ELECTRICITY TARIFF INDICATOR

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Abstract

This paper depicts the electricity billing system named "electricity with tariff indicator". It is easily accessible by the consumer, in which any consumer can buy a memory card (which is an EEPROM IC) with a password stored inside using a MC program. Different ranges of memory card are easily available. The Female symbolizes the memory card. The smart card is protected from other user. This is done when the consumer inserts a female (prepaid card) into male (card reader) which is connected to the kit. The stored into is read by the male and the info is deleted from the EEPROM IC with the aid of a microcontroller program. To avoid any inconvenience of the deletion of whole amount it is equipped with an alarm sound, which is another add on of our project

In this scheme, each consumer is provided with a memory card (female); with password and the required number of units pre-entered by the service provider and a microcontroller based system is installed at each consumer premises. The microcontroller based system is activated only after insertion of prepaid card and ensures the authentication and keeps track on consumption of energy, and cuts down the supply if either authentication fails or consumption expires. In this scheme the Electronic Energy meters are employed for measuring energy which will output a fixed number of pulses per unit of Energy which can be counted to estimate the units consumed.

Keywords-to design and develop tariff indicator system for distribution of Electrical Energy using 89C52 Microcontroller.

Introduction

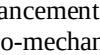
Electricity tariff indicator, the only direct revenue interface between utilities and the consumers, have undergone several advancements in the last decade. The conventional electro-mechanical meters are being replaced with electronic meters to improve accuracy in meter reading. The prepaid meters in the market today are coming up with smart cards to hold information on units consumed or equivalent money value. When the card is inserted, the electricity tariff indicator reads it, connects the supply to the consumerloads, and debits the value. The meters are equipped with light emitting diodes (LED) to inform consumers when 75 percent of the credit energy has beenconsumed. The consumer then recharges the prepaid card from a salesterminal or distribution point, and during this process any changes in the tariff can also be loaded in the smart card.[1]

Over 40 countries have implemented prepaid meters in their markets. In United Kingdom the system, has been in use for well over 70 years with about 3.5 million consumers. The prepaid program in South Africa was started in 1992, since then they have installed over 6 million meters. Other African counties such as Sudan, Madagascar are following the South African success. The concept has found ground in Argentina and New Zealand with few thousands of installations. The electricity tariff indicator used in this project work produces pulses according to the load and this meter is converted as prepaid electricity tariff indicator using smart card, hence this meter can be called smart electricity tariff indicator.This kind of smart electricity tariff indicators can also be installed at each and every house, where the state electricity department going to supply the conventional energy. Now a day's energy Measurement and electric energy pilferage detection has become prime importance for the state electricity department.[1]

Components used

1. Microcontroller 89C52
2. LCD (16*2 character)
3. Resistance
4. Capacitor
5. Transistor
6. IC-4013 (dual D type flip flop)
7. Transformer
8. Crystal oscillator
9. Smart Card (Female)

Resistors

The resistor's function is to reduce the flow of electric current. This symbol  is used to indicate a resistor in a circuit diagram, known as a schematic. Resistance value is designated in units called the "Ohm".[2]

LCD (16*2 character)

The 16*2 Parallel LCD is an 8 bit or 4 bit parallel interfaced LCD. This unit allows the user to display text, numerical data and custom created characters. The LCD uses the HD44780 series LCD driver from Hitachi, or equivalent controller. The LCD is connected to a female 14-pin connector for easy interface

with the BS2p24/40 Demo Board (#45187) and the Professional Development Board (#28138).[3]

MICROCONTROLLER 89C52

The AT89C52 is an erasable read only memory (PEROM) with 8K bytes of flash programmable has a low power performance CMOS 8 bit microcontroller as shown in fig 1. The device meets industry stands 80C51 and 80C52 instruction set and pin out which is because the device is manufactured using Atmel's high density non -volatile memory technology. The program memory can be reprogrammed in system or by conventional non-volatile memory programmer because of the on chip flash. The Atmel AT89C52 is a powerful microcomputer as it is coupled with a versatile 8bit CPU with flash on a monolithic chip. Because of these features it provides a highly flexible and cost effective solution to many engrafted control application..[4]

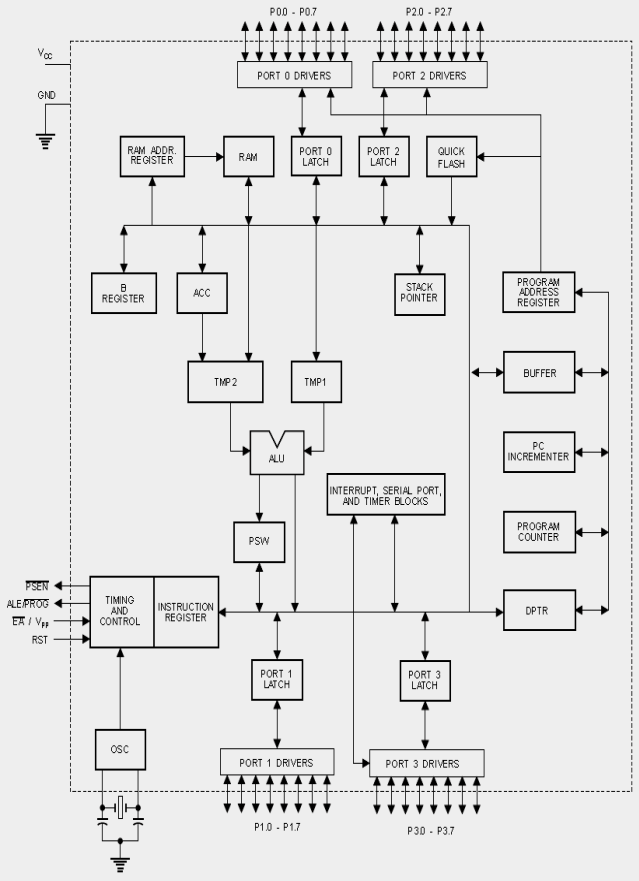


Fig.1 : Block Dig. Of microcontroller AT89C52[4]

555 TIMER

The 555's operation and relaxation oscillator's working becomes similar when 555 is wired as an oscillator, this mean there is a capacitor voltage that moves between two thresholds. To find out when to flip the output state, the555 uses two comparators comparing Vcap against 1/3and 2/3 f Vcc. monostable and astable are the two basic modes of operation which is shown fig no 2 and fig no 3.[5]

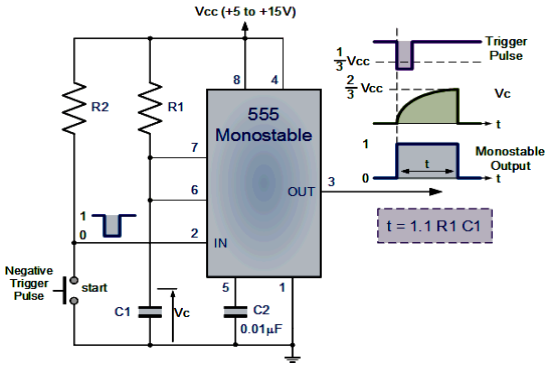


Fig.2: 555 timer in monostable mode[5]

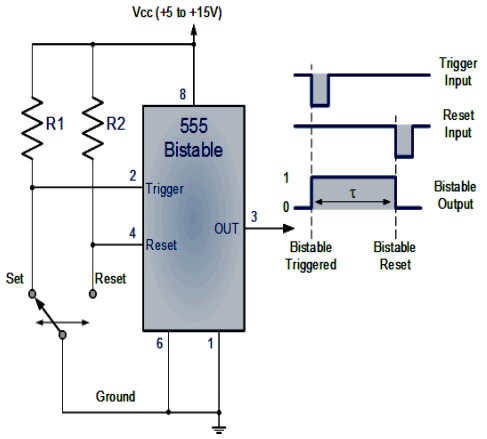


Fig.3: 555 timer in astable mode[5]

Crystal Oscillator

The oscillator's most important feature is its frequency stability which can also be defined as the ability to provide a constant frequency output under varying conditions. Temperature, variations in the load and changes in the power supply are some of the factor which affects the frequency stability used for the resonant feedback circuit including the amplifier.Proper selection of components can enhance the frequency stability of output signal but this is accompanied by a limit to the stability that can be obtained from normal LC and RC tank circuits. A quartz crystal is most of the times used for very high stability as the frequency determining device. This quartz crystal produces another type of oscillator circuit termed as crystal oscillator as shown in fig 4.[6]

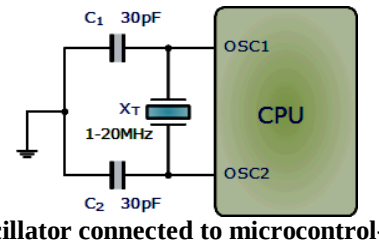


Fig.4: Crystal oscillator connected to microcontroller

Smart Card (Female)

Same size as a standard credit card. A microchip embedded in a plastic card to store information. Latest silicon technology does not require use of batteries. The chip can be programmed to carry out specific functions.[7]

Types of Smart Cards:

1. Contact based Smart Card:

Functions are carried out when there is a physical contact with the reader. [7]

2. Contact less Smart Card:

Because of the antenna coil and an embedded chip within the card no physical contact is required. The translation is processed as the internal antenna allows for communication and power with a receiving antenna in the reader. [7]

1. Microcontroller cards:

It is expensive but versatile also and provides the important feature of security.

Power Supply Circuit Working

In the powersupply circuit the 230 v supply is given to the step down transformer up to gradually 12 V AC. This step down transformer connected to bridge rectifier i.e. IC 4007 which convert the AC to DC supply. This DC supply pass to the 470 µF capacitor C1 used for back up to the main circuit against the failure of power supply or any abnormal condition. Then the IC 7805 converts the whole DC supply up to +/- 5V DC & capacitor C2 (1µF) it is for charging and discharging as shown in fig.5.[8]

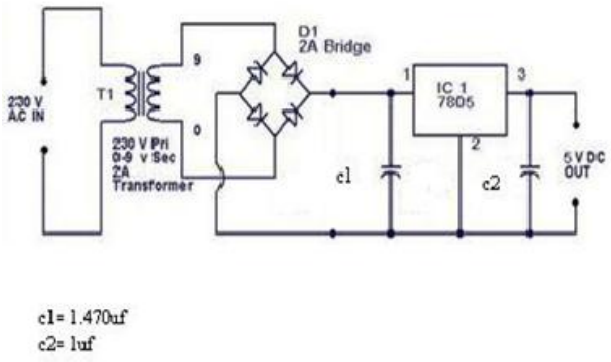


Fig.5: Power supply circuit

Working Of Electricity Tariff Indicator

A current transformer is used along the conjunction with bridge rectifier (IC 4007), capacitor (470µF) and a load connected with it.Here AC is converted by bridge rectifier to the DC and 470 µF is used for providing back up to the main circuit.Then these supplies are given to pin 3 & 4 of the IC 4066 and the pin 14 is connected with conjunction of BJT to 555 timer.555 timer gives thetime count of the bill according to the program feeded in the microcontroller.

The 10 kΩ resistance connected while doing the interfacing with microcontroller to IC 4066 and BC 547 BJT is for regulating the current.The crystal oscillator connected with the microcontroller is for providing clock pulses at constant frequency.The software program is saved in microcontroller.

The switch s1 is connected to recharge to read the code of the tariff of a prepaid card (female) connected with the card reader (male).The switch is pressed to read the card and recharge the tariff indicator.The LCD used of 16 * 2 characters with 10 kΩ resistance.The LCD is used for displaying the bill or the amount how much left.A buzzer is used to give alarm when the amount is less than the present value that is been set in the program as shown in fig.6.

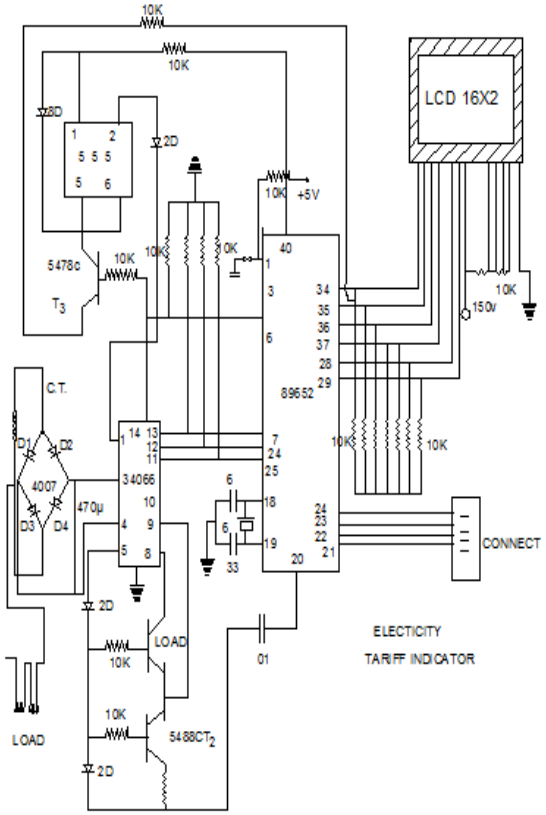


Fig.6: Main circuit Diagram

Coupon Circuit Working

The coupon as shown in fig.7 is used for recharging the electricity tariff indicator is made of IC 4013 dual d type flip flop.Pin 1, 6, 8, 13 of IC 4013 is used to

connect with female and recharge the tariff indicator. This coupon can be of any amount according to the availability and frequent use.Once this coupon is used its code cannot be reused. Only new code of coupon can be used to recharge again.

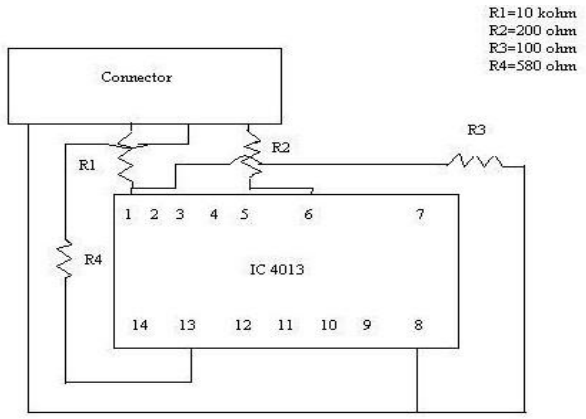


Fig.7: coupon circuit diagram

Benefits Of This Project

For Energy Suppliers

- Pay before use, keep customers on supply, recover money owed (debt), lower Overheads.
- No bill production, no bill distribution, no need to chase payments**,** no further actions such as disconnections,
- Social Acceptability**,** customer responsible for disconnect**,** load and Demand Side Management**,** limit load**,** load based**,** time based.

For Customer

- Flexible payment solution**,** pay to suit your income status**,** daily, weekly, monthly budgeting**,**
- Show true cost of consumption and money left**,** reduce consumption when income is tight– make money last**,** reduce waste – conserve energy**.**
- No Bills**,** no hidden surprises**,** no having to find the money**,** no billing errors**,** no socially unacceptable**,** disconnections.

Conclusion

Advanced electricity meters that generate consumption data enabling customers to see when they are using energy, to manage that use more efficiently

To save money by adjusting energy use in response to price signals.To save money, the consumed energy corresponding price is displayed for the consumer benefits.

This project work has been taken up which serves the purpose of energy monitoring and controlling by implementing prepaid system. It is hoped that this work helps the electrical engineers for better energy management and its utility in the distribution system for economic liability of the electrical companies.

Acknowledgment

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Biography

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