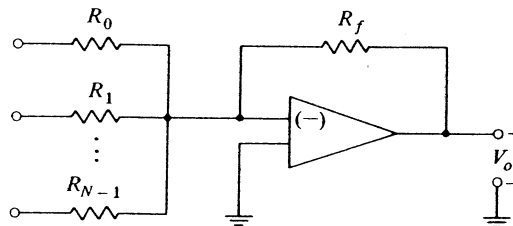


FIGURE 14.5-1
A weighted-resistor D/A converter.

$$\begin{aligned}
 I_{LS} &= V_R \left(\frac{S_{N-1}}{R_{N-1}} + \frac{S_{N-2}}{R_{N-2}} + \cdots + \frac{S_0}{R_0} \right) \\
 &= \frac{V_R}{R} (S_{N-1} 2^{N-1} + S_{N-2} 2^{N-2} + \cdots + S_0 2^0)
 \end{aligned}$$

14.5-3
op is used to buffer a weighted-
D/A converter.



account, as indicated in Fig. 14.5-1 of the fact that $R_{N-1} = R/2^{N-1}$, etc.,

$$V_o = -\frac{V_R R_f}{R} (S_{N-1} 2^{N-1} + S_{N-2} 2^{N-2} + \cdots + S_0 2^0) \quad (14.5-6)$$

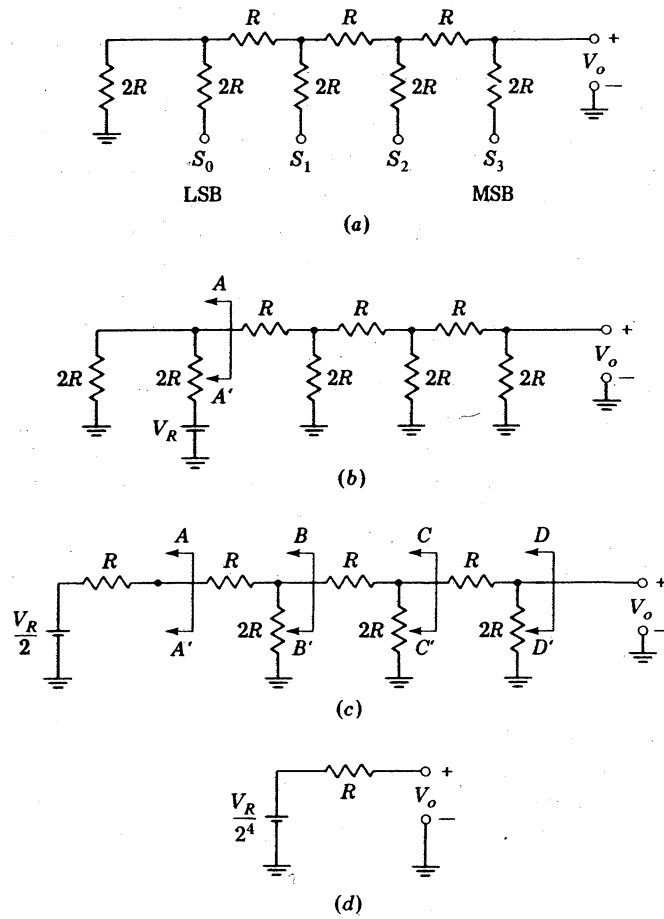


FIGURE 14.6-1
 (a) The R - $2R$ ladder D/A converter. (b and c) Thevenin's theorem used to determine the output voltage V_o . (d) The final equivalent circuit as seen at the output.

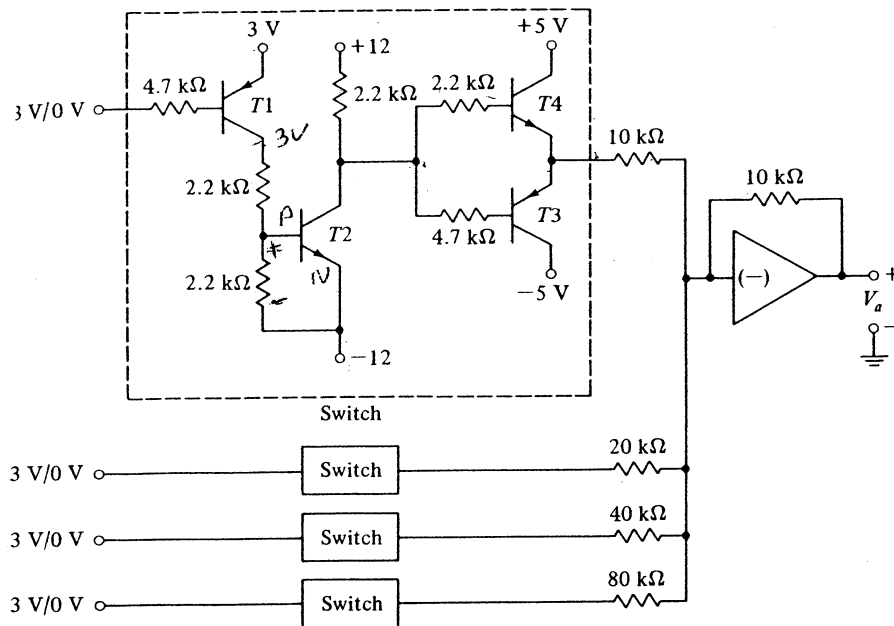


FIGURE 14.7-3
 An example of a D/A converter.

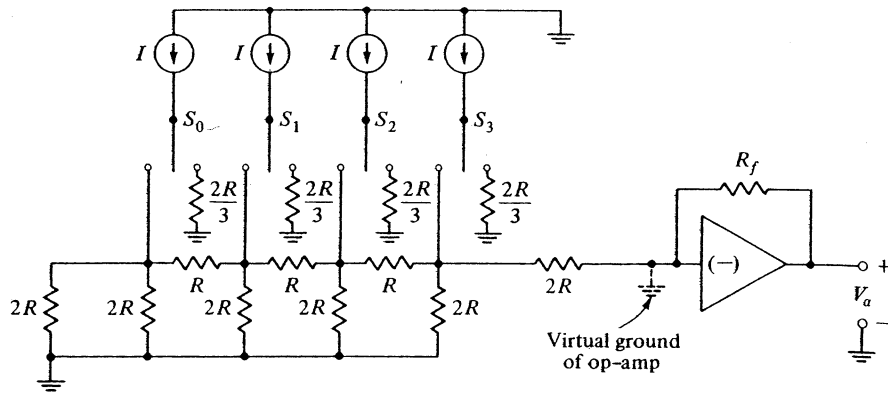


FIGURE 14.8-1
A current-driven ladder D/A converter.

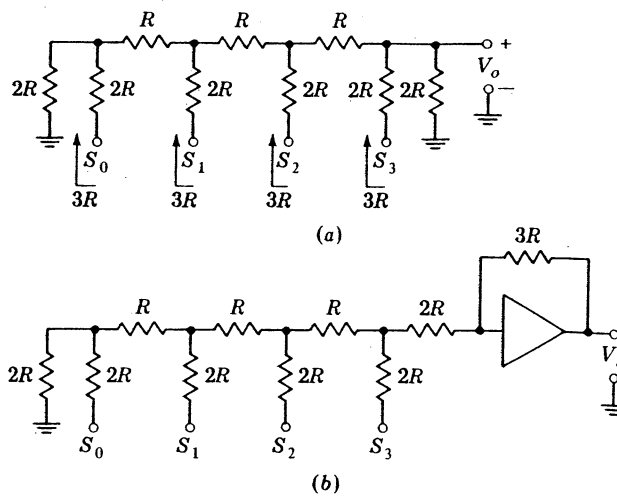


FIGURE 14.6-2
Connection of the R-2R ladder to an op-amp.

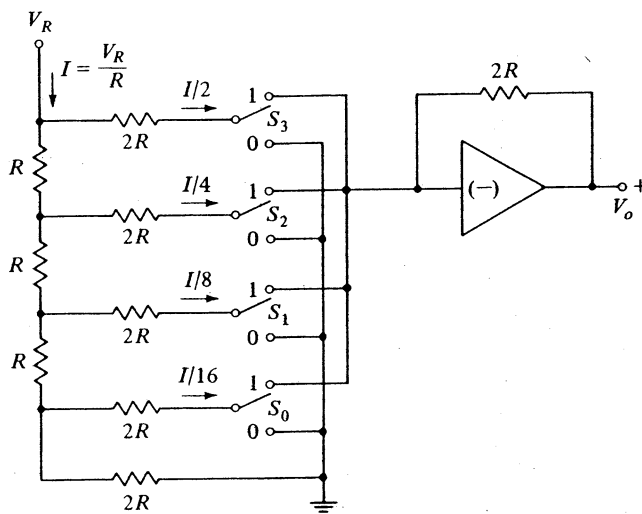


FIGURE 14.9-1
The inverted-ladder D/A converter.

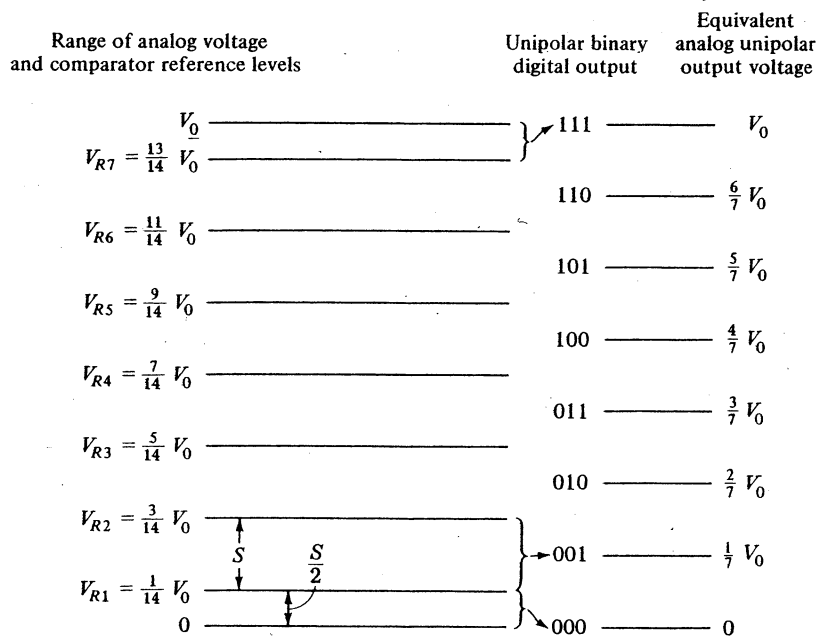
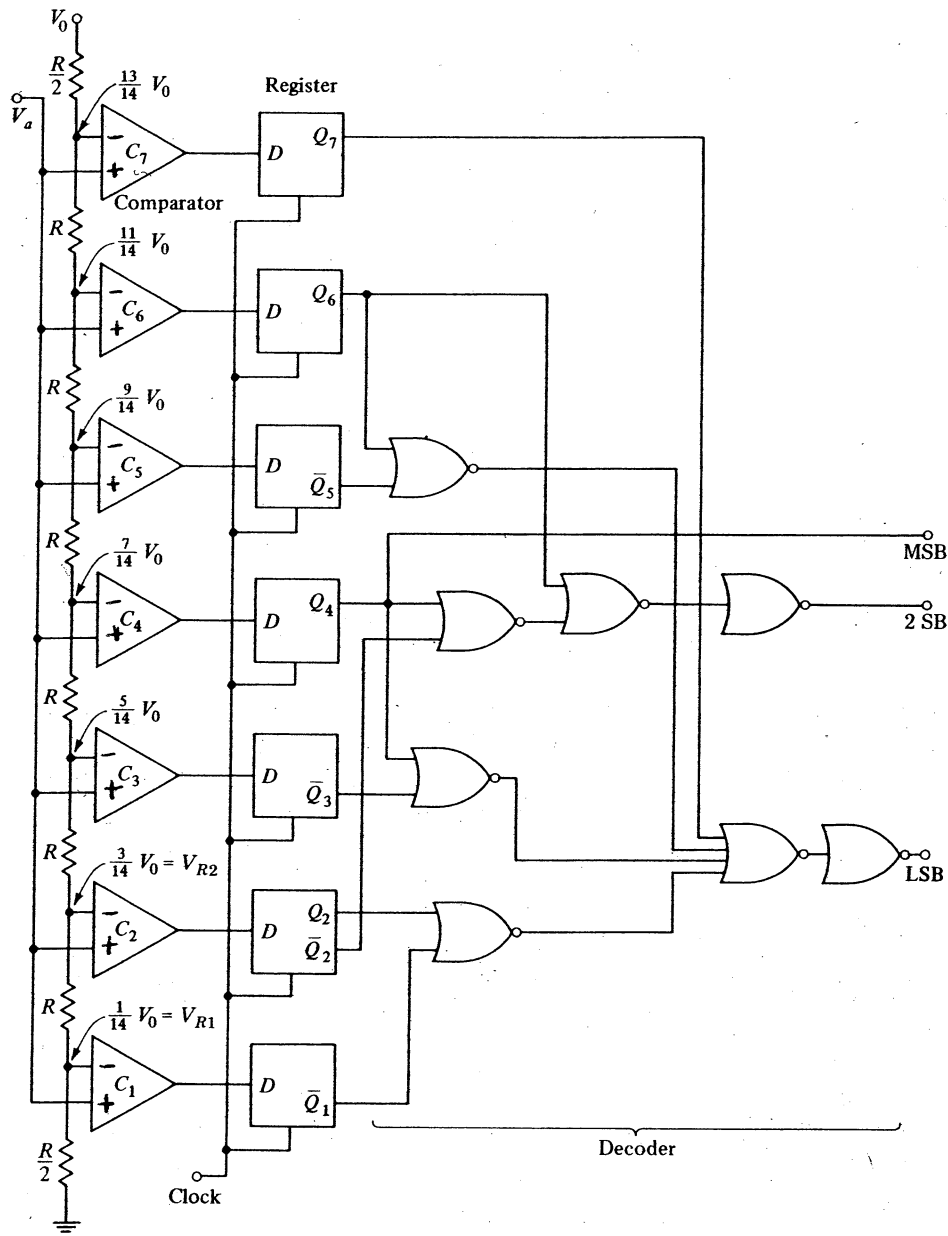


FIGURE 14.12-2
 A unipolar analog voltage is divided into intervals and the intervals assigned digital representations in a manner assuring uniform maximum quantization error over the entire range.

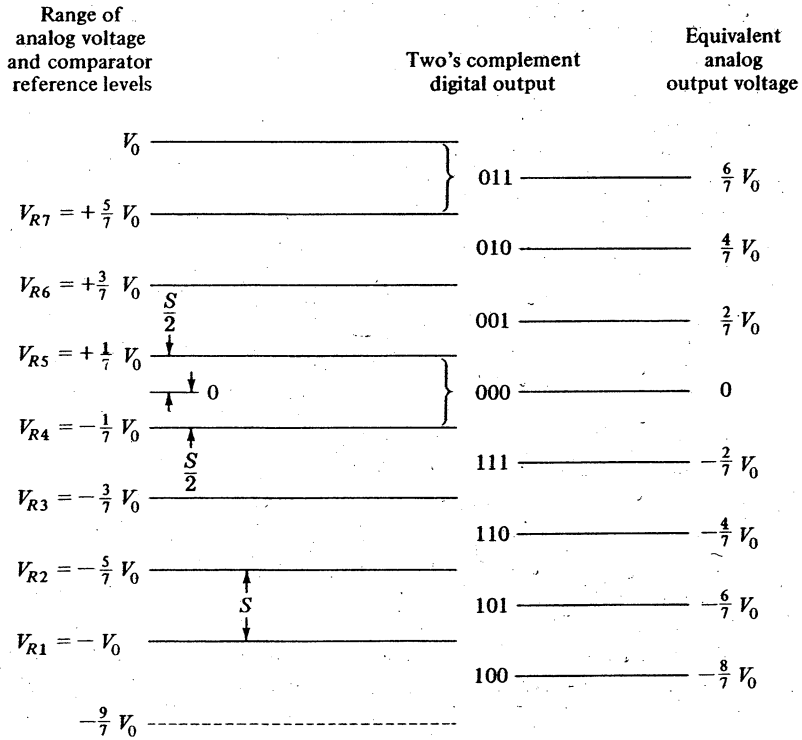


FIGURE 14.12-3 Reference levels and digital outputs for the comparator A/D converter using the two's complement representation.

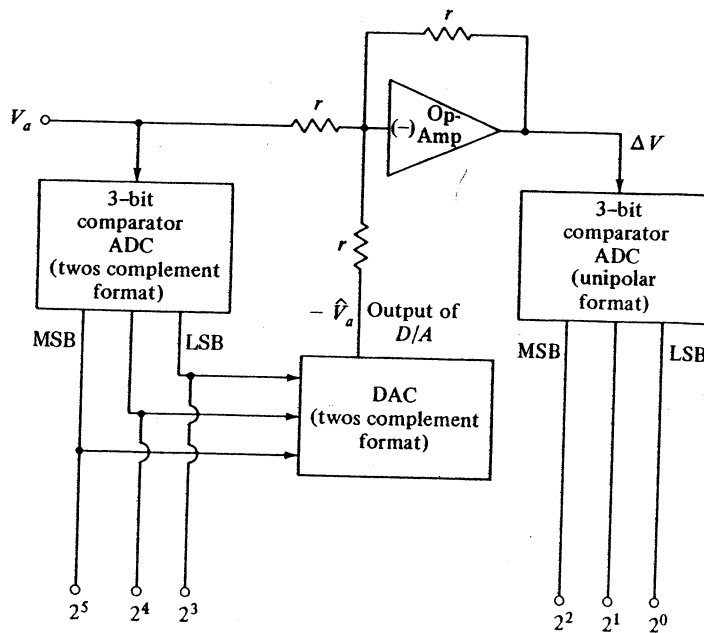


FIGURE 14.12-4 A 6-bit A/D converter comprising a cascade of two 3-bit comparator A/D converters.

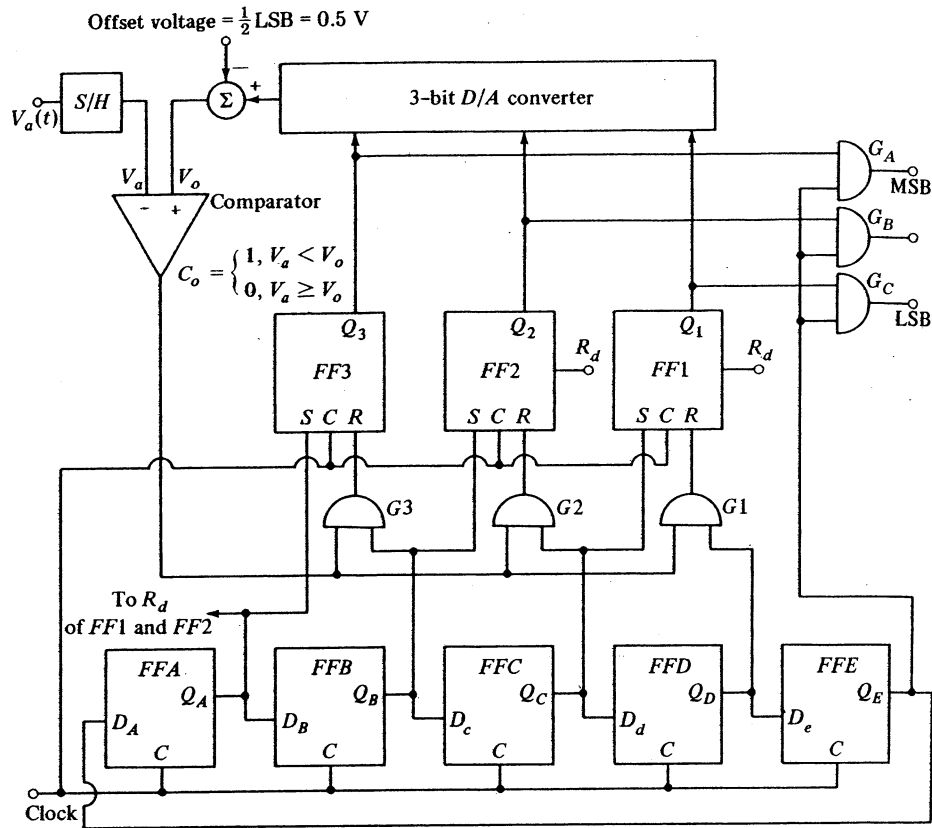


FIGURE 14.13-2
A 3-bit successive-approximation A/D converter.

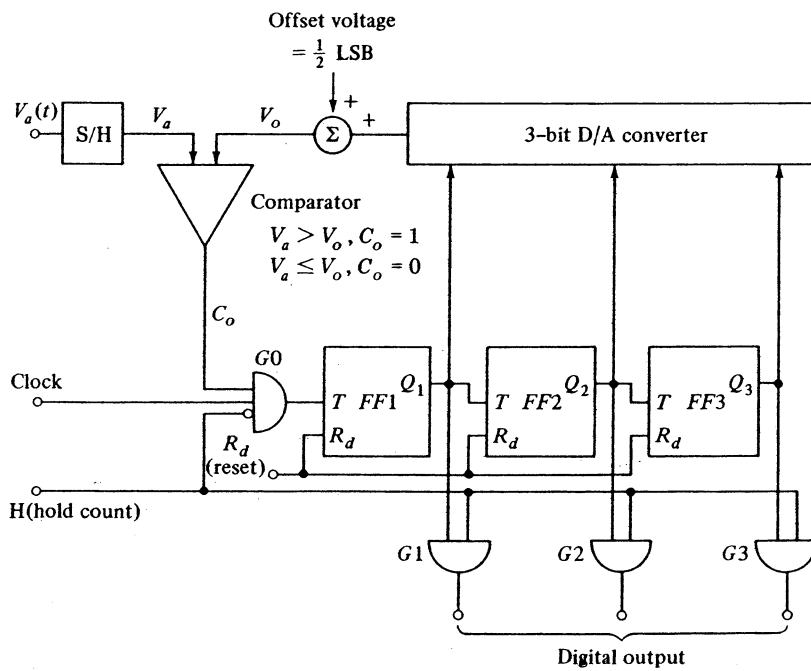


FIGURE 14.14-1
A 3-bit counting A/D converter.

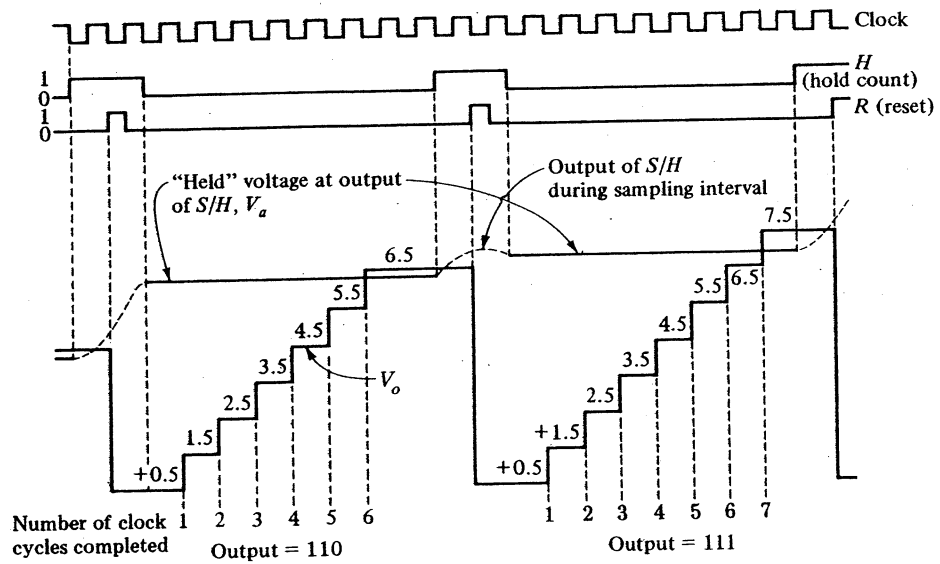
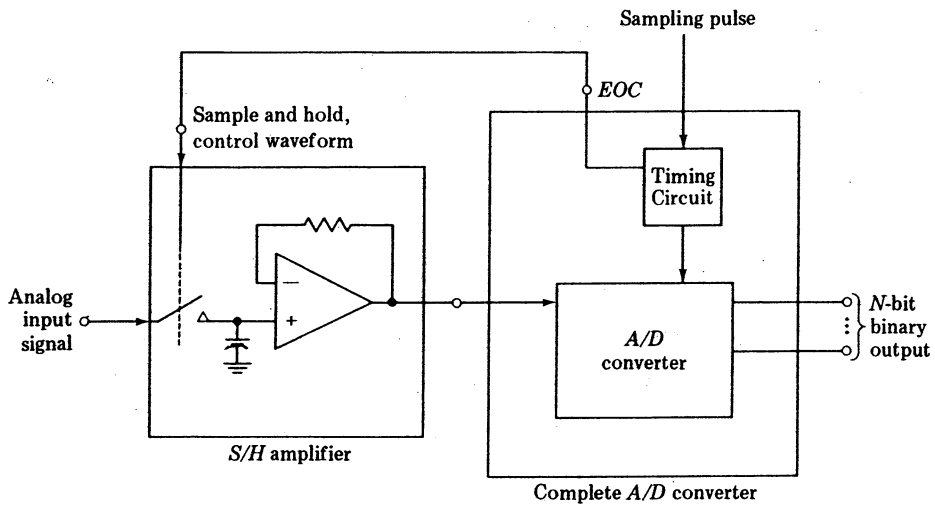
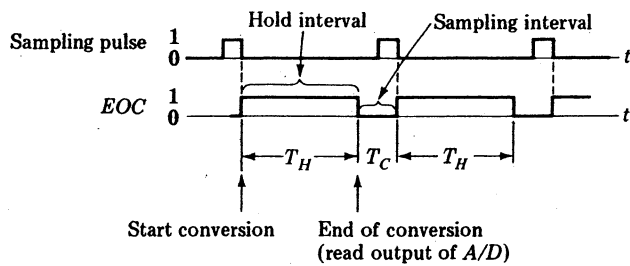


FIGURE 14.14-2
A/D converter waveforms for Fig. 14.13-1.



(a)



(b)

FIGURE 14.20-1
(a) Interconnection of the S/H circuit and A/D converter. (b) Waveforms.

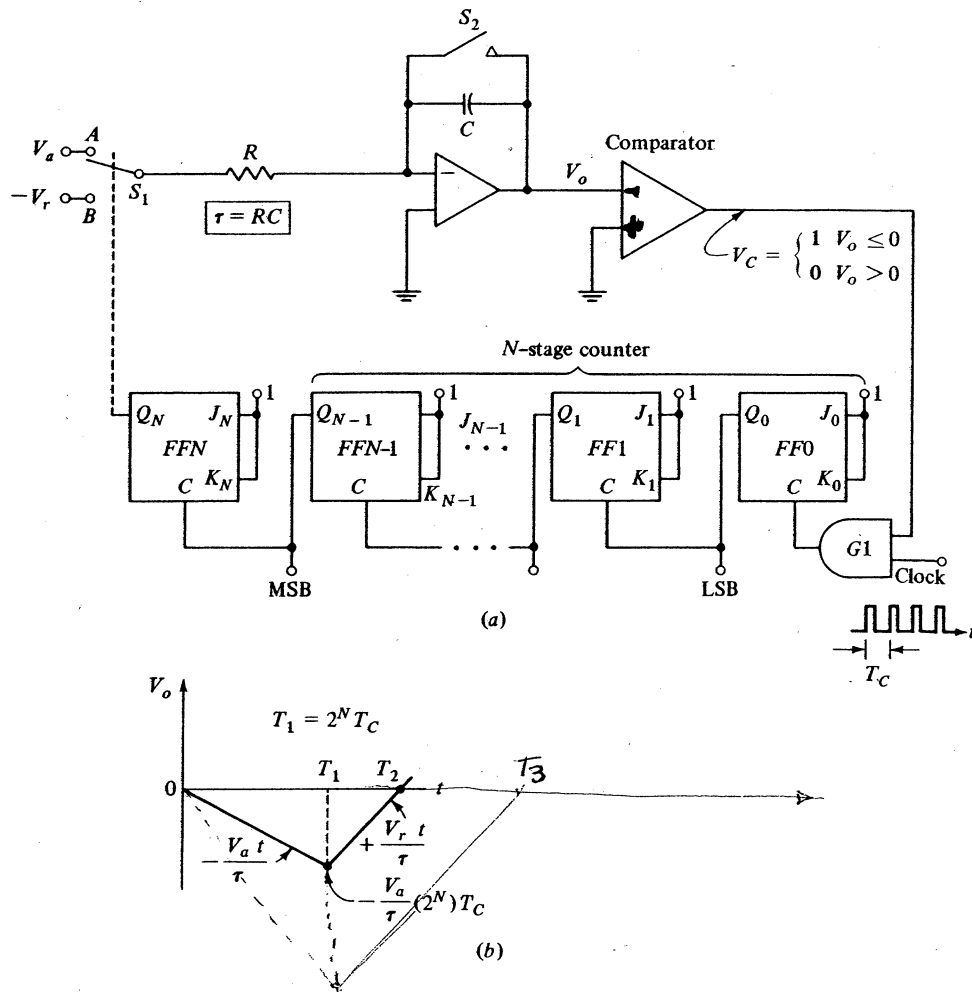


FIGURE 14.15-1
The dual-slope A/D converter.

Referring to Fig. 14.15-1b, we see that at the time T_2 V_o is again equal to 0 V and that therefore

$$\frac{V_r(T_2 - T_1)}{\tau} = \frac{V_a}{\tau} T_1 \quad (14.15-2)$$

Hence, the time interval $T_2 - T_1$ is

$$T_2 - T_1 = \frac{V_a}{V_r} 2^N T_C \quad (14.15-3)$$

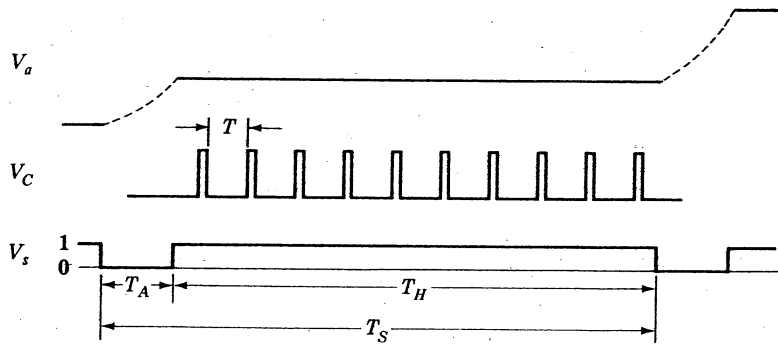
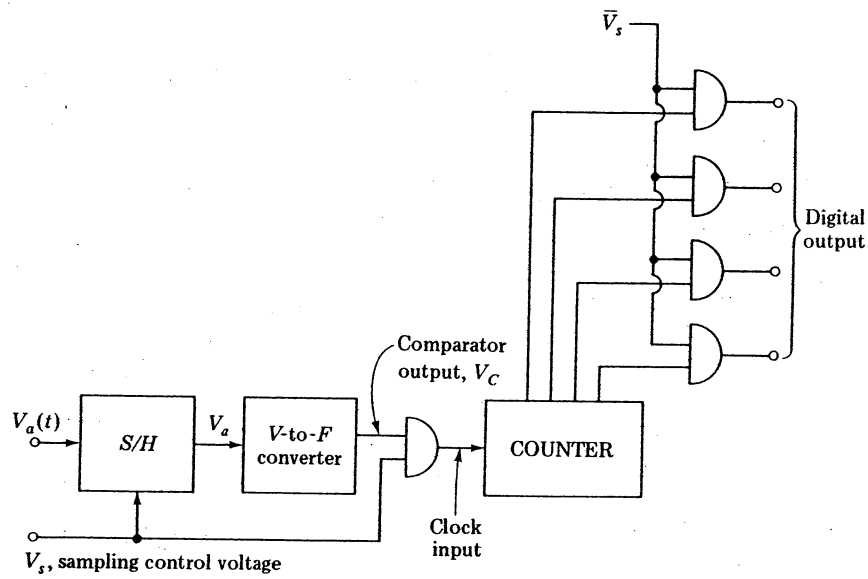
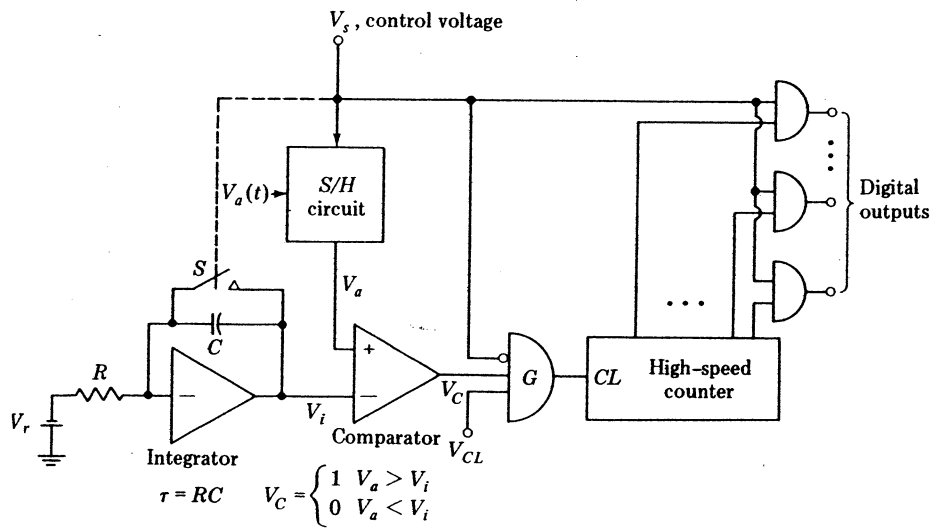
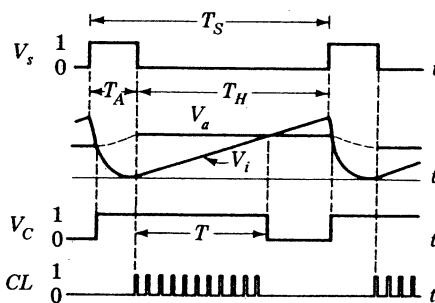


FIGURE 14.17-2
An A/D converter using a V/F converter and a counter.



(a)



(b)

FIGURE 14.18-1