

Dual Tone Multiple Frequencies

INTRODUCTION



The DTMF based remote monitoring system consists of sensors for sensing the present parameters of the process or machine.

The whole system can be installed at a distance place from where these data can be directly sent to the logging system.

The data obtained is sent to doctor's system by converting it into DTMF signals.

The DTMF stands for Dual Tone Multiple Frequencies.

The idea behind this project is generation of DTMF signal for sending data.

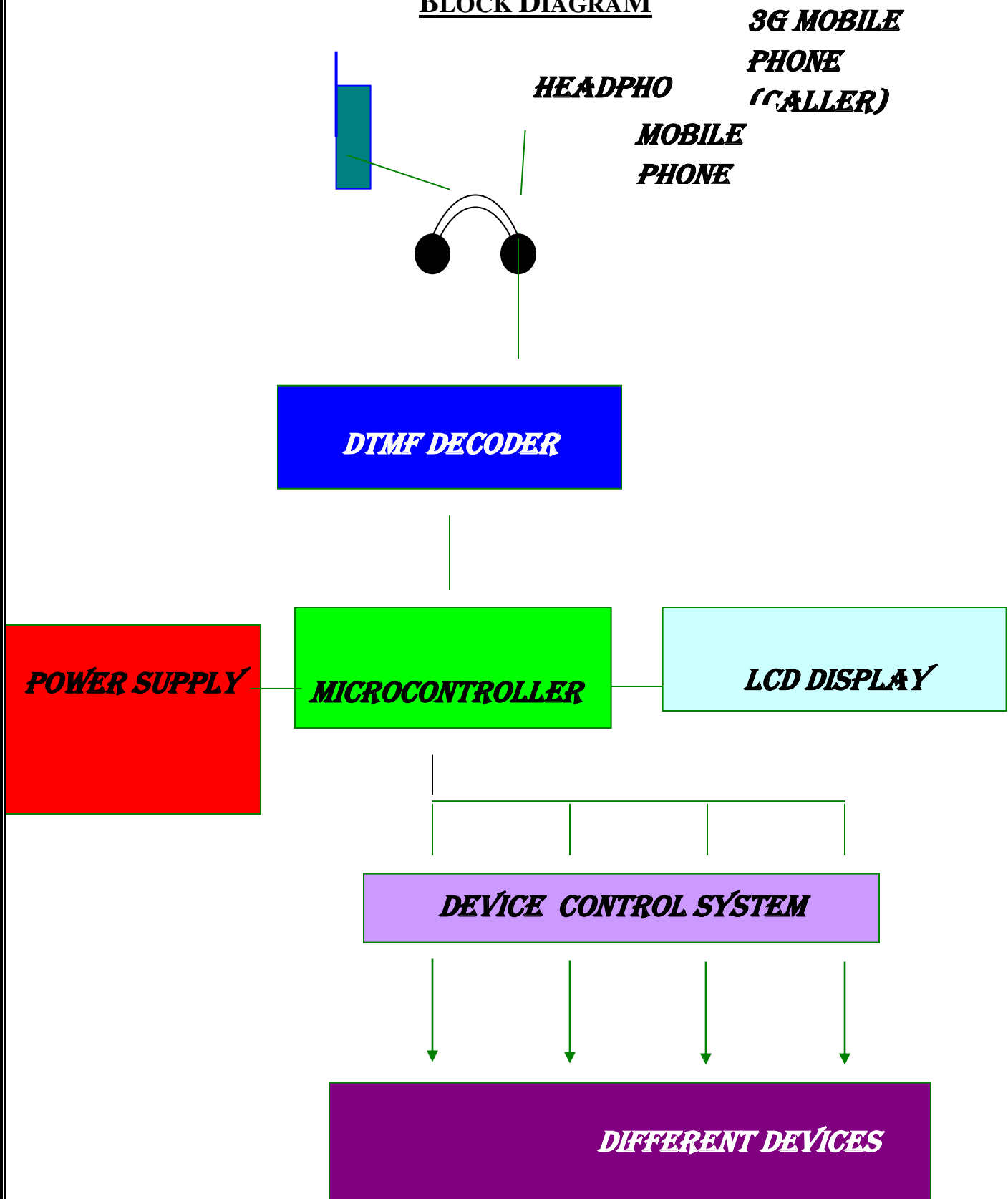
In communication any digit may be transmitted in pulse mode or in DTMF mode. We are generating DTMF tones at transmitter end and decoding these tones at receiving end which can be used for transmitting the data from one end to another end.

These signals are decoded at the receiving end and original data is recovered from it by the doctors.

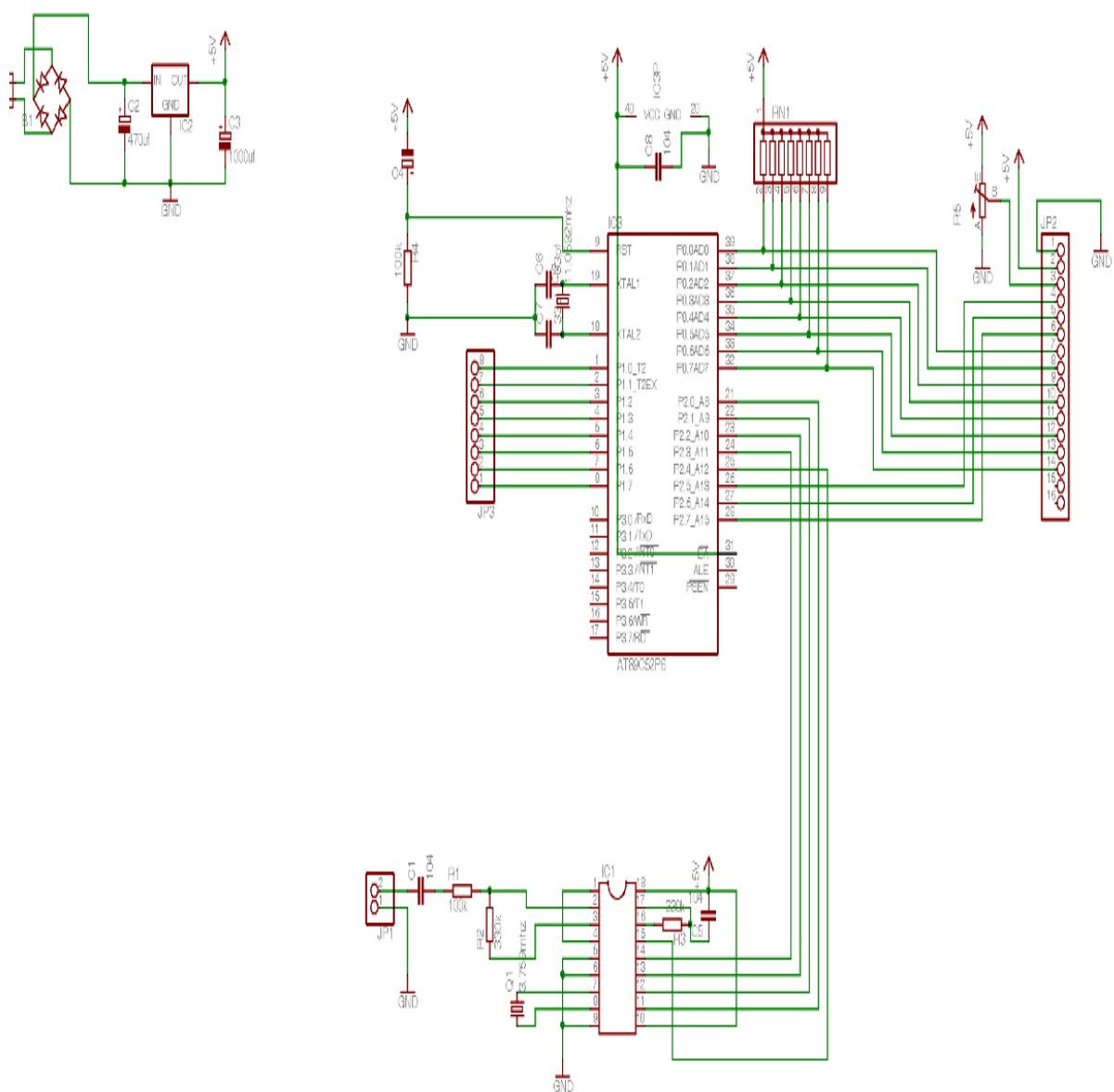
Dual-tone multi-frequency (DTMF) signaling is used for telephone signaling over the line in the voice-frequency band to the call switching center. The version of DTMF used for telephone tone dialing is known by the trademarked term Touch-Tone (canceled March 13, 1984), and is standardized by ITU-T Recommendation Q.23. Other multi-frequency systems are used for signaling internal to the telephone network.

As a method of in-band signaling, DTMF tones were also used by cable television broadcasters to indicate the start and stop times of local commercial insertion points during station breaks for the benefit of cable companies. Until better out-of-band signaling equipment was developed in the 1990s, fast, unacknowledged, and loud DTMF tone sequences could be heard during the commercial breaks of cable channels in the United States and elsewhere.

BLOCK DIAGRAM



3.1 CIRCUIT DIAGRAM:



3.2 WORKING OF CIRCUIT:

- ❖ DTMF decoder sends the information in the form of frequency from the 3G hand set ,Then DTMF decoder decode the information in the form of frequency and this information fed Here microcontroller is the heart of this project ,Firstly the power supply of 5v DC is very essential for this set up, this power supply trigger the microcontroller 8051,then 8051 is directly connected with LCD & device control, LCD gives the info regarding devices that can be operated by microcontroller 8051 & device control here acting as a switch with the help of relays .
- ❖ to microcontroller pins.Finally microcontroller performs the relative operations.

INSTRUMENT

- 4.1Microcontroller (AT89C51)
- 4.2 DTMF decoder 8870
- 4.3 Over load relay
- 4.4 LCD display
- 4.5 transformer
- 4.6 capacitors
- 4.7 resister

4.1-MICROCANTROLER (AT89C51)

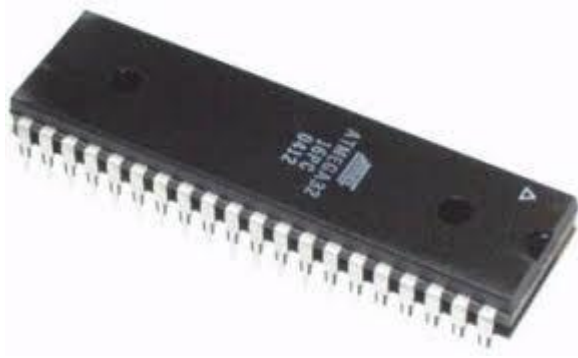


Fig-4.1 MICROCONTROLLER (AT89C51)

Introduction to AT89C51

The AT89C51 is a CMOS 8-bit microcomputer with 4K bytes of Flash programmable and erasable read only memory (PEROM). The on-chip Flash allows the program memory to be reprogrammed in-system or by a ordinary nonvolatile memory programmer. Atmel AT89C51 is a powerful microcomputer/microcontroller (as they are used inter-changeably) which provides a highly-flexible and cost-effective solution to embedded control applications.many

Features of AT89C51

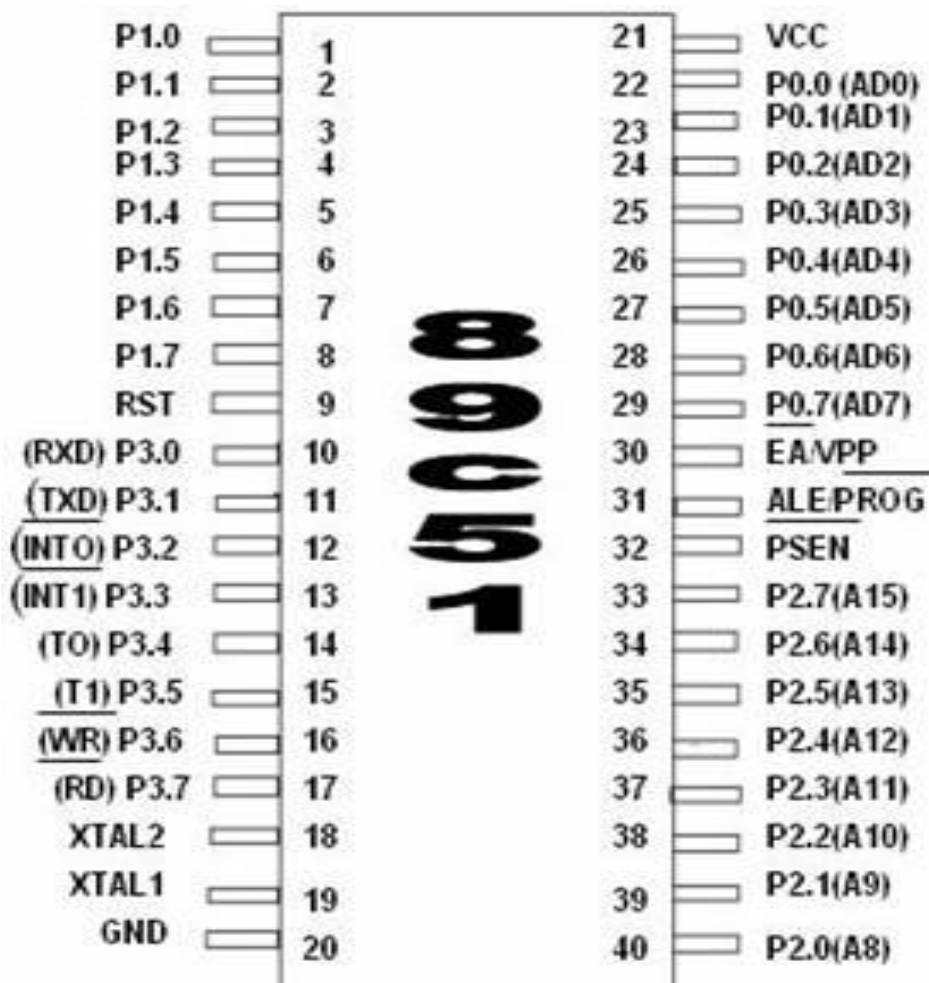
- Compatible with MCS-51™ Products
- 4K Bytes of In-System Reprogrammable Flash Memory
- Fully Static Operation: 0 Hz to 24 MHz
- Three-Level Program Memory Lock
- 128 x 8-Bit Internal RAM
- 32 Programmable I/O Lines
- Two 16-Bit Timer/Counters
- Six Interrupt Sources
- Programmable Serial Channel
- Low Power Idle and Power Down Modes

Description

The AT89C51 is a low-power, high-performance CMOS 8-bit microcomputer with 4K bytes of Flash Programmable and Erasable Read Only Memory (PEROM). The device is manufactured using Atmel's high density nonvolatile memory technology and is compatible with the industry standard MCS-51™ instruction set and pinout. The on-chip Flash allows the program memory to be reprogrammed in-system or by a conventional nonvolatile memory programmer. By combining a versatile 8-bit CPU with Flash on a monolithic chip, the Atmel AT89C51 is a powerful microcomputer which provides a highly flexible and cost effective solution to many embedded control applications

Pin configuration of AT89C51

The device is manufactured using Atmel's high-density nonvolatile memory technology and is compatible with the industry-standard MCS-51 instruction set and pinout.



Pin Description

VCC

Positive (+ve) Dc Supply voltage. Which is normally between 3V to 5V Dc.

GND

0v Ground. This pin is connected to -ve dc supply voltage.

Ports

Ports are generally used by computers to communicate to the outside world.

Microcontrollers use port to read input from another device or to send output to another device. At89C51 has four ports for communication.

Port 0, Port 1, Port 2, Port 3

These ports are 8-bit bi-directional I/O ports. They can be used for both input and output ports. As an output port, each pin can sink eight TTL inputs. Port can be used as an input when they are made to read data from another device (which can be a component or a sensor). Or as an output when the are used to send a signal to another device.

They basically understand two logic states, that is 1s and 0s.

RST

Reset input. This pin is used to reset the microcontroller. If a high remains on this pin for two machine cycles while the oscillator is running, the microcontroller is reset.

ALE/PROG

Address Latch Enable output pulse for latching the low byte of the address during accesses to external memory. This pin is also the program pulse input (PROG) during Flash programming. This pin is used to program the microcontroller.

Setting the ALE-disable bit has no effect if the microcontroller is in external execution mode.

PSEN

Program Store Enable is the read strobe to external program memory. When the AT89C51 is executing code from external program memory, PSEN is activated twice each machine cycle, except that two PSEN activations are skipped during each access to external data memory.

EA/VPP

External Access Enable. EA must be strapped to GND in order to enable the device to fetch code from external program memory locations starting at 0000H up to FFFFH. Note, however, that if lock bit 1 is programmed, EA will be internally latched on reset.

EA should be strapped to VCC for internal program executions.

This pin also receives the 12-volt programming enable voltage (VPP) during Flash programming, for parts that require 12-volt VPP.

XTAL1

Input to the inverting oscillator amplifier and input to the internal clock operating circuit. This pin is connected to the external crystal oscillator together with XTAL2.

XTAL2

Output from the inverting oscillator amplifier

There are two major ways to program AT89C51 microcontroller.

Using a high level programming language like C-language or

Using assembly language.

But in this particular tutorial, I am going to teach you how to use assembly language to program AT89C51

Function:

SETB sets the indicated bit to one (HIGH). SETB can be used to set the value of the carry flag to 1 (HIGH) when desired or can be used to set the value of any addressable bit to one (HIGH).

Example: Lets assume that Port 2 has the value

1 0 0 0 0 0 1 1 (remember the first bit is the MSB (P2.7) and the last bit the LSB (P2.0))

If we write : SETB P2.6

we have 1 (1) 0 0 0 0 1 1. we have now changed the bit no. 2 (which P2.6) from LOW voltage state to 1 (HIGH voltage state).51 is a CMOS 8-bit microcomputer with 4K bytes of Flash programmable and erasable .

4.2:- DTMF decoder 8870

Features

- Low Power Consumption
- Adjustable Acquisition and Release Times
- Central Office Quality and Performance
- Power-down and Inhibit Modes (-02 only)
- Inexpensive 3.58 MHz Time Base
- Single 5 Volt Power Supply
- Dial Tone Suppression

Applications

- Telephone switch equipment
- Remote data entry
- Paging systems
- Personal computers
- Credit card systems

Description

The LM-8870 is a full DTMF Receiver that integrates both bandsplit filter and decoder functions into a single 18-pin DIP or SOIC package. Manufactured using CMOS process technology, the LM-8870 offers low power consumption (35 mW max) and precise data handling. Its filter section uses switched capacitor technology for both the high and low group filters and for dial tone rejection. Its decoder uses digital counting techniques to detect and decode all 16 DTMF tone pairs into a 4-bit code. External component count is minimized by provision of an on-chip differential input amplifier, clock generator, and latched tri-state inter-face bus. Minimal external components required include a low-cost 3.579545 MHz color burst crystal, a timing resistor, and a timing capacitor. The LM-8870-02 provides a “power-down” option which, when enabled, drops consumption to less than 0.5 mW. The LM-8870-02 can also inhibit the decoding of fourth column digits

4.3: -Overload relay :

THERMAL OVERLOAD RELAY:



(Fig 4.1 Overload relay)

The operating principle of the thermal relay is the thermal effect of electric current. It does not measure temperature directly.

These relay utilized the electro thermal effect of the actuating current for their operation. They are widely used for protection of small motors against overloading and unbalance current. The thermal element is bimetallic strip; a bimetallic element consists of two metal strip of different co-efficient of thermal expansion, joined together.

- by increasing or decreasing the flow rate. For longer time periods, a mechanical clockwork timer is installed.

Besides these there are some common advantages:

1. More Efficiency of the motor.
2. Safety will be increase by this system.
3. Relays control output circuits of a much higher power.
4. Protective relays are essential for isolating faults in the system and keep equipment safe from being damaged

4.4 . LCD DISPLAY



Description

Above is the quite simple schematic. The LCD panel's Enable and Register Select is connected to the Control Port. The Control Port is an open collector / open drain output. While most Parallel Ports have internal pull-up resistors, there are a few which don't. Therefore by incorporating the two 10K external pull up resistors, the circuit is more portable for a wider range of computers, some of which may have no internal pull up resistors.

We make no effort to place the Data bus into reverse direction. Therefore we hard wire the R/W line of the LCD panel, into write mode. This will cause no bus conflicts on the data lines. As a result we cannot read back the LCD's internal Busy Flag 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. Nothing fancy here. As with all the examples, I've left the power supply out. You can use a bench power supply set to 5v or use a onboard +5 regulator. Remember a few decoupling capacitors, especially if you have trouble with the circuit working properly.

Most projects you create with the 8051 CPU require some form of display. The most common way to accomplish this is with the LCD (Liquid Crystal Display). LCDs have become a cheap and easy way to get text display for an embedded system. Common displays are set up as 16 to 20 characters by 1 to 4 lines.

Pinout

- 8 data pins D7:D0

Bi-directional data/command pins.

Alphanumeric characters are sent in ASCII format.

- RS: Register Select

RS = 0 -> Command Register is selected

RS = 1 -> Data Register is selected

- R/W: Read or Write

0 -> Write, 1 -> Read

- E: Enable (Latch data)

Used to latch the data present on the data pins. A high-to-low edge is needed to latch the data.

- VEE : contrast control

NOTE: When writing to the display, data is transferred only on the high to low transition of this signal. However, when reading from the display, data will become available shortly after the low to high transition and remain available until the signal falls low again.

Display Data RAM (DDRAM)

Display data RAM (DDRAM) is where you send the characters (ASCII code) you want to see on the LCD screen. It stores display data represented in 8-bit character codes. Its capacity is 80 characters (bytes). Below you see DD RAM address layout of a 2*16 LCD.

In the above memory map, the area shaded in black is the visible display (For 16x2 display) .

For first line addresses for first 15 characters is from 00h to 0Fh. But for second line address of first character is 40h and so on up to 4Fh for the 16th character.

So if you want to display the text at specific positions of LCD , we require to manipulate address

4.5-Transformer

4.5.1-BASIC INTRODUCTION OF TRANSFORMER

A **transformer** is a device that transfers electrical energy from one circuit to another through inductively coupled conductors—the transformer's coils. A varying current in the first or *primary* winding creates a varying magnetic flux in the transformer's core and thus a varying magnetic field through the *secondary* winding. This varying magnetic field induces a varying electromotive force (EMF), or "voltage", in the secondary winding. This effect is called inductive coupling.

If a load is connected to the secondary, an electric current will flow in the secondary winding and electrical energy will be transferred from the primary circuit through the transformer to the load. In an ideal transformer, the induced voltage in the secondary winding (V_s) is in proportion to the primary voltage (V_p), and is given by the ratio of the number of turns in the secondary (N_s) to the number of turns in the primary (N_p) as follows:



Fig: 4.5.1 Transformer

$$\frac{V_s}{V_p} = \frac{N_s}{N_p}$$

By appropriate selection of the ratio of turns, a transformer thus allows an alternating current (AC) voltage to be "stepped up" by making N_s greater than N_p , or "stepped down" by making N_s less than N_p .

In the vast majority of transformers, the windings are coils wound around a ferromagnetic core, air-core transformers being a notable exception.

Transformers range in size from a thumbnail-sized coupling transformer hidden inside a stage microphone to huge units weighing hundreds of tons used to interconnect portions of power grids. All operate with the same basic principles, although the range of designs is wide. While new technologies have eliminated the need for transformers in some electronic circuits, transformers are still found in nearly all electronic devices designed for household ("mains") voltage. Transformers are essential for high-voltage electric power transmission, which makes long-distance transmission economically practical.

4.5.2 Basic principles

The transformer is based on two principles: first, that an electric current can produce a magnetic field (electromagnetism), and, second that a changing magnetic field within a coil of wire induces a voltage across the ends of the coil (electromagnetic induction). Changing the current in the primary coil changes the magnetic flux that is developed. The changing magnetic flux induces a voltage in the secondary coil.

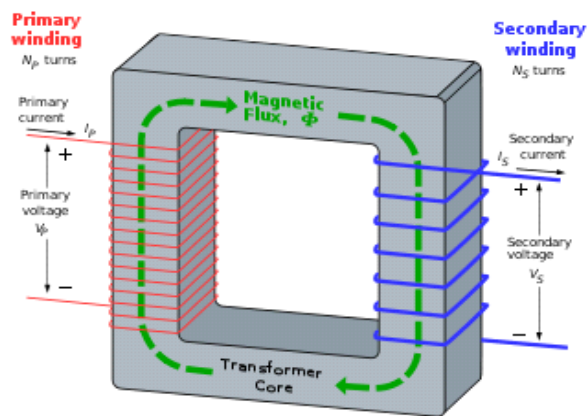


Fig:4.5.2 Magnetic field coil

An ideal transformer. The secondary current arises from the action of the secondary EMF on the (not shown) load impedance.

An ideal transformer is shown in the adjacent figure. Current passing through the primary coil creates a magnetic field. The primary and secondary coils are wrapped around a core of very high magnetic permeability, such as iron, so that most of the magnetic flux passes through both the primary and secondary coils. If a load is connected to the secondary winding, the load current and voltage will be in the directions indicated, given the primary current and voltage in the directions indicated (each will be alternating current in practice).

Detailed operation

The simplified description above neglects several practical factors, in particular the primary current required to establish a magnetic field in the core, and the contribution to the field due to current in the secondary circuit.

Models of an ideal transformer typically assume a core of negligible reluctance with two windings of zero resistance.^[32] When a voltage is applied to the primary winding, a small current flows, driving flux around the magnetic circuit of the core.^[32] The current required to create the flux is termed the *magnetizing current*; since the ideal core has been assumed to have near-zero reluctance, the magnetizing current is negligible, although still required to create the magnetic field.

The changing magnetic field induces an electromotive force (EMF) across each winding.^[33] Since the ideal windings have no impedance, they have no associated voltage drop, and so the voltages V_P and V_S measured at the terminals of the transformer, are equal to the corresponding EMFs. The primary EMF, acting as it

does in opposition to the primary voltage, is sometimes termed the "back EMF".^[34] This is due to Lenz's law which states that the induction of EMF would always be such that it will oppose development of any such change in magnetic field.

4.5.3. Leakage flux

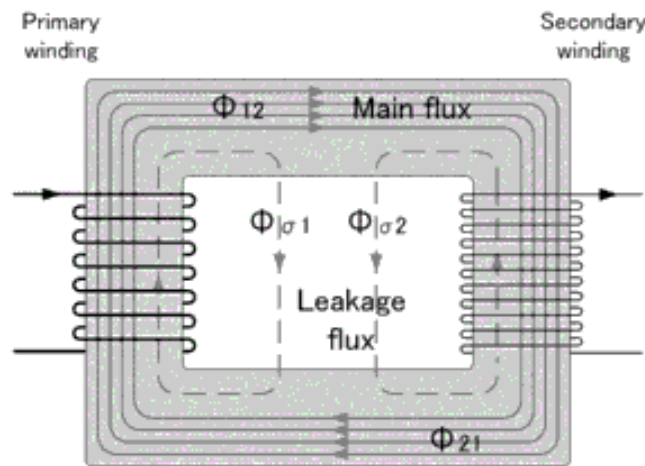


Fig: 4.5.3 Leakage flux of a transformer

The ideal transformer model assumes that all flux generated by the primary winding links all the turns of every winding, including itself. In practice, some flux traverses paths that take it outside the windings.^[35] Such flux is termed *leakage flux*, and results in leakage inductance in series with the mutually coupled transformer windings.^[34] Leakage results in energy being alternately stored in and discharged from the magnetic fields with each cycle of the power supply. It is not directly a power loss (see "Stray losses" below), but results in inferior voltage regulation, causing the secondary voltage to fail to be directly proportional to the primary, particularly under heavy load.^[35] Transformers are therefore normally designed to have very low leakage inductance. Nevertheless, it is impossible to eliminate all leakage flux because it plays an essential part in the operation of the

transformer. The combined effect of the leakage flux and the electric field around the windings is what transfers energy from the primary to the secondary.^[36]

In some applications increased leakage is desired, and long magnetic paths, air gaps, or magnetic bypass shunts may be deliberately introduced to a transformer's design to limit the short-circuit current it will supply.^[34] Leaky transformers may be used to supply loads that exhibit negative resistance, such as electric arcs, mercury vapor lamps, and neon signs; or for safely handling loads that become periodically short-circuited such as electric arc welders.^[37]

Air gaps are also used to keep a transformer from saturating, especially audio-frequency transformers in circuits that have a direct current flowing through the windings.^[38]

Leakage inductance is also helpful when transformers are operated in parallel. It can be shown that if the "per-unit" inductance of two transformers is the same (a typical value is 5%), they will automatically split power "correctly" (e.g. 500 kVA unit in parallel with 1,000 kVA unit, the larger one will carry twice the current).

Energy losses

An ideal transformer would have no energy losses, and would be 100% efficient. In practical transformers energy is dissipated in the windings, core, and surrounding structures. Larger transformers are generally more efficient, and those rated for electricity distribution usually perform better than 98%.

Experimental transformers using superconducting windings achieve efficiencies of 99.85%. The increase in efficiency can save considerable energy, and hence money, in a large heavily loaded transformer; the trade-off is in the additional initial and running cost of the superconducting design.

Losses in transformers (excluding associated circuitry) vary with load current, and may be expressed as "no-load" or "full-load" loss. Winding resistance dominates load losses, whereas hysteresis and eddy currents losses contribute to over 99% of the no-load loss. The no-load loss can be significant, so that even an idle transformer constitutes a drain on the electrical supply and a running cost; designing transformers for lower loss requires a larger core, good-quality silicon steel, or even amorphous steel, for the core, and thicker wire, increasing initial cost, so that there is a trade-off between initial cost and running cost. (Also see energy efficient transformer).

Transformer losses are divided into losses in the windings, termed copper loss, and those in the magnetic circuit, termed iron loss. Losses in the transformer arise from

Winding resistance

Current flowing through the windings causes resistive heating of the conductors. At higher frequencies, skin effect and proximity effect create additional winding resistance and losses.

Hysteresis losses

Each time the magnetic field is reversed, a small amount of energy is lost due to hysteresis within the core. For a given core material, the loss is proportional to the frequency, and is a function of the peak flux density to which it is subjected.

Eddy currents

ferromagnetic materials are also good conductor, and a core made from such a material also constitutes a single short-circuited turn throughout its entire length. eddy current therefore circulate within the core in a plane normal to the flux, and are responsible for resistive heating of the core material. The eddy current loss is a complex function of the square of supply frequency and inverse square of the material thickness. Eddy current losses can be reduced by making the core of a stack of plates electrically insulated from each other, rather than a solid block; all transformers operating at low frequencies use laminated or similar cores.

Magnetostriction

Magnetic flux in a ferromagnetic material, such as the core, causes it to physically expand and contract slightly with each cycle of the magnetic field, an effect known as magnetostriction. This produces the buzzing sound commonly associated with transformers, and can cause losses due to frictional heating.

Mechanical losses

In addition to magnetostriction, the alternating magnetic field causes fluctuating forces between the primary and secondary windings. These incite vibrations within nearby metalwork, adding to the buzzing noise , and consuming a small amount of power.

Stray losses

Leakage inductance is by itself largely lossless, since energy supplied to its magnetic fields is returned to the supply with the next half-cycle. However, any leakage flux that intercepts nearby conductive materials such as the transformer's support structure will give rise to eddy currents and be converted to heat. There are also radiative losses due to the oscillating magnetic field, but these are usually small.

4.6:- CAPACITOR:



(Fig 4.6.1 Capacitor)

A capacitor is a device that can store electrical charge. Because it can store a charge and then release that charge, it resists any change of voltage across it. Because of this, it can be used to "damp" changes in voltage, and it can also be used to block DC while permitting AC to "pass through" it (which is called filtering or coupling, depending on the circuit). The capacitor's one ability can be applied in a number of ways in electronic circuits, and it makes the capacitor an indispensable electronic component. The capacitor is the component that employs

the electronic characteristic we call capacitance, which is the resistance of something to a change in voltage across it.

Types of capacitor:

- 1) Electrolytic capacitor
- 2) Ceramic capacitor
- 3) Mica capacitor
- 4) Paper capacitor

4.7 :- RESISTOR



In electronic circuits, resistors play an important role to limit the current and provide only the required biasing to the vital active parts like the transistors and the ICs. We will try to find out what is the function of a resistor in electronics through the following illustrations:

Transistor Biasing: Through one of my previous articles you must have acquired a good knowledge regarding transistors. A transistor basically needs a small base voltage (>0.6) to make a large voltage flow through its collector/ emitter terminals. But the base of a transistor is quite vulnerable to high currents, so a resistor is incorporated here to limit the current and provide a safe biasing voltage.

Application:

- R.C. filter
- Voltage regulator circuit
- Amplifie

Applications of Project

The typical applications of this serial modem is for developing a wide range of equipment like

- Security and alarms devices
- Monitoring and control devices
- Vending machines
- Utilities device Fleet Management devices

ADVANTAGES

1. Economical
2. Consumes less power
3. Upgradeable
4. Low cast

DISADVANTAGES:

1. Network problem.
2. Availability of modem.

Conclusion

Controlling devices using switches are common. From a few decades controlling devices using remote control switches like infrared remote control switch, wireless remote control switches are becoming popular. But these technologies have their own limitations. Laser beams are harmful to mankind.

Some technologies like IR remote control are used for short distance applications. In such case if we have system, which does not require any radiations or which is not harmful, long remote control switch!! Here, introducing such a system, which does not require any radiations, any laser beam, which has no limitation of range, it can be used from any distance from meters to thousand kilometers using a mobile phone.

REFERENCES

- 1. www.ieee.com
- www.8051projects.com
- www.alldatasheet.com
- www.datasheet4u.com
- www.datasheetcatalog.com
