M-ary Amplitude Shift Keying (M-ary ASK)

In this exercise you can investigate the bit error rate (BER) performance for an M-ary ASK digital communication system with M = 8 symbols. An M = 4 level ASK system is described on pages 167-177 off the *SystemVue* text and shown in Figure 3.13.

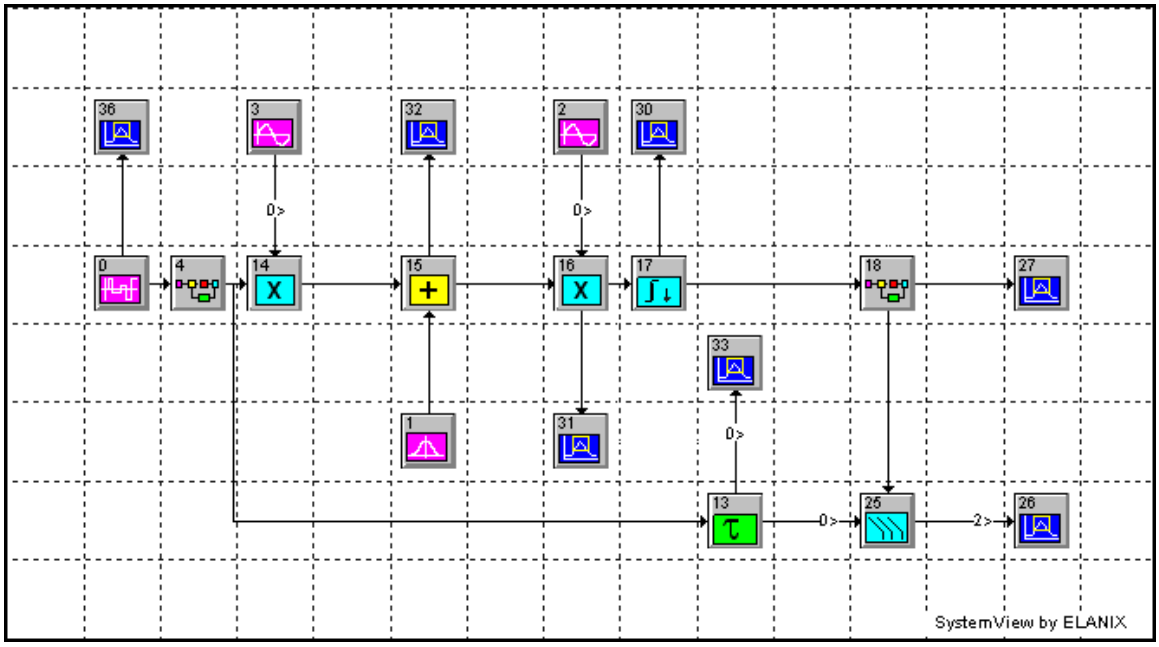

Figure 3.13

Metasystem token 4 is a 2-bit Gray encoder and bit-to-symbol translator for M = 4 ASK, as shown in Figure 3.14. Metasystem token 18 is the 2-bit Gray decoder and symbol-to-bit translator, as shown in Figure 3.15. The BER performance is given in Table 3.6 for the Gray-coded M = 4 ASK system.

You can chose a *random amplitude* from the values A = 0.5, 1.0, 1.5, 2.0 or 2.5 V and a single *random bit rate* from r_b = 2 to 20 kb/sec in steps of 2 kb/sec. The random amplitude A sets the amplitude interval for the M = 8 ASK with an initial amplitude of A (not 0) and a final amplitude of 8A for 8 level ASK. The PN Sequence Token can generate the requisite amplitudes as described in the Asymmetrical Pam Laboratory of the previous week.

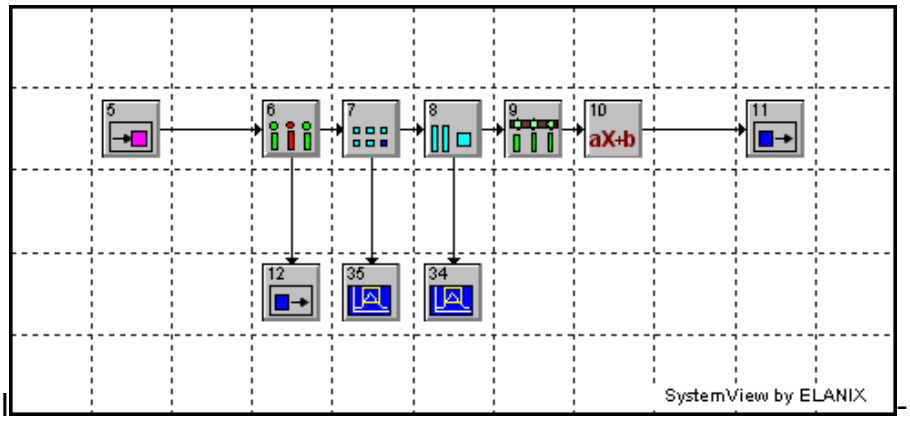

Figure 3.14

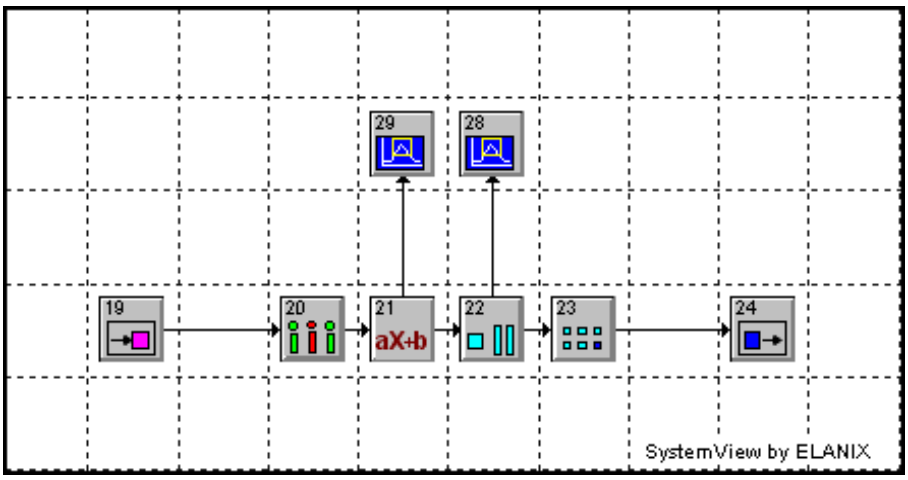

Figure 3.15

The data rate is higher than the *SystemVue* examples (1 kb/sec), so the *System Sampling Time* $T_S = 1/ f_S$, the parameters of the *delay* and the parameters of the *down-samplers* must all be carefully chosen for the simulation to be correct. The PN source, the Gray encoder and decoder, the bit-to-symbol and symbol-to-bit translator must be modified to provide an M = 8 ASK system.

You can assess the BER performance using the standard methodology that you have used in the Laboratory. You can determine the theoretical probability of bit error $P_{b,\ 8\text{-level}}$ following the analysis given on page 173-175 of the *SystemVue* text to be used in the analysis of your BER performance results. Discuss your observations of the BER performance and spectral efficiency of the M = 8 against the M = 4 ASK system.