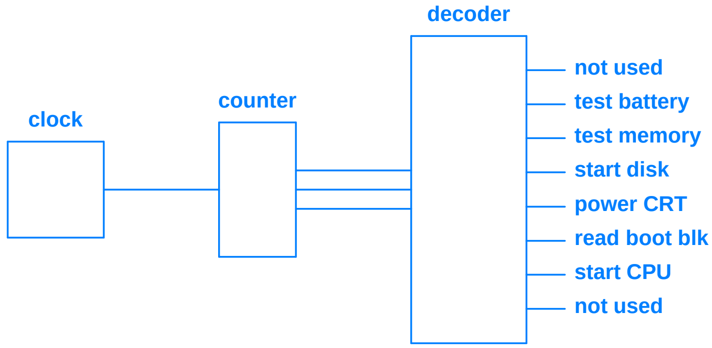

Figure 2.15 An illustration of how a clock can be used to create a circuit that performs a sequence of six steps. Output lines from the counter connect directly to input lines of the decoder.

To understand how the circuit operates, assume that the counter has been reset to zero. Because the counter output is 000, the decoder selects the topmost output, which is not used (i.e., not connected). Operation starts when the clock changes from logical 0 to logical 1. The counter accumulates the count, which changes its output to 001. When its input changes, the decoder selects the second output, which is labeled test battery. Presumably, the output wire connects to a circuit that performs the necessary test. The second output remains selected for one second. During the second, the clock output remains at logical 1 for one-half second, and then reverts to logical 0 for one-half second. When the clock output changes back to logical 1, the counter output lines change to 010, and the decoder selects the third output, which is connected to circuitry that tests memory.

Of course, details are important. For example, to be compatible with other devices, the clock must use five volts for logical 1, and zero volts for logical 0. Furthermore, to be directly connected, the output lines of the binary counter must use the same binary representation as the input lines of the decoder. The next chapter considers representation in more detail; for now, we assume they are compatible.

2.14 The Important Concept Of Feedback

The simplistic circuit in Figure 2.15 lacks an important feature: there is no way to control operation (i.e., to start or stop the sequence). Because a clock runs forever, the counter in the figure counts from zero through its maximum value, and then starts again at zero. As a result, the decoder will repeatedly cycle through its outputs, with each output being held for one second before moving on to the next.