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POWER THEFT DETECTION

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Abstract: Electricity theft can be termed as fraud which can be in the form of meter tampering, illegal connections, billing irregularities and unpaid bills. The financial records indicate that most of the theft of electricity is in the form of stealing of power. In modern electronic meters, meter tampering and magnetic locking cannot be done. Hence now a days the most common type of power theft is done by hooking directly from the distribution lines. Electricity consumer dishonesty is a problem faced by all power utilities. Finding efficient measurements for detecting fraudulent electricity consumption has been an active research area in recent years. This project focusses on the detection of unofficial power consumption and transmitting it to the TNEB

Keywords: Power theft, Meter tampering, Micro controller, Amplifier, current transformer, energy meter.

I. INTRODUCTION

Electricity has become one of the most necessary elements of our daily life. Nowadays, it is something that people cannot live without. It has become a necessary element for the survival of maximum human beings. But with the increasing need of the electricity, the electricity theft is also increasing and it will keep on continuing until some measures are not taken to detect and control it. With the advancement of technology particularly in the field of microcontrollers, all the activities in our day to day living have become a part of information and we find microcontrollers at each and every application. Nowadays, energy distribution/consumption has become a big subject for discussion because of huge energy theft. Theft in this case refers to a deliberate attempt to steal considerable amount of energy by ensuring no/low energy recording in the metering device. Hence, there is a need to think in this line and proffer a solution to this ugly trend. Thus this paper focuses on electrical energy monitoring so that energy theft can easily be detected and huge penalties be imposed on these thieves. By detecting energy theft cases, the economy of a nation can grow rapidly. This research paper is aimed at developing a system which monitors and detects incidences of power theft, whether in the form of connecting load directly to the power line or bypassing the energy meter thereby paying less than what is consumed or by changing connection of lines. Higher energy prices deject consumers from buying electricity. Table II illustrates energy prices in different countries. In light of this, rich and highly educated communities also steal electricity to escape from huge utility bills. The type of microcontroller used for this monitoring and detection is AT89S52 microcontroller.

II. METHODS OF THEFT

Methods used to commit theft fall into the Following broad categories:

A. Connection of supply without a meter Connection of supply without a meter following disconnection for nonpayment or by “squatters” occupying empty properties.

B. Bypassing the meter with a cable

It coveted into the supply side of the metering installation (i.e. the meter terminals, the metering cables, the cut-out or the service cable).

C. Interfering with the meter to slow or stop the disc, including use of electrical devices which stop the meter or cause it to reverse (so-called 'black boxes).

D. Interfering with the timing control equipment used for two rate tariffs to obtain a cheaper rate. Methods (C) and (D) usually involve removal of official

(Certification) seals and/or company seals

III. POWER SUPPLY UNIT

The design of every power supply unit is of paramount importance. It happens to be the basic building block of every electronic design in the sense that the overall functionality of the design depends on it. The required voltage of the system is supplied by the power supply. Every electronic circuit requires a Direct Current (DC) voltage as against the Alternating Current (AC) voltage supplied by electricity Distribution Company. This AC voltage is usually stepped down and then converted to the required DC level source so as to power the sub-circuits. In order to achieve this required DC for this system, the following are required: a 240/12Vtransformer, bridge rectifier, filtering capacitor, and a voltage regulator. The interconnections of the above components give rise to the power supply unit.

IV. RECTIFICATION

Bridge rectifier was used for rectification. A bridge rectifier is a device that converts alternating current (AC) to direct current (DC).

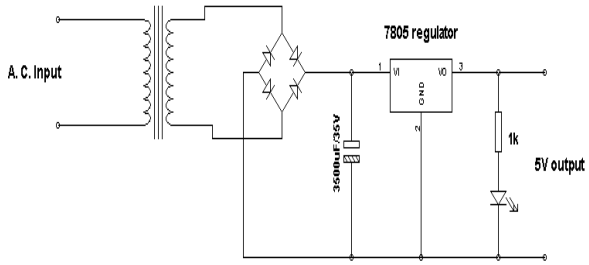
The process of rectification is brought about by the use of two or more diodes. Rectifier can be half-wave, full wave or bridge rectifier. Half wave rectification is achieved using only one diode while full-wave is achieved using two diodes. The type of rectifier required for this work is bridge rectifier and it is achieved by connecting four diodes in a manner shown in figure 3 below. The alternating current is fed to the bridge rectifier through terminals A and B while the rectified direct current is tapped from terminals C and D. During the positive half cycle, DR2R and DR3R are forward-biased while DR1R and DR4R are reverse-biased. During the negative half cycle, DR1R and DR4R become forward-biased while DR2R and

DR3R are reverse-biased. Thus in this way, current keeps flowing in one direction across any load connected to terminals C and D during both positive and negative cycles of the power supply.

V. FILTERING

After rectification, the output voltage still contains some ripples which need to be removed in order that the whole system functions properly. For this to be achieved a capacitor is connected in parallel with the output terminals.

This capacitor is called the smoothing capacitor and it serves as a reservoir for storing enough charges. Hence the value of this capacitor must be large enough to store much charge. The charges stored in this capacitor enable it to operate during the portion of AC cycle when the bridge rectifier is not conducting. To filter out the ripples, the capacitor charges up to near the peak of the AC half cycle and then discharges into the load for the remainder of the cycle, thereby obtaining a continuous DC supply.



VI. PROPOSED SYSTEM

The proposed system is designed to prevent the electricity theft happening in the present scenario, the increasing rates of the per unit electric power, because of theft of electricity due to this the electricity supplier companies are not able to recover the invested Amoeditor@ijtre.comunt, thus they have to undergo a large loss of revenue and thus, they increase the rates of electricity unit which the consumer has to pay. The proposed system will prevent the theft of electric power as much as possible. This system will not only detects the theft of electricity but also trace the location of theft and will trip the power supply of stolen power and also notify the nearest substation authority about this theft with exact location of the theft. This system will be installed at the supplier end but not at the consumer end. This system will need a background support in which separate lines for each connection will be installed from distribution boxes which are installed after the area transformers. The design system consist of 2 meters, 1 will be installed as the domestic meter which will monitor and indicate the power consumption of the house, and other will be installed inside the distribution box on the line the connection, which will indicate the power consumption of the line which starts from the distribution box and ends up at the house. Thus, every house will be having 2 meters, other than this there will be a processing unit which is programmed accordingly and with the help of 2 meters of a connection this unit can identify theft, if it identifies theft then the system automatically cut of the power supply of that particular connection and will notify the nearest substation that theft has been occurred at this location. One additional feature which is added to the system is that it can detect any kind of problem arising due to electricity such as short circuit. This part will be interfaced with the system and sensors are used to sense problem if any problem sensed the supply will be cut of and the LCD screen will display the problem.

VII. MICROCONTROLLER

A microcontroller is a single integrated chip or circuit which has features like processor, memory, and input/output pins. It is also known as a miniaturized computer in the sense that it has input and output, central processing unit, random access memory (RAM) and read only memory (ROM). It is a programmable memory device which accepts hexadecimal code and produces an output according to the instruction written in either embedded C language or assembly language. The microcontroller used for this paper is AT89S52. It has 8kB of on-chip ROM, 256 bytes of on-chip RAM, 4.0V-5.5V operating range, 32 programmable I/O lines, six interrupt sources. It contains the control program and its function is to co-ordinate all the activities of the entire system.

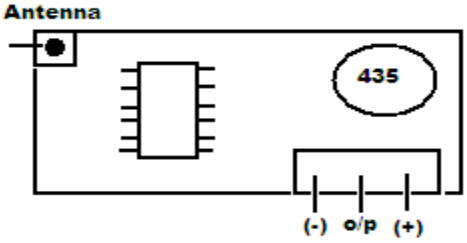
VIII. RF MODULE

RF modules are normally divided into three groups, RF transmitter module, RF receiver module and RF transceiver module. In system RF Transmitter transmit the signal from encoder to decoder.

Fig 7. RF Transmitter Module. Its range on open ground is 80m.Transmit Frequency is 315/433MHz.At decoder side RF Receiver is present for receiving the signal, and gives it to decoder, for decoding. Fig 8.

Receiver Module.

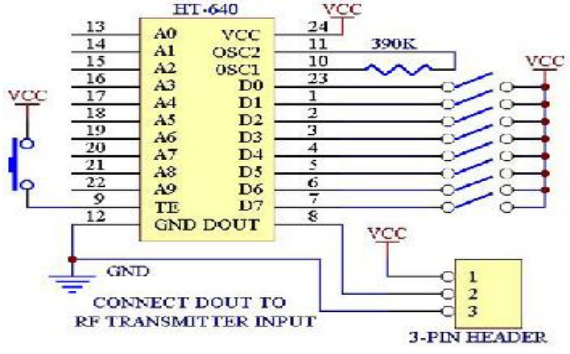
Receive frequency is 315/433MHz.



IX. ENCODER

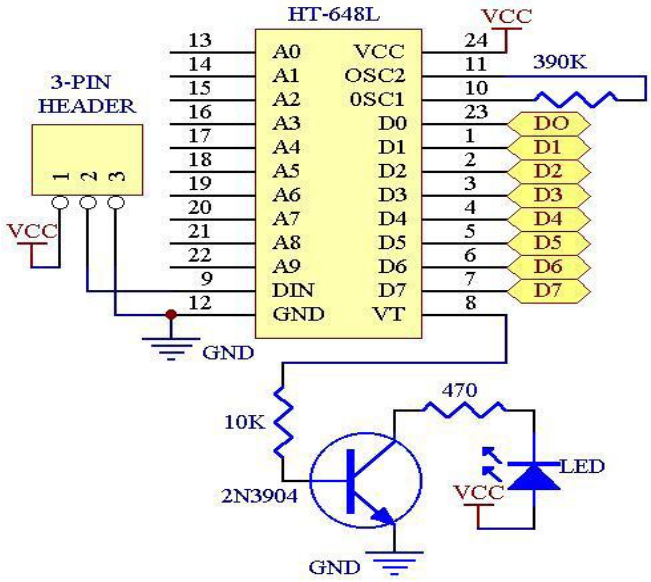
A digital circuit that produces a binary output code depending on which of its input is activated .The HT640 includes the following features: Scan, quick access channels, Battery life

Indicator Large LCD with back light.



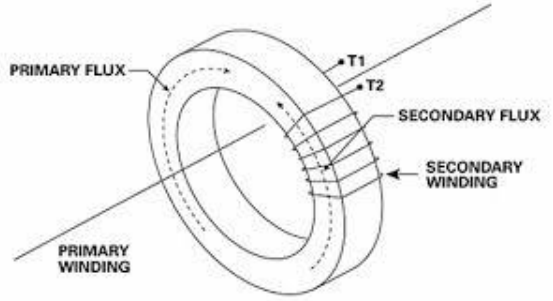
X. DECODER

A digital circuit that converts an input binary code into a single numeric out-put. Decoder HT648l decodes the incoming signals from encoder and send it to the server for comparing the outgoing and incoming signal for identifying power theft. Power Theft Detection Using RF

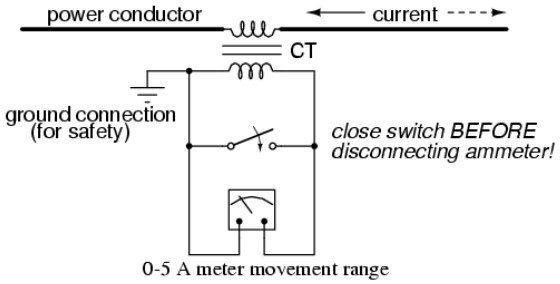


XI. CURRENT TRANSFORMER

A current transformer (CT) is a transformer that is used to produce an alternating current (AC) in its secondary which is proportional to the AC current in its primary. Current transformers, together with voltage transformers (VTs) or potential transformers (PTs), which are designed for measurement, are known as an Instrument transformer. When a current is too high to measure directly or the voltage of the circuit is too high, a current transformer can be used to provide an isolated lower current in its secondary which is proportional to the current in the primary circuit. The induced secondary current is then suitable for measuring instruments or processing in electronic equipment. Current transformers also have little effect on the primary circuit. Often, in electronic equipment, the isolation between the primary and secondary circuit is the important characteristic. Current transformers are used in electronic equipment and are widely used for metering and protective relays in the electrical power industry.



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.



XII. AMPLIFIER

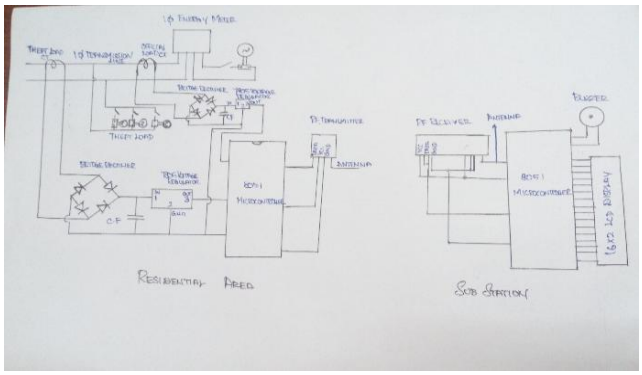
Lm 324 is an operational amplifier which is used to amplify the voltage with respect to the reference voltage. Here the amplifier is used in order to amplify the small voltage produced by the current transformer when small amount of load is been used unofficially. i.e. a small amount of power theft can also be detected by the microcontroller and transmitted to the electricity board.

XIII. FUTURE IMPLEMENTATION

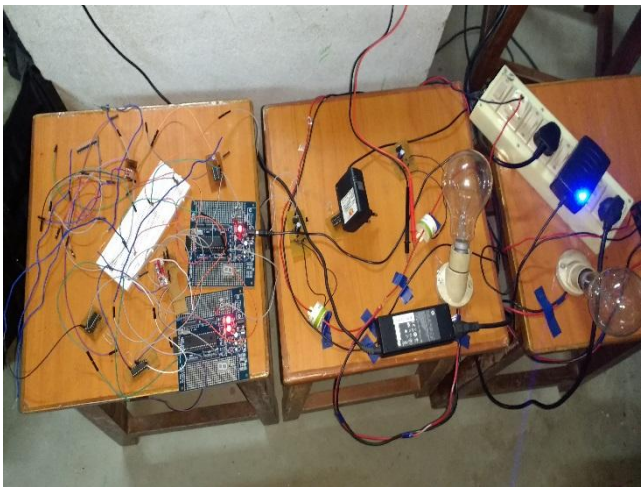
GSM modem.

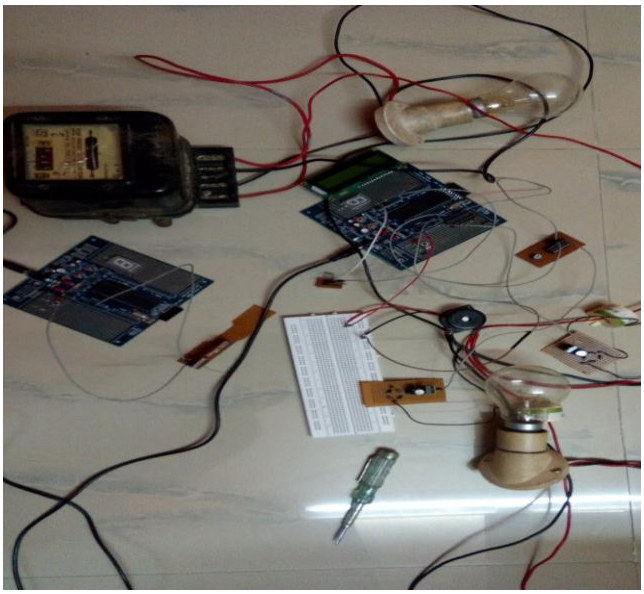
A GSM modem is a wireless device that works with a GSM wireless network. It operates over a subscription to a mobile operator. A wireless modem behaves like a dial-up modem. The main difference between them is that a dial-up modem sends and receives data through a fixed telephone line while a wireless modem sends and receives data through radio waves. From the mobile operator perspective, a GSM modem looks just like a mobile phone. When a GSM modem is connected to a computer, this allows the computer to use the GSM modem to communicate over the mobile network. While these GSM modems are most frequently used to provide mobile internet connectivity, many of them can also be used for sending and receiving SMS and MMS messages. Computers use AT commands to control modems (AT means attention). Both GSM modems and dial-up modems support a common set of standard AT commands. With these AT commands, you can do things like reading, writing and deleting SMS messages; sending SMS messages; monitoring the signal strength.

XIV. CIRCUIT DIAGRAM



XV. PROJECT PICTURE





XVI. CONCLUSION

This project detects electricity theft in social, economic, regional, political, infrastructural, literacy, criminal and corruption points of view. This project detects various cases, issues and setbacks in the design, development, deployment, operation, and maintenance of electricity theft controlling devices. In addition, various factors that influence people to steal electricity are minimized. This project illustrates the effect on quality of supply, burden on the generating station and tariff imposed on genuine customer.

