded system is a controller programmed and controlled (RTOS) by a dedicated function with in a larger electrical system, often with real time computing constraints. Embedded systems control many devices in common use today.[8] Ninety-eight percent of all microprocessors manufactured are used in embedded system. Monitoring of energy meters at lower cost is made possible. Daily consumption reports are generated which can be monitored through android application and/or web portal. Android users can pay their electric bills from their android application. The system is more reliable and accurate readings values are collected from energy meters. Live readings of the energy meter can be viewed through android application. An embedded system is a system which is going to do predefined specified task in the embedded system and is even defined as combination of both software and hardware. A general purpose definition of embedded system is that they are devices used to control, monitor or assist the operation of equipment.

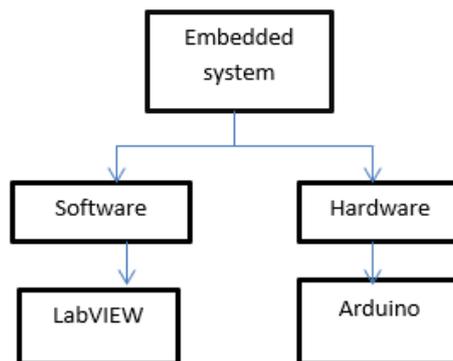


Fig.4: Embedded system

IV. Introduction to Ni-Labview

LabVIEW is the acronym for Laboratory Virtual Instrument Engineering Workbench. It is a graphical based programming language.VI (virtual instrument) is the basic LabVIEW element. [2] LabVIEW is a real time embedded for evaluation. It was introduced by National Instruments is a portable device and students can easily use it for the design and control of robots and may other system quite efficiently.[3] In this project the makerhub tool is used for arduino interface and web server tool is used for controlling and monitoring the front panel of the LabVIEW. By using the makerhub toolkit we can connect the digital output's from the LabVIEW software to Arduino Uno and collecting [7] current sensor output's samples from analog read from Arduino Uno to LabVIEW by serial communication. we can control and monitor the system by real time application by using internet through web server tool in the LabVIEW.

V. Current Sensor Calculation

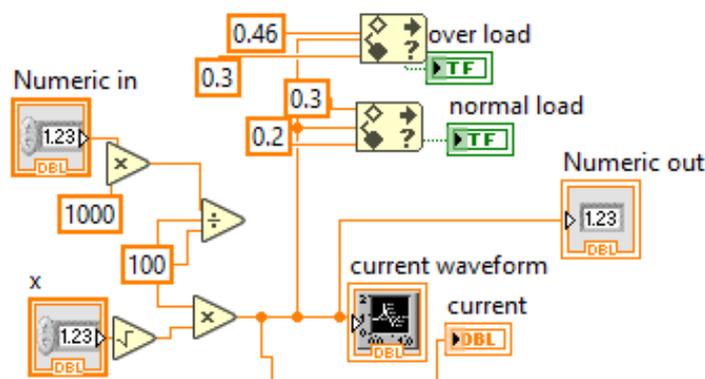


Fig.5: current sensor calculation

Current sensor detects and converts current to get an output voltage, which is directly proportional to the current. By using current sensor formulae the output voltage is,

$$Voltage = (RawValue \div 1024.0) * 5000$$

The raw value is output of the sensor,

$$RawValue = analogRead$$

The output current is measure as,

$$Amps = (voltage - ACSoffset) \div mVperA$$

ACSoffset is 2.5v

mVperA is 100 mv ;for 20A sensor

By using of above formules the current values can be determined in the LabVIEW simulation.[9]

MODELLING OF ENERGY METER EQUATION

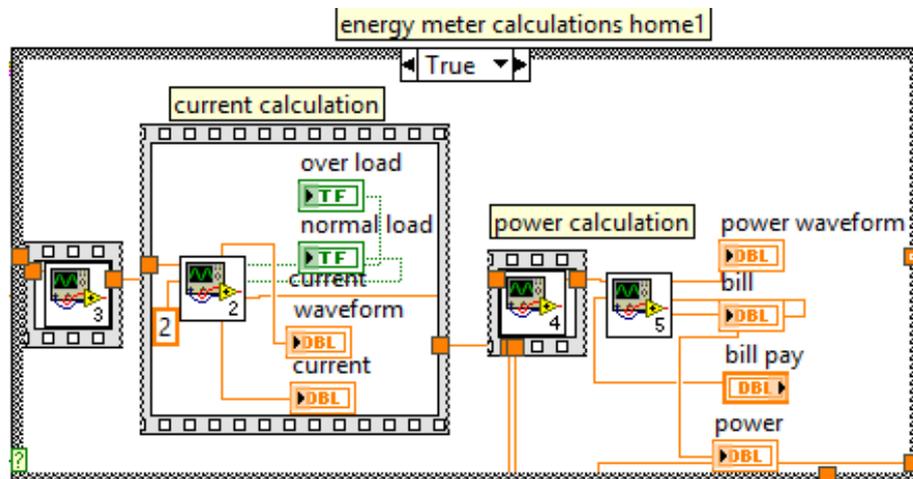


Fig.2: Energy meter calculation

$$Power = VI \cos \phi \text{ kWh}$$

Where v is voltage

I is current

ϕ is power factor

The current sensor output can be multiplied by the means of embedded software in the LabVIEW. That output can be stored in the host. The electricity bill can be sent to the consumer as well as supplier through the data web server day-by-day and monthly bill. The electricity bill sends through the web server to consumer and distribution board. Then consumer can pay electricity bill through the distribution billing websites i.e. billdesk and other third parties. If consumer didn't pay electricity bill long duration i.e. 6 months or more, the supplier can be disconnecting the meter connection through the remote placed in substation by web server front panel of LabVIEW. By using of simulation, the peak loads can be automatically indicating by front panel indicator (RED LIGHT). This process is done by taking of current sensor samples.

SIMULATION AND RESULTS

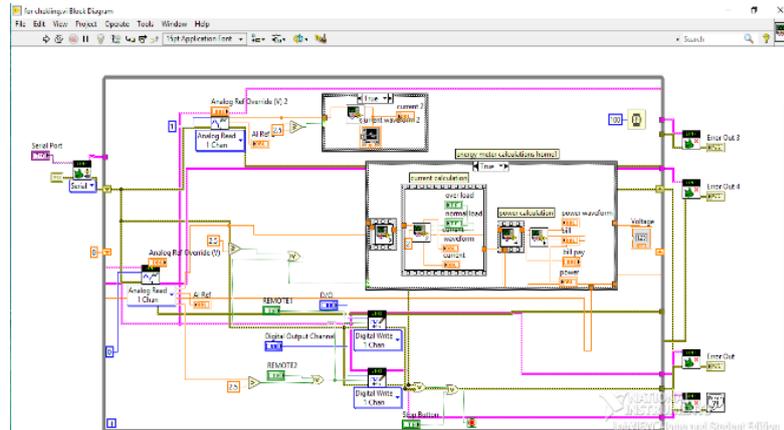


Fig.3: Block diagram

In this VI design of intelligent based remote control of electricity metering giving indication to the substation in any over load and day-by-day energy consumption to the customer and distribution. Initially we are operating constant loads and giving day-by-day energy consumption to the customer. Here the rated voltage is 230 volts and operating load is 10 amps as a constant load so there is no indication to the substation because of there is no over load on the feeder. In the present scenario there is no indication to the substation about over loads acting on the feeder. In this VI we designed indication to the substation about over loads acting on the feeders. [5] Here the rated voltage is 230 volts and operating current is 17 amps as an over load so their indication to the substation over load acting on the feeder. We can switch off power supply to the customer at the instant the indication is send to the customer through the web server in the energy meter display in the LabVIEW whenever high power and short circuit in the line the simulation is fixed constant current flow value the limit is more than that constant value that line is trip automatically by LabVIEW simulation and it's automatically recover when current is in normal value.

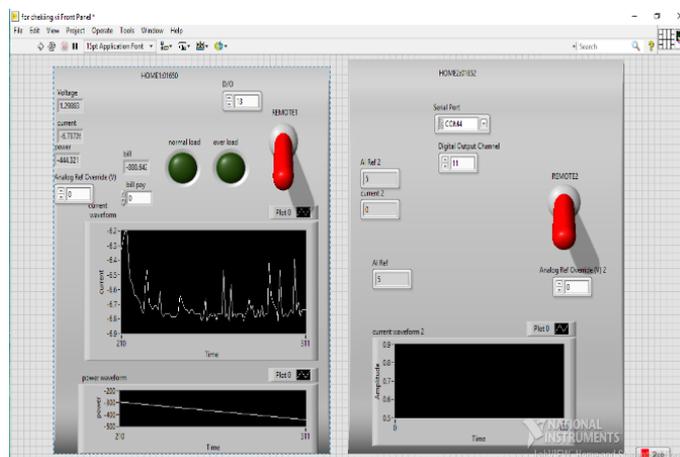


Fig.3: Front Panel

In the front panel of the substation monitor and control can be done by web server by using web publishing tool in the LabVIEW software. The consumer and supplier can be seeing the consumed bill, current measured, power, monthly bill, and remote-control switches. As the loads are varying continuously, the over loads and short circuits can be indicating in this front panel by indicating lights. The normal loads indicate the green light whereas over loads can be indicating by red light.

RESULT

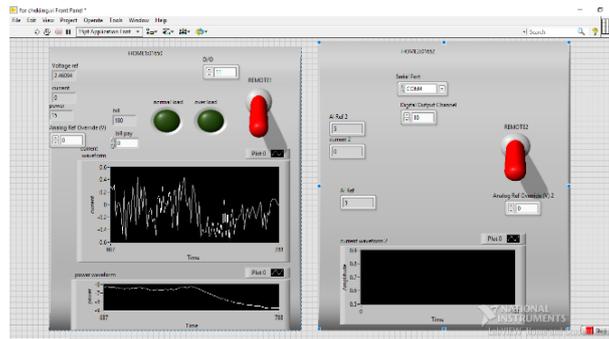


Fig.4: Output Waveform

HARDWARE



Fig.5: Project Hardware

VII. CONCLUSION

In this project work, we have implemented a complete working model using NI LabVIEW software. This project provides a best solution for the users to know how much amount of power is consumed in their day-to-day life and also the amount of power consumed is also under the user control and increases the transparency in power distribution.

Acknowledgement

Our special thanks to **National instrument** for providing the software. I would like to express my special thanks to **Mr.Y. BABU YADAV** who guided to complete this project hardware and simulation.

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