**Abstract**

This paper presents a CAN protocol based industrial data monitoring system to evaluate the feasibility of using such an industrial automation protocol in smart industry. Industry automation can be possible in either wired or wireless. Many technologies are available for industry automation. But CAN is superior among all these technologies. As CAN has the feature of low cost, easy to implement, Error checking, high data transmission rate. Hence this paper describes the Can based communication between the electronic devices for industrial automation.

**1. Introduction**

The main aim of this paper is to implementation for data communication based on CAN protocol by using microcontroller. The devices that are connected by a CAN network are typically sensors and control devices. 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 rates up to 1 Mbit/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 11898-1 (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.

2. Design Module Wise

2.1 Block Diagram

![Block Diagram]

Figure 1: Block Diagram
2.2 Block diagram Explanation

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

- **CAN drive 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.

![Figure 2: Pin diagram of MPC 2551](image)

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 (differential output). 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.).

- **Keypad:** Keypad is basically used to provide the input to the microcontroller. The keypad consists of micro switches which are connected to the microcontroller pins in a matrix format. Each key is assigned with the special character or symbol or digit. When user press the key the respective assigned ASCII value of that key is provided to the microcontroller via software.

- **Temperature sensor:** Temperature sensor is used to sense the temperature. We have used a Temperature sensor called LM35. This temperature sensor can sense the temperature of the atmosphere around it or the temperature of any machine to which it is connected or even can give the temperature of the human body in case if used. So, irrespective of the application to which it is used, it gives the reading of the temperature. The LM35 series are precision integrated-circuit temperature sensors, whose output voltage is linearly proportional to the Celsius (Centigrade) temperature. Temperature sensor is an analog sensor and gives the output into form of analog signal. This signal is feed to ADC which will convert it into digital form. Once converted into analog form, the microcontroller can process the digital temperature signal as per the application.

![Figure 3: LM35](image)
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. The intelligent sensor port powers the sensor. It is compatible with any of the security probe series base units, or the E-sensor 8 expansion modules. You can instantly be alerted should there be any drop below critical levels in your liquid. Advance alerting of possible liquid leaks or theft will ensure your tanks never run dry again. The sensor comes with a 40ft (10.2 meter) weatherproof cable that connects the float level assembly to the sensor adapter. Custom lengths of up to 2,300ft (700 meters) are available upon request. A supplied 5ft CAT5 cable links the sensor adapter to the security Probe base unit. This is extendable up to 100ft (30 meters) using standard CAT5 Ethernet cable.

Buzzer: Buzzer is used in a system to indicate or to grab the attention regarding an emergency situation occurred. Buzzer act as a panic horn which indicates the need of instant attention as the condition goes haywire.

Liquid Crystal Display: LCD is used in a project to visualize the output of the application. We have used 16x2 LCD which indicates 16 columns and 2 rows. So, we can write 16 characters in each line. So, total 32 characters we can display on 16x2 LCD. LCD can also be used in a project to check the output of different modules interfaced with the microcontroller. Thus LCD plays a vital role in a project to see the output and to debug the system module wise in case of system failure in order to rectify the problem.

Humidity sensor: Humidity sensor is an analog sensor and gives the output into form of analog signal. This signal is feed to ADC which will convert it into digital form. Once converted into analog form, the microcontroller can process the digital humidity signal as per the application. This sensor gives the value of change in humidity in the atmosphere as per the application.

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 more 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. Gas sensor is an analog sensor and gives the output into form of analog signal. This signal is feed to ADC which will convert it into digital form. Once converted into analog form, the microcontroller can process the digital gas signal as per the application.

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

RS 232: RS 232 is a serial communication cable used in the system. Here, the RS 232 provides the serial communication between the microcontroller and the outside world such as display, PC or Mobile etc. So it is a media used to communicate between microcontroller and the PC.

In our project the RS232 serves the function to transfer the edited notice (or data) from PC (VB software) to the microcontroller, for the further operation of the system.

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. Accelerometers use the piezoelectric effect - they contain microscopic crystal structures that get stressed by accelerative forces, which cause a voltage to be generated. Another way to do it is by sensing changes in capacitance. If you have two microstructures next to each other, they have a certain capacitance between them. If an accelerative force moves one of the structures, then the capacitance will change. Add some circuitry to convert from capacitance to voltage, and you will get an accelerometer. The three axis accelerometer are basically used to identify the movements across the three axis i.e. x-axis, y-axis, z-axis. Accelerometer is an electronic device which is interfaced using I2C protocol and provides the reading after every 1msec. According to the requirement of the application, the microcontroller will take the reading from the accelerometer within a fixed interval of time and do the necessary operation according to the requirement of the application.

3. Conclusion And Summary
This paper presents a CAN protocol based industrial data monitoring system and verifies that such a system can be used in a industries. We describe the structure of a CAN protocol based industrial data monitoring system and the design method of the CAN. Because the characteristics offered by the CAN communication protocol, the projected system have offered good conditions so that smart subsystems have communicated. The communication among the nodes and between CAN controller and the micro converter was quite efficient and robust, by providing reliability on the information. It is intended in future works, to increase the number of CAN nodes on the bus, using DSPs (Digital Signal Processor) and devices with interface TCP/IP for control and remote monitoring of the network via internet to acquire data using other conventional sensors, as pressure and humidity sensors and to apply to network in more complex systems.

4. Reference