CAN Protocol Based Industrial Data Monitoring System

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***Abstract* - The Controller Area Network is a Serial, Asynchronous, Multi-master communication protocol for connecting electronic control modules in Automotive and industrial applications. CAN have many features like: Low cost, Easy to implement, peer to peer Network with powerful Error Checking, Higher Transmission Rates 1MBitps. CAN is a multi-master broadcast serial bus standard for connecting electronic control unit (ECUs).Each node is able to send and receive messages, but not simultaneously: a message (consisting primarily of an ID usually chosen to identify the message-type/sender and up to eight message bytes) is transmitted serially onto the bus, one bit after another this signal pattern codes the message and is sensed by all nodes. At the instrumentation level the network is based on the CAN protocol. CAN, or Controller Area Network, is an open network standard that was first used in automotive industry, but nowadays is accepted and used in a wide range of areas, such as industrial automation, building automation, agricultural machinery, among others.**

***Keywords* - Industry auto control, CAN driver IC, Temperature sensor, Humidity sensor, Light sensor, Level sensor, Gas sensor, Accelerometer.**

I. INTRODUCTION

A CAN message never reaches these devices directly, but instead a host processor and a CAN controller are needed between these devices and the bus. If the bus is free, any node may begin to transmit. If two or more nodes begin sending messages at the same time, the message with the more dominant ID (which has more dominant bits, i.e., bit 0) will overwrite other nodes' less dominant IDs, so that eventually (after this arbitration on the ID) only the dominant message remains and is received by all nodes. Bit rate up to 1 M bits/s are possible at network lengths below 40 m. Decreasing the bit rate allows longer network distances (e.g. 125 Kbit/s at 500 m).

The CAN data link layer protocol is standardized in ISO 118988-1 (2003). This standard describes mainly the data link layer composed of the logical link control (LLC) sub layer and the media access control (MAC) sub layer and some aspects of the physical layer of the OSI reference model. All the other protocol layers are the network designer's choice.

The industrial control system deals with all the above-mentioned problems and can effectively control them and letting the industry be in safe mode. It is an embedded project and has the microcontroller as controlling controller. The temperature sensor maintains the temperature at the specified level. Light sensor is used to sense the Light. According to the Sensors the controller will activate through ADC and gives to the CAN transceiver. It transmits and CAN transceiver receives and gives to microcontroller. It displays the data in the LCD and data will be send to the PC or monitor control unit.

II. METHODOLOGY

The Functionality of this system is mainly categorized in following steps.

- Master Send request to slave 1 and slave 2
- Slave 1 and slave 2 check the master request is valid or not.
- Request is valid then slave 1 or slave 2 send data to the master.
- Communication between the Master and Slave1 or Slave2
- Communication is about the sensors data we used.

Fig 1 shows the block diagram of CAN protocol based industrial data montoring System.

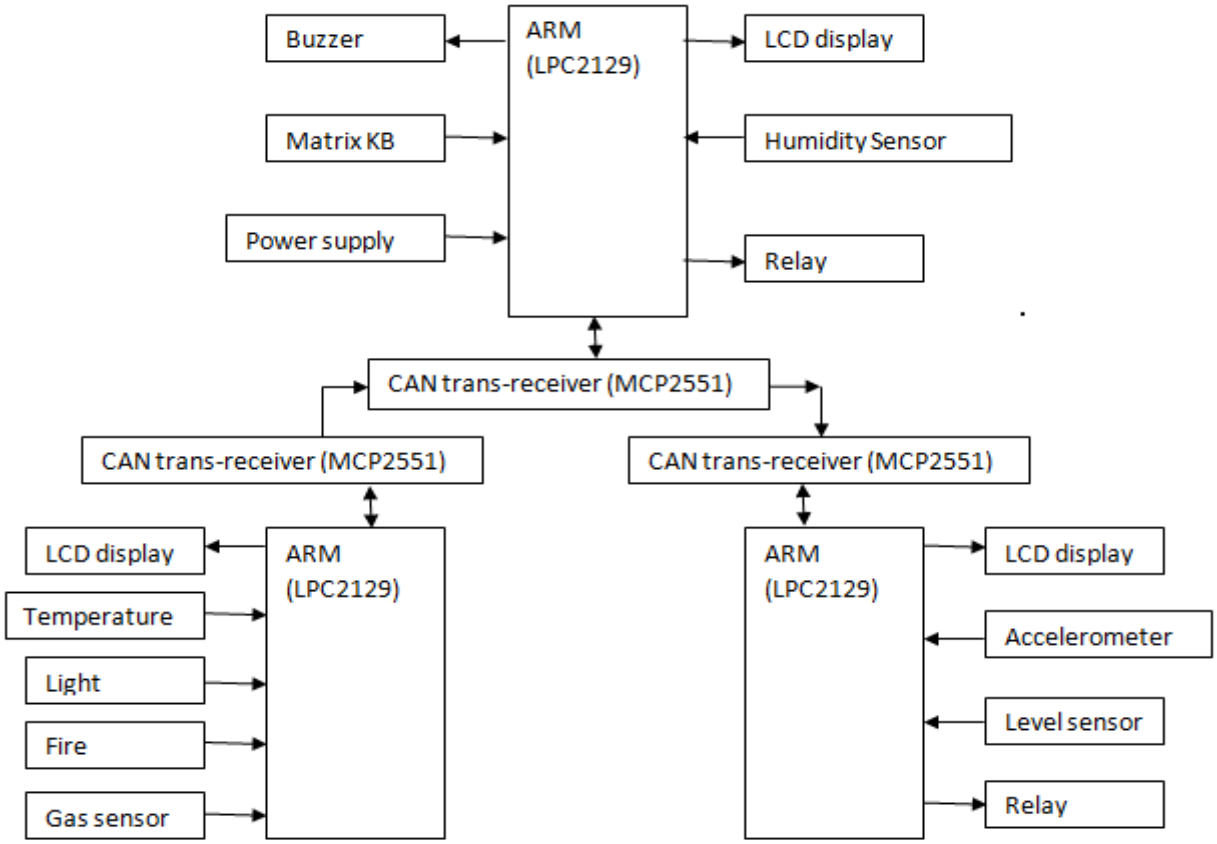

Figure 1. Block diagram of CAN protocol based industrial data monitoring system.

This system basically consist of CAN driver IC mcp2551, temperature sensor, light sensor, relay, Level sensor, Fire sensor ,Humidity Sensor, Gas Sensor, Matrix Keyboard and the LCD display(16x2 and 16x4) interfaced with the microcontroller.

A. CAN DRIVER IC

The CAN driver IC used is MCP 2551. This CAN IC is interfaced with the microcontroller CAN support pins i.e. CAN-TX and CAN-RX. The MCP2551 is a high-speed CAN, fault-tolerant device that serves as the interface between a CAN protocol controller and the physical bus. The MCP2551 provides differential transmit and receive capability for the CAN protocol controller and is fully compatible with the ISO-11898 standard, including 24V requirements. It will operate at speeds of up to 1 Mb/s. typically; each node in a CAN system must have a device to convert the digital signals generated by a CAN controller to signals suitable for transmission over the bus cabling. It also provides a buffer between the CAN controller and the high-voltage spikes that can be generated on the CAN bus by outside sources (EMI, ESD, electrical transients, etc.

B. TEMPERATURE SENSOR

The temperature sensor used in this project is LM35. LM35 is a precision IC temperature sensor with its output proportional to the temperature. The sensor circuitry is sealed and therefore it is not subjected to oxidation and other processes. With LM35, temperature can be measured more accurately than with a thermistor.

C. HUMIDITY SENSOR:

The humidity in the surrounding environment based on the water content in the atmosphere. The dielectric value is directly proportional to the humidity in the surroundings based on which the humidity value is calculated. It ensures high reliability and excellent long-term stability. This sensor includes a resistive-type humidity measurement component and an NTC temperature measurement component, and connects to a high-performance 8-bit microcontroller, offering excellent quality, fast response, anti-interference ability and cost- effectiveness.

SY-HS-220 humidity sensor is used for monitoring humidity inside the greenhouse. It has the following specifications.

D. GAS SENSOR

Gas sensor we are using **is MQ-6.** Sensitive material of MQ-6 gas sensor is SnO2, which with lower conductivity in clean air. When the target combustible gas exist, the sensor's conductivity is higher along with the gas concentration rising. Please use simple electro circuit, Convert change of conductivity to correspond output signal of gas concentration.

MQ-6 gas sensor has high sensitivity to Propane, Butane and LPG, also response to Natural gas. The sensor could be used to detect different combustible gas, especially Methane; it is with low cost and suitable for different application.

E. LEVEL SENSOR

Level sensor is used to calibrate the liquid available in a tank. Level Sensor is a float-type liquid level Sensor, used to monitor the liquid level in your storage tank

F. LIGHT SENSOR

Photo-sensors or **photo-detectors** are sensors of light or other electromagnetic energy. Photo-resistors or Light Dependent Resistors which change resistance according to light intensity. Normally the resistance of photo resistor decreases with increasing intensity of light falling on it.

G. ACCELEROMETER

An accelerometer is an electromechanical device that will measure acceleration forces. These forces may be static, like the constant force of gravity pulling at your feet, or they could be dynamic - caused by moving or vibrating the accelerometer.
By measuring the amount of static acceleration due to gravity, you can find out the angle the device is tilted at with respect to the earth. By sensing the amount of dynamic acceleration, you can analyze the way the device is moving.

III. SOFTWARE DESIGN

Software is also important in this system is developed in Embedded C language. For the Design and Simulation purpose Proteus software is used.

IV. ACKNOWLEDGMENT

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V. CONCLUSION

The final project of "*CAN PROTOCOL BASED INDUSTRIAL DATA MONITORING SYSTEM*" has been successfully studied. It has been developed by integrating features and the entire hardware component used. Presence of every device has been reasoned out the placed carefully. Thus contributing to the best working of using advanced CAN protocol and microcontroller also with the help of growing technology.

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