PREPAID ENERGY METER
INTRODUCTION:

A scheme of Electricity billing system called "PREPAID ENERGY METER WITH TARIFF INDICATOR" can facilitate in improved cash flow management in energy utilities and can reduces problem associated with billing consumer living in isolated area and reduces deployment of manpower for taking meter readings.

Every consumer can buy a memory card (is nothing but an EEPROM IC) with a password stored inside it using a MC program. The memory card is available at various ranges (i.e. Rs 50, Rs 100, Rs 200 etc). In our project we have given the name for memory card as smart card.

When the consumer inserts a smart card into the card reader which is a connected kit. Then the card reader will read the stored information and delete the information from the EEPROM IC (smart card) using the MC program. So that the smart card cannot be reused by others. Suppose if a consumer buys a card for Rs.50/- he / she can insert this amount through the card reader so that prepaid energy meter with tariff indicator kit will be
activated. According to the power consumption the amount will be reduced. When the amount is over, the relay will automatically shutdown the whole system. In our project we also have a provision to give an alarm sound to consumer before the whole amount is reduced.

A BRIEF INTRODUCTION TO

8051 MICROCONTROLLER:

When we have to learn about a new computer we have to familiarize about the machine capability we are using, and we can do it by studying the internal hardware design (devices architecture), and also to know about the size, number and the size of the registers.

A microcontroller is a single chip that contains the processor (the CPU), non-volatile memory for the program (ROM or flash), volatile memory for input and output (RAM), a clock and an I/O control unit. Also called a "computer on a chip," billions of microcontroller units (MCUs) are embedded each year in a myriad of products from toys to appliances to automobiles. For example, a
single vehicle can use 70 or more microcontrollers. The following picture describes a general block diagram of microcontroller.

**AT89S52:** The AT89S52 is a low-power, high-performance CMOS 8-bit microcontroller with 8K bytes of in-system programmable Flash memory. The device is manufactured using Atmel’s high-density nonvolatile memory technology and is compatible with the industry-standard 80C51 instruction set and pinout. The on-chip Flash allows the program memory to be reprogrammed in-system or by a conventional nonvolatile memory programmer. By combining a versatile 8-bit CPU with in-system programmable Flash on a monolithic chip, the Atmel AT89S52 is a powerful microcontroller, which provides a highly flexible and cost-effective solution to many, embedded control applications. The AT89S52 provides the following standard features: 8K bytes of Flash, 256 bytes of RAM, 32 I/O lines, Watchdog timer, two data pointers, three 16-bit timer/counters, a six-vector two-level interrupt architecture, a full duplex serial port, on-chip oscillator, and clock circuitry. In addition, the AT89S52 is designed with static logic for
operation down to zero frequency and supports two software selectable power saving modes. The Idle Mode stops the CPU while allowing the RAM, timer/counters, serial port, and interrupt system to continue functioning. The Power-down mode saves the RAM contents but freezes the oscillator, disabling all other chip functions until the next interrupt.

The hardware is driven by a set of program instructions, or software. Once familiar with hardware and software, the user can then apply the microcontroller to the problems easily.

The pin diagram of the 8051 shows all of the input/output pins unique to microcontrollers:
The following are some of the capabilities of 8051 microcontroller.

- Internal ROM and RAM
- I/O ports with programmable pins
- Timers and counters
- Serial data communication

The 8051 architecture consists of these specific features:

- 16 bit PC & data pointer (DPTR)
- 8 bit program status word (PSW)
- 8 bit stack pointer (SP)
- Internal ROM 4k
- Internal RAM of 128 bytes.
- 4 register banks, each containing 8 registers
- 80 bits of general purpose data memory
- 32 input/output pins arranged as four 8 bit ports: P0-P3
- Two 16 bit timer/counters: T0-T1
  - Two external and three internal interrupt sources Oscillator and clock circuits.
How to recharge your card,

For making a unit price card for Rs 2.50

1. Insert the card into the Programmer

2. Dial 1*0250#

The format is

1 for unit price

* for start process

- Higher digit of the unit price

- lower digit of the unit price

- Higher digit of the unit paise

- lower digit of the unit paise
3. The red led will blink for every key press

4. If the programming done successfully then the Green led will long Blink finally.

5. If it fails then the RED led will give a long blink

**For making a Recharge card for Rs 400**

1. Insert the card into the Programmer

2. Dial 2*0400#

3. The red led will blink for every key press

4. If the programming done successfully then the Green led will long blink finally.

5. If it fails then the RED led will give a long blink
**BLOCK DIAGRAM:**

**Transmitter Circuit:**

![Transmitter Circuit Diagram](Image)

*Fig 6.1 Block Diagram of Transmitter Circuit*

**Receiver Circuit:**

![Receiver Circuit Diagram](Image)

*Fig 6.2 Block Diagram of Receiver Circuit*
CONCLUSION:-

The digital energy meter used here is a high accuracy, low cost, single phase power meter based on the ADE7757. The meter is designed for use in single phase 2 wire distribution system. A relay is connected in between power lines and the load. The relay is controlled by the primary controller. Microcontroller 89C51 acts as the primary controller. The primary controller collects information from digital energy meter as well as from the smart card. Smart gives information about the limitation of units. The digital energy meter reading is compared with the smart card information by the primary controller and hence suitably primary controller controls the relay.
References:

The 8051 microcontroller and Embedded systems using assembly and C Muhammad Ali Mazidi, Janice Gillespie Mazidi


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6. AT89c51 datasheet available at www.alldatasheets.com