Advanced Methodology to improve performance of RS-232 in REAL TIME Environment

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Abstract-- **CAN bus which is used in existing serial communication, could realize to construct network with multidrop and long-distance communication. Method of conversion between RS-232 and CAN bus is discussed and a communication convertor with advanced design and debug is introduced in the paper. The Software design of control system to apply in real time system is introduced.**
It was examined through debug that there are some advantages of long direct communication distances, high communication velocity, simple configuration, low cost with the design. For reasons of simple configuration and low-cost. Introduction of CAN also gives more accuracy because of Higher Precision.

Keywords **-** communication, protocol, CAN bus, RS-232, Accuracy.

I. INTRODUCTION:

Electrical power system is a production department with the highest automatization degree all through the ages. The control system based on CAN bus will replace the dispersive control system step by step, and become the dominant equipment of electronic system automatization in our nation.

Owing to the short communication distance of RS-232 (according to EAT/TAI-232 criterion, only be 15m), that only can be communicated point to point, it can not buildup network with multidrop communication. CAN bus is one of communication protocol with serial data transfer which was used in network measure technique.

RS-232 is a normal bus using in serial communication widely. Kinds of computers, exterior facilities, and measure equipments can be connected organically by it conveniently, and then form a measure control system. However, for its low velocity, short-distance of transfers and it can bring crosstalk among signals on interface. It can not be used in industry control directly.

CAN bus has gained recognition in industry which is just fame for the capabilities of high-powered, high-reliable and the unique design. For instance, it is used CAN bus system in s-type cars of Benz; some American enterprises have apply CAN bus to product line and machine tool as inner bus.

Simultaneously, for CAN bus can supply more securities, it is used in many fields as medical treatment, weaving mechanism and lift control widely.

II. SYSTEM SUMMARIZATION

First of all, it should be defined function of each node, in order to sure the number, type, signal characters of node control quantity. This is the first step of proceeding the control system to realize networking. Secondly, it should be chosen node controller and relevant CAN components. For the

functions of every node are single comparatively, and the quantities of data are also small, the demand of CPU is reduced greatly, which could be fulfilled by 89C51. The parts of CAN bus are mainly constructed by controller port, bus transceiver which used as 82C250 and parts of I /O. Finally, according to agreement of physical layer in CAN bus to choose the medium of bus, design the wiring project, and connect it to be control network.

A. Capability Comparison between RS-232 and CAN Bus Industry facilities communication often related to a lot of hardware and soft ware product. It is used to connect the protocol between standard computer flat and industry automatic application facilities. Moreover, the facilities and protocols in which were used are various. Therefore, it is hoped that most automatic application facilities can perform simple serial orders, especially hoped that these orders are compatible with the standard serial ports in PC or accessional serial port boards. RS-232 which has widest application in PC and communication industry is one of the serial ports. RS-232 is defined as a sort of single end standard which could increase the communication distance in serial communication with low-velocity. With the communal signal ground

between sending port and sink of RS-232, it can not use signal with two ports. Otherwise, the common mode noise will be coupling into signal system. CAN is one of the field bus which is widest application internationally full named "Controller Area Network". As a sort of serial communication bus with multi-mainframe mode, the basic design criterion of CAN demands high-velocity and better capability of contradicting electromagnetism disturb, even demands to check any mistakes which are produced in communication bus. When the distance of signal communication reached 10km, CAN still provide digital communication velocity with 50kbit/s [3].

Control Area Network controls the security of the Electronic equipments using the RS-232 protocol. We use CAN for Monitoring Sensors. Data can be stored in the System and the software is used for backup. We can get reports on hourly, weekly and monthly basis. The Controller Area Network (CAN) bus is a multi-master message broadcast system that is suitable for systems where data contained in short messages are needed to be received at multiple locations simultaneously. Because messages are sent to all the nodes in a system, CAN is especially suited to systems where consistency in the received messages at all the receiving nodes is needed. In this case, all nodes are notified of the rejection, ensuring the data consistency across the network.

DISTRIBUTED real-time systems are being used increasingly in control applications such as in automobiles, aircraft, robotics, and process control.[1] The existing techniques give very loose bounds on the end-to-end response time when a transaction visits the same resource multiple times, which we call a multiple visit problem[2]. when transmission is over band-limited, error-prone wireless channels, a compromise should be made between compression fidelity and protection/resilience to channel errors and packet loss [3].These systems consist of multiple computational nodes, sensors, and actuators interconnected by a LAN [5]. Of the multiple LAN protocols available for such use (including MAP [6], TTP [7], etc.), the Controller Area Network (CAN) [8] has gained wide-spread acceptance in the industry [9].

Messages are sent to all nodes, but their "message identifiers" indicate whether each node should act on the message. However, all nodes participate in indicating whether the message was sent correctly, increasing the reliability of the bus.

Designing and development process can be divided in to three Section.
1) Primarily Design
2) Embedded System
3) Monitoring Software

A digital machine now a day operates upon embedded network. Embedded network consists of many nodes and communication network that connects those nodes. Node consists of μc based electronics control unit. There are many nodes in a system to monitor sensors and control the actuators

CAN controller is a low-cost communications link to connect industrial devices to a network and eliminate expensive hardwiring. The direct connectivity provides improved communication between devices as well as important device-level diagnostics not easily accessible or available through hardwired I/O interfaces. CAN controller is a simple, networking solution that reduces the cost and time to wire and install industrial automation devices, while providing Interchangeability of "like" components from multiple vendors. For years the process industry has been attempting to develop a single, open standard to address all kinds of field devices. The origin scope of their standards effort was aimed at replacing the 4-20 mA standard with a single digital standard. As the scope increased to address complex and sophisticated services (such as high data rate communications between controllers, time synchronization of large numbers of devices scanning at very high speeds), the development of a single standard became necessary   At the same time, the cost of communication technology has dropped

Considerably in recent years, making it cost-effective to connect simple devices never considered for field bus directly to a network. a standard for simple devices requires the same level of interchange-ability as exists for 120/220 VAC and 24 VDC discrete, hardwired I/O CAN controller allows the interchangeability of simple devices while making interconnectivity of more complex devices possible. In addition to reading the state of discrete devices, CAN controller provides the capability to report temperatures and energizes the actuator as per the priority

For a modular system, distributed architecture is meant for embedded system .If the manufacturer provides different solutions depending upon possibilities of well defined modules, price per module is matter of concern.

Therefore two options are available
i)Universal asynchronous Receiver and transmitter
ii)CAN controller

Both are serial communications. CAN controller provide speedy serial bus communication, which is reliable and efficient? CAN controller provides the control of sensors (Presure, Temperature,etc)and actuators of electronically controlled unit, which is economically viable.

III DESIGN OF SYSTEM HARDWARE

Hardware circuit of system is mainly constructed by level transition circuit of RS-232, controller and transceiver of CAN.
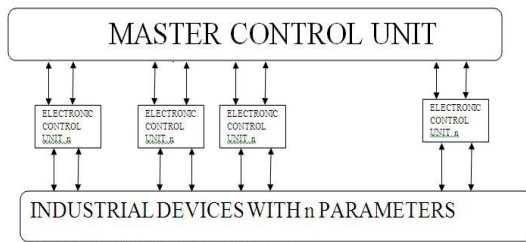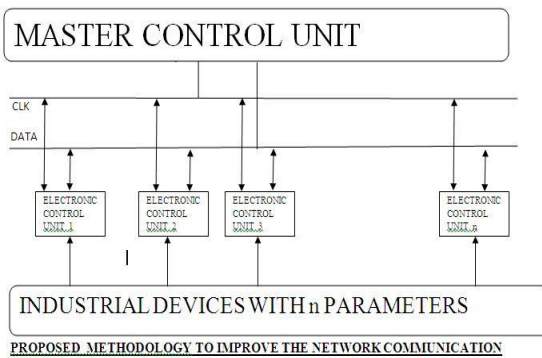

Fig 1. EXISTING NETWORK COMMUNICATION

PROPOSED METHODOLOGY TO IMPROVE THE NETWORK COMMUNICATION

Result of the co design of the proposed dircuit is as shown below.

Sr. No.	Temperature Reading without CAN	Temperature Reading with CAN
1	10 degrees	10.25 degrees
2	11 degrees	10.75 degrees
3	12 degrees	11.75 degrees
4	13 degrees	13.25 degrees
5	14 degrees	14.00 degrees

IV. CONCLUSION

This convertor referred in the paper are just used some cheap and universal components, like 89C51, MAX232, SJA1000 ect. For circuit design having the advantages of briefness and integrity, it has the characters of simple configuration and low-cost which compared to some similar industrial products.

There are some excellences of choosing CAN bus technique: (1) Speedy response, better anti-jamming capability; (2) lowest malfunction rate, high communication baud rate, great data transfer with network which was constructed by two twisted-pairs; (3) simple configuration, great scalability, high security and convenient setting, servicing [7]. The system based on field bus CAN has a very nicer application foreground in control system domain for a good many excellences of CAN. Switched RS-232communication network to CAN communication network could realize to construct network

with multidrop of RS-232 and long-distance communication conveniently. Moreover, it could substitute the CAN interface card with costly price in current market to realize data communication between PC serial interfaces and CAN bus fleetly and exactly. The configuration of hardware or software and the codes of this design were all debugged and passed, which have nicer transplant and expansibility.

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