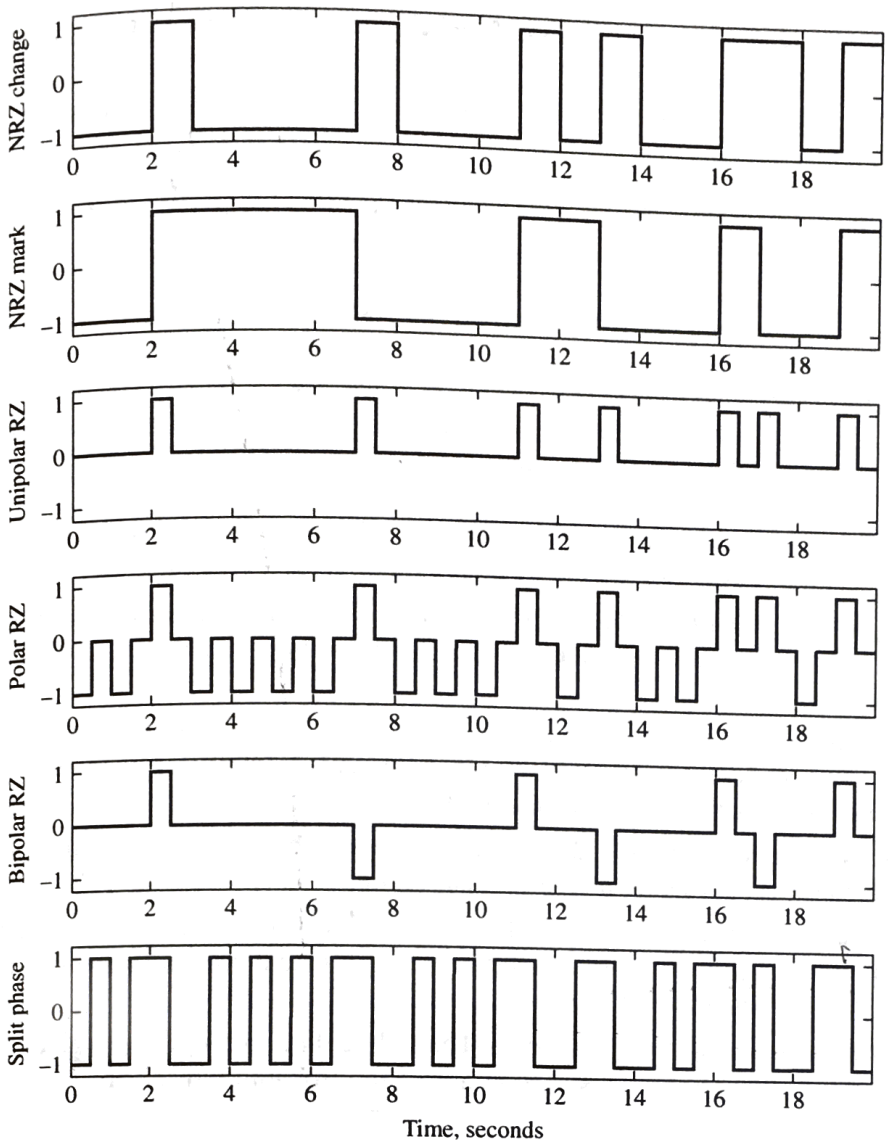

Figure 5.2
Abbreviated list of binary data formats.[1]

applied to certain of these. Briefly, during each signaling interval, the following descriptions apply:

- Nonreturn-to-zero (NRZ) change (referred to as NRZ for simplicity)—a 1 is represented by a positive level, A; a 0 is represented by $-A$
- NRZ mark—a 1 is represented by a change in level (i.e., if the previous level sent was A, $-A$ is sent to represent a 1, and vice versa); a 0 is represented by no change in level
- Unipolar return-to-zero (RZ)—a 1 is represented by a $\frac{1}{2}$-width pulse (i.e., a pulse that "returns to zero"); a 0 is represented by no pulse

[1] Adapted from J. K. Holmes, *Coherent Spread Spectrum Systems*, New York: John Wiley, 1982.

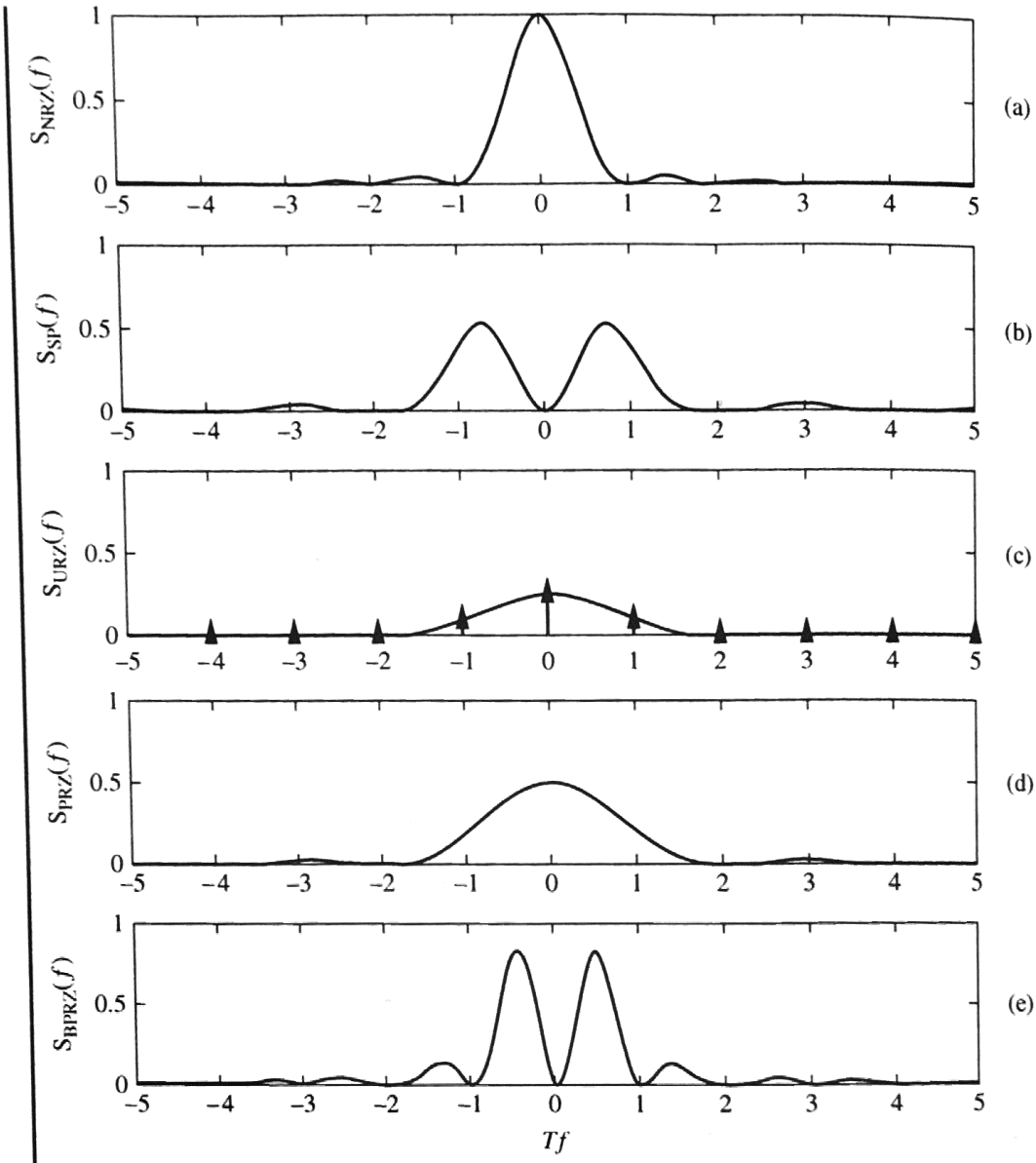

Figure 5.3
Power spectra for line-coded binary data formats.

```
    APRZ = sqrt(2);
    SPRZ = APRZ^2*T/4*(sinc(T*f/2)).^2;
    areaSPRZ = trapz(f, SPRZ)   % Area of polar return-to-zero spectrum as
check
    ABPRZ = 2;
    SBPRZ = ABPRZ^2*T/4*((sinc(T*f/2)).^2).*(sin(pi*T*f)).^2;
    areaBPRZ = trapz(f, SBPRZ)  % Area of bipolar return-to-zero spectrum
as check
    subplot(5,1,1), plot(f, SNRZ), axis([-5, 5, 0, 1]), ylabel('S_N_R_Z(f)')
    subplot(5,1,2), plot(f, SSP), axis([-5, 5, 0, 1]), ylabel('S_S_P(f)')
    subplot(5,1,3),   plot(f,   SURZc),   axis([-5,   5,   0,   1]),   yla-
bel('S_U_R_Z(f)')
    hold on
    subplot(5,1,3), stem(fdisc, SURZd, '^'), axis([-5, 5, 0, 1])
    subplot(5,1,4), plot(f, SPRZ), axis([-5, 5, 0, 1]), ylabel('S_P_R_Z(f)')
```