

COST DISPLAY DIGITAL ENERGY METER (CDDEM)

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Introduction

Cost Display Digital Energy Meter is designed for displaying the unit of Electric Energy. It also displays how much cost of Electrical energy is incurred in each movement. Also using this theme it is also possible to find out everyday how much Electrical Energy is used in different sectors of an industry. Basically it is designed for household purpose. For example, now-a-days, people are not satisfied with their electricity bill. They are unable to calculate how much of Electrical Energy is used at every instant. Also they cannot calculate readily the amount pertaining to different slab cost rules of electricity board. Hence cost display digital energy meter may prove to be quite handful in today's perspective. After all, this meter would help them find out the quantity of electricity consumption each time they wish.

Electro mechanical energy meter

The general electromechanical energy meter is based on the principle of deflection of electromagnetic field. In the point of view of construction there is a circular disc which is rotated by application of rotating magnetic field. The rotating magnetic field is generated by current coil and by voltage coil. This circular disc is joined with a gear which is again connected with gear display.

Problem for Electromechanical energy meter

Today all measuring meters are digitized. So they

have become very accurate and very precise.

The Electromagnetic Energy meter has some problems. There is no protection from Surge. The current coil and voltage coil are damaged very often. The circular disc gets deflected from its path. The gear display can be jammed. The gears may not be setting properly. The main problem for this energy meter is damage of current coil and voltage coil. Moreover, the large problem in this case is manual meter reading control. The rotating magnetic field is changed by high power magnet outside. As a result, the meter reading gets changed and it gives different value less than the actual value of energy.

Development

A very preliminary idea is introduced here. Just by using the concept of circular disc along with the primary microprocessor 8085 we can make this circuit. At present it is now developed in advance stage. Here the basic concept is presented briefly.

Circuit Explanation

The mechanical energy meter works on the principle that when the circular plate completes 1600 cycles (or 1800 cycles) 1 unit is counted.

The circular plate has one hole. A light is placed at the upper side of the hole. And a light dependent diode (LDD) is situated at the bottom of this light. They are placed so as the light, the hole and the LDD are in straight line. Because LDD is sensed when hole comes between the light and LDD.

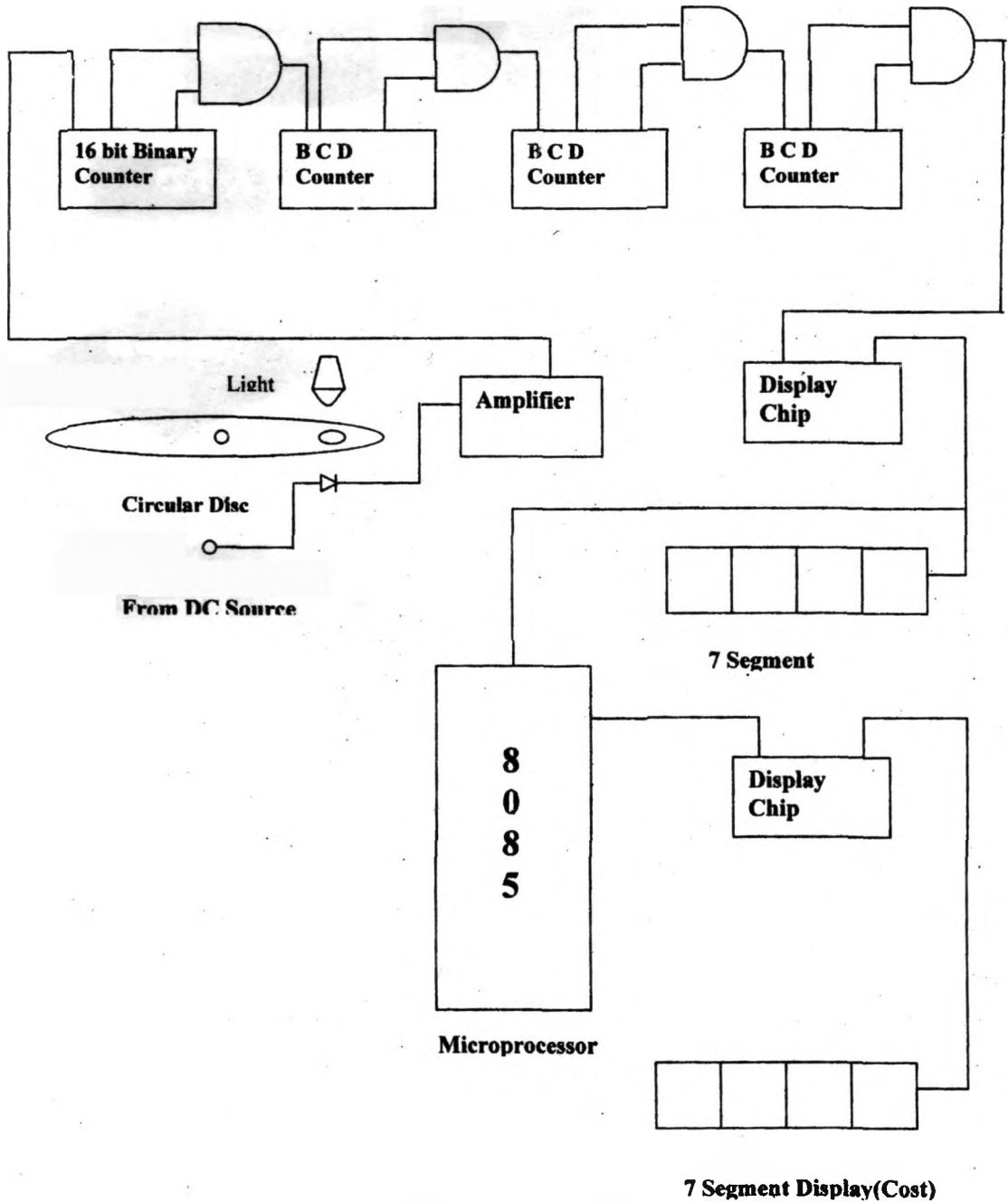


Fig 1: Circuit Block Schematic Diagram

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The signal is passed through the LDD to complete one circular path of the hole and make single pulse. The pulse is passed through the amplifier and fed to the input pin of 16 bit binary counter (SN74LV8154) then after counting of 16 times the MSB Q1 and USB Q16 are logic 1. And than it is passed through the AND gate and fed to the BCD (74LS46) input. When the output of BCD Q0 and Q3 are logic 1 then it counts (16*10) times and then it is passed through the AND gate.

The same phenomenon of circuit of BCD is done another time and then through AND gate it is passed through display chip (7447) and then 7 segment display comes up.

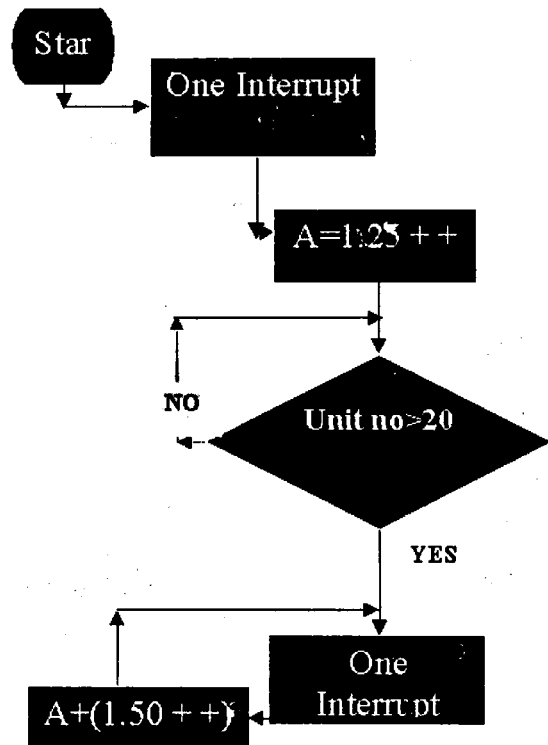
Also this peak is created interrupt of 8085 Microprocessor by peripheral. And there is program displaying the cost Rs.1/unit for 100 units. When the counter exceeds 100 cost of current it becomes Rs.2/ unit. After passing through play chip it is displayed. .

Also for supplying DC power AC to DC converter is required or the out side battery can supply the power.

Microprocessor Programming

As 8085 Microprocessor is very privileged but for testing purpose we have used this type of program considering fixed slab of 20 unit (BOT) and the cost of 1 unit current under first step is Rs. 1 per unit and when it is greater than 20 it costs Rs.2 per BOT (Board of Trade Unit).

Flow Chart:



Firmware programming:

Main Program

```
EI  
INTR  
CALL Subroutine1;
```

Subroutine1:

```
MVI A,02H  
CMI 14H  
JNC Subroutine2;
```

Subroutine2:

```
ADD 03H  
JMP Subroutine2;
```

The main program is the interrupt program which is called display function. Display function is basically used for displaying the cost of electricity but there was huge mismatch and complication in this programming. But as a preliminary stage it was accepted. In the newly developed concept it is differently introduced.

The above program is basically very short portion of main program. It only supports the flowchart. The 8085 processor is very privileged. But for testing propose we have used this type of processor considering first slab as 20 units (BOT) and the cost of 1 unit current under first slab is Rs.2/unit; when the unit consumption is 20 the cost is Rs.3/unit (BOT). Obviously, in general the slab is not like that. We have considered this range just for the sake of simplicity.

Advanced thinking in Development

The development took a new turn when YECOS Ltd took over this project and sponsored. There was different proposal which was introduced by West

Bengal State Electricity Board. The development is also going on to achieve the goal. The primary concept of this Cost Display Digital Energy Meter is getting advanced and new thoughts are pouring in.

The Problem in Primary Circuit

There was some problem in Cost Display Digital Energy Meter circuit. The use of 8085 Processor has made the circuit complicated. Also the use of peripheral interrupt may lead to some error in the actual reading. Also the LDD may miss the light or some complex problems may be there.

The Developed Circuit Introduction

Today is the age of Microcontroller. All the electronic thinking is converted to the processor concept. And on the base of development the advanced embedded technology is introduced. So the concept of 8085 Processor is gone. The microcontroller AT89C2051 Processor chip is in use. Using this chip the mathematical operation can be done easily and for the display program the internal RAM can be used easily which is situated inside the AT89C2051 microcontroller chip.

The concept of rotating disc is also avoided. The power measurement IC already is developed. So using this IC the Electromechanical concept is avoided. The display is also done by using VFD Display.

The new concept on the way of Development

In the past the telephone bill was made by telephone exchange after one month or two months. So there is no clear view for a consumer to know how many calls they had made. Also sometimes exchange could not get original value of service money for manual fault. After introduction of digitized system the calculation became accurate. Also when mobile communication

developed cash card system was introduced. So the consumer can get talk time before use of it. Also if somebody cannot take the cash card he cannot use outgoing facility also.

In case of Cost Display Digital Energy Meter (CDDEM) this cash card system concept is developed. Today the electromagnetic energy meter can make its reading for every two months. The reading is checked manually. If any consumer cannot pay their bill within the actual given date the electricity line is cut out manually. But it is very lengthy and abstract process. To minimize this type of problem the Cost Display Digital Energy Meter (CDDEM) is developed.

The development is going purposefully. The concept of Cash card system cannot be applied here. Because to setup the concept of cash card the huge network should be introduced. So the cash card system is changed by a down counter. The devious is in the preliminary stage of the development which can be attached with the energy meter and also it has the port which can connect with the energy reading mentioned

devious (generally Computer). Consumer can easily take this device (mobile devious) to the electricity office and recharge the energy unit (BOT) as for their requirement. Then he connects it with the meter. So the energy value is consumed and the amount of money becomes gradually low as the talk time balance becomes low. There is a circuit of power relay which is connected to the line. So if the energy value of the devious becomes zero then the relay circuit is on and the power is disconnected from the consumer. But there is a concept of alarm when the energy balance is very poor.

Conclusion

Today all the manual system is automated and digitized. In view of this automation this project is tried to make the automatic digitized concept of the previous electromechanical energy meter further developed. There is only a hint of circuit and concept of Cost Display Digital Energy Meter (CDDEM) development as depicted in the present article.