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A PATH FOR HORIZING YOUR INNOVATIVE WORK

PC TO PC OPTICAL FIBER COMMUNICATION SYSTEM

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Abstract- The use of optical fiber in field of computers and electronics is a topic of recent research interest [1]. Revolution will take place rapidly in the field of communication in near future on replacing the metal wires linking between components in normal computers with faster and more efficient optical fiber lines. Optical fiber has immense capability to transport signals(data) having much larger information, over much longer distance communication at much higher speed with less losses compared to the metal wires. The principles of working of optical fiber along with the benefits of optical fiber communication are presented. Limitations of Von Newman architecture and metal wire interconnection in conventional computers system are presented along with how they are got rid of by employing optical fiber interconnection in optical computers [6]. Applications of optical fibers in the field of communication and networking including PC to PC communication, computer networks, internet and computing are covered in this. The development of optical transmitters and receivers circuit for transmitting and receiving 0-15 V analog signal in optical fiber cable is presented, which shows a direct relation between input signal transmitted and output signal received [5]. This project PC to PC fiber optic communication deals with data transfer from one computer to another computer. It uses the serial ports of the Computer [8]. MAX 232 IC is used to convert RS 232 logic to TTL logic and then an optical transmitter circuit is used to transmit data via fiber optic cable. The optical transmitter circuit has a optical transmitter (SFH756v) which is matched as far the cable and MAX232 is concerned. At the optical receiver circuit an optical receiver (SFH350v) and a MAX 232 again to convert TTL logic to RS 232 for the serial port at the receiving end computer [2]. The desired baud rate can be set. Fast data transfer is the need of today's era. Most of people can use internet for this. But presently it would consume more time. One can also use wireless medium for data transfer. But then its cost will be affected. The need, therefore, is felt for optical fiber communication which is cheaper and more suitable for the task. Optical communication is cheaper than wireless communication and the losses are very less than wireless.[4] Optical fibers have their own advantages: larger bandwidth, high speeds, low cost. Therefore, we need to implement optical fibers for LAN and internet. This project can be used to chat between two PCs. It can help transfer files at the desired speed between two computers. If we expand further, a network of computers can be connected as it is observed in the cable net available today. The optical fibers can replace the conventional LAN cable as it can provide much higher speeds and also larger information bearing capacity.[6]

Keywords:- Adder, Ripple carry adder, Carry look-ahead adder, VHDL code

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INTRODUCTION

A fiber-optic communication system is similar to the copper wire system that optical fiber is replacing. The difference is that optical use light pulses to transmit information down fiber cables instead of using electronic pulses to transmit information down copper wires. Looking at the components in an optical fiber chain will give a better understanding of how the system works in conjunction with wire based systems. At one side of the system is a transmitter circuit. This is the place of origin for information coming on to optical fiber cable. The transmitter accepts coded electronic pulse information coming from copper wire. It then processes and converts that information into equivalently coded light pulses. A light-emitting diode (LED) or a photo transistor can be used for generating the light pulses. A photo diode is used for reception of a light pulses [10].

In the internet communication, fiber optics network has taken a major role, allowing broadband communications with audios, videos, data and microwaves all traveling along the same fiber optic cable, creating the so called internet revolution.[3] Optical fiber has tremendous capability to transfer signals having larger information, over much longer distances and at much higher speed with less losses and distortions than the copper wire link. Metallic wire offer resistances and capacitances, which are proportional to their length and its RC time constant places a fundamental limit on the maximum data bit rate as well as the distance signal can be transmitted.[5] Fiber-optic cables have the ability to transmit both electrical and computer data simultaneously, adding to the cables versatility. Optical fiber has potential to act as an excellent interconnector for computer applications.

I. BLOCK DIAGRAM:

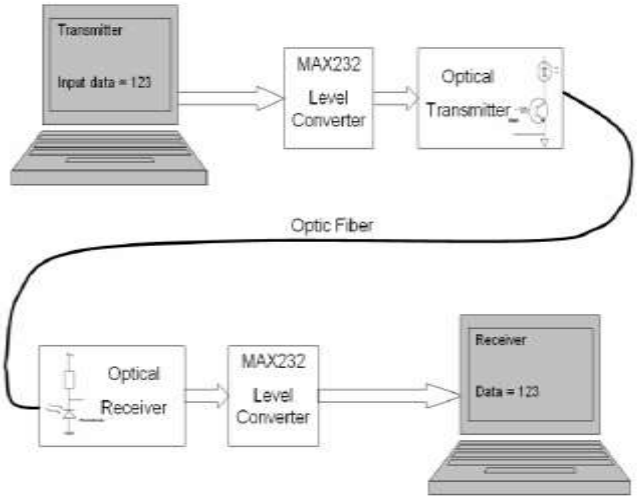

Fig: Block Diagram of PC to PC Communication Using Optical Fiber Cable

II. TRANSMITTER:

Data signals transmitted through pin no.3 of 'DB9' connector of RS-232 COM port are sent to pin8 of MAX232 and it converts these RS-232 compatible levels of +9V or -9V to 0/5 volt TTL logic levels. The output of MAX232 drives the npn transistor 2N2222 through a bias resistor of 1k ohm, to SFH756v optical transmitter [7]. Here actually when the output of

MAX232 is 0V at that time the npn transistor will be conduct. And when the output of MAX232 is 5V at that time the npn transistor will not conduct it is in cut-off region. We can use laser diodes or LED for the transmitter. Both have their own advantages and disadvantages. But LED's are more reliable and also cheap, so we will be using a LED. [9]

There are several different schemes for carrying out the modulation function. These are respectively: Intensity Modulation, Frequency Shift Keying (FSK), Phase Shift Keying (PSK) and polarization, modulation. Within the context of a premise optical data link the only one really employed is intensity of modulation. It must be noted that one reason for the popularity of modulation is its suitability for operation with LED's. An LED or photo transmitter can only produce incoherent optical power. Since Intensity of Modulation does not require coherence it can be used with an LED or photo transmitter.

SFH756v

Fig: SFH756v

Features: 2.2 mm Aperture holds Standard 1000 Micron Plastic Fiber, No Fiber Stripping Required, Good Linearity (Forward current > 2 mA), Molded Micro lens for Efficient Coupling.

Plastic Connector Housing: Mounting Screw Attached to the Connector, Interference Free Transmission from

Light-Tight Housing, Transmitter and Receiver can be flexibly positioned, No Cross Talk, Auto insertable and Wave solderable , Supplied in Tubes

Applications: Household Electronics, Power Electronics, Optical Networks, Light Barriers.

III. Receiver:

The photo transistor detects the light signals. The detected TTL logic levels (0/5V) signals are coupled to pin no.10 of MAX 232 IC .These TTL levels are converted to +9Vor -9V logic levels internally &output at pin no. 7. A LED at pin no. 7 of MAX232 IC indicated that the signals are properly received. Pin no. 7 is also connected to pin no.2 of pin no.9 ‘D’ connector used for the serial port in the computers, so that the data may be read .The optical signals received by the photo receivers are converted to electrical pulses and both the computers “thinks” that there is null modem cable connected between them. The Receiver circuit serves two functions. First, it must sense or detect the light coupled out of the optical fiber cable then convert the light into an electrical signal. Secondly, it must demodulate this light signal to determine the identity of the binary data that signal represents. In total, it must detect light and then measure the relevant information bearing light wave parameters. An optical receiver is generally designed with a optical transmitter. Both are modules within the same package. The very heart of the receiver is the means for sensing the light output of the fiber optic cable. Light is detected and then converted to an electrical signal. The demodulation decision process is carried out on the resulting electrical signal converted via

light signal. The light detection is carried out by a photo receiver. This senses light and converts it into an electrical current.

SFH350v

Fig: SFH350v

Features: 2.2 mm aperture holds standard 1000 micron plastic fiber, No fiber stripping required, Good linearity, Sensitive in visible and near IR range, Molded micro lens for efficient coupling**.**

Plastic Connector Housing: Mounting screw attached to the connector ,Interference-free transmission from light-tight housing ,Transmitter and receiver can be flexibly positioned ,No cross talk ,Auto insertable and wave solderable ,Supplied in tubes**.**

Applications: Household electronics, Power electronics, Optical networks, Medical instruments, automotive electronics, Light barriers.

IV. Why Serial Port?

Serial cables can be longer than parallel cables. The serial port transmits a '1' as -3 to -25 volts and a '0' as +3 to +25 volts where as a parallel port transmits a '0' as 0V and '1' as 5V. Therefore the serial port can have a maximum swing of 50V compared to the parallel port which has a maximum swing of 5 Volts. Therefore cable loss is not going to be as much of a problem for serial cables as they are for parallel. You don't need as many wires as parallel transmission. If your device needs to be mounted a far distance away from the computer then 3 core cable (Null Modem) is going to be a lot cheaper that running 19 or 25 core cable. However you must take into account the cost of the interfacing at each end.

V. 9 - PIN CONNECTOR:

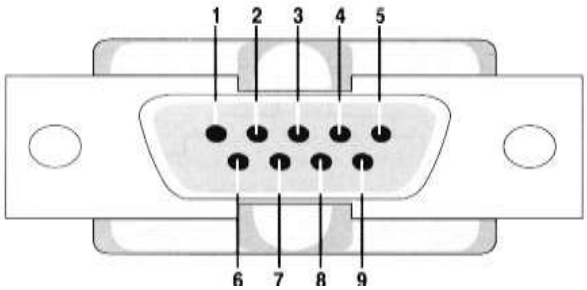

Fig: DB9 Connector

1. Carrier Detect - Determines if the modem is connected to a working phone line.
2. Receive Data - Computer receives information sent from the modem.
3. Transmit Data - Computer sends information to the modem.
4. Data Terminal Ready - Computer tells the modem that it is ready to talk.
5. Signal Ground - Pin is grounded.
6. Data Set Ready - Modem tells the computer that it is ready to talk.
7. Request To Send - Computer asks the modem if it can send information.
8. Clear To Send - Modem tells the computer that it can send information.

9. Ring Indicator - Once a call has been placed, computer acknowledges signal (sent from modem) that a ring is detected.

VI. MAX-232 LEVEL CONVERTER IC:

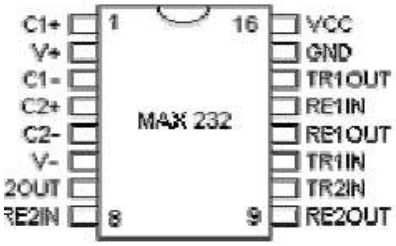

Fig: MAX-232 IC

Almost all digital devices which we use require either TTL or CMOS logic levels. Therefore the first step to connect a device to the RS- 232 port is to transform the RS-232 levels back into 0 and 5 Volts. And this is done by Two common Level Converters are the 1488 RS- 232 Driver and the 1489 RS-232 Receiver. Each package contains 4 inverters of the one type, either Drivers or Receivers. The driver requires two supply rails, +7.5 to +15v and -7.5 to -15v. Another device is the **MAX-232.** It includes a charge Pump, which generates +10V and -10V from a single 5v supply. This I.C. also includes two transmitters and two receivers in the same package. This is handy in many cases when you only want to use the transmit and receive data lines. You don't need to use two chips, one for the receive line and one for the transmit line. However all this serviceability comes at a price, but compared with the price of designing a new power supply it is very cheap. There are also many variations of these devices. The large value of capacitors is not only bulky, but also expensive. Therefore other devices are available which use smaller capacitors and even some with inbuilt capacitors. However the MAX-232 is the most common.

VII. CONCLUSION

Optical fiber vs. copper: the choice is clear		
	Optical Fiber	Copper
Capex Cost (2,000-user optical LAN)	< $300,000	>$1,000,000
Lifecycle	30-50 years	5 years
Distance	12 miles	300 feet
Weight (per 1,000 ft.)	4 lbs.	39 lbs.
Energy Consumed	2 watts per user	more than 10 watts per user
Maximum Bandwidth	69 Tbps	10 Gbps
Security	Hard to tap, easy to alarm	Emits EMI

The comparison of an optical fiber cable with a conventional copper cable is shown above it covers various parameters to clearly show that which is the better choice. Recent advancements in fiber optics technology have reduced signal degradation to such an extent

that regenerations of the optical signals are only needed to transport over distances of hundreds of kilometers. Optical fiber is more secure to the EM interference. But, fiber-optic can save money for network users in the long run as it is having life of more than 20 years, because it needs less maintenance and takes lesser fiber-optic cabling than coaxial cables or Ethernet cables as well as lesser number of switches and routers to create the same size network. It should be noted that, traditional copper wires or coaxial cables needs separate lines for transmitting data with a single optical fiber cable having diameter approx equal ton human hair.

A lot of research is going on worldwide to use silicon photonics at the motherboard level and the development of low cost lasers, low cost-receivers and associated optical components like optical switches, waveguides, optical routers and detectors are topic of focused area of current interest. It is expected that while fully optical computer may take some more time for commercial utilization, hybrid computer employing some optical components with existing electronic hardware will come to market soon.

REFERENCES

1. Raghavendra A.M.V, Srinivasas Rao B.V, “Fiber Optics Based Parallel Computer Architecture,” International Journal of Scientific & Engineering Research, vol. 1, Issue. 2, pp. 1-10, Nov., 2010.
2. Gerd Keiser,Optical Fiber Communications, 4thedition, Tata McGraw-Hill, 2008.
3. Alwayn, Vivek, Fiber-Optic Technologies. Cisco Systems, 12- 31(2006).
4. G.Agrawal,*"Fiber-Optic Communications Systems"*, Third edition, Academic Press, 2002.
5. J. P. Javaudin and M. Bellec, "Technology convergence for future home networks," in Wireless Days, 2008, 1st IFIP, 2009, pp. 1-5
6. T. Kamalakis, I. Neokosmidis, A. Tsipouras, S. Pantazisand I. Andrikopoulos, "Hybrid free space optical/millimeter wave outdoor links for broadband wireless access networks," in Personal, Indoor and Mobile Radio Communications, IEEE 18th International Symposium on, 2007, pp. 1-5.
7. Xiang Yang, Yang Hechao,*”The Application of OptiSystem in Optical Fiber Communication Experiments “*, Proceedings of the Third International Symposium on Computer Science and Computational Technology (ISCSCT ’10), pp. 376-378, August 2010.
8. Fok MP, Wang Z, Deng Y, Prucnal PR. Optical layer security in fiber-optic networks. IEEE T Inf Foren 2011; 6(3):725_36.
9. K. Kazaura, K. Wakamori, M. Matsumoto, T. Higashino,K.Tsukamoto and S. Komaki, "RoFSO: A universal platform for convergence of fiber and free-space optical communication networks," Communications Magazine,IEEE, vol. 48, 2010, pp. 130-137.
10. O. Bouchet, M. El Tabach, M. Wolf, D. C. O'Brien, G.E.Faulkner, J.W. Walewski, S. Randel, M. Franke, S.Nerreter, K.D. Langer, J. Grubor and T. Kamalakis,"Hybrid wireless optics (HWO): Building the next generation home network," in Communication Systems, Networks and Digital Signal Processing, 6th International Symposium on, 2008, pp. 283-287