

PART IV

SYSTEM PERFORMANCE FROM VERY LOW TO VERY HIGH RATES

The benefits of the digital mode for communication started to dawn on the telephone system designers with the advent of digital carriers. This was indeed an innovative concept in its own right. The T1 carrier paved the way to bring digital techniques to the trunk facilities and to some extent to the subscriber plant. Meanwhile, the computer revolution of the 1950s and 1960s was exerting an insidious influence on the telecommunication industry to serve distributed systems. The latter influence shaped the telecommunication industry toward low rate (120 bps, 240 bps, 480 bps, etc.), modem-based digital services from the 1960s to the early 1970s. In those days, the audio frequency based on-off type analog devices served very low speed peripherals, such as electro-mechanical teleprinters. This was indeed a very modest beginning, but it did set an important stage for the *modem* technology of the 1980s and 1990s at rates to 32 kbps (or even higher rates) using the V.bis and V.fast technology. The digital carriers themselves have followed a parallel expansion in their capacity. In this part of the book, the focus is on the copper-based systems in the loop plant and in the premises distribution systems. The impact of fiber is presented in Part V.

Chapter 11 discusses the numerous rates and their viability up to the E1 rates, i.e., 2.048 Mbps for European PRISDN. Chapter 12 presents the loop plant performance at the E1 rate. Chapter 13 presents the simulation results of uncoded or trellis-encoded systems in the American loop plant. In Chapter 14, the ultimate limits of United States loop plants and their Shannon capacity (with only crosstalk setting the upper ceiling for the data rates) are presented.