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AUTOMATIC METER READING FOR ELECTRIC BOARD USING RF (RADIO FREQUENCY)

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Abstract: *This project proposes the AMR system starts at the meter. Some means of translating readings from rotating meter dials, or cyclometer style meter dials, into digital form is necessary in or to send digital metering data from the customer site to a central point. With the use of Electro-optical interface and Signal Processing Electronics. In this project will have communication in between EB (electrical board) office to house/industry energy meters for taking the electrical energy usage and sent to the used electrical energy bill amount to house/industry and the same time if they are not paid the bill on time the EB will disconnect the house/industry electrical power line and after paid the bill will reconnect the connection without going in to the home/industry area, this all will be do by using RF communication technology.*

Keywords: *RF transmitters. TF receivers, Encoders, Decoders, RX antenna, TX antenna, Microcontrollers, Sensors*

I. INTRODUCTION

Electricity Board measures the power consumption by the consumers using Energy meter. In the present scenario every month an officer from the electricity board office will visit firm/house and issues a bill based upon the consumption rate read on the energy meter for a period of 30 days. Issued bill must be paid within a period of 20 days from the issued date otherwise; the main connection line for power will be disconnected on 21st day by the workers of electricity board. After the payment of due amount the power line will be reconnected. This is the way in which the electricity department is running on in the present day situation.

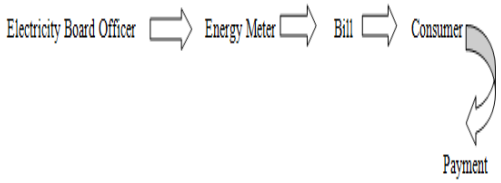


Fig1: Electricity bill generation loop through AMR

The home/industry energy meter will connect the microcontroller unit and this unit will have the connection to energy meter, RF transmitter and receiver, control unit, display unit, sensor unit and etc, the sensor will take the meter reading with the help off meter will rotation/pulse and it will sent to the microcontroller and this controller will display the present used energy reading in units as well as amount of the units, and the controller will convert as a bit address and it will send to encoder, the encoder will encode as a IF signals, this IF signals will send to RF transmitter for converting the RF signals as well as to transmit the signal to the EB, after receiving this RF signals will convert as a IF signals in EB office side unit and the same time IF signals will decode with the help off decoder, after decoding the if signals it will convert as a bit address and this address will send to microcontroller, this controller will convert and send to computer with the help off level converter. The computer will display present house/industry using energy. The EB side unit will send all the payment details using the computer. The EB will take the data from computer and it will send to IF and RF signals will transmitted with the help of EB TX antenna, the transmitted RF signals will send receive the specified home/industry unit and it will display energy meter display panel itself. In case the home/industry owner are not paid bill amount within date the EB side unit will send one more data to cut off the power line to the home/industry unit for disconnect the energy usage after getting this data the home/industry side microcontroller will disconnect the power line until clear the bill. After paying the bill the EB unit will send clear signals to home/industry unit and with the help of this the microcontroller will connect the power line to home/industry.

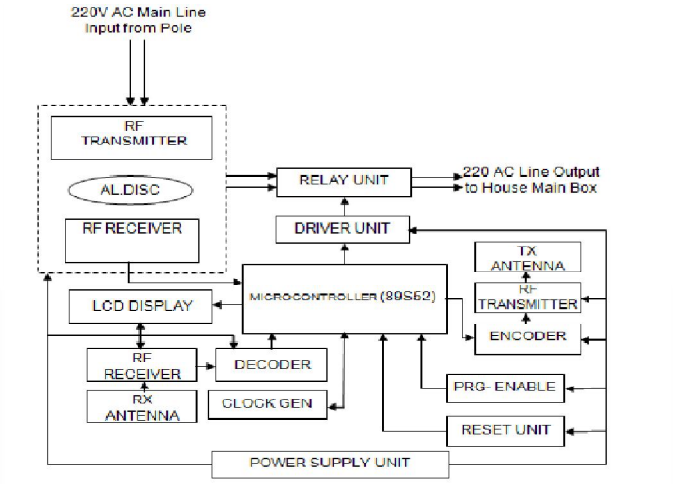


Figure 1.1 System block diagram

The microcontroller is the heart of the proposed embedded system. It constantly monitors the digitized parameters of the various sensors and verifies them with the predefined threshold values and checks if any corrective action is to be taken for the condition at that instant of time. In case such a situation arises, it activates the actuators to perform a controlled operation In this project TX01 is used to transmit the signal. Encoded signal is given to the RF transmitter.

We are using IC HT12E Encoder which is an 18 pin IC. This encoder circuit will encode the data send by the microcontroller and transmit the encoded the data to the receiver through RF Module

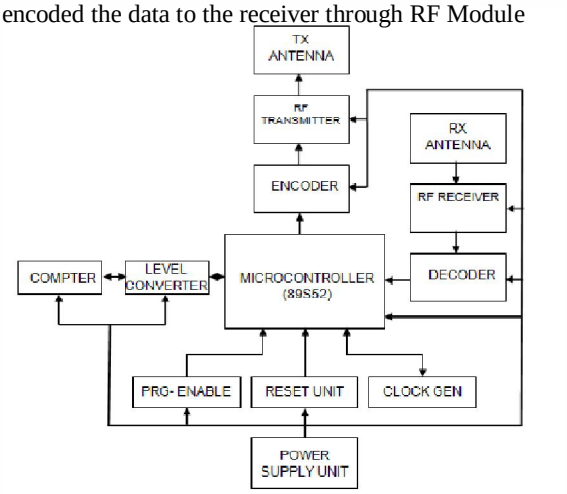


Figure 2. EB Office side unit Block diagram

Software design and working of embedded systems:

In the design of the software, it simply has a loop called control loop. The loop calls subroutines. Each subroutine manages a part of the hardware or software. Interrupts generally set flags, or update counters that are read by the rest of the software.

A simple API disables and enables interrupts. Done right, it handles nested calls in nested subroutines, and restores the preceding interrupt state in the outermost enable. This is one of the simplest methods of creating an exokernel. There is some sort of subroutine in the loop to manage a list of software timers, using a periodic real time interrupt. Hardware events fail about once in a trillion times. A change of state stores a different function into the pointer.

RF communication works by creating electromagnetic waves at a source and being able to pick up those electromagnetic waves at a particular destination. These electromagnetic waves travel through the air at near the speed of light. The wavelength of an electromagnetic signal is inversely proportional to the frequency; the higher the frequency, the shorter the wavelength.

Frequency is measured in Hertz (cycles per second) and radio frequencies are measured in kilohertz (KHz or thousands of cycles per second), megahertz (MHz or millions of cycles per second) and gigahertz (GHz or billions of

cycles per second). Higher frequencies result in shorter wavelengths. The wavelength for a 900 MHz device is longer than that of a 2.4 GHz device.

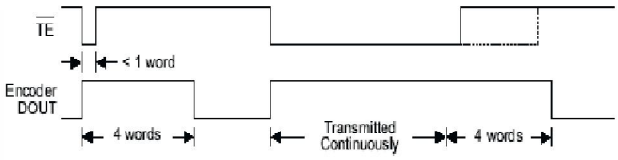
Functional

Description Operation

The encoders begin a 4-word transmission cycle upon receipt of a transmission enable (TE for the HT12E, active low). This cycle will repeat itself as long as the transmission enable TE is held low. Once the transmission enable returns high the encoder output completes its final cycle and then stops as shown below

Transmission Enable

For the HT12E encoders, applying a low signal to the TE pin enables transmission.



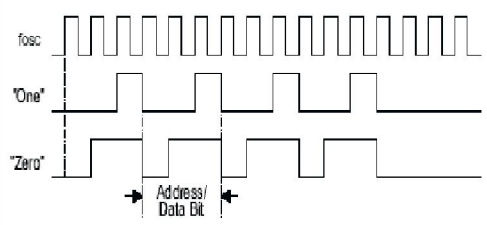
Transmission timing for the HT12E

Fig 3. Transmission timing Diagram

Address/Data Programming (Preset)

The status of each address/data pin can be individually pre-set to logic _high_ or _low_. If a transmission-enable signal is applied, the encoder scans and transmits the status of the 12 bits of address/data serially in the order A0 to AD11 for the HT12E encoder During information transmission these bits are transmitted with a preceding synchronization bit. If the trigger signal is not applied, the chip enters the standby mode and consumes a reduced current of less than 1_A for a supply voltage of 5V.

Usual applications preset the address pins with individual security codes using DIP switches or PCB wiring, while the data is selected by push buttons or electronic switches.



Address/Data bit waveform for the HT12E

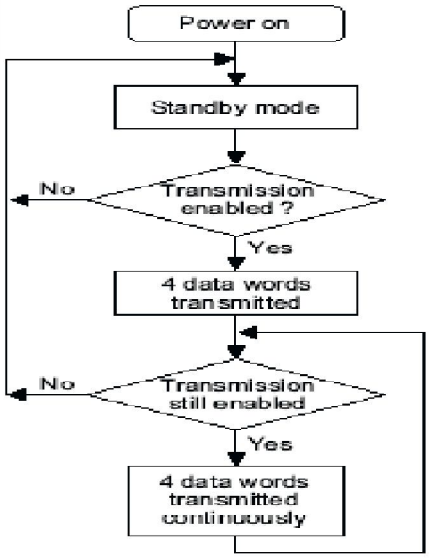


Fig 3.1 Flow chart of encoder

Decoder

The decoders are a series of CMOS LSIs for remote Control system applications. For proper operation, a pair of encoder/decoder with the same number of addresses and data format should be chosen. The decoders receive serial addresses and data from programmed encoders. Which are transmitted by a carrier using an RF or an IR transmission medium. They compare the serial input data three times continuously with their local addresses.

II. SOFTWARE DESCRIPTION

KEIL SOFTWARE

Keil is a cross compiler. Compilers are programs used to convert a High Level Language to object code. Cross compiler is a compiler that runs on one computer but produces object code for a different type of computer. They are used to generate software that can run on computers with a new architecture or on special-purpose devices that cannot host their own compilers. They are very popular for embedded development, where the target probably couldn't run a compiler.

Some of the advantages of using cross compiler are: development of complex embedded systems can be completed in a fraction of the time, register allocation and addressing mode details are managed by the compiler, program development and debugging times are dramatically reduced when compared to assembly language programming, etc.

Today, Keil software provides a broad range of development tools for the embedded systems market place. Products including ANSI C compilers, macro assemblers, debuggers, linkers, simulators, library managers and real time operating systems have helped Keil software become the choice of embedded systems software developers around the globe.

Simulation

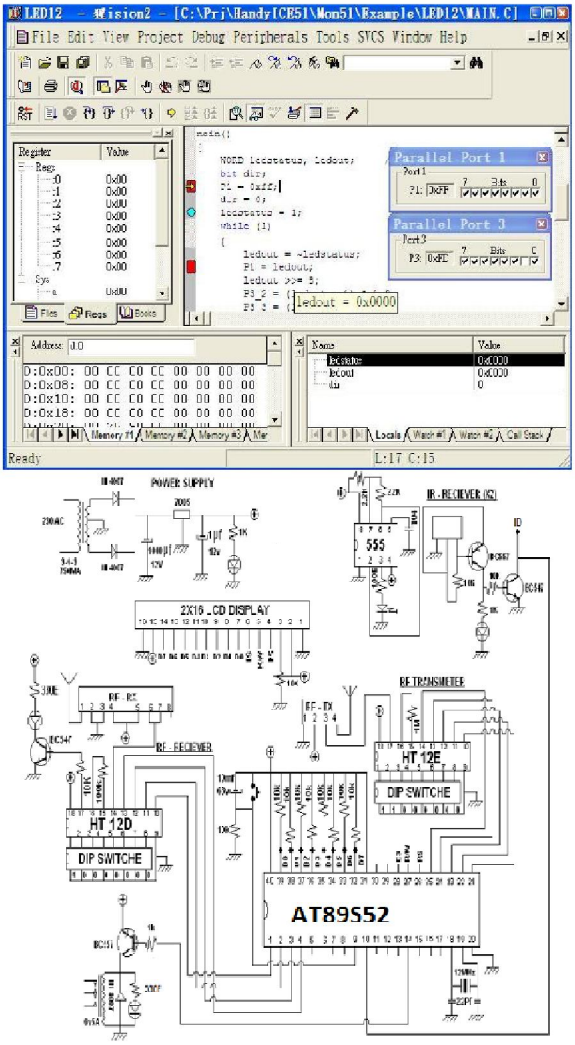


Fig.4 System Schematic Design

III. CONCLUSION

A step-by-step approach in designing the microcontroller based system for automatic meter reading system, here one input essential parameters for unit calibration, i.e. IR Rays has been followed of the rotation of the ALLSEC Disc. The results obtained from the IR receiver (TSOP1738) have shown that the system performance is quite reliable and accurate. The system has successfully overcome quite a few shortcomings of the existing systems by reducing loss of power and complexity, at the same time providing a flexible and precise form maintaining the unit of the meter reading of the EB department.

The continuously decreasing costs of hardware and software, the wider acceptance of Electronic systems in Transport department and an emerging automatic vehicle control system industry in several areas of vehicle production will result in reliable control systems that will address several aspects of quality and quantity of production. Further improvements will be made as less expensive and more reliable sensors are developed for use in vehicle Production and Artificial intelligent.

Although the enhancements mentioned in the previous chapter may seem far in the future, the required technology and components are available, many such systems have been independently developed, or are at least tested at a prototype level. Also, integration of all these technologies is not a daunting task and can be successfullycarried out.