



SNS COLLEGE OF ENGINEERING
(Autonomous)
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING



UNIT 4 EMBEDDED SYSTEM
Parallel Communication ,RS-232



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PARALLEL COMMUNICATION

In data transmission, parallel communication is a method of conveying multiple binary digits(bits) simultaneously.It contrasts with communication.The communication channel is the number of electrical conductors used at the physical layer to convey bits.

Parallel communication implies more than one such conductor. For example, an 8-bit parallel channel will convey eight bits (or a byte) simultaneously, whereas a serial channel would convey those same bits sequentially, one at a time. Parallel communication is and always has been widely used within integrated circuits, in peripheral buses, and in memory devices such as RAM.



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Product level communication interface (External Communication Interface):

The Product level communication interface“ (External Communication Interface) is responsible for data transfer between the embedded system and other devices or modules.

It is classified into two types

1. Wired communication interface
2. Wireless communication interface

1. Wired communication interface:

Wired communication interface is an interface used to transfer information over a wired network.It is classified into following types.



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RS-232C:

- RS-232 C (Recommended Standard number 232, revision C from the Electronic Industry Association) is a legacy, full duplex, wired, asynchronous serial communication interface.
- RS-232 extends the UART communication signals for external data communication.
- UART uses the standard TTL/CMOS logic (Logic „High“ corresponds to bit value 1 and Logic „LOW“ corresponds to bit value 0) for bit transmission whereas RS232 use the EIA standard for bit transmission.
- As per EIA standard, a logic „0“ is represented with voltage between +3 and +25V and a logic „1“ is represented with voltage between -3 and -25V.
- In EIA standard, logic „0“ is known as „Space“ and logic „1“ as „Mark“.

The RS232 interface define various handshaking and control signals for communication

apart from the „Transmit“ and „Receive“ signal lines for data communication

RS-232 supports two different types of connectors, namely; DB-9: 9-Pin connector and DB-25:25-Pin connector.

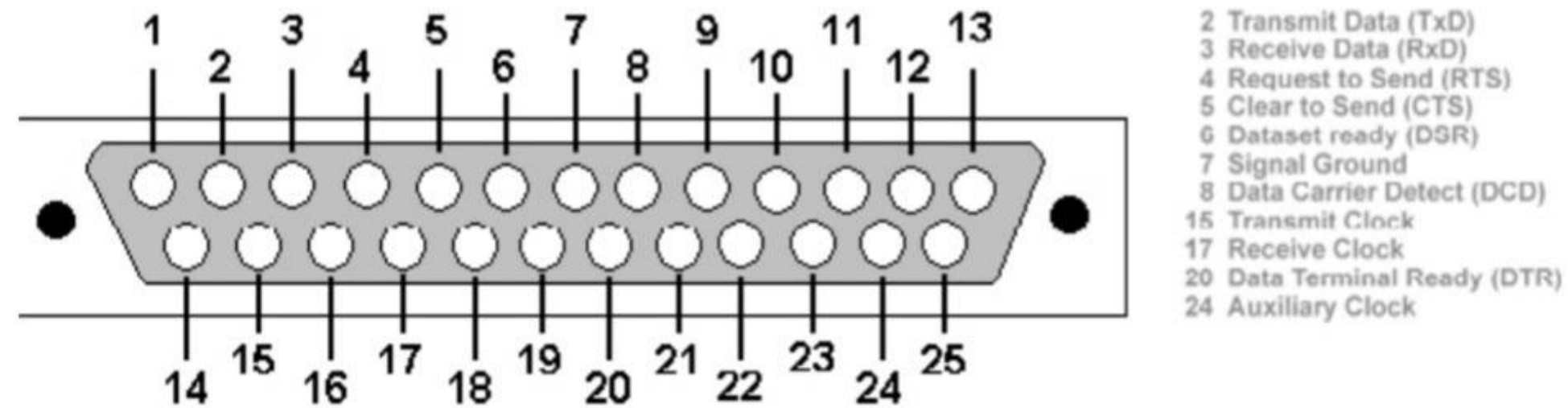
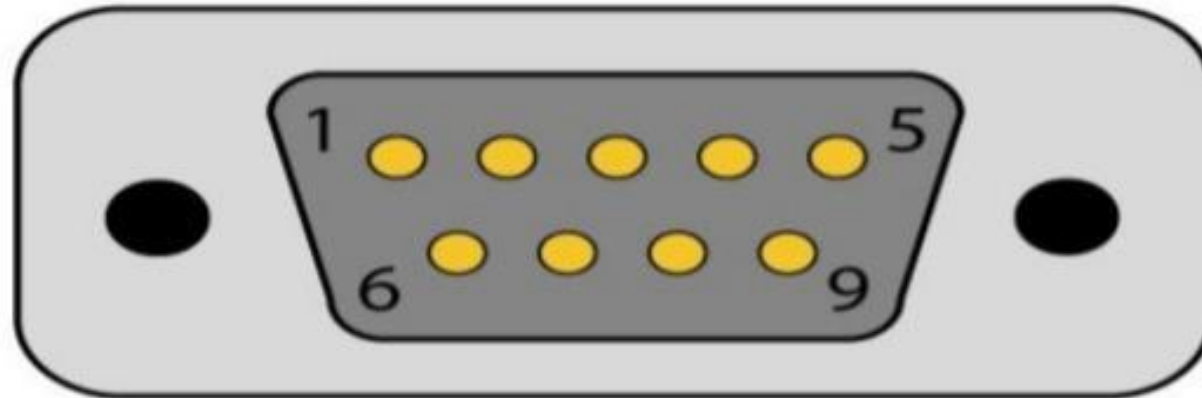


Fig: DB-25:25-Pin connector.

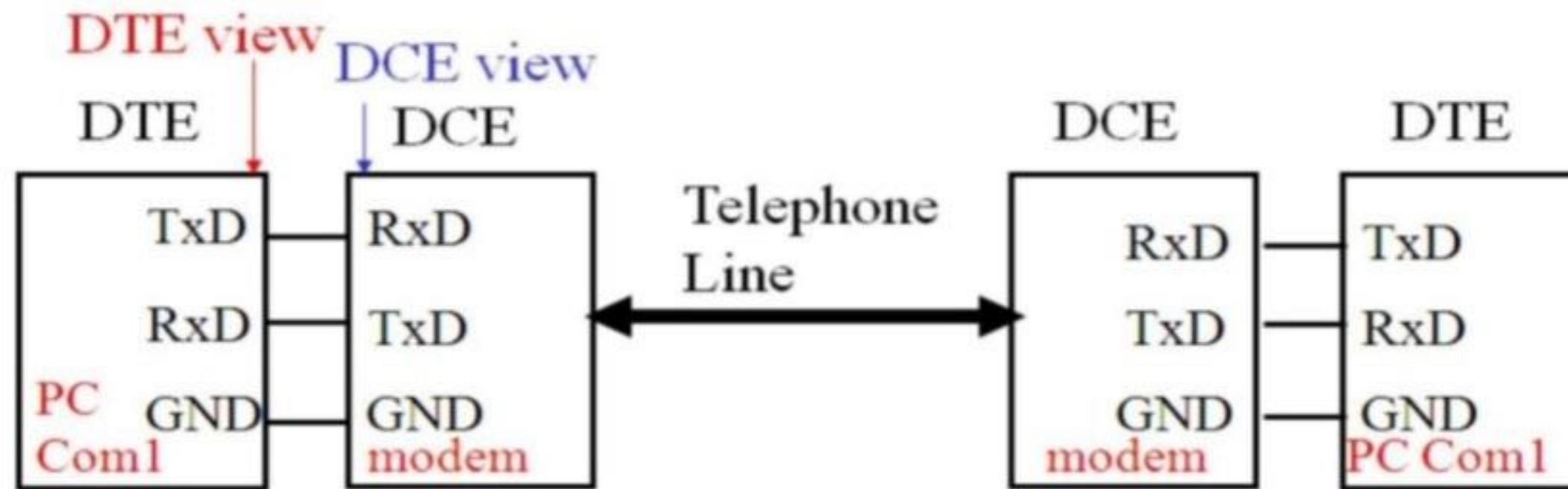
DB9M Connector



RS232 Pin Out

Pin #	Signal
1	DCD
2	RX
3	TX
4	DTR
5	GND
6	DSR
7	RTS
8	CTS
9	RI

Fig: DB-9:9-Pin connector.



- RS-232 is a point-to-point communication interface and the devices involved in RS-232 communication are called „Data Terminal Equipment (DTE)“ and „Data Communication Equipment (DCE)“
- If no data flow control is required, only TXD and RXD signal lines and ground line (GND) are required for data transmission and reception.
- The RXD pin of DCE should be connected to the TXD pin of DTE and vice versa for proper data transmission.



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- If hardware data flow control is required for serial transmission, various control signal lines of the RS-232 connection are used appropriately.
- The control signals are implemented mainly for modem communication and some of them may be irrelevant for other type of devices.
- The Request to Send (RTS) and Clear To Send (CTS) signals co-ordinate the communication between DTE and DCE.
- Whenever the DTE has a data to send, it activates the RTS line and if the DCE is ready to accept the data, it activates the CTS line.
- The Data Terminal Ready (DTR) signal is activated by DTE when it is ready to accept data.
- The Data Set Ready (DSR) is activated by DCE when it is ready for establishing a



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- Ring Indicator (RI) is a modem specific signal line for indicating an incoming call on the telephone line.
- As per the EIA standard RS-232 C supports baudrates up to 20Kbps (Upper limit 19.2Kbps).
- The commonly used baudrates by devices are 300bps, 1200bps, 2400bps, 9600bps, 11.52Kbps and 19.2Kbps.
- The maximum operating distance supported in RS-232 communication is 50 feet at the highest supported baudrate.
- Embedded devices contain a UART for serial communication and they generate signal levels conforming to TTL/CMOS logic.



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USB (UNIVERSAL SERIAL BUS):

- External Bus Standard.
- Allows connection of peripheral devices.
- Connects Devices such as keyboards, mice, scanners, printers, joysticks, audio devices, disks.
- Facilitates transfers of data at 480 (USB 2.0 only), 12 or 1.5 Mb/s (mega-bits/second).
- Developed by a Special Interest Group including Intel, Microsoft, Compact, DEC, IBM, Northern Telecom and NEC originally in 1994.



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- 480 Mb/s signaling bit rate
- NRZI with bit stuffing used
- SYNC field present for every packet
- There exist two pre-defined connectors in any USB system - Series “A” and Series “B”

Connectors.

- Series “A” cable: Connects USB devices to a hub port.
- Series “B” cable: Connects detachable devices (hot- swappable)
- **USB HOST:** Device that controls entire system usually a PC of some form. Processes data arriving to and from the USB port.
- **USB HUB:** Tests for new devices and maintains status information of child devices. Serve as repeaters, boosting strength of up and downstream signals. Electrically isolates devices



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Wireless communication interface :

Wireless communication interface is an interface used to

transmission of information over a distance without help of wires, cables or any other forms of electrical conductors.

They are basically classified into following types

1. Infrared
2. Bluetooth
3. Wi-Fi
4. Zigbee



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THANK YOU