How RS232 Serial Communication Works

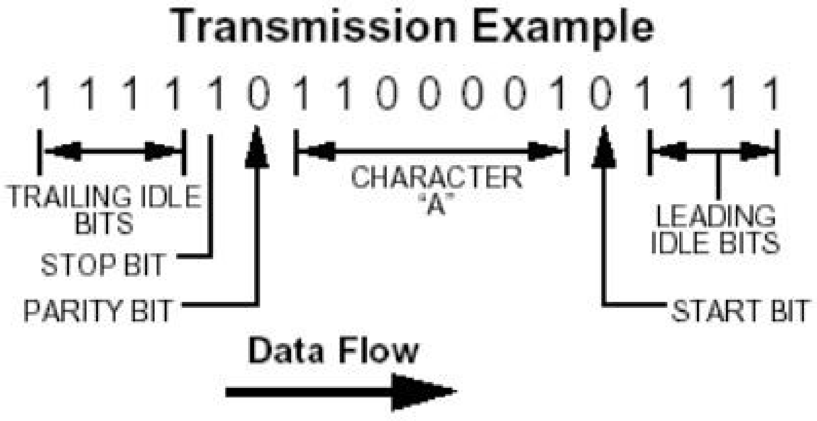
Information being transferred between data processing equipment and peripherals is in the form of digital data which is transmitted in either a serial or parallel mode. Parallel communications are used mainly for connections between test instruments or computers and printers, while serial is often used between computers and other peripherals.

RS232 protocol transmission involves the sending of data one bit at a time, over a single communications line. In contrast, parallel communications require at least as many lines as there are bits in a word being transmitted (for an 8-bit word, a minimum of 8 lines are needed). RS232 Serial transmission is beneficial for long distance communications, whereas parallel is designed for short distances or when very high transmission rates are required.

RS232 Standards

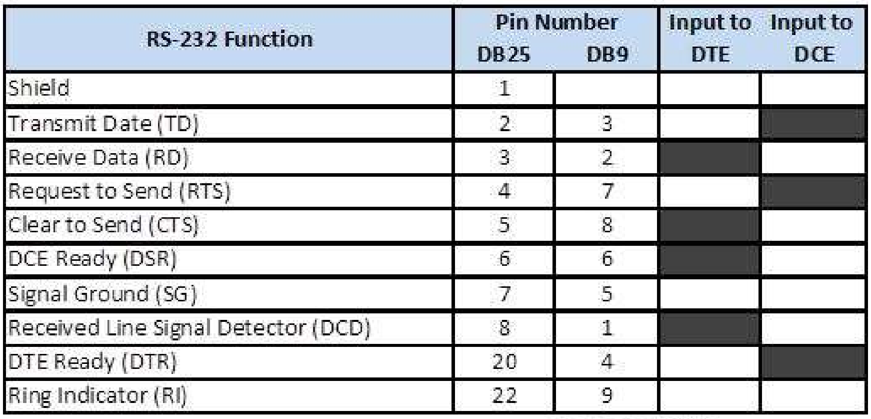
One of the advantages of the RS232 protocol is that it lends itself to transmission over telephone lines. The serial digital data can be converted by modem, placed onto a standard voice-grade telephone line, and converted back to serial digital data at the receiving end of the line by another modem.

fficially, RS-232 is defined as the "Interface between data terminal equipment and data communications equipment using serial binary data exchange." This definition defines data terminal equipment (DTE) as the computer, while data communications equipment (DCE) is the modem. A modem cable has pin-to-pin connections, and is designed to connect a DTE device to a DCE device.

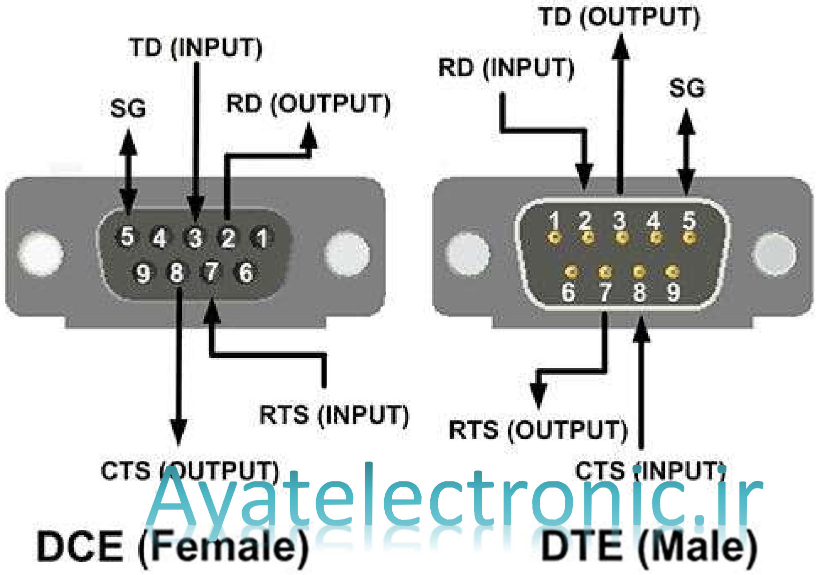


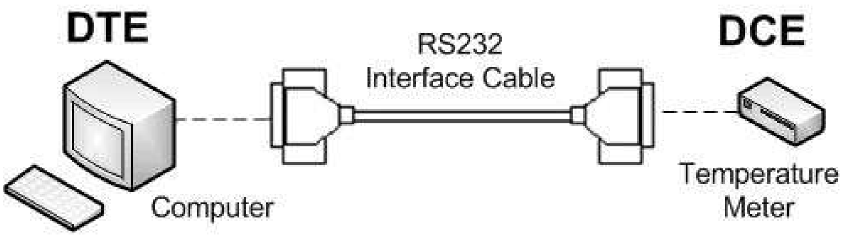
RS232 port

In addition to communications between computer equipment over telephone lines, RS-232 protocol is now widely used for connections between data acquisition devices and computer systems. As in the definition of RS232, the computer is data transmission equipment (DTE). However, many interface products are not data communications equipment (DCE). Null modem cables are designed for this situation; rather than having the pinto- pin connections of modem cables, null modem cables have different internal wiring to allow DTE devices to communicate with one another.



RS-232 Function	Pin Number		Input to	Input to
	DB25	DB9	DTE	DCE
Shield	1			
Transmit Date (TD)	2	3		■
Receive Data (RD)	3	2	■	
Request to Send (RTS)	4	7		■
Clear to Send (CTS)	5	8	■	
DCE Ready (DSR)	6	6	■	
Signal Ground (SG)	7	5		
Received Line Signal Detector (DCD)	8	1	■	
DTE Ready (DTR)	20	4		■
Ring Indicator (RI)	22	9		





Cabling Options

RS-232 cables are commonly available with either 4, 9 or 25-pin wiring. The 25-pin Rs232 cable connects every pin; the 9-pin Rs232 cables do not include many of the uncommonly used connections; 4-pin Rs232 cables provide the bare minimum connections, and have jumpers to provide "handshaking" for those devices that require it. These jumpers connect pins 4, 5 and 8, and also pins 6 and 20.

The advent of the IBM PC AT has created a new wrinkle in RS-232 communications. Rather than having the standard 25-pin connector, this computer and many new expansion boards for pc's feature a 9-pin serial port. To connect this port to a standard 25- pin port, a 9- to 25-pin adaptor cable may be utilized, or the user may create his own cable specifically for that purpose.

Selecting a RS232 Cable

The major considerations in choosing an RS-232 cable are based upon the devices to be connected. First, are you connecting two DTE devices (null modem cable) or a DTE device to a DCE device (modem cable)? Second, what connectors are required on each end, male or female, and 25 or 9-pin (AT style)? Usually, it is recommended that the user obtain the two devices to be connected, and then determine which cable is required.

RS-232 pinout

TRANSMITTED SIGNAL

VOLTAGE LEVELS:

Binary 0: +5 to +15 Vdc (called a " space" or "on")

Binary 1: -5 to -15 Vdc (called a "mark" or "off")

RECEIVED SIGNAL

VOLTAGE LEVELS:

Binary 0: +3 to +13 Vdc

Binary 1: -3 to -13 Vdc

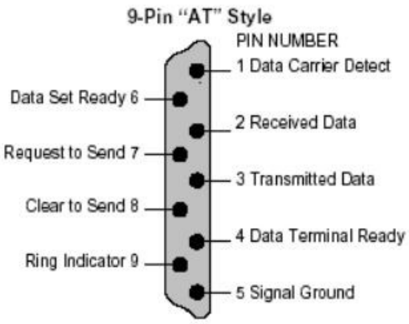
DATA FORMAT

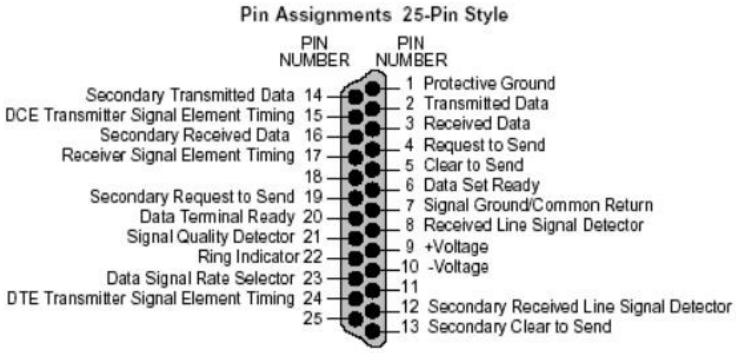
Start bit: Binary 0

Data: 5, 6, 7 or 8 bits

Parity: Odd, even, mark or space (not used with 8-bit data)

Stop bit: Binary 1, one or two bits




Pin Assignments 25-Pin Style
PIN NUMBER
PIN NUMBER
Secondary Transmitted Data 14
DCE Transmitter Signal Element Timing 15
Secondary Received Data 16
Receiver Signal Element Timing 17
18
Secondary Request to Send 19
Data Terminal Ready 20
Signal Quality Detector 21
Ring Indicator 22
Data Signal Rate Selector 23
DTE Transmitter Signal Element Timing 24
25
1 Protective Ground
2 Transmitted Data
3 Received Data
4 Request to Send
5 Clear to Send
6 Data Set Ready
7 Signal Ground/Common Return
8 Received Line Signal Detector
9 +Voltage
10 -Voltage
11
12 Secondary Received Line Signal Detector
13 Secondary Clear to Send