

Concept of Earth Wire based Communication System

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Abstract : In this era of digital world, communication plays the backbone structure for our systems as from our daily activities till the industries communication is used in different forms and in different ways to fulfill the requirement for the developing technology for human. For powering different machines, equipment or devices generally electrical supply is provided through the mains wiring consisting of the phase or phases with neutral along with the earth wire for the protection of the user from leakage current or fault current occurred in the equipment or casing ⁽¹⁾⁽⁴⁾⁽⁷⁾. Communication method based on the earth wire in the electrical installation is proposed in this paper.

Keywords: Communication, Communication system, Earthing, Encoder- decoder, Microcontroller, Processing Unit.

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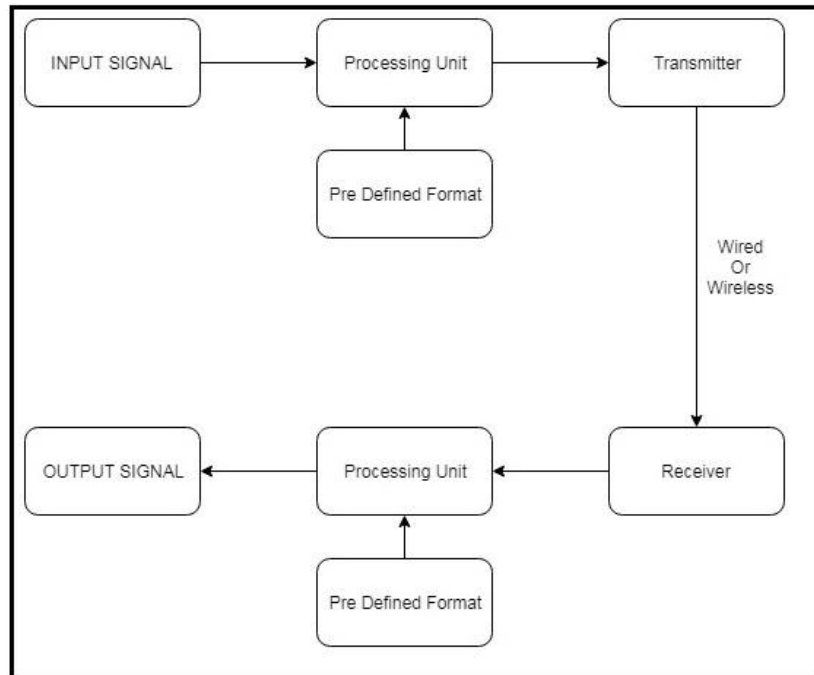
I. Introduction

In electrical installation it consists of the single phase wire or three phase wire with the neutral wire and earth wire laid all along your load points and other ends are connected to the energy meter passing from safety devices installed for protection as earth wire is also used for the protection against the leakage current or the charge stored on the equipment connected to the mains which basically earth the current through the conductor passing by earth electrode ⁽¹⁾⁽⁴⁾⁽⁷⁾. At the time of the healthy condition the earth wire of the installation is not used as it serves only purpose to earth the leakage current at the time of the faulty condition so where the communication is utilized in order to control the electrical mains power it is wise option to use the earth wire as the communication medium whose method is explained in our paper.

II. Basics of Communication System

A simple structure showing the fundamental principle as a block diagram of system is shown in fig 2.1 representing the working behind how the data or a control signal in transferred from a given point (transmitting) to the receiving point ⁽²⁾⁽³⁾⁽⁵⁾⁽⁶⁾.

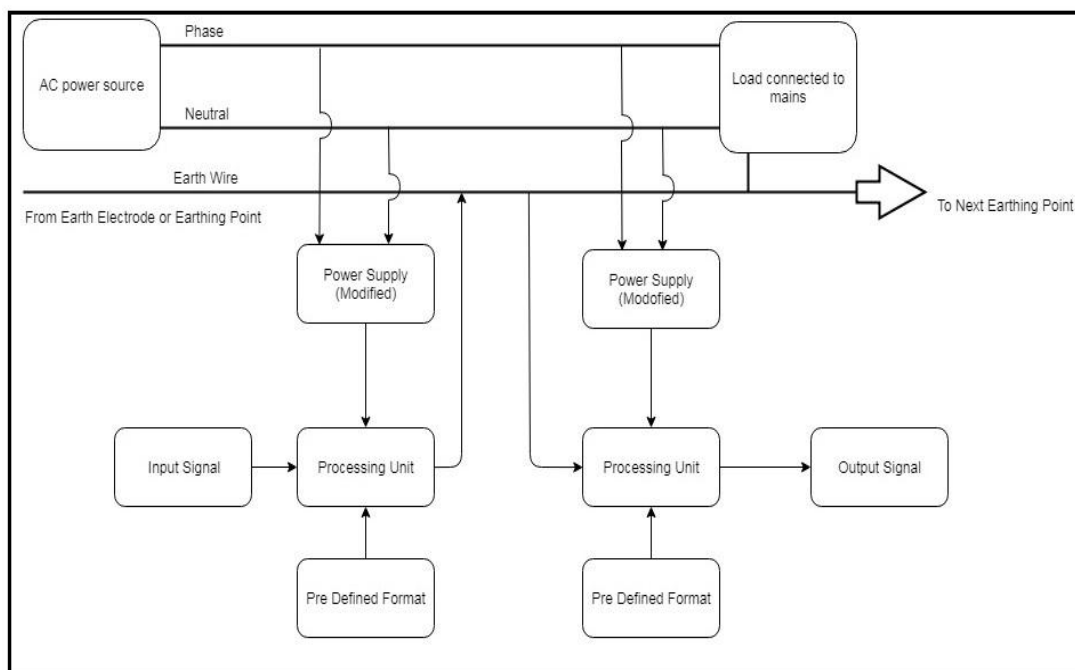
Generally a input signal is feed into the microcontroller or the encoders where the digital form of the input signal is formatted into the pre-defined format which is designed so that of transmission of that output from the microcontroller or the encoders are easy to transmit which is in a digital form in string or a packet format transmitting serially to the receiver side through the wired or the wirelessly through this transmission medium the receiver gets the data or the control signal in the encoded format which is decoded with respect to the pre-defined format in the microcontroller or decoder section and the output from it serves the data or the control signal feed in the input section of the transmitter section.



(Fig 1. Block Diagram of Basic Communication System)

III. Basic Concept Behind Earth Wire Communication

The fig 3.1 represents the basic model of the arrangement for the earth wire based communication system. Input signals are provided to the processing unit which is powered by a power supply(Modified) from the mains line(in order to prevent the short circuit condition when the two source are synchronized with each other modification are made in supply where neutral as common ground sharing connection is kept), the output of the processing unit is feed to the earth conductor looped in the electrical installation and as the data transmitted by the transmitter is collected by the receiver section through the earth wire . Receiving section collects the data in the encoded form and decodes it using the decoder or microcontroller with its pre-defined format and the output signals or the data is obtained from its output which is generally in the digital form.



(Fig 2. Block Diagram for Earth Wire Communication System)

IV. Basic Working for Practical Communication Unit

As discussed in the III in the transmitting as well receiving unit it consists of the microcontroller or encoder/decoder based digital preprogrammed IC which serves the purpose of converting the input signal from user to the encoded pre-defined format and send to the transmitting medium and at the receiving end it is performing the vice versa function of decoding the encoded data in the normal user format received from the transmitting unit.

For the simplicity of the unit the Encoder and decoder are used which will provide the base function of this system here as for the addition of the extra feature like password protected transmission it can be executed by the microcontrollers⁽⁸⁾⁽²⁾.

V. Some Advantages Along with Application

Transfer of the data from one point to another in a closed earth conductor installed in electrical installation can be utilized as the medium for the communication, it can be also further more developed into the automation sector for the domestic purpose as in that main part of communication can be done effectively using this methodology as well as this can be useful in the alert system like fire alarm, etc. where the immediate signal all over the place or the building is the most prior thing to be performed as that is emergency situation and it can be executed by signaling through earth wire.

If further more development in this method may give the way to replace the PLCC as in the plcc the Losses are occurred as signal in the mains line where as it can be executed by this method using the earth conductor.

VI. Conclusion

After studying the need of the communication system and the earth wire it can be conclude as the method discussed above might be effective choice for automation and has a better scope for the new method of the communication as well as modification can be made easily due to its digital structure and scope for this method is vast as it gives the advantages of wired communication as noninterference of the third party as well as it also gives the advantage of the wireless communication as no need to provide the extra medium for the transfer of data as in this method earth wire fulfill that requirement.

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References

Journal Papers:

- [1]. Ajayi,A1 Jerome,D.K2, Osayi F.S3 and Izugie F.I4 **Understanding the Concept of Earthing In Electric Power System Engineering**, *IOSR Journal of Electrical and Electronics Engineering (IOSR-JEEE)* e-ISSN: 2278-1676,p-ISSN: 2320-3331, Volume 11, Issue 3 Ver. III (May. – Jun. 2016), PP 29-33www.iosrjournals.org
- [2]. Pradeep Giri11, Hardik Dhanmeher2,Ajay Shingade3, Akshay Shelke, Prof Dimple Bafna 5 **Controlling Lights Using Bluetooth** *IOSR Journal of Engineering (IOSRJEN)* www.iosrjen.org ISSN (e): 2250-3021, ISSN (p): 2278-8719 Volume 7, PP 58-61
- [3]. **PROBIR K. BONDYOPADHYAY, SENIOR MEMBER, IEEE INTRODUCTION TO “RADIO COMMUNICATION”, INVITED PAPER**
- [4]. N.A.Sundaravaradan, M.Jaya Bharata Reddy, How is Earthing done? published in IEEE Potentials, vol. 37, no. 2, pp. 42-46, March-April 2018 doi: 10.1109/MPOT.2014.2387131
- [5]. **DIDIK HARIYANTO, ARIADIE CHANDRA NUGRAHA, ANDIK ASMARA**, DESIGN AND DEVELOPMENT OF AN ASYNCHRONOUS SERIAL COMMUNICATION LEARNING MEDIA TO VISUALIZE THE BIT DATA, *JOURNAL OF PHYSICS CONFERENCE SERIES* 1140(1):012010 · DECEMBER 2018
- [6]. Ms.Neha R. Laddha*, Prof. A. P. Thakare A Review on Serial Communication by UART Volume 3, Issue 1, January 2013 ISSN: 2277 128X International Journal of Advanced Research in Computer Science and Software Engineerin g

Chapters in Books:

- [7]. <https://www.usbr.gov/ssle/safety/RSHS/appC.pdf> article
- [8]. <http://eie.uonbi.ac.ke/sites/default/files/cae/engineering/eie/ABSTRACT%20final.pdf>

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