

*This page intentionally left blank.*

---

## CHAPTER 19

---

# Designing for Success

---

A host of details allow the major components of a system to function properly. Miscellaneous topics are often left out of many engineering discussions, because it is assumed that they will be covered elsewhere. This chapter attempts to gather into one place some of the remaining practical issues that make the difference between a smooth development process and one that is punctuated by a series of obstacles that waste time and detract from the operation of unique design elements that represent a system's true value.

Acquiring the necessary components and fabricating circuit boards is a mandatory step between design and testing. It is important to select technologies that are appropriate for both the application and your own resources. Practical considerations such as business relationships and support costs may constrain the choices of components and materials at your disposal. In extreme cases, it may not be possible to realize certain design goals with limited resources. In other situations, alternative implementation strategies may have to be employed to circumvent difficulties in obtaining the most ideal component for a given application. These topics are covered first, because they should be taken into consideration during initial conceptual and architectural definition phases of a project.

Next is a fairly simple topic near and dear to all digital systems: reset. Properly generating a reset sequence that allows a microprocessor to boot when power is applied is a task that is easy to accomplish once learned and is usually taken for granted once it becomes reliable. However, reset is a topic that requires introduction, because unpredictable reset behavior can become the Achilles' heel of an otherwise fine system.

The middle of this chapter discusses debugging strategies and how troubleshooting efforts can be reduced when proper design decisions are made ahead of time. Designing a system that can be more easily analyzed for problems does not initially occur to some engineers as a requirement. Some engineers learn this lesson the hard way after a system has already been assembled, a subtle problem arises, and there is no clear way to make a diagnosis. While head scratching and frustration over mysterious problems cannot be eliminated from the development process, proper consideration for debugging in the design phases of a project can greatly ease fault isolation.

The remainder of the chapter is devoted to support tools, both software and hardware, that assist with the development and analysis of circuits. Schematic capture software packages are almost universally known. An analog circuit simulation tool that many digital electronics engineers could employ to greater advantage is Spice. Spice is presented herein, along with real circuit examples to show how easily it can be used to answer questions that would otherwise be answered through trial and error in the lab. Once in the lab, test instruments become important partners in gaining visibility into the circuits' operation. A brief introductory discussion of common test equipment provides an orientation to what may be at your disposal once a prototype is ready for testing.