

# Design of Digital Multimeter for Locating Switch in Control Panel

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**Abstract** - The electrical industries consist of many electrical equipment, which are installed for different applications. Whenever there would be any fault or problem occur in any machine or a part of system, complete system is being turned off by isolating the power supply. In this procedure, the equipment who is working without fault also stops. This project is all about dealing with these problem, we are designing & making a device which is in the form of a Advanced Multi-meter with additional feature such as locating of switch in the panel Whenever there is any fault in any part of system, our Device can be used as a detector by swapping the multi-meter across equipment which has a problem and immediately a LED light will glow near the switch which will help to detect the switches belonging to faulty equipment.

**Keywords-** Multimeter, Copper Card.

## 1. Introduction

The electrical industries consist of many electrical equipments, which are installed for different applications. Whenever there would be any fault or problem occur in any machine or a part of system, complete system is being turned off by isolating the power supply. In this procedure, the equipments who is working without fault also stops.

In such a situation the operation of all fault detecting activities are very critical to understand in a day or in couple of days, and when any new comer joins the industry, it would be very difficult for him to understand the system and if this new comer needs to turn off the power supply, he has to go through 'n' number of switches and panels. The reason is that this new joiner is not aware of the actual switches of each and every machine. And for that he has to go through manuals, cross checking with so many switches which results delay of time, & human error.

This project is all about dealing with these problem, we are designing & making a device which is in the form of a Advanced Multi-meter with feature for part finding. Normally Digital multimeter, one of the most common measuring equipment in the automatic measuring system, is capable of fulfilling measurement of ordinary signal. With the development of embedded system and widening application of virtual instrument in the measuring field, the measurement technology has experienced great development and features standardization, intelligentization and modularization. Currently the volume of multimeter becomes smaller while the precision is higher. We are providing an additional facility in the digital multimeter for locating a switch in the control panel. This Device will help to tackle with these problems. Whenever there is any fault in any part of system, our Device can be used as a detector by swapping the multi-meter across equipment which has a problem and immediately a LED light will glow near the switch which will help to detect the switches belonging to faulty equipment and then that equipment can be switched off without affecting the others system.

If any part of any machine gets damage or faulted then it takes up to 10 to 20 days to locate actual path & switch of equipments. The person who has the experience will easily detect the problem and he will instruct the person who has responsible for supply of particular equipment to turn off the supply switch.

The person will try to identify the actual switch of the particular equipment for that he has to search various manuals but it is not that easy to do that as there are 'n' number of switches and also manuals are not regularly updated.

Need of this project is not depend on fault condition but it is essential even whenever small faults are developing in

equipments. The skill person will easily identify these small developing faults. So to come over these problem the person will simply swap our designed multi-meter across any equipment and instruct the person at the supply system about the switch which will be easy to locate even when the bond symbols are removed from the switches or the wire have many bunches of wires.

## 2. Previous Work

In past few years, Multimeter has become an area of interest and lot of work had been done on it. The most advanced multimeter was produced by Xu Meng, Li Zhi called “*Design and Realization of Digital Multimeter Module Interface Circuit Based on LXIbus*”[1] in the year 2012. In this paper digital multimeter module (DMM) interface circuit design scheme based on LXIbus is proposed. LXI instrument bus is regarded as a new generation instrument bus, it contains computer network technology. Compared with conventional bus systems in building distributed weapon system, it has an unparalleled advantage, for it solved problems in the test distance limitations of traditional bus. DMM is the most commonly used measurement module in automatic test system, the measurement accuracy and measurement capabilities continue to improve, based on these, this paper designed the DMM based on LXI bus, mainly on the interface circuit design. It uses S3C2440 as the interface circuit using the main processor, and designed external circuit such as the power supply circuit, crystal oscillator circuit, memory circuit and network interface circuit, and achieve interface functions of DMM based on LXIbus.

Huang Jing, Qiao Leline, “*Research of Automatic Digital Multimeter Interface Technology based on UART*”[2] in the year 2012. In this paper the method of serial communication using UART is used in Digital multimeter as multimeter is huge and not compatible automatic digital multimeter provide a serial communication interface to avoid the trouble of moving the instrument hence in this paper the serial communication method using UART is used which helps the user to quickly measure voltage, current online etc which is convenient and easy.

Wang Lei-gao, “*Design of Digital Multimeter Module Based on ARM*”[3] in the year 2010. In this paper design and implementation of digital multimeter module based on ARM is given. The paper describes about the LTC2440 which was employed to conduct high-precision A/D conversion, and S3C2440 which was utilized as the master chip to control analog switch group to carry out

function setting and range switching, and perform data processing and real-time measurement result displaying as well. It was proved that, the digital multimeter module with reliable performance and easy operation, possesses relatively high measurement precision, and can satisfy the measurement requirement of laboratory. The digital multimeter module following the concept of modularization and intelligentization takes direct voltage adjusting circuitry as the base and employs high-precision A/D conversion chip to accomplish the design. The experiment has shown that the multimeter module, the precision of which can reach 5Yz, works steadily and achieves the anticipated design objective.

Xiaoxiang Chen, “*Development of Intelligent Multimeter System Based on LabVIEW*” [4] in the year 2012. In this paper an intelligent multimeter system using 51 series microcontroller C8051F020 as the controlling core is used and the interface module is based on LABVIEW. The system consists of measuring module, storage module, communicating module, gear selecting module, microcontroller module.

This paper focus on the design and realization of intelligent multimeter system. Microcontroller module reads corresponding information from storage module and then generates control signals when one gear is selected by gear selecting module. Receiving the control signals, measuring module measures the signal under test and return the result. An effective value is converted from the result by microcontroller, and send to PC to display in the interface.

Jeff Robins, “*Incorporating Advanced Instrumentation Capabilities into a PXI Digital Multimeter Instrument*”. [5] in the year 2012. This paper discusses the requirements and techniques used to develop a PXI-based, high performance DMM. A review of the required performance parameters is presented along with a analysis of the alternative design methods employed in order to achieve the necessary performance capabilities without compromising the overall capabilities of the hardware.

Areas covered in this paper include a discussion of design techniques which includes the use of multi-function circuitry to reduce overall volume requirements, the conversion of purely analog circuitry into a mixed signal format to reduce volume and power requirements, minimizing power supply noise when replacing a mains-based power supply with isolated and non-isolated DC/DC circuitry and the requirement to operate over an extended temperature range.

### 3. Working

1. Firstly, in this project to the Digital Multimeter we are providing the additional facility for locating a particular application/device switch in the control panel.
2. For the above purpose the multimeter is attached by an transmitter. To this transmitter we have attached an Card Edge Connector.
3. The card edge connectors are inserted into the copper clad. These copper clad card are designed for with different resistances, for that purpose itching is performed on them.
4. As soon as, the card edge connector is inserted into the card a frequency is generated.
5. This frequency is transmitted by the transmitter which we have attached to the multimeter.
6. The receiver, which is placed in the control panel receives this particular frequency and decodes it.
7. Output which we get from the receiver are connected to the Light Emitting Diode placed on the switches.
8. Then the LED on the particular switch glows.
9. Till the multimeter is inserted in the card the led which is place above the switch will glow for the concerned device and we can put off the switch.

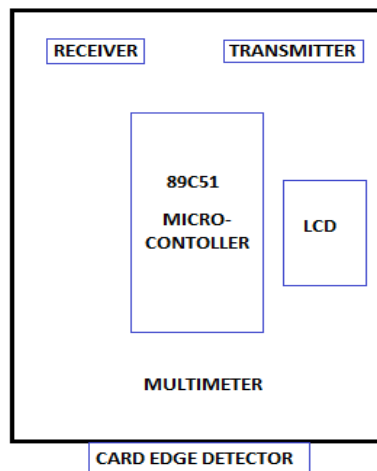


Fig 1 Block Diagram

#### Advantage

- The project is simple in construction and can be installed in every type of machine.
- Power consume is less
- Automatic operation
- Multimeter is easiest to carry.
- This project automatically indicate switch of particular equipment through led in the pannel.

### 4. Result and Discussion

The project is giving good and accurate results. as soon as the Multimeter is inserted in the copper clad card which is placed near the device or any appliances the concerned switch LED for that device in the control panel glows. How we get this result let discuss it briefly. First of all in this project to the Digital Multimeter we are providing the additional facility for locating a particular application/device switch in the control panel. For the above purpose the multimeter is attached by an transmitter. To this transmitter we have attached an Card Edge Connector. The card edge connectors is inserted into the copper clad. These copper clad card are designed for with different resistances, for that purpose itching is performed on them. As soon as, the card edge connector is inserted into the card a frequency is generated. This frequency is transmitted by the transmitter which we have attached to the multimeter. The receiver, which is placed in the control panel receives this particular frequency and decodes it. Output which we get from the receiver are connected to the Light Emitting Diode placed on the switches. Then the LED on the particular switch glows. Till the multimeter is inserted in the card the led which is place above the switch will glow for the concerned device and we can put off the switch. Thus, as soon as the Multimeter is inserted in the copper clad card which is placed near the device or any appliances the concerned switch LED for that device in the control panel glows.

### 5. Conclusion

This project is not depend on fault condition but it is essential even whenever small faults are developing in equipments and we want to find out its switch in the control panel The skill person will easily identify these small developing faults. So to come over these problem for finding its concerned switch the person will simply insert our designed multi-meter across any the copper clad card equipment and instruct the person at the supply system about the switch which will be easy to locate even when the bond symbols are removed from the switches or the wire have many bunches of wires.

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