"GSM BASED POWER THEFT DETECTOR"

A Project report submitted in partial fulfillment for the degree of
Bachelor of Engineering

In

Electrical Engineering

By

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(2015-16)

CERTIFICATE

This is to certify that this dissertation report entitled "GSM BASED POWER THEIFT DETECTOR" is a record of work carried out by

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of B.E. (Electrical Engineering)(Sem-VIII) class and is submitted to the Mumbai University, Mumbai in partial fulfillment of the requirement for the degree of Bachelor of Engineering in Electrical Engineering. The project report has been approved.

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(Internal Guide)	**(External Guide)**
Pro	
(Head of Department)	**(Principal)**

Approval of Project

The project report entitled "**GSM BASED POWER THEIFT DETECTOR**" submitted by:

Of **B.E. (Electrical Engineering) (Sem-VIII)** has been accepted in partial fulfillment of Bachelor Engineering in Electrical Engineering of Mumbai University. The project has been approved.

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ACKNOWLEDGEMENT

I owe a deep sense of gratitude to my project guide **Mr. VIVEK TIWARI** for stimulating my interest in the subject. His involvement right from conceptualization of the study through its execution and meticulous perusal of the manuscript ensured its timely completion.

I would also like to thank my internal guide and Head Of Department **Prof. KALEEM SAYYED** for his thought provoking comments, valuable suggestions constant motivation encouragement and support.

I would also like to thank all our teachers for contributing to my overall training.

Heartfelt thanks to our family for their unconditional support and last but not the least our friends and colleagues for their help and co-operation.

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ABSTRACT

Home automation is designed to prevent an actual confrontation between a returning occupant and an intruder. In the market, we found out many systems that can be use to protect the property. However if a member of the family was away, we wanted a system that would inform the member if the house has being broken into. This was ultimate safety that one looks for in a home security system. We can also add features such as lpg gas leakage, fire breakdowns or even water tank overflow.

Chapter 2 deals with the history of home automation along a brief description of Hardware & Software.

Chapter 3 deals with the basics of GSM System. It gives the details of the adopted methodology which includes Block diagram, Circuit diagram, Hardware & Software used.

Chapter 4 deals with Analysis, Experimentation & Results. It includes descriptions of various ICs used, PCB layout & Challenges faced during our project.

Chapter 5 deals with the future scope and conclusion.

In order to make the system ‘smart’, we have made the mobile phone almost a universal remote controller, where in the user can control various devices at his home just through the SMS.

We have even solved the i/o port limitations by expanding the ports using latches and buffers so that more sensors can be interfaced in future.

GSM Based Power Theift detectior

Introduction:

electricity is indispensable to our daily life. Traditional remote meter reading system uses telephone lines and Modem to transmit data and control signals, but with the drawbacks of high maintenance costs, poor scalability and instable performance of Modem that is charged for too long. With the development of GSM network and its increasing popularity, GSM Modem and Short Message are gradually used to transmit information but there are still a few shortcomings, such as the unsatisfactory real-time ability to control the theft of electricity when user is not at home

. The objective of this project is to design the SYSTEM in order to avoid the displeasure for the USERS From cut of electricity meter WITH intelligent control of meter by user Utility companies are under pressure. Growing populations are using increasing amounts of power,

which is putting a strain on existing supplies. In many countries the increase in demand is growing at a faster rate than transmission capacity And the cost of providing power is also increasing due to higher fuel prices and increases in the cost of construction and capital expenses.This paper provides an overview of Wireless Sensor Network for Power Management.

Brief methodology:

This project is designed with

- Current sensor
- PIC
- GSM INTERFACE
- Gsm modem
- Relay driver circuit with relay
- Max 232 (serial port)
- LCD display

current sensor

The Allegro® ACS712 provides economical and precise solutions for AC or DC current sensing in industrial, commercial, and communications systems. The device package allows for easy implementation by the customer. Typical load detection and management, switchmodepower supplies, and over current fault protection. The device is not intended for automotive applications.

The device consists of a precise, low-offset, linear Hall circuit with a copper conduction path located near the surface of the die. Applied current flowing through this copper conduction path generates a magnetic field which the Hall IC converts into a proportional voltage.

the primary copper conduction path (from pins 1 and 2, to pins 3 and 4), which is the path used for current sampling. The internal resistance of this conductive path is 1.2 mΩ typical, providing low power

loss. The thickness of the copper conductor allows survival of

Features and Benefits

▪ Low-noise analog signal path

▪ Device bandwidth is set via the new FILTER pin

▪ 5 μs output rise time in response to step input current

▪ 80 kHz bandwidth

▪ Total output error 1.5% at TA = 25°C

▪ Small footprint, low-profile SOIC8 package

▪ 1.2 mΩ internal conductor resistance

▪ 2.1 kVRMS minimum isolation voltage from pins 1-4 to pins 5-8

▪ 5.0 V, single supply operation

▪ 66 to 185 mV/A output sensitivity

▪ Output voltage proportional to AC or DC currents

▪ Factory-trimmed for accuracy

▪ Extremely stable output offset voltage

▪ Nearly zero magnetic hysteresis

▪ Ratiometric output from supply voltage

PIC 16F877

1. High-Performance RISC CPU:

- Only 35 single-word instructions to learn
- All single-cycle instructions except for program branches, which are two-cycle
- Operating speed: DC – 20 MHz clock input DC – 200 ns instruction cycle
- Up to 8K x 14 words of Flash Program Memory, Up to 368 x 8 bytes of Data Memory (RAM), Up to 256 x 8 bytes of EEPROM Data Memory
- Pinout compatible to other 28-pin or 40/44-pin PIC16CXXX and PIC16FXXX microcontrollers

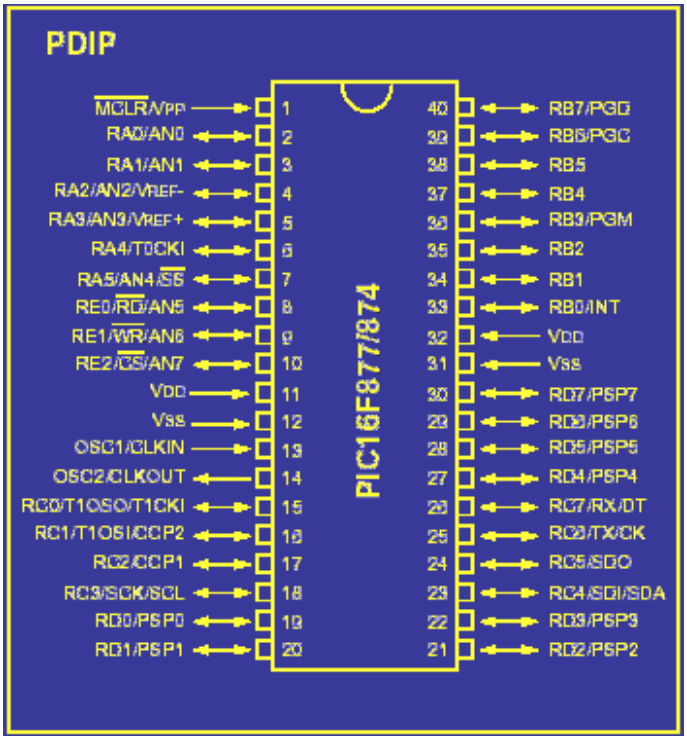
2. Peripheral Features:

- Timer0: 8-bit timer/counter with 8-bit prescaler.
- Timer1: 16-bit timer/counter with prescaler, can be incremented during Sleep via external crystal/clock.
- Timer2: 8-bit timer/counter with 8-bit period register, prescaler and postscaler.
- Two Capture, Compare, PWM modules - Capture is 16-bit, max. resolution is 12.5 ns.
    - Compare is 16-bit, max. resolution is 200 ns - PWM max. resolution is 10-bit
- Synchronous Serial Port (SSP) with SP (Master mode) and I2C™ (Master/Slave)
- Universal Synchronous Asynchronous Receiver Transmitter (USART/SCI) with 9-bit address
- Detection • Parallel Slave Port (PSP) – 8 bits wide with external RD, WR and CS controls (40/44-pin only)
- Brown-out detection circuitry for Brown-out Reset (BOR)

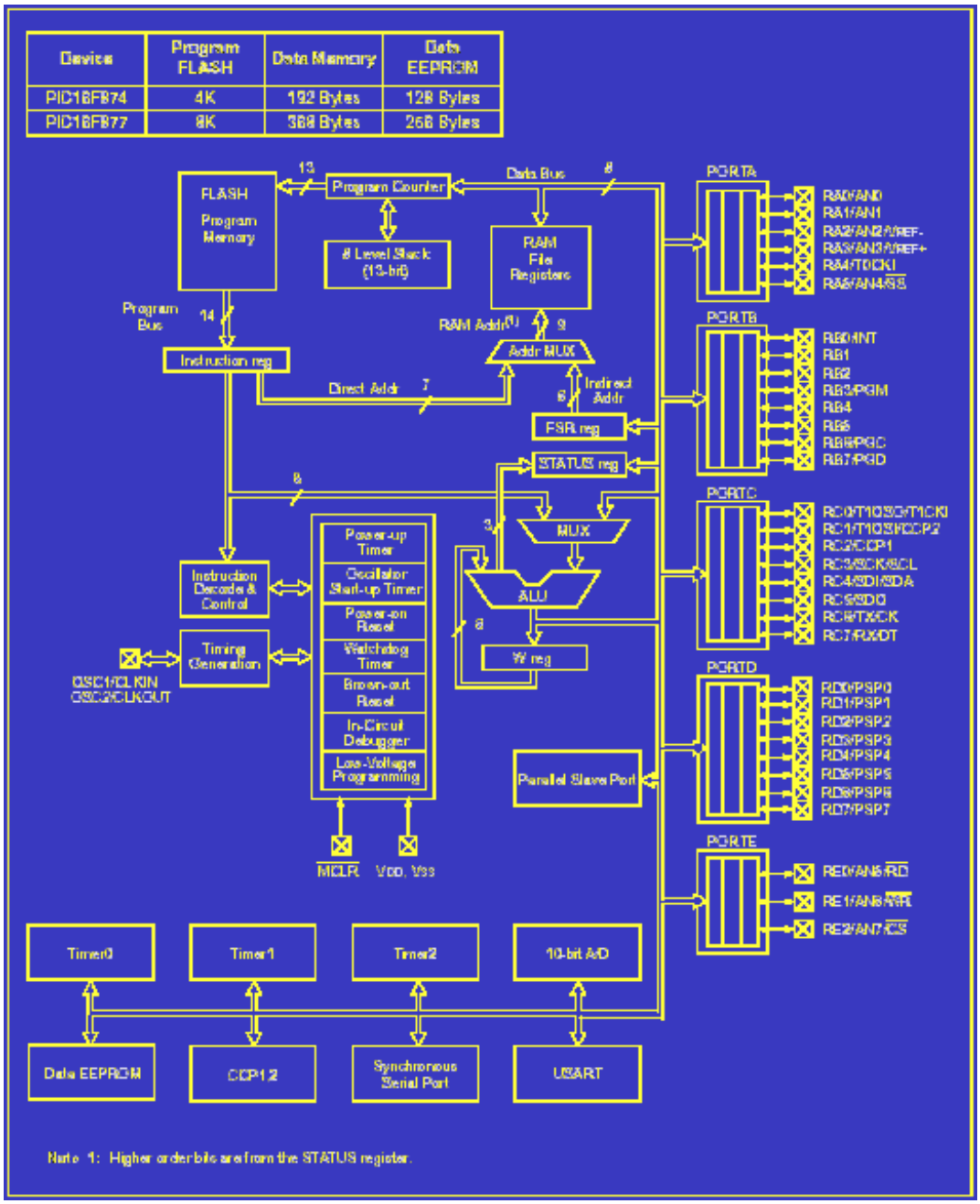
3. Analog Feature

- 10-bit, up to 8-channel Analog-to-Digital
- Converter (A/D)
- Analog Comparator module with:
    - Two analog comparators
    - Programmable on-chip voltage reference
- (VREF) module
    - Programmable input multiplexing from device
- Inputs and internal voltage reference

4. PIC Pin Diagram



5. PIC Architecture



GSM MODULE

1.Theory of GSM

The diagram below shows the flow of the data via a GSM module. The first embedded device is the microcontroller which sends the data to the module. The module then via wireless link will send the data to the GSM receiver in mobile phone. The mobile phone here acts as a second embedded device which reads the data.

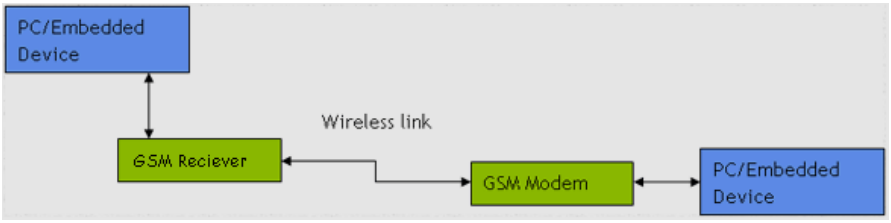


Fig. 3.6

2.Description:

More and more applications emerged with the rapid development of wireless data services, such as meter navigation, remote monitoring, wireless Internet access, wireless POS, etc. Thus, more and more devices need to be able to do wireless communication.

With this background, Sky microwave Corp. develops its MOD 9001 BENQ GSM/GPRS Modem. Users of this product can add wireless communication capability easily to their own products, and then, develop many applications. The MOD 9001 BENQ GSM/GPRS Modem mostly fits the need of data transfer, with SMS data communication, GPRS data navigation, Circuit Switch / Data Connectivity, TCP/IP protocol etc. Because the easy setting up in SCM (Single Chip Micyoco), it is convenient for network data communication. The MOD 9001 BENQ GSM/GPRS Modem with small size, which fits both embedded application and external peripheral equipment. The AT command set and RS232 interface will offer easy data connection without any extra circuit control. Traditionally, the above applications use digital cellular, CDPD or other wire-line modem to do communication, and these technologies are of

3.Features :

- Supporting 900/1800/1900 MHz GSM Tri band, better signal quality.
- Status lights indication.
- Standard RS-232 serial port, easy to use.
- Supporting both Chinese/English SMS data communication.

4.Technical Specifications:

- Operation temperature: -25℃ to +60℃
- Receive Sensitivity: -102dBm
- Maximum Transmit Power: 1W
- Dynamic range: 62dB
- Power supply: 5V, 7.5V, 12V optional, and can be changed according to customer's requirement.
- Current: standby 50mA, work 300mA
- Weight: 250g

5.Modem specification:

This GSM modem is a highly flexible plug and play GSM 900 operating frequency modem for direct and easy integration RS232, voltage range for the power supply and audio interface make this device perfect solution for system integrators and single user. Voice, Data/Fax, SMS, GPRS, integrated TCP/IP stack, RTC and other features like the GSM / GPRS.

It has Built-in TCP/IP Protocol Built-in RTC in the module. AT Command based system it has the signaling speed of 85.6 kbps

Power Supply: . Input voltage: 9V-12V

ii. Input current: 15mA in idle mode, 110mA in communication

iii. Temperature range: Operating -20 to +55 degree Celsius; Storage -25 to

+70 degree Celsius

ii. Output DC Voltage: 12V

iii. Output DC Current : 2A

Interfaces user can connect the GSM modem and initializes the modes like speed and incoming and outgoing by connecting to the following connectors

RS-232 through D-TYPE 9 pin connector

ii. Serial port baud rate 1200 to 115200 bps

6.command:

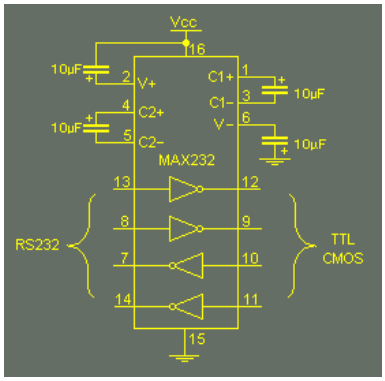
Command	Description
AT+CMGD	DELETE SMS MESSAGE
AT+CMGF	SELECT SMS MESSAGE FORMAT
AT+CMGL	LIST SMS MESSAGES FROM PREFERRED STORE
AT+CMGR	READ SMS MESSAGE
AT+CMGS	SEND SMS MESSAGEF
AT+CMGW	WRITE SMS MESSAGE TO MEMORY
AT+CMSS	SEND SMS MESSAGE FROM STORAGE
AT+CMGC	SEND SMS COMMAND
AT+CNMI	NEW SMS MESSAGE INDICATIONS
AT+CPMS	PREFERRED SMS MESSAGE STORAGE
AT+CRES	RESTORE SMS SETTINGS
AT+CSAS	SAVE SMS SETTINGS
AT+CSCA	SMS SERVICE CENTER ADDRESS
AT+CSCB	SELECT CELL BROADCAST SMS MESSAGES
AT+CSDH	SHOW SMS TEXT MODE PARAMETERS
AT+CSMP	SET SMS TEXT MODE PARAMETERS
AT+CSMS	SELECT MESSAGE SERVICE

RS232 Standards

In telecommunications, RS-232 (Recommended Standard 232) is a standard for serial binary data signals connecting between a DTE (Data terminal equipment) and a DCE (Data Circuit-terminating Equipmentand most recently as TIA 232. Valid signals are plus or minus 3 to 15 volts. The range near zero volts is not a valid RS-232 level; logic one is defined as a negative voltage, the signal condition is called marking, and has the functional significance of OFF. Logic zero is positive, the signal condition is spacing, and has the function ON. The standard specifies a maximum open-circuit voltage of 25 volts. The region -3 to +3 is called as a dead band, since the voltages are undefined in this region. For this reason to use RS232 to any microcontroller we must first use voltage converters like MAX232 to convert TTL logic to RS232 logic and vice versa. Such chips are commonly known as line drivers.

1. **MAX232**

A standard serial interfacing for PC, RS232C, requires negative logic, i.e., logic '1' is -3V to -12V and logic '0' is +3V to +12V. To convert a TTL logic, say, TxD and RxD pins of the uC chips, thus need a converter chip. A MAX232 chip has long been using in many uC boards. It provides 2-channel RS232C port and requires external 10uF capacitors. This I.C. also includes two receivers and two transmitters in the same package. This is useful in many cases when you only want to use the Transmit and Receive data Lines. You don't need to use two chips, one for the receive line and one for the transmission.



16X2 LCD DISPLAY

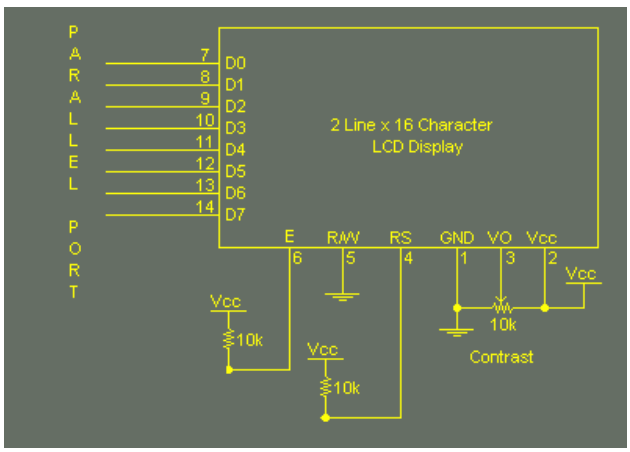
1. Features

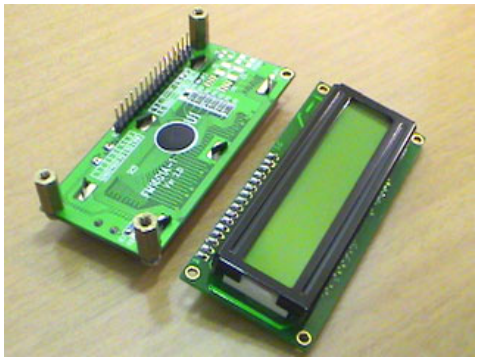
- Maximum input voltage: 5.3VDC
- Operating input voltage: 5VDC
- 8-bit interface data bus
- Controller: HD47780 equivalent
- Character font size: 0.125"W x 0.200"H
- 16 pin/terminals
- Display size: 2.5"L x 0.7"W
- Module size: 3.4"L x 1.2"W x 0.5"T

2. Description

This is a 16 character by 2 line display, with the standard HD44780 chipset. It works great with any microcontroller and it is very easy to interface. This LCD has 8-bit parallel interface. It is possible to use all 8 bits plus 3 control signals or 4 bits plus the control signals.

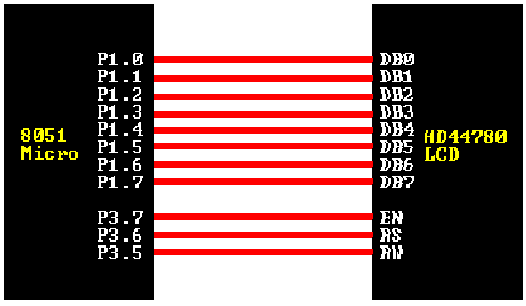
3. Pin Diagram



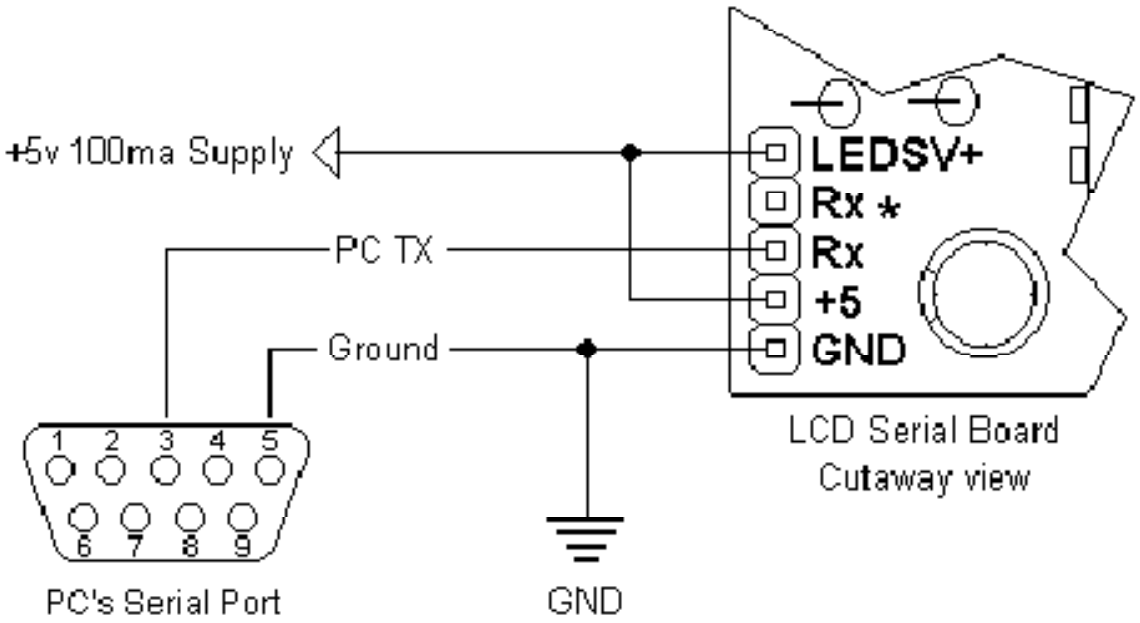


4. **LCD Interfacing diagram**

The diagram below gives the interfacing configuration of the LCD with the microcontroller.



Connecting to PC



BackSpace Ctrl-H
Causes the cursor to move back once space. The cursor will wrap from the first column of a line to the last column of a previous line. Sending backspace when at the home position causes the cursor to wrap to the last character position of the last line.

HorizontalTab Ctrl-I
Causes the cursor to move forward to the next tab position. If the cursor is near the end of the line and no more tab positions are on the line, then the cursor will advance to the next line. The LCD Controller is initial set up with tab positions at every 4'th column. To set the tab position at a different column use the setTabSize command.

NewLine Ctrl-J
Causes the cursor to advance to column 1 of the next line. If the cursor is on the last line, it will wrap to the home position.

5

VerticalTab Ctrl-K
Causes the cursor to advance to the next line, but stay on the same column. If the cursor is on the last line of the screen, it will wrap to the first line of the screen.

FormFeed Ctrl-L
Causes the screen to be cleared and the cursor positioned to the home position. The form feed command takes some time to complete. It may take up to 2ms to complete. Since the LCD Controller has a finite amount of internal buffer space (16 bytes) for storing commands and data before sending to the LCD, you may overrun the internal buffer when sending multiple form feed commands in

succession followed by other data.

CarriageReturn Ctrl-M

Causes the cursor to go to column 1 of the current line

ResetController Ctrl-N

Resets the LCD controller as if it had been just power on. This command will also cause the hardware jumpers to be reread, so you can use it if you want to change baud rate or display size. This command takes about 1 second to complete.

SetGeometry Ctrl-O

Defines the layout (or geometry of the LCD). This command needs to issued before any other commands if the LCD is not a 20 character by 4 line LCD. You need to send 5 addition bytes after sending a setGeometry command.

Example:

15,20,0x80, 0xC0,0x94,0xD4Standard 20 column by 4 line display

15,16,0x80, 0xC0,0x94,0xD4Standard 16 column by 4 line display

15,16,0x80, 0xC0,0x80,0x80 Standard 16 column by 2 line display

If the display is less than 4 lines then you still need to send the line 1 starting address for the unused starting addresses. See the appendix for the typical layout of various LCD modules.

SetTabSize Ctrl-P

Sets the size of a tab. You need to send a byte that is the negative of the tab size. The default tab size is 4. The tab size should be a power of 2 (i.e. 0, 1, 2, 4, 8, 16)

6

SetCursorPositionCtrl-Q

Sets the cursor position. The following 2 bytes specify the zero based row and column of the cursor position. The bytes need to be within the display range. Sending bytes outside the display range will position the cursor to unpredictable locations.

SetContrast Ctrl-S

Sets the display contrast. The byte following the the setContrast command will set the display contrast. A contrast of 0 is no contrast and a contrast of 255 is full contrast. The contrast is set to 50% after power up.

SetBacklight Ctrl-T

Sets the display backlight brightness. The byte following the setBrightness command will set the display brightness. A brightness level of 0 will turn off the backlight completely. A brightness level of 255 is full brightness. The brightness is set to 80% after power up.

CommandEscape Ctrl-U

The following byte is sent to the LCD controller as a raw LCD controller command. See the appendix for a list of commands that the LCD controller supports. You will mostly use this command to define custom characters and to set the cursor shape and visibility.

DataEscape Ctrl-V

The following byte is treated as data. This command is used to send bytes that would normally be interpreted as commands. Some LCD displays (in particular

PROGRAM

```
DEFINE  OSC 20
CLEAR



;----[LCD definitions]---------------------------------------------------
DEFINE LCD_DREG  PORTD
DEFINE LCD_DBIT  0
DEFINE LCD_EREG  PORTD
DEFINE LCD_EBIT  5
DEFINE LCD_RSREG PORTD
DEFINE LCD_RSBIT 4
DEFINE LCD_BITS  4
DEFINE LCD_LINES 2



ADC1 VAR BYTE
ADC2 VAR BYTE
SW1    VAR PORTB.4
SW2    VAR PORTB.5
SW3    VAR PORTB.6
SW24   VAR PORTB.7
RLY1   VAR PORTB.0
RLY2   VAR PORTB.1
```

```
   RLY3    VAR PORTB.2
   RLY4    VAR PORTB.3

   GOTO MAIN




MAIN:
   lcdout $fe,1,"POWER MANAGEMENT"
   lcdout $fe,$c0,"SYSTEM."
   pause 3000
   lcdout $fe,1,"A.I.K.T.C"
   lcdout $fe,$c0,"2015-16"
   pause 3000

   WHILE 1
CHECK:

      IF SW1 = 0 THEN GOSUB MODE1
      IF SW2 = 0 THEN GOSUB MODE2
      IF SW3 = 0 THEN GOSUB MODE3
      IF SW4 = 0 THEN GOSUB MODE4
```

```
MODE1:
   lcdout $fe,1,"MORNING TIME"
   HIGH RLY1 : LOW RLY2 : LOW RLY3 : LOW RLY4


MODE2:
   lcdout $fe,1,"AFTERNOON TIME"
   HIGH RLY1 : HIGH RLY2 : LOW RLY3 : LOW RLY4

RETURN

MODE3:
   lcdout $fe,1,"EVENING TIME"
   HIGH RLY1 : HIGH RLY2 : HIGH RLY3 : LOW RLY4

RETURN

MODE4:
   lcdout $fe,1,"NIGHT TIME"
   HIGH RLY1 : HIGH RLY2 : HIGH RLY3 : HIGH RLY4

RETURN

   lcdout $fe,$c0,"CURRENT:", DEC3 ADC1 , "              "
```

```
IF ADC1 > 50 THEN
        SEND_SMS
       HSEROUT ["AT+CMGS="09769478416",]
       PAUSE 500
       HSEROUT ["OVER CURRENT:  ADC1, ]
     ENDIF


       '-----------------------------------------------------
       '-----------------------------------------------------
       HSERIN["AT+CMGR=",]
       PAUSE 100
       HSerin 500,CHECK,[wait("*ABC:"),""]
       PAUSE 100
       lcdout $fe,$c0,"VAL: ", DEC SER_DATA
       PAUSE 10000

       ELSEIF SER_DATA = 6 THEN
         LOW RLY1 :LOW RLY2 : LOW RLY3 : LOW RLY4
       ENDIF

    WEND
```

BLOCK DIGRAM