WRITING DESCRIPTIONS

Technical communication often requires descriptions: verbal and visual representations of objects, mechanisms, and processes.

- *Objects.* An object is anything ranging from a physical site such as a volcano to a synthetic artifact such as a hammer. A tomato plant is an object, as is an automobile tire or a book.
- *Mechanisms.* A mechanism is a synthetic object consisting of a number of identifiable parts that work together. A DVD player is a mechanism, as is a voltmeter, a lawn mower, or a submarine.
- *Processes.* A process is an activity that takes place over time: species evolve; steel is made; plants perform photosynthesis. *Descriptions of processes*, which explain how something happens, differ from *instructions*, which explain how to do something. Readers of a process description want to *understand* the process; readers of instructions want a step-by-step guide to help them *perform* it.

Descriptions of objects, mechanisms, and processes appear in virtually every kind of technical communication. For example, an employee who wants to persuade management to buy some equipment includes a mechanism description of the equipment in the proposal to buy it. A company manufacturing a consumer product provides a description and a graphic on its Web site to attract buyers. A developer who wants to build a housing project includes in his proposal to municipal authorities descriptions of the geographical area and of the process he will use in developing that area.

Typically, a description is part of a larger document. For example, a maintenance manual for an air-conditioning system might begin with a description of the system to help readers understand first how it operates and then how to fix or maintain it.

Analyzing the Writing Situation for Descriptions

Before you begin to write a description, consider carefully how the audience and the purpose of the document will affect what you write.

What does the audience already know about the general subject? For example, if you want to describe how the next generation of industrial robots will affect car manufacturing, you first have to know whether your readers understand the current process and whether they understand robotics.

Your sense of your audience will determine not only how technical your vocabulary should be but also how long your sentences and paragraphs should

Markel, M. (2010). *Technical communication* (9th ed.). Boston: Bedford/St. Martin's

be. Another audience-related factor is your use of graphics. Less-knowledgeable readers need simple graphics; they might have trouble understanding sophisticated schematics or decision charts. As you consider your audience, think about whether any of your readers are from other cultures and might therefore expect different topics, organization, or writing style in the description.

Consider, too, your purpose. What are you trying to accomplish with this description? If you want your readers to understand how a personal computer works, write a *general description* that applies to several varieties of computers. If you want your readers to understand how a specific computer works, write a *particular description*. A general description of personal computers might classify them by size, then go on to describe palmtops, laptops, and desktops in general terms. A particular description, however, will describe only one model of personal computer, such as a Millennia 2500. Your purpose will determine every aspect of the description, including its length, the amount of detail, and the number and type of graphics.

There is no single structure or format used for descriptions. Because descriptions are written for different audiences and different purposes, they can take many shapes and forms. However, the following four suggestions will guide you in most situations:

- Indicate the nature and scope of the description.
- Introduce the description clearly.
- Provide appropriate detail.
- Conclude the description.

Indicating the Nature and Scope of the Description

In This Book
For more about titles and headings, see Ch. 9, pp. 200 and 201.

If the description is to be a separate document, give it a title. If the description is to be part of a longer document, give it a section heading. In either case, clearly state the subject and indicate whether the description is general or particular. For instance, a general description of an object might be titled "Description of a Minivan," and a particular description might be called "Description of the 2009 Honda Odyssey." A general description of a process might be titled "Description of the Process of Designing a New Production Car," and a particular description might be called "Description of the Process of Designing the Chevrolet Malibu."

Introducing the Description Clearly

Provide information that readers need in order to understand the detailed information that follows. Most introductions to descriptions are general: you want to give readers a broad understanding of the object, mechanism, or process. You might also provide a graphic that introduces readers to the overall concept. For example, in describing a process, you might include a flowchart summarizing the steps in the body of the description; in describing an

object, such as a bicycle, you might include a photograph or a drawing showing the major components you will describe in detail in the body.

Table 20.1 shows some of the basic kinds of questions you might want to answer in introducing object, mechanism, and process descriptions. If the answer is obvious, simply move on to the next question.

Figure 20.2 on page 552 shows the introductory graphic accompanying a description of a headlamp.

Table 20.1 Questions to Answer in Introducing a Description

For object and mechanism descriptions	*For process descriptions*
• *What is the item?* You might start with a sentence definition. • *What is the function of the item?* If the function is not implicit in the sentence definition, state it: "Electron microscopes magnify objects that are smaller than the wavelengths of visible light." • *What does the item look like?* Include a photograph or drawing if possible. (See Chapter 12 for more about incorporating graphics with text.) If not, use an analogy or comparison: "The USB drive is a plastic- or metal-covered device, about the size of a pack of gum, with a removable cap that covers the type-A USB connection." Mention the material, texture, color, and the like, if relevant. Sometimes, an object is best described with both graphics and words. • *How does the item work?* In a few sentences, define the operating principle. Sometimes, objects do not "work"; they merely exist. For instance, a ship model has no operating principle. • *What are the principal parts of the item?* Limit your description to the principal parts. A description of a bicycle, for instance, would not mention the dozens of nuts and bolts that hold the mechanism together; it would focus on the chain, gears, pedals, wheels, and frame.	• *What is the process?* You might start with a sentence definition. • *What is the function of the process?* Unless the function is obvious, state it: "The central purpose of performing a census is to obtain current population figures, which government agencies use to revise legislative districts and determine revenue sharing." • *Where and when does the process take place?* "Each year the stream is stocked with hatchery fish in the first week of March." Omit these facts only if your readers already know them. • *Who or what performs the process?* If there is any doubt about who or what performs the process, state it. • *How does the process work?* "The four-treatment lawn-spray plan is based on the theory that the most effective way to promote a healthy lawn is to apply different treatments at crucial times during the growing season. The first two treatments—in spring and early summer—consist of. . . ." • *What are the principal steps of the process?* Name the steps in the order in which you will describe them. The principal steps in changing an automobile tire, for instance, include jacking up the car, replacing the old tire with the new one, and lowering the car back to the ground. Changing a tire also includes secondary steps, such as placing chocks against the tires to prevent the car from moving once it is jacked up. Explain or refer to these secondary steps at the appropriate points in the description.

Figure 20.2 Graphic with Enlarged Detailed Graphics

In this description of a headlamp, the introductory graphic includes five graphics showing different portions or views of the headlamp or additional components. Notice the use of the numbered boxes to help readers link the individual boxes to the main photograph of the headlamp.

Source: Petzl, 2005.

Providing Appropriate Detail

In the body of a description—the part-by-part or step-by-step section—treat each major part or step as a separate item. In describing an object or a mechanism, define each part and then, if applicable, describe its function, operating principle, and appearance. In discussing the appearance, include shape, dimensions, material, and physical details such as texture and color (if essential). Some descriptions might call for other qualities, such as weight or hardness. If a part has important subparts, describe them in the same way.

In describing a process, treat each major step as if it were a separate process. Do not repeat your answer to the question about who or what performs the action unless a new agent performs it, but do answer the other important questions: what the step is; what its function is; and when, where, and how it occurs. If the step has important substeps, explain them, too.

A description resembles a map with a series of detailed insets. A description of a computer system includes a keyboard as one of its parts, and the description of the keyboard includes the numeric keypad as one of its parts. And the description of the numeric keypad includes the arrow keys as one of its parts. The level of detail depends on the complexity of the item and the readers' needs. The same principle applies in describing processes: a step might have substeps. For each substep, you need to describe who or what performs it (if it is not obvious), and you need to describe what the substep is, what its function is, and when, where, and how it occurs.

Guidelines

Providing Appropriate Detail in Descriptions

Use the following techniques to flesh out your descriptions.

For mechanism and object descriptions	*For process descriptions*
• **Choose an appropriate organizing principle.** Two organizational principles are common: — Functional: how the item works or is used. In a radio, the sound begins at the receiver, travels into the	• **Structure the step-by-step description chronologically.** If the process is a closed system—such as the cycle of evaporation and condensation—and thus has no first step, begin with any principal step.

For mechanism and object descriptions

amplifier, and then flows out through the speakers.

— Spatial: based on the physical structure of the item: from top to bottom, east to west, outside to inside, and so forth.

Descriptions can be organized in various ways. For instance, the description of a house could be organized functionally (the different electrical and mechanical systems) or spatially (top to bottom, inside to outside, east to west, and so on). A complex description can use a combination of patterns at different levels in the description.

- **Use graphics.** Present a graphic for each major part. Use photographs to show external surfaces, drawings to emphasize particular items on the surface, and cutaways and exploded diagrams to show details beneath the surface. Other kinds of graphics, such as graphs and charts, are often useful supplements (see Chapter 12).

For process descriptions

- **Explain causal relationships among steps.** Don't present the steps as if they have nothing to do with one another. In many cases, one step causes another. In the operation of a four-stroke gasoline engine, for instance, each step creates the conditions for the next step.
- **Use the present tense.** Discuss steps in the present tense unless you are writing about a process that occurred in the historical past. For example, use the past tense in describing how the Snake River aquifer was formed: "The molten material condensed. . . ." However, use the present tense in describing how steel is made: "The molten material is then poured into. . . ." The present tense helps readers understand that, in general, steel is made this way.
- **Use graphics.** Whenever possible, use graphics to clarify each point. Consider additional flowcharts or other kinds of graphics, such as photographs, drawings, and graphs. For example, in a description of how a four-stroke gasoline engine operates, use diagrams to illustrate the position of the valves and the activity occurring during each step.

Concluding the Description

A typical description has a brief conclusion that summarizes it and prevents readers from overemphasizing the part or step discussed last.

A common technique for concluding descriptions of mechanisms and of some objects is to state briefly how the parts function together. At the end of a description of how the Apple iPhone touch screen works, for example, the conclusion might include the following paragraph:

> When you touch the screen, electrical impulses travel from the screen to the iPhone processor, which analyzes the characteristics of your touch. These characteristics include the size, shape, and location of the touch, as well as whether you touched the screen in several places at once or moved your fingers. The processor then begins to process these data by removing any background noise and mapping and calculating the touch area or areas. Using its gesture-interpreting software, which combines these data with what it already knows about which function (such as the music player) you were using, the processor then sends commands to the music-player software and to the iPhone screen. How long does this process take? A nanosecond.

Like an object or mechanism description, a process description usually has a brief conclusion: a short paragraph summarizing the principal steps. Here, for example, is the concluding section of a description of how a four-stroke gasoline engine operates:

> In the intake stroke, the piston moves down, drawing the air-fuel mixture into the cylinder from the carburetor. As the piston moves up, it compresses this mixture in the compression stroke, creating the conditions necessary for combustion. In the power stroke, a spark from the spark plug ignites the mixture, which burns rapidly, forcing the piston down. In the exhaust stroke, the piston moves up, expelling the burned gases.

For descriptions of more than a few pages, a discussion of the implications of the process might be appropriate. For instance, a description of the Big Bang might conclude with a discussion of how the theory has been supported and challenged by recent astronomical discoveries and theories.

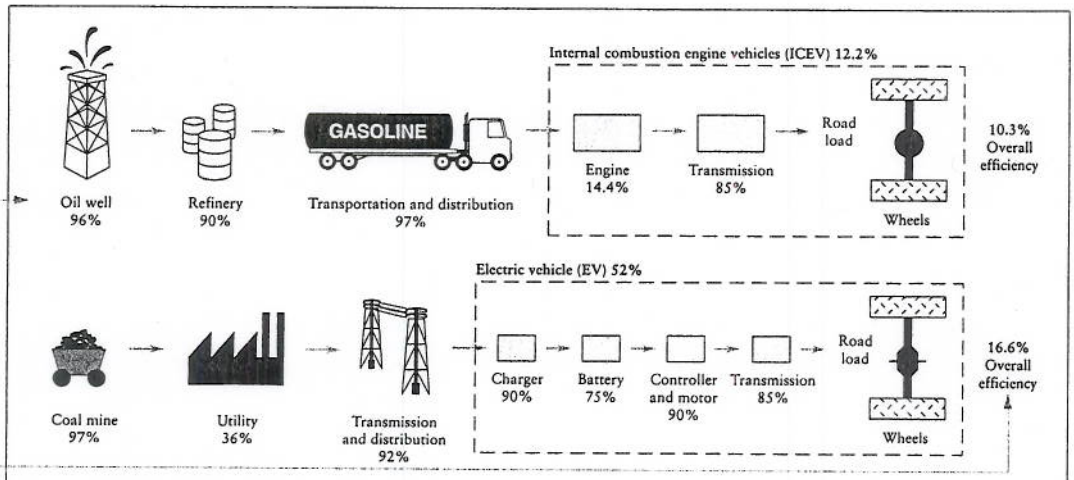
A Look at Sample Descriptions

A look at some sample descriptions will give you an idea of how different writers adapt basic approaches for particular audiences and purposes.

Figure 20.3 shows the extent to which a process description can be based on graphics. Figure 20.4 is an excerpt from a mechanism description.

At each step in the process of turning raw materials into energy to power the vehicles, the efficiency is noted as a percentage.

Finally, the overall efficiencies of the two technologies are compared.



Note: An electric drivetrain can be three to four times as efficient as a mechanical ICE drivetrain (e.g., 52 percent for electric vehicles (EVs) versus 12 percent for ICEVs). This efficiency differential drops substantially when the overall fuel chain efficiency for ICEVs and EVs is taken into consideration (16.6 percent for coal-powered EVs versus 10.3 percent for gasoline-powered ICEVs). The fuel chain efficiency for EVs could be much higher if new power generation technologies are deployed. Advanced coal plants might achieve efficiencies close to 50 percent, while efficiencies of 60 percent are possible for advanced natural gas plants. With an advanced natural gas plant the overall fuel chain efficiency for EVs could rise to 27 percent.

Source: John Brogan and S. Venkateswaran, "Diverse Choices for Hybrid and Electric Motor Vehicles," in *Proceedings of the International Conference on Urban EVs* (Stockholm, Sweden: Organization for Economic Cooperation and Development, May 1992).

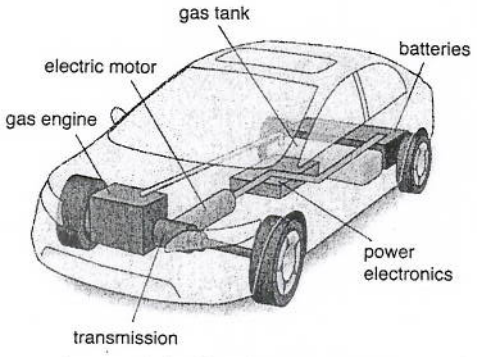
Figure 20.3 A Process Description Based on Graphics

Notice how effectively graphics show the relative efficiencies of an internal combustion engine vehicle (top row) and an electric vehicle (bottom row). The graphics clarify the process and make it interesting.

Source: U.S. Congress, Office of Technology Assessment, 1995.

Hybrid Cars: Gasoline and Electric

The propulsion system of a typical hybrid car is similar to that of a conventional car—the major difference is that hybrid cars use an **electric motor** in addition to a **gas-powered engine** to provide the transmission with the power it needs to turn the wheels. The electric motor is itself powered by **batteries**, whose flow of electricity is controlled by a **power electronics box**.



the power train of a typical hybrid vehicle

The Electric Motor

In all hybrid cars, an electric motor is used to supplement the gas-powered engine. It can do so in a variety of ways:

- **The electric motor powers the transmission:** The transmission turns the car's wheels, so whatever powers the transmission makes the car go. In some hybrid cars, the electric motor powers the transmission on its own when the car is at low speeds. At these speeds, the gas-powered engine contributes no power and uses no gas.
- **The electric motor assists the engine:** When the electric motor isn't powering the car by itself, it adds **torque**, which assists the engine in turning the transmission. Hybrid cars have smaller engines than gasoline-only cars, since the motor works alongside the engine to power the transmission. The combined operation of the smaller engine and the electric motor means that hybrid cars need less gasoline than conventional cars to spin their wheels with the same amount of power.
- **The electric motor turns off and restarts the engine:** Conventional cars use gasoline when they idle, since the engine continues to run when the car is stopped. Hybrid cars don't use gasoline when they idle. The motor on a hybrid car acts as a starter that turns the engine on when it's needed and off when it's not needed (for example, when stopped at a red light). The motor also keeps the air conditioning and other electronics on whenever the car is operating.
- **The electric motor recharges the batteries:** The electric motor can also generate its own power by recharging its batteries during normal vehicle operation.

These four main functions of the electric motor help make hybrid cars run just as efficiently as conventional cars while using less gas. But not *all* hybrid car models have electric motors that perform all four functions. The more of these four functions a hybrid car's motor does perform, the more fuel-efficient the car is.

Figure 20.4 Excerpt from a Mechanism Description
Source: Quamut, 2008 <www.quamut.com/quamut/buying_a_hybrid_car/page/how_hybrid_cars_work.html>.

This excerpt from a mechanism description begins with a brief comparison of hybrid cars and conventional cars.

The typical mechanism description begins with a graphic that highlights the components that will be discussed in the description.

The section describing the electric motor focuses on the four jobs it performs in a hybrid car. Notice that the audience and purpose of this description determine the kind of information it contains. Because the description seeks to answer the question "How does a hybrid work?" the discussion of the electric motor focuses on its function, not on the materials it is made of or on its technical specifications.