Multiplexed Energy Distribution Management System

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Abstract: - This system comprises of a main meter through which energy is distributed to various units having their individual sub meter. The energy meters used are electronic energy meters for high accuracy. The electronic energy meters are interfaced to a relay circuit so that the energy count can be converted into pulses. The main meter is interfaced to the PC parallel port using the relay circuit so that the total energy count can be calculated. Likewise the distant sub meters are interfaced by the relay circuit to an encoder circuit which converts multiple bit pulse pattern into a single serial stream, which is then wirelessly transmitted. The receiver at the main meter side receives the wireless signals are decoded using an appropriate decoder and fed to the PC. The PC now has the reading of the total energy count, the energy consumed by individual units and the Transmission & distribution loss percentage. This project is a solution to remote detection of illegal electricity[1]. By this project we prevent illegal usage of electricity and remote detection of illegal usage of electricity. We can achieve this with the help of four energy meters. The energy meters used are electronic energy meters for high accuracy. The electronic energy meters are interfaced to a relay circuit so that the energy count can be converted into pulses. Main energy meter delivers the power continuously to the three sub meters. The main meter is interfaced to the PC serial port using the relay circuit so that the total energy count can be calculated. Likewise the sub meters are interfaced by the relay circuit to an encoder circuit which converts multiple bit pulse pattern into a single serial stream, which is then wirelessly transmitted. The receiver at the main meter side receives the wireless signals and the signals are decoded using an appropriate decoder and fed to the pc. The PC now has the reading of the total energy count and the energy consumed by individual units. By comparing the data of main energy meter and three sub-meters, detection of illegal usage of electricity is achieved. For remote detection of illegal usage of electricity all the energy count is shown on computer. Thus energy

distribution can be managed in a very simple way.

Introduction:-

There is a huge demand for electricity and there is always a mismatch between supply and demand. Satisfactory operation of power system requires overall coordination of all the power system components. Attention and focus are given for generating power using both renewable and non- renewable energy sources of energy. But the transmission of power also plays a vital role in conveying power with minimal loss to the consumers. Hence proper maintenance of transmission as well as distribution network is mandatory for efficient and effective distribution of power. Though the losses associated with generation can be exactly formulated, there is no proper and precise quantification of transmission and distribution losses. Many parameters are involved and hence more data is required in addition to the sending end data.[2] Also it is not only the technical parameters that influences transmission and distribution losses, but also the non-technical parameters[3]. Power theft is one such parameter in developing countries. In India, the aggregate losses of discoms due to power theft and collection inefficiency stood at 19.72% of electricity purchases, according to the latest data.

A energy distribution management system is a collection of application designed to monitor & control the entire distribution network efficiently and reliably[4]. It acts as a decision support system to assist the control room and field operating personnel with the monitoring and control of the electric distribution system[5]. Improving the reliability and quality of service in terms of reducing outages, minimizing outage time, maintaining acceptable frequency and voltage levels[6].

Block Diagram:-

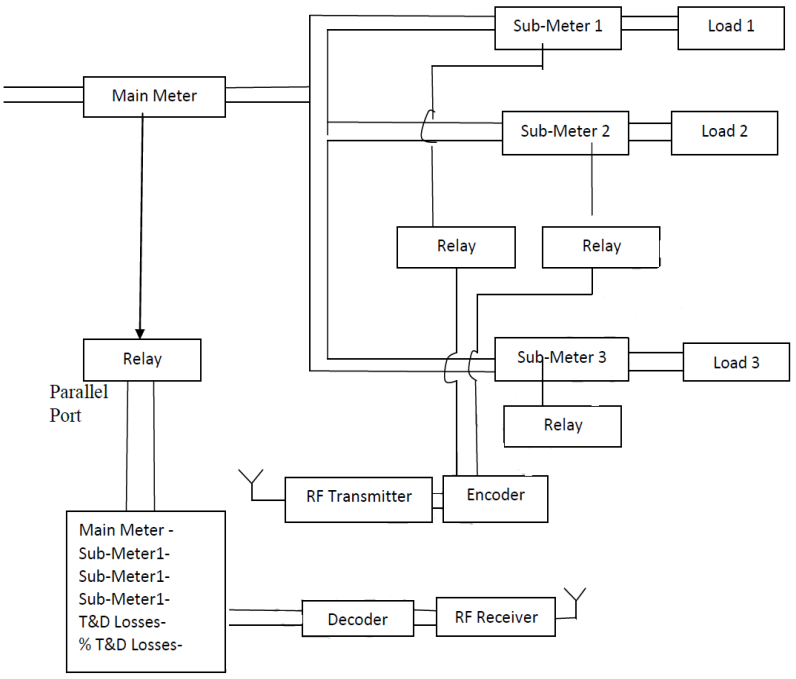

Fig: - 1. Block diagram of multiplexed energy distribution management system

Energy meter:-

A meter is any device built to accurately detect and display an electrical quantity in a form readable by a human being. Usually this "readable form" is visual motion of a pointer on a scale. In the analysis and testing of circuits there are meters designed to accurately measure the basic quantities of voltage, current and resistance. There are many other types of meters as well, but this chapter primarily covers, the design, meaning that their readable display is in the form of numerical digits. Older designs of meters are mechanical in nature, using some kind of pointer device to show quantity of measurement. In either case, the principles applied in adapting a display unit to the measurement of (relatively) large quantities of voltage, current, or resistance are the same.

The display mechanism of a meter in often referred to as a movement borrowing from its mechanical nature to move a pointer along a scale so that a measured value may be read. Though modern digital meters have no moving parts, the term "movement" maybe applied to the same basic device performing the display function.

TX433 (Transmitter Module):-

The TX433 wireless RF transmitter uses on/off keying to transmit data to the matching receiver, RX433. The data input "key" the saw resonator in the transmitter when the input is +3 volts or greater AM modulating the data onto the 433 MHz carrier. The data is then demodulated by the receiver, which accurately reproduces the original data. The data input is CMOS level compatible when unit is run in +5 volts[7].

When driving with a CMOS input, there must be enough level to achieve at least 3V on the data input, 5V is preferable. This is due to the start-up time of the oscillators needing to be fast to accurately reproduce your data. If the voltage is too low, the oscillator will not start fast enough to accurately reproduce your data, especially at higher data rates. Luckily not much drive is needed, so this should be easy since it is 22K ohms of load. Almost any CMOS output will drive this without any problem. There are some CMOS outputs which have very little drive capability which may not work, so testing the voltage at the data input may be a wise choice if you are having problems.

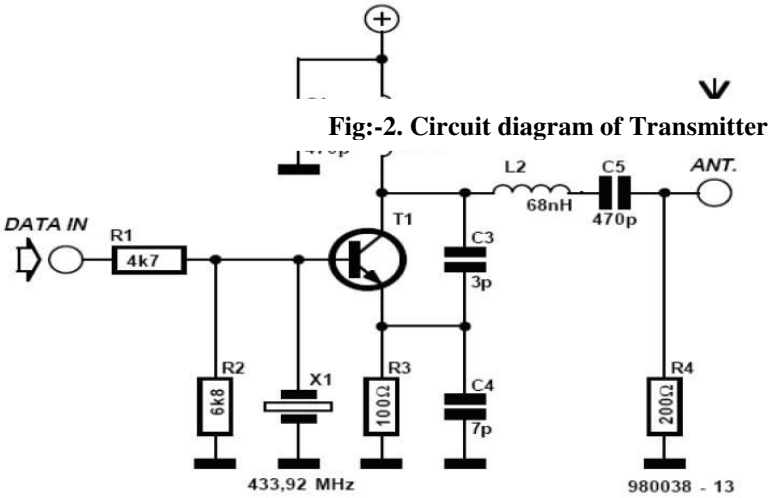

Fig:-2. Circuit diagram of Transmitter

RX 433 (Receiver Module):-

The receiver shown in Figure also contains just one transistor. It is biased to act as a regenerative oscillator, in which the received antenna signal causes the transistor to switch to high amplification, thereby automatically arranging the signal detection. Next, the „raw" demodulated signal is amplified and shaped-up by op-amps. The result is a fairly clean digital

signal at the output of the receiver. The logic high level is at about 2/3 of the supply voltage, i.e., between 3 V and 4.5 V.

The range of the simple system shown in Figures is much smaller than that of more expensive units, mainly because of the low transmit power (approx. 1 mW) and the relative insensitivity and wide-band nature of the receiver. Moreover, amplitude-modulated noise is not suppressed in any way.

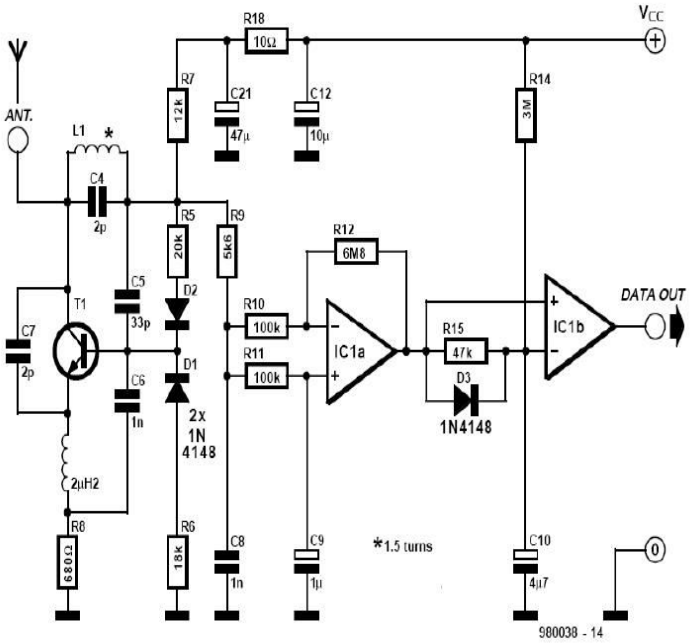

Fig:-2. Circuit diagram of Receiver

Tera Term Software:-

Tera Term (alternatively **TeraTerm**) is an open-source, free, software implemented, terminal emulator (communications) program. It emulates different types of computer terminals. It supports telnet, SSH 1 & 2 and serial port connections. It also has a built-in macro scripting language and a few other useful plug-ins.

Overview of Hardware of Project:-

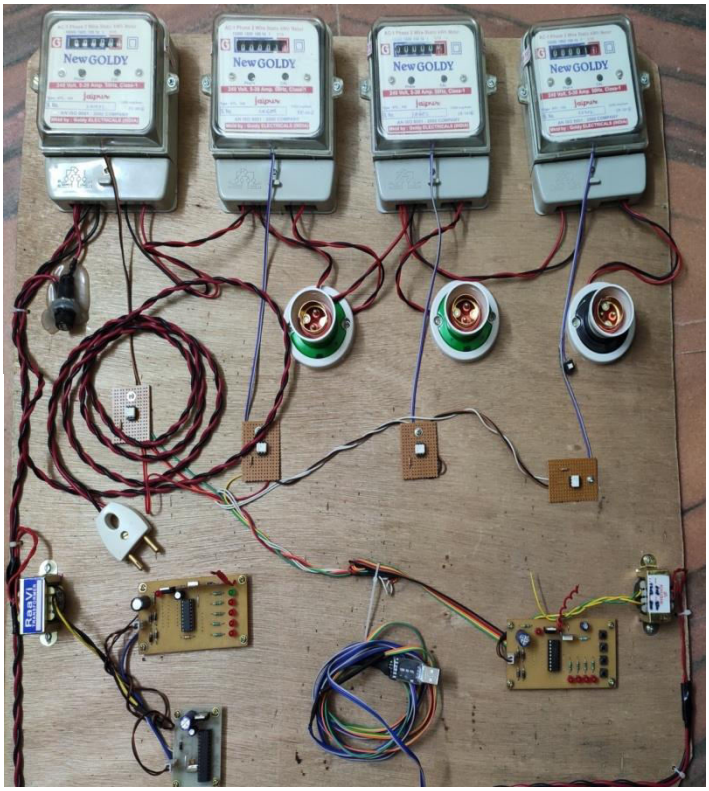

Fig:-3 Overview of Hardware of the Project

Conclusion:-

This project is a solution to remote ɔction of illegal electricity. By this project we prevent illegal usage of electricity and remote detection of illegal usage of electricity. We can achieve this with the help of four energy meters.

One is the main meter and others are sub-meters. The main meter is connected to relay, which is connected to the parallel port. All the sub-meters are connected to the load in series and also connected to the relay as shown in block diagram. The entire relay connected to the encoder and this encoder is connected to RF transmitter. Other side as shown in block diagram a decoder and RF receiver is

connected to the parallel port which in turn gives the readings on the PC.

Future Scope:-

This project has great scope in future enhancement and implantation. With some modification and addition of advanced components, it could be used for power theft and automatic meter reading.

This project can be use for analysis of power consumption of housing society, a particular area and the non- technical parameters like power thefts can be reduce. If these type of system assembled in particular areas then we are able to know real time data of power consumption of loads and can track the thefts. And by tracking these non technical parameters, the power system will become more secure and stable.

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