



Traffic Signal Design Manual

ORIGINATOR Director, Bureau of Highway Operations		8-1-1
CHAPTER 8	Detector and Controller Logic	
SECTION 1	Vehicle Detection	
SUBJECT 1	Detector/Controller Functions	

As it affects signal timings, the signal designer *should* understand the modes of operation for both detectors and controllers. The scope of this manual does not cover guidelines for determining intersection signal timing; however, the following discussion provides a brief overview of various modes of operation, which are directly related to signal timing. The selection of the detector/controller mode of operation is dependent on the location and desired objective of the loop layout (see TSDM Subject 8-1-5 through 8-1-7). It *should* be noted that certain loop layout strategies require specific detector/controller functions to be utilized.

DETECTOR OPERATIONS

Pulse and Presence

There are two basic modes of vehicle detection, pulse and presence. In pulse detection, the detector amplifier sends a pulse call to the controller upon detection of a vehicle. This is a call of short duration, and it does not depend upon the speed of the detected vehicle, its length, its continued presence over the loop, or the length of the loop. In presence detection the detector amplifier issues a continuous call to the controller for as long as any portion of the vehicle remains over the loop. The length of the call is, therefore, dependent on the speed of the vehicle, the length of the vehicle, and the length of the loop.

Extension Stretch

Extension stretch is used when the passage interval feature is set at a low value. Extension stretch allows an increment of time to pass while a vehicle travels from one point of detection to some other position. The interval *may* be used to extend the green, allowing a vehicle to pass the dilemma zone, or allow a vehicle to enter or clear the intersection. The various detector placements discussed in TSDM Subjects

8-1-5 through 8-1-7 have different passage and extension stretch intervals associated with them. The designer *should* select the passage intervals which fulfill the requirements of the loop detector layout selected.

Delayed Call

Using the delayed call mode, the detector amplifier will delay the output until the detection zone has been occupied for a preset time. This has two common uses. First: at near detection in shared through and right-turn lanes or right-only lanes, vehicles turning right on red *may* occupy the near detection for a short period without unnecessarily calling the controller to the respective phase. Second, at near loops that *may* be driven over by cross-street left-turning vehicles.

Detector Disconnect

The detector disconnect feature allows a chosen detector(s) to be disconnected during a phase. This feature is infrequently used. Figure 1 shows a sample signal plan which uses the detector disconnect feature. At this installation, the minor-street right-turn detectors are set with detector disconnect.

CONTROLLER OPERATIONS

There are several modes of operation, which can be handled by the controller. Some more commonly used modes at signalized intersections include: minimum green time, maximum green time, passage interval, non-locking detection memory, phase recall, etc. Phase recall is discussed below; other controller functions are included in the glossary.

Phase Recall

Use of these features is common for major-route intersections with heavy traffic or pedestrian volumes. The phase recall function allows a phase (vehicle or pedestrian) to be displayed during each cycle whether demand exists or not.

The MIN recall setting will force its respective PHASE NUMBER (column 1 of the Detector Logic Chart--see TSDM Subject 8-2-1) to be serviced, each cycle, for the established minimum green time. The MAX recall setting will force its respective PHASE NUMBER to be serviced, each cycle, for its maximum green time. The PED recall setting will force its respective PHASE NUMBER pedestrian walk display to be serviced during each cycle.

At isolated intersections the mainline is generally put on MIN recall bringing the green back to dwell on the mainline phases.

Locking and Non-Locking

All calling detectors can function as locking or non-locking. Locking detectors hold a call when a vehicle is at rest on the detector and after the vehicle passes over the detector. The non-locking detection mode requires the vehicle to occupy the detector in order for a call to be issued to the controller. All detectors for each phase must be set to locking or non-locking; controllers do not allow individual detector settings within a phase.