

Getting Vehicle Detectors to Detect Bicycles

By Fred Oswald, Professional Engineer, Bicycling Safety Instructor

Many traffic lights are controlled by “vehicle detectors”. Typically, these detectors work through magnetic induction using loops of wire buried in the pavement to sense the presence of a vehicle (actually any conductor) by the disturbance it creates in the magnetic field of the loop.

Bicycles have much less metal than motor vehicles, thus it can be somewhat more difficult (but not impossible) to make loop detectors sense bicycles. There are several patterns of wire loops. Older loops are dipoles (simple rectangles). Many newer types utilize a double loop (quadrapole) that includes a third wire running down the center of the rectangle. The double loop type is generally better able to detect bicycles and it has a wider “sweet spot” in the middle. However, even most dipole loops can be made to work if they are adjusted carefully and if cyclists know where to stop. (See figure 1 below for depiction of these loops.)

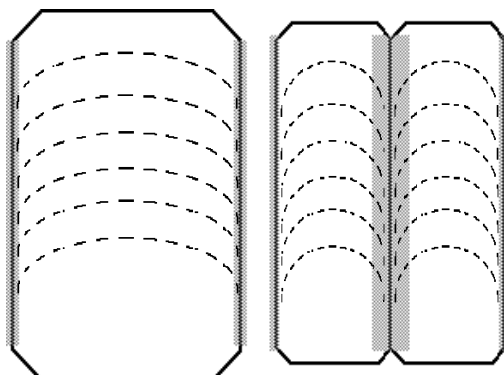
Since a bicycle has very little metal compared to a motor vehicle, cyclists must generally stop directly over a wire loop (sometimes within 1 cm) to “trigger” the detector. This causes problems. (1) Few people know how these detectors work. (Motorists do not have to know.) (2) If cyclists cannot see the wire cuts, they cannot see where to place their wheels. (3) Some incorrectly-adjusted detectors fail to work even if the bicycle is directly over a wire.

Communities should mark detectors with a stencil such as is shown in Figs 2-3. The stencil must be accurately located along the “sweet spot” of the detector. In any case, the detectors must be tested and adjusted to ensure they work properly and people must be taught how to use the detectors. Motorcycle operators report similar problems with non-working vehicle detectors.

Malfunctioning detectors contribute to the attitude of many cyclists that they should not be governed by traffic laws. Detectors that do not detect all traffic must be regarded as “broken” and they must be fixed promptly.

There are other detector styles. These include different patterns, such as the Caltrans “diagonal type D” as well as other technologies, such as video or microwave detectors. Some of these may be better at detecting bicycles and motorcycles.

For more information, see two articles on the Web: “Re-Evaluating Signal Detector Loops” by Alan Wachtel at www.bikeplan.com/aw-signals.pdf and “Detection of Bicycles by Quadrapole Loops at Demand-Actuated Traffic Signals” by Steven Goodridge at <http://humantransport.org/bicycledriving/library/signals/detection.htm>.



Simple dipole loop

Quadrapole loop

Fig 1 – Vehicle detector loops. Shading depicts sensitive “sweet spots”. Dashed lines depict magnetic field



Fig 2 – Vehicle detector stencil



Fig 3 – Marked detectors at NASA

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Bicycle Detector Symbol

First, set detector circuit sensitivity as high as possible without creating spurious detection. Second, test the loop using a bicycle wheel. We recommend a 20" child's BMX rim because it generates about the same signal as 2 wheels of an adult folding bicycle with 16" wheels. Third, mark the "sweet spots" as shown below unless there are no "dead zones" in the loop.

Excerpt from the *Manual on Uniform Traffic Control Devices, Part 9 Traffic Controls for Bicycle Facilities*, 2003 Edition, <http://mutcd.fhwa.dot.gov/>

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Section 9C.05 Bicycle Detector Symbol

Option:

A symbol (see Figure 9C-7) may be placed on the pavement indicating the optimum position for a bicyclist to actuate the signal.

Figure 9C-7. Example of Bicycle Detector Pavement Marking

