ACTIVITY
17 Controller Timing Process

READING

Purpose

The purpose of this activity is to give you the opportunity to learn more about basic actuated controller timing processes.

Learning Objective

- Describe the actuated controller timing processes

Deliverables

- Define the terms and variables in the Glossary
- Prepare a document that includes answers to the Critical Thinking Questions

Glossary

Provide a definition for each of the following terms. Paraphrasing a formal definition (as provided by your text, instructor, or another resource) demonstrates that you understand the meaning of the term or phrase.

gap out	
max out	
maximum green	
minimum green	
passage time	

Critical Thinking Questions

When you have completed the reading, prepare answers to the following questions.

1. What are the two types of phase termination and what are the factors that result in each of these two types?

2. What happens if the passage timer expires before the minimum green timer expires?

3. What is a *traffic control process diagram* and what processes does it illustrate?

Information

In Chapter 1, you were introduced to the traffic control process diagram. This diagram, which is represented in Figure 73, shows the four processes or components of the traffic control system and how they interrelate:

1. The user arrives at the intersection and is detected.
2. The detector sends a call to the traffic controller.
3. The controller determines the signals to display.
4. The user responds to the signal that is displayed, shown with the feedback loop on the left of Figure 73.

In this chapter, you will learn about the three most important timing processes that govern the operation of the actuated controller, and the logic that is used to determine how long a phase remains active ("is timing") and when and how the phase will terminate.

Let's first define these parameters and the process that each follows. It should be noted that we will describe both a timing parameter and a process, each with the same name. This may seem a bit confusing at first!

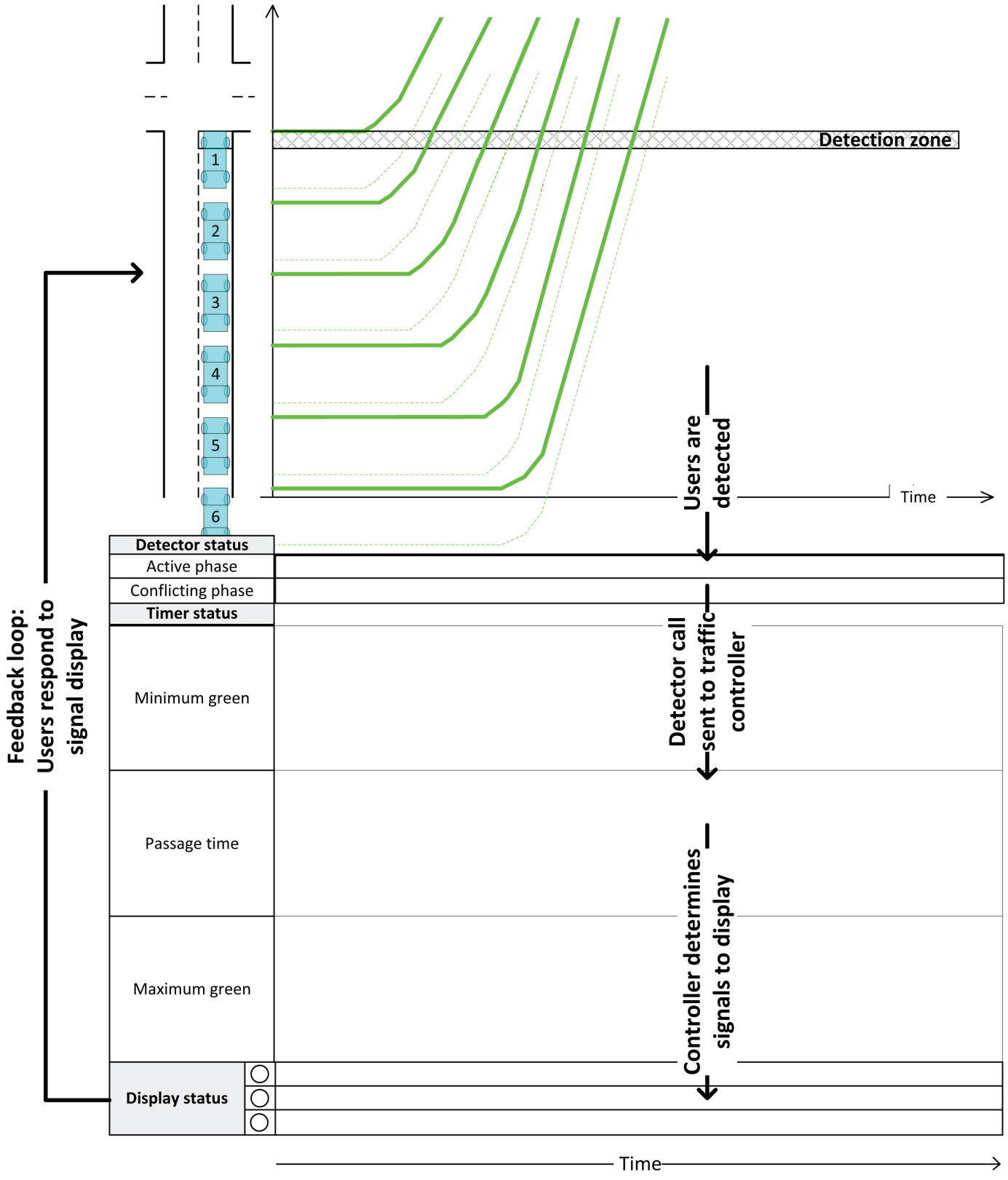

Figure 73. Traffic control process diagram

The minimum green time is the minimum time that the display will remain green for a phase no matter what else occurs. The minimum green timer is initially set to a value equal to the minimum green time. When the phase begins timing, the minimum green timer begins to time down and it expires when its value reaches

zero, as shown in Figure 74. You will learn more about determining the length of the minimum green time in Chapter 6.

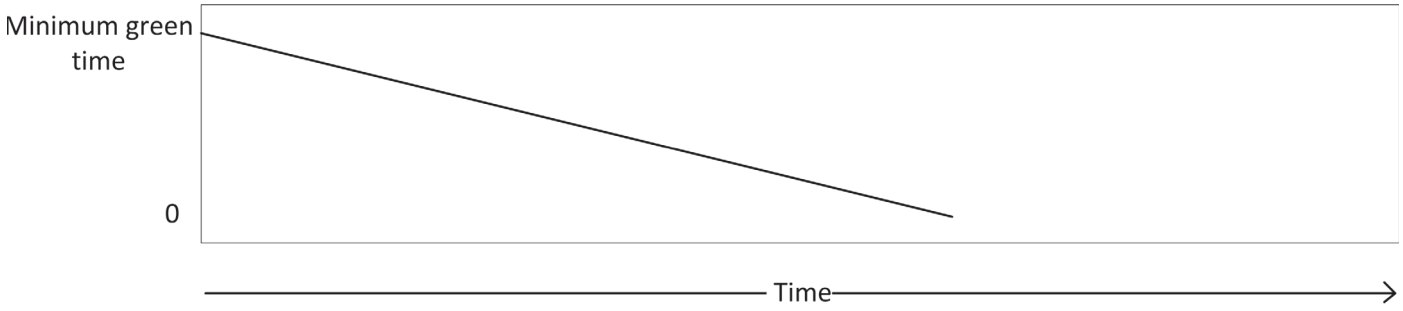

Figure 74. Minimum green timer process

The purpose of the passage timer (sometimes called the vehicle extension timer) is to extend the green until a gap of a pre-determined size is reached. The passage time is the maximum time that a detector can remain unoccupied before the passage timer expires. The significance of the relationship between the passage time and the maximum allowable headway will be described in Chapter 6. As long as a vehicle remains in the detection zone (or, "a call is active"), the timer will remain at its initial value or setting. Once a vehicle leaves the zone, the timer begins to time down. When a subsequent vehicle enters the zone, the timer is reset to its initial value. We will see in Chapter 6 the relationship of the passage time to the maximum allowable headway, the maximum headway that we will tolerate before allowing the phase to terminate. We will also see that this relationship is dependent on the length of the detection zone.

The following figures show example timing processes for the passage timer. In Figure 75, the passage timer begins to time down when a vehicle leaves the detection zone. In this example, it expires because no subsequent vehicle resets the timer.

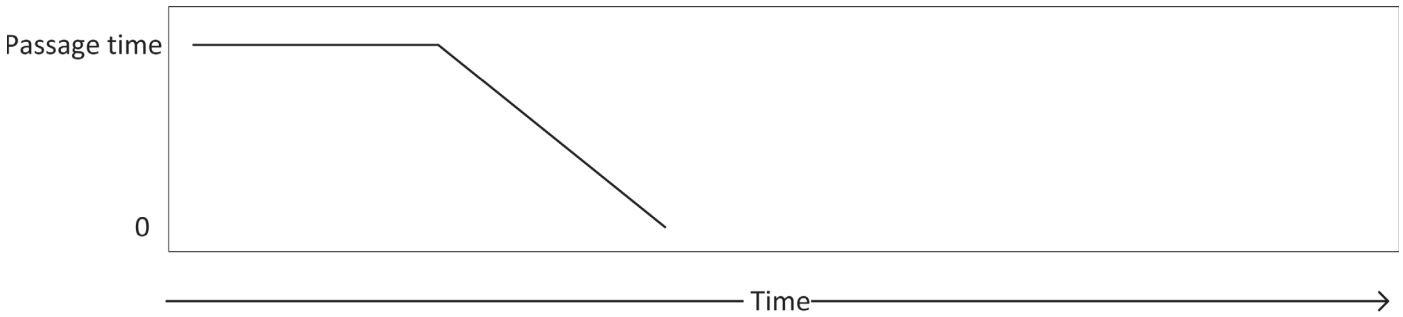

Figure 75. Passage timer process

By contrast, in Figure 76, the passage timer is reset several times, as one vehicle leaves the zone and a subsequent vehicle arrives in the zone, before the timer reaches zero.

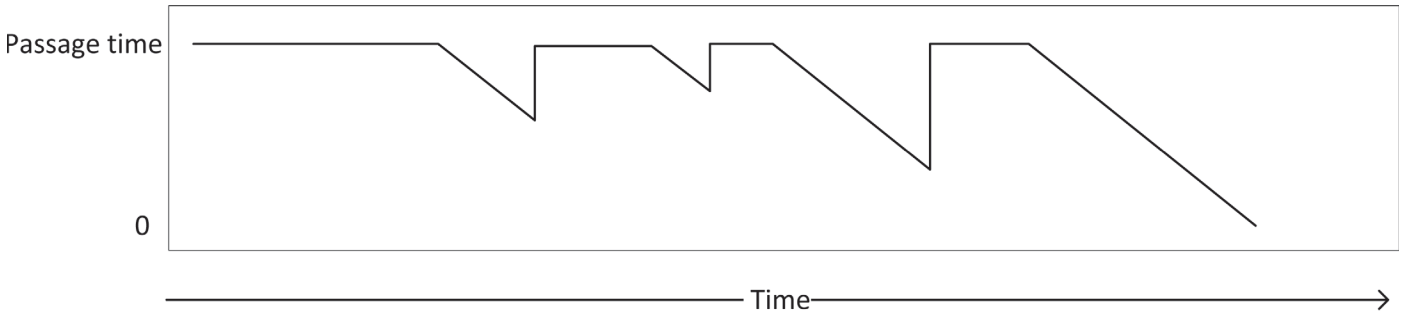

Figure 76. Passage timer process

The purpose of the maximum green time is to produce a maximum cycle length that keeps delay at a reasonable level. The maximum green time is the maximum duration that the signal display will remain green after a call has been received on a conflicting phase. When such a call is received, the timer will begin to time down and continue until it reaches zero as shown in Figure 77. You will learn more about setting the value for the maximum green time in Chapter 7.

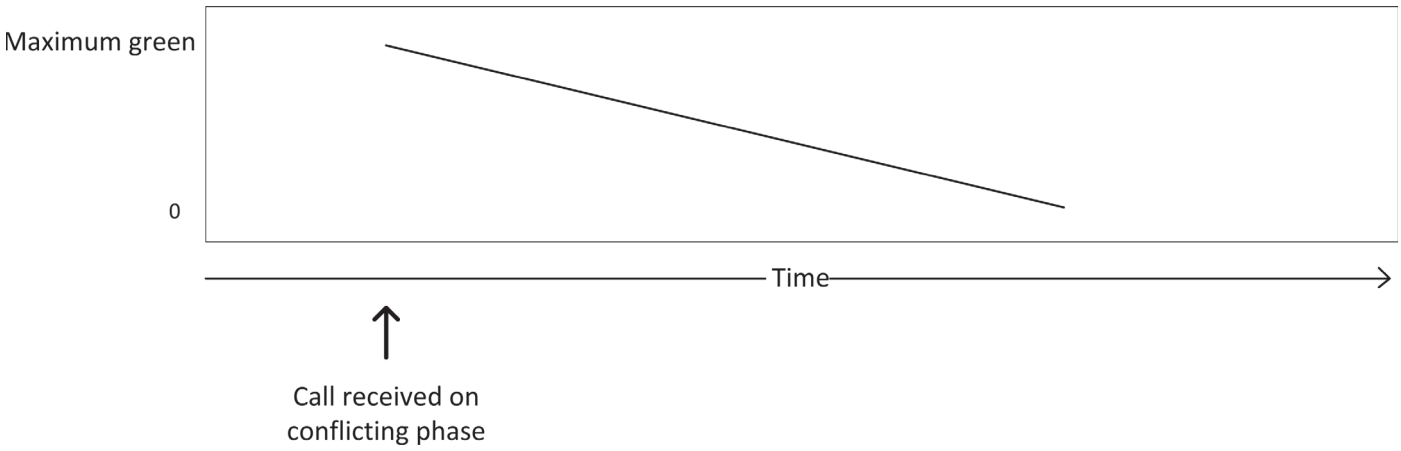

Figure 77. Maximum green timer process

The phase termination logic in a controller determines how long a phase will time and when it will terminate. The timing and termination logic is covered in more detail in Chapter 6 of this book. For standard actuated traffic control, a phase will continue to time until one of two possible events occur, either a gap out or a max out.

A gap out occurs when both the minimum green timer and the passage timer have expired. An example of a gap out is shown in Figure 78. While the maximum green timer is still active and timing down, once the passage timer expires, the phase will gap out.

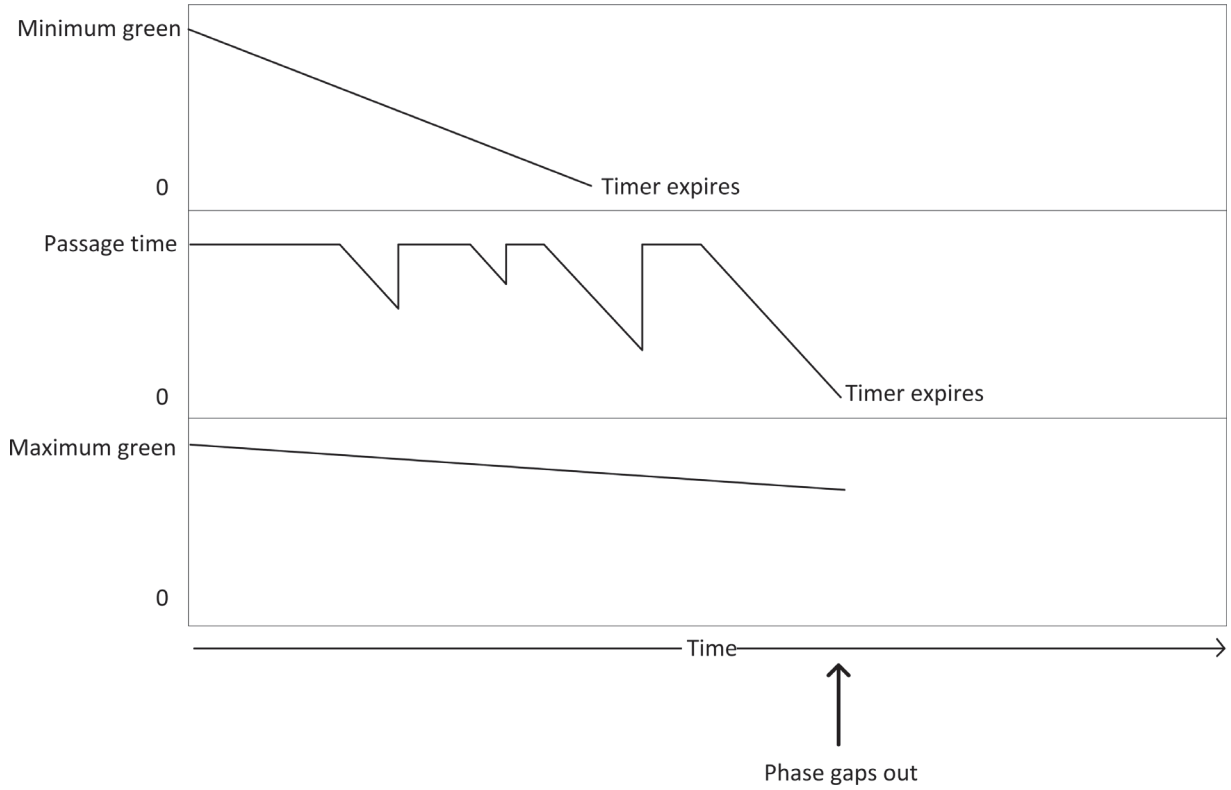

Figure 78. Example of gap out

A max out occurs when the maximum green timer expires. An example of a max out is shown in Figure 79. While the minimum green timer has expired, continuing demand extends the passage timer, as it resets each time a new vehicle is detected. However, the phase terminates when the maximum green timer expires.

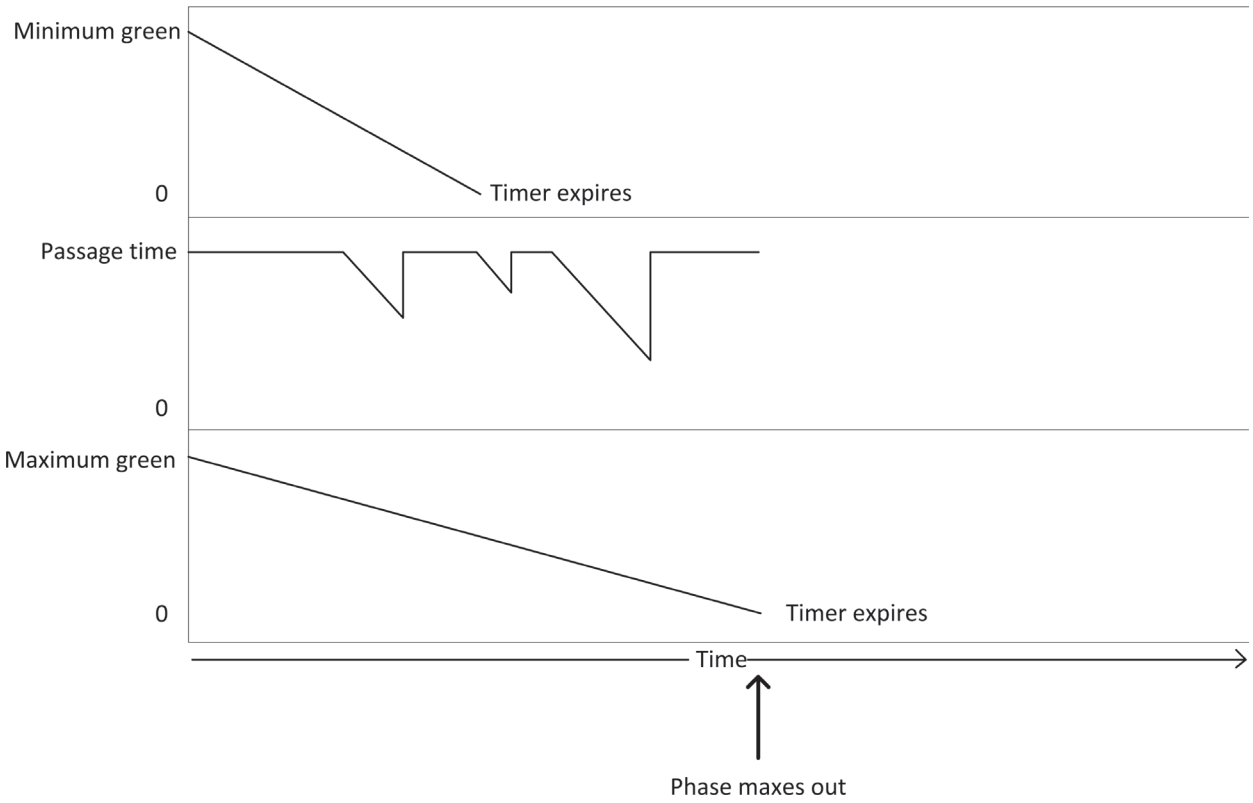

Figure 79. Example of max out