Dhirubhai Ambani Institute of Information & Communication Technology

Wireless Sensor Network based
Automatic Meter Reading

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http://wsnamr.blogspot.com

Can you find something interesting among this?...

This represent obsolete application replaced due to development.

These are obvious…   These is increasing in application…

Was this development necessary!!!

Automatic Meter Reading

To automate utilities consumption reading like Electricity , Gas, Water etc. consumption.

❑ Various Technology

➢ Touch Technology
- Infrared, Proximity sensing
- Called as "On Site AMR"

➢ Fixed Network Technology
- GSM. GPRS, Telephone, Internet, Optical Fiber
- Can become costlier than manual process…
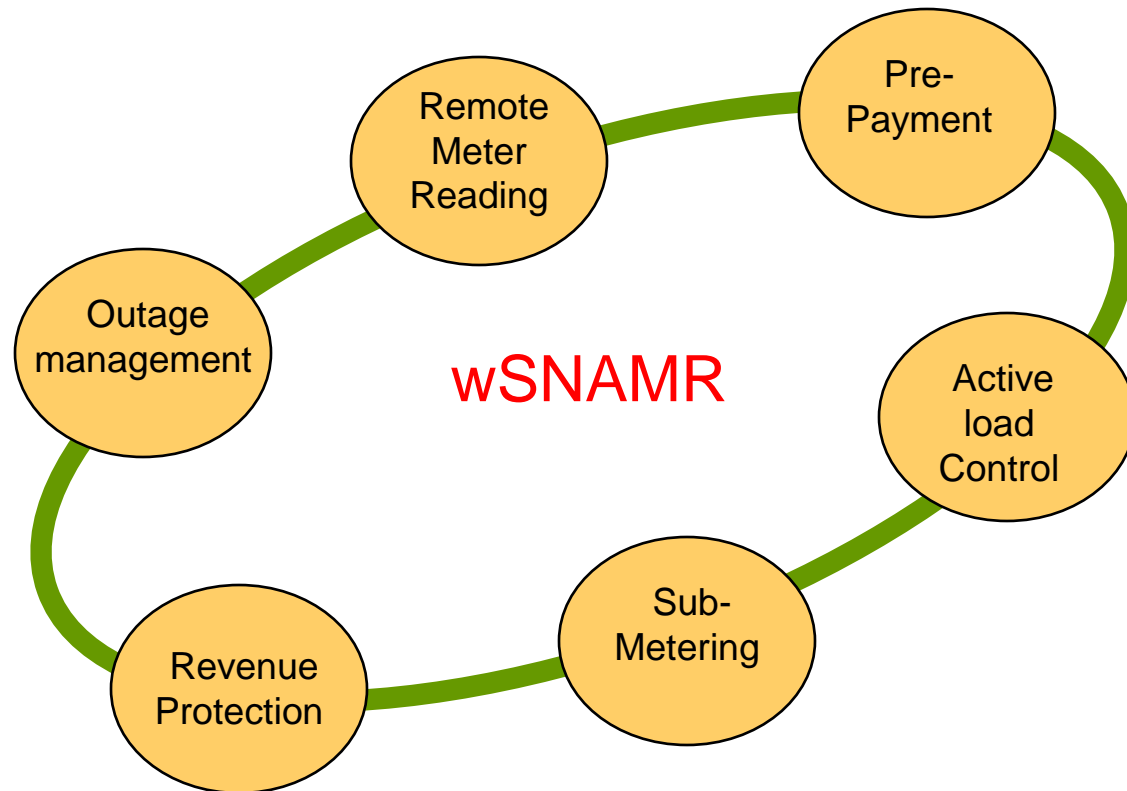
➢ Radio Frequency Technology
- Walk by AMR
- Mobile AMR
- AMR with internet connectivity

➢ Power Line Communication
- Data transfer over Power line
- On Medium voltage line data rate is very low
- At high voltage, it is proven to be unreliable due to noisier environment
- It can provide low cost solution
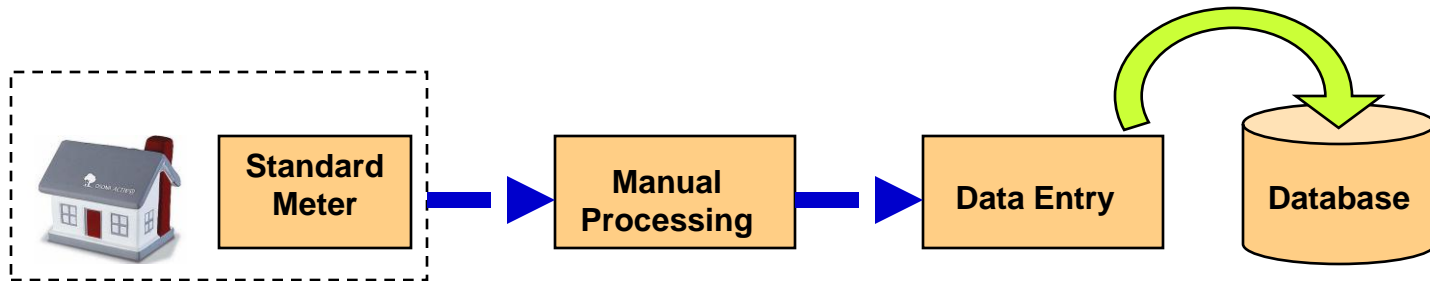
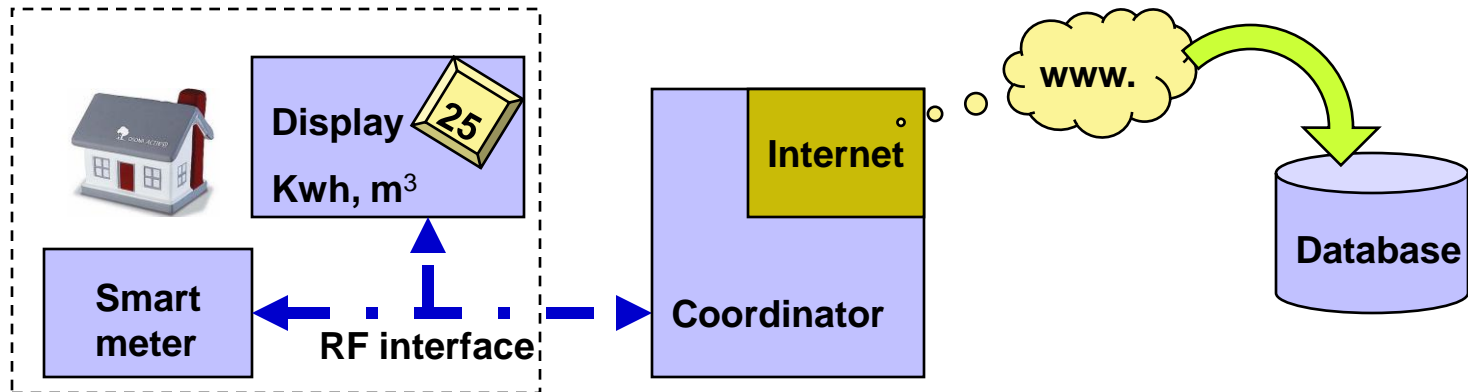# Wireless Sensor Network based Automatic Meter Reading

Motivation

❖To enable wireless monitoring of electric energy consumption.

❖To have total control of Electricity consumption remotely and so enabling prepaid services option.

❖To enable Multi tariff scheme for Dynamic load management by means of hourly consumption data.

❖To save most important utility resources like electricity, water, gas which are lacking, by means of smart devices.

❖To reduce cost of utility data collection and hence revenue protection.
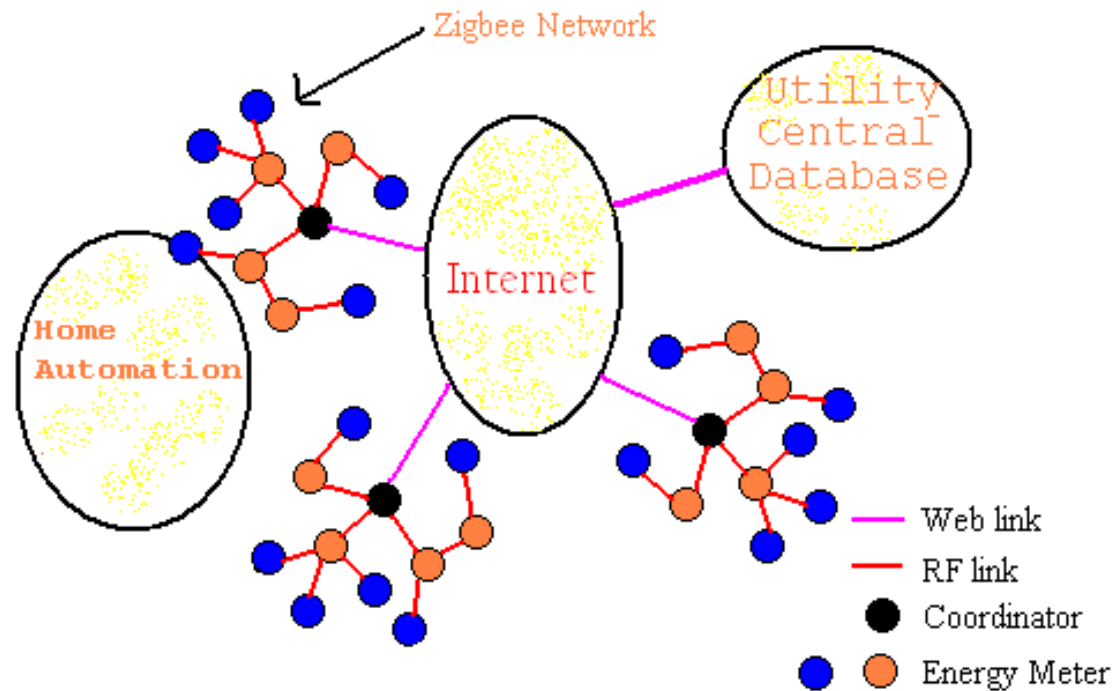
Technology Situation

Standard Meter → **Manual Processing** → **Data Entry** → **Database**

Current Situation

Display 25 **Kwh, m^3**

Smart meter ← **RF interface** → **Coordinator** — **Internet** — **www.** → **Database**

Smart Metering

System Architecture

wSNAMR System

System Architecture

It can be divided in three main parts

❖ Digital Energy Meter

Which will involve measurement of Electric energy based on ASIC chip

❖ Wireless Transceiver

Which will have zigbee compatibility.
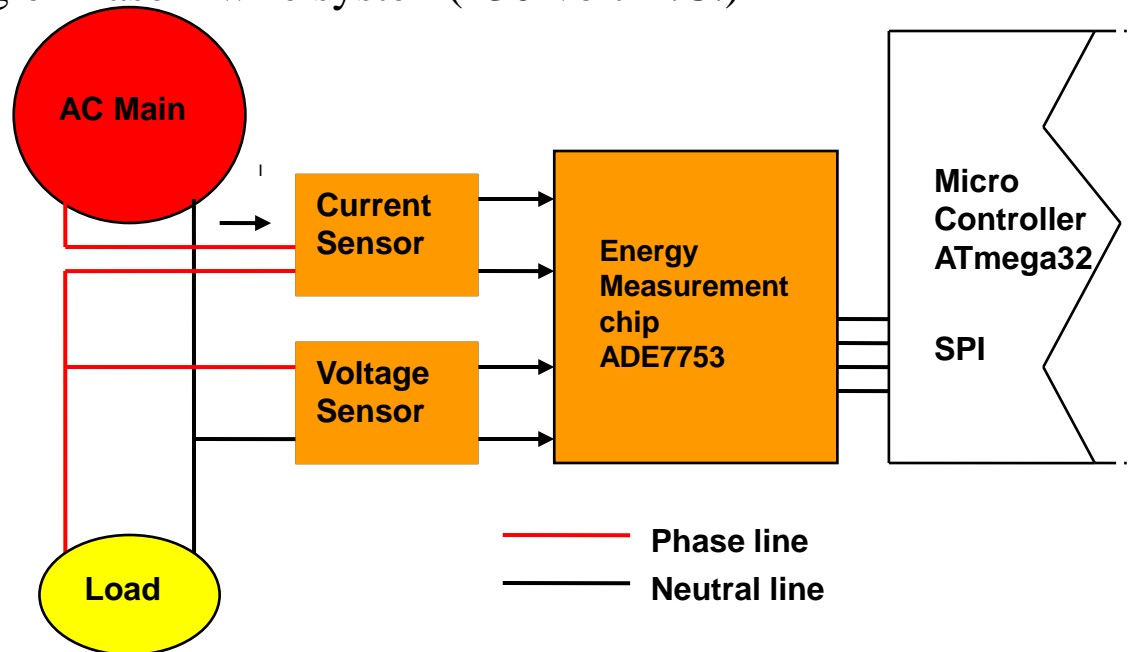
❖ Web based Software

Which will enabled easy monitoring of energy consumption and control of electricity.
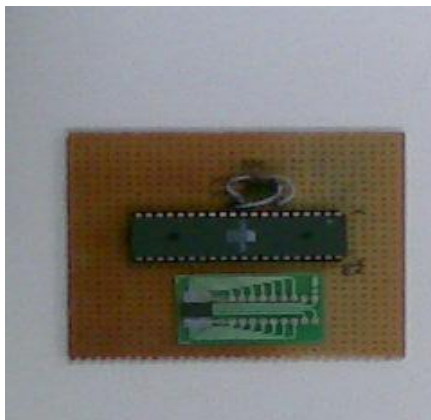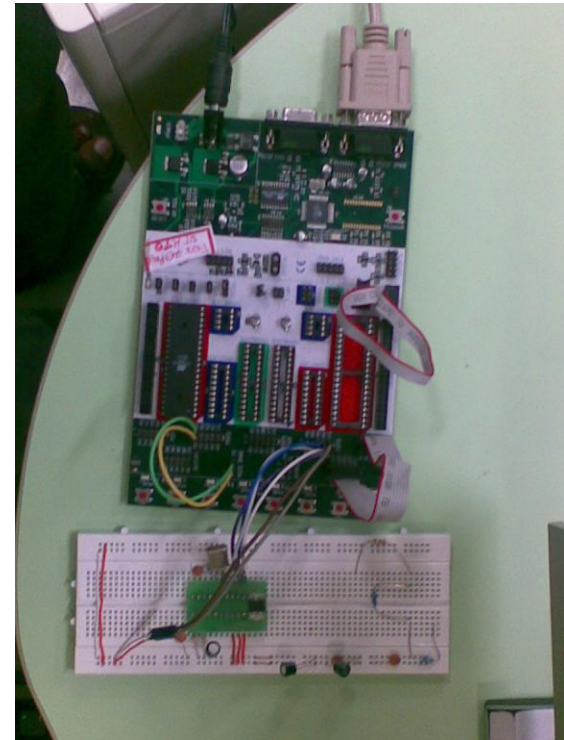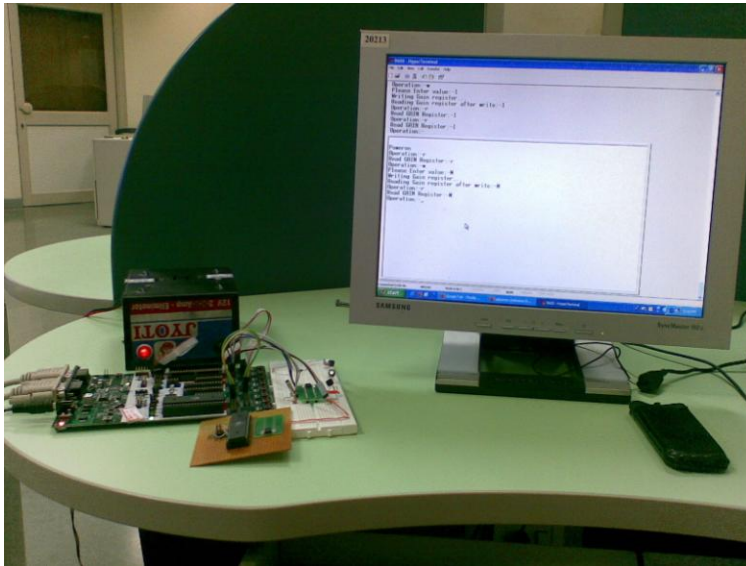
Digital energy Meter

❖ Energy measurement chip ADE7753(2$)

❖ Microcontroller ATmega32 just for testing

❖ It can measure Vrms, Irms, Instantaneous Power, Active energy, provide waveform and lot more.

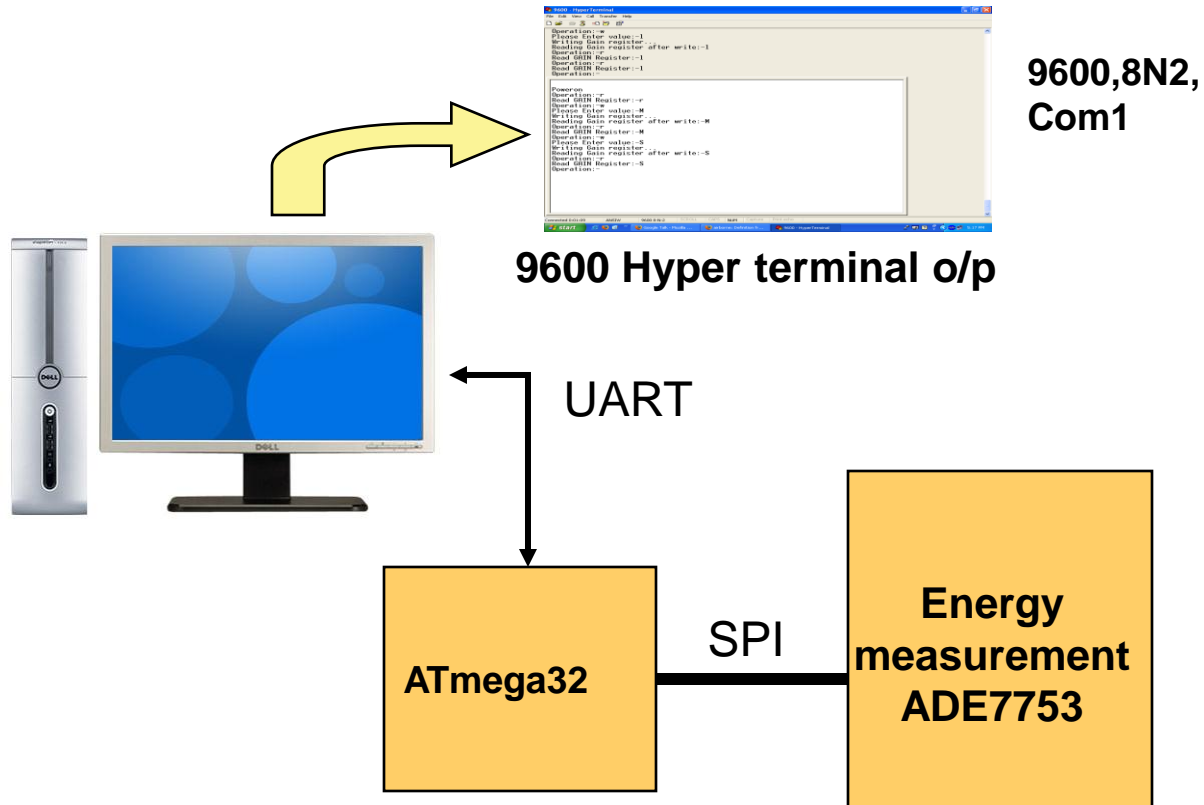❖Single Phase 2 wire system(230 Volt A.C.)

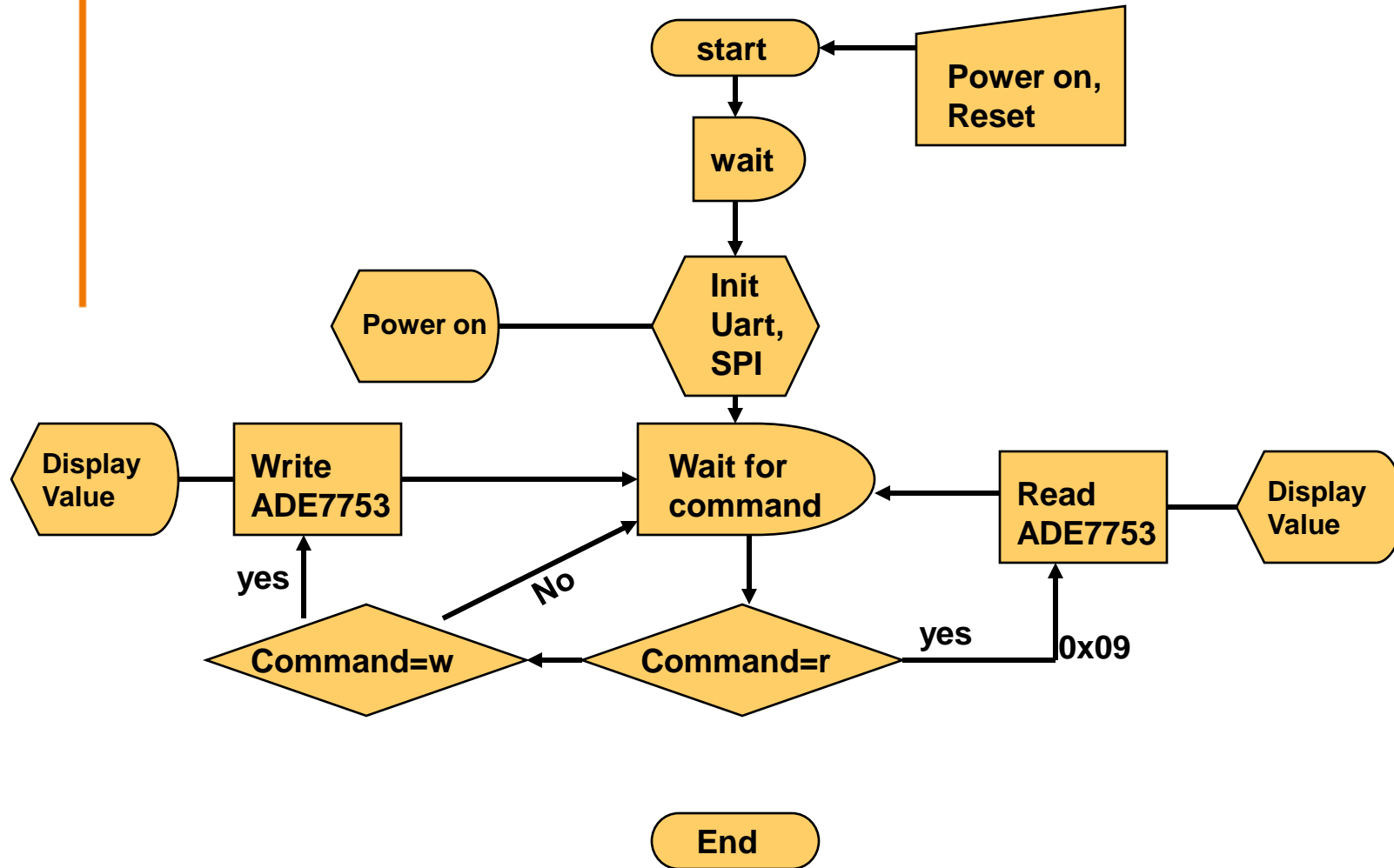Digital Energy Meter Block Diagram

Digital Energy Meter Hardware snapshot

Digital Energy Meter Hardware setup

9600,8N2, Com1

9600 Hyper terminal o/p

UART

SPI

ATmega32

Energy measurement ADE7753

Firmware program flow

Output on hyper terminal

References.

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❖ Pilferage pf electricity: Issues and Challenges by G. Sreenivasan at www.ksebpa.org , Kerala State Electricity Board.

❖ New Zigbee Smart Energy Profile deliver efficiency and savings, Article at www.industrial-embedded.com

❖ Zigbee smart energy: The Standard for energy efficiency, Article at www.zigbee.org

❖ http://en.wikipedia.org/wiki/Automatic_meter_reading

❖ "Design Considerations for Implementation of Large Scale Automatic Meter Reading Systems", By Sioe Mak et al, Senior Member, IEEE, IEEE Transactions on Power Delivery, Vol. 10, No. 1, January 1995

❖ "Implementation of AMR system using Power line communication", By B. S. Park, Associate member, IEEE, 2002

❖ "Added value services through the use of AMR in commercial and Industrial Accounts", By M Baker, Itron Ltd, At Conference "Metering and tariffs for energy supply", 1999

❖ "Survey of Technologies and Cost Estimates for Residential Electricity Services" , By Jason W. Black et al, IEEE, 2001

❖ "Control and Monitoring of electrical distribution grid using automatic readers system", By Joao costa, IEEE Porto power tech conference, 2001

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❖ "Integration of CEBus with utility load management and automatic meter reading", By J. Mike Surratt, IEEE transaction, 1992

❖ ADE7753 datasheet

❖ www.analog.com , ADE7753 related content

❖ www.ti.com , Zigbee transceiver related content

❖ www.cirrus.com , CS5464 related content

❖ Smart Metering Presentation, Rob van gerwen, December 2006,KEMA

Que?

Thank You

On a special day of Teachers