Increasing speed of serial transmission using   PROFIBUS.

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Abstract:

Serial data transmission was always considered reliable but with slow speeds. In Industrial applications transmission speeds with reliability in such a way that it is fast becoming the most sought-after protocol in industrial communication for control system.

PROFIBUS uses a shielded twisted pair cable with RS-485 interfacing and enables transmission rates up to 12 Mbit/sec on account of its different frame structure. By extracting the internal working details on PROFIBUS, we can see a way to increase the speed of serial transmission even further without compromising on reliability of Transmission.

Keywords:Brewing,Manchester,Sought,Impedance.

1. Introduction of Profibus:

Profibus is not one communication system but a variety of protocols built on the same field-bus technology bundle user can combine varieties of PROFIBUS protocol with their own software and other requirements. Resulting in unique application profibus with many profibus available. Profibus has a specific need. Profibus devices meet a high standard of quality befitting a high network.

It is a smart, field-bus technology device on the system connect to a central line PROFIBUS benefits from superior design of its OSI layer and basic topology.

It user the bus topology. In this topology a center line or bus is wired throughout the system. Devices are attached to this central controller to each individual device.

Profibus is more universal called PROFIBUS DP (Decentralize Periphery) this protocol is much simpler and faster. It is used in the overwhelming majority of PROFIBUS application profibus in use today. Profibus DP has itself 3 separate version each version from DP-V0 to DP-V1 and DP-V2.

Profibus PA is a protocol designed for process Automation. PROFIBUS PA is a type of PROFIBUS DP Application profile. Profibus PA standardize the process of transmitting measured data. PROFIBUS PA operates over RS485 twisted pair media PA application profile supports power over the bus in explosive.

2. History:

PROFIBUS was born out of a German Government, German companies and other industry leaders in the late 1980's. Their effort created an automation solution that is not only still variable today but has led t further solutions. The proud heritage of PROFIBUS allows for many European Customer to turn to automation specific to their needs.

3. Origin:

In 1987, 21 companies and Institutions in Germany Joined. A large group was formed in 1995 and named PROFIBUS International or PI. It is a largest field bus user association in the world; PI is a progression of task of profibus. It helps with quality assurance, setting standards and developing new PROFIBUS technologies.

4. Organization:

PROFIBUS Standards are maintained and advanced via a pair of important organization. In 1989, PROFIBUS manufactures and users created the PROFIBUS user organization (PNO). A large group was formed in 1995 and named PROFIBUS International field bus user association in the world.

5. RS Cables of Profibus

5.1] RS-232

RS-232 is a standard that originated as a communications guide for modems, printers, and other PC peripherals. It provided a single-ended channel with baud rates to 20kbps, later enhanced to 1Mbps. Other RS-232 specifications include nominal ±5V transmit and ±3V receive (space/mark), 2V common-mode rejection, 2200pF maximum cable load capacitance, 300Ω maximum driver output resistance, 3kΩ minimum receiver (load) impedance, and 100ft (typical) maximum cable length. RS-232 systems are point-to-point, not multidroppable. Any RS-232 system must accommodate these constraints.

5.2] RS-422

RS-422 is a unidirectional, full-duplex standard for electrically noisy industrial environments. It specifies a single driver with multiple receivers. The signal path is differential, and handles bit rates above 50Mbps. The receivers' common-mode range is ±7V, the driver output resistance is 100Ω maximum, and the receiver input impedance can be as low as 4kΩ.

5.3] The RS-485 Standard

RS-485 is a bidirectional, half-duplex standard featuring multiple 'bussed' drivers and receivers, in which each driver can relinquish the bus. It meets all RS-422 specifications, but is more robust. It has a higher receiver-input impedance and larger common-mode range (-7V to +12V).

Receiver input sensitivity is ±200mV, which means that to recognize a mark or space, a receiver must see signal levels above +200mV or below -200mV. Minimum receiver input impedance is 12kΩ, and the driver output voltage is ±1.5V minimum, ±5V maximum.

Drive capacity is 32 unit loads, i.e., 32 12kΩ receivers in parallel. For receivers of higher input impedance, the number of unit loads on one bus can be higher. Any number of receivers can be connected to the bus, provided that the combined (parallel) load presented to the driver does not exceed 32 unit loads (375Ω).

The driver load impedance is 54Ω maximum, which, in a typical 24AWG twisted-pair environment, is 32 unit loads in parallel with two 120Ω terminators. RS-485 has become the best choice for POS, industrial and telecom applications. The wide common-mode range enables data transmission over longer cable lengths and in noisy environments such as the floor of a factory. Also, the receivers' higher input impedance allows more devices to be dropped on the lines.

Profibus and Field bus are buses used mainly in industrial plants, and are an extension of RS-485. The plant wiring systems measure sensors, control actuators, collect and display data, and conduct data communications between the process control system and the network of sensors and actuators.

Profibus and Field bus are the overall system descriptions; RS-485 is the standard for the PHY layer of the network supporting them. Profibus and Field bus have slightly different specifications. Profibus requires a 2.0V minimum differential output voltage with RL = 54Ω; Field bus requires a minimum differential output voltage of 1.5V, with RL = 54Ω. Profibus transmits at 12Mbps, vs. 500kbps for Field bus. Skew and capacitance tolerance are tighter in Profibus applications.

6. Protocols Best Fit

6.1] RS-232: communication with modems, printers, and other PC peripherals. The typical maximum cable length is 100ft.

6.2] RS-422: industrial environments that require only one bus master (driver). Typical applications include process automation (chemicals, brewing, paper mills), factory automation (autos, metal fabrication), HVAC, security, motor control, and motion control.

6.3] RS-485: industrial environments for which more than one bus master/driver is needed. Typical

applications are similar to those of RS-422: process automation (chemicals, brewing, paper mills), factory automation (autos, metal fabrication), HVAC, security, motor control, and motion control.

7. Profibus Architecture

The profibus Architecture is basically divided into 4 types.

1. Application Profibus I
2. Application Profibus II
3. Communication Technologies
4. Transmission Technologies

The profibus is based on the ISO/OSI Reference model. It based on lower layers. The application profibus I and II are impleme- nted an lower network layers.

The following figure shows the implementation of profibus architecture.
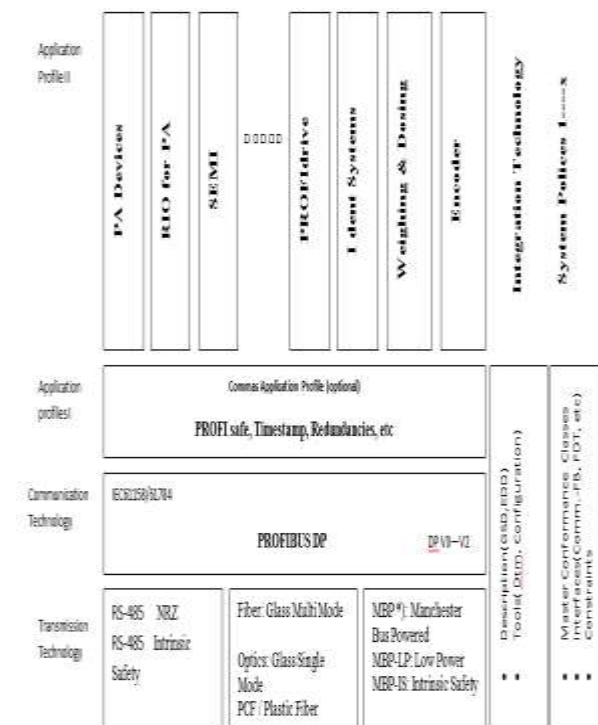
The Application profibus II contains,

- PA Devices
- RIO for PA
- SEMI
- Profi Drive

- Ident System

ProfiBus PA

The profibus PA is defined as, specific selection. The profibus PA is basically used to fulfill the requirements of process automation. The profibus PA device are used to basically contain all technology components used to connect intelligent field devices to controller control system and engg.station.

RIO stands for Remote Input/Output.It is basically used in the international standards **IEC 61158 & IEC 61784** is open.This is particularly used in fields of factory.

SEMI stands for Semiconductor equipment & material institute.It announces acceptance of communication system.

POFIDRIVE defines the profile for driver technology.

IDENT No The profibus & profinet devices have a unique ID allocated to the assists with engineering ,identification & other users.

The Application Profile I has common application profiles like PROFI safe, Timestamp& Redundancy.

PROFIsafe : It stands for PROFIBUS SAFETY Or PROFINET SAFETY. It is basically used for communication safety to do distributed automation. It is almost used in all industries with applications like RS-485 & MBP-IS.

The communication technology in the PROFIBUS architecture are as follows,

PROFIBUS DP the DP stands for Decentralized Periphery.This protocol is much simpler & faster.This types of applications are majorly used .The PROFIBUS DP is further has 3 different versions as DP V0,V1,V2.

The Tansmission technologies used in PROFIBUS are as follows,

1) RS-485
2) RS-485-IS
3) MBP
4) MBP-LS

5) MBP-IS

This all technologies are used in transmission of data for PROFIBUS.The RS-485 gives you the speed of 12.1 mbps. The Fiber Optics is used where the greater distance is required. The MBP stands for Manchester Coded Bus Powered. It deals with bus powering & intrinsic safety.

Existing System:

The profibus is invented in 1987 in Germany. The goal was the realization and establishment of a bit-serial field bus. It is basically used in industrial network.

RS-485 is most commonly used transmission technology. It uses shield twisted pair and enables transmission rate up to 12 Mbit/sec.RS-485-IS It is similar to RS-485 but user wire medium to transmit data.

It is transmission protocol MBP (Manchester Bus Powered) transmission technology is available for application in process automation with a demand for bus powering and intrinsic safety of devices.

It user communication protocol like FMS (Filed bus message specification).FMS is designed for communication at cell level.

DP (Decentralize Periphery) is the simple fact, cyclic, deterministic process data exchange between a bus master and assigned slave devices.

Proposed System:

Overview of RS-485

Enables the configuration of in expensive local network and multidrop communication links. It can span relatively large distance up to 4.

A tram b rule says that the speed in bit/s multiplied by the length in marks should not execute than 10^8.

This means that a so mater cable should not signal faster than 12 mbits/sec. Using RS-485 multiple device i.e 32 devices can communicate

simultaneously. This can use the half-duplex mode a signal pair wire and ground wire at distance up to 1200 meter.

The length of network and no. of devices can be increased using different devices repeater.

In RS-485 the wires are arranged as a connected series of point –to –point nodes i.e in a bus topology not in any other topology.

It transmits data on twisted pair the properties of twisted-pair cable such as high-noise immunity and long-distance capability are helpful to transmit data with high speed. It can also work on 2-wire and 4-wire.

In 2-wire network, the transmitter and receiver of each device are connected to a twisted pair. The master-port has one transmitter connected with slave port and one receiver is connected with slaves system on a twisted-pair cable.

Noise in straight and twisted pair cables

Straight cable

Twisted pair cable

→ **Magnetic field**
→ **Induced noise current**
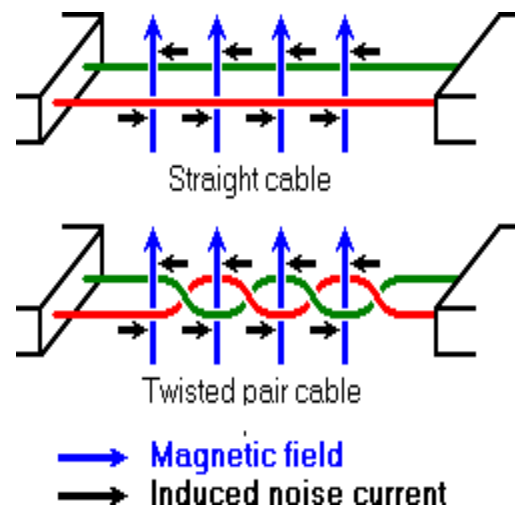
In conclusion, we can say that, using twisted pair cable with RS-485 we can increase the speed of transmission up to 12-1 mbps. Because the RS-485 enables the transmission using multi-drop communication lines and if distance more than speed is also get increased we can connect 32-devices simultaneously on half-duplex mode.

As well as by using twisted pair cable on 4-wire with half-duplex mode means, Here the connect is RS-485 and mode to transfers is twisted-pair cable on

4-wire which enables us to communicate master-slave technology because it can communicate using multiple device simultaneously. In 4-wire we are using four-wire+ground-wire.

This topic is proper research but in communication protocol.In that profibus we can increase the speed of up to 12.1 mbps.It's more like proposing a new frame structure or something like that for a faster protocol.

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