Serial Port Interfacing with LabVIEW

Umer Hassan
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Details...

- Cable Connectors
- Hardware Specification
  1. Pin Identification
  2. Communications Specifications
- LabVIEW Interfacing
Cable Connectors
DB-9 Connector
Pin-outs

- Pin 1: Data Carrier Detect (DCD) (not used)
- Pin 2: Receive Data (RXD)
- Pin 3: Transmit Data (TXD)
- Pin 4: Data Terminal Ready (DTR) (not used)
- Pin 5: Ground
- Pin 6: Data Set Ready (DSR) (not used)
- Pin 7: Request to Send (RTS)
- Pin 8: Clear to Send (CTS)
- Pin 9: Ringing Indicator (RI) (not used)
A Data Communications Equipment (DCE) can be interfaced to a Data Terminal Equipment (DTE) using a straight through serial cable. Typically, PC's are defined as a DTE and peripherals are defined as DCE. To interface a DCE with another DCE, or a DTE with another DTE, a null modem (or a Crossover) cable is required. The null modem simply swaps pins to convert a DCE to a DTE and vice-versa.
RS232 Serial Interface Standard

- A “Space” (logic 0) will be between 3 and 25 volts.
- A “Mark” (logic 1) will be between -3 and -25 volts.
- The region between 3 & -3 volts is undefined.
- Maximum data rates may be up to 20 kbps.
- The reason to study RS-232C is that the serial part (Com port) found in PC’S uses this standard.
ASCII representation

- American Standard Code for Information Interchange
- http://www.ascii-table.com/
Baud Rate

- The baud rate is simply “the rate of data transmission expressed in bits per second, kilo Bits per second or Mega bits per second etc”.
Data Bits

- The sender & receiver decide upon no of bits in one data frame such as 8 bits (1 byte) etc.
Each frame is started with the *start bit*, which is always identified by the space line level. Because the line is in mark state when idle, the start bit is easily recognized by the receiver.
Stop Bit

- The stop bit identifying the end of a data frame can have different lengths. Actually, it is not a real bit but a minimum period of time the line must be idle (mark state) at the end of each word. On PC's this period can have three lengths: the time equal to 1, 1.5 or 2 bits. 1.5 bits is only used with data words of 5 bits length and 2 only for longer words. A stop bit length of 1 bit is possible for all data word sizes.
Data Frame

Logic 1 = +5 V

Logic 0 = 0 V

Transmission 1

Word 1

Stop-bit
Parity Bit

- **Parity** is of two types
- 1. Even parity
- 2. Odd parity
- Suppose your data word is 8 bit in length i.e. one byte.
- The sender, before transmitting byte, determines whether the no of bits in the byte to be sent are even. Suppose sender’s wants to send
  - 10011101
  - In which there are 5 “1’s” and 3 “0’s”.
- To keep the no. of 1’s even the sender adds an extra bit at the end of byte so that the total no. of 1’s are 6 (an even no.). This extra bits is called parity bit. Since this bit keeps the no. of 1’s even, so it is called even parity.
Failure of Parity

- What if you transmit above byte 10011101 with even parity being used and on receiver side you receive
  - 10000101 1
  - 2 bits inverted during transmission
  - On receiver side the no. of 1’s including parity=4 (no error for even parity). But actually it is false.
  - So parity does not ensure error detection in all cases.
Odd Parity
Odd parity is added to keep the no. of 1’s odd in transmission. For example for above case of data being
10011101
The odd parity will be added as 0 as no of 1’s are already 5 (an odd no.).
Flow Control

- So if our DTE to DCE speed is several times faster than our DCE to DCE speed the PC can send data to your modem at 115,200 BPS. Sooner or later data is going to get lost as buffers overflow, thus flow control is used. Flow control has two basic varieties, Hardware or Software.

- Software flow control, sometimes expressed as Xon/Xoff uses two characters Xon and Xoff. Xon is normally indicated by the ASCII 17 character whereas the ASCII 19 character is used for Xoff. The modem will only have a small buffer so when the computer fills it up the modem sends a Xoff character to tell the computer to stop sending data. Once the modem has room for more data it then sends a Xon character and the computer sends more data. This type of flow control has the advantage that it doesn't require any more wires as the characters are sent via the TD/RD lines. However on slow links each character requires 10 bits which can slow communications down.

- Hardware flow control is also known as RTS/CTS flow control. It uses two wires in your serial cable rather than extra characters transmitted in your data lines. Thus hardware flow control will not slow down transmission times like Xon-Xoff does. When the computer wishes to send data it takes active the Request to Send line. If the modem has room for this data, then the modem will reply by taking active the Clear to Send line and the computer starts sending data. If the modem does not have the room then it will not send a Clear to Send.
Device Manager

Communications Port (COM1) Properties

- Bits per second: 9600
- Data bits: 8
- Parity: None
- Stop bits: 1
- Flow control: None

[Advanced] [Restore Defaults]
Measurement & Automation explorer

Configuration

Port binding: COM1

Settings:
- Baud rate: 9600
- Data bits: 8
- Parity: None
- Stop bits: 1
- Flow control: None

Validate

Open VISA Test Panel

Save

Revert

What do you want to do?
- Rename my device
- Communicate with my device
- View and edit properties of baud rates for my serial ports
- Remove a serial resource
- Save pending changes
- Discard pending changes

Baud rate
Sets the rate, in bits per second (bps), that you want data to be transmitted through this port. Usually, this is set to the maximum rate supported by the computer or device with which you are communicating.
LabVIEW
Loopback test
Geiger Counter VI
Counts per min: 36