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Implementation of CAN Protocol

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Abstract

Controller Area Network (CAN) is ideally suited to the many high-level industrial protocols embracing CAN and ISO-11898:2003 as their physical layer. Its cost, performance, and upgradeability provide for tremendous flexibility in system design. Due to multiple connections of data electrical lines connected to microcontroller it becomes very complex to understand troubleshoot it. It also restricts us long distance data transfer due to large number of lines. To minimize all these problems, we can use "CAN" protocol to connect these entire network. Using CAN protocol we have connected multiple microcontrollers other devices to a common can bus like temperature sensor, smoke detector, etc.

Key Words: CAN, flexibility, ISO-11898:2003, Protocol, upgradeability.

Introduction

The CAN bus was developed by BOSCH as a multi-master, message broadcast system that specifies a maximum signaling rate of 1 megabit per second (bps).Unlike a traditional network such as USB or Ethernet, CAN does not send large blocks of data point-to-point from node A to node B under the supervision of a central bus master.

In a CAN network, many short messages like temperature or RPM are broadcast to the entire network, which provides for data consistency in every node of the system.

Once CAN basics such as message format, message identifiers, and bit-wise arbitration are major benefits of the CAN signaling scheme; Controller Area Network (CAN) was initially created for automotive applications as a method for enabling robust serial communication. The goal was to make auto-mobiles more reliable, safe and fuel efficient while decreasing wiring harness weight and complexity. Since CAN protocol has gained widespread popularity in industrial automation and automotive/truck applications.

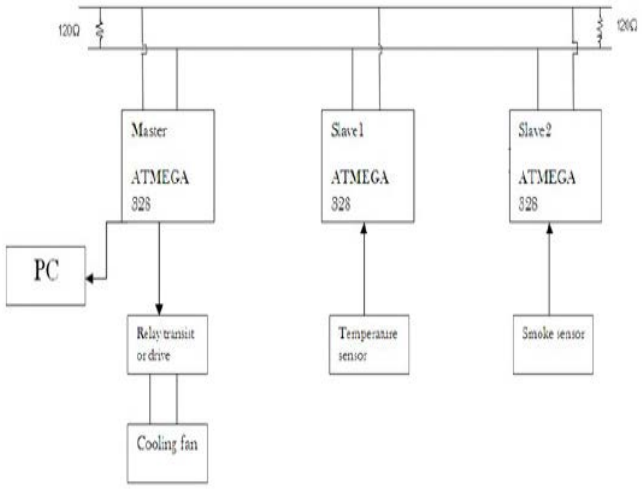

Figure 1: Block Diagram of CAN Protocol

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DESCRIPTION:

Fig shows one master and two slaves are connected to common two wire bus. The con-trolling parameters used are temperature and smoke. Master is used to accept the request from slave 1 and slave 2 and controls the parameters as per the requirements. Both the parameters have particular set points. If these set points are crossed, both the slaves send requests to the master individually or simultaneously depending upon the condition. Master accepts the request and controls the parameters and it also monitors the value by displaying it on pc.

This entire communication takes place within few seconds and just by using 2 wires and hence complexity is reduced. Multiple parameters are controlled using CAN bus with high speed. For example, temperature sensor detects temperature of any system and if this temperature increases and crosses the set point, slave1 detects and sends request to the master. Relay is driven by the master for switching. Master controls the temperature by turning ON relay, which in the response turns ON the cooling fan.

ATMEGA 328

ATMEGA 328 acts as master as well as slaves to establish communication between different devices using two wire bus and it also provides functionality of monitoring and controlling various parameters of devices.

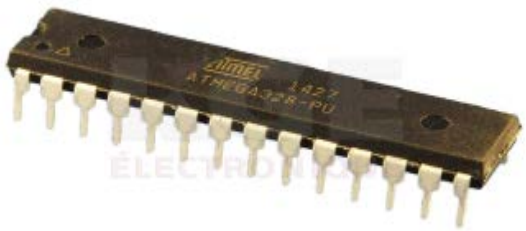

Figure 2: ATMEGA 328

TEMPERATURE SENSOR LM35

The LM35 series are precision integrated-circuit temperature sensors, whose output voltage is linearly proportional to the Celsius (Centigrade) temperature. The LM35 thus has advantage over linear temperature sensors calibrated in O Kelvin, as the user is not required to subtract a large constant voltage from its output to obtain convenient Centigrade scaling. The LM35 does not require any external calibration or trimming to provide typical accuracies of ±1/4OC at room temperature and ±3/4OC over a full -55 to +150OC temperature range. Low cost is assured by trimming and calibration at the wafer level.

Figure 3: Temperature Sensor

SMOKE DETECTOR MQ-7

Sensitive material of MQ-7 smoke sensor is SnO2, with which lower conductivity in clear air. It makes detection by method of cycle high and low temperature, and detect CO when low temperature(heated by 1.5v).The sensors conductivity is more higher along with gas concentration rising. When high temp it cleans other gases adsorbed under low temperature.
MQ-7 gas sensor has high sensitivity to Carbon Monoxide. The sensors could be used to detect different gases containing CO, it is with low cost and suitable for different application.

RELAY

A relay is an electrical switch that uses an electromagnet to move the switch from the off to on position instead of a person moving the switch. It takes a relatively small amount of power to turn on a relay but the relay can control something that draws much more power.

Relays are electromagnetically operated switches. An actuating current on a coil operates one or more galvanically separated contacts or load circuits.

The electromechanical relay is a remote control switch capable of switching multiple circuits, either individually, simultaneously or in a sequence.

Fig. Relay

FLOWCHART

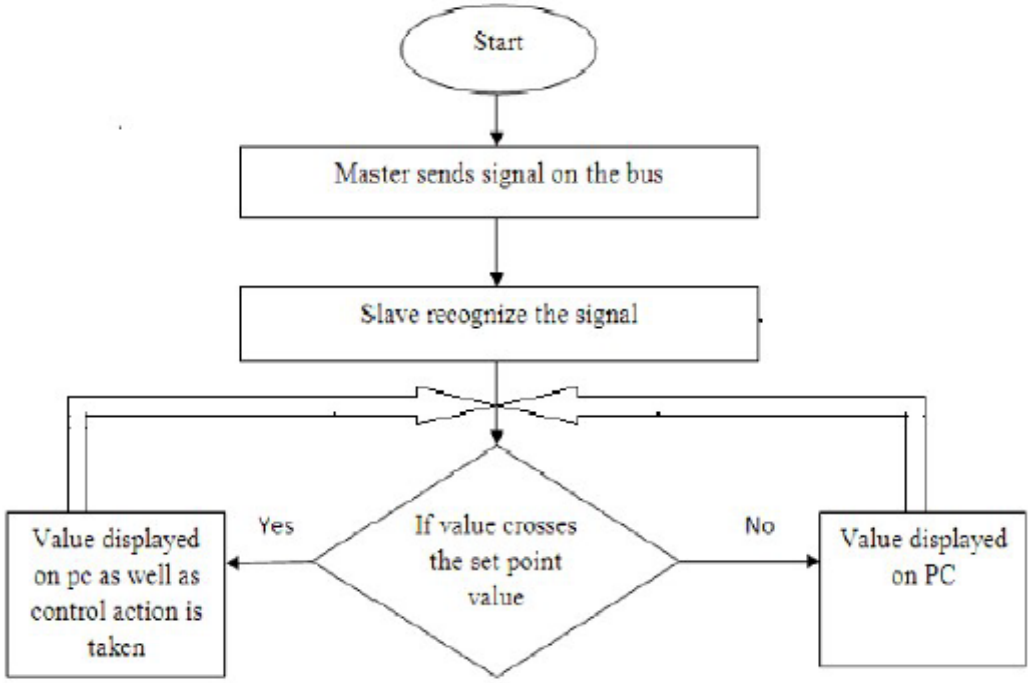

Figure 4: Flowchart

ADVANTAGES

- Wiring is less complicated, more economic.
- More Reliable
- Easy to implement.
- Installation place exchangeable without electric problems.
- Can add / remove nodes.

DISADVANTAGES

- High software expenditure.
- Risk of incomplete technology for customers.

APPLICATIONS

- Automotive
- Military Vehicles
- Industrial Machinery.
- Agricultural Machinery.
- Marine control and Navigation.
- Most common use is in the automobile industry.
- Used to connect subsystems within an electronic control unit as well as connect electronic control units together.
- Many devices in cars use CAN including the radio, transmission, airbags, ABS, cruise control, and power steering.
- CAN is also used in both railway and aerospace applications.
- Other applications include use in hospital equipment, elevators, and even coffee machines.

CONCLUSION:

CAN is ideally suited in applications requiring a large number of short messages with high reliability in rugged operating environments. Because CAN is message based and not address based, it is especially well suited when data is needed by more than one location and system-wide data consistency is mandatory. Fault confinement is also a major benefit of CAN. Faulty nodes are automatically dropped from the bus, which prevents any single node from

bringing a network down, and ensures that bandwidth is always available for critical message transmission.

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