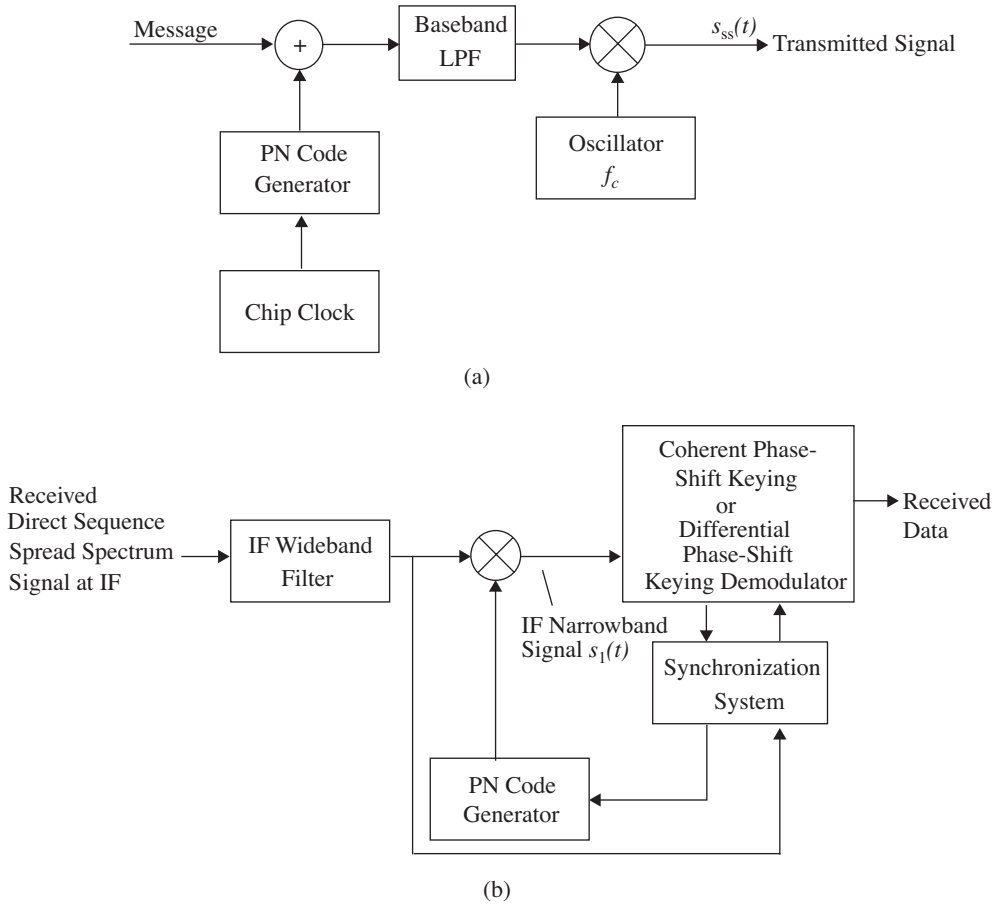

Figure 6.49 Block diagram of a DS–SS system with binary phase modulation: (a) transmitter; and (b) receiver.

The received spread spectrum signal for a single user can be represented as

$$s_{ss}(t) = \sqrt{\frac{2E_s}{T_s}} m(t)p(t)\cos(2\pi f_c t + \theta) \tag{6.134}$$

where $m(t)$ is the data sequence, $p(t)$ is the PN spreading sequence, f_c is the carrier frequency, and θ is the carrier phase angle at $t = 0$. The data waveform is a time sequence of nonoverlapping rectangular pulses, each of which has an amplitude equal to +1 or –1. Each symbol in $m(t)$ represents a data symbol and has duration T_s. Each pulse in $p(t)$ represents a chip, is usually rectangular with an amplitude equal to +1 or –1, and has a duration of T_c. The transitions of the data symbols and chips coincide such that the ratio T_s to T_c is an integer. If B_{ss} is the bandwidth of $s_{ss}(t)$ and B is the bandwidth of a conventionally modulated signal $m(t)\cos(2\pi f_c t)$, the spreading due to $p(t)$ gives $B_{ss} \gg B$.