A Kind of New Designing Method About High Speed Optical Network Auto Protect Switch System

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Abstract. In this paper, we research and develop a new type of optical fiber based on high-speed switching FPGA routing automatic protection switching device, its innovative USES high-speed electronic SWITCH high-speed exchange of FPGA design, will be 0 to 10 g digital optical signal photoelectric conversion amplification and rearrangement of the equipment selected by the high speed switching FPGA SWITCH protection, can for any important 0 to 10 g optical signal circuit after transformation (1 + 1) send after protect rearrangement of amplification, adopt concurrent optimization of transmission mode, automatic selection of high quality circuit signal in the microsecond time complete electrical SWITCH (far superior to the traditional common optical SWITCH SWITCH time), based on the development of commercial products for the national grid ehv transmission network users with high reliability, high performance of 0 to 10 g optical signal transmission channel protection. If there is no insertion loss, does not affect the original light path, also used in long-distance optical network transmission protection system in the west and subvert the traditional light path switching apparatus for at least 2 ~ 5 DBM large insertion loss. It overcomes the disadvantage of the traditional optical switch protection device.

Preface

In the information age, modern large-capacity communication optical cable network has been connected to thousands of households. But in the increasingly fierce competition in the telecommunications market, only the large capacity communication ability is not enough, more important is the service quality and network performance, such as the core of competition, a good network performance for supported the communication of every customer to provide security. So should adopt what kind of technical measures and schemes to ensure large data of fiber optic cable without blocking, especially the important communication transmission main, thus protecting the fundamental interests of the users, and is an important issue we face.

In has been built long and large capacity of the backbone of high-speed optical fiber communication online to realize secure communication, in addition to the transmission equipment factors, consider above all is physical routing optical transmission implement automatic protection technology solutions, the second solution should be safe and reliable, protection quickly, with a strong resistance to disaster, and blocking resistance, and needs less investment, effective, is becoming more and more important in network security highlight today, which are highly valuable in application promotion.

Protection Technology Introduction

The Self-healing Technology of the Optical Path SDH System

The classical protection of SDH has been widely accepted. Through the network structure of SDH self-healing ring, the nodes in the ring can flexibly move up and down the circuit according to the
demand of the traffic. At the same time, the circuit can be 100% protected, without human intervention, the network can automatically recover business from the failure of failure, thus realizing the self-healing function.

However, it is closely related to the signal and software, and it needs to be protected by the four cores of the ring. The cost is high, and the equipment of the same manufacturer is required to be used on both the multi-end and the Internet. The limitation is very large.

**Manual Scheduling Protection**

Alleged artificial scheduling protection, it is the obstacle in the optical fiber, according to cable contingency plans, through engineering and line units to cooperate, use the same other optical cable circuit circuitous scheduling, the artificial way to repair cable business using the system. Artificial scheduling protection need strong support and actively cooperate with engineering department, and manual electric road not only requires to have attendant is present, the personnel on duty at the same time to have a certain circuit repair operation level of consciousness, and hands-on ability. According to the current maintenance system, the municipal department has professional maintenance personnel, which can meet the above requirements; But for none of duty station and county township of relay station room, due to the comprehensive maintenance, on duty personnel technical level and practical ability are than cities of maintenance personnel, in fault occurs, therefore, cannot meet the requirements of artificial rapid pour electricity road, business recovery for a long time.

**Automatic Switching Protection Technology**

Light path automatic protection switching technology is based on optical fiber transmission of power change automatic analysis of real-time monitoring and alarm information, to find fault and hidden danger in time, in the event of a serious fault, quickly will automatically switch to the standby channel, working light path in a very short period of time to restore the communication, complete the cable fault mechanism of quick response and recovery.

The protection technology has two basic implementation modes:

1) it is commonly used in 1X2 and 2X2 mechanical optical switching devices, but the traditional optical switch protection device has the disadvantages of large insertion loss and long reversal time.

2) using high-speed switching ASIC SWITCH high-speed switching SWITCH, due to the electronic level than mechanical level rearrangement of speed, and enlarge regeneration function, so this paper particularly discusses the principle and the advantages of this kind of exchange SWITCH technology.

**Implementation Principle and Implementation Mode of This Research**

Structure design of this study is shown in figure 1, the signal to send and receive function of high-speed cable protection device, electronic switch mode is applied to the same has to send and receive and transmit signal cable terminal equipment, the main use of the function and the standby cable between the terminal equipment, and through the man-machine interface and peripheral signal transmission and control PC, its composition (as shown in figure 1) include: the first light turn electricity unit, a second light turn electricity unit, high-speed signal intersection switching unit, 3 r amplifier unit, equipment monitoring and control unit, Dian Zhuan light unit and power supply unit;

First light turn electricity unit receives the main cable sent by the Lord use fiber optical signals and transformation is given priority to electrical signals sent to the high speed crossing switching unit, at the same time send light turn electricity main status signal to device control units; Again, second light turn electricity unit receives the spare cable sent by spare cable light signal is converted to a standby electrical signals sent to the high speed signal and cross switch unit, at the same time send light to turn electric standby state signals to equipment monitoring unit;

And the twice are designed to facilitate the processing of signal by hardware circuit, which comprises Optical sub-module (Optical Subassembly; OSA) and electronic submodule (Electrical Subassembly; ESA) two large parts; First of all, the optical submodule is made up of gallium
arsenide (GaAs), phosphating indium (InP), gallium arsenide (InGaAs), etc., to form optical signals. The electronic sub-module contains the transmission drive IC and the receiving drive IC, respectively, which can be used to drive the laser diode and the secondary tube of the detector to form an electrical signal. The optical signals that the winner USES as a spare cable can be converted into electrical signals.

Equipment monitoring unit is composed of network management board, CPLD and MPU, MPU described receive light turn electric main state signal and light turn electricity standby signal processing for switch control signal and the CPLD is sent to the high-speed signal cross switching unit; If equipment monitoring unit itself has not sent automatically switching control signals to the high-speed cross switch unit, the peripheral PC according to light turn electric main state signal and light turn electricity active standby signal send high-speed switching control instruction signal cross switching unit.

High-speed signal cross switch unit is composed of comparator, the microprocessor and the electronic switch, the microprocessor according to the control signal to the main electricity switch signals and the standby signal quality judgement and comparison, if the main electricity signal and the standby signal is present, the main electrical signal through the comparator selection and standby electrical signals in the current value the big electrical signal all the way as the cable terminal equipment needed to transmit electrical signals transmitted to the electronic switch; The electronic switch is composed of two triode gate circuits, and the control electrode of the electronic switch is controlled by the microprocessor control 0 or 1 output control.

Specific network implementation of multi-channel switch and if necessary, can be used in a unitary system structure, the first and second photoelectric conversion unit, electro-optical conversion unit, switch signals 3 r amplifier unit, high-speed intersection, passive spectral road units, equipment monitoring unit and power supply unit and external display device has become an organic whole. At both ends of two optical transmitter device inserted between two high speed protection device, electronic switch light on two high-speed electronic switch protection device access between a pair of protection with the spare cable, which can be implemented in the main cable and nondestructive automatic instantaneous switching between the spare cable. And monitor the state of the equipment remotely, and protect the stable operation of power communication equipment.
Program Summary and Application

This programme and the equipment developed have been successfully applied to the state grid's ultra-high voltage power grid, some provincial-level power, telecom and other special line services or other important optical transmission services. The light switch in the use of improved the security of the important optical network, on the technology to meet the alternate routing channels, light cutting rate when access to the attenuation of offset, light channels of network monitoring, etc.

Development Prospects

The optical path protection system based on MSXIM ASIC SWITCH is designed for optical route fault, which is completely independent of SDH system and the network element equipment of DWDM system. The switching protection network can be formed in the case of a standby optical fiber routing or idle wavelength channel. It is proved by practice that light automatic switching protection has the advantages of fast reliability, safe and flexible and strong business recovery ability. At the same time, it provides a practical, safe and economical solution for the non-blocking communication of the main line optical network with the cooperation of switching protection network and SDH equipment network.

Future for escalating in the optical transmission network such as telecom, electric power, we will further provide more solutions and equipment of large higher rate, complex, and the condition of cable equipment model of optical fiber transmission network, based on the 3r SWITCH chip than SDH ring optical fiber automatic protection switching field protection, optical SWITCH, the use of more prospects; That in turn promises to make the network faster, better, and safer. Therefore, the prospect of automatic switching protection based on high-speed 3R SWITCH chip is more promising.

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