Design and Implementation of Multi-Core Cable Tester with Multi Analyzer

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DESIGN AND IMPLEMENTATION OF MULTI-CORE CABLE TESTER WITH MULTI ANALYZER

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Abstract—In this paper is presented a brief knowledge and easy quality checking of cable assemblies testing system designed for applications in modern industry. The implementation of the proposed equipment is based on the controller. The central processing board that is used together with a proprietary application. The experimental stand contains a set of specialized connectors used for interconnecting the central system with the ends of the tested cables. Using a predefined set of templates, the system can verify accurately and quickly the correctness of the connections for cable assemblies having multiple wires. The templates used for tests can be configured by the user. Once the system is initially configured, the quality check can be performed in an slim and smart manner[1].The obtained results are presented on a user friendly interface contained by the Proteus software application. The proposed system can be used for testing both signal and power cable assemblies, including flexible interconnection structures.

Keywords— cable assemblies; automated test; templates;

I. INTRODUCTION

There are many types of cables for electric power and telecommunication the interface definition is complex. The connectivity and definition of cables need to be tested in the process of business debugging and usage. Usually people use a multi-metre to complete a short circuit test[2]. In this test, all stitches of the cable should be tested one to one, as shown in Figure 1. There are many problems such as complex operation, long testing time, and no direct test results. In order to improve the test method and to improve the test efficiency, an easy-to-operate and portable telecommunication cable tester is designed to test the connectivity of common interfaces (DB25, DB15, DB9) cable and visually present the test results.

II. BACKGROUND STUDY

Sun He, Jia Chengrui, have described A telecommunication cable tester is designed to improve telecommunication cable test mode and test efficiency at the same time. The telecommunication cable tester implements the cable connectivity test by means of high and low level scanning. By changing the way of circuit composition, it can test the connectivity of cable according to a certain order. The tester adopts a multi-socket terminal box, which is suitable for cables with common interfaces and the test results can be presented intuitively.

Rong Huang, Runhan Wang, have described A work on the design, fabrication, characterization and transmission experiments of a novel bend-insensitive small core diameter graded-index fiber. This fiber is compatible for both multimode transmission between 850 nm to 950 nm and single-mode transmission between 1270 nm to 1330 nm. It has a great potential application as viable transmission medium for current and future data center.

Geon Seok Lee, Gu-Young Kwon, Su Sik Bang, Yeong Ho Lee, Seung Jin Chang, Song Ho Sohn, Kijun Park, have explained the electrical insulation of a high temperature superconducting (HTS) cable, wrapped polypropylene laminated paper (PPLP) tape is typically used. Unfortunately, it is possible that unexpected faults at insulation layers will be present in the cables as a result of either a problematic manufacturing processor an incomplete installation procedure. In order to protect against operational failures of grid-connected HTS cable systems, this paper propose a non-destructive diagnostic technique; time frequency domain reflectometry (TFDR), and focus on the characteristic of HTS cable caused the local insulation defects. To verify the performance of the proposed method, detection and localization of local insulation failure via TFDR is compared with traditional time domain reflectometry (TDR). The experiments are conducted at room temperature and under the liquid nitrogen in order to check efficacy of proposed method in varieties of HTS cable’s conditions.

III. DIAGNOSIS OVER CABLE

Cables are used to connect multiple devices, enabling the passing of electrical power from one equipment to another. Cables are used for multi purposes, and each must be adapted for that purpose. Cables are used extensively in electrically
devices for power and signalling circuits. More distance communication takes place over sea cables.

Power cables are used for mass transmission of alternating and dc power, especially using HT cable. Electrical cables are mainly used in building wiring for lighting, power and control circuits stably installed in buildings.

An electrical cable is an assembly containing of more conductors with its own insulations and variety of screens, appropriate covering, assembly of grading protection. Cables made more flexibility by stranding the conducting wires. In this manner, smaller wires (electronics wire) are twisted together to produce larger wires that are more convenient than solid wires of similar size. [3]

Copper wires in a cable may be without insulation, or they may be plated with a less layer of another metal, most often tin or few of gold and silver are used. Gold, tin and silver are much less level to oxidation than copper, which may increase in life time of wire, and makes easy to soldering.

A. Cables And Electromagnetic Fields

Generally current-carrying conductor, cable propagates electromagnetic field. In same way, any conductor or cable will induce energy from any existing electromagnetic field around it. This phenomenon effects are often unpredictable, in the first case accounting the unwanted transmission of energy which may affect mainly nearby equipment or other parts of the same body of equipment. In the second case, unwanted production of noise which may cover the desired signal being carried over by the cable.

The solution for the first problems is to lay the cable lengths in buildings small length since developing and transmission are essentially relatively to the length of the cable. The solution for the second problems is to lay the cables away from problematically placed. Apart from this, there are particular cable designs that minimize electromagnetic induce and transmission.

Major three techniques are coaxial geometry, twisted-pair geometry and shielding. Shielding makes use of the theory of the electrical Faraday cage. The cable is covered for its entire length in foil or wire mesh.

B. Types

Shielded Twisted Pair (STP): STP is similar to UTP but with each pair covered by an additional copper braid jacket or foil wrapping. This shielding helps protect the signals on the cables from external interference. STP is more expensive than UTP but has the benefit of being able to support higher transmission rates over longer distances. STP is used in IBM token ring networks.

Coaxial Cable: Coaxial Cable was the cable of choice because it was relatively inexpensive, reliable and robust. It consists of central conductor, insulator, braided metallic shielding, outer jacket. The core of a coaxial cable carries the electronic signals and the braided metallic shielding is used to protect the signal from external noise and crosstalk that could cause interference and possibly corrupt the data. Due to this protection, coaxial cable is more resistant to interference and attenuation than twisted pair cabling.

C. Types of Coaxial Cable

Thin-net (10Base2): Thin-net coaxial cable is connected using special connectors and requires to be terminated at each end using a 50ohm resistor. 10Base2 stands for Data Transmission Rate of 10Mbps, i.e. 10 Uses baseband transmission, i.e. Base Used in Ethernet networks it has a maximum cable length of 185 metres, i.e. the 2 for approximately 200 metres.
A: Jacket B: Metal braiding C: Insulator D: Central core

**Thick-net (10Base5):** Is similar in construction to Thin-net, however, there is an additional layer of aluminium insulation and copper braid.

This means that the cable is more rigid and reliable and can be used for longer runs. The thicker the copper core, the further the cable can carry signals.

Thick-net is sometimes used as a backbone to connect several smaller thin-net based networks. 10base5 stands for data Transmission Rate of 10Mbps,

- 10Uses baseband transmission,
- Base Used in Ethernet networks it has a maximum cable length of 500 metres,

the 5 is for 500 metres.

![Thick-net(10base5)](image)

**Fig. 5.** Thick-net(10base5)

**IV. PROPOSED ARCHITECTURE**

The telecommunication cable tester implements the cable connectivity test by means of high and low level scanning. By changing the way of circuit composition, we can test the connectivity of cable according to a certain order. The block diagram is shown in Figure 6. This paper explains about testing of cable health using cable test bench. The position sensing are sensed and delivers signal as output are sent to PIC micro controller where the signals are processed and give the status of the required cable test.[4]

The selector switch is placed on bench, to select the cable various faults i.e. short circuit , open circuit and line interchange. Test output send as message to the person through sound alarm and current condition of the cable health is displayed on the display and web through IoT . This information can be viewed by the person via IoT for knowing the present condition of the cable to proceed the further process like dispatching.

**A. PIR sensor**

The Infrared light radiated from an object is measured by an electronic sensor this sensor is known as Passive Infrared sensor (PIR sensor). The radiation in the form of heat energy with a temperature above the absolute zero limit. Infrared radiations are not visible to human eye but can be detected by some of the designed electronic devices. Working of this sensor is entirely based on the reflection from the object through the detection of infrared radiation. Heat is not detected or measured using this sensor.

![Proposed System Block Diagram](image)

**Fig. 6.** Proposed System Block Diagram

**B. WI-FI module(ESP 8266)**

Wi-Fi technology or Wireless Local Area Network is a wireless transmission medium. The IEEE802.11 has flexibility of mobility of stations and it commonly uses the 2.4 gigahertz (12 cm) UHF and 5.8 gigahertz (5 cm) SHFISM radio bands. The network communication takes place as a part of the radio spectrum that is designed as license free, which is cost effective and requires frequent modification due to minimal wiring and setting the device according to the user.

**C. Selector Switch**

DIP switches are through-hole switches designed in the same mould as a through-hole DIP IC. They can be placed in a breadboard, in the same manner a through-hole IC might, by straddling the centre area. These switches often come in arrays of eight or more separate SPST switches, with tiny little sliding levers. They were widely used in the olden days of computing, but they're still useful for configuring a devices via hardware.
V. IMPLEMENTATION OF PROPOSED ARCHITECTURE

A. Cable Tester Bench Method

In quality control section the multi-core cable are checked by the unit of the cable tester with the following steps:

In this unit display and buzzer are the monitoring and alerting section for the present situation maximum number of 12 core cable can connect and test in this unit, 12 pin fixed near the position sensor which is used to find the availability of the cable in testing area[5]. After satisfying the cable position the cable is tested by means of microcontroller. The signals produces by the sockets based selection of Pins (core), by the way of signal from the controller the following faults are found out

- Open circuit
- Short circuit
- Interchange

Open circuit:

Open circuit may happen one to the broken of the conductor in between the cable.

Interchange circuit:

Interchange circuit may happened one of the conductor is connected to another conductor in between the cable.
B. Passive Infrared Sensors Method

Passive Infrared Sensors have multiple variables which affects its input and output and that is the reason why these sensors are complicated. Two slots are present in the PIR sensor, where each slot is made of a special material sensitive to IR. The lens used here basically checks the sensors sensitivity. The slots detects the same IR when its idle. A positive differential change between the two halves are identified when a warm body such as humans or animals pass by similarly when there is negative differential change then it is understood that the warm body has left the sensing area. This is what detected by the Passive Infrared Red sensor.

Fig.11. PIR sensing material
The above Fig.11 describes the sensing material used for movement detection. It’s a JFET type with very low noise and has high impedance.

VI. CONCLUSION
With the increasing the productivity quality must be maintained accordingly. The manual error may acquire because of the cable assemblies considered as distributed interconnection structures & wear and tear. Using a predefined set of templates, the unit can verify accurately and quickly the correctitude of the connections for cable. The templates used for tests can be configured by the user. The application for controlling the test system considered many features from the Proteus software development environment, including an very fast and easy implementation correlated with a best versatility and a very user friendly interface for the proposed design. For extending the number of physical connectors used for attaching the cable assemblies to the testing unit, a higher speed data acquisition speed and a input multiplexer must be employed.

VII. REFERENCES