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ADVANCED ELECTRONIC VOTING MACHINE

By

M.AHMED BASHA Reg No: 0710107001

S.DHINESH NAGANDRAN Reg No: 0710107021

B.GOWTHAM Reg No: 0710107033

NANDU GOPINATH Reg No: 0710107060

of

KUMARAGURU COLLEGE OF TECHNOLOGY,
COIMBATORE - 641 049.
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A PROJECT REPORT

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BONAFIDE CERTIFICATE

This is to be certify that this project report "**ADVANCED ELECTRONIC VOTING MACHINE**" is the bonafide work of "**M.AHMED BASHA, S.DHINESH NAGANDRAN, B.GOWTHAM and NANDU GOPINATH**" who carried out the project work under my supervision.

SIGNATURE

Dr.(Mrs).Rajeswari Mariappan

Head of the Department

Department of Electronics and

Communication Engineering,

Kumaraguru College of Technology

Coimbatore.

SIGNATURE

Dr.(Mrs).Rajeswari Mariappan

Project Guide

Department of Electronics and

Communication Engineering,

Kumaraguru College of Technology

Coimbatore.

The candidates with University Register numbers **0710107001, 0710107021, 0710107033, 0710107060** were examined by us in the Project Viva voce Examination held on 18-4-2011

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ABSTRACT

"Democracy is the government of the people, by the people and for the people", the famous quote said by Abraham Lincoln suits well for our country. India being the second largest democratic country in the world selects the opt person for ruling the government by the Voting process. Our project aims at enhancing the existing method with the help of new technology available.

Three modules are used in our project are

- Finger print reader- Authentication purpose
- Touch screen- Casting the vote.
- Bluetooth - Transmitting data to the main server.

The personal detail of the voters along with their finger print is stored in the PC in the poll booth. The voters have to scan their finger in the finger print reader and after authentication they cast their vote in the touch screen where the Identification symbols of the candidates are displayed. In case the finger print authentication fails, then the voter is not allowed to vote so that anti voting can be avoided. The detail of the voters and the selected candidate is then transmitted from the polling booth PC to the main server with the help of Bluetooth which gets updated every minute. This helps in announcing the result on the same day.

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CHAPTER 1

INTRODUCTION

1.1 BRIEF OVERVIEW

Voting is a method for a group such as a meeting or an electorate to make a decision or express an opinion—often following discussions, debates, or election campaigns. It is often found in democracies and republics. A **vote** is an individual's act of voting, by which he or she expresses support or preference for a certain motion (for example, a proposed resolution), a certain candidate, a selection of candidates, or a political party. In our project we have created a voting machine kit using PIC16F877A microcontroller for casting the vote.

Anti-voting is an existing philosophy in our election process using which single person casts several votes for his desired candidate instead of other people. This anti voting can be avoided by using finger print scanner which acts as an extra security feature as no two individual have the same and matching finger print. Also the vote counting can be instant as the database in the PC gets updated each and every second. The PC in the poll booth is connected to the central server wireless with the help of Bluetooth technology. Thus vote counting results can be announced the instance polling gets over.

1. 2 BLOCK DIAGRAM

The block diagram of this project comprises of two major sections namely,

1. Client section,
2. Server section

1.2.1 CLIENT SECTION

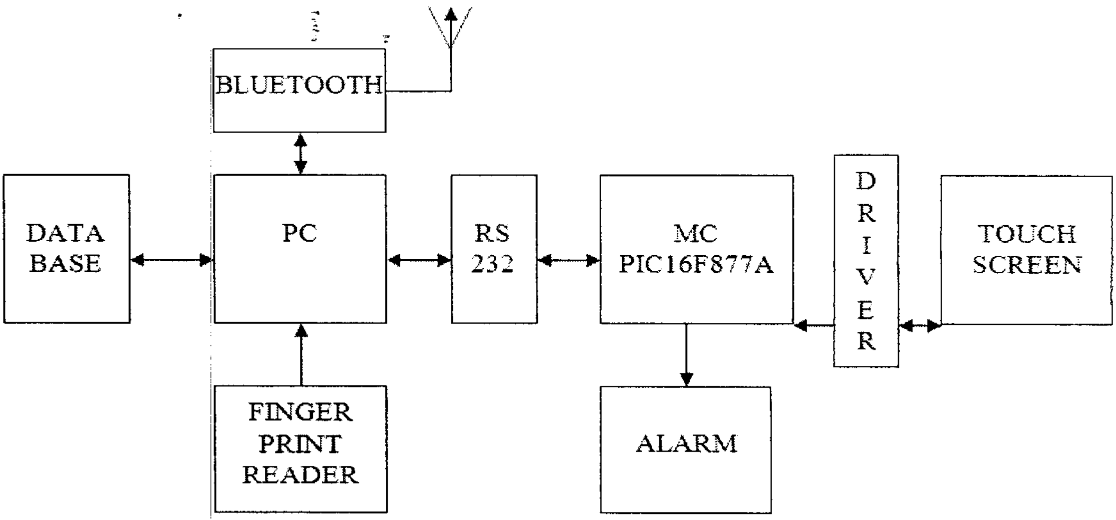


Fig 1.1 Block diagram of Client section

1.2. 2 SERVER SECTION

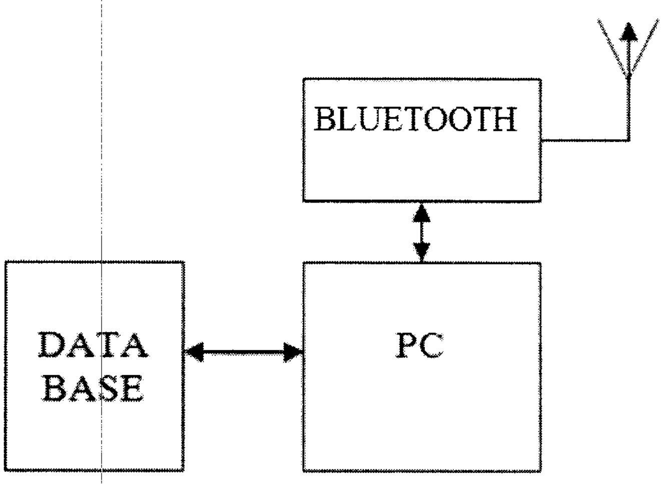


Fig 1.2 Block diagram of Server section

1.3 DESCRIPTION OF CLIENT SECTION

The power supply section is the important one. It should deliver constant output regulated power supply for the successful working of the project. A 0-12V/mA transformer is used for this purpose. The primary of this transformer is connected into power supply through ON/OFF switch and fuse for protecting from overload and short circuit protection. The secondary is connected to the diodes to convert 12V AC to 12 DC voltages and filtered by the capacitors, which are further regulated to +5v, by using IC 7805.

Microcontroller PIC16F877A is one of the PICMicro Family microcontroller which is popular at this moment, start from beginner until all professionals. Because very easy using PIC16F877A and use FLASH memory technology so that can be write-erase until thousand times. The superiority this Risc Microcontroller compared to with other microcontroller 8-bit especially at a speed of and his code compression. PIC16F877A have 40 pin by 33 path of I/O.

RS-232 is an important part in interfacing a peripheral device with microcontroller. The output of the microcontroller is usually in TTL format but the peripheral devices require a RS-232 input. Hence RS-232 serves the part of serial communication.

A touch screen is a 2 dimensional sensing device that is constructed of two sheets of material separated slightly by spacers. A common construction is a sheet of glass providing a stable bottom layer and a sheet of polyethylene (PET) as a flexible top layer. When the PET film is pressed down the two resistive surface meet. The position of this meeting (a touch) can be read by a touch screen controller circuit.

The controller reads the X and Y positions many times per seconds. So the user may move his stylus or finger rapidly across the touch screen and the data will be captured. This provides smooth operation and allows drag and drop or signature capture.

This optical fingerprint scanner is ergonomically designed, resistant to scratch, impact and electrostatic discharge due to its hardened contact contact area. The use of the latest in optical sensor technology ensures that the images captured are in ultra-high resolution.

Another remarkable feature is the Auto-On function, which automatically turns on the sensor whenever a finger is placed on the scanner. The Secugen Hamster IV FIPS 201 USB Fingerprint Scanner comes with an integrated guide, removable weighted stand, and USB cable.

This device, measuring 27X40X73 mm and weighing a mere 100 grams, is highly effective in temperatures ranging from 0 to 40 degrees and humidity less than 90 percent. On an average this Flips compliant fingerprint reader has a life span of 60,000 hours in normal operating conditions.

The alarm in our project contains both buzzer and LED .It determines whether the command receive or not in the Bluetooth receiving section. The alarm circuit sounds a warning in the form of a continuous or intermittent buzzing or beeping sound.

1.4 DESCRIPTION OF SERVER SECTION

Bluetooth technology makes its link robust in a noisy radio frequency environment through its fast acknowledgment and frequency-hopping scheme. Bluetooth needs shorter packets and hops faster. It also offers a global bridge to the prevailing data networks, a peripheral interface, and a mechanism to form small private ad-hocks grouping of connected devices away from the fixed network infrastructures. Bluetooth device in the transmitter section receives the command from the microcontroller through RS-232. Bluetooth transceiver in the transmitter section sends the command in the form of radio frequency signals in the range of 2.4GHz. Bluetooth transceiver in the receiver section receives the signals from the transmitting antenna and sends into microcontroller in the receiver section. According to the command send by the user, the microcontroller operates its function.

PC section must have the following requirements of the Operating System of Windows XP, Microsoft office tools and Visual Studio being installed.

1.5. OVERALL CIRCUIT DIAGRAM

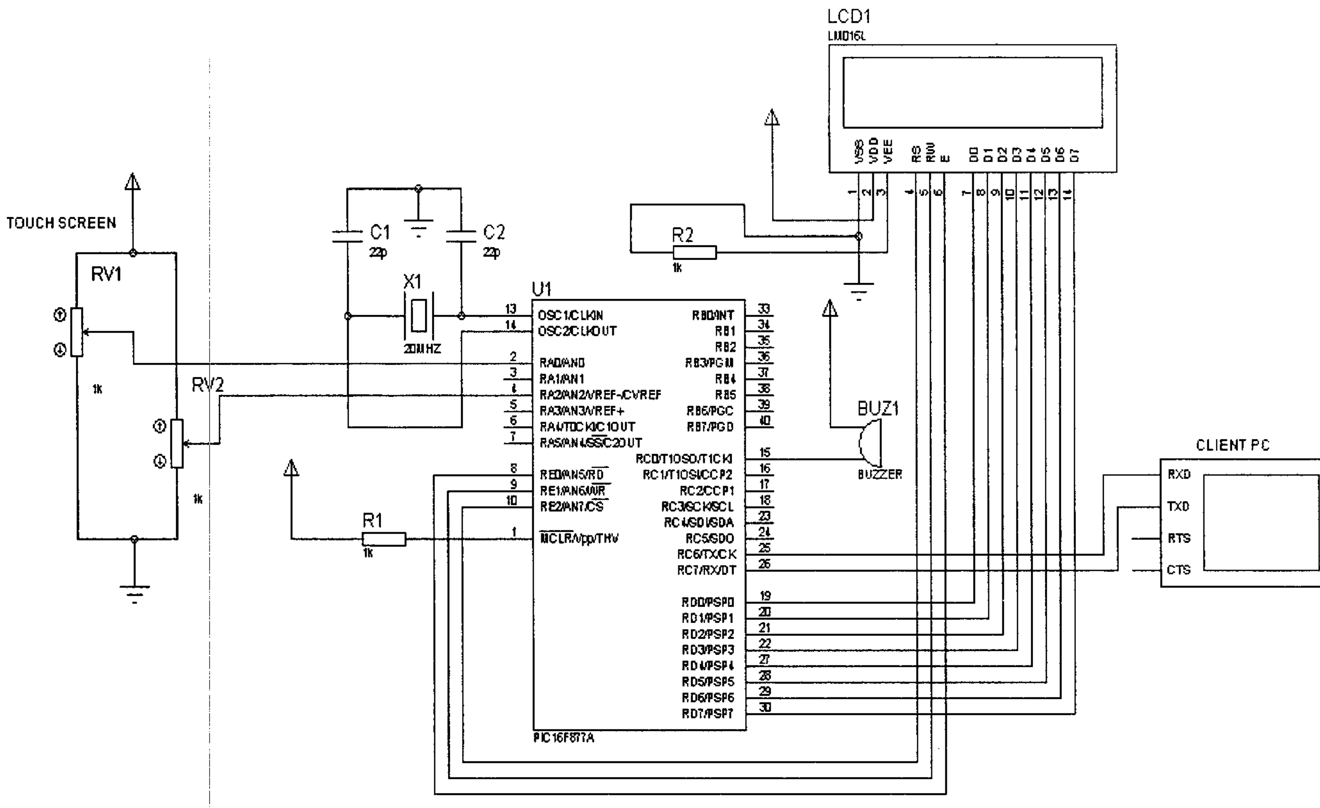
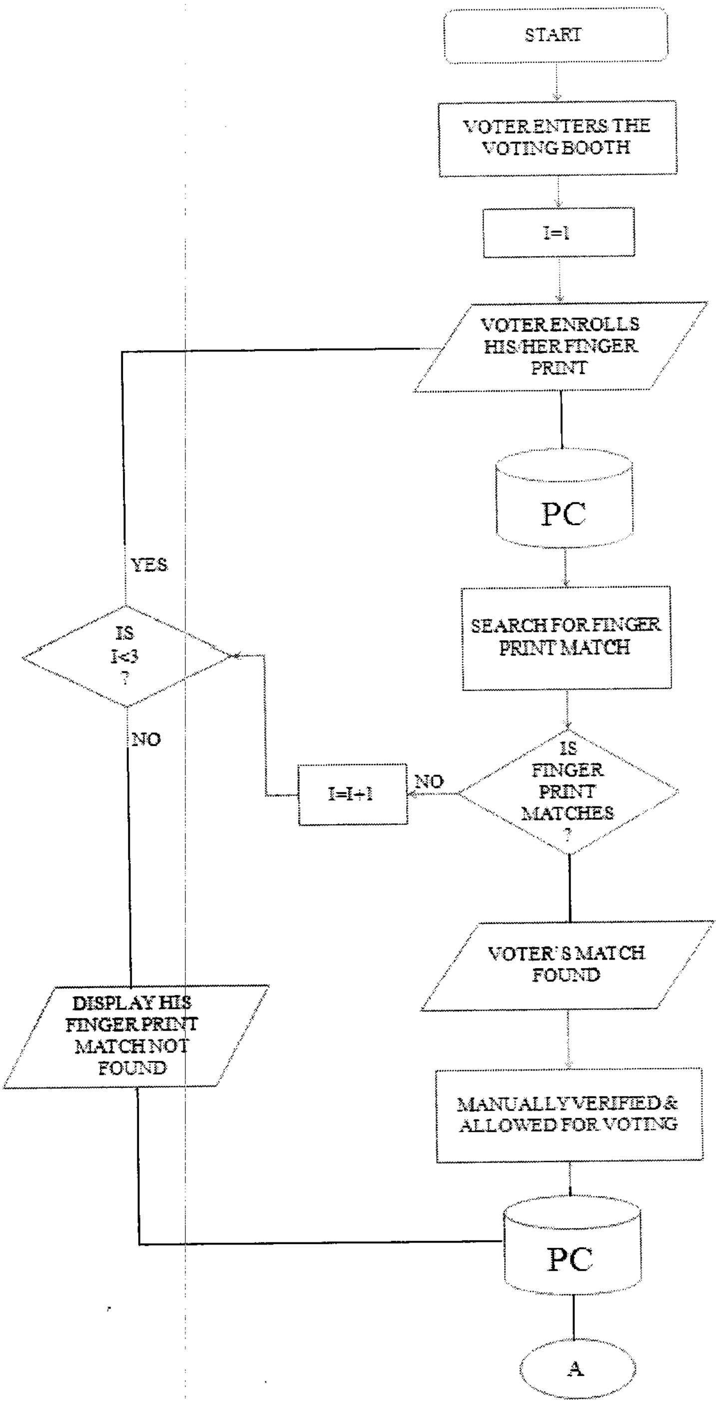
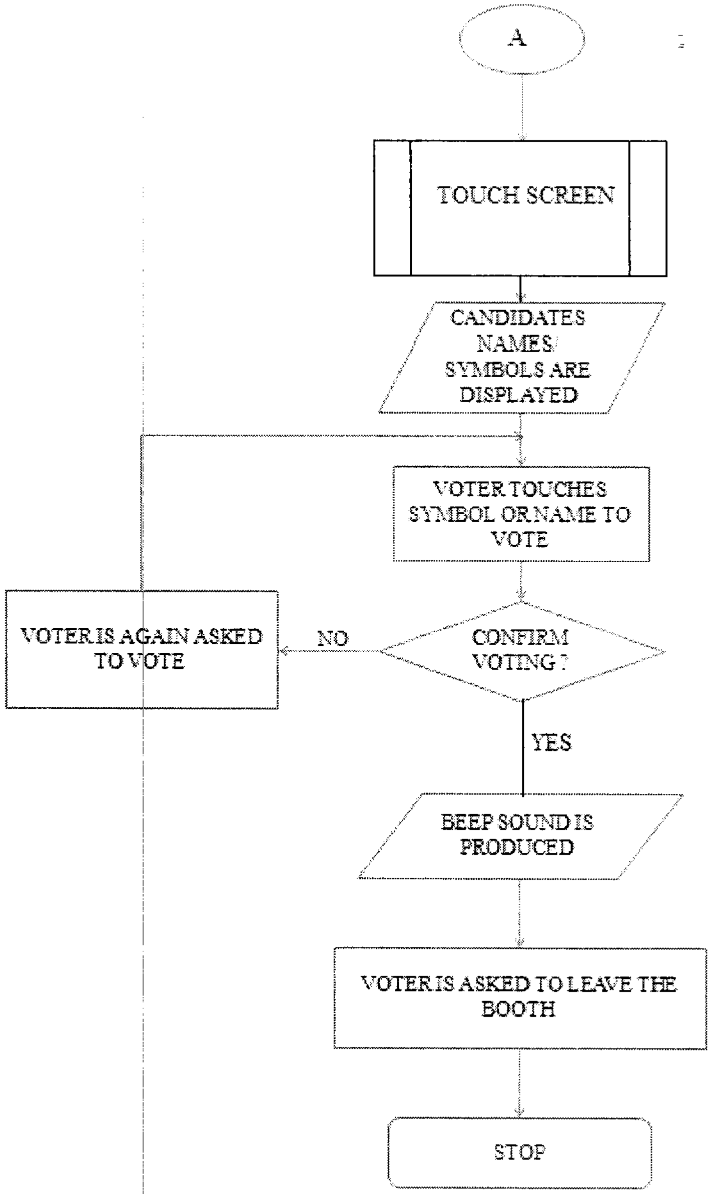


Fig1.3 Circuit diagram -Microcontroller LCD display and Touch screen

1.6 FLOW CHART




A
TOUCH SCREEN
CANDIDATES NAMES/ SYMBOLS ARE DISPLAYED
VOTER TOUCHES SYMBOL OR NAME TO VOTE
CONFIRM VOTING ?
NO
VOTER IS AGAIN ASKED TO VOTE
YES
BEEP SOUND IS PRODUCED
VOTER IS ASKED TO LEAVE THE BOOTH
STOP

CHAPTER 2
POWER SUPPLY

2.1 INTRODUCTION

Power supply circuits are built using Transformer, Filters, Rectifiers, and Voltage regulators. AC voltage given as an input to the transformer is converted to a steady dc voltage at the regulator output. The high AC voltage is converted to a lower level AC voltage using transformer. The low level AC voltage is converted to a DC voltage by the rectifier. The DC signal is then converted into a pure DC signal using filters. The DC voltage now obtained is not a steady voltage .Hence we employ a regulator to get a constant DC supply.

2.2 BLOCK DIAGRAM

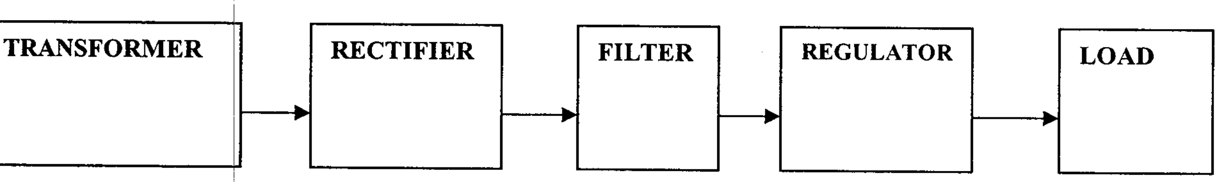


Fig 2.1 Block diagram of power supply

2.3 TRANSFORMER

The transformer employed here is 230V to 12V step down transformer. Transformer is a unit that converts a voltage level higher or lower than its original level. Usually step up transformers are very huge, they are used in power stations.

Here require a lower voltage than its own input hence used a step down transformer.

Transformer comprises of a primary and secondary windings. The turn's ratio is the ratio of winding of secondary to the primary.

2.4 RECTIFIERS

Rectifier is a unit that converts an AC signal into a DC signal. The type of rectifier used here is a bridge rectifier. It is used because it has some advantages over the full wave rectifier.

Bridge rectifier consists of four diodes connected back to back, of which two diodes work in the positive half cycle and other two diodes works in negative half cycle. Hence we get a unidirectional DC voltage of both the half cycles.

Rectifier used here is a diode namely IN 4007. The diode consists of a positive terminal anode and a negative terminal cathode.

2.5 FILTERS

A filter is a unit that removes the unwanted AC ripples in the DC signal, thereby producing DC signals without ripples. The filters used popularly are, 1. Capacitor

2. Inductor

3. LC Filter

Of the above filters we use capacitor here. The capacitor here removes the ripples in DC voltage produced due to intervention of AC voltage. The capacitor used here is 1000 UF. The use of the value of this capacitor depends on the input current. For a precautionary purpose we use an additional filter of 1UF at the load end to save the power supply circuit from vibrations produced by the load.

2.6 REGULATORS

Regulator is a unit that produces a constant DC voltage. Regulator IC units contain the circuitry for reference source, comparator amplifier, control device, and overload protection all in a single IC. Although the internal construction of the IC is somewhat different from that described for discrete voltage regulator circuits, the external operation is much the same. IC units provide regulation of either a fixed positive voltage, a fixed negative voltage, or an adjustably set voltage.

Regulator used is IC 7805. The 78XX series comes under the class of regulators. Here the requirement is 5V hence IC 7805 is used.

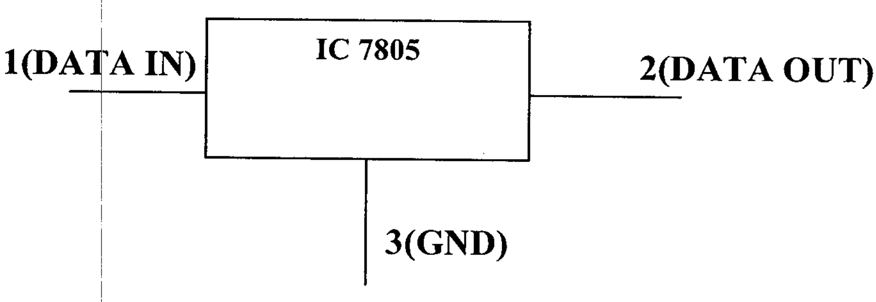


Fig 2.2 Representation of regulator

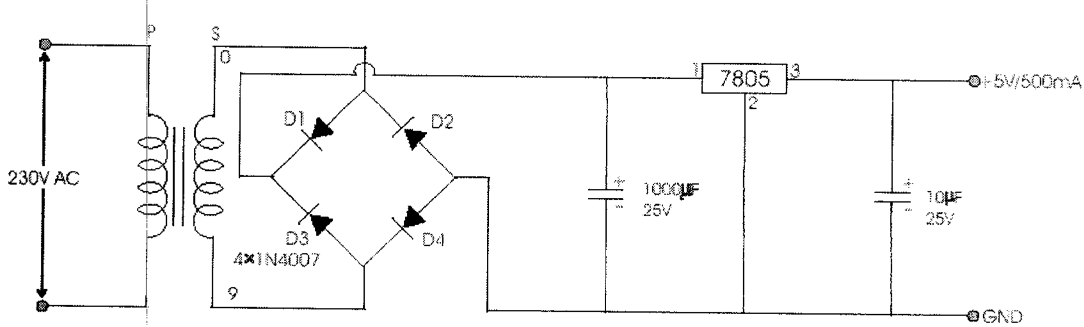


Fig 2.3 Circuit diagram of power supply

CHAPTER 3

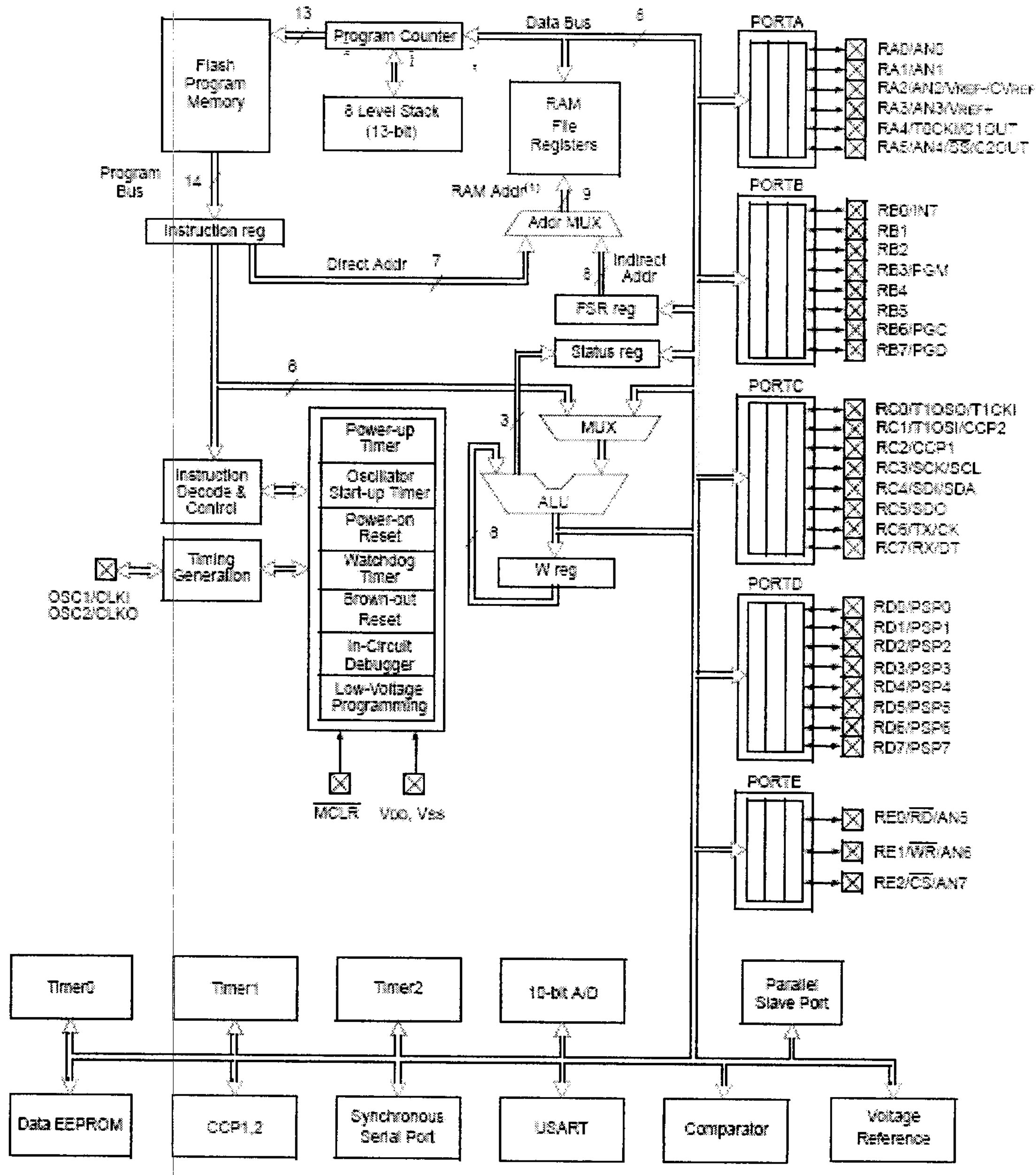
MICRO CONTROLLER (PIC 16F877A)

3.1 INTRODUCTION

The PIC16F877A features 256 bytes of EEPROM data memory, self programming, an ICD, 2 comparators, 8 channels of 10-bit Analog to Digital (A/D) converter, 2 capture/compare/PWM functions, the synchronous serial port can be configured as either 3-wire Serial Peripheral Interface (SPI) or the 2 wire Inter-Integrated Circuit(I^2C)bus and a Universal Asynchronous Receiver Transmitter (USART). All of these features make it ideal for more advanced level A/D applications in automotive, industrial, appliances and consumer applications.

3.2 MICROCONTROLLER ARCHITECHTURE

The micro controller architecture is shown in Fig 3.1.the midrange architecture includes members of PIC 12 and PIC 16 families that features a 14 bit program word architecture. These families are available with 8 to 64 pin package options. The higher pin count packages are available with flash and OTP program memory options. The mid range micro controllers are with an intelligence level due to additional features such as interrupt handling, a deeper hardware stack, multiple A/D channels and EEPROM data memory. The mid range PIC 16 device offer low to high level of peripheral integration. It features various serial, analog and digital peripherals.



Device	Program Flash	Data Memory	Data EEPROM
PIC16F874A	4K words	192 Bytes	128 Bytes
PIC16F877A	8K words	368 Bytes	256 Bytes

Fig 3.1 Architecture of Microcontroller

3.3 SPECIAL MICROCONTROLLER FEATURES:

- 100,000 erase/write cycle Enhanced Flash program memory typical
- 1,000,000 erase/write cycle Data EEPROM memory typical
- Data EEPROM Retention > 40 years
- Self-reprogrammable under software control
- In-Circuit Serial Programming™ (ICSP™) via two pins
- Single-supply 5V In-Circuit Serial Programming
- Watchdog Timer (WDT) with its own on-chip RC oscillator for reliable operation
- Programmable code protection
- Power saving Sleep mode
- Selectable oscillator options
- In-Circuit Debug (ICD) via two pins
- 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

3.4 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 SPI™ (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)

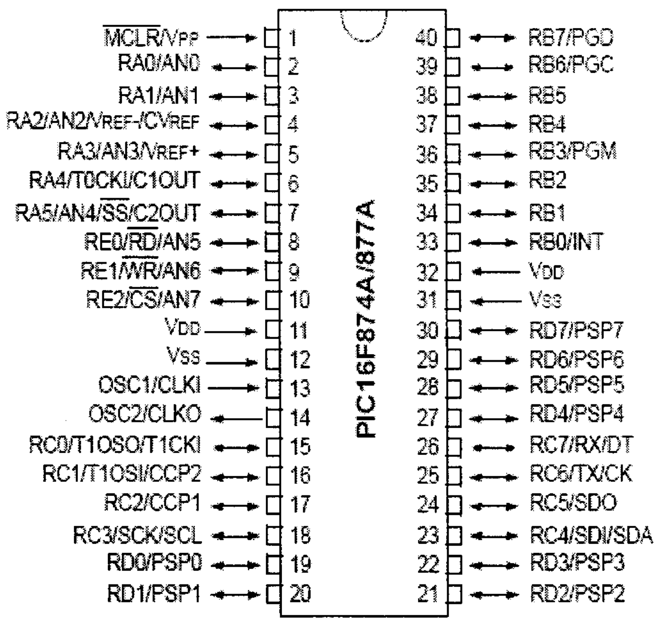


Fig 3.2 Pin configuration of Microcontroller

CHAPTER 4

SERIAL COMMUNICATION (MAX-232)

4.1 INTRODUCTION

The MAX232 is a dual driver/receiver that includes a capacitive voltage generator to supply TIA/EIA-232 voltage levels from a single 5V supply. Each receiver converts TIA/EIA-232-F inputs to 5V TTL/CMOS levels. These receivers have a typical threshold of 1.3 V, a typical hysteresis of 0.5 V and can accept ±30V inputs. Each driver converts TTL/CMOS input levels into TIA/EIA-232 levels.

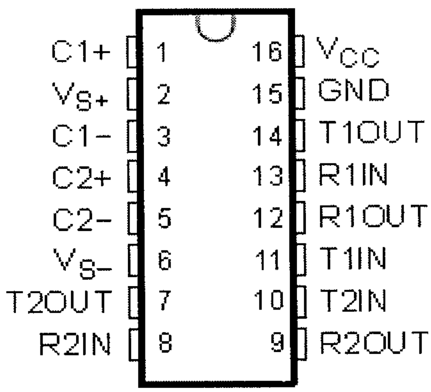


Fig 4.1 Pin configuration of MAX 232

PIN No	DESCRIPTION
1	The positive terminal of capacitor C1 is connected.
2	A supply voltage of +5V

3	Negative terminal of C1
4	Positive terminal of C2
5	Negative terminal of C2
6	Negative supply of -5V
7	Driver 2 output(RS 232)
8	Receiver 2 input(RS 232)
9	Receiver 2 output(TTL)
10	Driver 2 input(TTL)
11	Driver 1 input(TTL)
12	Receiver 1 output(TTL)
13	Receiver 1 input(TTL)
14	Driver 1 output (RS 232)
15	Ground
16	VCC (+5V)

Table 4.1 Pin description of MAX 232

4.2 VOLTAGE LEVELS OF RS232

The RS-232 standard defines the voltage levels that correspond to logical one and logical zero levels. Valid signals are plus or minus 3 to 25 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.

So a Logic Zero represented as +3V to +25V and Logic One represented as -3V to -25V. As shown in fig 4.2 .

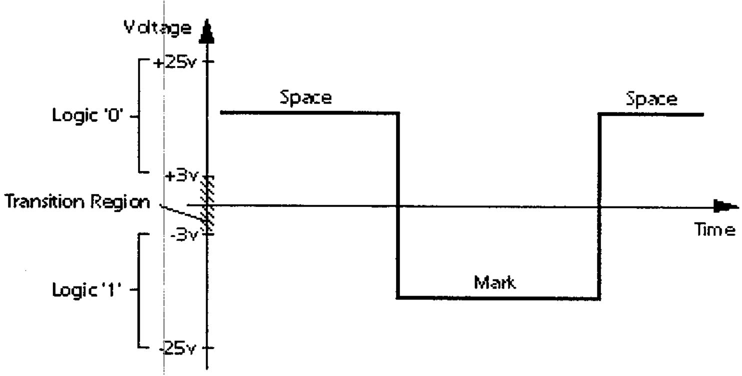


Fig 4.2 Figure of voltage levels of RS 232

4.3 RS-232 LEVEL CONVERTERS

Usually all the digital ICs work on TTL or CMOS voltage levels which cannot be used to communicate over RS-232 protocol. So a voltage or level converter is needed which can convert TTL to RS232 and RS232 to TTL voltage levels.

The most commonly used RS-232 level converter is MAX232. This IC includes charge pump which can generate RS232 voltage levels (-10V and +10V) from 5V power supply. It also includes two receiver and two transmitters and is capable of full-duplex UART/USART communication.

4.4 MAX232 INTERFACING WITH MICROCONTROLLER

To communicate over UART or USART, we just need three basic signals which are namely, RXD (receive), TXD (transmit), GND (common ground). So to interface MAX232 with any microcontroller (AVR, ARM, 8051, PIC etc.) we just need the basic signals. A simple schematic diagram of connections between a microcontroller and MAX232 is shown below along with interface of Zigbee and RFID reader. The interface is available in fig 4.3.

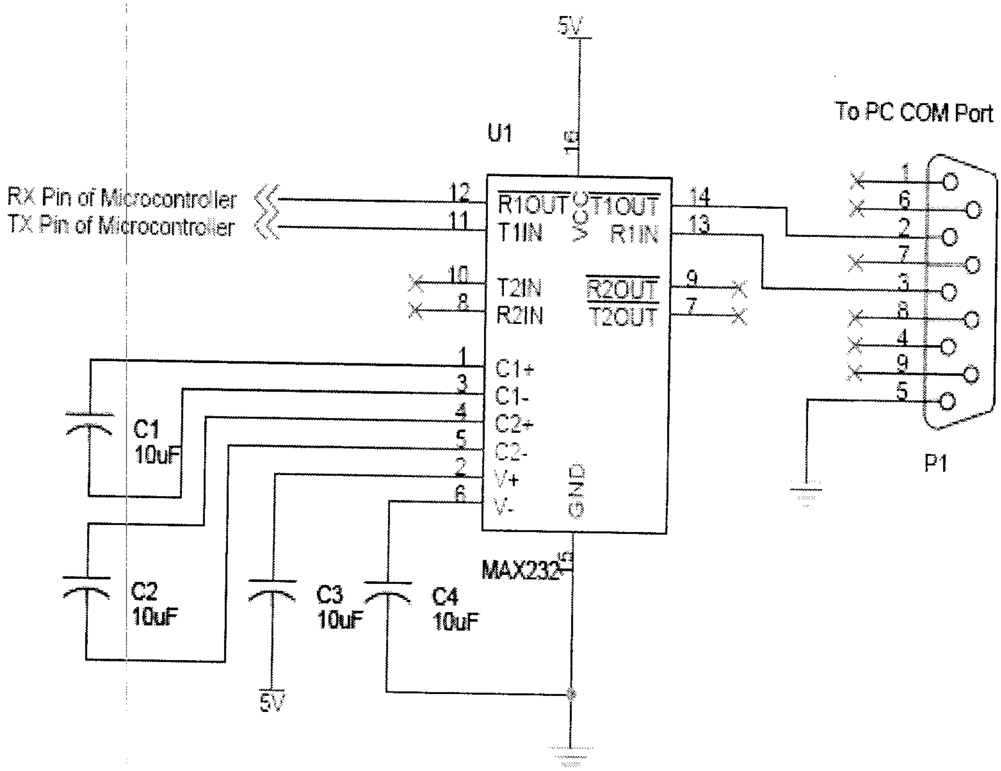


Fig 4.3 Interfacing circuit of MAX 232 with microcontroller

4.5 RS232 TO TTL CONVERSION

- Burg Connecter for Supply Input and TTL O/p
- 9Pin D type male Connecter For Rs232 O/p

Description	Signal	9-pin DTE
Carrier Detect	CD	1
Receive Data	RD	2
Transmit Data	TD	3
Data Terminal Ready	DTR	4
Signal Ground	SG	5
Data Set Ready	DSR	6
Request to Send	RTS	7
Clear to Send	CTS	8
Ring Indicator	RI	9

Table 4.2 RS 232 with 9-pin connector pins

CHAPTER 5

LCD DISPLAY

5.1 INTRODUCTION

LCD's also are used as numerical indicators, especially in digital watches where their much smaller current needs than LED displays (microamperes compared with mill amperes) prolong battery life. Liquid crystals are organic (carbon) compounds, which exhibit both solid and liquid properties. A 'cell' with transparent metallic conductors, called electrodes, on opposite daces, containing a liquid crystal, and on which light falls, goes 'dark' when a voltage is applied across the electrodes. The effect is due to molecular rearrangement within the liquid crystal. The LCD display used in this project consists of 2 rows. Each row consists of maximum 16 characters. So using this display only maximum of 32 characters can be displayed.

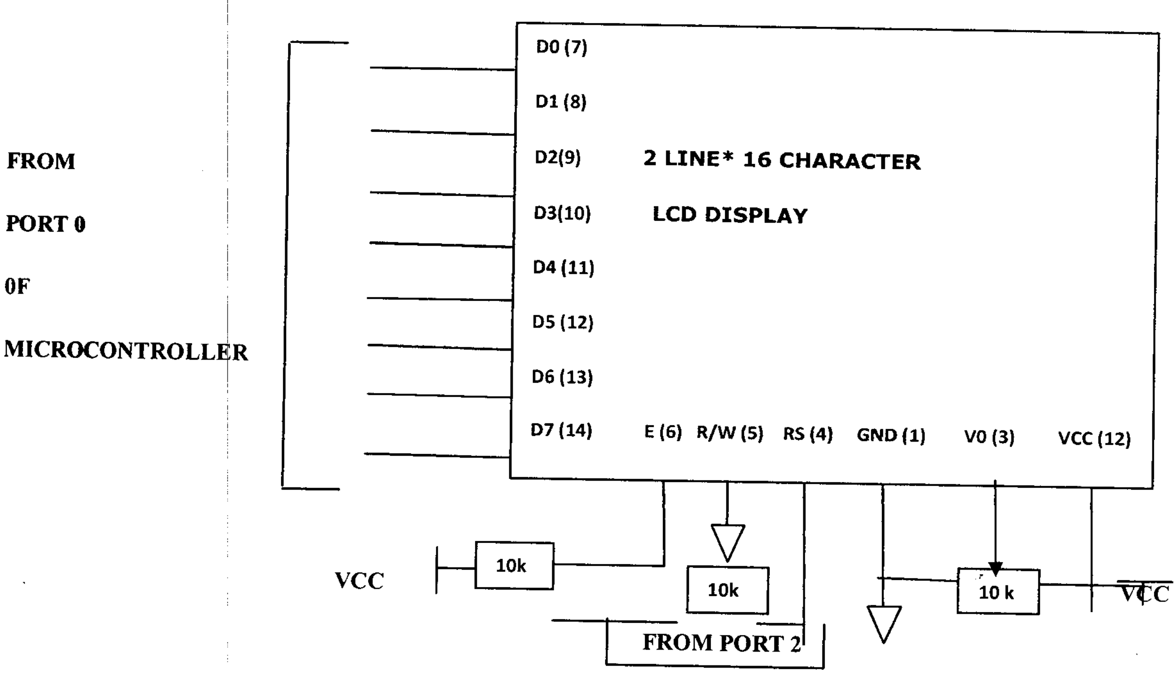


Fig 5.1 Schematic diagram of LCD display

5.2 CIRCUIT DESCRIPTION

- The LCD panel's Enable (E) of pin (6) and Register Select (RS) of pin (4) are connected to the Control Port (port 2).
- The Control Port is an open collector / open drain output. While all ports except port 0 have internal pull-up resistors, hence we incorporate the two 10K external pull up resistors, the circuit is more portable for a wider range of devices, some of which may have no internal pull up resistors.
- There is no need to make the Data bus into reverse direction. Hence hard wire the R/W line pin (5) of the LCD panel, into write mode. This will cause no bus conflicts on the data lines. As a result, read back the LCD's internal Busy Flag is not possible, which tells us if the LCD has accepted and finished processing the last instruction. This problem is overcome by inserting known delays into our program.
- The 10k Potentiometer controls the contrast of the LCD panel through V0 of pin (3). Pin (1) is ground.

The lines D0-D7 are called data lines they are connected with the port 0 through internal pull up resistors. They belong to the pins (7-14) .Pin (12) forms the supply VCC.

5.3 FEATURES OF LCD DISPLAY

- 16 Characters x 2 Lines.
- 5 x 7 Dots with Cursor.
- Built in Controller with +5V power supply.

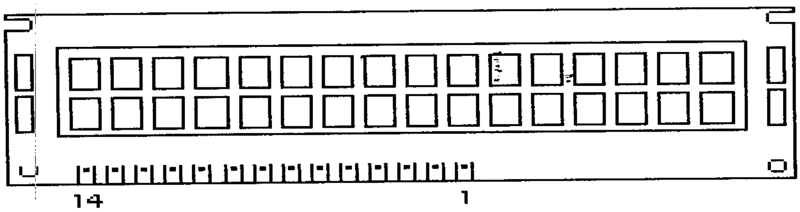


Fig 5.2 Schematic view of LCD display

5.4 MAJOR STEPS IN LCD DISPLAY

Major task in LCD interfacing is the initialization sequence. In LCD initialization you have to send command bytes to LCD. Here you set the interface mode, display mode, address counter increment direction, set contrast of LCD, horizontal or vertical addressing mode, color format. This sequence is given in respective LCD driver datasheet. Studying the function set of LCD lets you know the definition of command bytes. It varies from one LCD to another. If you are able to initialize the LCD properly 90% of your job is done.

Next step after initialization is to send data bytes to required display data RAM memory location. Firstly set the address location using address set command byte and then send data bytes using the DDRAM write command. To address specific location in display data RAM one must have the knowledge of how the address counter is incremented.

5.5 COMMANDS AND INSTRUCTION SET

Only the instruction register (IR) and the data register (DR) of the LCD can be controlled by the MCU. Before starting the internal operation of the LCD, control information is temporarily stored into these registers to allow interfacing with various MCUs, which operate at different speeds, or various peripheral control devices. The internal operation of the LCD is determined by signals sent from the MCU. These signals, which include register selection signal (RS), read/write signal (R/W), and the data bus (DB0 to DB7), make up the LCD instructions (Table 5.1). There are four categories of instructions that:

- Designate LCD functions, such as display format, data length, etc.
- Set internal RAM addresses
- Perform data transfer with internal RAM
- Perform miscellaneous functions

COMMANDS	D7	D6	D5	D4	D3	D2	D1	D0	HEXADECIMAL VALUE
CLEAR DISPLAY	0	0	0	0	0	0	0	1	01
DISPLAY & CURSOR HOME	0	0	0	0	0	0	1	X	02 or 03
CHARACTER ENTRY MODE	0	0	0	0	0	0	1/D	S	04 to 07
DISPLAY ON AND OFF	0	0	0	0	1	D	U	B	08 to 0F
DISPAY/ CURSOR SHIFT	0	0	0	1	D/C	R/L	X	X	10 to 1F
FUNCTION SET	0	0	1	8/4	2/1	10/7	X	X	20 to 3F
SET DDRAM ADDRESS	0	1	A	A	A	A	A	A	40 to 7F
SET DISPLAY ADDRESS	0	A	A	A	A	A	A	A	80 to FF

Table 5.1 LCD commands table

1/D - **'1'** corresponds to increment

'0' corresponds to decrement

S - **'1'** display on

'0' display off

U - **'1'** corresponds to cursor underline on

'0' cursor underline off

B -**'1'** corresponds to cursor blink on

'0' corresponds to cursor underline off

R/L -**'1'** corresponds to right shift

'0' corresponds to left shift

8/4 -**'1'** corresponds to 8bit interface

'0' corresponds to 4 bit interface

2/1 -**'1'** corresponds to 2 line mode.

'0' corresponds to 4 line mode.

10/7 -**'0'** corresponds to 5*10 dot frame format

'1' corresponds to 5*7 display format

CHAPTER 6

TOUCH SCREEN

6.1 INTRODUCTION

Resistive touchscreens are touch-sensitive computer displays composed of two flexible sheets coated with a resistive material and separated by an air gap or microdots. When contact is made to the surface of the touchscreen, the two sheets are pressed together. On these two sheets there are horizontal and vertical lines that when pushed together, register the precise location of the touch. Because the touchscreen senses input from contact with nearly any object (finger, stylus/pen, palm) resistive touchscreens are a type of "passive" technology.

During operation of a four-wire touchscreen, a uniform, unidirectional voltage gradient is applied to the first sheet. When the two sheets are pressed together, the second sheet measures the voltage as distance along the first sheet, providing the X coordinate. When this contact coordinate has been acquired, the uniform voltage gradient is applied to the second sheet to ascertain the Y coordinate. These operations occur within a few milliseconds, registering the exact touch location as contact is made.

An electronic controller converts these voltages into digital X and Y coordinates which are then transmitted to the host computer.

- Because resistive touchscreens are force activated, all kinds of touch input devices can activate the screen, including fingers, fingernails, styluses, gloved hands, and credit cards.
- All have similar optical properties, resistance to chemicals and abuse.

- Both the touchscreen and its electronics are simple to integrate into imbedded systems, thereby providing one of the most practical and cost-effective touchscreen solutions.

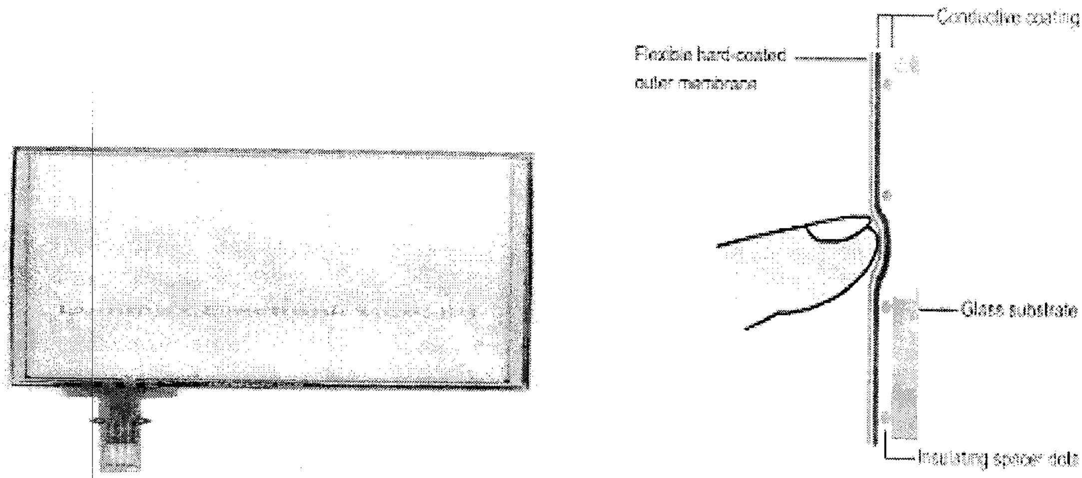


Fig 6.1 Touch Screen

6.2 Four-Wire Resistive Touchscreen

Four-wire resistive technology is the simplest to understand and manufacture. It uses both the upper and lower layers in the touchscreen "sandwich" to determine the X and Y coordinates. Typically constructed with uniform resistive coatings of indium tin oxide (ITO on the inner sides of the layers and silver buss bars along the edges, the combination sets up lines of equal potential in both X and Y.In the illustration below, the controller first applies 5V to the back layer. Upon touch, it probes the analog voltage with the coversheet, reading 2.5V, which represents a left-right position or X axis.It then flips the process, applying 5V to the coversheet, and probes from the back layer to calculate an up-down position or Y axis. At any time, only three of the four wires are in use (5V, ground, probe).

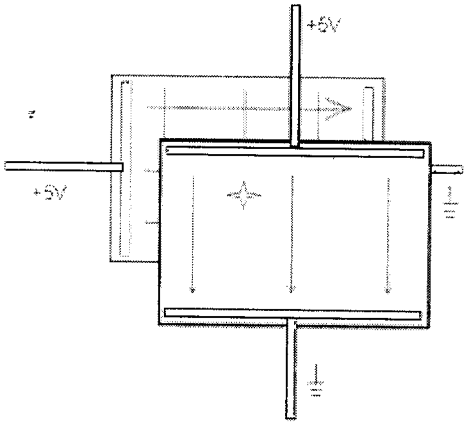


Fig 6.2 Four wire touch screen diagram

The primary drawback of four-wire technology is that one coordinate axis (usually the Y axis), uses the outer layer, the flexible coversheet, as a uniform voltage gradient. The constant flexing that occurs on the outer coversheet with use will eventually cause microscopic cracks in the ITO coating, changing its electrical characteristics (resistance), degrading the linearity and accuracy of this axis.

Unsurprisingly, four-wire touchscreens are not known for their durability. Also, accuracy can drift with environmental changes. The polyester coversheet expands and contracts with temperature and humidity changes, thereby causing long-term degradation to the coatings as well as drift in the touch location.While all of these drawbacks can be insignificant in smaller sizes, they become increasingly apparent the larger the touchscreen. Therefore, Elo normally recommends four-wire touchscreens in applications with a display size of 6.4" or smaller.

CHAPTER 7

FINGERPRINT SENSOR

7.1 INTRODUCTION

A fingerprint sensor is an electronic device used to capture a digital image of the fingerprint pattern. The captured image is called a live scan. This live scan is digitally processed to create a biometric template (a collection of extracted features) which is stored and used for matching. This is an overview of some of the more commonly used fingerprint sensor technologies.

7.2 OPTICAL FINGERPRINT SENSOR

Optical fingerprint imaging involves capturing a digital image of the print using visible light. This type of sensor is, in essence, a specialized digital camera. The top layer of the sensor, where the finger is placed, is known as the touch surface. Beneath this layer is a light-emitting phosphor layer which illuminates the surface of the finger. The light reflected from the finger passes through the phosphor layer to an array of solid state pixels (a charge-coupled device) which captures a visual image of the fingerprint. A scratched or dirty touch surface can cause a bad image of the fingerprint.

A disadvantage of this type of sensor is the fact that the imaging capabilities are affected by the quality of skin on the finger. For instance, a dirty or marked finger is difficult to image properly. Also, it is possible for an individual to erode the outer layer of skin on the fingertips to the point where the fingerprint is no longer visible. It can also be easily fooled by an image of a fingerprint if not coupled with a "live finger" detector. However, unlike capacitive sensors, this sensor technology is not susceptible to electrostatic discharge damage.

7.3 MINUTIA FEATURES

The major Minutia features of fingerprint ridges are: ridge ending, bifurcation, and short ridge (or dot). The ridge ending is the point at which a ridge terminates. Bifurcations are points at which a single ridge splits into two ridges. Short ridges (or dots) are ridges which are significantly shorter than the average ridge length on the fingerprint. Minutiae and patterns are very important in the analysis of fingerprints since no two fingers have been shown to be identical.

Fingerprint Sensor	OPP 01
Dimensions	25.3(W) x 40.7(L) x 67.7(H) mm
Scanner Resolution	500 dpi
Verification Time	Less than 1 second
Operating Temperature	0° to 40°C
Operating Humidity	< 90% relative, non-condensing
Supply voltage	5 V from USB port
Interface	USB 1.1
Supported Operating Systems	Windows 98/Me/NT4/2000/XP
Certifications	EMI,FCC,CE,MIC

Table 7.1 Specification of fingerprint

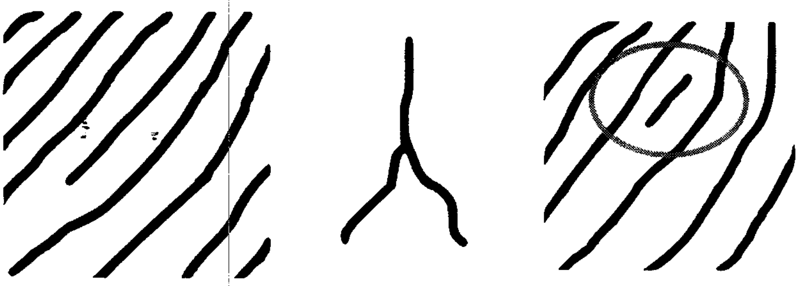


Fig 7.1 Minutia features of finger print

7.4 FEATURES:

- Precise user authentication through the distinct algorithm.
- Compact and elegant design, which is more convenient to use.
- Excellent product durability that assures a long life.
- High-quality, rugged, maintenance-free optical fingerprint sensor with ultra-precise 500 DPI resolution
- Supports: Fingerprint recognition, fingerprint verification, fingerprint authentication, fingerprint scanning & fingerprint matching applications.
- Works well with dry fingers.

CHAPTER 8

SOFTWARE CODING

8.1 EMBEDDED C CODING

8.1.1 INTRODUCTION TO MP LAB IDE

To make working with the PIC microcontroller even easier, Microchip provides an excellent group of software it is called MPLAB IDE. MPLAB IDE is a software program that runs on a PC to develop applications for Microchip microcontrollers. It is called an Integrated Development Environment, or IDE, because it provides a single integrated "environment" to develop code for embedded microcontrollers. MPLAB IDE contains a text editor, assembler (MPASM assembler) and simulator (MPSIM) and this stuff will run under DOS or WINDOWS. With MPLAB IDE in hand we can write the program using the included text editor, and then assemble it with the MPSAM assembler program. The MPSAM assembler will develop the code format (HEX) that the PIC Microcontroller wants that code can then be burned into a PIC with the programmer.

8.1.2 ENVIRONMENT

MP LAB IDE can be run entirely from professional development environment. It is possible to compile, assemble and link embedded application with a single step. Optionally the compiler may be run directly from the command line, allowing compiling, assembling and linking using are command.

8.1.3 COMPILER

MP LAB IDE is an ANSI C compiler supporting all standard data types including floating point. Features of the compiler include:

- Unlimited number of source files
- Multiple optimization levels
- Comprehensive library with source code
- Floating point support (24 bit and 32 bit)
- Mixed C and assembler programming
- Generated assembler
- Optimizing assembler
- Minimize RAM usage
- Full linker with over laying of local variables

8.1.4 PROCESSORS SUPPORTED

MP LAB IDE compiler supports microchip PIC 12XX, PIC 14000, PIC 16XX and PIC 17XX series micro controllers. All base lines, mid range and high-end devices are supported.

8.1.5 TOUCHSCREEN INTERFACE CODING

```
#include<pic.h>
#define RS RE2
#define RW RE1
#define EN RE0
#define x1 RB0
#define y1 RB1
#define x2 RB2
```

```
#define y2 RB3
#define buzzer RC0
void lcd_init();
unsigned char adc(unsigned char );
void lcd_datacommand(unsigned char,unsigned short int );
void lcd_display(unsigned char *);
void delay(unsigned int);
void serial_tx(unsigned char );
void serial_rx();
void compare();
void sensex();
void sensey();
void voting();
void votea();
void voted();
void voteg();
void voten();
void voteok();
unsigned short int data=1,cmd=0,datano,del,i,j,result;
unsigned char rx;
unsigned char value1,value2,temp1,temp2;
unsigned char v0=0,v1=1,v2=2,v3=3,v4=4,v5=5,v6=6,v7=7,v8=8,v9=9;
unsigned char flag=0x00;
unsigned char name[]={"VOTE FOR --->"};
unsigned char thank[]={" THANK YOU  "};
unsigned char ch[]={" E-VOTING  "};
void main()
```

```
{
	TRISA=0XFF;
	PORTA=0XFF;
	TRISB=0X00;
	PORTB=0X00;

	TRISC=0XF0;
	PORTC=0XF0;
	TRISD=0X00;
	PORTD=0X00;
	TRISE=0X00;
	PORTE=0X00;
	ADCON1=0XC2;
	lcd_init();
	serial_tx('S');
	while(1)
	{
		voting();
		serial_tx(flag);
		delay(500);
		serial_rx();
		/*lcd_datacommand(0XC0,cmd);
		lcd_datacommand('R',data);
		lcd_datacommand('X',data);
		lcd_datacommand(':',data);
		lcd_datacommand(rx,data);*/
		if(rx=='b')
```

```
{
	buzzer=0;
	lcd_datacommand(0X01,cmd);
	delay(50);
	flag=0;
}
else
{
	buzzer=1;
}
if(rx=='r')
{
	sensex();
	/*lcd_datacommand(0X80,cmd);
	lcd_datacommand('X',data);
	lcd_datacommand('=',data);
	lcd_datacommand((value1/100)+0X30,data);
	lcd_datacommand(((value1%100)/10)+0X30,data);
	lcd_datacommand((value1%10)+0X30,data);
	lcd_datacommand('~',data);*/
	sensey();
	/*lcd_datacommand('Y',data);
	lcd_datacommand('=',data);
	lcd_datacommand((value2/100)+0X30,data);
	lcd_datacommand(((value2%100)/10)+0X30,data);
	lcd_datacommand((value2%10)+0X30,data);*/
	//compare();
```

```
            }
            while(rx=='s')
            {
                delay(500);
                serial_rx();
                delay(500);
                sensex();
                lcd_datacommand(0X80,cmd);
                lcd_datacommand('X',data);
                lcd_datacommand('=',data);
                lcd_datacommand((value1/100)+0X30,data);
                lcd_datacommand(((value1%100)/10)+0X30,data);
                lcd_datacommand((value1%10)+0X30,data);
                lcd_datacommand('~',data);
                sensey();
                lcd_datacommand('Y',data);
                lcd_datacommand('=',data);
                lcd_datacommand((value2/100)+0X30,data);
                lcd_datacommand(((value2%100)/10)+0X30,data);
                lcd_datacommand((value2%10)+0X30,data);
            }
        }
}
unsigned char adc(unsigned char ch)
{
        ADCON0=ch;
        delay(500);
```

```
    ADON=1;
    ADIF=0;
    ADGO=1;
    while(ADGO==1);
    ADIF=0;
    result=(((ADRESH*255)+(ADRESL))/4);
    delay(500);
    return(result);
}
void lcd_init()
{
    lcd_datacommand(0X38,cmd);      // 16X2 lines
    delay(10);
    lcd_datacommand(0X01,cmd);          // clr disp
    delay(10);
    lcd_datacommand(0X06,cmd);              // right sft cursor
    delay(10);
    lcd_datacommand(0X0C,cmd);              // disp on cursor off
    delay(10);
    lcd_datacommand(0X80,cmd);              // force cursor to 1st line 1st position
    delay(10);
}
void lcd_datacommand(unsigned char dat,unsigned short int datano)
{
    PORTD=dat;
    RS=datano;
    RW=0;
```

```
	EN=1;
	delay(10);
	EN=0;
}

void lcd_display(unsigned char *d)
{
	while(*d!='\0')
	{
		lcd_datacommand(*d,data);
		delay(10);
		d++;
	}
}
void delay(unsigned int del)
{
	for(i=0;i<del;i++)
	{
		for(j=0;j<50;j++);
	}
}
void serial_tx(unsigned char tx)
{
	SPEN=1;
	TXIF=0;
	TXEN=1;
	SYNC=0;
```

```
        BRGH=1;
        SPBRG=129;
        TXREG=tx;
        while(TXIF==0);
        TXIF=0;
}
void serial_rx()
{
        SPEN=1;
        RCIF=0;
        CREN=1;
        SYNC=0;
        BRGH=1;
        SPBRG=129;
        if(RCIF==1)
        {
                rx=RCREG;
                RCIF=0;
        }
}
void compare()
{
        if(value1!=temp1)
        {
                temp1=value1;
                serial_tx('X');
                serial_tx('=');
```

```
        serial_tx((value1/100)+0X30);
        serial_tx(((value1%100)/10)+0X30);
        serial_tx((value1%10)+0X30);
        serial_tx('~');
        serial_tx('Y');
        serial_tx('=');
        serial_tx((value2/100)+0X30);
        serial_tx(((value2%100)/10)+0X30);
        serial_tx((value2%10)+0X30);
        delay(500);
        serial_tx(0X0D);
        delay(500);
}
if(value2!=temp2)
{
        temp2=value2;
        serial_tx('X');
        serial_tx('=');
        serial_tx((value1/100)+0X30);
        serial_tx(((value1%100)/10)+0X30);
        serial_tx((value1%10)+0X30);
        serial_tx('~');
        serial_tx('Y');
        serial_tx('=');
        serial_tx((value2/100)+0X30);
        serial_tx(((value2%100)/10)+0X30);
        serial_tx((value2%10)+0X30);
```

```
            delay(500);
            serial_tx(0X0D);
            delay(500);
        }
}
void voting()
{
        lcd_datacommand(0X80,cmd);
        delay(10);
        lcd_display(name);
        votea();
        voted();
        voteg();
        voten();
        voteok();
        if(flag=='K')
        {
            lcd_datacommand(0XC0,cmd);
            delay(10);
            lcd_display(thank);
        }
        else
        {
            lcd_datacommand(0XC0,cmd);
            delay(10);
            lcd_display(ch);
        }
```

```
}
void sensex()
{
        value1=adc(0X00);
}
void sensey()
{
        value2=adc(0X10);
}
void votea()
{
        if(value1>51&&value1<60)
        {
                lcd_datacommand('A',data);
                flag='A';
        }
        /*else if(value1==31&&value2==14)
        {
                lcd_datacommand('A',data);
                flag='A';
        }*/
}
void voted()
{
        if(value1>=61&&value1<70)
        {
                lcd_datacommand('D',data);
```

```
			flag='D';
		}
		/*else if(value1==32&&value2==14)
		{
			lcd_datacommand('D',data);
			flag='D';
		}
		else if(value1==32&&value2==15)
		{
			lcd_datacommand('D',data);
			flag='D';
		}
		else if(value1==33&&value2==15)
		{
			lcd_datacommand('D',data);
			flag='D';
		}*/
}
void voteg()
{
		if(value1>=71&&value1<83)
		{
			lcd_datacommand('G',data);
			flag='G';
		}
		/*else if(value1==35&&value2==15)
		{
```

```
            lcd_datacommand('G',data);
            flag='G';
      }*/
}
void voten()
{
      if(value1>=84&&value1<100)
      {
            lcd_datacommand('N',data);
            flag='N';
      }
      /*else if(value1==38&&value2==17)
      {
            lcd_datacommand('N',data);
            flag='N';
      }
      else if(value1==37&&value2==17)
      {
            lcd_datacommand('N',data);
            flag='N';
      }*/
}
void voteok()
{
      if(value1>120&&value1<140)
      {
            flag='K';
```

```
}
/*else if(value1==44&&value2==19)
{
        lcd_datacommand('K',data);
        flag='K';
}
else if(value1==46&&value2==19)
{
        lcd_datacommand('K',data);
        flag='K';
}
else if(value1==48&&value2==19)
{
        lcd_datacommand('K',data);
        flag='K';
}
else if(value1==40&&value2==19)
{
        lcd_datacommand('K',data);
        flag='K';
}
else if(value1==41&&value2==19)
{
        lcd_datacommand('K',data);
        flag='K';
}*/
```

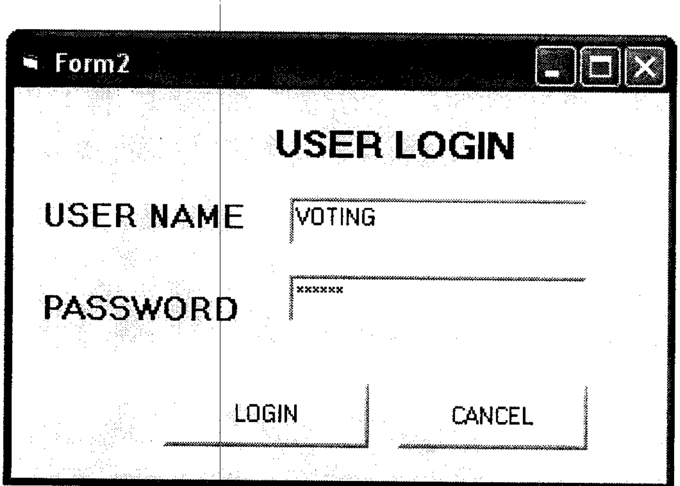
8.2 VISUAL BASIC CODING

8.2.1 INTRODUCTION

Visual Basic is the third generation event driven programming language and integrated development environment (IDE) from Microsoft for its COM programming model.

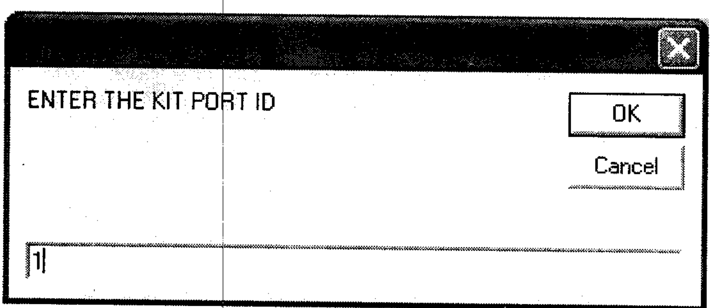
Visual Basic was derived from BASIC and enables the rapid application development (RAD) of graphical user interface (GUI) applications. A programmer can put together an application using the components provided Visual Basic itself. Programs written in Visual Basic can also use the Windows API, but doing so requires external functions declarations.

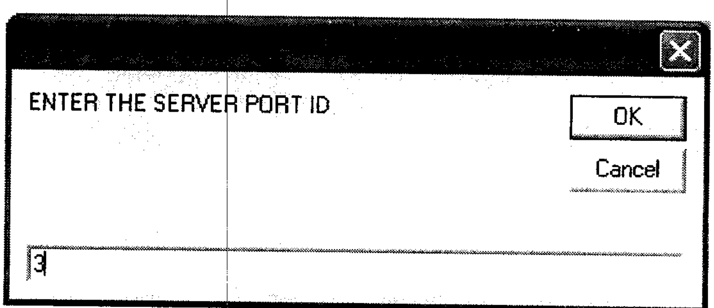
8.2.2 CLIENT SECTION CODING

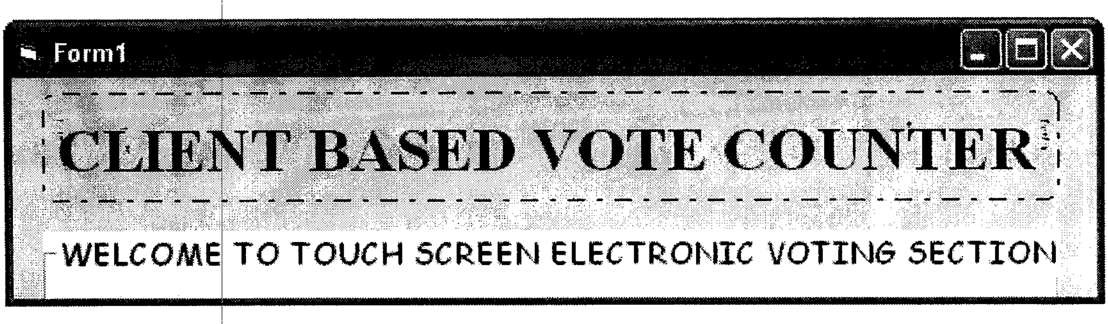



```
Private Sub Command1_Click()

If Text1.Text = "VOTING" And Text2.Text = "VOTING" Then

Unload Me
```

```
Form1.Show
Else
MsgBox "In Correct UserName Or PassWord.."
End If
End Sub
Private Sub Command2_Click()
Unload Me
End Sub
```








```
Private Declare Sub Sleep Lib "kernel32" (ByVal dwMilliseconds As Long)

Dim S, A, B, C As Integer

Dim voie As String

Private Sub Command1_Click()

S = S + 1

Text1.Text = S

End Sub

Private Sub Command2_Click()

A = A + 1

Text2.Text = A

End Sub

Private Sub Command3_Click()

B = B + 1

Text3.Text = B

End Sub
```

```
Private Sub Command4_Click()
C = C + 1
Text4.Text = C
End Sub
Private Sub Command5_Click()
MSComm1.Output = "b"
MsgBox "THANK YOU..."
MSComm1.Output = "  "
Sleep 500
MSComm1.PortOpen = False
Unload Me
End
End Sub
Private Sub Form_Load()
S = 0
A = 0
B = 0
C = 0
Text1.Text = S
```

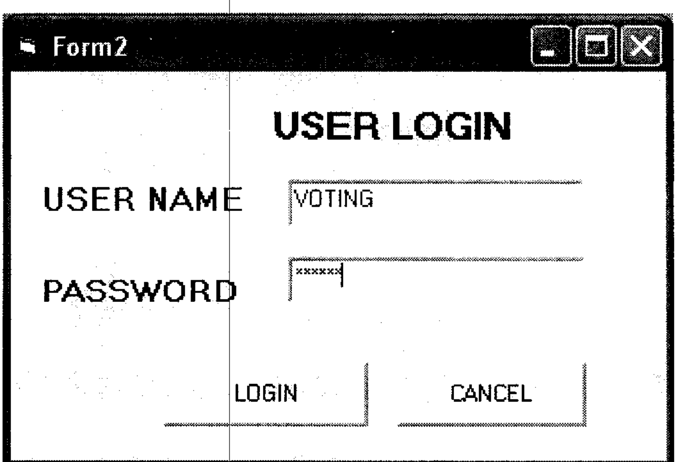
```
Text2.Text = A
Text3.Text = B
Text4.Text = C
MSComm1.CommPort = InputBox("ENTER THE KIT PORT ID ", P)
MSComm2.CommPort = InputBox("ENTER THE SERVER PORT ID ", P)
MSComm1.PortOpen = True
MSComm2.PortOpen = True
Timer1.Enabled = True
Timer2.Enabled = True
MSComm1.Output = "b"
MSComm2.Output = "S"
End Sub
Private Sub Picture1_Click()
End Sub
Private Sub Timer1_Timer()
vote = MSComm1.Input
Timer1.Enabled = False
If vote > "" Then
Debug.Print vote
```

```
End If
If InStr(vote, "K") > 0 Then
  If InStr(vote, "A") > 0 Then
    MSComm1.Output = "b"
    Call Command1_Click
    Sleep 500
    MSComm1.Output = " "
  End If
  If InStr(vote, "D") > 0 Then
    MSComm1.Output = "b"
    Call Command2_Click
    Sleep 500
    MSComm1.Output = " "
  End If
  If InStr(vote, "G") > 0 Then
    MSComm1.Output = "b"
    Call Command3_Click
    Sleep 500
    MSComm1.Output = " "
```

```
    End If
    If InStr(vote, "N") > 0 Then
        MSComm1.Output = "b"
        Call Command4_Click
        Sleep 500
        MSComm1.Output = " "
    End If
    If InStr(vote, "K") > 0 Then
        Sleep 500
        MSComm1.Output = "r"
    End If
Else
    MSComm1.Output = "r"
End If
MSComm1.Output = "r"
Sleep 500
vote = ""
Timer1.Enabled = True
End Sub
```

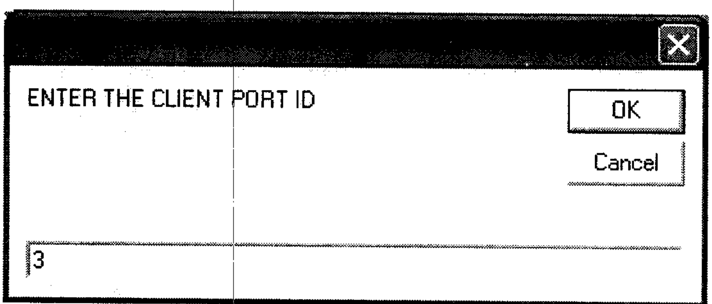
```
Private Sub Timer2_Timer()

Timer2.Enabled = False

Debug.Print MSComm2.Input

MSComm2.Output = "A" & Text1.Text & "D" & Text2.Text & "G" & Text3.Text
& "N" & Text4.Text

'Text1.Text & Text2.Text & Text3.Text & Text4.Text



Timer2.Enabled = True

End Sub
```

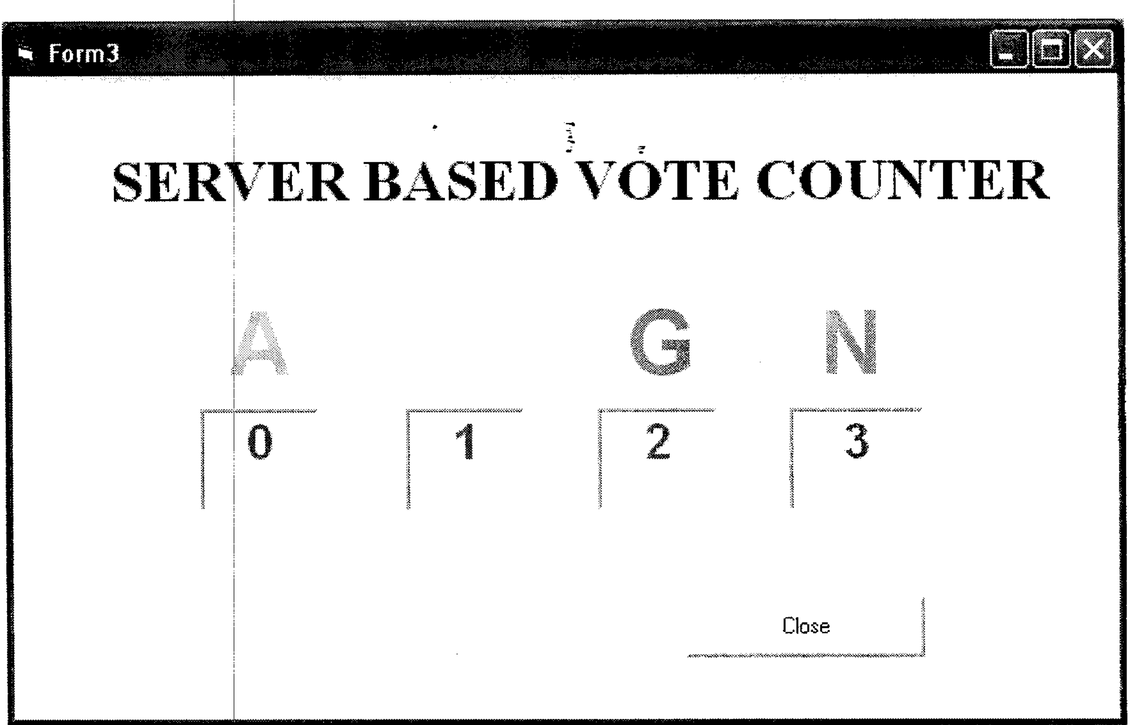
8.2.3 SERVER SECTION CODING




```
Private Sub Command1_Click()

If Text1.Text = "VOTING" And Text2.Text = "VOTING" Then
```

```
Unload Me

Form3.Show

Else

MsgBox "In Correct UserName Or PassWord.."

End If

End Sub

Private Sub Command2_Click()

Unload Me

End Sub
```






```
Dim recive As String

Private Sub Command1_Click()

MSComm1.Output = "TEST"

End Sub

Private Sub Command2_Click()

Unload Me

End

End Sub

Private Sub Form_Load()

MSComm1.CommPort = InputBox("ENTER THE CLIENT PORT ID ", p)
```

```
MSComm1.PortOpen = True

Timer1.Interval = 1000

Timer1.Enabled = True

End Sub

Private Sub Timer1_Timer()

Dim val As Integer

receive = MSComm1.Input

Text5.Text = receive

Timer1.Enabled = False

'A10D11G12N13

If (Text5.Text > "000") Then

val = InStr(Text5.Text, "D")

If (val > 3) Then

val = InStr(Text5.Text, "A")

Text1.Text = Mid(Text5.Text, val + 1, 2)

Else

val = InStr(Text5.Text, "A")

Text1.Text = Mid(Text5.Text, val + 1, 2 - 1)

End If
```

```
val = InStr(Text5.Text, "G")
If (val > 6) Then
val = InStr(Text5.Text, "D")
Text2.Text = Mid(Text5.Text, val + 1, 2)
Else
val = InStr(Text5.Text, "D")
Text2.Text = Mid(Text5.Text, val + 1, 2 - 1)
End If
val = InStr(Text5.Text, "N")
If (val > 9) Then
val = InStr(Text5.Text, "G")
Text3.Text = Mid(Text5.Text, val + 1, 2)
Else
val = InStr(Text5.Text, "G")
Text3.Text = Mid(Text5.Text, val + 1, 2 - 1)
End If
val = InStr(Text5.Text, "N")
Text4.Text = Mid(Text5.Text, val + 1, 2)
End If
```

```
receive = ""

Text5.Text = ""

Timer1.Enabled = True

End Sub
```

CHAPTER 9

CONCLUSION

Advance electronic voting machine is a multipurpose voting machine which does simultaneously the process of verification, counting and voting. It is different from the current voting machine as it includes modern technology like the touch screen, Bluetooth and fingerprint scanner. Our project helps to prevent anti voting ,it also helps to count the vote and display the result instantaneously. Manual errors can be drastically avoided with the help of the machine. The process of voting is made simple and faster for the public.

CHAPTER 10

FUTURE ENHANCEMENT

- As for now our project works satisfactory considering the counting and the voting process but more enhancements could be made in the security aspects of the project.
- The fingerprint scanner can be replaced by a retina scanner or a face recognition for voter verification purpose.
- The voters information including their pictures can also be displayed on the screen for verification purpose.
- At present in our project we included Bluetooth technology but in the future it can be enhanced by using GSM interfacing technology in which people from all over the world can cast their vote.

APPENDIX A-1

PIC16F87XA

28/40/44-Pin Enhanced Flash Microcontrollers

Devices Included in this Data Sheet:

- PIC16F873A
- PIC16F874A
- PIC16F876A
- PIC16F877A

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

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 SPI™ (Master mode) and I^2C™ (Master/Slave)
- Universal Synchronous Asynchronous Receiver Transmitter (USART/SCI) with 9-bit address detection
- Parallel Slave Port (PSP) – 8 bits wide with external $\overline{RD}$, $\overline{WR}$ and $\overline{CS}$ controls (40/44-pin only)
- Brown-out detection circuitry for Brown-out Reset (BOR)

Analog Features:

- 10-bit, up to 8-channel Analog-to-Digital Converter (A/D)
- Brown-out Reset (BOR)
- Analog Comparator module with:
  - Two analog comparators
  - Programmable on-chip voltage reference (VREF) module
  - Programmable input multiplexing from device inputs and internal voltage reference
  - Comparator outputs are externally accessible

Special Microcontroller Features:

- 100,000 erase/write cycle Enhanced Flash program memory typical
- 1,000,000 erase/write cycle Data EEPROM memory typical
- Data EEPROM Retention > 40 years
- Self-reprogrammable under software control
- In-Circuit Serial Programming™ (ICSP™) via two pins
- Single-supply 5V In-Circuit Serial Programming
- Watchdog Timer (WDT) with its own on-chip RC oscillator for reliable operation
- Programmable code protection
- Power saving Sleep mode
- Selectable oscillator options
- In-Circuit Debug (ICD) via two pins

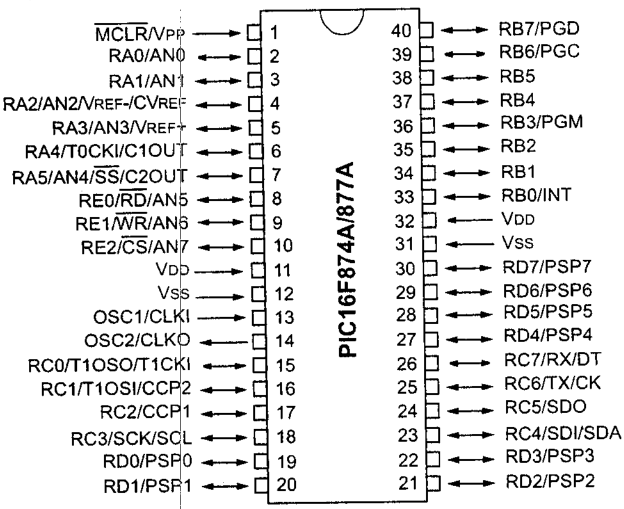
CMOS Technology:

- Low-power, high-speed Flash/EEPROM technology
- Fully static design
- Wide operating voltage range (2.0V to 5.5V)
- Commercial and Industrial temperature ranges
- Low-power consumption

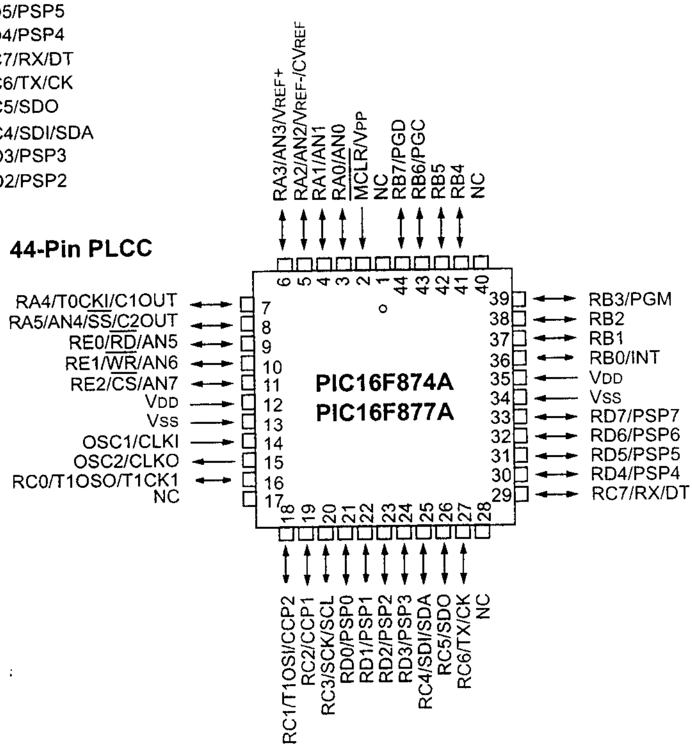
Device	Program Memory		Data SRAM (Bytes)	EEPROM (Bytes)	I/O	10-bit A/D (ch)	CCP (PWM)	MSSP		USART	Timers 8/16-bit	Comparators
	Bytes	# Single Word Instructions						SPI	Master I^2C			
PIC16F873A	7.2K	4096	192	128	22	5	2	Yes	Yes	Yes	2/1	2
PIC16F874A	7.2K	4096	192	128	33	8	2	Yes	Yes	Yes	2/1	2
PIC16F876A	14.3K	8192	368	256	22	5	2	Yes	Yes	Yes	2/1	2

Pin Diagrams (Continued)

40-Pin PDIP



44-Pin PLCC



44-Pin TQFP

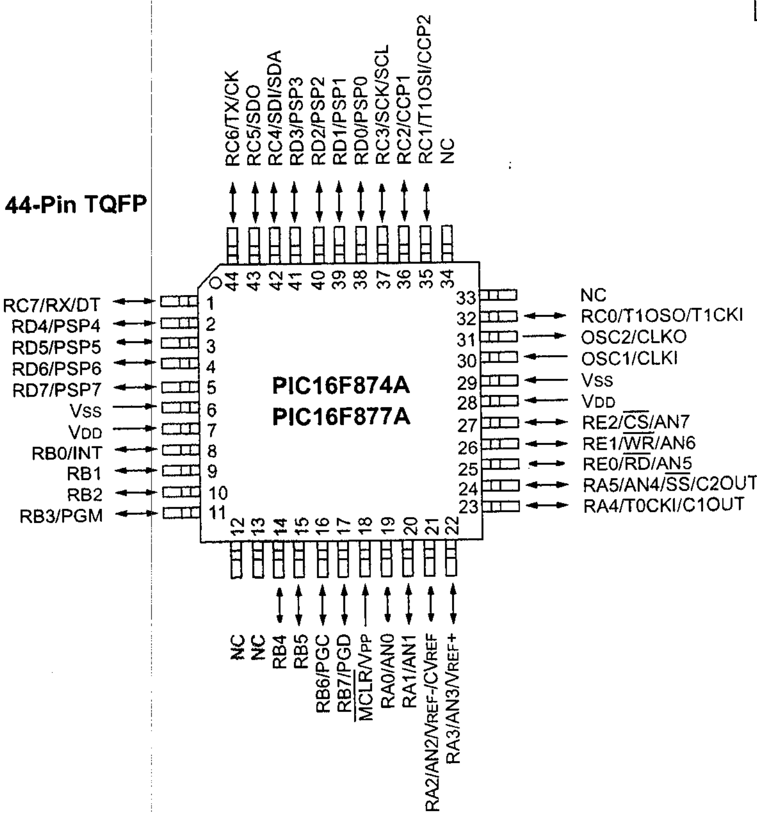
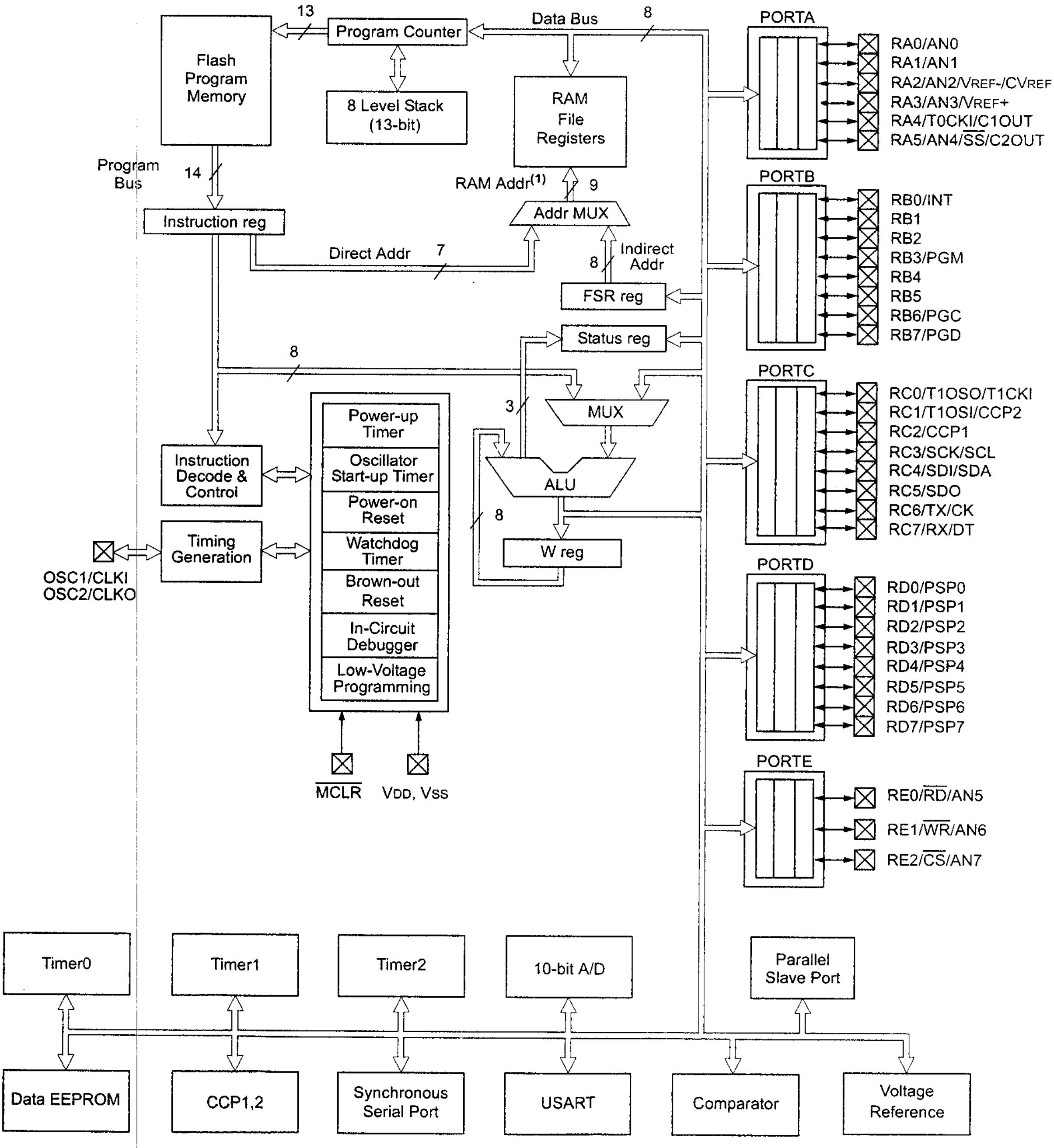


FIGURE 1-2: PIC16F874A/877A BLOCK DIAGRAM



Device	Program Flash	Data Memory	Data EEPROM
PIC16F874A	4K words	192 Bytes	128 Bytes
PIC16F877A	8K words	368 Bytes	256 Bytes

Note 1: Higher order bits are from the Status register.

TABLE 1-3: PIC16F874A/877A PINOUT DESCRIPTION

Pin Name	PDIP Pin#	PLCC Pin#	TQFP Pin#	QFN Pin#	I/O/P Type	Buffer Type	Description
OSC1/CLKI	13	14	30	32		ST/CMOS(4)	Oscillator crystal or external clock input.
OSC1					I		Oscillator crystal input or external clock source input. ST buffer when configured in RC mode; otherwise CMOS.
CLKI					I		External clock source input. Always associated with pin function OSC1 (see OSC1/CLKI, OSC2/CLKO pins).
OSC2/CLKO	14	15	31	33		—	Oscillator crystal or clock output.
OSC2					O		Oscillator crystal output. Connects to crystal or resonator in Crystal Oscillator mode.
CLKO					O		In RC mode, OSC2 pin outputs CLKO, which has 1/4 the frequency of OSC1 and denotes the instruction cycle rate.
$\overline{MCLR}$/VPP	1	2	18	18		ST	Master Clear (input) or programming voltage (output).
$\overline{MCLR}$					I		Master Clear (Reset) input. This pin is an active low Reset to the device.
VPP					P		Programming voltage input.
							PORTA is a bidirectional I/O port.
RA0/AN0	2	3	19	19		TTL	
RA0					I/O		Digital I/O.
AN0					I		Analog input 0.
RA1/AN1	3	4	20	20		TTL	
RA1					I/O		Digital I/O.
AN1					I		Analog input 1.
RA2/AN2/VREF-/CVREF	4	5	21	21		TTL	
RA2					I/O		Digital I/O.
AN2					I		Analog input 2.
VREF-					I		A/D reference voltage (Low) input.
CVREF					O		Comparator VREF output.
RA3/AN3/VREF+	5	6	22	22		TTL	
RA3					I/O		Digital I/O.
AN3					I		Analog input 3.
VREF+					I		A/D reference voltage (High) input.
RA4/T0CKI/C1OUT	6	7	23	23		ST	
RA4					I/O		Digital I/O – Open-drain when configured as output.
T0CKI					I		Timer0 external clock input.
C1OUT					O		Comparator 1 output.
RA5/AN4/$\overline{SS}$/C2OUT	7	8	24	24		TTL	
RA5					I/O		Digital I/O.
AN4					I		Analog input 4.
$\overline{SS}$					I		SPI slave select input.
C2OUT					O		Comparator 2 output.

Legend: I = input O = output I/O = input/output P = power
— = Not used TTL = TTL input ST = Schmitt Trigger input

Note 1: This buffer is a Schmitt Trigger input when configured as the external interrupt.
2: This buffer is a Schmitt Trigger input when used in Serial Programming mode.
3: This buffer is a Schmitt Trigger input when configured in RC Oscillator mode and a CMOS input otherwise.

TABLE 1-3: PIC16F874A/877A PINOUT DESCRIPTION (CONTINUED)

Pin Name	PDIP Pin#	PLCC Pin#	TQFP Pin#	QFN Pin#	I/O/P Type	Buffer Type	Description
							PORTB is a bidirectional I/O port. PORTB can be software programmed for internal weak pull-up on all inputs.
RB0/INT	33	36	8	9		TTL/ST(1)	
RB0					I/O		Digital I/O.
INT					I		External interrupt.
RB1	34	37	9	10	I/O	TTL	Digital I/O.
RB2	35	38	10	11	I/O	TTL	Digital I/O.
RB3/PGM	36	39	11	12		TTL	
RB3					I/O		Digital I/O.
PGM					I		Low-voltage ICSP programming enable pin.
RB4	37	41	14	14	I/O	TTL	Digital I/O.
RB5	38	42	15	15	I/O	TTL	Digital I/O.
RB6/PGC	39	43	16	16		TTL/ST(2)	
RB6					I/O		Digital I/O.
PGC					I		In-circuit debugger and ICSP programming clock.
RB7/PGD	40	44	17	17		TTL/ST(2)	
RB7					I/O		Digital I/O.
PGD					I/O		In-circuit debugger and ICSP programming data.

Legend: I = input O = output I/O = input/output P = power
— = Not used TTL = TTL input ST = Schmitt Trigger input

Note 1: This buffer is a Schmitt Trigger input when configured as the external interrupt.
2: This buffer is a Schmitt Trigger input when used in Serial Programming mode.
3: This buffer is a Schmitt Trigger input when configured in RC Oscillator mode and a CMOS input otherwise.

Resistive Touch Screens

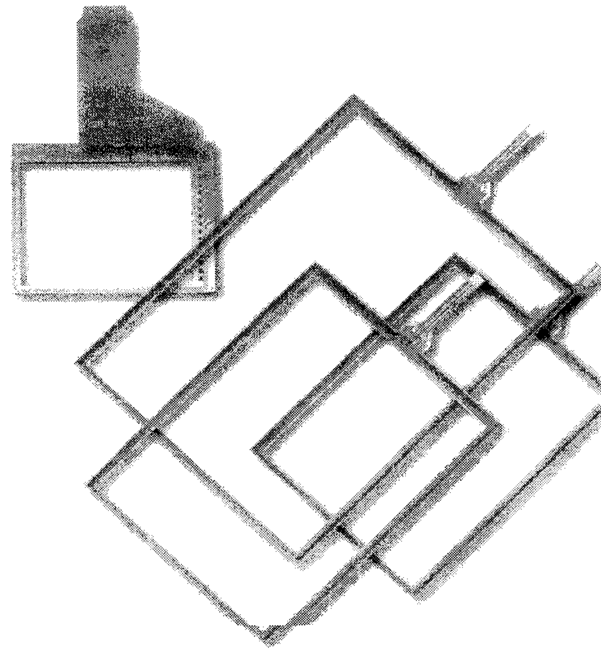
5-Wire, 4-Wire & Digital Solutions

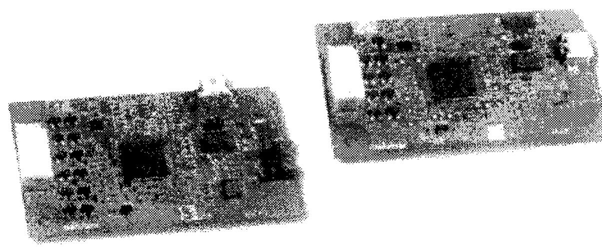
NKK's transparent touch screens are engineered to complement the application of choice while offering superior durability and flexibility. With options in multiple sizes, and choices of input by finger, gloved finger or stylus, we maintain a consistent focus on impeccable quality and value added solutions with the diverse needs of our customers at the forefront.

Whether an application requires the 5- or 4-wire technology, the features include metal tails (analog), contact reliability with a connector, and ANR film, eliminating many of the typical visual artifacts. The film surface is non-glare and hard coated for ease of use and integrity of the surface.

Additional benefits of NKK's 5-wire touch screens include:

- Screens highly resistant to static electricity and noise pollution
- Drift-free operation despite any temperature fluctuation
- Greater touch point density translating to more precision and reduction of false actuations
- Quicker response time





DISTINCTIVE CHARACTERISTICS

- Wide Range of Available Sizes
- Custom Solutions a Specialty
- Digital and Analog Solutions
- Controllers Available
- Anti-Newton Ring (ANR) Technology
- Design Minimizes Visual Artifacts
- RoHS Compliant

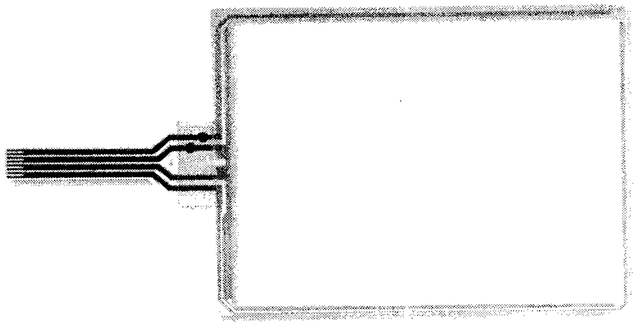
APPLICATIONS

- Information Kiosks
- Industrial Automation
- Banking, Exchange Management Systems
- Broadcast
- Office Automation
- Medical Equipmen
- Hand-held Devices
- Hospitality and Restaurant
- Gaming

ENERAL SPECIFICATIONS FOR 4-WIRE

Vire Analog Resistive Touch Screens

	Optical
t Transmission	Analog: 80% standard Digital: 78% standard
Options	Anti-glare, anti-Newton ring standard
	Electrical
ver Level	1mA @ 5V DC (resistive load)
lation Impedance	10MΩ minimum @ 25V DC
arity	3% maximum (analog)
ttering Time	10 milliseconds maximum
	Mechanical
ch Activation Force	1.4N maximum
ilable Sizes	5.7″ ~ 15″ standard
	Durability
face Hardness	2H (JIS K5600)
ected Operational Life	1,000,000 operations minimum
	Environmental
erating Temperature Range	−10°C ~ +60°C (+14°F ~ +140°F)
rage Temperature Range	−20°C ~ +70°C (−4°F ~ +158°F)
ative Humidity	+60°C (+140°F), humidity 90%, 240 hours



Analog
FTAS00-57AS4

ART NUMBERS & DESCRIPTIONS FOR 4-WIRE

4-Wire Analog Touch Screens

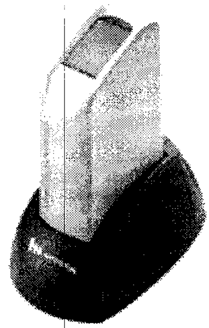
Part Number	Screen Size in Inches	Key Area Dimensions	Viewing Area Dimensions	External Dimensions	Panel Thickness	* Terminal Detail 8 Pin .049″ (1.25mm) Pitch
TAS00-57AS4	5.7	4.54″ x 3.40″ (115.2mm x 86.4mm)	4.76″ x 3.61″ (121.0mm x 91.6mm)	5.16″ x 3.98″ (131.0mm x 101.0mm)	.055″ (1.4mm)	Length 2.56″ (65.0mm)
TAS00-65AS4	6.5	5.20″ x 3.90″ (132.0mm x 99.0mm)	5.43″ x 4.13″ (138.0mm x 105.0mm)	5.91″ x 4.57″ (150.0mm x 116.0mm)		Length 2.56″ (65.0mm)
TAS00-84AS4	8.4	6.73″ x 5.10″ (170.9mm x 129.6mm)	6.95″ x 5.33″ (176.5mm x 135.4mm)	7.34″ x 5.69″ (186.5mm x 144.4mm)	.083″ (2.1mm)	Length 3.15″ (80.0mm)
AS00-104AS4	10.4	8.32″ x 6.24″ (211.2mm x 158.4mm)	8.47″ x 6.39″ (215.0mm x 162.4mm)	8.88″ x 6.75″ (225.6mm x 171.4mm)		Length 3.15″ (80.0mm)
AS00-104AV4	10.4	8.35″ x 6.28″ (212.2mm x 159.4mm)	8.52″ x 6.43″ (216.4mm x 163.4mm)	8.92″ x 7.21″ (226.5mm x 183.0mm)		Length 3.15″ (80.0mm)
TAS00-121A4	12.1	9.72″ x 7.30″ (246.76mm x 185.32mm)	10.04″ x 7.53″ (255.0mm x 191.32mm)	10.67″ x 8.07″ (271.0mm x 205.0mm)		Length 3.15″ (80.0mm)
AS00-121AS4	12.1	9.69″ x 7.26″ (246.0mm x 184.5mm)	9.84″ x 7.42″ (250.0mm x 188.5mm)	10.28″ x 7.80″ (261.0mm x 198.0mm)		Length 3.15″ (80.0mm)
TAS00-150A4	15.0	12.05″ x 9.06″ (306.1mm x 230.1mm)	12.21″ x 9.25″ (310.0mm x 235.0mm)	12.91″ x 9.84″ (328.0mm x 250.0mm)		Length 3.15″ (80.0mm)

ote: Input methods are finger or stylus.

* 4 pin available with 1.0mm or 1.25mm pitch. Contact factory for details.

Fingkey Hamster

fingerprint recognition device for those computers that are equipped with compact fingerprint recognition Sensor
Whose primary function is for security and convenience



Fingkey Hamster™ is a fingerprint recognition device for those computers that are equipped with compact fingerprint recognition Sensor. Whose primary function is for security and convenience. It supports various OS and USB interfaces so that it is suitable for application of PC-infra security solutions.

Features Specifications S/W package Applications

Features

- Precise user authentication through the distinct algorithm.
- Compact and elegant design, which is more convenient to use.
- Excellent product durability that assures a long life..
- Provides fast matching.
- Provides USB interface.
- Applied to various client/server and internet environment as well as computer security

Specifications

Item	Description
Interface Type	USB
External Interface Spec	USB1.1
Fingerprint Recognition Sensor	OPP01
Resolution	500 [DPI]
Size	27.2(W)x40.4(L)X73.3(H)(mm)
OS	Windows 98SE / 2000 / XP /2003 /Vista
Operating Temperature	0 ~ 40 [°C]
Operating Voltage	DC 5 [V]
Certification	MIC, CE, FCC, WHQL

S/W package

eNDeSS Professional

- User Management
- Verification DB Management
- Log Management
- Screen Saver
- Lpg-on
- System Restriction
- File Encryption
- DB Backup

Applications

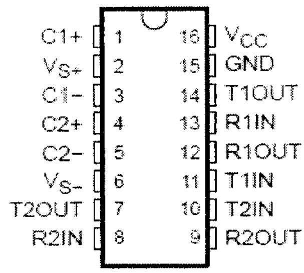
- Security for computer and network
- Computer Security
- Company IT Solution
- e-commerce
- Security for banking and financial institutes for user authentication
- Medical information system
- Other fields requiring user authentication

MAX232, MAX232I
DUAL EIA-232 DRIVERS/RECEIVERS

SLLS047L – FEBRUARY 1989 – REVISED MARCH 2004

- Meets or Exceeds TIA/EIA-232-F and ITU Recommendation V.28
- Operates From a Single 5-V Power Supply With 1.0-μF Charge-Pump Capacitors
- Operates Up To 120 kbit/s
- Two Drivers and Two Receivers
- ±30-V Input Levels
- Low Supply Current . . . 8 mA Typical
- ESD Protection Exceeds JESD 22
  – 2000-V Human-Body Model (A114-A)
- Upgrade With Improved ESD (15-kV HBM) and 0.1-μF Charge-Pump Capacitors is Available With the MAX202
- Applications
  – TIA/EIA-232-F, Battery-Powered Systems, Terminals, Modems, and Computers

MAX232 . . . D, DW, N, OR NS PACKAGE
MAX232I . . . D, DW, OR N PACKAGE
(TOP VIEW)



description/ordering information

The MAX232 is a dual driver/receiver that includes a capacitive voltage generator to supply TIA/EIA-232-F voltage levels from a single 5-V supply. Each receiver converts TIA/EIA-232-F inputs to 5-V TTL/CMOS levels. These receivers have a typical threshold of 1.3 V, a typical hysteresis of 0.5 V, and can accept ±30-V inputs. Each driver converts TTL/CMOS input levels into TIA/EIA-232-F levels. The driver, receiver, and voltage-generator functions are available as cells in the Texas Instruments LinASIC™ library.

ORDERING INFORMATION

T_A	PACKAGE†		ORDERABLE PART NUMBER	TOP-SIDE MARKING
0°C to 70°C	PDIP (N)	Tube of 25	MAX232N	MAX232N
	SOIC (D)	Tube of 40	MAX232D	MAX232
		Reel of 2500	MAX232DR	
	SOIC (DW)	Tube of 40	MAX232DW	MAX232
		Reel of 2000	MAX232DWR	
	SOP (NS)	Reel of 2000	MAX232NSR	MAX232
−40°C to 85°C	PDIP (N)	Tube of 25	MAX232IN	MAX232IN
	SOIC (D)	Tube of 40	MAX232ID	MAX232I
		Reel of 2500	MAX232IDR	
	SOIC (DW)	Tube of 40	MAX232IDW	MAX232I
		Reel of 2000	MAX232IDWR	

† Package drawings, standard packing quantities, thermal data, symbolization, and PCB design guidelines are available at www.ti.com/sc/package.

Please be aware that an important notice concerning availability, standard warranty, and use in critical applications of Texas Instruments semiconductor products and disclaimers thereto appears at the end of this data sheet.

LinASIC is a trademark of Texas Instruments.

absolute maximum ratings over operating free-air temperature range (unless otherwise noted)†

Input supply voltage range, V_{CC} (see Note 1) . . . . −0.3 V to 6 V
Positive output supply voltage range, V_{S+} . . . . V_{CC} − 0.3 V to 15 V
Negative output supply voltage range, V_{S-} . . . . −0.3 V to −15 V
Input voltage range, V_I: Driver . . . . −0.3 V to V_{CC} + 0.3 V
Receiver . . . . ±30 V
Output voltage range, V_O: T1OUT, T2OUT . . . . V_{S-} − 0.3 V to V_{S+} + 0.3 V
R1OUT, R2OUT . . . . −0.3 V to V_{CC} + 0.3 V
Short-circuit duration: T1OUT, T2OUT . . . . Unlimited
Package thermal impedance, θ_{JA} (see Notes 2 and 3): D package . . . . 73°C/W
DW package . . . . 57°C/W
N package . . . . 67°C/W
NS package . . . . 64°C/W
Operating virtual junction temperature, T_J . . . . 150°C
Storage temperature range, T_{stg} . . . . −65°C to 150°C

† Stresses beyond those listed under "absolute maximum ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under "recommended operating conditions" is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

NOTES: 1. All voltages are with respect to network GND.
2. Maximum power dissipation is a function of T_J(max), θ_{JA}, and T_A. The maximum allowable power dissipation at any allowable ambient temperature is $P_D = (T_J(max) - T_A)/\theta_{JA}$. Operating at the absolute maximum T_J of 150°C can affect reliability.
3. The package thermal impedance is calculated in accordance with JESD 51-7.

recommended operating conditions

			MIN	NOM	MAX	UNIT
V_{CC}	Supply voltage		4.5	5	5.5	V
V_{IH}	High-level input voltage (T1IN,T2IN)		2			V
V_{IL}	Low-level input voltage (T1IN, T2IN)				0.8	V
R1IN, R2IN	Receiver input voltage				±30	V
T_A	Operating free-air temperature	MAX232	0		70	°C
		MAX232I	−40		85	

electrical characteristics over recommended ranges of supply voltage and operating free-air temperature (unless otherwise noted) (see Note 4 and Figure 4)

PARAMETER		TEST CONDITIONS	MIN	TYP‡	MAX	UNIT
I_{CC}	Supply current	V_{CC} = 5.5 V, All outputs open, T_A = 25°C		8	10	mA

‡ All typical values are at V_{CC} = 5 V and T_A = 25°C.

NOTE 4: Test conditions are C1−C4 = 1 µF at V_{CC} = 5 V ± 0.5 V.

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