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# TESTING OF SWITCH FOR MAXIMUM ENDURANCE LIFE

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**Abstract –**In this paper, proposed system is used for testing of switch for maximum endurance life. The system is having PC interface to log the data for further analysis. The switches are used in many appliances in different machinery. The switch manufacturing industry manufacture the switch with certain specifications like 230V AC , 1amp , 50,000 life cycles (ON/OFF) , 12 V DC , 1 Amp , 50,000 life cycles (ON/OFF) etc. When switch will be faulty or short then buzzer will be ON. In this Paper we are going to see how to test the switch after manufacturing in company? Here we are testing switch and its maximum endurance life.

***Key Words***: Switch, Testing, Endurance

## INTRODUCTION

It's important to maintain the quality of the electrical and electronic devices (electrical household switches, sockets-outlet, .etc), since they pose danger to the users. These devices affect directly the national economy. Most of the international and national organizations including the Sudanese standard and metrology organization have paid so much concern to the electrical devices quality through stabling a lot of standard specifications to control its quality. Regarding the electrical household switches and sockets-outlet, all the standard specifications which have been established are required. The difficulties of simulating the normal operating test manually for the electrical household switches, and sockets come from the needs of perfectly performing the following tests: - Pregnancy current. - Electrical endurance. For electrical household switches (up to 15A, 250V) according to Sudanese standard SDS (3926/2007),and socket-outlet (up to12.5A,230V) according to Sudanese standard SDS (4829/2011), which required the on/off times for electrical switches to be approximately equal. So in this paper two separate devices are subjected to tests. The first one is for the electrical household switches and the second is for the sockets-outlet.[1] This system overcomes the old methods that used in switch manufacturing industries, while testing the switch they need to count the voltage, current and the life cycles, either internal contacts of switch are open or closed and maintain that record manually one by one. But from this project we can measure the voltage, current, life cycles and save these parameters also display values of parameters automatically. The above system is used for testing of switch for maximum endurance life. The system is having PC interface to log the data for further analysis. The toggle switch is used in many appliances in different machinery. The switch manufacturing industry manufacture the switch with certain specifications like 230V AC, 1Amp, 25,000 life cycles (ON/OFF), 12V DC, 1Amp, 50,000 life cycles (ON/OFF) etc. That's why it is necessary to test the switch after manufacturing. Our system is for that purpose. A switch is a component which controls the open-ness or closed-ness of an electric circuit. They allow control over current flow in a circuit (without having to actually get in there and manually cut or splice the wires). Switches are critical components in any circuit which requires user interaction or control. A switch can only exist in one of two states: open or closed. In the off state, a switch looks like an open gap in the circuit. This, in effect, looks like an open circuit, preventing current from flowing. In the on state, a switch acts just like a piece of perfectly-conducting wire a short. This closes the circuit, turning the system "on" and allowing current to flow unimpeded through the rest of the system

## Motivation

During the holidays my students B.E E&TC attended one training in a switch manufacturer industry. then we got chance to work in switch industry, that time we observe their work carefully we understand that was much hardworking and time wasted for measuring the parameters of switch like voltage, current, and life cycles with maintain record manually. We decide to search a system which will be overcome these drawbacks.

## PRESENT THEORIES AND PRACTICES

This system overcomes the old methods that used in switch manufacturing industries, while testing the switch they need to count the voltage, current and the life cycles, either internal contacts of switch are open or closed and maintain that record manually one by one. But from this project we can measure the voltage, current, life cycles and save these parameters also display values of parameters automatically.

## PROPOSED WORK

This system used to reduce time, man power as well as hardworking. In this project we use the current and voltage transformer to sense the voltage and current, and then it will give the very precise value. These voltage, current, life cycle values of the switch parameter read through Microcontroller .but it accepts the digital input for that purpose we use ADC 0808 to convert analog signal

into digital signal. It will display on LCD and this information is saving to PC. The DC motor used to ON and OFF testing switch automatically.

## SCOPE

Our system used for testing the numbers of switch in industries. In our project we measure the parameter like Voltage, Current, Life cycle.

## BLOCK DIAGRAM

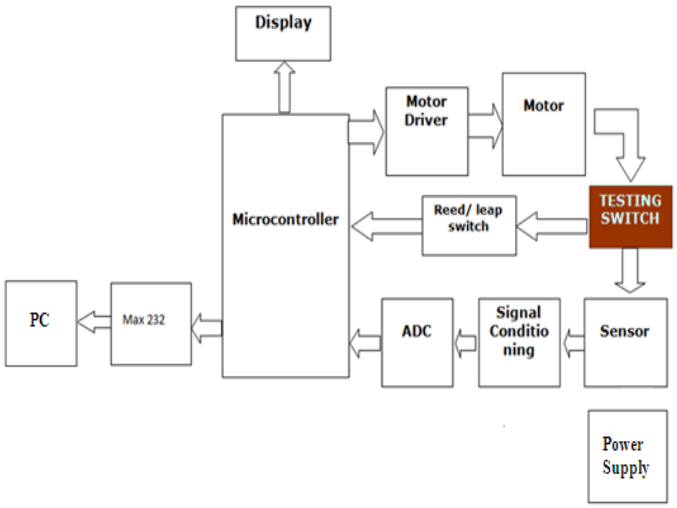


**Fig.1 Block diagram of switch endurance test**

Fig.1 indicates block diagram of switch endurance test which consist of sensor , ADC , motor ,Microcontroller, motor driver , Display , Testing switch,Max-232 ,PC etc.

## Microcontroller

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 non volatile memory technology and is compatible with the industry-standard MCS-51 instruction set and pin out. The on-chip Flash allows the program memory to be reprogrammed in-system or by a conventional non-volatile 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.

**Motor** A DC motor is any of a class of electrical machines that converts direct current electrical power into mechanical power. The most common types rely on the forces produced by magnetic fields. Nearly all types of DC motors have some internal mechanism, either electromechanical or electronic; to periodically change the direction of current flow in part of the motor. Most types produce rotary motion; a linear motor directly produces force and motion in a straight line.

## Motor driver

ULN2803 is a High voltage, high current Transistor Array IC used especially with Microcontrollers where we need to drive high power loads. Thic IC consists of a eight NPN Darlington connected transistors with common Clamp diodes for switching the loads connected to the output. This IC is widely used to drive high loads such Lamps, relays, motors etc. It is usually rated at 50v/500mA. This article brings out the working of ULN2803 IC and how to use it in a circuit. Most of the Chips operates with low level signals such as TTL, CMOS, PMOS, NMOS which operates at the range of (0-5)v and are incapable to drive high power inductive loads. However this chip takes low level input signals (TTL) and use that to switch/turn off the higher voltage loads that is connected to the output side

## Sensor

## CURRENT SENSOR

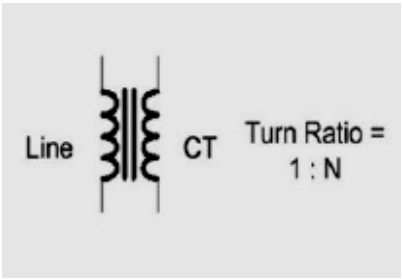


**Fig.2- Current sensor**

Fig.2 indicates current sensor. The current sensor senses the current level of the commercial single phase supply line. The Current transformer used here is the Current sensor. Current sensor we are using here is of 1: N ratio and the current provided to primary winding are directly drawn from the single phase supply. The amount of current drawn from the supply will be variable as it depends on the loads applied at the output. The primary is connected in series with single phase commercial line. The other way to sense the current is, series resistance method' but in this method we will have to make the physical connection with the line which may sometime be hazardous for our meter. We have to connect a series resistance with the line, which should have very low and accurate value which doesn't happen practically.

## Voltage sensor

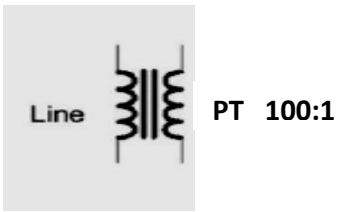


**Fig.3-Voltage sensor**

Fig.3 indicates voltage sensor. The other important section is the voltage sensing circuit, the vtg

transformer is used as a voltage sensor from the single phase supply .The primary of transformer is used in parallel with the supply and the secondary conducts by mutual induction phenomenon. The transformer with the turn's ratio of 100:1 is used in order to step down the voltage and further the voltage divider network is connected so as to get the required voltage for the energy IC.

**ADC 3202**

**FEATURES**

- 12-bit resolution
- ±1 LSB max DNL
- ±1 LSB max INL (MCP3202-B)
- ±2 LSB max INL (MCP3202-C)
- Analog inputs programmable as single-ended
- On-chip sample and hold
- SPI® serial interface (modes 0,0 and 1,1)
- Single supply operation: 2.7V - 5.5V

MCP3202 is a successive approximation 12-bit Analog-to-Digital (A/D) Converter with on-board sample and hold circuitry. The MCP3202 is programmable to provide a single pseudo-differential input pair or dual single-ended inputs. Differential Nonlinearity (DNL) is specified at ±1 LSB, and Integral Nonlinearity (INL) is offered in ±1 LSB (MCP3202-B) and ±2 LSB (MCP3202-C) versions. Communication with the device is done using a simple serial interface compatible with the SPI protocol. The device is capable of conversion rates of up to 100ksps at 5V and 50ksps at 2.7V. The MCP3202 device operates over a broad voltage range (2.7V - 5.5V). Low current design permits operation with typical standby and active currents of only 500nA and 375μA.

**MAX 232**

The MAX232 converts signals from anRS-232 serial port to signals suitable for use in TTL 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 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 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 levels. These receivers have a typical threshold of 1.3 V, and a typical hysteresis of 0.5 V

**Display** In this project we use 16*2 LCD this is interfacing with the 89c51 at port 1.which displays current ,voltage of the testing switch when switch is ON/OFF.

**Flowchart**

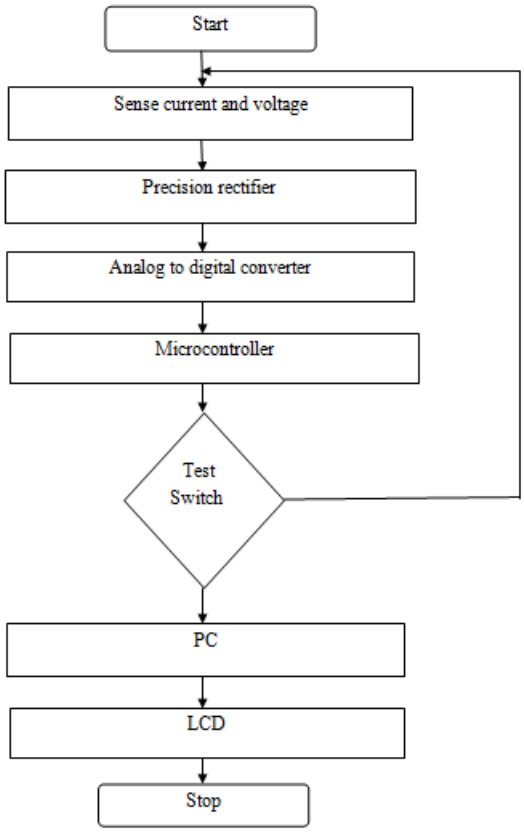


**Fig.4 Flowchart of switch testing**

**Working**

Fig.4 indicates flowchart of switch testing and Fig.1 shows the block diagram of switch endurance test 12V DC supply is given to the DC motor. The rocker switch ON/OFF through the DC motor which is to be testing switch. When switch is ON it displays the its current and voltage on LCD display.LCD display is connected to port 1 of the 89c51 microcontroller .simultaneously it goes to PC where ON and OFF voltage and current is recorded. Where serial communication is used interfacing through DB9 connecter at port 3 of AT89c51.when switch ON and OFF it completes one life cycle known as 1 count that also recorded on PC we can save that information.

**Result**

We can decide the Switch is in good condition when it shows the maximum current value for switch is ON and it should shows the zero for switch is OFF. There are two conditions that decides switch is faulty

1. Switch remains continuously ON due to its internal structure is short circuited.
2. Switch remains continuously OFF due to its internal structure is remaining open.

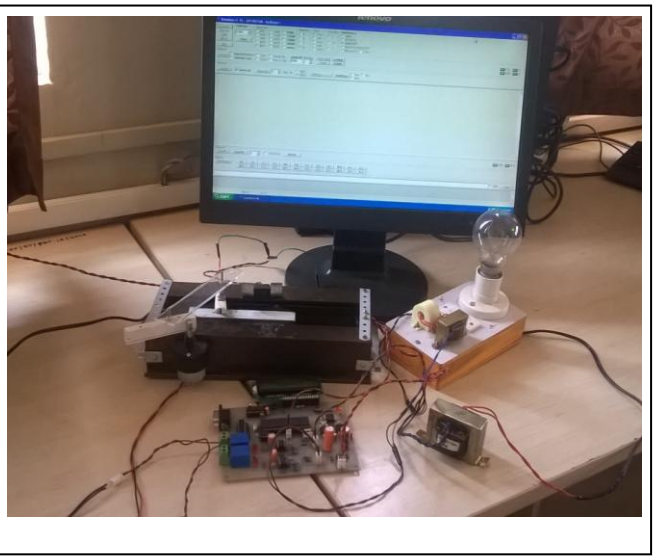

**Fig.5 During testing, switch is off**

Fig.5 indicates during testing switch is off. After completing positive half cycle motor rotate in anticlockwise direction and switch is OFF and shows the Zero current.

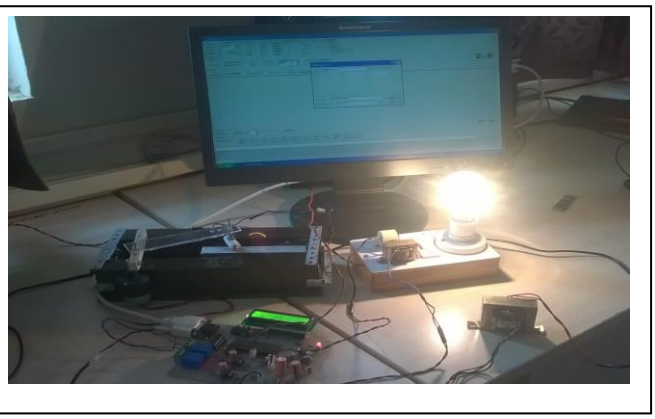

**Fig.6 During testing, switch is on**

Fig.6 indicates during testing switch is on. When 12V supply is given to the DC motor. Motor rotate in clockwise direction, switch is on complete positive half cycle then bulb is ON and shows the high current.

## REFERENCES

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## BIOGRAPHIES

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