

# **Development of PROFIBUS Analog IO Using ASIC VPC3+S for Industrial Communication**

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**ABSTRACT:** PROFIBUS (Process Field Bus) DP is the most used field communication bus in the worldwide industry. The increasing use of this field bus network protocol in industrial plants PROFIBUS Analog Input Output Module is used to monitor the different errors occurring and to build the network in the huge plant in Automation Industries. This Module is designed by combining both Analog Input Output Module. Thus by using this combined module there is no need to replace Modules frequently. This makes System more Flexible and avoids frequent replacements of Modules. This work describe the profibus slave analog input output device, It is used in industrial communication, going through conversion of analog to digital signal for a slave device in PROFIBUS communication using ASIC-VPC3+S maintain the communication between analog input output device.

**KEYWORDS:** DP, DecentralizedPeripheral, Profibus, VPC3, ASIC.

## **I. INTRODUCTION**

Different types of Fieldbus Networks are available in the market for integrating and interconnecting industrial automation systems and instruments. Profibus DP networks are among those networks internationally normalized by IEC 61185. Profibus DP is world-wide known in the manufacturer sector and also in the process industries with nearly twenty-five years of existence. This article focuses the Profibus DP network protocol. Fieldbus Networks, including the Profibus DP proto-col, have several advantages when compared to conventional "point to point" network architectures. In Industrial plant the main input output device basically performed important part for a PROFIBUS communication, in a plant. IO device are analog those device data are in analog from those data must be transferred in digital from towards the microprocessor then its towards the ASIC VPC3+S so that ASIC can work as a master processor for a communication same as well as from output data can get output devices so that here input and output device combined so it can more advantages work for industrial plant. Due to plant complexity reduced so it is easy to implement in industrial plant.

## **II. BACKGROUND WORK**

VPC3+S is Profibus-DP Slave ASIC chip recommended by a German company called VIPA. It integrates to achieve a complete DP protocol, with which all communication tasks can be completely independent, and can automatically detect the baud rate from 9.6 Kbit / s ~12Mbit / s. It integrates 4KByte communication RAM mode register, status register, interrupt register, and a variety of buffer pointers and buffer. Three buffer with the user and master data exchange Mechanisms to ensure reliability of the system's speed of communication and data exchange. VPC3+S protocol chip has eight data lines and 11 address lines, in which the lower 8 address lines and data lines can be multiplexed. VPC3+S has an address latch, so there is no need for additional latches.

VPC3+S can generate the chip-select signal by itself, and its address range is 0x0000 0x0FFF. If we chose the MCU whose address lines and data lines are multiplexed, we should calculate the VPC3+S's physical address based on

# International Journal of Innovative Research in Science, Engineering and Technology

(An ISO 3297: 2007 Certified Organization)

Vol. 5, Issue 5, May 2016

the RAM's size of MCU. The mode register 0 of the VPC3+S sets the Profibus - DP's mode of operation, such as min TSDR,SY NC,FREEZE, mode register 1 can dynamically change the state of diversification. A watchdog timer is integrated in VPC3+S, to abort the Profibus-DP communication when the application processor is wrong. In addition, VPC3+S has a common interrupt output, which reports all relevant communications events, if there were events input into VPC3+S and also directly trigger the interrupt request register, you can read the interrupt register to determine the nature of the interrupt source. Compared with the Siemens VPC3+S chip, VPC3+S does not only support DP-VO protocol functions, but also supports the DP-V1 and DP-V2 protocol. Which is to support the acyclic communication and alarm functions, and data exchange broadcast (DXB) and the synchronous mode (IsoM) function. In addition to that, VPC3+S can operate under 3.3V or 5V supply voltage, 5V tolerant inputs.

### III. HARDWARE DESIGN

#### A. System Block Diagram

At present, among the intelligent field devices, profibus is the most widely used communication protocol. The goal of this design is to connect instruments and equipment's with Modbus communication module to the Profibus field bus control system.

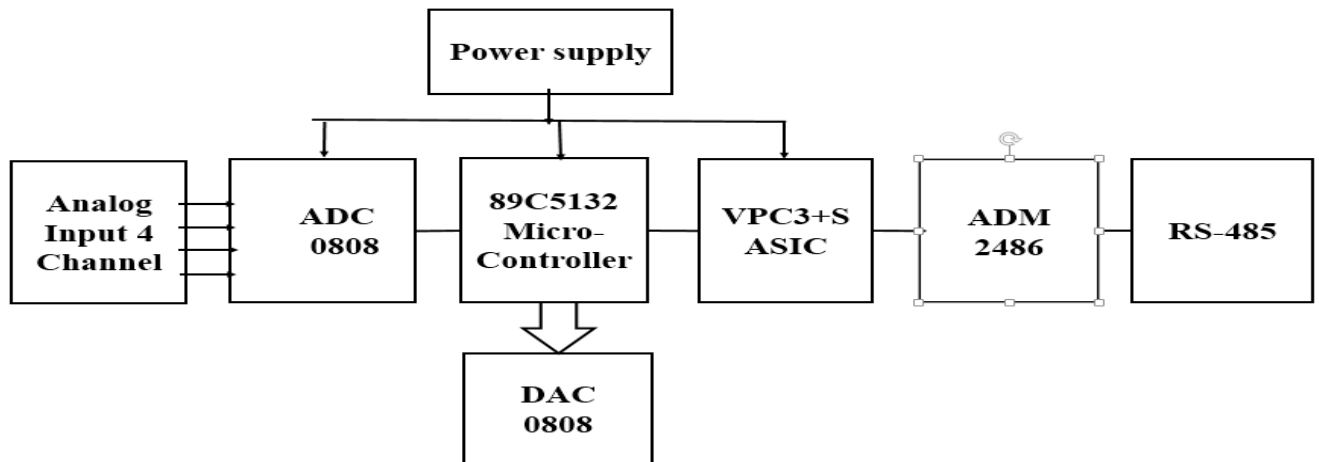


Fig: 1. Block diagram

Fig: 1. the block diagram includes ADC, Microcontroller 89v51, VPC3+S, DAC. ADC is interfaced with Microcontroller and the Microcontroller is interfaced with VPC3+S which is a Profibus controller. The data with VPC3+S is given to the Profibus Master. The analog input is applied to the ADC. The Digital data is then given to Microcontroller. The Microcontroller will communicate with VPC3+S on SPI Bus. The VPC3+S will process the data from the Microcontroller. VPC3+S will send the data to the Profibus Master. The Master will process the data again and send it back to the VPC3+S. The VPC3+S will communicate with microcontroller through SPI bus. The output of microcontroller will transmit the data to the DAC. Then it is transmitted output to ADM 2486 transceiver then its give output to RS485.

#### B. Flow chartAlgorithm

The analog quantity is applied to the ADC through sensors. This analog quantity is converted into digital form by the ADC. The digital data is then given to the microcontroller 89C5132. The microcontroller will scale the input. The scaled signal is then applied to the VPC3+S which is a PROFIBUS controller. VPC3+S will convert scaled signal into PROFIBUS Protocol. This signal is then applied to PROFIBUS master. The PROFIBUS Master contains all the information regarding what to initialize at the output side.

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The master will again send the data to the VPC3+S. VPC3+S and the Microcontroller will again communicate with each other.

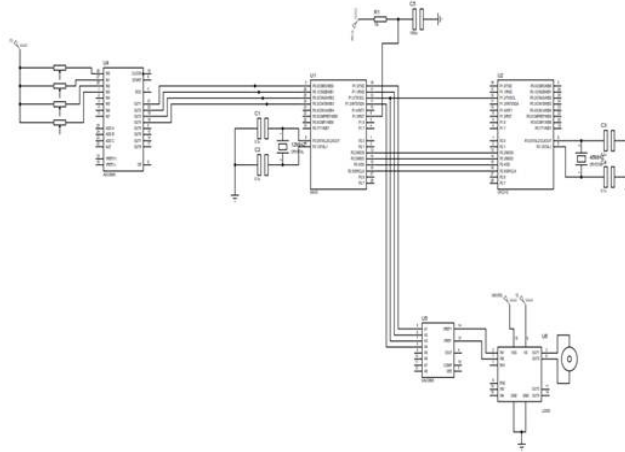


Fig: 2.Schematic diagram

The data received by the microcontroller will be given to the DAC which will convert the digital data into analog signal. The respective output will be enabled. If any error occurs then the output will not be enabled and the information will be sent back to the VPC3+S.

Flowchart

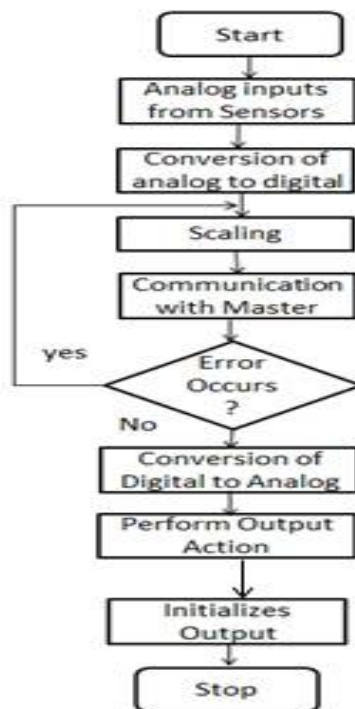


Fig: 3 Flowchart

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## C. PCB Design

After drawing the schematic diagram of to design for PCB here we used **SPICE** simulation software with help of this software, designing of PCB done.

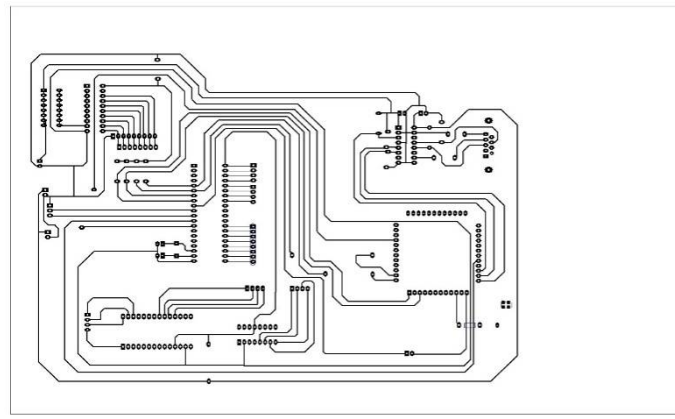


Fig: 4.PCB design layout

With the help circuit diagram and PCB design layout the soldering done on the PCB.as per the schmatic diagram requirement of the PCB single layers done so PCB used through that connection layout was done as per requirement so user can define those connection on PCB.

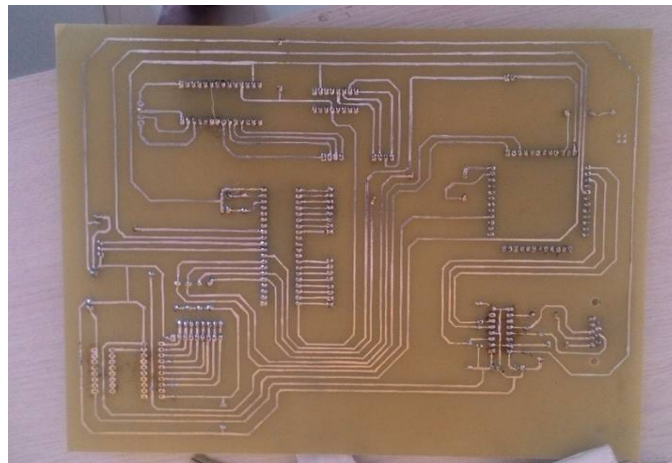


Fig: 5.PCB layout design and hardware

## IV. RESULT

### A. Advantages

Installation- With less Hardware, Installation is easier and faster. Manufacturing Flexibility- As a demand shifts, changes in manufacturing can be implemented rapidly. Maintenance and Operations- With the powerful diagnostics of a fieldbus come in improved availability and reduced down-time. Engineering and Documentation- Engineering is simpler, and the documentation is less complicated. Process Variables- The diagnostic information and status bytes available tell the user if they can trust the process variable or not.

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(An ISO 3297: 2007 Certified Organization)

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## B. Limitations

In PLCs, it is a wired communication so long distance communication is not possible. It is used only in PLCs and not used for generalized applications.

## V. CONCLUSION

We have implemented the PROFIBUS analog input output device as to detect errors in the system very easily and also faster. The use of combined Analog Input Output Module helps in eliminating frequent replacing of Module.

## VI. ACKNOWLEDGMENT

We thank the UL Group Pvt.Ltd, Pune for providing support and allow us to continue our project in their Research and Development center. We also thanks to our ECE Department, VelTech Dr.RR & Dr.SR Technical University, Chennai and Centre for Development of Advanced Computing (C-DAC), Pune for allowing us to work at UL Group Pvt.Ltd.Pune.

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