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## RS-232 Marks/Spaces and Cable Length/Grounding

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### MARKs and SPACES

All RS-232 signals (except grounds) will be above + 3 volts or below - 3 volts (commonly + or - 12 volts). The area between + 3 volts and - 3 volts is called the transition region.

No RS-232 signal (excluding ground) should ever be stationary at a voltage in the transition region. If one is found between + 3 volts and - 3 volts, it is a definite indication of a problem.

A high RS-232 voltage (between + 3 volts and + 25 volts) is called a SPACE.

A low voltage (between - 3 volts and - 25 volts) is called a MARK.

All Control and Clock signals are SPACES when ON and MARKs when OFF.

All Data signals are SPACES when a logic ZERO and MARKs when a logic ONE.

### CABLE LENGTH

One of the problems in an RS-232 installation is determining the length of cable to be used. This is because capacitance increases with cable length and increased capacitance can eventually degrade the signal to the point where it will cause the loss of data integrity.

The RS-232 standard very conservatively recommends that the maximum length of cable be 50 feet (unless special low capacitance cable is used) and that its total capacitance be limited to 2500 uf or less. However, this length can usually be doubled, tripled, and more depending on the BPS rate (the higher the BPS rate used, the shorter the cable may have to be).

If a cable is over 50 feet and a length problem is suspected, try using a lower BPS rate. If the problem goes away, then try using a shorter or lower capacitance cable at the higher data rate. If the problem doesn't reappear then it must have been the longer cable.

### CABLE GROUNDING

If long cables (over 50 feet) are used, the cable should be shielded. In this case the shield, SG (pin 7), and CG (pin 1) should be grounded to the chassis on only one side of the interface (either the DTE or DCE).

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