11.4. Lengths of serial cables

The RS-232 standard 9600bps port will drive 15 metres of shielded cable. More precisely, an RS-232 line driver will operate against a capacitance of up to 2500 picoFarad with low enough skew to allow a 9600bps signal to be recovered.

If you select a cable with lower capacitance you can drive further distances. For example, *ANSI/TIA /EIA-568-A* unshielded twisted pair category 5 cable has a maximum capacitiance of 55pF per metre, so this popular "UTP cat 5" cable can be safely driven up to 45m. Beyond that you should check the cable manufacturers specifications for the actual "shunt capacitance" (a common figure is 47.5 pF/m, giving a maximum cable length of about 50m). However long runs of unshielded cable will pick up noise easily, as the RS-232 signals are not balanced. Some cable manufacturers offer shielded low capacitance cables which can be driven up to 100m.

Similarly, if you select a lower data rate you can drive further distances. Table 11-1 shows the maximum distances over standard shielded cable at differing data rates.

Table 11-1. Data rates and the maximum distances recommended in *RS-232*

Data rate (bps)	Distance (m)
2400	60
4800	30
9600	15
19200	7.6
38400	3.7
56000	2.6

If you are comfortable in working beyond specifications then you might note that the experience of enterprise network operators has been that structured cabling layout in buildings is limited by the 100m distance limitation of fast ethernet over category 5 cable, not by the practical distances achieved by RS-232 asynchronous signals at 9600bps over category 5 cable.

For longer distances use an RS-232 line driver; these will typically drive up to 2000 meters over category 3 UTP cable. For greater distances consider using fiber optical modems, the global telephony system, the mobile telephony system, satellite or radio.