

Serial Communication

(For reference only)

RS-232 single-ended data transmission system

RS-232 is a single-ended data transmission system, which means that it uses a single wire for data transmission. (Since useful communication is generally two way, a two-wire system is employed, one to transmit and one to receive.) Signals are processed by determining whether they are positive or negative when compared with a ground. Because signals traveling this single wire are vulnerable to degradation, RS-232 systems are recommended for communication over short distances (up to 50 feet) and at relatively slow data rates (up to 20 kbps). However, in practice, these limits can be exceeded.

RS-422 Balanced Transmission

The RS-422 protocol greatly expands the practical possibilities of the serial bus. It provides a mechanism by which serial data can be transmitted over great distances (to 4,000 feet) and at very high speeds (to 10 Mbps). This is accomplished by splitting each signal across two separate wires in opposite states, one inverted and one not inverted. The receiver to determine the logical state of the

Signal compares the difference in voltage between the two lines. This wire configuration, called differential data transmission or balanced transmission, is well suited to noisy environments.

COMPARISON CHART OF RS - 232 / 422 / 485

	RS-232	RS-422	RS-485
Mode of Operation	Single ended	Differential	Differential
Drivers per Line	1	1	32
Receivers per Line	1	10	32
Maximum Cable Length	50 feet	4000 feet	4000 feet
Maximum Data Rate	20 kbps	10 Mbps	10 Mbps
Driver Output Maximum Voltage	±25V	-0.25 to +6V	-7 to +12V
Driver Output Signal Level (loaded)	±5V	±2V	±1.5V
Driver Output Signal Level (unloaded)	±15V	±5V	±5V
Driver Load Impedance	3k to 7k	100k	54k
Max. Driver Output Current (Power on)	n/a	n/a	±100µA
Max. Driver Output Current (Power off)	VMAX/300	±100µA	±100µA
Slew Rate	30V/µs max.	n/a	n/a
Receiver Input Voltage Range	±15V	-7V to +7V	-7V to +12V
Receiver Input Sensitivity	±3V	±200mV	±200mV
Receiver Input Resistance	3k to 7k	4k	12k

RS-485 The True Multidrop Network

RS-485 is an upgraded version of the RS-422 protocol that was specifically designed to address the problem of communication between multiple devices on a single data line. It is a balanced transmission system that is virtually identical to RS-422 with the important addition of the ability to allow up to 32 devices to communicate using the same

data line. Thus any Point A through Point FF can directly communicate with each other, taking on the role of master and slave as needed. This is achieved with tristatable drivers, which are usually controlled by a programmable handshake line to ensure that only one device acts as a driver at any one time. In such a system, the RS-485 line cannot be thought to have a beginning and an end, because communication can be initiated from any point on the line. Thus, terminating resistors must be placed at both ends of the RS-485 wire to achieve the infinite line illusion.

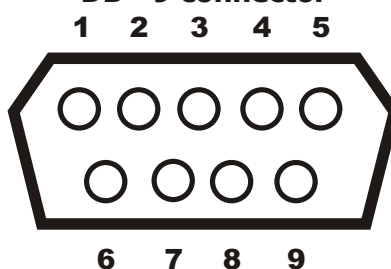
PIN DESCRIPTION

- DTR** : Data Terminal Ready--Used by a DTE to signal that it is plugged in and available to begin communication.
- DSR** : Data Set Ready--Sister signal to DTR, it is used by the DCE to indicate it is ready to begin communication.
- CTS** : Clear to Send--Used by DCE to signal it is available to send data, and used in response to a RTS request for data.
- RTS** : Request to Send--Used by a DTE to indicate that it wants to send data. Also, in a multi-drop network, used to turn carrier on the modem on and off.
- DCD** : Data Carrier Detect--Used by a DCE to indicate to the DTE that it has received a carrier signal from the modem and that real data is being transmitted.
- RI** : Ring Indicator--Used by DCE modem to tell the DTE that the phone is ringing and that data will be forthcoming.
- TxD** : Transmit Data--This wire is used for sending data.
- RxD** : Receive Data--This line is used for receiving data.
- GND** : Signal Ground--This pin is the same for DTE and DCE devices, and it provides the return path for both data and handshake signals.

Pin details of the DB - 9 connector

Pin	Signal	Description
1	DCD	Data carrier detect
2	RxD	Receive Data
3	TxD	Transmit Data
4	DTR	Data terminal ready
5	GND	Signal ground
6	DSR	Data set ready
7	RTS	Ready to send
8	CTS	Clear to send
9	RI	Ring Indicator

DB - 9 connector



Pin layout of the DB-9 connector

Pin	Rs232	Rs422	Rs485
1	-	Tx-	Data-
2	Rx	-	-
3	Tx	Rx-	-
4	DTR	Rx+	-
5	GND	-	-
6	DSR	-	-
7	RTS	-	-
8	CTS	-	-
9	-	Tx+	Data+