Designing a Monitoring System for Master Switching Unit (MSU) of a Reputed Telecommunication Company

Wishwanath HPN[1]
Bogoda MHAK[2]

ABSTRACT

This research was done with a reputed Telecom company's Switching Department in Kurunegala. The main objective of this research was to design an accurate and good monitoring system for switching section and supplying uninterrupted service to their customers. This method is low cost easy to handle and repair. The alarm system was developed with the use of relays, transistor, capacitors, resistor, diode, preset, comparator and sensors.

KEYWORDS: Master Switching Unit, Central Processor Subsystem, Remote Switching Units, Extention Line Unit.

INTRODUCTION

The company of internet is the hub of telecommunication in Sri Lanka and represents the role of the National Telecom Service provider for the country.

The motive of the company is to provide telecom services to each and every customer in the country. Telecommunication has undergone a rapid growth in the last five years, and the best example is the improvement in mobility.

Telecommunication becomes a common option in all portions in the society such as residential use, business etc. Special thing is that it becomes a part of our life.

The national transmission network consists of several methodologies. Digital microwave transmission systems are the most widely used techniques. The company started with the telegraph, and the first circuit from Galle to Colombo.

Research Project

The research project is about designing a monitoring system for master switching unit of a Telecommunication company. In the previous alarm system, when a failure occurs the monitoring unit should be sent to the repair center. But in the proposed system worker can make necessary repairs.

This project introduces an easy to use, maintenance and low cost monitoring unit that defectively detects and alarm.

[1] Graduate, Department of computing and information systems, Faculty of Applied Sciences, Wayamba University of Sri Lanka.

[2] Lecturer, Department of computing and information systems, Faculty of Applied Sciences, Wayamba University of Sri Lanka

LITERATURE

Switching

Switching is the process which setting up a connection between subscribers as they can communicate with each other. A switch or an exchange determines that which call to where and the path that traffic should flow.

Early in the past century, switching was done manually. The first telephone switch was installed in 1878 in USA. Those manual switches were controlled by one central office. Today, a call can be made anywhere in the world by just pressing few numbers.

During the early days of telephones, one pair of wires was required to route signals from each individual telephone to a central office where multitudes of operators routed calls from the calling party to the destination.

With the development of electrical and electronic technology number of researches underwent to convert manual switches to automatic. A Strowger invented the first electromechanical automatic switch. With the help of new technology now Stored Program Control (SPC) exchanges and soft switches have arrived.In the company of interest, Ericsson AXE 10 Telecom Carrier Switches and NEAX switches are commonly used.

The Ericsson AXE system is the most widely deployed switching system in the world. It is used in public telephony-oriented applications of every type, including traditional fixed network applications in local, transit, international and combined networks. AXE is also deployed for all major mobile standards - analogue as well as digital.

An Ericsson AXE10 exchange can be split into three main parts which called as APT, APZ, and IOG (called APG in later generations).

APT which handles the call switching, customer access and junction access, contains the following subsystems:

- Subscriber Switching Subsystem (SSS) to provide customer access
- Trunk and Signaling Subsystem (TSS) which deals with junction access
- Group Switching Subsystem (GSS) which handles switching
- Common Channel Subsystem (CCS) which handles signaling

APZ which is responsible for the control in the exchange contains the following subsystems:

- Regional Processor Subsystem (RPS)
- Central Processor Subsystem (CPS)
- IOG which handles the Input and output connections to terminals, printers, alarms, storage devices, and data links contains the following subsystems:
- Support Processor Subsystem (SPS) to supervise the operation of all IOF functions
- Man-machine Communication Subsystems (MCS) to handle communications between input/output devices and the rest if the AXE10 exchange.
- Data Communications Subsystem (DCS) to handle communications over digital links
- File Management Subsystem (FMS)

Types of alarms at master switching unit

There are seven alarms in master switching unit at Kurunegala. They are commercial power failure alarm, DC power urgent alarm, DC power non urgent alarm, Distribution failure alarm, High temperature in battery room alarm, Fire alarm, Battery alarm.

- **Commercial power failure alarm**
  When the commercial power supply fails, an alarm should be fired. (Without considering alternative power supply like generator power). That is called commercial power failure.
- **DC power urgent alarm**
  Power room is equipped with rectifiers. If one rectifier is tripped due to any problem, then the DC power alarm should be fired. This is called as DC power urgent.
- **DC power non urgent alarm**
  When a commercial power failure has occurred, if the battery level is not lower than +47 volts an alarm should be fired, and is called DC power non urgent alarm.
- **Distribution failure alarm**
  AC power distribution to any of the rectifier is stopped due to the tripping off the AC distribution board. That is called distribution failure alarm.
- **High temperature in battery room alarm**
  The battery room is an air condition room, and always the temperature is lower, when temperature of the battery room is increasing an alarm is fired. This is called high temperature in battery room alarm.
- **Fire alarm**
  In case of a fire emergency, an alarm needs to be fired.
- **Battery low alarm**
  Whenever the battery level of the battery bank is lower than 47volts, an alarm needs to be fired, this is called battery low alarm.

METHODOLOGY

Existing system

Kurunegala Master switching Unit has an alarm system, There was a system including seven firing alarms. It was developed used a microprocessor. In some parts are not properly function. 17 Remote Switching Units(RSU) and 18 Extention Line Unit(ELU) are connected to this Kurunegala MSU. First the need for a new monitoring system for MSU identified. How the design should be done for new monitoring system, so the research is divided in to two basic parts. One part will carry out as a survey and the other will be experimental.

Finding out what are the problems of previous alarm system and requirements of a new monitoring system was the primary part of the research. The main problem with the existing alarm system was that some alarms were not working. Other problem was that officers and not have enough knowledge to repair or maintain the existing alarm system. Even for a simple problem, equipment was sent to the repair center. This was a lengthly process which costed a lot to the company.

Finding out alternative solutions

The second and most critical part of this research was to find an alternative solution to exist alarm system, and identifying a better monitoring system. Next was to design alarm set of sample monitoring system circuits. They were check for most effective, low cost and easy to maintain circuit from the group of circuits.

Data collection strategy

Two methods were used of data collection, normally They are primary data and secondary data. Being an experimental research it has less data collections. As primary data the researcher used personal interviews. As secondary data, the researcher used previous records, circuit manuals and used articles related to alarm systems on internet.

DATA COLLECTION & ANALYZING

In switching department the researcher got monthly alarm records. First the collected data was

analyzed. Data gathered using the Records and calculation of percentage values for problems with previous alarm system.
Consider the first week fault which refers to the alarms triggered.

All alarms= commercial power failure +DC power urgent + DC power non urgen + Distribution failure + High temperature in battery room +Fire alar m + Battery low

$$\text{Percentage of correct Occurrence alarms} = \frac{\text{Fired alarm}}{\text{All alarm}} \times 100$$

Days	Percentage of alarm
Monday	75%
Tuesday	88%
Wednesday	68.42%
Thursday	45.45%
Friday	100%
Saturday	52.17%
Sunday	100%

Table1: Percentage of the alarm accurance in considered days

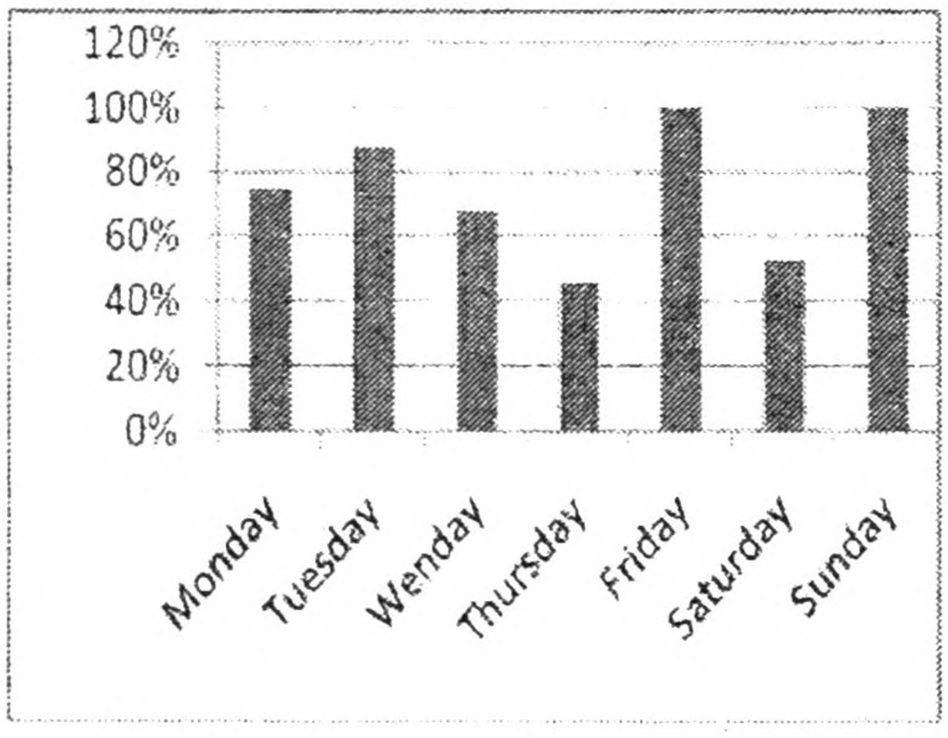

Figure 1: Details of occurrence alarms

From the above equation presentages in the table were calculated. The percentage it shows the existing alarm system is useless for the switching office.

Problems with current alarm system

The following were the frequent problems identified in Kurunegala.

- Number of alarms working limited.
- Some alarms were not working through out.
- Repairing is very difficult
- High cost.

New monitoring system

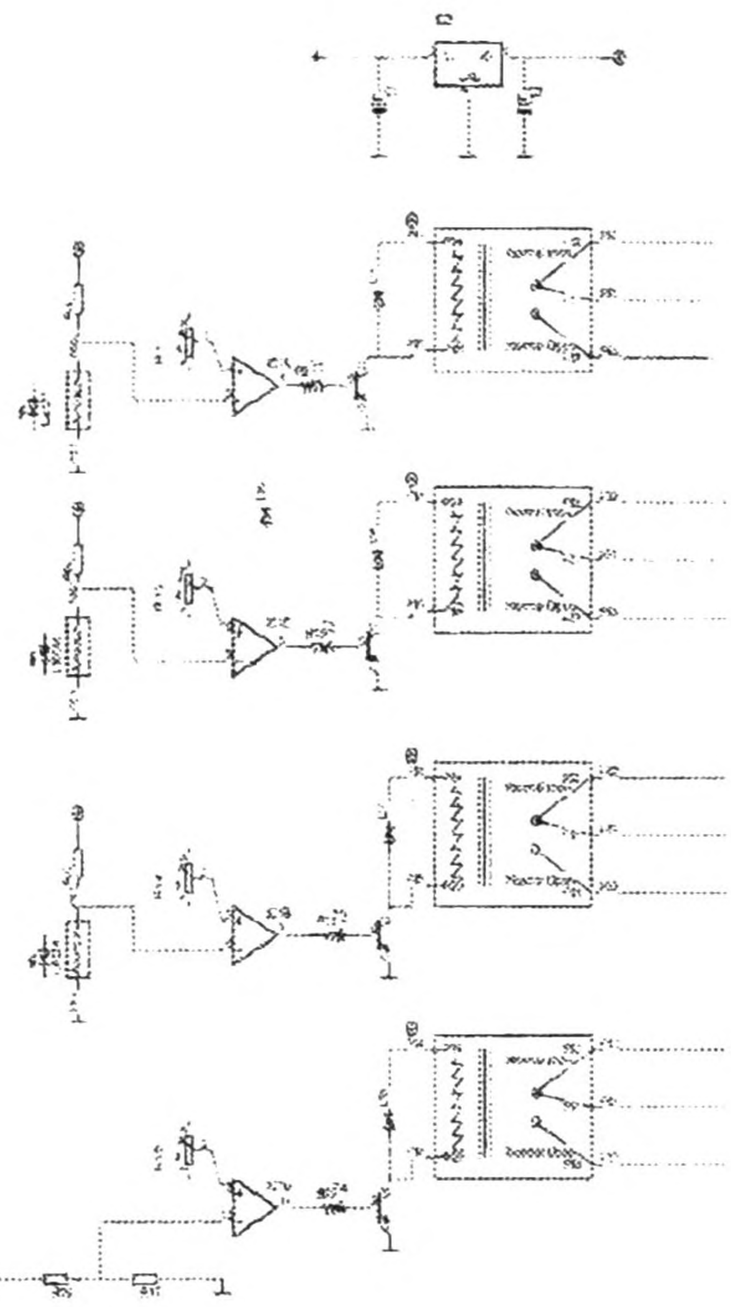

Figure 2(a): Schematic of the Circuit.

The above figure shows the new alarm system which was developed as follows. First a voltage divider is built using 10KΩ and 100Ω. One of the two outputs sent to comparator. The other is sent to the light depend resistor. The output of the comparator is sent to the transistor and from transistor via a diode sent to a relay. The output from the relay is received at the main distribution frame and connected to the alarm card in the MDF. Finally, from the alarm card the output is sent to the switch office.

RESULTS AND DISCUSSION

So considering the table 1 can identify the inaccuracy of the alarm system. Percentage of the occurrence of alarm must be 100% but considering the weekly alarm fault. The occurrence alarm marked two days out of seven days.

Alternative Solutions

1. Repair the existing alarm system

Repairing the previous alarm system is difficult, because existing alarm system microcontroller

programmed alarm system. It was made in Japan. Company switch officers can't repair it. Because they do not have sufficient knowledge to repair it. Alarm needs to be sent it to the repair center or motherland for repair. It takes a long time like few months. It was a big lost for the company.

This new monitoring system is very simple. The researcher used relays, transistors, comparators, capacitors, diodes and sensors. All of the electronic educated people know those equipments.

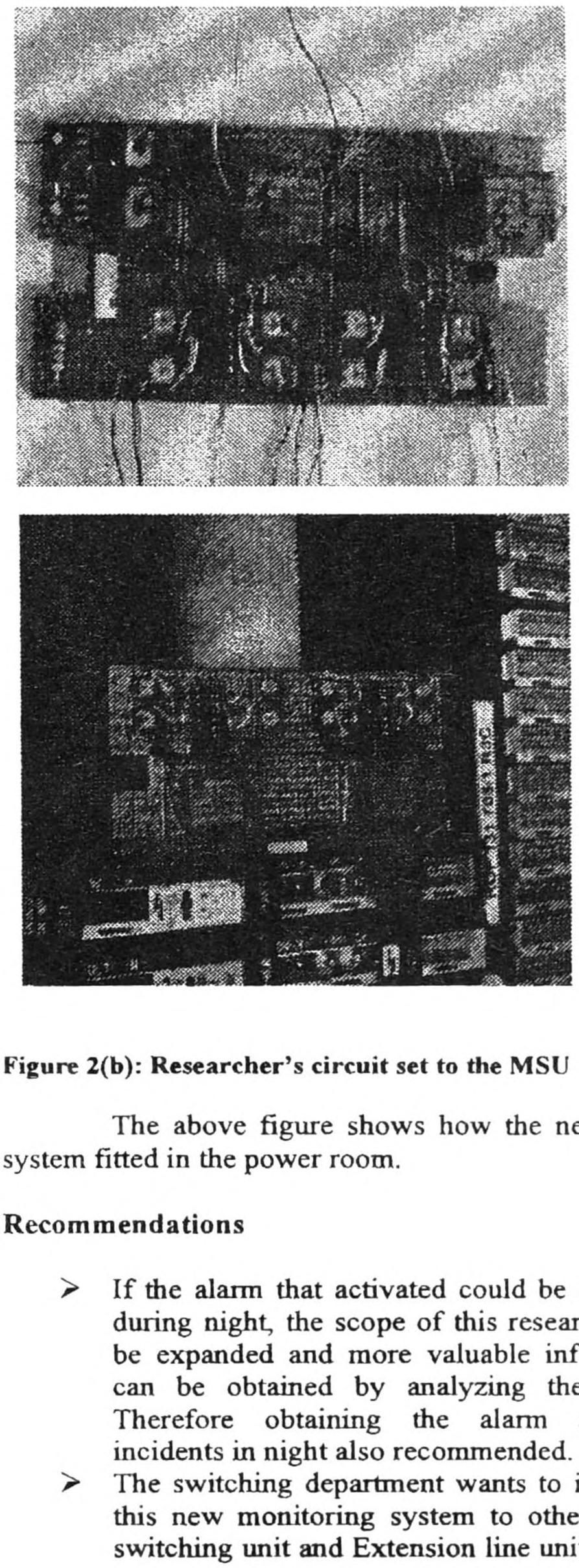

Figure 2(b): Researcher's circuit set to the MSU

The above figure shows how the new alarm system fitted in the power room.

Recommendations

- If the alarm that activated could be observed during night, the scope of this research could be expanded and more valuable information can be obtained by analyzing these data. Therefore obtaining the alarm activated incidents in night also recommended.
- The switching department wants to introduce this new monitoring system to other remote switching unit and Extension line unit as well.

But my training period was limited for six months, could not succeed it.

- This new monitoring circuit's expected life time is less than three years, because the researcher used 230 volts relay. But using a high voltage relay, it can be used for a long time period.

CONCLUSION

It was the first time that the researcher was able to implement an engineering solution to industrial environment and it is for the leading telecommunication industry in Sri Lanka. While researching to design a new monitoring system, he had finished designing the new monitoring system and set it in the switching section. It worked accurately. The entire alarm faults were reported.

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