RS-232

Ali Mirghasemi

Introduction

- RS-232, which stands for Recommended Standard 232, is a widely used serial communication protocol that defines the electrical and functional characteristics of a point-to-point or multi-point communication interface.

- Originally developed by the Electronic Industries Association (EIA) in 1960, RS-232 has been a fundamental standard for serial data communication for decades.

- Despite the advancement of newer communication standards, RS-232 is still prevalent in various industrial, scientific, and consumer applications due to its simplicity and robustness.

Applications

- **Computer Peripherals**
  - It was historically used to connect devices such as modems, mice, and printers to computers.

- **Industrial Control Systems**
  - RS-232 is employed in industrial automation to connect programmable logic controllers (PLCs), sensors, and other devices to control systems.

- **Networking Equipment**
  - It's used in configuring and managing network devices like routers and switches.

- **Medical Equipment**
  - Many medical instruments and devices use RS-232 for data transfer and control.

- **Telecommunications**
  - RS-232 was used in the past for connecting telecommunication equipment, although it's mostly replaced by more modern standards.

Parameters

| Baud Rate (bps)	Maximum cable length (meter)	Maximum cable length (feet)
19200	15.24 m	50 ft
9600	152.4 m	500 ft
4800	304.8 m	1000 ft
2400	914.4 m	3000 ft

Connector

- The RS-232 connector is most commonly a DB-25 (25-pin) or a DB-9 (9-pin) D-sub connector.

- The DB-25 connector is typically found in older equipment, while the DB-9 connector is more common in modern devices and computers.

- Adapters are often used to connect devices with different connector types.
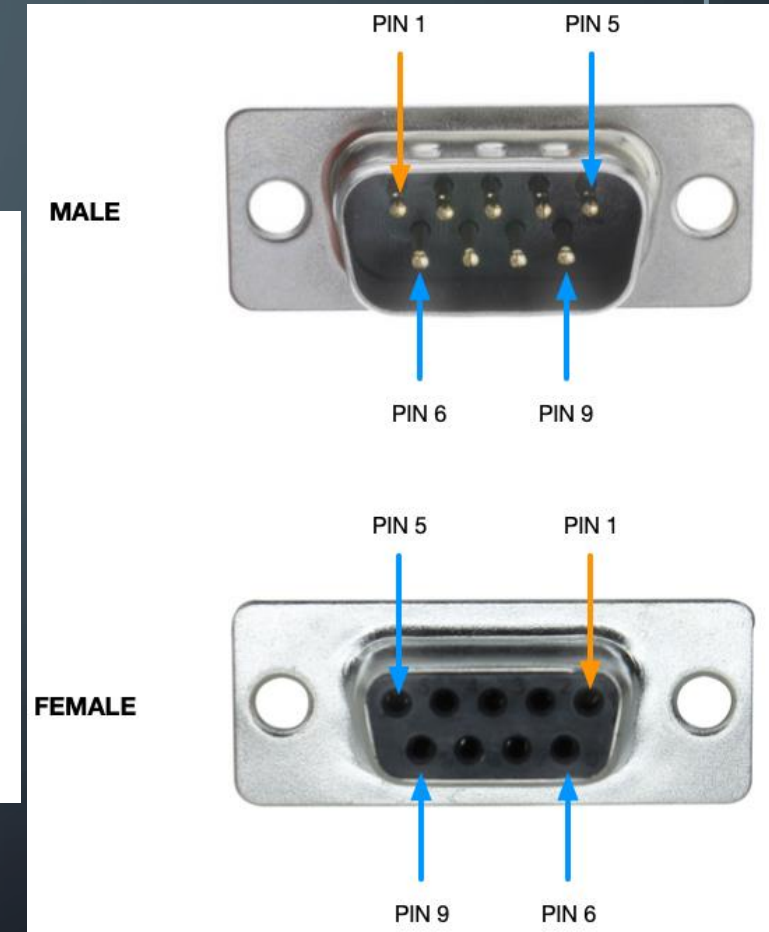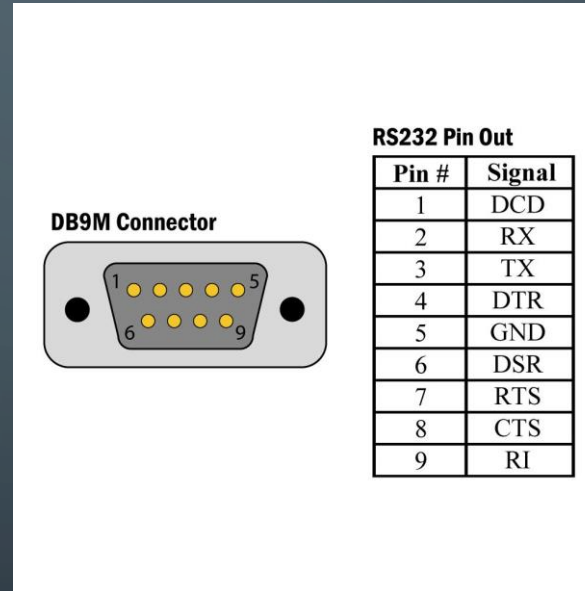
Pinout (DB-25)

- Transmit Data (TXD): Pin 2

- Receive Data (RXD): Pin 3

- Request to Send (RTS): Pin 4

- Clear to Send (CTS): Pin 5

- Data Terminal Ready (DTR): Pin 20

- Data Set Ready (DSR): Pin 6

- Signal Ground (SG): Pin 7
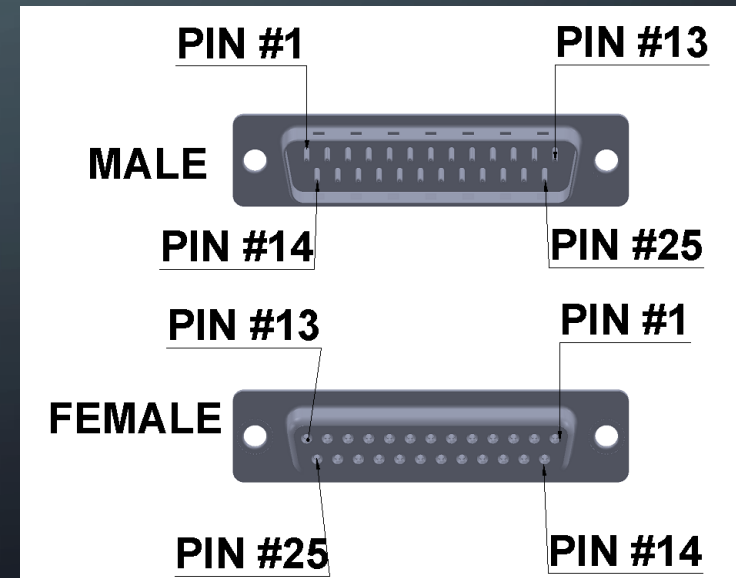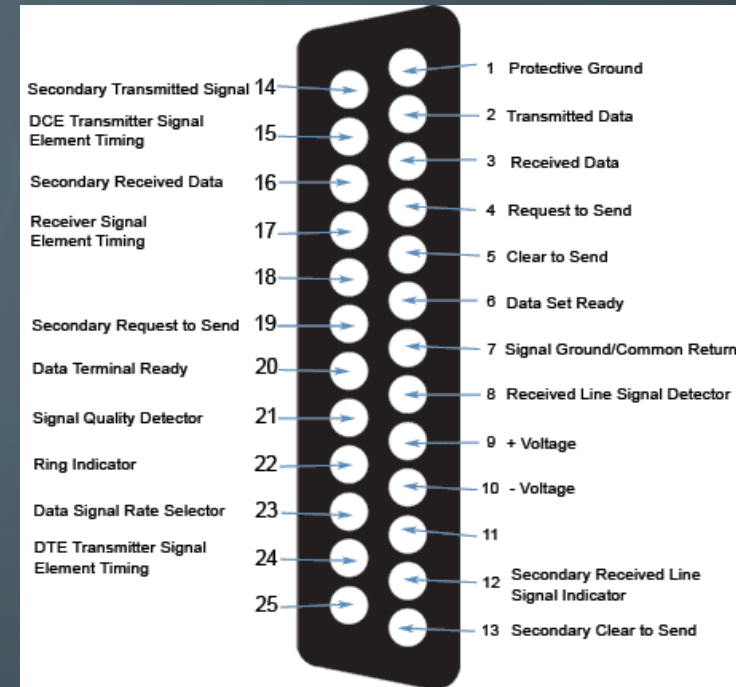
Pinout (DB-9)

- Transmit Data (TXD): Pin 2

- Receive Data (RXD): Pin 3

- Request to Send (RTS): Pin 7

- Clear to Send (CTS): Pin 8

- Data Terminal Ready (DTR): Pin 4

- Data Set Ready (DSR): Pin 6

- Signal Ground (SG): Pin 5

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

Voltage State

- RS-232 uses voltage levels to represent binary data. It's considered a bipolar signal, which means it can swing both positively and negatively to represent different states.

- The voltage levels are typically between +3 to +15 volts for logic "0" (space) and -3 to -15 volts for logic "1" (mark).

- The voltage range provides noise immunity, making RS-232 robust for communication over relatively long distances.

Signal

RS232 Transmission of the letter 'J' - 0x4A
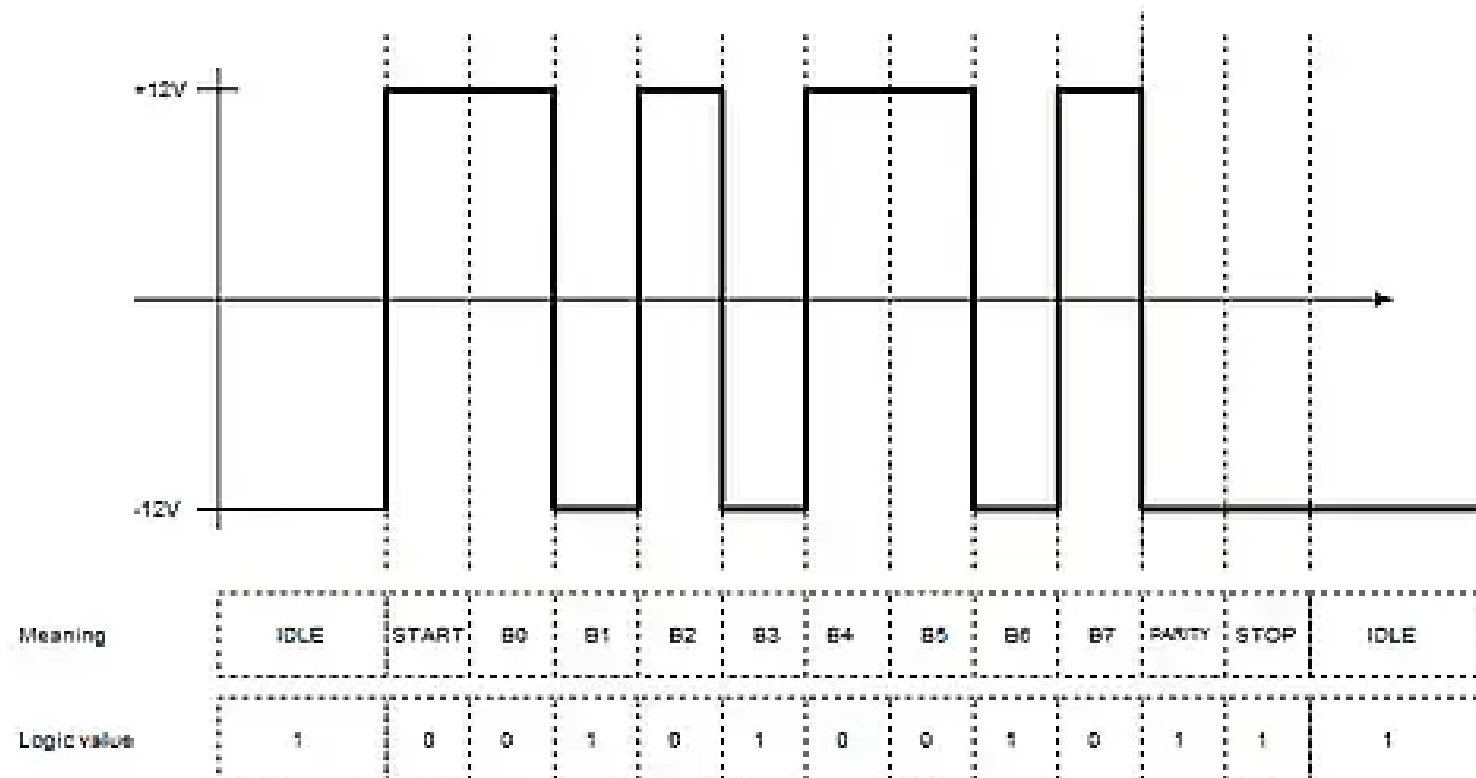
Cable

- To ensure reliable RS-232 communication, it's essential to use the right cable. RS-232 cables are typically shielded to reduce electromagnetic interference. A common RS-232 cable consists of at least three wires:

  - **Transmit Data (TXD)**: Connects to the RXD pin of the receiving device.
  - **Receive Data (RXD)**: Connects to the TXD pin of the receiving device.
  - **Signal Ground (SG)**: Connects to the SG pin of the receiving device.

- Additional wires for handshake lines, such as RTS, CTS, DTR, and DSR, may be included for more advanced communication and control. The cable should be properly wired according to the requirements of the devices being connected.

Phy (MAX232)