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REMOTE SURVEILLANCE SYSTEM
A PROJECT REPORT

Submitted by

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ABSTRACT

In this digital era, Remote Surveillance Systems are of great interest in space exploration and defense systems. However, development of such systems in flexible assembly lines and automated environments hasn't seen much daylight due to the high cost incurred. The project targets at finding a low cost and optimal solution for such surveillance systems.

The need for wireless robotic systems has become the top notch of today's requirement due to its high significance. The project is also centered on transmission and reception of signals in wireless fashion

The primary target of the project is to develop software that effectively communicates with a remote embedded surveillance hardware system. Stress will be laid in developing a forward compatible software solution. Moreover, an optimal wireless communication protocol will be concurrently developed.

A single FM transmitter cum receiver circuit is used for transmitting control signals from PC and to receive the same in the robot. Two stepper motors are used to move the vehicle in the forward, reverse, right and left directions. Radio frequency is used to control the remote vehicle from the system interface. The user interface is developed using Visual Basic, with which the user interacts with the system.

The project can be implemented in emerging IT fields and in defense applications. Due to its optimal cost and miniature model, applications are plenty. The project will pave way for the future of unmanned systems in military and space research.

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LIST OF SYMBOLS AND ABBREVIATIONS

AC	Alternating Current
AM	Amplitude Modulation
BCD	Binary Coded Decimal
dB	Decibel
DC	Direct Current
DR	Deviation Ratio
DTMF	Dual Tone Multi Frequency
FM	Frequency Modulation
GHz	Gigahertz
KHz	Kilohertz
MHz	Megahertz
NBFM	Narrow Band Frequency Modulation
PCB	Printed Circuit Board
PSW	Program Status Word
RF	Radio Frequency
Rms	Root Mean Square
SFR	Special Function Register
WFM	Wideband Frequency Modulation

1. INTRODUCTION

1.1 WIRELESS SYSTEMS

1.1.1 FUNDAMENTALS OF WIRELESS COMMUNICATION

A wireless communication system deals with two directions, a transmitting direction and a receiving direction. Normally, the size of the antenna must be as large as one fourth of the wavelength of the signal to be transmitted or received to get enough efficiency. For this reason, the original signal (normally the voice) with a large wavelength must be transferred to a higher frequency (smaller wavelength) to downsize the antenna. At the transmitting end, the original signal is imposed on a locally generated radio frequency (RF) signal called a carrier. This process is called modulation.

This carrier signal, along with the information signal imposed on it, is then radiated by the antenna. At the receiving end, the signal is picked up by another antenna and fed into a receiver where the desired carrier with the imposed information signal is selected from among all the other signals impinging on the antenna. The information signal (e.g., voice) is then extracted from the carrier in a process referred to as demodulation.

1.1.2 FREQUENCY MODULATION

Frequency Modulation (FM) is a technique used to mix (encode) an information-carrying signal onto a much higher sine wave carrier frequency, so that the signal can be transmitted over long distances as a radio wave. Time varying changes in the information signal cause the instantaneous value of the carrier frequency to shift from its nominal or center frequency, by an amount proportional to the amplitude of the signal results in positive and negative deviations in frequency. It is these shifts of frequency that are detected in the receiver, and which are demodulated to reveal the original signal.

Analogue or digital signals can be modulated onto a carrier wave using this type of frequency modulation, and in case of analogue signals the frequency deviations will vary in a continuous process. Digital FM is implemented differently, and in this case the carrier frequency is shifted abruptly to any of a number of new fixed carrier frequencies, based on a binary (to the power of 2)

System. The number of different levels of digitization that are required for digital FM, i.e. the number of discrete frequencies used, will depend on the bandwidth needed for the information to be transmitted

Wireless communications commonly use narrowband FM, and this can cause frequency deviations from the carrier center frequency of up to about 5kHz, FM is often encountered by the general public in the form of

FM radio broadcasting on the 88-108 MHz frequency band, which supports high fidelity sound and stereophonic reproduction. The size of FM radios has decreased to the point where it is now possible to find mobile phones that include an integrated FM radio built in the handset. FM communication is less liable to noise interference than amplitude modulation (AM), the other common types of modulation used for radio communications and broadcasting.

1.1.2.1 COMPARISON OF AM TO FM

It is universally agreed that FM radio stations have better quality sound than AM radio stations. Part of the reason for this is the noise immunity introduced by the non-linear modulation. Another reason is that the bandwidth for FM stations is 15 kHz, whereas AM stations are only allowed with 5 kHz.

Also, FM receivers can have aerials which are half the wavelength of the transmitted carrier (due to the higher frequency of operation). This allows more signal powers to be received than the AM case, where aerial would need to be many times longer.

only. With standard decoders, it is possible to signal at a rate of about 10 "beeps" (=5 bytes) per second. DTMF standards specify 50ms tone and 50ms space duration. For shorter lengths, synchronization and timing becomes very tricky.

1.1.3.1 DTMF USAGE:

DTMF is the basis for voice communications control. Modern telephony uses DTMF to dial numbers, configure telephone exchanges (switchboards), and so on. Occasionally, simple floating codes are transmitted using DTMF - usually via a CB transceiver (27 MHz). It is used to transfer information between radio transceivers, in voice mail applications, etc.

Almost any mobile (cellular) phone is able to generate DTMF after establishing connection. If your phone can't generate DTMF, you can use a stand-alone "dialer". DTMF was designed so that it is possible to use acoustic transfer, and receive the codes using standard microphone.

1.1.3.2 COMPOSITION OF DTMF SIGNALS

The table shows how to compose any DTMF code. Each code, or "beep", consists of two simultaneous frequencies mixed together (added amplitudes). Standards specify 0.7% typical and 1.5% maximum tolerance. The higher of the two frequencies may have higher amplitude (be "louder") of 4 dB max. This shift is called a "twist". If the twist is equal to 3 dB, the higher frequency is 3 dB louder. If the lower frequency is louder, the twist is negative.

	1209 Hz	1336 Hz	1477 Hz	1633 Hz
697 Hz	1	2	3	A
770 Hz	4	5	6	B
852 Hz	7	8	9	C
941 Hz	*	0	#	D

Table 1.a Frequency Table

This table resembles a matrix keyboard. The X and Y coordinates of each code give the two frequencies that the code is composed of. Notice that there are 16 codes; however, common DTMF dialers use only 12 of them. The "A" through "D" is "system" codes. Most end users won't need any of those: they are used to configure phone exchanges or to perform other special functions.

1.1.3.3 HOW TO TRANSMIT DTMF

Most often, dedicated telephony circuits are used to generate DTMF (for example, MT8880). On the other hand, a microprocessor can do it, too. Just connect a RC filter to two output pins, and generate correct tones via software. However, getting the correct frequencies often requires usage of a suitable Xtal for the processor itself - at the cost of non-standard cycle length, etc. So, this method is used in simple applications only.

1.1.3.4 HOW TO DECODE DTMF

It is not easy to detect and recognize DTMF with satisfactory precision. Often, dedicated integrated circuits are used, although a functional solution for DTMF transmission and receiving by a microprocessor exists. It is rather complicated, so it is used only marginally. Most often, a MT 8870 or compatible circuit would be used.

Most decoders detect only the rising edges of the sine waves. So, DTMF generated by rectangular pulses and RC filters works reliably. The mentioned MT 8870 uses two 6th order band pass filters with switched capacitors. These produce nice clean sine waves even from distorted inputs, with any harmonics suppressed.

In DTMF there are 16 distinct tones. Each tone is the sum of two frequencies: one from a low and one from a high frequency group. There are four different frequencies in each group.

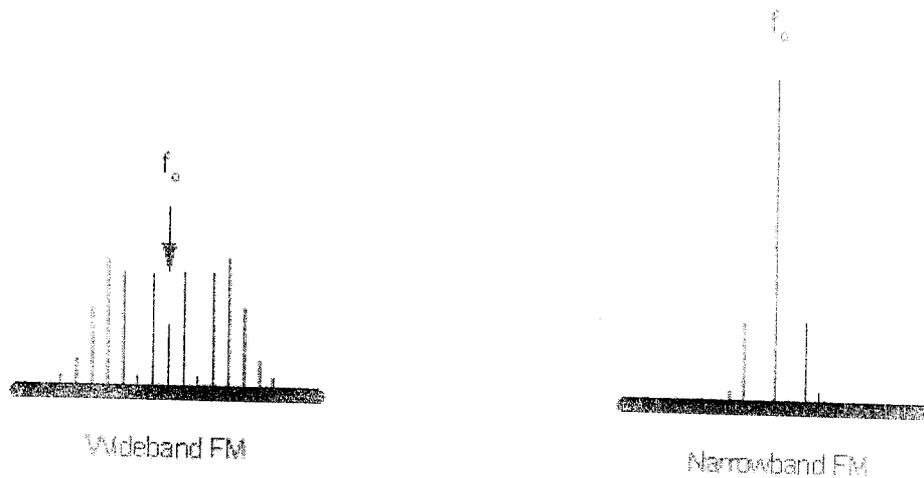


Fig 1.a Depiction of Wideband FM and Narrowband FM

FM is used in the following applications:

1. Non-commercial broadcasting from 88 – 90 MHz (WFM)
2. Commercial broadcasting from 90 – 108 MHz (WFM)
3. Television audio (WFM)
4. Public Service communications (police, fire departments, etc.) from 30 – 50 MHz, 136-174 MHz, 450-470 MHz, and 800 MHz (NBFM)
5. Amateur Radio Service Communications 29.5 – 29.7 MHz, 52 – 54 MHz, 144 – 148 MHz, 222 – 225 MHz, 440 – 450 MHz, 902 MHz, 1240 – 1300 MHz, and other frequencies above 2.3 GHz (NBFM)
6. Point-to-point microwave links used by telecommunications companies (this is very wideband FM – the deviation of the carrier can be 10 MHz or more)

1.1.3 DTMF

DTMF (Dual-tone Multi Frequency) is a tone composed of two sine waves of given frequencies. Individual frequencies are chosen so that it is quite easy to design frequency filters, and so that they can easily pass through telephone lines (where the maximum guaranteed bandwidth extends from about 300 Hz to 3.5 kHz). DTMF was not intended for data transfer; it is designed for control signals

1.1.2.3 FM APPLICATIONS

FM applications are divided into two broad categories:

- Wideband FM (WFM)
- Narrowband FM (NBFM)

The primary difference between the two types of FM is the number of sidebands in the modulated signal. Wideband FM has a large number (theoretically infinite) number of sidebands. Narrowband FM has only a single pair of significant sidebands.

It is possible to determine if a particular FM signal will be wide or narrow band by looking at a quantity called the Deviation Ratio (DR). It is defined as the ratio of the maximum deviation of the FM signal to the maximum modulating frequency:

$$DR = \frac{\delta}{f_{MAX}}$$

The DR is also the modulation index of the highest modulating frequency. If the $DR \geq 1.0$ the modulation is called wideband FM (WFM). If the $DR < 1.0$, the modulation is narrow band FM (NBFM).

One of the drawbacks of wideband FM is the large bandwidth required. Commercial FM broadcasting requires 150 KHz of bandwidth to transmit a 15 KHz audio signal, 5 times the bandwidth required for an AM signal.

The figure below compares the spectra of a WFM signal ($DR = 5$) and a NBFM signal ($DR = 0.5$). The separation between sidebands is equal to the modulating frequency. Thus the bandwidth for NBFM is $2 * f_m$, which is the same as for AM. However, for WFM, the bandwidth is approximately $2N * f_m$, where N = the number of sidebands.

DTMF Row/Column Frequencies	
LOW-FREQUENCIES	
ROW #	FREQUENCY (HZ)
R1: ROW 0	697
R2: ROW 1	770
R3: ROW 2	852
R4: ROW 3	941
HIGH-FREQUENCIES	
COL #	FREQUENCY (HZ)
C1: COL 0	1209
C2: COL 1	1336
C3: COL 2	1477
C4: COL 3	1633

Table 1.b List of Frequencies

The graph as in fig 1.b is a captured screen from an oscilloscope. It is a plot of the tone frequency for the "1" key:

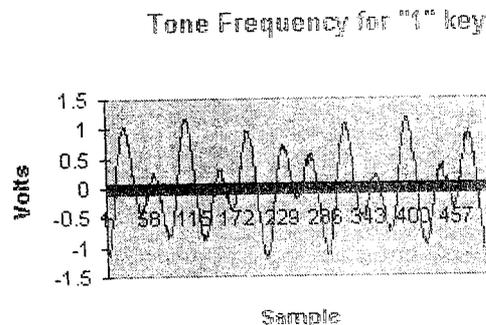


Fig 1.b Sample of a Tone Frequency

1.3 STEPPER MOTOR

Motion Control, in electronic terms, means to accurately control the movement of an object based on speed, distance, load, inertia or a combination of all these factors. There are numerous types of motion control systems, including: Stepper Motor, Linear Step Motor, DC Brush, Brushless, Servo, Brushless Servo and more. This document will concentrate on Step Motor technology.

In Theory, a Stepper motor is a marvel in simplicity. It has no brushes, or contacts. Basically it's a synchronous motor with the magnetic field electronically switched to rotate the armature magnet around.

A Stepping Motor System consists of three basic elements, often combined with some type of user interface (Host Computer, PLC or Dumb Terminal).

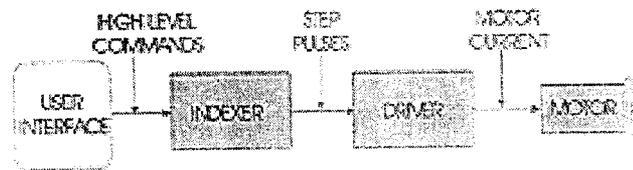


Fig 1.c Elements of a Stepper Motor

The Indexer (or Controller) is a microprocessor capable of generating step pulses and direction signals for the driver. In addition, the indexer is typically required to perform many other sophisticated command functions.

The Driver (or Amplifier) converts the indexer command signals into the power necessary to energize the motor windings. There are numerous types of drivers, with different current/amperage ratings and construction technology. Not all drivers are suitable to run all motors, so when designing a Motion Control System the driver selection process is critical.

The Step Motor is an electromagnetic device that converts digital pulses into mechanical shaft rotation. Advantages of step motors are low cost, high reliability,

high torque at low speeds and a simple, rugged construction that operates in almost any environment. The main disadvantages in using a step motor is the resonance effect often exhibited at low speeds and decreasing torque with increasing speed.

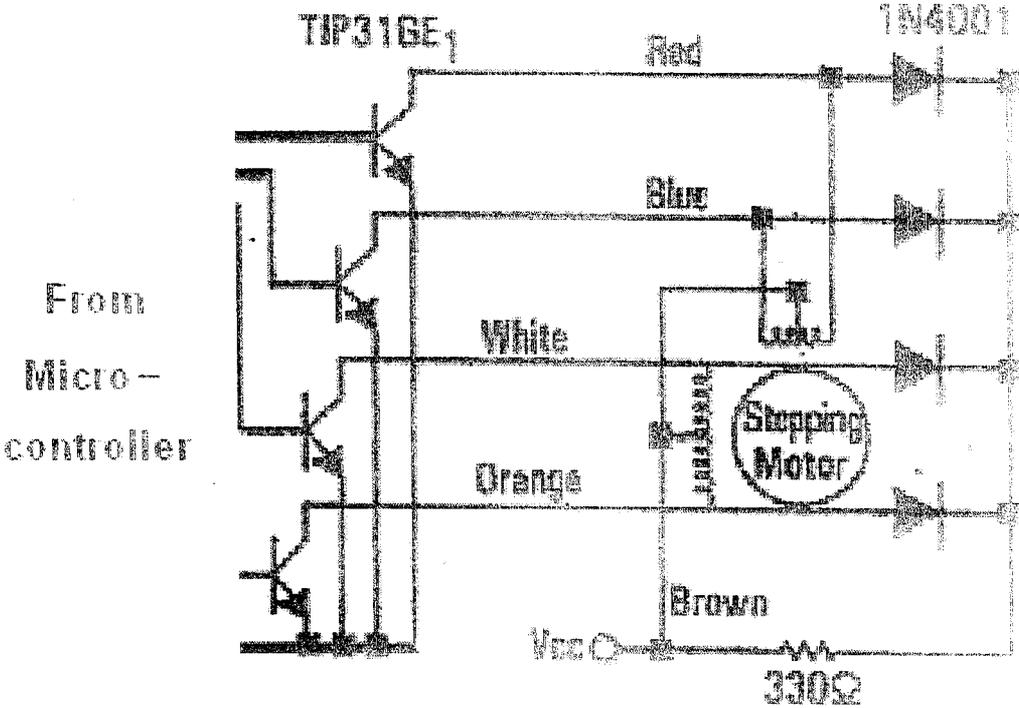


Fig 1.d Stepper motor circuit

1.3.1 TYPES OF STEPPER MOTORS

There are basically three types of stepper motors; variable reluctance, permanent magnet and hybrid. They differ in terms of construction based on the use of permanent magnets and/or iron rotors with laminated steel stators.

1.3.1.1 VARIABLE RELUCTANCE

The variable reluctance motor does not use a permanent magnet. As a result, the motor rotor can move without constraint or "detent" torque. This type of construction is good in non industrial applications that do not require a high degree of motor torque, such as the positioning of a micro slide .

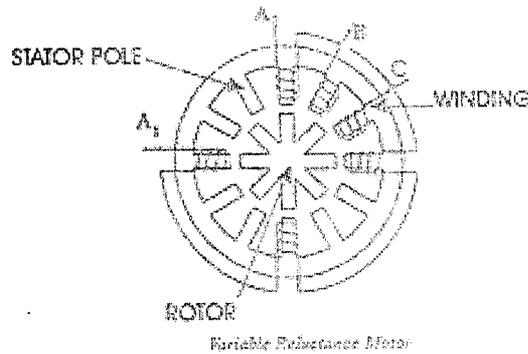


Fig 1.e Variable Reluctance Motor

The variable reluctance motor in the above illustration has four "stator pole sets" (A, B, C, D), set 15 degrees apart. Current applied to pole A through the motor winding causes a magnetic attraction that aligns the rotor (tooth) to pole A. Energizing stator pole B causes the rotor to rotate 15 degrees in alignment with pole B. This process will continue with pole C and back to A in a clockwise direction. Reversing the procedure (C to A) would result in a counterclockwise rotation.

1.3.1.2 PERMANENT MAGNET

The permanent magnet motor, also referred to as a "canstack" motor, has, as the name implies, a permanent magnet rotor. It is a relatively low speed, low torque device with large step angles of either 45 or 90 degrees. Its simple construction and low cost make it an ideal choice for non industrial applications, such as a line printer print wheel positioner.

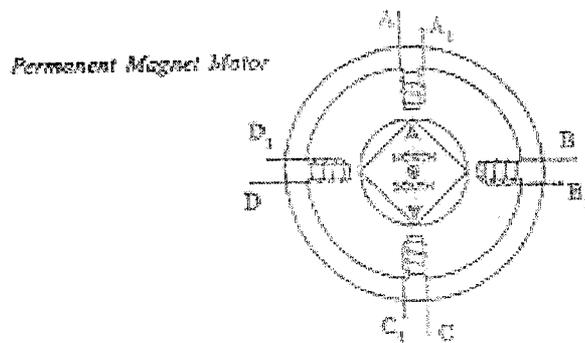


Fig 1.f Permanent Magnet Motor

Unlike the other stepping motors, the PM motor rotor has no teeth and is designed to be magnetized at a right angle to its axis. The above illustration shows a simple, 90 degree PM motor with four phases (A-D). Applying current to each phase in sequence will cause the rotor to rotate by adjusting to the changing magnetic fields. Although it operates at fairly low speed the PM motor has a relatively high torque characteristic.

2. TRANSMITTER SECTION

At the system side the following are the PCBs, as depicted in figure 1, with VLSI chips affixed on them to perform specific functions, enabling the user to control the vehicle from a pc, whose signals are processed and then transmitted to the vehicle as control signals.

- Power supply
- Interface Circuit
- Encoder
- Transmitter
- Receiver

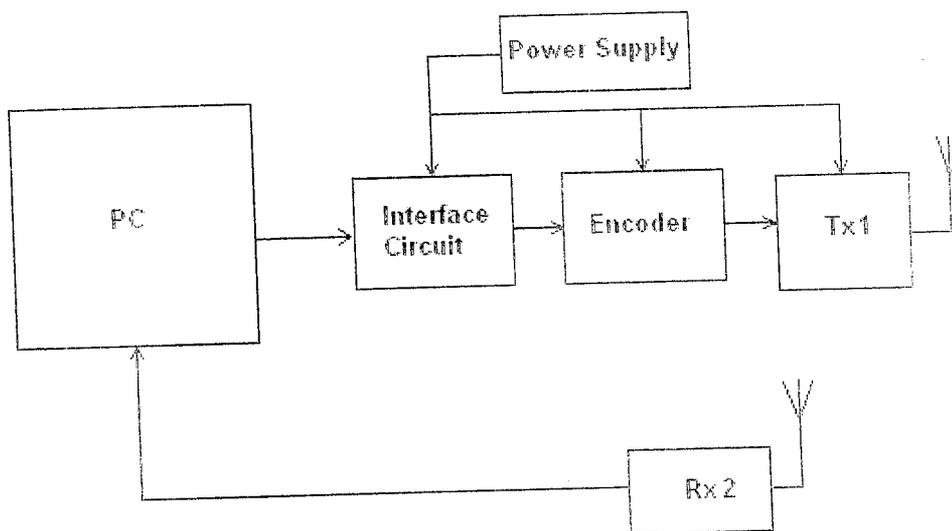


Fig 2.a Block Diagram of Transmitter Section

The commands from the user are converted into respective 8 bit data. In our case only one bit is high (1) and the rest low (0) to denote a particular user command. Hence, 00000001, 00000010, 00000100, 00001000, 00010000, 00100000, 01000000, 10000000 are the possibilities to denote a command. This data is fed to the parallel port output pins of the computer, from which is extracted to the interfacing circuit. Here the signals are of very low voltage, since the electronic

components detect signals around 5V, these low voltage signals are boosted up using transistors. The boosted signals are then fed to IC ULN2003 which in turn drives relays connected to them. A matrix arrangement is made using relays that resemble DTMF matrix. Based on the pin that receives high voltage from the computer a particular relay is switched ON at a time, which drives a row and a column of the matrix short, which in turn when connected to UM91215 encoder produces a tone unique to every bit driven high. This tone is fed to a FM transmitter where it is modulated using a carrier of 105MHz and is transmitted through an antenna.

Simultaneously a video receiver captures video signal transmitted by a camera from the robot and in turn sends them to a video capture card placed in the computer. Windows ® operating system has built-in dll files for reading this signal and reproducing the video as captured by the camera. The application program uses this dll files to play the captured video on screen.

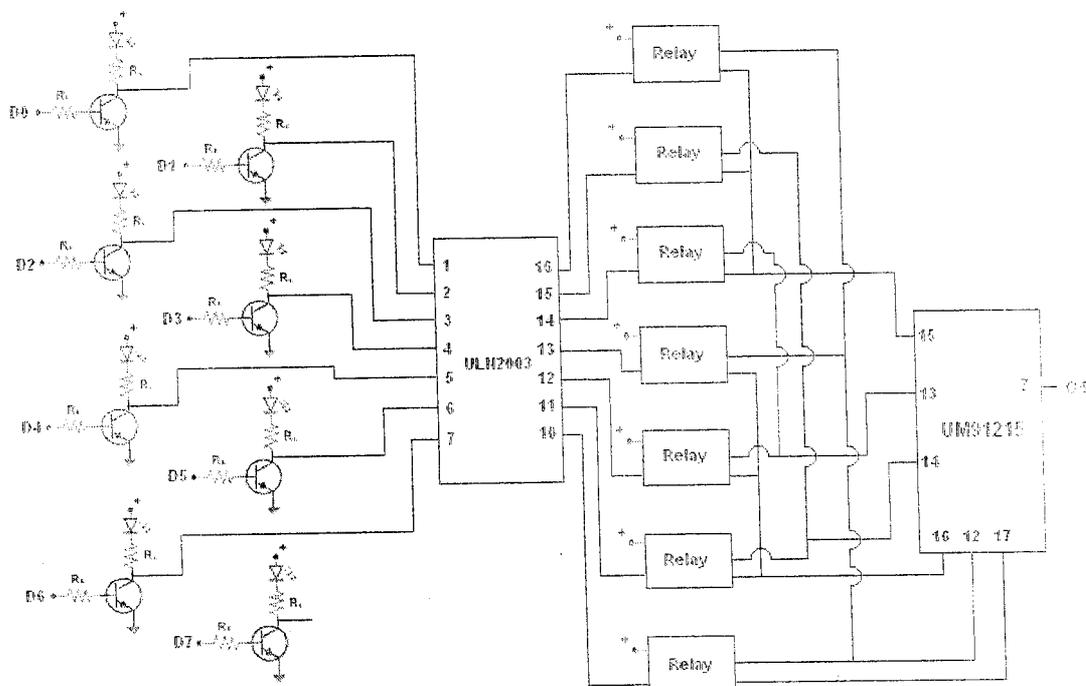


Fig 2.b Circuit diagram of transmitter section

2.1 POWER SUPPLY

Since all electronic circuits work only with low D.C. voltage we need a power supply unit to provide the appropriate voltage supply. This unit consists of transformer, rectifier, filter and regulator. A.C. voltage typically 230V rms is connected to a transformer which steps that AC voltage down to the level to the desired AC voltage. A diode rectifier then provides a full-wave rectified voltage that is initially filtered by a simple capacitor filter to produce a DC voltage. This resulting DC voltage usually has some ripple or AC voltage variations. A regulator circuit can use this DC input to provide DC voltage that not only has much less ripple voltage but also remains the same DC value even the DC voltage varies some what, or the load connected to the output DC voltages changes.

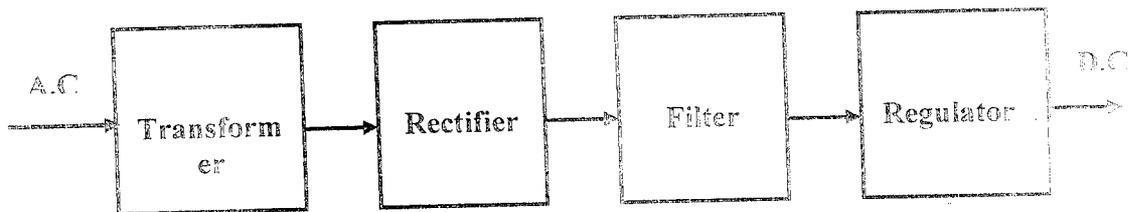


Fig 2.c Block Diagram of Power Supply

The main things used in the power supply unit are Transformer, Rectifier, Filter, and Regulator. The block diagram of the power supply unit is shown in the above block diagram. The 230V ac supply is converted into 12V ac supply through the transformer. The output of the transformer has the same frequency as in the input ac power. This ac power is converted into dc power through the diodes. Here the bridge diode is used to convert the ac supply to the dc power supply. This converted dc power supply has the ripple content and for the normal circuit operation the ripple content of the dc power supply should be as low as possible. Because the ripple content of the power supply will reduce the life of circuit.

So to reduce the ripple content of the dc power supply, the filter is used. The filter is nothing but the large value capacitance. The output waveform of the filter capacitance will almost be the straight line.

This filtered output will not be the regulated voltage. For the normal operation of the circuit it should have the regulated output. Specifically for the microcontroller IC regulated constant 5V output voltage should be given. For this purpose 78xx regulator should be used in the circuit. In that number of IC, the 8 represents the positive voltage and if it is 9, it will represent the negative voltage. The xx represents the voltage. If it is 7805, it represent 5V regulator, and if it is 7812, it represent 12V regulator. Thus the regulated constant output can be obtained. The brief description of the above blocks is follows.

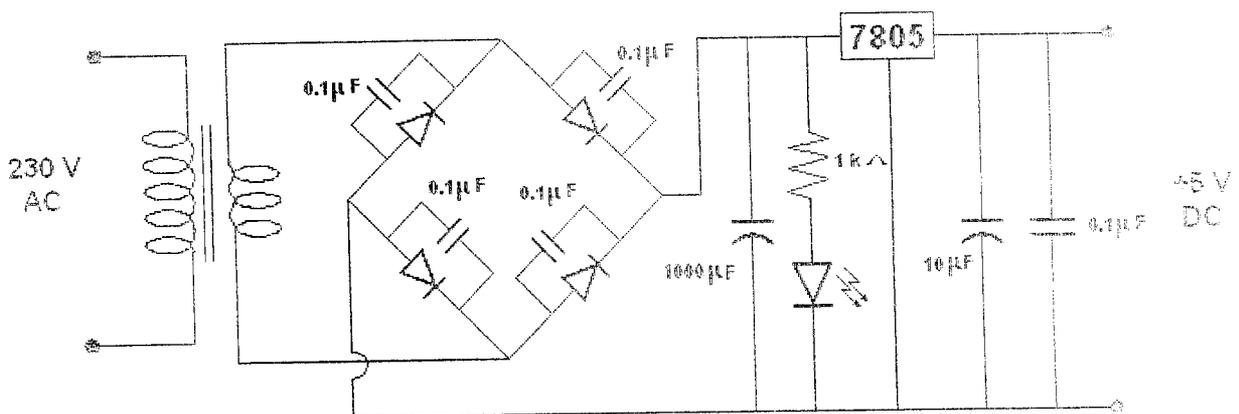


Fig 2.d Circuit Diagram of Power Supply

2.1.1 TRANSFORMER

A transformer is a static (or stationary) piece of which electric power in one circuit is transformed into electric power of the same frequency in another circuit. It can raise or lower the voltage in a circuit but with a corresponding decrease or increase in current. It works with the principle of mutual induction. In our project we are using step down transformer for providing a necessary supply for the electronic circuits. In our project we are using a 230/12 v transformer.

2.2 INTERFACE CIRCUIT

The model we have suggested being designed for wireless mode of operation, the function of the interfacing circuit comes to the fore. This board stands as the mediator between the system and the transmitter circuit in the transmitter end i.e., the instructions that are got from the user to control the vehicle are in the form that could be read by the computer which are not compatible with the microcontroller, so these instructions need to be converted to a suitable form that could be properly interpreted at the receiver end that is by the microcontroller and should carry out the function specified in the right way.

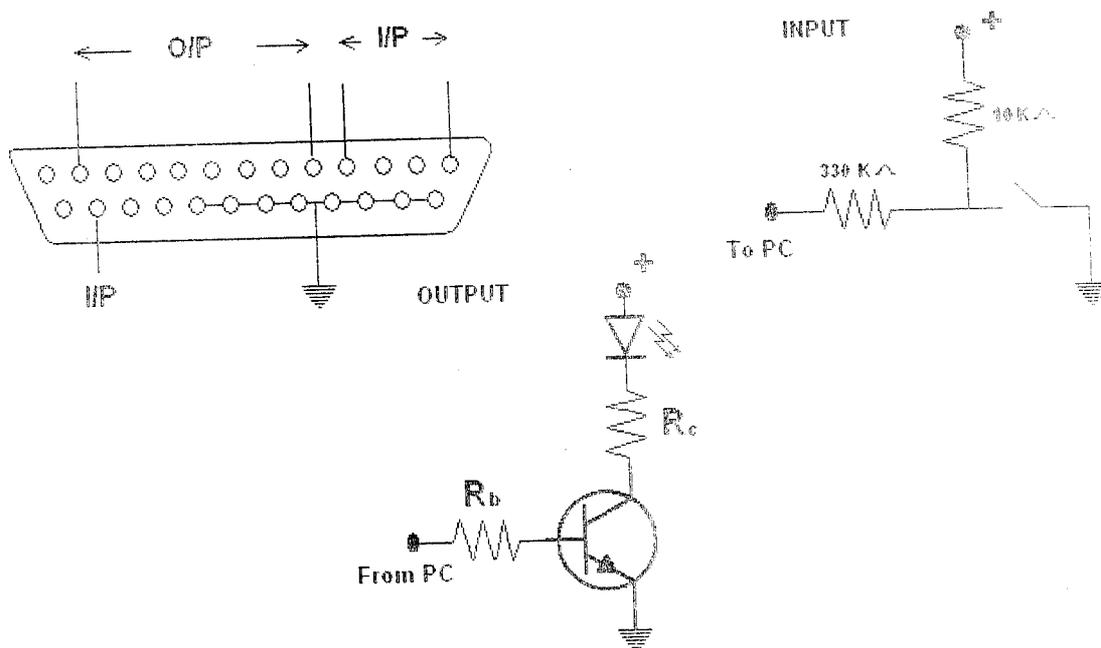


Fig 2.e Parallel Port Interface

Of the 25 pins in the parallel port, the pins from 2 to 9 are used for output and the pins from 10 to 13 and 15 are used for input. The signals to and from these pins are felt even if a light load passes by. For this purpose we use npn junction diodes, in which when a signal is passed, a small current passes by, which is called as the base current. As this current flows the collector current flows through the emitter, as a result the control signal from the user is fed to the encoder relay as electronic signals. The input pins are to receive the signals from the vehicle. In the same way,

the output pins are to transmit the signals that emanate from the computer, which are the control signals to the vehicle that are caused by the user. The parallel port is connected to switches on the transmitter side for testing purpose.

2.3 ENCODER

The UM91215 is a single chip, silicon gate, CMOS integrated circuit with an on-chip oscillator for a 3.68MHz crystal or ceramic resonator. It provides dialing pulse (DP) or dual tone multi-frequency (DTMF) dialing. A standard 4*4 matrix keyboard can be used to support either DP or DTMF modes. Up to 32 digits can be saved in the on-chip RAM for redialing. In the DTMF mode, minimum tone duration and minimum inter tone pause provide for rapid dialing. Maximum tone duration is dependent upon the key depression time in manual dialing.

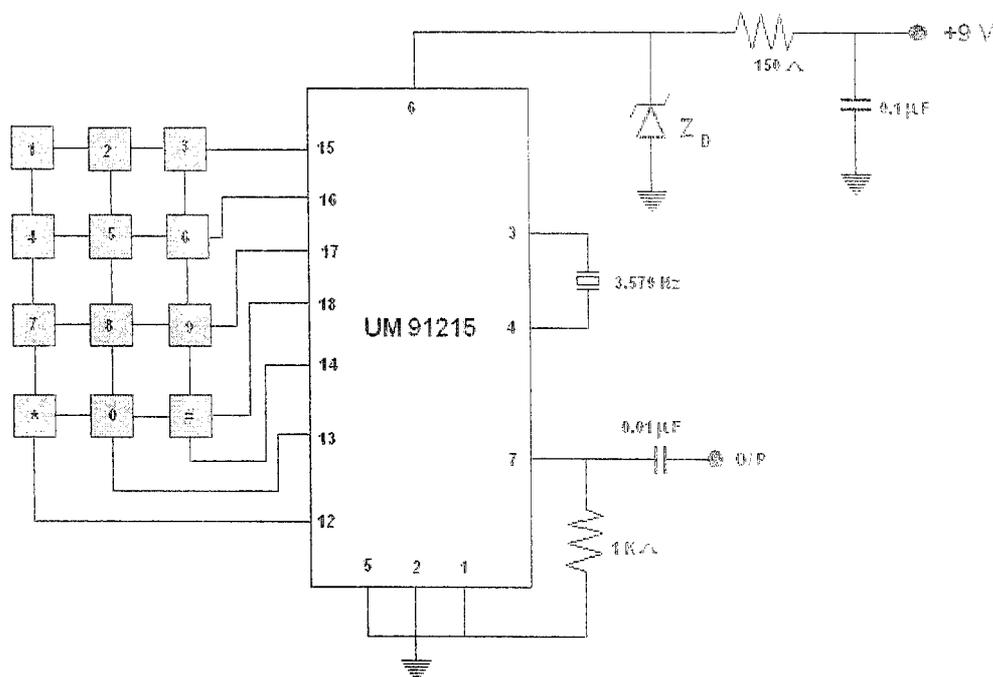


Fig 2.f Encoder Schematic

2.4 ENCODER RELAY

The ULN2003, high voltage, high current Darlington array each containing seven open collector Darlington pairs with common emitters. Each channel rated at 500mA and can withstand peak currents of 600mA. Suppression diodes are included for inductive load driving and the inputs are pinned opposite the outputs to simplify board layout.

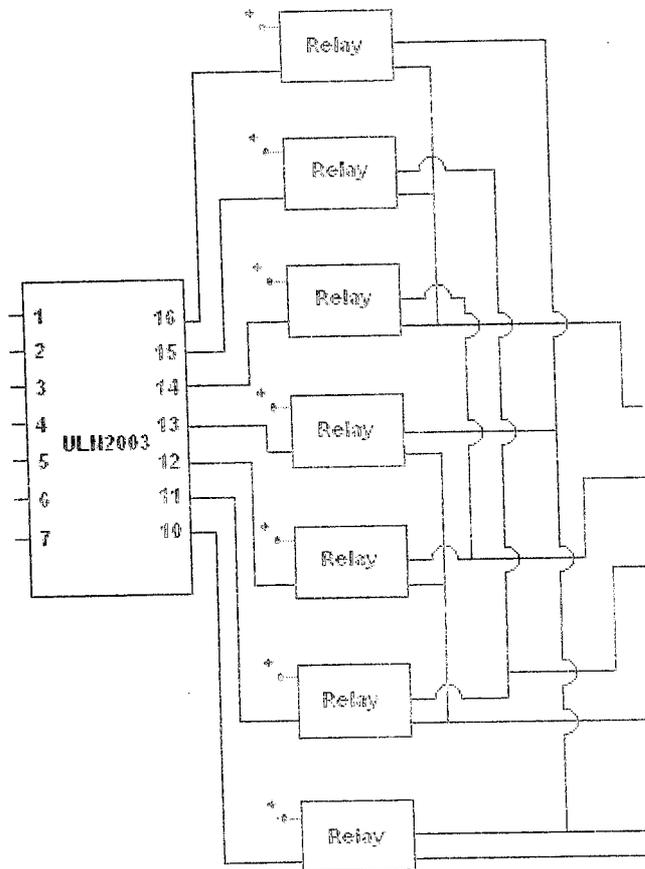


Fig 2.g Encoder Relay Schematic

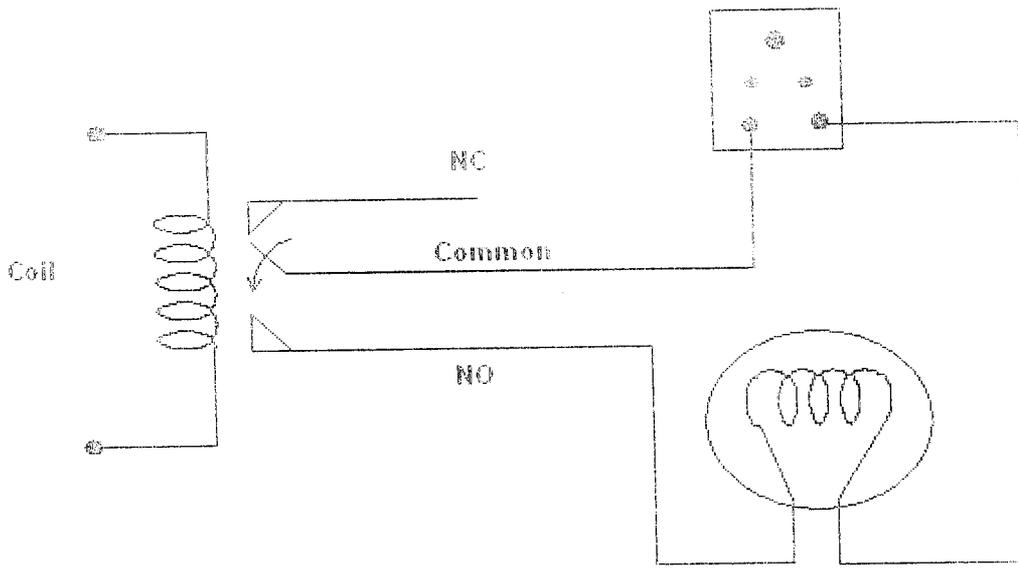


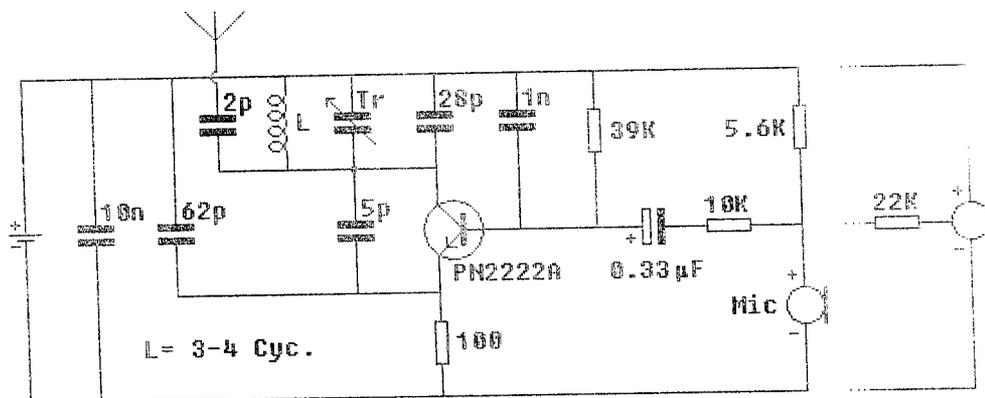
Fig 2.h Simple Illustration of Relay

The ULN2003, used have 16 pin plastic DIP packages with a copper lead frame to reduce thermal resistance.

As illustrated in fig 2.h the Normally Close (NC) line is closed with the common line when the relay is OFF. But when current flows through the coil due to electromagnetic effect the common line deflects and closes with the Normally Open (NO) line, thus completing any circuit connected to it. Thus, relay is used to switch high voltage circuits connected between NO and common. ON and OFF, using a low voltage passed through the coil. Hence, a relay is used as an electrical switch.

2.5 TRANSMITTER

An ordinary transmitter that alters the frequency of the carrier signal in accordance to the frequency of the modulating signal is used, as the frequency modulated signals are stronger than amplitude modulated signals and also these signals are less subjected to interferences caused by other obstacles in the atmosphere.



Simple FM Transmitter, 30/50 meters range, operates with 1.5V

Fig 2.i FM Transmitter

The distance between the transmitter and the receiver could be elapsed to a maximum distance of 30 to 50 meters in the absence of any obstruction for better quality in reception. Also, the transmitter cum receiver is available as a pair, which avoids the need for perfection in winding up of the coils, thereby increasing the perception of reception. Thus, the control signals to the vehicle, in the form of a tone generated at a particular frequency, with respect to the signal being generated is transmitted from the system side. This form of signal is got from the encoder where a crystal is used to generate the tone at the particular frequency, in accordance to the signal being transmitted.

3. RECEIVER SECTION

The FM signals received by the receiver are demodulated to recover the DTMF tones. This tone is fed as input to CM8870 which is the decoder IC used here. The output of the decoder is a 4 bit BCD data that represent the respective bit that was high in the transmitting end. This 4 bits along with an additional bit representing reception of a DTMF signal is given as input to 89C51 micro controller's port C. The pins from port 1 and port 3 are connected to ULN2803 and ULN2003 ICs respectively. Naturally we use the ports 1 and 3 as output ports and port 0 as input port. The microcontroller is programmed suitably to identify the command received as input and send output signals to assist the motion of the stepper motors connected to ULN2803 and ULN2003. Out of the two motors connected to ULN2803 one is used for forward and reverse motion of the vehicle, the other for the rotary motion of the vehicle. The motor connected to ULN2003 is used to bring about the rotary motion of the camera.

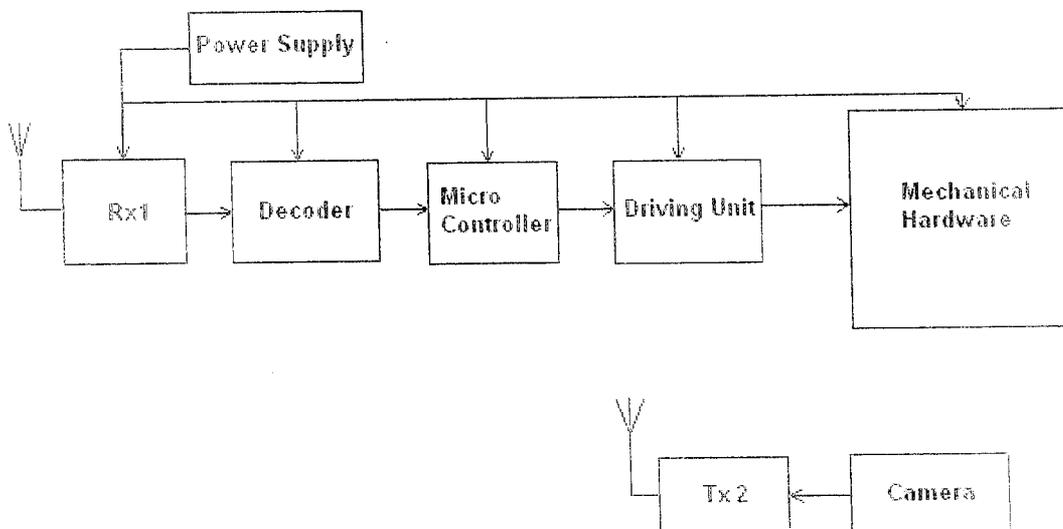


Fig 3.a Block Diagram of Receiver Section

Simultaneously the camera connected to the vehicle captures live video, modulates the same in the order of GHz and transmits them through an antenna connected to the camera.

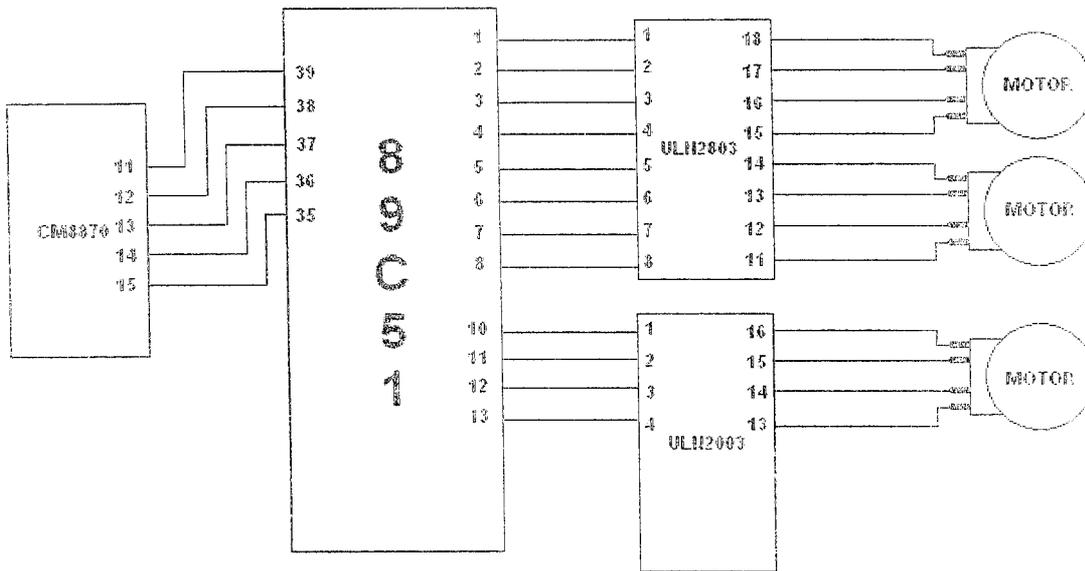


Fig 3.b Circuit diagram of receiver section



P-1633

3.1 FM RECEIVER:

FM Receiver consists of CXA1619AS, a one-chip FM radio IC. It receives the transmitted signals from the transmitter and demodulates to give the DTMF tones.

3.1.1 DESCRIPTION

CXA1619AM/AS is a one-chip FM/AM radio IC designed for radio-cassette tape recorders and headphone tape recorders, and has the following functions.

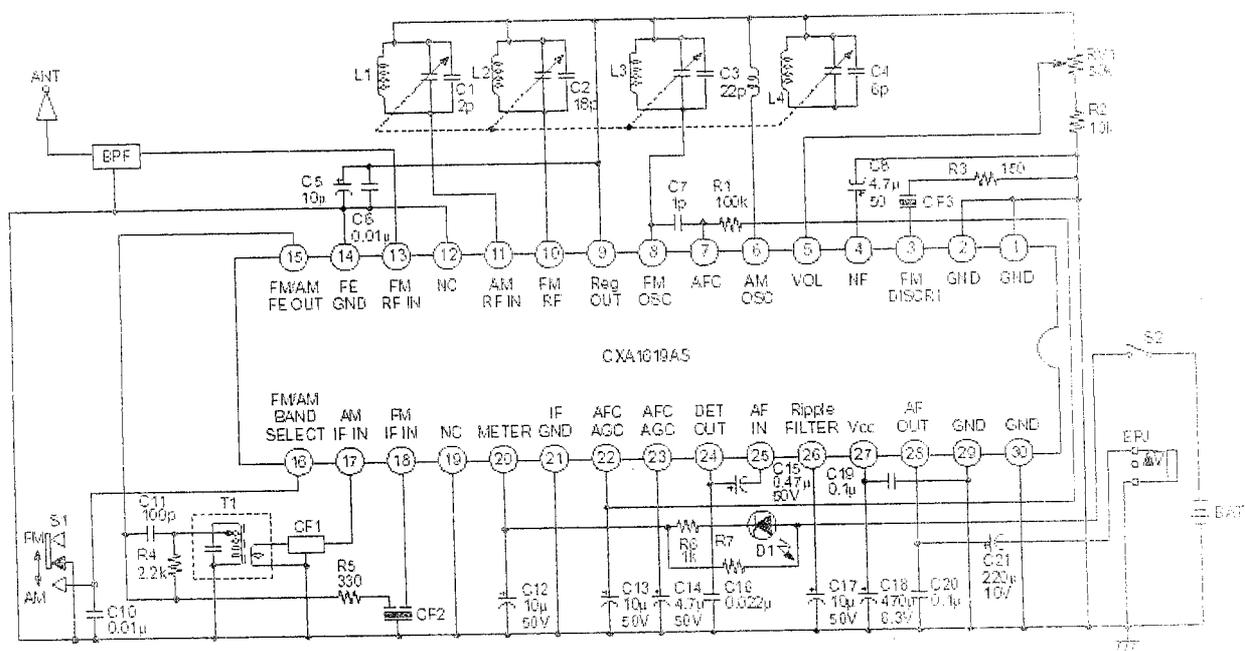


Fig 3.c FM Receiver

3.1.2 FEATURES

- Small number of peripheral components.
- Low current consumption ($V_{CC}=3\text{ V}$)
 - For FM : $I_D=5.8\text{ mA}$ (Typ.)
 - For AM : $I_D=4.7\text{ mA}$ (Typ.)
- Built-in FM/AM select switch.
- Large output of AF amplifier.

3.1.3 FUNCTIONS

FM section

- RF amplifier, Mixer and OSC (incorporating AFC variable capacitor).
- IF amplifier
- Quadrature detection
- Tuning LED driver AM section
- RF amplifier, Mixer and OSC (with RF AGC)
- IF amplifier (with IF AGC)
- Detector
- Tuning LED driver AF section
- Electronic volume control

3.2 DECODER

The function of the decoder is to obtain the transmitted signals from the receiver, which is received in the form of tones, each tone being differentiated by its frequency, and the decoder does the conversion of these tones to signals in a form that could be processed by the microcontroller. Thereby, the decoder enables the microcontroller to identify the transmitted information and react upon in accordance to the control signals being transmitted and received.

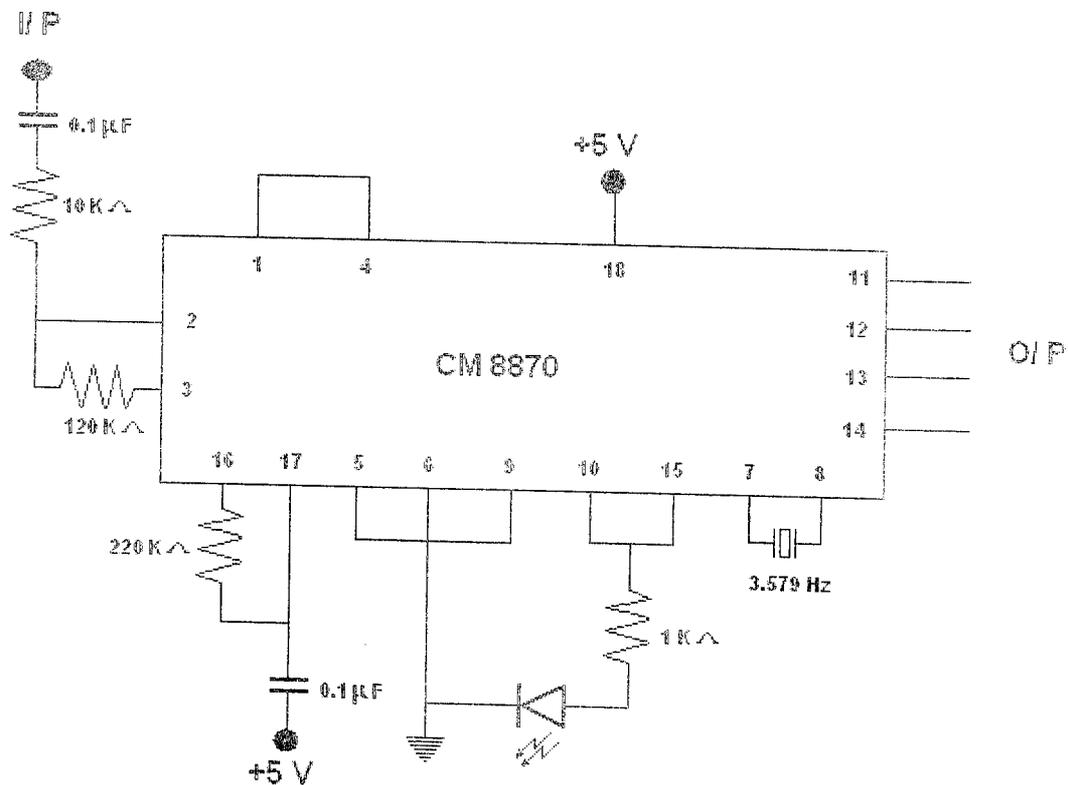


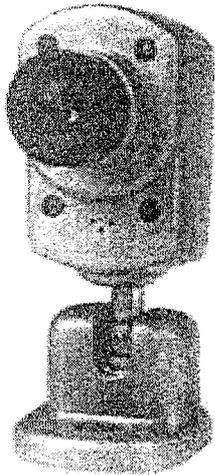
Fig 3.d Decoder Schematic

The chip used for this purpose is an 18 pin IC CM8870, which uses either a quartz crystal or ceramic resonators to decode the signal received. The internal structure of the IC consists of a band split filter that separates the high and low tones of the received pair, which is followed by a digital decode(counting) which verifies both the frequency and the duration of the received tones before passing the resultant 4-bit code. The decoder thus by using digital counting techniques for detection and decoding, converts all 16 DTMF tone pairs into 4bit code.

The CM8870 provides full DTMF receiver capability by integrating both the band split filter and digital decoder functions into a single 18-pin DIP. The CM8870 is manufactured using state-of-the-art CMOS process technology for low power consumption and precise data handling. The filter section uses a switched capacitor technique for both high and low group filters and dial tone rejection.

3.5 CAMERA

WS-809AS (CMOS Camera)



WS-809AS Color / wireless cam

WS-809B B/W Camera

380 TV Lines

Metal Case

Fig 3.g WS – 809 AS CMOS Camera

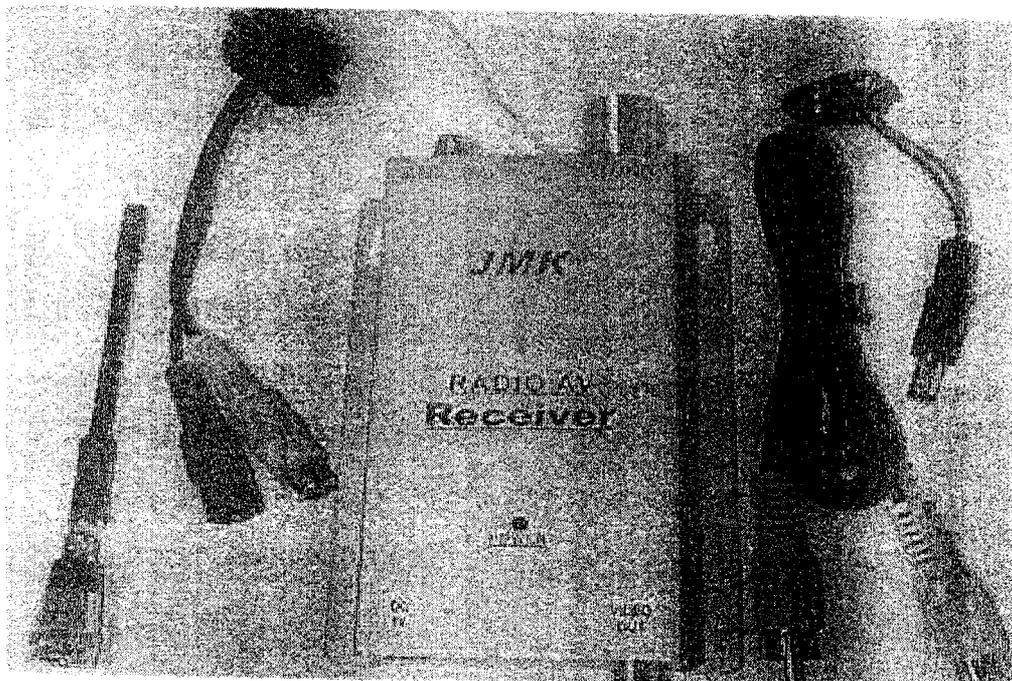


Fig 3.h Video signals – Receiver

3.5.1 DESCRIPTION

High quality Sound, Super high resolution and sensitivity ,Integrated lens can be adjusted ,Low consumption and excellent stabilization ,Compact and easy to install Fit for the security system of stores, banks, hotels, school. hospitals, factories and apartments.

	Color	B/W
Picture Element	PAL: 628X582 NTSC:510X492	EIA(NTSC):320X240 CCIR(PAL):352X268
Electronic Shutter	1/60-1/15000's	1/50 - 1/6000
S/N Ratio	48dB	46dB
Horizontal Resolution	382 TV LINES	380 TV LINES
Video Output	1Vp-p 75ohm	1Vp-p 75ohm
Min Illumination	2LUX	0.2LUX
Backlight Opensation	AUTO	AUTO
Operating Temp	-10;æ--+50;æ	-10;æ--+50;æ
Power Supply	DC6--12V	DC6--12V
Power Consumption	50mA	55mA (with infrared ray)
IC	OV7910	OV5116

Table 3.a Specification of WS – 809 AS CMOS Camera

3.5.2 FEATURES

1. High quality Sound
2. Super high resolution and sensitivity
3. Integrated lens can be adjusted
4. Low consumption and excellent stabilization
5. Compact and easy to install
6. Fit for the security system of stores, banks, hotels, school, hospitals, factories and apartments.

4. CONCLUSION

With the incursion of wireless systems, applications and services in our day to day life, the model of a robot we have designed aids in the research field. Also, with further enhancements more and more applications could be embedded in our model by changing few of its present components, so that it would provide support for the new applications. When such enhancements are done, our project could be used as a model to build a robot in real life. Exploration of space involves designing of robots to scan the information about the destination; this project would well serve this purpose. Also, our project could be used in 'home security' system, where the vehicle could be controlled by a system connected to the vehicle through an intermediate system, connected in a network. In the same way our project with little modification could be use as a model to build a robot, which could be used to scrutinize real time industrial applications.

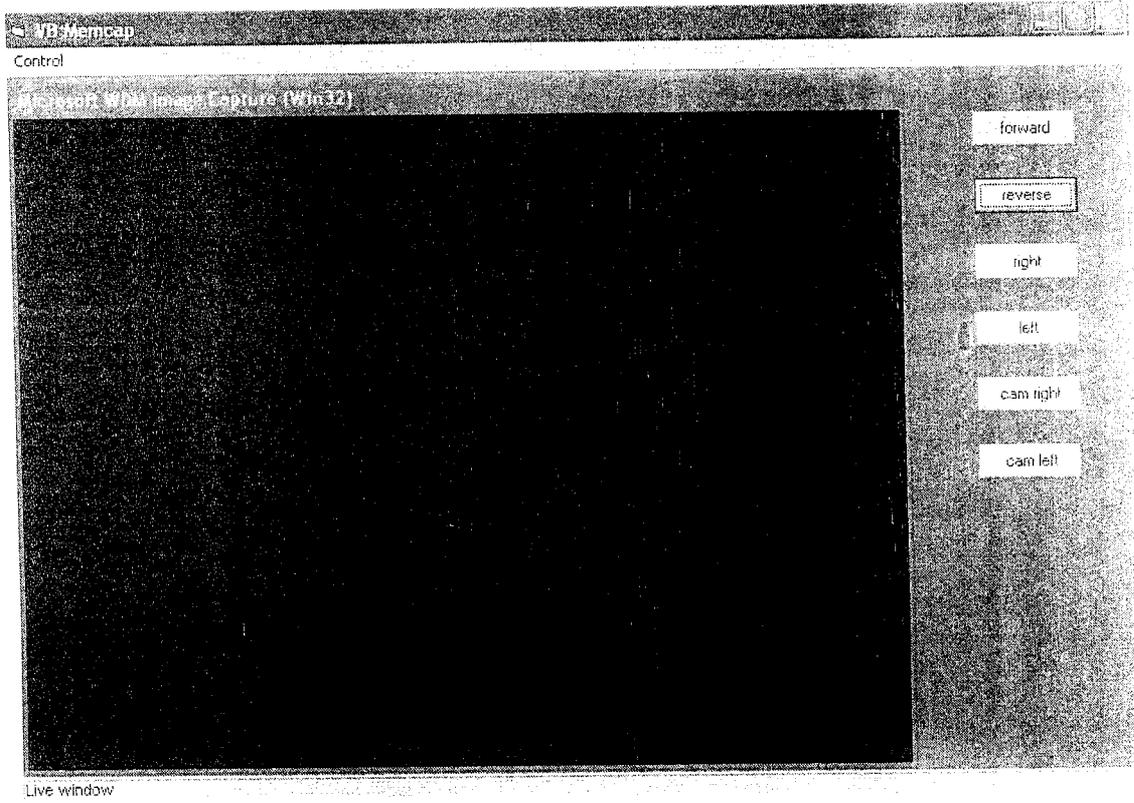
Thus our project increases mobility of service in addition to the idea of the model we have suggested.

```
Option Explicit
Private PortAddress As Integer
Private register As Byte
Private Sub Allout_Click()
PortAddress = &H378
Out PortAddress, 0
End Sub
```

'Project Done By K.G.Vikram & G.Mathiyavan

```
Private Sub Button_KeyDown(Index As Integer, KeyCode As Integer, Shift As Integer)
If KeyCode = 104 Then 'straight
PortAddress = &H378
Out PortAddress, 1
ElseIf KeyCode = 98 Then 'back
PortAddress = &H378
Out PortAddress, 2
ElseIf KeyCode = 100 Then 'right
PortAddress = &H378
Out PortAddress, 8
ElseIf KeyCode = 102 Then 'left
PortAddress = &H378
Out PortAddress, 4
ElseIf KeyCode = 97 Then '1
PortAddress = &H378
Out PortAddress, 10
ElseIf KeyCode = 103 Then '7
PortAddress = &H378
Out PortAddress, 9
ElseIf KeyCode = 105 Then '9
PortAddress = &H378
Out PortAddress, 5
ElseIf KeyCode = 99 Then '3
PortAddress = &H378
Out PortAddress, 6
End If
End Sub
Private Sub Button_KeyUp(Index As Integer, KeyCode As Integer, Shift As Integer)
Call Allout_Click
End Sub
Private Sub Form_Load()
Call Allout_Click
End Sub
```

5.2 APPENDIX 2 - SNAP SHOTS



5.3 APPENDIX 3 – DATA SHEETS

AT89C51

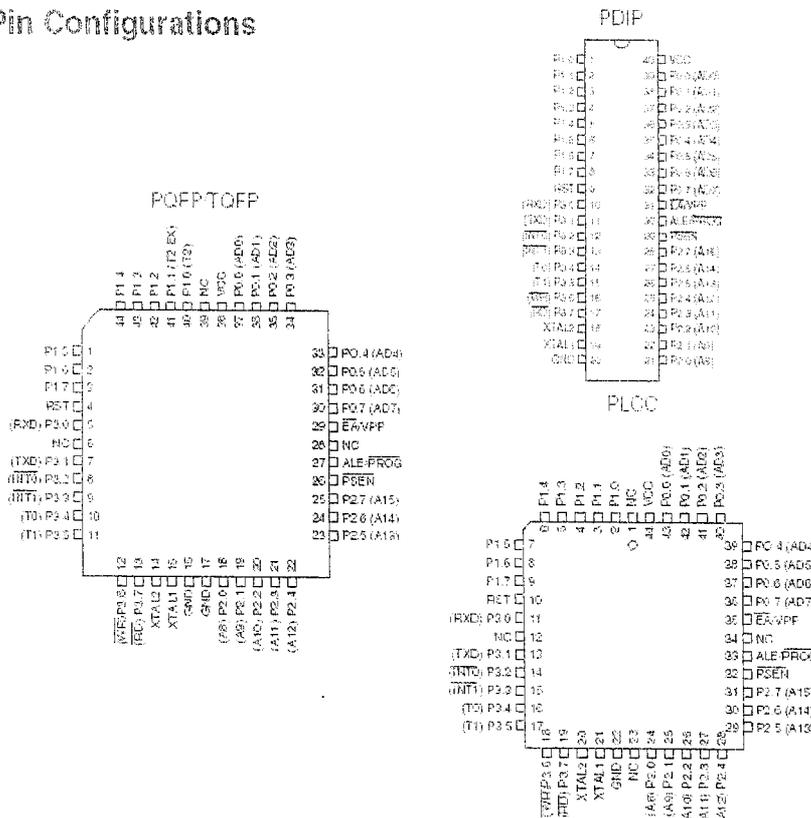
Features

- Compatible with MCS-51™ Products
- 4K Bytes of In-System Reprogrammable Flash Memory
 - Endurance: 1,000 Write/Erase Cycles
- 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 Configurations

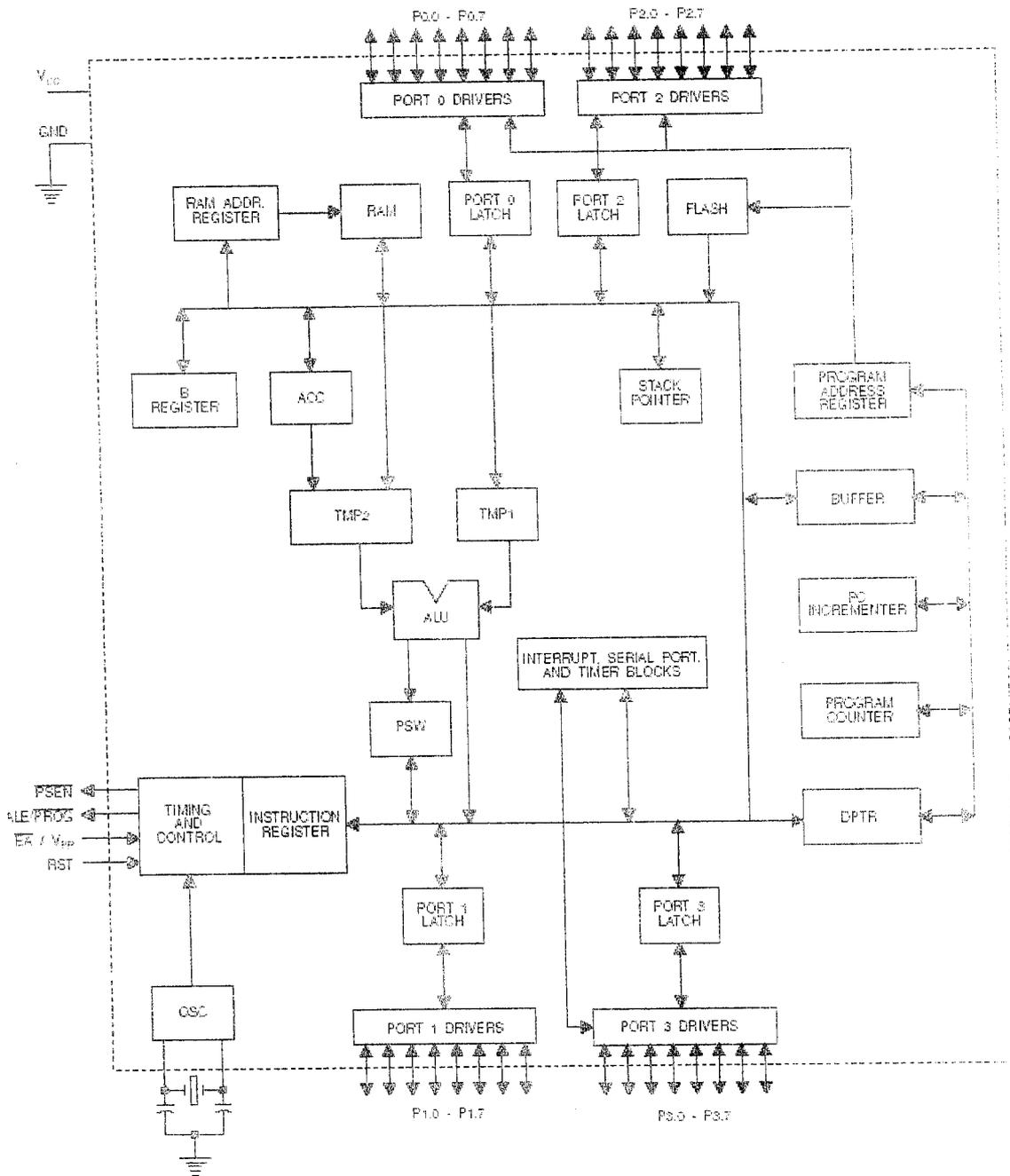


8-bit
Microcontroller
with 4K Bytes
Flash

AT89C51



Block Diagram



The AT89C51 provides the following standard features: 4K bytes of Flash, 128 bytes of RAM, 32 I/O lines, two 16-bit timer/counters, a five vector two-level interrupt architecture, a full duplex serial port, on-chip oscillator and clock circuitry. In addition, the AT89C51 is designed with static logic for operation down to zero frequency and supports two software selectable power saving modes. The Idle Mode stops the CPU while allowing the RAM, timer/counters, serial port and interrupt system to continue functioning. The Power-down Mode saves the RAM contents but freezes the oscillator disabling all other chip functions until the next hardware reset.

Pin Description

VCC

Supply voltage.

GND

Ground.

Port 0

Port 0 is an 8-bit open-drain bi-directional I/O port. As an output port, each pin can sink eight TTL inputs. When 1s are written to port 0 pins, the pins can be used as high-impedance inputs.

Port 0 may also be configured to be the multiplexed low-order address/data bus during accesses to external program and data memory. In this mode P0 has internal pullups.

Port 0 also receives the code bytes during Flash programming, and outputs the code bytes during program verification. External pullups are required during program verification.

Port 1

Port 1 is an 8-bit bi-directional I/O port with internal pullups. The Port 1 output buffers can sink/source four TTL inputs. When 1s are written to Port 1 pins they are pulled high by the internal pullups and can be used as inputs. As inputs, Port 1 pins that are externally being pulled low will source current (I_{IL}) because of the internal pullups.

Port 1 also receives the low-order address bytes during Flash programming and verification.

Port 2

Port 2 is an 8-bit bi-directional I/O port with internal pullups. The Port 2 output buffers can sink/source four TTL inputs. When 1s are written to Port 2 pins they are pulled high by the internal pullups and can be used as inputs. As inputs,

Port 2 pins that are externally being pulled low will source current (I_{IL}) because of the internal pullups.

Port 2 emits the high-order address byte during fetches from external program memory and during accesses to external data memory that use 16-bit addresses (MOVX @ DPTR). In this application, it uses strong internal pullup when emitting 1s. During accesses to external data memory that use 8-bit addresses (MOVX @ R1), Port 2 emits the contents of the P2 Special Function Register.

Port 2 also receives the high-order address bits and some control signals during Flash programming and verification.

Port 3

Port 3 is an 8-bit bi-directional I/O port with internal pullups. The Port 3 output buffers can sink/source four TTL inputs. When 1s are written to Port 3 pins they are pulled high by the internal pullups and can be used as inputs. As inputs, Port 3 pins that are externally being pulled low will source current (I_{IL}) because of the pullups.

Port 3 also serves the functions of various special features of the AT89C51 as listed below:

Port Pin	Alternate Functions
P3.0	RXD (serial input port)
P3.1	TXD (serial output port)
P3.2	$\overline{INT0}$ (external interrupt 0)
P3.3	$\overline{INT1}$ (external interrupt 1)
P3.4	TO (timer 0 external input)
P3.5	T1 (timer 1 external input)
P3.6	\overline{WR} (external data memory write strobe)
P3.7	\overline{RD} (external data memory read strobe)

Port 3 also receives some control signals for Flash programming and verification.

RST

Reset input. A high on this pin for two machine cycles while the oscillator is running resets the device.

ALE/ \overline{PROG}

Address Latch Enable output pulse for latching the low bytes of the address during accesses to external memory. This pin is also the program pulse input (\overline{PROG}) during Flash programming.

In normal operation ALE is emitted at a constant rate of 1/6 the oscillator frequency, and may be used for external timing or clocking purposes. Note, however, that one ALE



pulse is skipped during each access to external Data Memory.

If desired, ALE operation can be disabled by setting bit 0 of SFR location 8EH. With the bit set, ALE is active only during a MOVX or MOVC instruction. Otherwise, the pin is weakly pulled high. 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.

XTAL2

Output from the inverting oscillator amplifier.

Oscillator Characteristics

XTAL1 and XTAL2 are the input and output, respectively, of an inverting amplifier which can be configured for use as an on-chip oscillator, as shown in Figure 1. Either a quartz crystal or ceramic resonator may be used. To drive the device from an external clock source, XTAL2 should be left

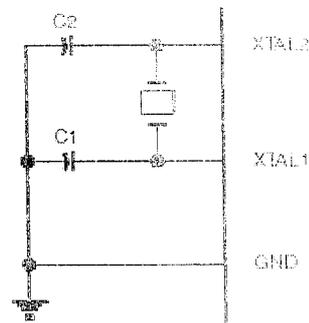
unconnected while XTAL1 is driven as shown in Figure 2. There are no requirements on the duty cycle of the external clock signal, since the input to the internal clocking circuitry is through a divide-by-two flip-flop, but minimum and maximum voltage high and low time specifications must be observed.

Idle Mode

In idle mode, the CPU puts itself to sleep while all the on-chip peripherals remain active. The mode is invoked by software. The content of the on-chip RAM and all the special functions registers remain unchanged during this mode. The idle mode can be terminated by any enabled interrupt or by a hardware reset.

It should be noted that when idle is terminated by a hardware reset, the device normally resumes program execution, from where it left off, up to two machine cycles before the internal reset algorithm takes control. On-chip hardware inhibits access to internal RAM in this event, but access to the port pins is not inhibited. To eliminate the possibility of an unexpected write to a port pin when Idle is terminated by reset, the instruction following the one that invoked Idle should not be one that writes to a port pin or to external memory.

Figure 1. Oscillator Connections

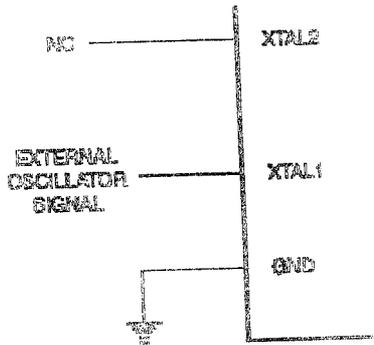


Note: C1, C2 = 30 pF ± 10 pF for Crystals
= 40 pF ± 10 pF for Ceramic Resonators

Status of External Pins During Idle and Power-down Modes

Mode	Program Memory	ALE	PSEN	PORT0	PORT1	PORT2	PORT3
Idle	Internal	1	1	Data	Data	Data	Data
Idle	External	1	1	Float	Data	Address	Data
Power-down	Internal	0	0	Data	Data	Data	Data
Power-down	External	0	0	Float	Data	Data	Data

Figure 2. External Clock Drive Configuration



Power-down Mode

In the power-down mode, the oscillator is stopped, and the instruction that invokes power-down is the last instruction executed. The on-chip RAM and Special Function Regis-

ters retain their values until the power-down mode is terminated. The only exit from power-down is a hardware reset. Reset redefines the SFRs but does not change the on-chip RAM. The reset should not be activated before V_{CC} is restored to its normal operating level and must be held active long enough to allow the oscillator to restart and stabilize.

Program Memory Lock Bits

On the chip are three lock bits which can be left unprogrammed (U) or can be programmed (P) to obtain the additional features listed in the table below.

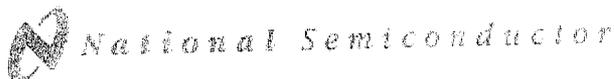
When lock bit 1 is programmed, the logic level at the EA pin is sampled and latched during reset. If the device is powered up without a reset, the latch initializes to a random value, and holds that value until reset is activated. It is necessary that the latched value of EA be in agreement with the current logic level at that pin in order for the device to function properly.

Lock Bit Protection Modes

	Program Lock Bits			Protection Type
	LB1	LB2	LB3	
1	U	U	U	No program lock features
2	P	U	U	MOV _C instructions executed from external program memory are disabled from fetching code bytes from internal memory, EA is sampled and latched on reset, and further programming of the Flash is disabled
3	P	P	U	Same as mode 2, also verify is disabled
4	P	P	P	Same as mode 3, also external execution is disabled

LM7805 - REGULATOR

May 2000



LM78XX Series Voltage Regulators

General Description

The LM78XX series of three terminal regulators is available with several fixed output voltages making them useful in a wide range of applications. One of these is local on card regulation, eliminating the distribution problems associated with single point regulation. The voltages available allow these regulators to be used in logic systems, instrumentation, HiFi, and other solid state electronic equipment. Although designed primarily as fixed voltage regulators these devices can be used with external components to obtain adjustable voltages and currents.

The LM78XX series is available in an aluminum TO-3 package which will allow over 1.0A load current if adequate heat sinking is provided. Current limiting is included to limit the peak output current to a safe value. Safe area protection for the output transistor is provided to limit internal power dissipation. If internal power dissipation becomes too high for the heat sinking provided, the thermal shutdown circuit takes over preventing the IC from overheating.

Considerable effort was expended to make the LM78XX series of regulators easy to use and minimize the number of external components. It is not necessary to bypass the out-

put, although this does improve transient response. Input bypassing is needed only if the regulator is located far from the filter capacitor of the power supply.

For output voltage other than 5V, 12V and 15V the LM1117 series provides an output voltage range from 1.2V to 57V.

Features

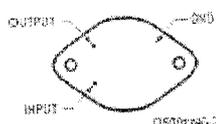
- Output current in excess of 1A
- Internal thermal overload protection
- No external components required
- Output transistor safe area protection
- Internal short circuit current limit
- Available in the aluminum TO-3 package

Voltage Range

LM7805C	5V
LM7812C	12V
LM7815C	15V

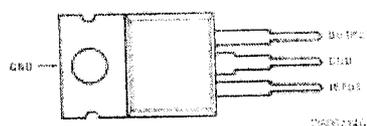
Connection Diagrams

Metal Can Package
TO-3 (K)
Aluminum



Bottom View
Order Number LM7805CK,
LM7812CK or LM7815CK
See NS Package Number KC02A

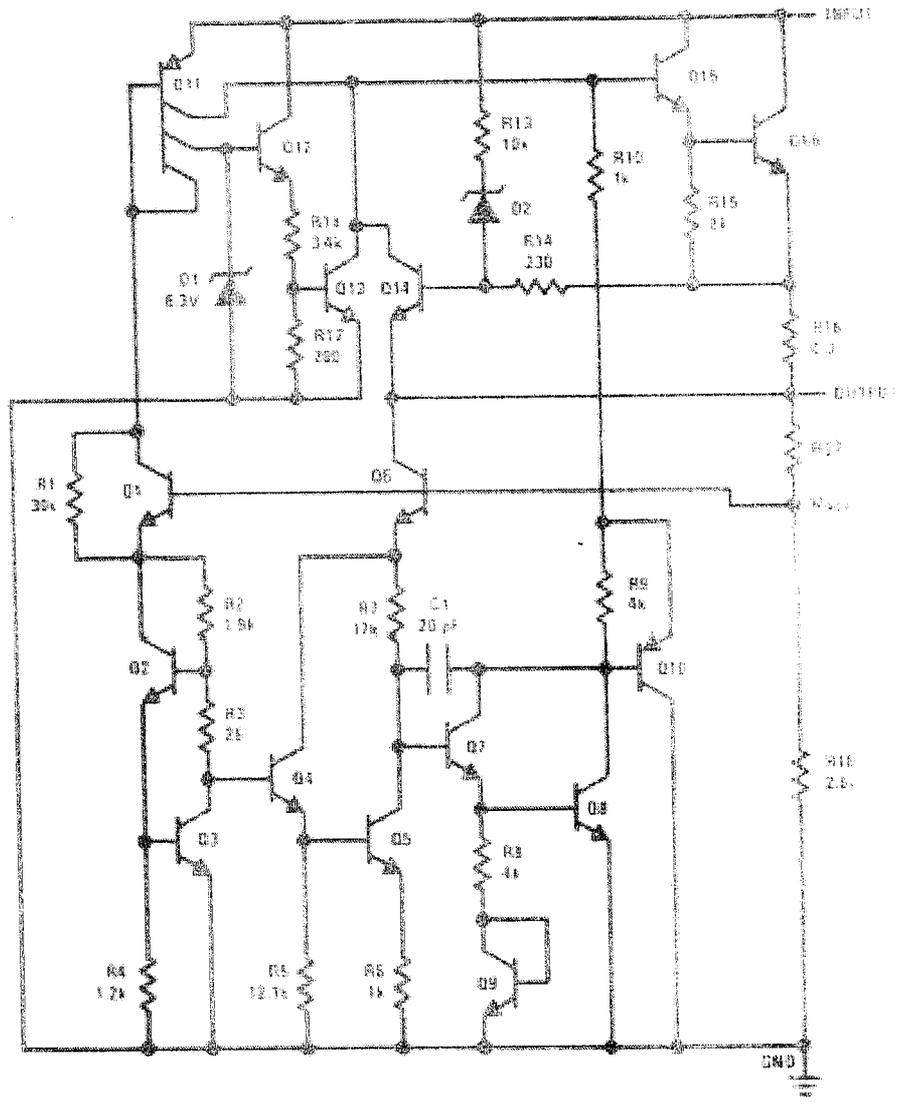
Plastic Package
TO-220 (T)



Top View
Order Number LM7805CT,
LM7812CT or LM7815CT
See NS Package Number T03E

LM78XX Series Voltage Regulators

Schematic



7. REFERENCES

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10. www.cctvstuff.co.uk