**MULTIPLE DEVICE SWITCHING**

**THROUGH PC**

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**Chapter-1**

**INTRODUCTION**

The MAX-232 of PCs is a versatile tool to use. Using it, you can develop several PC based applications. Controlling a triac to switch on/off the gadgets is one of them, where the computer decides the sequence of switching. The circuit given here can be used to eight devices through MAX-232 data lines.

**MAX-232:**

The **MAX232** is an [integrated circuit](http://en.wikipedia.org/wiki/Integrated_circuit) that converts signals from an [RS-232](http://en.wikipedia.org/wiki/RS-232) serial port to signals suitable for use in [TTL](http://en.wikipedia.org/wiki/Transistor-transistor_logic) compatible digital logic circuits. The MAX232 is a dual driver/receiver and typically converts the RX, TX, CTS and RTS signals.

The drivers provide RS-232 voltage level outputs (approx. ± 7.5 V) from a single + 5 V supply via on-chip [charge pumps](http://en.wikipedia.org/wiki/Charge_pump) and external capacitors. This makes it useful for implementing RS-232 in devices that otherwise do not need any voltages outside the 0 V to + 5 V range, as [power supply](http://en.wikipedia.org/wiki/Power_supply) design does not need to be made more complicated just for driving the RS-232 in this case. The receivers reduce RS-232 inputs (which may be as high as ± 25 V), to standard 5 V [TTL](http://en.wikipedia.org/wiki/Transistor-transistor_logic) levels. These receivers have a typical threshold of 1.3 V, and a typical [hysteresis](http://en.wikipedia.org/wiki/Hysteresis) of 0.5 V. The later MAX232A is backwards compatible with the original MAX232 but may operate at higher [baud](http://en.wikipedia.org/wiki/Baud) rates and can use smaller external capacitors – 0.1 [μF](http://en.wikipedia.org/wiki/Farad) in place of the 1.0 μF capacitors used with the original device. The newer MAX3232 is also backwards compatible, but operates at a broader voltage range, from 3 to 5.5 V.

**VOLTAGE LEVELS:**

It is helpful to understand what occurs to the voltage levels. When a MAX232 IC receives a TTL level to convert, it changes a TTL Logic 0 to between +3 and +15 V, and changes TTL Logic 1 to between -3 to -15 V, and vice versa for converting from RS232 to TTL. This can be confusing when you realize that the RS232 Data Transmission voltages at a certain logic state are opposite from the RS232 Control Line voltages at the same logic state. To clarify the matter, see the table below. For more information see [RS-232 Voltage Levels](http://en.wikipedia.org/wiki/RS-232#Voltage_levels).

|  |  |  |
| --- | --- | --- |
| **RS232 Line Type & Logic Level** | **RS232 Voltage** | **TTL Voltage to/from MAX232** |
| Data Transmission (Rx/Tx) Logic 0 | +3 V to +15 V | 0 V |
| Data Transmission (Rx/Tx) Logic 1 | -3 V to -15 V | 5 V |
| Control Signals (RTS/CTS/DTR/DSR) Logic 0 | -3 V to -15 V | 5 V |
| Control Signals (RTS/CTS/DTR/DSR) Logic 1 | +3 V to +15 V | 0 V |

# RS232:

In [telecommunications](http://en.wikipedia.org/wiki/Telecommunications), **RS-232** (Recommended Standard 232) is the traditional name for a series of standards for [serial](http://en.wikipedia.org/wiki/Serial_communications) binary [single-ended](http://en.wikipedia.org/wiki/Single-ended_signalling) [data](http://en.wikipedia.org/wiki/Data_signal) and [control](http://en.wikipedia.org/wiki/Control_signal) signals connecting between a *DTE* ([Data Terminal Equipment](http://en.wikipedia.org/wiki/Data_Terminal_Equipment)) and a *DCE* ([Data Circuit-terminating Equipment](http://en.wikipedia.org/wiki/Data_circuit-terminating_equipment)). It is commonly used in [computer](http://en.wikipedia.org/wiki/Computer) [serial ports](http://en.wikipedia.org/wiki/Serial_port). The standard defines the electrical characteristics and timing of signals, the meaning of signals, and the physical size and pinout of connectors.

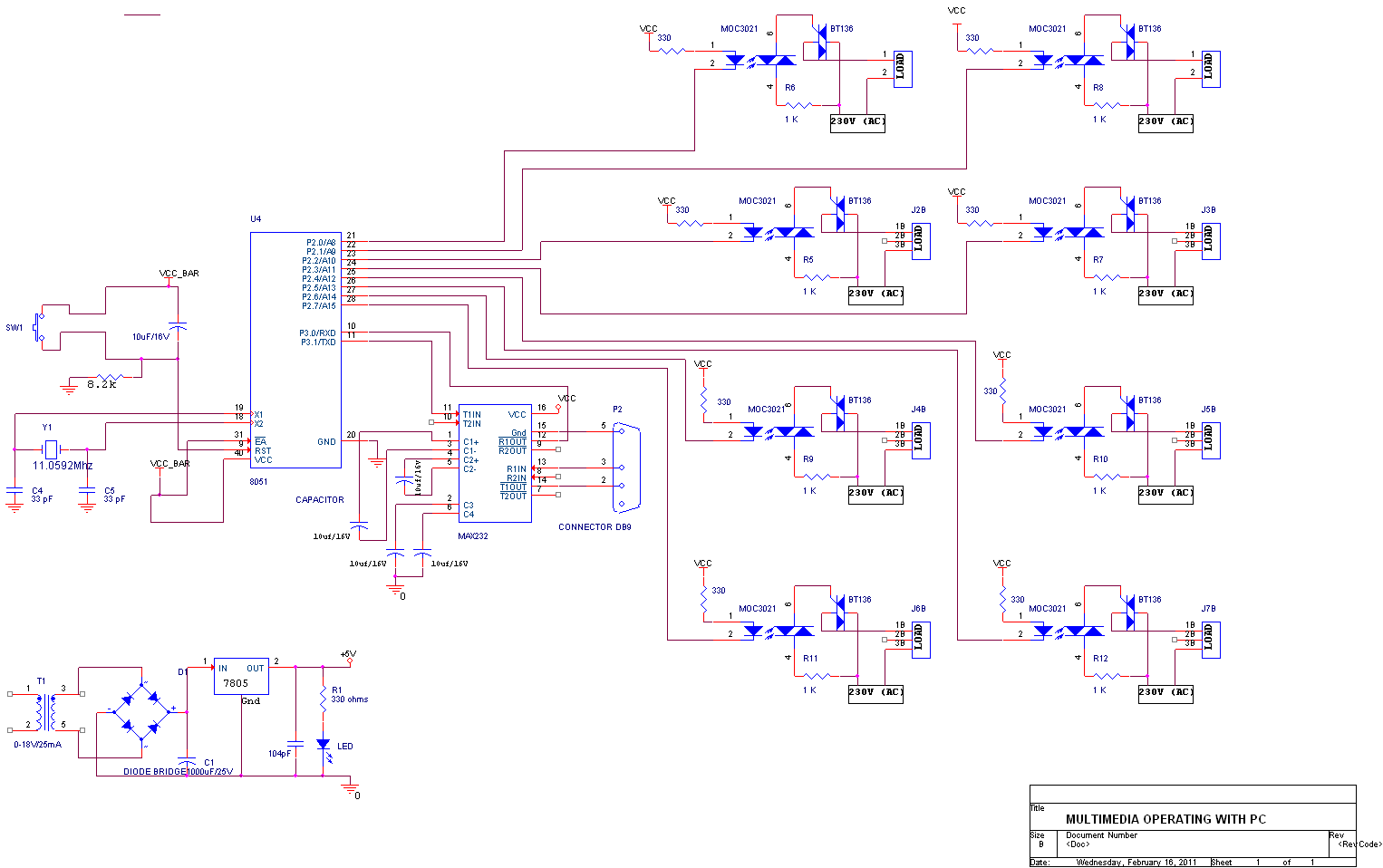
**Chapter-2**

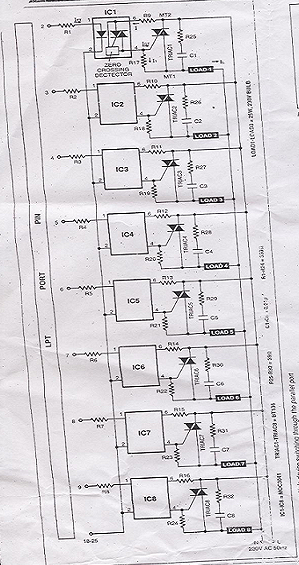
**CIRCUIT DESCRIPTION & WORKING**

**2.1 Circuit description**

Fig. 1 shows the circuit for multiple device switching through the serial port. The circuit comprises zero-crossing optically-isolated triac driver MOC3041,triac BT136 and a few discrete components. Parallel-port pins 2 through 9 are connected to pin 1 of IC1 through IC8 via current limiting resistor R1 through R8, respectively.Pin2 of IC1 through IC8 is joined together and connected Pins 18 through 25 of the parallel port.

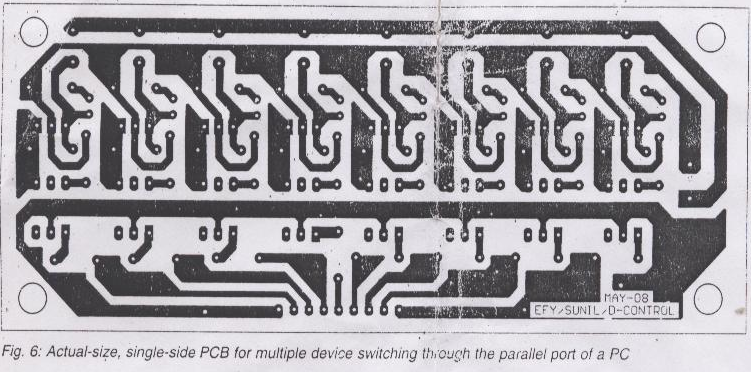
The zero crossing, optically isolated triacdriver is an effective solution for interface application between the parallel port and AC power loads. When pin2 of the parallel port is low and the internal LED of IC1 is ‘off’, the AC line voltage appears across main terminals of both the triac and the triacdriver. When pin2 of the parallel port goes high and sufficient current Ift is supplied to the internal LED, the triac driver latches ‘on’. This action introduces a gate current in the main triac (BT136), triggering it from the blocking state into full condition. Once triggered, the voltage the main terminals drops to a very low value lower than its holding current, thus forcing the triac driver into ‘off’ state, even when sufficient current for the internal LED is applied. The power triac remains conducting until the load current drops below its holding current-a situation that occurs every half cycle. The actual duty cycle for the triac drive is very short(in the range of 1 to 3µs).When sufficient current for conduction of internal LED is present, the power triac will re-trigger every half cycle of the AC line voltage until the internal LED is switched off and the power triac has gone through a zero current point(see Fig2)Use of resistor R9n is not mandatory when the load is resistive since the current is limited by gate-trigger currentIgt of the power triac. However, resistor R9 prevents possible destruction of the triac driver in those application where the load is highly inductive. Unintentional phase control of the main triac may happen if current-limiting resistor R9 is too high in value. The function of this resistor is to limit the current through the triac driver in case the main triac is forced into the non-conductive state close to the peak of the line voltage and the energy stored in ‘snubber’ capacitor C1 is discharged into the driver.

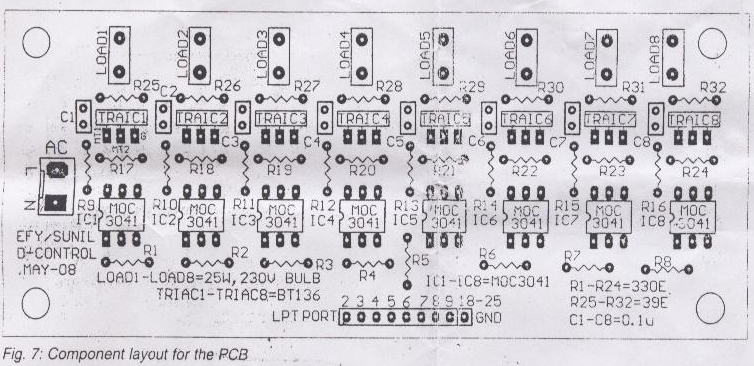




**Chapter-3**

**PCB DESIGN AND LAYOUT**





Gate resistor R17 is necessary only when the internal gate impedance of the triac, is very high, which is the case with sensitive gate thyristors. These devices display very poor noise immunity and thermal stability with put R17. The value of the gate resistor in this case should be between 100 and 500 ohms (we have chosen 330 ohms).

Note that use of a gate resistor calls for higher trigger current since R17 drains off part of the trigger current. Using gate resistor R17 in combination with current-limiting resistor R9 can result in an unintended delay or phase shift between the zero crossing point and the time when the power triac triggers. Resistor R25 and Capacitor C1 form the snubber network provide protection against the rate of change of the voltage across the load. Similarly, other parallel-port pins drive the load.

An actual-size, single-side PCB for multiple device switching through the parallel-port of a PC is shown in Fig.6 and its component layout in Fig 7

# Chapter-4

# Waveform Analysis

# 

# Chapter-5

**LIST OF COMPONENTS**

**Semiconductors:**

**1. IC1-IC8 :**MOC3041Zero-crossing

Opto-isolated triac driver

**2. TRIAC1-TRIAC8 :**BT136triac

**3. Micro controller :AT89S52**

**4. MAX232**

**5. RS-232**

**Resistors (all ¼-watt,±5% carbon):**

**R1-R24** :330-ohm

**R25-R32** :39-ohm

**Capacitors:**

**C1-C8** :0.01Μf ceramic disk

**Miscellaneous:**

**LOAD1-LOAD8 :25W, 230Vbulb**

**Chapter-6**

**DESCRIPTION OF semiCONDUCTOR COMPONENTS**

**6.1 IC MOC3041:**

**6.1.1 DESCRIPTION:**

The MOC303XM and MOC304XM devices consist of aAlGaAs infrared emitting diode optically coupled to a monolithic silicon detector performing the function of a zero voltage crossing bilateral triac driver.

They are designed for use with a triac in the interface of logic systems to equipment powered from 115 VAC lines, such as teletypewriters, CRTs, solid-state relays, industrial controls, printers, motors, solenoids and consumer appliances, etc.



The zero-cross family of optically isolated triac drivers is an inexpensive, simple and effective solution for interface applications between low current dc control circuits such as logic gates and microprocessors and ac power loads (120, 240 or 380 volt, single or 3-phase).

These devices provide sufficient gate trigger current for high current, high voltage thyristors, while providing a guaranteed 7.5 kV dielectric withstand voltage between the line and the control circuitry. An integrated, zero-crossing switch on the detector chip eliminates current surges and the resulting electromagnetic interference (EMI) and reliability problems for many applications. The high transient immunity of 5000 V/µs, combined with the features of low coupling capacitance, high isolation resistance and up to 800 volt speciﬁed VDRM ratings qualify this triac driver family as the ideal link between sensitive control circuitry and the ac power system environment.

Optically isolated triac drivers are not intended for stand alone service as are such devices as solid state relays. They will, however, replace costly and spaces demanding discrete drive circuitry having high component count consisting of standard transistor optoisolators, support components including a full wave rectiﬁer bridge, discrete transistor, trigger SCRs and various resistor and capacitor combinations.

This paper describes the operation of a basic driving circuit and the determination of circuit values needed for proper implementation of the triac driver. Inductive loads are discussed along with the special networks required to use triacsin their presence. Brief examples of typical applications are presented.

**6.1.2. Electrical Characteristics:**

A simpliﬁed schematic of the optically isolated triac driver is

Shown in Figure 2. This model is sufficient to describe all important characteristics. A forward current ﬂow through the LED generates infrared radiation which triggers the detector. This LED trigger current (IFT) is the maximum guaranteed current necessary to latch the triac driver and ranges from 5 mA for the MOC3063 to 15 mA for the MOC3061. The Led’s forward voltage drop at IF = 30 mA is 1.5 V maximum. Voltage-current characteristics of the triac are identiﬁed. Once triggered, the detector stays latched in the "on state” until the current ﬂow through the detector drops below the holding current (IH) which is typically 100 µA. At this time, the detector reverts to the "off" (non-conducting) state. The detector may be triggered "on" not only by IFT but also by exceeding the forward blocking voltage between the two main terminals (MT1 and MT2) which is a minimum of 600 volts for all MOC3061 family members. Also, voltage ramps (transients, noise, etc.) which are common in ac power lines may trigger the detector accidentally if they exceed the static dV/dt rating. Since the fast switching, zero-crossing switch provides a minimum dV/dt of 500 V/µs even at an ambient temperature of 70°C, accidental triggering of the triac driver is unlikely. Accidental triggering of the main triac is a more likely occurrence. Where high dV/dt transients on the ac line are anticipated, a form of suppression network commonly called a "snubber" must be used to prevent false "turn on" of the main triac. A detailed discussion of a "snubber" network is given under the section "Inductive and Resistive Loads."Figure 4 shows a static dV/dt test circuit which can be used to test triac drivers and power triacs. The proposed test method is per EIA/NARM standard RS-443.Tests on the MOC3061 family of triac drivers using the test circuit of Figure 4 have resulted in data showing the effects of temperature and voltage transient amplitude on static dV/dt. Figure 5 is a plot of dV/dt versus ambient temperature while Figure 6 is a similar plot versus transient amplitude.

**6.1.2 FEATURES:**

• Simplifies logic control of 115 VAC power

• Zero voltage crossing

• dv/dt of 2000 V/μs typical, 1000 V/μs guaranteed

• VDE recognized (File # 94766) -ordering option V (e.g., MOC3043VM)

**6.1.4 APPLICATIONS:**

• Solenoid/valve controls

• Lighting controls

• Static power switches

• AC motor drives

• Temperature controls

• E.M. contactors

• AC motor starters

• Solid state relays

**6.2 BT136:**

**6.2.1 GENERAL DESCRIPTION:**

Passivated triacs in a plastic envelope, intended for use in applications requiring high bidirectional transient and blocking voltage capability and high thermal cycling performance. Typical applications include motor control, industrial and domestic VDRM Repetitive peak off-state 600 V lighting, heating and static switching.



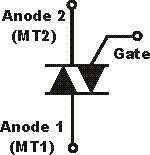
**6.2.2.TRIAC AND ITS WORKING:**

Triacs are widely used in AC power control applications. They are able to switch high voltages and high levels of current, and over both parts of an AC waveform. This makes triac circuits ideal for use in a variety of applications where power switching is needed. One particular use of triac circuits is in light dimmers for domestic lighting, and they are also used in many other power control situations including motor control.

The triac is a development of the thyristor. While the thyristor can only control current over one half of the cycle, the triac controls it over two halves of an AC waveform. As such the triac can be considered as a pair of parallel but opposite thyristors with the two gates connected together and the anode of one device connected to the cathode of the other, etc.

## 6.2.3. Triac symbol

The basic triac symbol used on circuit diagram indicates its bi-directional properties. The triac symbol can be seen to be a couple of thyristor symbols in opposite senses merged together.



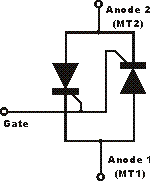
**Triac symbol for use in circuit diagrams**

Like a thyristor, a triac has three terminals. However the names of these are a little more difficult to assign, because the main current carrying terminals are connected to what is effectively a cathode of one thyristor, and the anode of another within the overall device. There is a gate which acts as a trigger to turn the device on. In addition to this the other terminals are both called Anodes, or Main Terminals These are usually designated Anode 1 and Anode 2 or Main Terminal 1 and Main Terminal 2 (MT1 and MT2). When using triacs it is both MT1 and MT2 have very similar properties.

## 6.2.4. How does a triac work?

Before looking at how a triac works, it helps to have an understanding of how a thyristor works. In this way the basic concepts can be grasped for the simpler device and then applied to a triac which is more complicated. The operation of the thyristor is covered in the article in this section and accessible through the "Related Articles" box on the left of the page and below the main menu.

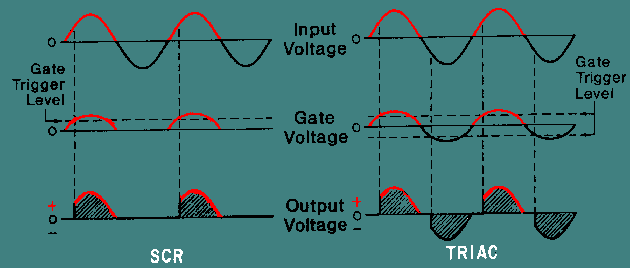
For the operation of the triac, it can be imagined from the circuit symbol that the triac consists of two thyristors in parallel but around different ways. The operation of the triac can be looked on in this fashion, although the actual operation at the semiconductor level is rather more complicated.



**Equivalent circuit of a triac**

When the voltage on the MT1 is positive with regard to MT2 and a positive gate voltage is applied, one of the thyristors conducts. When the voltage is reversed and a negative voltage is applied to the gate, the other thyristor conducts. This is provided that there is sufficient voltage across the device to enable a minimum holding current to flow.

6.2.5. **Comparison of SCR and TRIAC waveforms:**



## 6.2.6. Usingtriacs

There are a number of points to note when using triacs. Although these devices operate very well, to get the best performance out of them it is necessary to understand a few hints on tips on using triacs.

It is found that because of their internal construction and the slight differences between the two halves, triacs do not fire symmetrically. This results in harmonics being generated: the less symmetrical the triac fires, the greater the level of harmonics that are produced. It is not normally desirable to have high levels of harmonics in a power system and as a result triacs are not favoured for high power systems. Instead for these systems two thyristors may be used as it is easier to control their firing.

To help in overcoming the problem non-symmetrical firing ad the resulting harmonics, a device known as a diac (diode AC switch) is often placed in series with the gate of the triac. The inclusion of this device helps make the switching more even for both halves of the cycle. This results from the fact that the diac switching characteristic is far more even than that of the triac. Since the diac prevents any gate current flowing until the trigger voltage has reached a certain voltage in either direction, this makes the firing point of the triac more even in both directions.

# 6.3Atmel AT89S52

The Atmel AT89S52 is an 8051 based Full Static CMOS controller with Three-Level Program Memory Lock, 32 I/O lines, 3 Timers/Counters, 8 Interrupts Sources, Watchdog Timer, 2 DPTRs, 8K Flash Memory, 256 Bytes On-chip RAM.

**AT89S52** microcontroller is a great family compatible with [Intel MCS-51](http://ro.wikipedia.org/wiki/Intel_MCS-51) . Atmel AT89S52 is created by, indicated by the initials "AT". This is a low power microcontroller, but the 8-bit CMOS gives high performance with an 8K Bytes of internal flash memory. This is achieved by using technology and high-density non-volatile memory that belongs to Atmel and is compatible with standard 80C51. Flash memory chip allows internal or scheduled to be reprogrammed by a non-volatile memory. By combining an 8-bit CPU with Flash memory programmable monolithic kernel, Atmel AT89S52 microcontroller is very powerful, has great flexibility and is thus the perfect solution for many embedded applications.

**FEATURES**:

The main features of the microcontroller are:

* compatibility with the MCS 51 family;
* 8-bit CPU at maximum frequency of 33MHz;
* RAM: 256 Bytes;
* Flash Memory: 8K Bytes;
* 32 lines of programming for the input / output of a general nature;
* 8 sources interruptions organized two levels of priority;
* 3 timers / counters for each 16-bit;
* Watchdog Timer;
* two data pointers;
* 1 serial port (full duplex UART)
* ISP programming interface 8K Bytes;
* supports up to 10 000 rewrites;
* contains an oscillator;
* short-term programming.

**Pin configuration:**

**AT89S52** is a 40-pin microcontroller, their significance is expressed below. In parentheses is the number of the pin bearing in mind that pin 1 is top left, and pin 40 in the right corner.

**Vcc (40):** supply voltage;

**GND (20):** grounding;

**Port 0 (39-32):** Port 0 is a bidirectional port input / output 8-bit. As output port, each pin is assigned eight TTL inputs. When Port 0 pins are registered with a logical value, they can be used as high impedance inputs. Port 0 can also be configured as the least significant address or data during access to external program and data memory. Port 0 is also the one who receives the code during Flash programming and deliver bits resulting from the verification program. Closing transistor is required during program verification.

**Port 1 (1-8):** Port 1 is also a bidirectional port input / output with internal pull-up (trazistorul is automatically closed). Port 1 output buffers can support four TTL inputs. When a port is entered with a logical value, ie the transistor is closed, we can use the port for reading, otherwise, if the transistor is opened for writing using the port. Port 1 also receives the least significant address bits during Flash programming and verification. In addition, pins 0 and 1 of port 1 may be configured as a timer and counter-e-e, and pins 5, 6, 7 are used for programming interface.

**Port 2 (21-28):** Port 2 is also a bidirectional port of entry / ieţire 8-bit internal pull-ups. Given the same operating mode as a port in relation to existing transistor. Port 2 is the one who gives us the most significant bits of the address during extraction and during external memory access to external data memory that use 16-bit addresses. In this mode of use, Port 2 uses strong internal pull up an issue of a logical value. During access to external data memory that utilizes 8-bit addresses, port 2 is used for special function registers. Port 2 also receives the most significant address bits and some control signals during Flash programming and verification.

**Port 3 (10-17)**: Port 3 is also a port bidirectional input / output 8-bit internal pull-up, behaving like one and two port. Port 3 receives control signals for Flash memory programming. Other special functions you can perform port 3 are:

* pin 0 has the alternative function, input port (RXD)
* Pin 1 is used as output port (TXD)
* pins 2 and 3 are used for external interrupt (INT0 #, INT1 #);
* pins 4 and 5 may be used interchangeably as timers (T0 and T1);
* pin 6 is used as a signal to write external memory (# WR);
* pin 7 is used as a signal read from external memory (RD #).

RST (9) serves as a reset RST input. A high value on this pin between two machine cycles while the oscillator running, resets the device. This pin acts high for 98 oscillator periods after the watchdog stops. To disable this feature using the DISRTO bit special function registers at exactly the 8EH. In the default state of bit DISRTO feature RESET is active HIGH.

**ALE / PROG # (30):** The acronym comes from ALE Address Latch Enable, and he is controlling the buffer that stores the least significant address. In this pin during programming Flash memory programming is designed input pulses: # PROG (Program Pulse Input). For normal operation, ALE issued at a time constant equal to 1 / 6 of oscillation frequency and speeds can be used as a clock or external. For the willing, the function that performs ALE can be disabled by setting bit special register at 8EH logical value 0. With this bit set, ALE is active only for the instructions MOVX and MOVC. ALE Disable bit has no effect on the microcontroller if the execution module.

**PSEN (29):** Acronym PSEN Program Store Enable is the control signal and means for external program memory. When the AT89S52 code running external program memory, PSEN # is activated by two times for each machine cycle, except when activating PSEN # signal is omitted during external data memory access.

**EA / VPP (31)**: EA acronym stands External Access Enable. # It must be connected to GRD to activate the device for extracting code from external program memory address 0000h to address internal program executions FFFFH.Pintru # EA must be connected to Vcc.

**XTAL1 (19)**: XTAL1 is used as inverting input of the oscillator clock as input amplified and operational circuit.

**XTAL2 (18)**: XTAL2 oscillator inverter output is amplified.

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**CHAPTER-7**

**Description of Components**

**7.1 Capacitor:**

A capacitor or condenser is a [passive](file:///G:\wiki\Passivity_(engineering))[electronic component](file:///G:\wiki\Electronic_component) consisting of a pair of [conductors](file:///G:\wiki\Electrical_conductor) separated by a [dielectric](file:///G:\wiki\Dielectric) (insulator). When a [potential difference](file:///G:\wiki\Potential_difference) (voltage) exists across the conductors, an [electric field](file:///G:\wiki\Electric_field) is present in the dielectric. This field stores [energy](file:///G:\wiki\Energy) and produces a mechanical force between the conductors. The effect is greatest when there is a narrow separation between large areas of conductor, hence capacitor conductors are often called plates.

An ideal capacitor is characterized by a single constant value, [capacitance](file:///G:\wiki\Capacitance), which is measured in [farads](file:///G:\wiki\Farad). This is the ratio of the [electric charge](file:///G:\wiki\Electric_charge) on each conductor to the potential difference between them. In practice, the dielectric between the plates passes a small amount of [leakage current](file:///G:\wiki\Leakage_(electronics)). The conductors and [leads](file:///G:\wiki\Lead_(electronics)) introduce an [equivalent series resistance](file:///G:\wiki\Equivalent_series_resistance) and the dielectric has an electric field strength limit resulting in a [breakdown voltage](file:///G:\wiki\Breakdown_voltage).

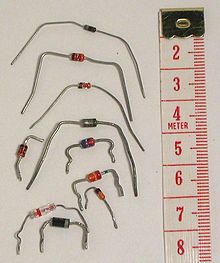
Capacitors are widely used in electronic circuits to block the flow of [direct current](file:///G:\wiki\Direct_current) while allowing [alternating current](file:///G:\wiki\Alternating_current) to pass, to filter out interference, to smooth the output of [power supplies](file:///G:\wiki\Power_supply), and for many other purposes. They are used in [resonant circuits](file:///G:\wiki\LC_circuit) in radio frequency equipment to select particular [frequencies](file:///G:\wiki\Frequency) from a signal with many frequencies

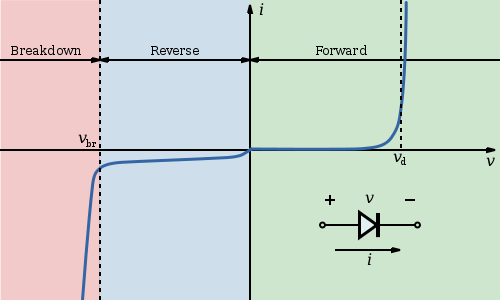


**7.2 Diode**:

In [electronics](file:///G:\wiki\Electronics), a diode is a two-terminal electronic that conducts [electric current](file:///G:\wiki\Electric_current) in only one direction. The term usually refers to a semiconductor diode, the most common type today, which is a crystal of [semiconductor](file:///G:\wiki\Semiconductor) connected to two electrical terminals, a [P-N junction](file:///G:\wiki\P-N_junction). A vacuum tube diode, now little used, is a [vacuum tube](file:///G:\wiki\Vacuum_tube) with two [electrodes](file:///G:\wiki\Electrode); a [plate](file:///G:\wiki\Plate_electrode) and a [cathode](file:///G:\wiki\Cathode).

The most common function of a diode is to allow an electric current in one direction (called the diode's forward direction) while blocking current in the opposite direction (the reverse direction). Thus, the diode can be thought of as an electronic version of a [check valve](file:///G:\wiki\Check_valve). This unidirectional behaviour is called [rectification](file:///G:\wiki\Rectification_(electricity)), and is used to convert [alternating current](file:///G:\wiki\Alternating_current) to [direct current](file:///G:\wiki\Direct_current), and extract [modulation](file:///G:\wiki\Modulation) from radio signals in radio receivers.





**7.3 Resistor:**

[Electronic symbol](file:///G:\wiki\Electronic_symbol)

[Resistor symbol Europe.svg](file:///G:\wiki\File:Resistor_symbol_Europe.s)(Europe) 

[Resistor symbol America.svg](file:///G:\wiki\File:Resistor_symbol_America.s)(US)

A resistor is a two-terminal electronic that produces a [voltage](file:///G:\wiki\Voltage) across its terminals that is [proportional](file:///G:\wiki\Proportionality_(mathematics)#Direct_proportion) to the [electric current](file:///G:\wiki\Electric_current) passing through it in accordance with [Ohm's law](file:///G:\wiki\Ohm%27s_law):

*V* = *IR*

Resistors are elements of [electrical networks](file:///G:\wiki\Electrical_networks) and electronic circuits and are ubiquitous in most electronic equipment. Practical resistors can be made of various compounds and films, as well as [resistance wire](file:///G:\wiki\Resistance_wire) (wire made of a high-resistivity alloy, such as nickel/chrome).

The primary characteristics of a resistor are the [resistance](file:///G:\wiki\Electrical_resistance), the [tolerance](file:///G:\wiki\Engineering_tolerance#Electrical_component_tolerance), maximum working voltage and the [power](file:///G:\wiki\Power_(physics)) rating. Other characteristics include [temperature coefficient](file:///G:\wiki\Temperature_coefficient), [noise](file:///G:\wiki\Electrical_noise), and [inductance](file:///G:\wiki\Inductance). Less well-known is [critical resistance](file:///G:\w\index.php?title=Critical_resistance&action=edit&redlink=1), the value below which power dissipation limits the maximum permitted current flow, and above which the limit is applied voltage. Critical resistance is determined by the design, materials and dimensions of the resistor. Resistors can be integrated into [hybrid](file:///G:\wiki\Hybrid_circuit) and [printed circuits](file:///G:\wiki\Printed_circuit_board), as well as [integrated circuits](file:///G:\wiki\Integrated_circuits). Size, and position of leads (or terminals) are relevant to equipment designers; resistors must be physically large enough not to overheat when dissipating their power.

**CHAPTER-8**

**CODE IMPLEMENTED**

/\*----------------------------------------------------------------------------

Multiple Devices operating with PC

-----------------------------------------------------------------------------\*/

#include<reg51.h>

#include"UART.h"

sbit load1 = P2^0;

sbit load2 = P2^1;

sbit load3 = P2^2;

sbit load4 = P2^3;

sbit load5 = P2^4;

sbit load6 = P2^5;

sbit load7 = P2^6;

sbit load8 = P2^7;

/\*-----------------------------------------------------------------------------

Function definitions

-----------------------------------------------------------------------------\*/

void delay(int value);

void delay1(unsigned char itime);

unsigned char pcdata;

/\*------------------------------------------------------------------------------

Serial Interrupt sub-routing

-------------------------------------------------------------------------------\*/

voidserial\_int(void) interrupt 4{

if(RI==1){

RI=0;

pcdata=SBUF;

}

}

/\*------------------------------------------------------------------------------

main program

------------------------------------------------------------------------------\*/

void main(){

delay(100);

UART\_init();

load1=load2=load3=load4=load5=load6=load7=load8=0;

enter();

enter();

send\_to\_pc("MULTI-CHANNEL DEVICE SWITCHING THROUGH PC");

enter();

send\_to\_pc("1 for load-1");

enter();

send\_to\_pc("2 for load-2");

enter();

send\_to\_pc("3 for load-3");

enter();

send\_to\_pc("4 for load-4");

enter();

send\_to\_pc("5 for load-5");

enter();

send\_to\_pc("6 for load-6");

enter();

send\_to\_pc("7 for load-7");

enter();

send\_to\_pc("8 for load-8");

enter();

enter();

send\_to\_pc("Please press respective keys to operate the loads:");

enter();

ES=1;

EA=1;

enter();

/\*-----------------------------------------------------------------------------------

to switch on the particular loads

------------------------------------------------------------------------------------\*/

while(1){

if(pcdata=='1') {

enter();

pcdata=0;

load1=~load1;

if(load1==1)

send\_to\_pc("load-1 has been switched ON ");

else

send\_to\_pc("load-1 has been switched OFF ");

}

if(pcdata=='2') {

enter();

pcdata=0;

load2=~load2;

if(load2==1)

send\_to\_pc("load-2 has been switched ON ");

else

send\_to\_pc("load-2 has been switched OFF ");

}

if(pcdata=='3') {

enter();

pcdata=0;

load3=~load3;

if(load3==1)

send\_to\_pc("load-3 has been switched ON ");

else

send\_to\_pc("load-3 has been switched OFF ");

}

if(pcdata=='4') {

enter();

pcdata=0;

load4=~load4;

if(load4==1)

send\_to\_pc("load-4 has been switched ON ");

else

send\_to\_pc("load-4 has been switched OFF ");

}

if(pcdata=='5') {

enter();

pcdata=0;

load5=~load5;

if(load5==1)

send\_to\_pc("load-5 has been switched ON ");

else

send\_to\_pc("load-5 has been switched OFF ");

}

if(pcdata=='6') {

enter();

pcdata=0;

load6=~load6;

if(load6==1)

send\_to\_pc("load-6 has been switched ON ");

else

send\_to\_pc("load-6 has been switched OFF ");

}

if(pcdata=='7') {

enter();

pcdata=0;

load7=~load7;

if(load7==1)

send\_to\_pc("load-7 has been switched ON ");

else

send\_to\_pc("load-7 has been switched OFF ");

}

if(pcdata=='8') {

enter();

pcdata=0;

load8=~load8;

if(load8==1)

send\_to\_pc("load-8 has been switched ON ");

else

send\_to\_pc("load-8 has been switched OFF ");

}

}

}

/\*---------------------------------------------------------------------------------

delay and delay1 function

---------------------------------------------------------------------------------\*/

void delay (int value){

int k;

for (k=0;k<value;k++);

}

void delay1(unsigned char itime)

{

unsigned char i,j;

for(i=0;i<itime;i++)

for(j=0;j<100;j++);

}/\*---------------------------------------------------------------------------------\*/

**CONCLUSION**

This multiple device switching allows the user to operate up to eight devices simultaneously through serial communication port of the pc. The implementation of micro-controller allows the conversion of the data from parallel communication to serial communication.

The future implementations of this application provide the wireless and distant accessing of devices through RF module, IRmodule, zig bee module. This application is now available with even more comfortable mobile accessing schemes.

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