

IDC Technologies' Tech Brief (*Communications*)

Balanced versus Unbalanced Standards

Ensure that you select a balanced standard whenever considering a data communications link. The Balanced standards include such ones as RS-485 or RS-422. Unbalanced standards include RS-232. The reasons are briefly discussed below.

Unbalanced Standard

In data communications systems using the EIA-232 or EIA-423 interface standards, the voltage signal is said to be unbalanced because only one wire carries the signal voltage, which is referenced to the signal common wire, sometimes called the signal ground. The transmitted signal is the voltage between the signal conductor and the common reference conductor.

This approach works well if the signal currents are small and the common conductor has a very low impedance. Typically this works well over short communications links. For long communications links, the common conductor does not have the same zero voltage at all points along its length or at its ends. The common conductor can also pick up noise and have other voltages superimposed on it. Sometimes the shield conductor is used as the common reference wire. However this practice can introduce excessively high noise levels and should be avoided.

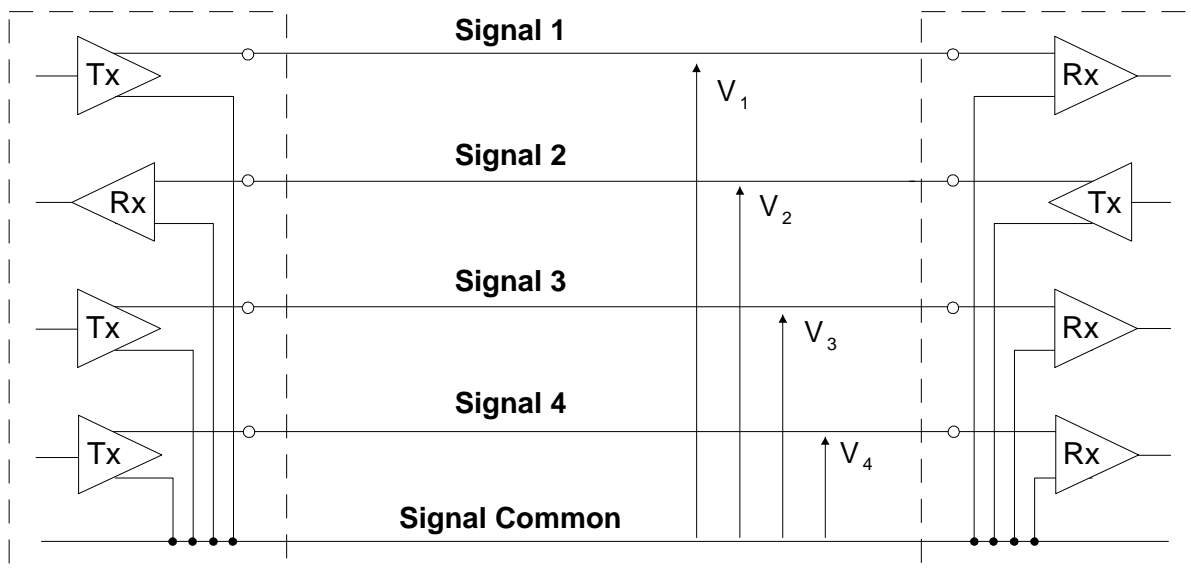


Figure 1: Data Communications with Unbalanced Interfaces.

Balanced Standard

Communication interfaces operating in accordance with the EIA-422 or EIA-423 interface standards require two conductors to transmit each signal. The voltage at the receiving end is measured as the voltage difference between these two wires. This is known as a balanced or differential system. This eliminates many of the interference problems associated with the common reference wire.

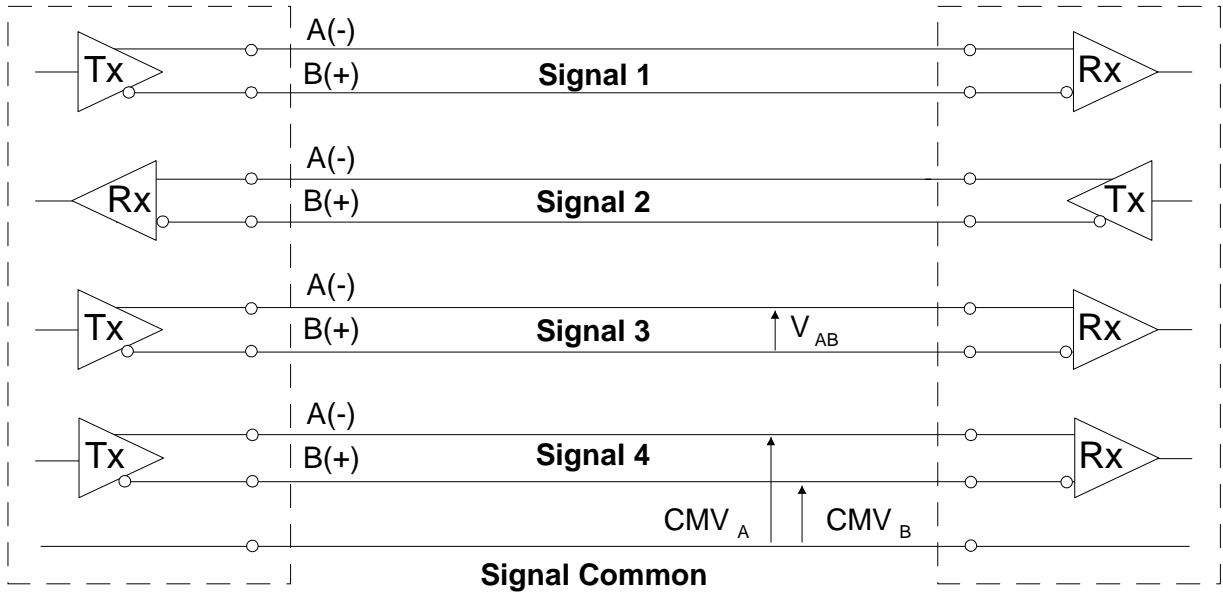


Figure 2: Data Communications with Balanced Interfaces.

Conclusion

The balanced transmission line permits a higher rate of data transfer over longer distances. The differential method of data transfer is preferable in industrial applications where noise can be a major problem. The disadvantage is that a balanced system requires two conductors for every signal. One problem to be aware of is to be careful of the common voltage on both lines exceeding a defined limit. Ideally the common voltage on the two wires will cancel out completely but it should be noted that the greater the common voltage and the greater the voltage difference and the more likely that the noise will affect the signal.