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(54) **Title:** INTELLIGENT AUTOMATIC METER READING SYSTEM FOR COLLECTING AND MANAGING DATA FROM METERING DEVICES

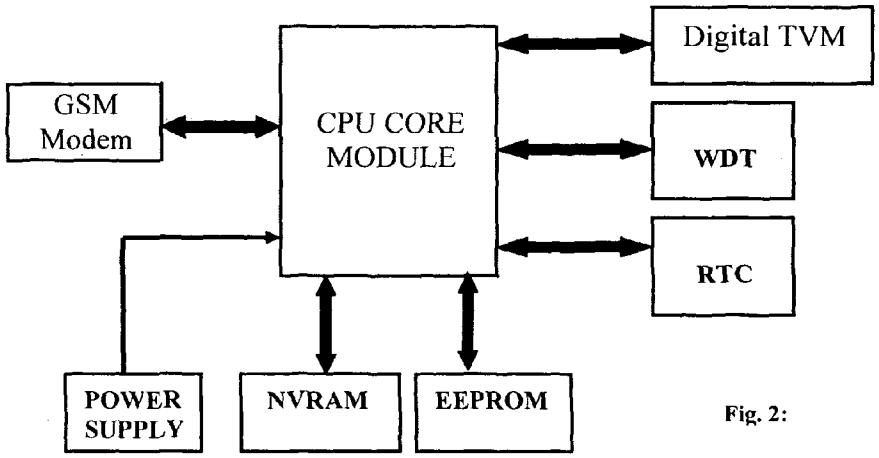

Fig. 2:

(57) **Abstract:** Intelligent automatic meter reading system for collecting and managing data from metering devices which comprises of two main modules i.e., CPU and GSM modern module, CPU module being powered with an ARM7 core controller (LPC2214), the microcontroller has two internal UARTs (compatible with 16C550) that are utilized for connecting a serial GSM modem and an Electronic TVM, the firmware is built such a way, that the controller reads the meter instantaneous parameters at regular intervals and analyzes the data for any abnormal conditions, in case an abnormality is found, the controller further checks for some more time for the existence of the same abnormality and after the fixed time is lapsed, it sends an SMS message to the base station about the abnormality with the snapshot of the instantaneous parameters, the unit having a large memory space to store additional data such as billing parameters and load survey, the data is being sent to the base station from time to time in the form of SMS and different reports are generated and presented at the base station for a proper analysis of load flow and power consumption.

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INTELLIGENT AUTOMATIC METER READING SYSTEM FOR COLLECTING AND MANAGING DATA FROM METERING DEVICES

The present invention relates to intelligent automatic meter reading system for collecting and managing data from metering devices

Prior Art

The power corporations collate the meter information either manually or with a conventional meter reading device called CMRI and send the data to the billing department once in a month or at periodic intervals. This is a manpower intensive process and requires huge resources and time. If there is any tampering or theft the DISCOM (Distribution Companies) incurs further loss. The need of the hour is a system, which can be integrated with the energy meter and relay the metered data to base station, is called as the automatic meter reading or remote meter reading. This system is tamper proof and functions smoothly 24/7 without any interruptions

Disadvantages of prior art

Two major draw backs of reading meter data at consumer place are more time consume and not cost effective. The conventional manual methods can not avoid loss due to unauthorised operations like power theft and deviations from set norms if any etc.

Meter reading of each month at consumer place is still a tedious job. A deployed team by electricity department consist of 3-4 members. Team has to visit at each consumer to collect the billing information. Besides the billing they have to read meter relevant data. For reading whole meter data it takes lot of time. And also economically it is not advisable, because they have to charge fuel and other relevant cost. After getting information they have to spend more time for making billing and other report and there is also no instantaneous look up of the meter status. It is fully manual method. As a result, there is every possibility of influencing of human error.

The present invention proposed to remove above disadvantages of prior art and is easier to operate, saves labour and is economical.

According to present invention there is provided Intelligent automatic meter reading system for collecting and managing data from metering devices which comprises:

two main modules i.e., CPU and GSM modern module, CPU module being powered with an ARM7 core controller (LPC2214), the microcontroller has two internal UARTs (compatible with 16C550) that are utilized for connecting a serial GSM modem and an Electronic TVM, the firmware is built such a way, that the controller reads the meter instantaneous parameters at regular intervals and analyzes the data for any abnormal conditions, in case an abnormality is found, the controller further checks for some more time for the existence of the same abnormality and after the fixed time is lapsed, it sends an SMS message to the base station about the abnormality with the snapshot of the instantaneous parameters, the unit having a large memory space to store additional data such as billing parameters and load survey, the data is being sent to the base station from time to time in the form of SMS and different reports are generated and presented at the base station for a proper analysis of load flow and power consumption.

The Intelligent automatic meter reading system for collecting and managing data from metering devices, have another controller that controls the mode of operation of the main controller from execution mode to ISP mode and back from ISP mode to execution mode to facilitate programming of the main controller from a remote location

Work stations (W1 & W2) are high end computers used for receiving, down loading meter data as well as executing the control functions, the quantity of work stations to be employed depends on the size of I-AMR implementation and frequency of data retrieval and each work station is attached two GSM modems with accessories

GSM transceivers consists of two GSM modems (M1 & M2/ M3 & M4) are attached with each work stations along with their accessories (Accessories like antenna and power supply) and LED indication panel for communication display, out of two modems, one will only receive the message and data i.e. only meant for in-coming communication, other one will dispatch the commands for control function or

e-directing the information to field officials cell phone i.e. only out going communication

Once meter information displayed on work station screen, immediately it goes to database which resides in the database server, the database is designed keeping all the requirement of utility, the database used for this purpose can be SQL or ORACLE.

Intelligent automatic meter reading system for collecting and managing data from metering devices wherein it acts as an interface among data base server, web server and utility intranet, for any data transaction/display both web server and utility intranet system have to interact with the data base server through application server which is very important from security point view also

Intelligent automatic meter reading system for collecting and managing data from metering devices, as described above wherein consumer may access their account that resides in the web server through internet and utility officials can access certain information up to a specific level, web applications are developed on J2EE platform, web-clients can be incorporated for using them from laptops through the internet giving the same functionality as if logged on to utility intranet giving the virtual access to authorized personnel.

Intelligent automatic meter reading system for collecting and managing data from metering devices as described above wherein the utility intranet-clients will be directly served by the main system through leased-line with standby ISDN, through which it has access to all application including administrative/operative access and can be customized in as per the utility's need.

Intelligent automatic meter reading system for collecting and managing data from metering devices as described above wherein it is provided for generating number of custom defined reports, analysis graphs etc and connected directly to the database server or through any terminal server depending on the type of security and data integrity need by utility.

IAMR (Intelligent Automatic Meter Reading) is a device built on the powerful and sophisticated μcontroller to monitor the electrical parameters of the Tri-vector energy meter. It uses the more popular GSM network for data transaction through SMS. SMS can be sent from the base station to retrieve the required electrical parameters. The query from the base station can be broadcasted to a group of meters, say, 70-100 numbers and the meters in turn respond to the query by sending the required electrical parameters.

IAMR is a fast growing sector of the metering industry. Increasing the speed and accuracy with which meter readings can be taken is key to improve billing efficiency. Although there are a variety of industry definitions, IAMR generally is regarded as the reading of a utility meter by means that does not require physical access or visual inspection of the meter. IAMR consists of mainly (Figure 1).

- Core μcontroller
- GSM module
- NVRAM
- E^2PROM
- Serial RTC
- External Watchdog
- Power supply

Intelligent AMR in which the data transfer from the remote meter to the base station is through SMS using GSM network. The query from the base station can be broadcasted to a group of meters, say, 70-100 numbers and the meters in turn respond to the query by sending the required parameters. The serial link can be either RS-232/optical or RS-485.

IAMR is the only true multi-vendor meter data management system for collecting and managing data from the complex metering devices typically used for large commercial and industrial customers. In addition to its unparalleled data collection capabilities, IAMR offers powerful data management and analysis tools that ensure data integrity and process consistency. Increase the accuracy and reliability of consumption and load data by establishing a single data repository with auditable validating, estimating and editing processes. Improve operational

efficiencies through the automation of system process such as collecting data and delivering that data to stakeholders throughout the utility. Improve how you manage large amounts of meter data as well as customer and market participant contractual relationships that require direct access to data in a timely and accurate manner. Experience unmatched system performance with IAMR multi-threaded processing, 32-bit Windows application, high-performance database, and powerful task manager for all system operations. Provide aggregated meter data from any number of meter points or aggregation of meter data up to a settlement point in the market where transactions are tracked—for a higher level of customer service. Easily transfer and exchange meter, billing and settlement data with other market participants by using IAMR flexible array of data exchange formats. Utilize powerful analytics to provide value-added services to your customers, including time of use (TOU), loss calculations, billing determinant calculations, load profiling and forecasting, energy scheduling and bidding, rate and profitability analysis, and more.

Net working elements and UPS: Requisite net-working and other protection facility can be incorporated based on utility's requirement, size of implementation and base station infrastructure

Software: The type and varieties of software to be implemented for IAMR are as follows:

- Data acquisition and control software loaded on work station (Base station software)
- Designed database loaded in database server
- Application package loaded in application server
- Web application loaded to web server
- Report generation package loaded in client computer terminal
- Intranet application loaded at each end user terminal (Client Computer Terminal)
- Meter specific dial-up software loaded on work stations

IAMR Operational functionality

Data retrieval by SMS:	Following meter parameters are retrieved by IAMR and dispatched to base station
Instantaneous parameters:	Three phase voltages, three phase line current, active current, reactive current, three phase power factor, average power factor, active power in KW, reactive power KVA
Energy parameters	KWh, KVAh, KVArh (lag), KVArh (lead), Angle P.F

Frequency of data retrieval: Intelligent AMR sends the data at predefined time interval by SMS. The frequency (time interval) at which IAMR sends data can be programmed from the base station such as the data retrieval frequency may be set at every 30 minutes or every 15 minutes i.e. any time interval. For example if the data retrieval frequency is set for every 30 minutes for all the meters, then IAMR fitted to these meters will start sending data to base station in every 30 minutes

Data retrieval in fixed time: Irrespective of the retrieval frequency a specific time (fixed time) can be also set in addition to the retrieval frequency, so that IAMR will send that in that fixed time also, if the utility want to get data of all meters at 00.00 hrs, it can be achieved in this method.

Data on request: Irrespective of data retrieval frequency and data retrieval fixed time, meter data can also be collected by generating a request by base station

Door open and door close station: IAMR unit sends an instantaneous SMS message to the base station when someone opened the door of the box in which the meter is enclosed and also incase closing the door unless maintenance is enabled. Maintenance can be enabled or disabled only from the base station for maintenance works.

Maintenance enable/disable: For any official work purpose if the utility officials want to execute any sorts of maintenance activities; with respect to that, the maintenance enable function can be activated from base station so that IAMR will not send any message such as Door Open to the base station. Once the maintenance job is

over. maintenance disable function can be activated from base station and after that IAMR will start checking for Door Open/Door close status

Tamper detection: IAMR detects tamper caused by the consumer and send tamper alerts in the form of SMS to the base station. Following are the sample types of tampers IAMR detects and sends the alerts to the base station.

- Potential missing occurrence/restoration
- CT reversal occurrence/restoration
- CT open occurrence/restoration
- CT short occurrence/restoration

The IAMR sends SMS message regarding the occurrence and restoration of any of the above mentioned conditions. The persistence time for occurrence is 5 minutes and 3 minutes for restoration facility for setting the persistence time is provided from base station.

The logics used for tamper conditions are programmable from the base station. These logics are used for deciding tamper condition. Tamper condition and logics vary from utility to utility. So provisions are kept in IAMR to incorporate the custom defined tamper types, conditions or logics as per the utility's requirement.

Broad casting of messages to field official's mobile phone: Provision is provided at the base station that for the type of messages identified by the utility will be re-directed to field official's mobile phone for immediate information and action

Enabling/disabling of tamper through SMS: Any specific tamper types can be disabled or enabled depending upon utility's need from base station it self by sending an SMS from it

Download of meter data through meter specific dial-up software: IAMR is designed such away that it can switch from SMS to DATA mode. If the utility want to download the complete 36/61 days of meter data can achieve it by dialing the meter from base station through data call using meter specific dial-up software.

Instantaneous parameters on mobile phone: Provision is provided that utility officials can access any meter at any point of time integrated with IAMR and they can retrieve specific parameters of meter also through their mobile phones

Change of base station: Provision is also made for change of base station for specific meters from the existing base station

Remote connection and disconnection: Remote connection and disconnection of consumer can be made through SMS from base station. For this purpose utility has to provide switching arrangement at consumer premises. We provide a NO/NC contact which will be connected to the trip circuit of switch gear

Finding the GSM signal strength at remote place: The signal strength of the modem at the remote end can also be monitored from the base station

Power failure detection (Optional): The unit detects the power failure condition and sends an SMS message when power failure occurs. Power failure restoration is also intimated after the power is restored

Base station Operational Functionality

The work stations loaded with custom built data acquisition & control software (base station software) and meter specific dial-up software act as base station has the following operational functionalities.

Data acquisition: Receiving meter parameters, tamper messages and door open/door close messages in the form of SMS. Broad casting of messages, Meter data retrieval using meter specific dial-up software

Control function

- Setting of data retrieval frequency and time
- Tamper logic and tamper enable/disable settings
- Maintenance enable/disable
- Remote connection/ disconnection
- Change of base station

Report generation

Using report generation package a number of query and selection based reports can be generated or reports may be customer specific. Apart from that number of forms is also provided for entering relevant data into the database. Followings are few sample reports generated by report generation package:

- Instantaneous report with respect to a specific time
- Energy reports
- Maximum demand reports
- Tamper reports and specific type tamper reports

Load survey analysis report: Load survey analysis reports are nothing but the graphical representation of different electrical quantities with respect to time at a

specific interval of time such as 15 minutes or 30 minutes which gives a clear picture of the load profile and consumption pattern of the consumer at any point of time. Load survey graphics can be drawn between the following as well as for custom defined need.

- 3phase voltages Vs time in minutes
- 3phase currents Vs time in minutes
- Demand in KW and KVA Vs time in minutes
- Energy audit report

To draw load survey every 15/30 minutes data has to be there in the database. i.e. IAMR has to send the requisite information from meter in every 15/30 minutes in the from of SMS, which is programmable from the base station. Once the every 15/30 minutes data is stored on the database, using the report generation package (which is having inbuilt customized graphic representation package) both static as well as dynamic load survey curves can be generated

Receiving messages in every 15/30 minutes from a large amount of installations is very much viable and secured against the DATA CALL as each message dispatched by IAMR bears the time stamp of meter read time. Even if the message received by the base station gets delayed due to networking congestion, still it solves the utility purpose as the message carries the meter read time.

We shall now describe the invention with reference to accompanying drawing and particularly block diagram:

This board is designed for reading digital electronic Tri-Vector Meter (TVM) of any make. There are two main modules in this board. The CPU module and the GSM modem module. The CPU module is powered with an ARM7 core controller (LPC2214) and The GSM module is powered with a WISMO Quik Q2403 Modem (Fig 2).

The µcontroller has two internal UARTs (compatible with 16C550) that are utilized for connecting a serial GSM modem and an Electronic TVM (Tri Vector Meter). The firmware is built such a way, that the controller reads the meter instantaneous parameters at regular intervals and analyzes the data for any abnormal conditions. Once an abnormality is found, the controller further checks for some more time for the existence of the same abnormality and after the fixed time is lapsed, it

sends an SMS message to the base station about the abnormality with the snapshot of the instantaneous parameters.

Also, the unit has a large memory space to store additional data such as billing parameters and load survey. All this data is sent to the base station from time to time in the form of SMS and different reports are generated and presented at the base station for a proper analysis of load flow and power consumption.

Added to the basic features, the unit has another controller that controls the mode of operation of the main controller from execution mode to ISP mode and back from ISP mode to execution mode to facilitate programming of the main controller from a remote location.

Description of the IAMR Unit

The IAMR unit is an aluminium channel of dimensions 262mm x 60mm x 37mm. The box has two panels. The front panel has a 9-pin D-type female connector to connect the optical cable going to the meter and a DC jack to power the device. The rear panel consists of female SMA connector for connecting an antenna (0dBi or 3dBi), a 2 pin connector for connecting the door sensor, 5 LEDs and an opening for SIM card holder (Fig 3(a) and 3(b)).

ADVANTAGES

- Reduces labour, lowers the cost and improves the productivity.
- Access to real time information
- Bi-Directional communication
- Peak load management and real time pricing
- It has high degree of tamper protection and electronic lock facility
- It is efficient because no-dial up network is involved Improve revenue forecasting
- Consumption information to Production data and expected billings
- Encourages Energy conservation
- Enable more frequent readings with little incremental cost
- Streamlines high bill investigation
- Faster rate of transmission of data
- Increase revenues from reducing system losses

- As the data transmission is through SMS, the operational cost will be less and the flexibility is more.
- Only one software (developed by ICSA) is sufficient at the base station (sub-division) to get the data from different makes of meters.
- Query can be sent to a group of meters, say, 70-100 numbers at a time and the data (through SMS) received from the meters can be formatted and stored in the database and reports can be generated in a desired way.
- The time taken to get the data of all meters in a sub-division will be less.

Features

a. IAMR will interact with the meter using optical port or as direct connection with cable using RS232 / RS485 serial ports.

b. Communication to the base station: It can be done using various options like GSM network – SMS and data calls, GPRS network, CDMA network, PSTN lines, radio modems, RF communications and PLCC.

c. Built in intelligence for auto selection of the programs depending on the type and make of meter and sending in a common format to the base station.

d. The system is capable of changing any firmware (if required during commissioning/operation as per the user) in the IAMR from the base station by using remote programming method.

e. Capability to interface with various gain antennas like 0 db, 3 db and other higher gains, depending upon the signal strengths, for reliable communication.

f. The IAMR unit has a power supply, which is Compact, slim SMPS power supply, capable to withstand wide input variation with 6 KV surge protection. The input supply can be 50 Hz, 110V/230V+/- 30%; and the power supply will operate in extreme conditions like 1 phase or 2 phase or neutral missing. The burden on the PTs will never exceed the limits at any time.

g. Current consumption is less than 500 mA at power level 5 & peak current limited to 2A during transmission.

h. The IAMR has Multiplexing facility to connect various meters to a single modem, where the meters are in the same vicinity.

i. IAMR has facility for monthly billing generation automatically, at the end of the monthly billing data and send SMS to the individual consumers regarding their bill amount.

j. IAMR system has facility to connect with the Web so that the consumers / distribution companies can view the required data using internet, any where.

k. IAMR is certified for environmental tests by ETDC (an Indian government electronic test laboratory) as per standard IS 9000 (part I) - 1988 – part III & V.

l. Indicating LEDs on the unit for power, data transmission / reception and Communication ready.

m. Password protection at various levels for data security.

Special functions

1. Instantaneous parameters can be queried at any time.
2. Automatic load survey for every half an hour.
3. Automatic Billing data generation at the mid night (11:58:00 hrs).
4. Automatic alert of tamper and fraud.
5. The meter data's can be retrieved from any authorised cell phone.
6. Graphical representation of the load survey data.
7. Separate daily, weekly and monthly summary report for the quick reference according to substation wise.
8. Detail reports of the instantaneous, tamper, billing and load survey data.
9. SMS messages alert to the officers-in charge (cell number needs to be authorised).
10. Back-up recovery of the 7-days mid night billing data.
11. Back-up recovery for the last 7 months billing data
12. Uses GSM / CDMA / RF / PLCC / PSTN Networks.

Applications

- All Power distribution companies.
- All power generation companies.
- Bulk power consumers

Specifications

- Controller section
- Unit is based on: 32 bit micro controller
- Memory: on chip: 256 KB Flash; External: 1 MB NV RAM, 128 KB EEPROM
- Clock speed: 14.7456 MHz
- External Real time clock: provided with battery backup.
- External watch dog timer: Provided

Modem section

Type of modem: GSM/GPRS (optional CDMA / RF / PLCC)

- Dual band operation.
- Output power 2W for GSM 900, IW for GSM 1800/1900,
- Control and configurable through AT commands, remote mode – (GSM 07.07.05)

GSM Data Transfer Specification

- The data transfer rate is up to 14.4 Kbps or higher.
- Circuit asynchronous transparent and non transparent modes
- GSM Modem have auto bauding facility – 300 TO 38,400 bps.
- Baud rate: from 300 to 115,200 bps
- Indicator: Separate LED indications for transmit data, received data, carrier detects and Power ON - is available.
- dBi antenna with Wall mount
- SIM Holder: Plastic SIM card cover with interlocking with screws

Connection with the meter unit

- Common optical cable to read various makes of trivector meters
- Data interface EIA-RS232-C
- Connectors Data 9 pin D Connector

-15-

Ambient Condition

(a)	Operating temperature		-2° C to 55° C.
(b)	Relative Humidity	:	0% to 98%
(c)	Rainfall in a year	:	Varying 1800mm to 3480mm.
(d)	Storage temperature	:	storage -25° C to 85° C.

Mechanical Specification

Box

Material: aluminum anodized

Color : Silver

Dimension: 263 x 63 x 38 mm (L x B x h)

Weight: 200 Gms

End plate

Material Plastic

Color Black

Dimensions 75 x 3 x 40 mm (L x B x h)

Symbols used in the above document:

Gms : Grams

L x B x h: Length X Breadth X Height

LED: Light emitting diode

GSM: Global system for mobile

SIM: Subscriber interface module

GPRS: General packet radio service

Kbps: Kilo bits per second

CDMA: Code division multiple access

RF: Radio Frequency

PLCC: Power line carrier communication

EEPROM: Electrically erasable programmable read only memory

RAM: Random access memory

KB: Kilo Bytes

MB: Mega Bytes

PTs: Potential transformers

bps: bits per second

SMS: Short message service

ETDC: Electronic Test & Development Centre

PSTN: Public Switching Telephone Network

WHAT IS CLAIMED IS:

1. Intelligent automatic meter reading system for collecting and managing data from metering devices which comprises:

two main modules i.e., CPU and GSM modern module, CPU module being powered with an ARM7 core controller (LPC2214), the microcontroller has two internal UARTs (compatible with 16C550) that are utilized for connecting a serial GSM modem and an Electronic TVM, the firmware is built such a way, that the controller reads the meter instantaneous parameters at regular intervals and analyzes the data for any abnormal conditions, in case an abnormality is found, the controller further checks for some more time for the existence of the same abnormality and after the fixed time is lapsed, it sends an SMS message to the base station about the abnormality with the snapshot of the instantaneous parameters, the unit having a large memory space to store additional data such as billing parameters and load survey, the data is being sent to the base station from time to time in the form of SMS and different reports are generated and presented at the base station for a proper analysis of load flow and power consumption.

2. Intelligent automatic meter reading system for collecting and managing data from metering devices as claimed in claim 1, having another controller that controls the mode of operation of the main controller from execution mode to ISP mode and back from ISP mode to execution mode to facilitate programming of the main controller from a remote location.

3. Intelligent automatic meter reading system for collecting and managing data from metering devices as claimed in claim 1 or 2, wherein work stations (W1 & W2) are high end computers used for receiving, down loading meter data as well as executing the control functions, the quantity of work stations to be employed depends on the size of I-AMR implementation and frequency of data retrieval and each work station is attached two GSM modems with accessories.

4. Intelligent automatic meter reading system for collecting and managing data from metering devices as claimed in claim 1 to 3, wherein GSM transceivers consists of two GSM modems (M1 & M2/ M3 & M4) are attached with each work stations along with their accessories (Accessories like antenna and power supply) and LED indication panel for communication display, out of two modems, one will only receive the message and data i.e. only meant for in-coming communication, other one will dispatch the commands for control function or re-directing the information to field officials cell phone i.e. only out going communication

5. Intelligent automatic meter reading system for collecting and managing data from metering devices as claimed in claim 1 to 4, wherein once meter information displayed on work station screen, immediately it goes to database which resides in the database server, the database is designed keeping all the requirement of utility, the database used for this purpose can be SQL or ORACLE.

6. Intelligent automatic meter reading system for collecting and managing data from metering devices as claimed in claim 1 to 5, wherein it acts as an interface among data base server, web server and utility intranet, for any data transaction/display both web server and utility intranet system have to interact with the data base server through application server which is very important from security point view also.

7. Intelligent automatic meter reading system for collecting and managing data from metering devices as claimed in claim 6, wherein consumer may access their account that resides in the web server through internet and utility officials can access certain information up to a specific level, web applications are developed on J2EE platform, web-clients can be incorporated for using them from laptops through the internet giving the same functionality as if logged on to utility intranet giving the virtual access to authorized personnel.

8. Intelligent automatic meter reading system for collecting and managing data from metering devices as claimed in claim 1 to 7, the utility intranet-clients will be directly served by the main system through leased-line with standby ISDN, through

which it has access to all application including administrative/operative access and can be customized in as per the utility's need.

9. Intelligent automatic meter reading system for collecting and managing data from metering devices as claimed in claim 1 to 8, wherein it is provided for generating number of custom defined reports, analysis graphs etc and connected directly to the database server or through any terminal server depending on the type of security and data integrity need by utility.

10. Intelligent automatic meter reading system for collecting and managing data from metering devices as claimed in claim 1 to 9, wherein it can be obtained from GSM service provider with the activation of SMS and DATA CALL facility.

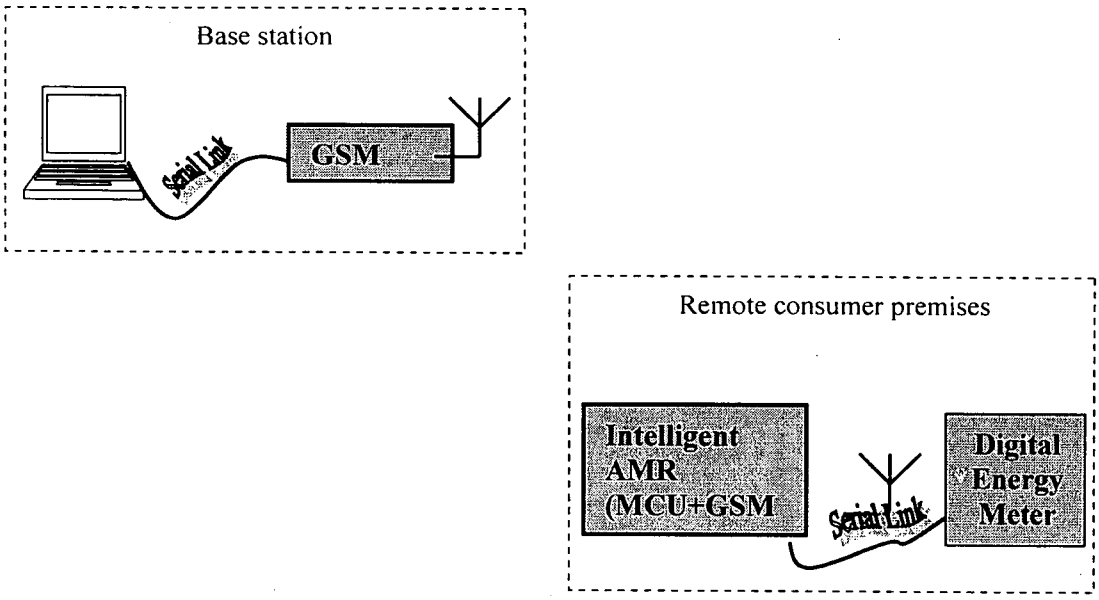
Base station
Serial Link
GSM
Remote consumer premises
Intelligent AMR (MCU+GSM
Serial Link
Digital Energy Meter

Fig.1

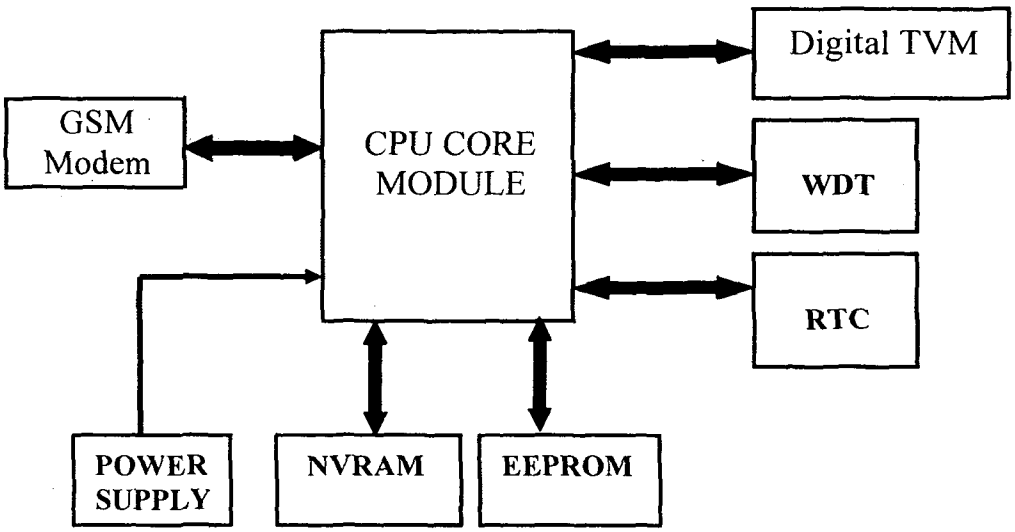
GSM Modem
CPU CORE MODULE
Digital TVM
WDT
RTC
POWER SUPPLY
NVRAM
EEPROM

Fig. 2:

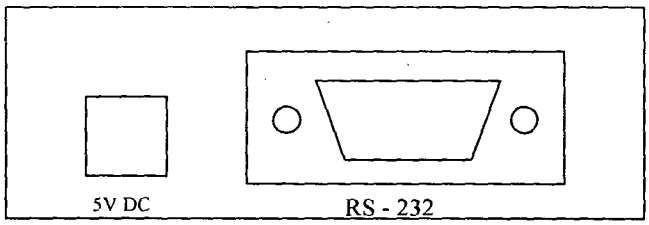

Fig3 (a). Front panel

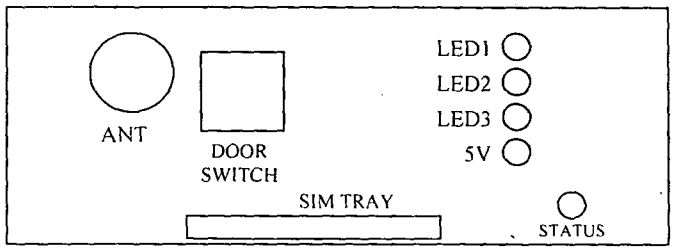

Fig 3(b). Rear Panel

INTERNATIONAL SEARCH REPORT

International application No
PCT/IN2008/000152

A. CLASSIFICATION OF SUBJECT MATTER
INV. G01D4/00 H04L12/58 H04Q7/22

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
G01D H04Q H04L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	GB 2 394 077 A (ABB LTD [GB]) 14 April 2004 (2004-04-14) the whole document	1-10
Y	WO 03/079717 A (QUALCOMM INC [US]) 25 September 2003 (2003-09-25) the whole document	1-10
Y	DE 102 04 065 A1 (EMSYC GMBH [DE]) 14 August 2003 (2003-08-14) paragraphs [0010], [0021]	1-10
Y	US 2007/055803 A1 (FUCHS KENNETH C [US] ET AL) 8 March 2007 (2007-03-08) paragraph [0015]	1-10

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[X] Further documents are listed in the continuation of Box C.

[X] See patent family annex.

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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
5 August 2008	13/08/2008

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL – 2280 HV Rijswijk Tel. (+31–70) 340–2040, Tx. 31 651 epo nl, Fax: (+31–70) 340–3016	Kurze, Volker

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INTERNATIONAL SEARCH REPORT

International application No
PCT/IN2008/000152

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	WO 2004/109964 A (IXI MOBILE INC [US]; YITZCHAK AVI [IL]; FORNELL PETER [US]; HALLER AMI) 16 December 2004 (2004-12-16) page 2	1-10
Y	DE 196 53 475 A1 (SIEMENS AG [DE]) 25 June 1998 (1998-06-25) column 1, lines 8-11	1-10

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/IN2008/000152

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		BR PI0308464 A	27-03-2007
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