

Application Note AN-0013

Summary of RS232 and RS422 Standards

This application note details the main differences between the common serial interface standards.

RS-232

This is the oldest and most widely known interface standard. It provides a single ended (unbalanced) non-terminated line.

The standard uses voltages of +/-5v min to +/-15v max to represent the binary 0's and 1's. The original specification recommended a 16 metre maximum cable length and 20k baud data rates. Modern driver/receiver IC's can cope with data rates up to 115K baud but at shorter cable lengths.

The maximum cable length that can be driven will depend on the baud rate, the driver/receiver IC's, the cable type, and the amount of electrical noise in the surrounding environment. The following table can be used as a guide.

Baud Rate	Max Cable Length
1200	400m
4800	100m
9600	50m
38400	12m
115200	4m

As most modern computer systems work from a single +5v supply, generating the nominal +/-12v required for the RS-232 link could be a problem. However, many IC manufacturers have developed RS-232 driver chips that generate their own +/-10v using voltage doubling and inverting techniques. These IC's will typically use +/-9v as their RS-232 signal voltages.

The transmit line of a RS-232 interface can be identified by measuring the voltages at the connector pins, the Tx line will normally sit between -5v and -12v. Be careful not to confuse the Tx pin with other pins that may also sit at a negative voltage. Using an oscilloscope is the best method as the Tx line will sit at the negative voltage and then show transitions to an equal positive voltage during any transmission.

RS-423

This standard was introduced in 1975 and is an improved version of RS-232. It is not commonly used.

RS-422

This standard was introduced in 1975 to offer improvements over the older RS-232 standard. It provides a balanced line with optional termination.

The standard uses a voltage differential of 2v min to 5v max to represent the binary 0's and 1's. The specification allows data rates up to 10M baud at 40 feet maximum cable length.

The maximum cable length that can be driven will depend on the baud rate, the driver/receiver IC's, the cable type, and the amount of electrical noise in the surrounding environment. The following table can be used as a guide.

Baud Rate	Max Cable Length
1200	1200m
4800	1200m
9600	1200m
38400	1200m
115200	1000m
500K	250m
1M	125m
10M	12m

RS-422 can be used for point-to-point communication or for multi-drop one-master/many-slave systems.

RS-485

This standard was introduced in 1983 as an extension to the RS-422 standard. It has improved electrical properties to allow up to 32 drivers and receivers to share the same line.

RS-485/422 Compatibility

RS-485 is a derivative of the RS-422 standard. All the main operating voltage levels are the same assuring a high degree of compatibility (99%) with Quartz port routers and other equipment. The RS485 standard supports 2-wire and 4-wire modes. The 4-wire mode is the universally preferred and supported option. Check that the device to be connected is using the 4-wire mode. This will be the case if the device connector has a transmit pair (Tx+ & Tx-) and a receive pair (Rx+ & Rx-).

Some RS-485 (and RS-422) devices will tri-state (Hi-Z) their driver when not transmitting, effectively disconnecting the device and rendering it transparent. This may cause problems for the port router when used in auto-detect mode. For these devices, the port routers individual port must be configured to turn off the auto-detect mode. This locks the transmit and receive pairs to their respective connector pins.