



Digital Electric Control and Monitoring System

KEYWORDS

Digital Power meters, e-Billing, GSM modem, database

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ABSTRACT

The development of a GSM automatic power meter reading (GAPMR) system is presented in this paper. The GAPMR system consists of GSM Digital Power meters installed in every consumer unit and an Electricity e-Billing system at the energy provider side. The GSM Digital Power meter (GPM) is a single phase digital kWh power meter with embedded GSM modem which utilizes the GSM network to send its power usage reading using short messaging System (sms) back to the energy provider wirelessly. At the power provider side an e-billing system is used to manage all received sms meter reading, compute the billing cost, update the database, and to publish billing notification to its respective consumer through sms.

2. INTRODUCTION:

2.1. OUR COUNTRY.

Traditional meter reading for electricity consumption and billing is done by human operator from houses to houses and building to building. This requires huge number of labor operators and long working hour to achieve complete area data reading and billing. Human operator billing or prone to reading error as sometime the houses electric power meter is place in a location where it is not easily accessible. Labor billing job is sometime also restricted and is slowed down by bad weather condition. The increase development of residential housing and commercial building in the developing country

2.2. IN ABROAD.

such as for example, Malaysia require more human operators and longer working hours to complete the meter reading task. This increases the energy provider operation costs for meter reading. In order to achieve efficient meter reading, reduce billing error and operation costs, automatic meter reading (AMR) system play an important role to address the above mentioned problems.

2.3. INNOVATIVE.

AMR is an effective mean of data collection that allow substantial saving through the reduction of meter re-read, greater data accuracy, improved billing and customer service, more timely energy profiles and consumption trends updates, and better deployment and human resources. With the advent of digital technology analogue electro-mechanical meter is continuously replaced by digital electronic meter. Digital energy meter offer greater convenience to implement and establish automatic meter readings systems electronically. Efficiency and reliability of retrieving meter reading in the AMR system was a major challenge. Various AMR methods and technologies using power line carrier (PLC) communications, supervisory control and data acquisition (SCADA), telephone modem, internet, Ethernet, embedded RF module, Wi-Fi, blue tooth and ZigBee were Top of the document established and developed to provide and demonstrate the solution of efficiency reliability and effectiveness of AMR. The above mention methods are either too expensive to imple-

ment and operate, required complex setup of infrastructure, sort operating distant and still require field intervention of human operators or prone to error. With the rapid development of global system mobile (GSM) infrastructure and information communication technology (ICT) in the past few decades has made wireless automatic meter reading system more reliable and possible. The GSM automatic power meter reading system (GAPMR) presented in this paper takes advantage of the available GSM infrastructure nation wide coverage in the country and the short messaging system (SMS) cell broadcasting feature to request and retrieve individual and building power consumption meter reading back to the energy provider wirelessly.

3. OBJECTIVE:

To implement automatic Power meter reading for providing high flexibility, accuracy using GSM Network

3.1. PROBLEM STATEMENT.

- Meter reading taken manually
- Bill pay manually
- Errors occurred due to less concentration
- Meter reading not accurate
- Huge Manpower needed
- Delayed work due to external conditions
- Power cut manually due to lack of payment

3.2. PROPOSED SYSTEM: (Scope).

- Meter reading taken automatically using gsm technology
- Power cut achieved from EB office through wireless
- Normal work happen at any time and external conditions
- Less Manpower
- High Accurate meter reading
- Customer service well
- Reduced billing errors
- Less operation cost
- Less manpower
- High efficiency and reliability

4. METHODOLOGY:

4.1. BLOCK DIAGRAM.



4.2.HARDWARE:

- Power supply[5v]
- PIC16F877A microcontroller
- Zigbee Module
- Current Transformer
- Voltage Transformer
- Display unit(LCD)
- Relay
- Max232 – serial communication
- optocouplers

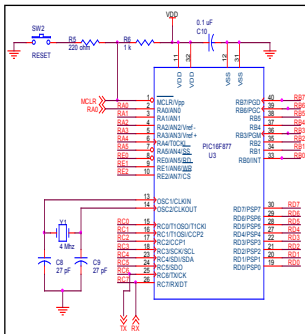
4.3.Power Supply Circuit.

4.4.Power Supply – Circuit Description.

The operation of power supply circuits built using filters, rectifiers, and then voltage regulators. Starting with an AC voltage, a steady DC voltage is obtained by rectifying the AC voltage, then filtering to a DC level, and finally, regulating to obtain a desired fixed DC voltage. The regulation is usually obtained from an IC voltage regulator Unit, which takes a DC voltage and provides a somewhat lower DC voltage, which remains the same even if the input DC voltage varies, or the output Load connected to the DC voltage changes.

4.5.Microcontroller.

- PIC16F877A



4.6.Potential Transformers.

PTs or VTs are the most common devices used. These devices are conventional transformers with two or three windings (one primary with one or two secondary). They have an iron core and magnetically couple the primary and secondary. The high side winding is constructed with more copper turns than the secondary (i.e.), and any voltage impressed on the primary winding is reflected on the secondary windings in direct proportion to the turns ratio or PT ratio.

4.7.Current Transformers.

A current transformer (CT) is a type of instrument transformer designed to provide a current in its secondary winding proportional to the alternating current flowing in its primary. They are commonly used in metering and protective relaying in the electrical power industry where they facilitate the safe measurement of large currents, often in the presence of high voltages. The current transformer safely isolates measurement and control circuitry from the high voltages typically present on the circuit being measured.

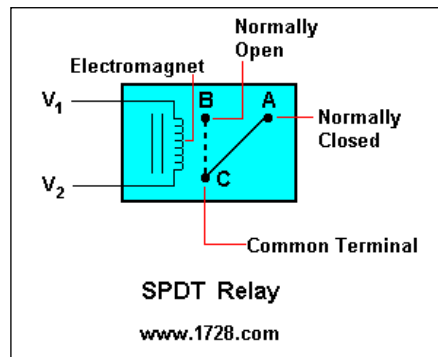
4.8.Serial communication.

- PIC microcontroller and write the code to initialize the USART and use it to send and receive data
- Data you need to transmit and it will do the rest.
- It transmits data at standard speeds of 9600, 19200 bps etc.
- The advantage of hardware USART is that you just need to write the data to one of the registers of USART and you're done; you are free to do other things while USART is transmitting the byte.
- USART automatically senses the start of transmission of RX line and then inputs the whole byte and when it has the byte it informs you(CPU) to read that data from one of its registers



4.9.Relay.

A relay is an electrical switch that opens and closes under the control of another electrical circuit. In the original form, the switch is operated by an electromagnet to open or close one or many sets of contacts



4.10.Relay Operation

Diagram that a relay uses an electromagnet. This is a device consisting of a coil of wire wrapped around an iron core. When electricity is applied to the coil of wire it becomes magnetic, hence the term electromagnet. The A B and C terminals are an SPDT switch controlled by the electromagnet. When electricity is applied to V1 and V2, the electromagnet acts upon the SPDT switch so that the B and C terminals are connected. When the electricity is disconnected, then the A and C terminals are connected. It is important to note that the electromagnet is magnetically linked to the switch but the two are NOT linked electrically.

4.11.GSM modem.

- A GSM modem is a wireless modem that works with a GSM wireless network.
- A wireless modem behaves like a dial-up modem. The main difference between them is that a dial-up modem

sends and receives data through a fixed telephone line while a wireless modem sends and receives data through radio waves.

- A GSM modem can be an external device or a PC Card / PCMCIA Card. Typically, an external GSM modem is connected to a computer through a serial cable or a USB cable.
- Like a GSM mobile phone, a GSM modem requires a SIM card from a wireless carrier in order to operate.

4.12. Optocouplers.

The single-transistor type optocouplers are used to perform high-speed switching (with high-speed response). The Darlingtontype optocouplers are used to obtain a large output current by utilizing a small input current (independently of switching speeds).

Designing the circuits properly will improve the PS2601 optocoupler (Single Transistor type) by having a base pin in terms of switching speed, elimination of noise in input signals, and output leakage current (collector dark current, and application to highvoltage circuits).

5. TERMINOLOGY:

- GAPMR-GSM automatic power meter reading
- GPM -GSM Digital Power meter
- SMS-short messaging system
- AMR -automatic meter reading
- PLC -power line carrier
- SCADA -supervisory control and data acquisition
- GSM -global system mobile
- ICT-information communication technology

6. EMBEDDED SOFTWARE:

• MPLAB IDE.

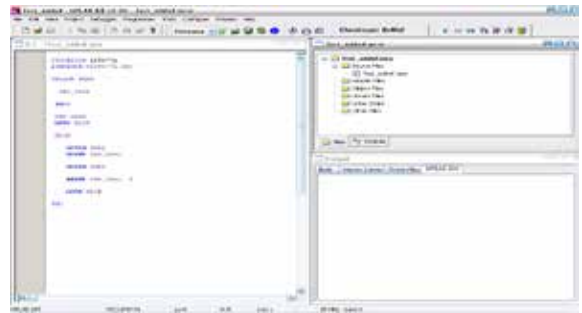
The current version of MPLAB IDE is version 8.89. It is a 32-bit application on Microsoft Windows and includes several free software components for application development, hardware emulation and debugging. MPLAB IDE also serves as a single, unified graphical user interface for additional Microchip and third-party software and hardware development tools. Both Assembly and C programming languages can be used with MPLAB IDE v8. Others may be supported through the use of third-party programs. Support for MPLAB IDE, along with sample code, tutorials, and drivers can be found on Microchip's website. MPLAB IDE v8 does not support Linux,

Unix or Macintosh operating systems.

• Hi-tech c compiler.

A compiler is a computer program (or set of programs) that transforms source code written in a programming language (the source language) into another computer language (the target language, often having a binary form known as object code). The most common reason for wanting to transform source code is to create an executable program.

• Winpic programmer.



7. CONCLUSION:

Traditional meter reading for electricity consumption and billing is done by human operator from houses to houses and building to building. This requires huge number of labor operators and long working hour to achieve complete area data reading. The development of a GSM automatic power meter reading (GAPMR) system is presented in this paper. The GAPMR system consists of GSM Digital Power meters installed in every consumer unit and an Electricity e-Billing system at the energy provider side. The GSM Digital Power meter (GPM) is a single phase digital kWh power meter with embedded GSM modem which utilizes the GSM network to send its power usage reading using short messaging System (sms) back to the energy provider wirelessly. At the power provider side an e-billing system is used to manage all received sms meter reading, compute the billing cost, update the database, and to publish billing notification to its respective consumer through sms.

REFERENCE

- Carboneau, N; Vallerand, R; Fernet, C; Guay, F. (2008). The Role of Passion for Teaching in Intrapersonal and Interpersonal Outcomes. *Journal of Educational Psychology*, 100(4): 977-987 | | Day, C. (2004). *A Passion for Teaching*. London: Routledge Falmer. | | Fink, L.D. (2003). *Creating significant learning experiences*. San Francisco, CA: Jossey | Bass. | | Fredricks, J; Alfeld-Liro, C; Eccles, J. (1999). *Developing and Fostering a Passion for Learning and Engagement*. Paper presented at the annual meeting of the American Educational Research Association, Montreal, Quebec, Canada. | | Fried, R. (1998). *The Heart of the Matter*. In *Kaleidoscope: readings in Education*, (Ryan, K. & Cooper, J.M., Eds.). Boston: Houghton Mifflin Company. | | Fried, R. (2001). *The passionate teacher: A practical guide*. Boston: Beacon Press. | | Hansen, D.T. (1995). *The Call to Teach*. New York: Teachers College Press. | | Hansen, D.T. (2001). *Exploring the Moral Heart of Teaching: Toward a Teacher's Creed*. New York: Teachers College Press. | | Hargreaves, A. (Ed.). (1997). *Rethinking educational change with heart and mind*. Alexandria, VA: Association for Supervision and Curriculum Development. | | Olson, D.L. (2003). *Principles, Impracticality, and Passion*. *Phi Delta Kappan*, 85(4): 307-309 | | Vallerand, R. J. (2007). *On the psychology of passion: In search of what makes life most worth living*. Presidential Address at the 68th Canadian Annual Psychological Association Convention in Ottawa, Ontario. doi: 10.1037/0708.5591.49.1.1 | | Zehm, S. J., & Kottler, J. A. (1993). *On being a teacher: The human dimension*. Thousand Oaks, CA: Corwin Press. | |