

Set It Off

Successfully Tripping Loop Detectors

by Franke Santos

A NNOYED THAT YOU can't set off that traffic light's loop detector on your way home? Are you tired of illegally running red lights or waiting for cars to finally pull up behind you, so the light turns green?

Here's a quick primer on exactly how these traffic light signalling devices work so that you can properly trip the signal on your next journey.

I went to Irvine City Hall to find out all about loop detectors, how they work, and how they are set up.

Duane Dexter, a traffic systems specialist with the City of Irvine, took me through it. He said loop detectors are three loops of 12- or 14-gauge copper wire, buried 3" under the pavement. An electrical current is sent through the loop, making it an electromagnet. Once a car or motorcycle drives over the loop, the metal on the vehicle's underside causes a disturbance in the magnetic field, tripping the detector and sending a signal to the traffic light to turn green.

Surprisingly, the most sensitive area in a loop is not directly above the wire, but about a foot away, either on the inside or

on the outside. The loop's magnetic field is shaped like a doughnut, with a bit of a dip in sensitivity right over the wire, Dexter said. Theoretically, the magnetic field is supposed to be dome-shaped, but in practice, he finds that there is frequently a dead spot in the center of the loop when he tests it with a Loop Finder Module (the instrument you see in the pictures).

At many intersections, the leading end of the loop is either a foot into the intersection, or a foot behind the inner line for the crosswalk (called a "limit line" in traffic engineering circles). So the best place to stop at the light would be with your front tire right on the inner line for the crosswalk, two feet from the lane's border, he said. The usual width of a lane is 10', and loops are usually 6' diameter circles or 6' x 6' squares. On a square detector, the weakest points are at the corners. In Irvine, "square" detectors frequently appear as octagonal cuts in the pavement.

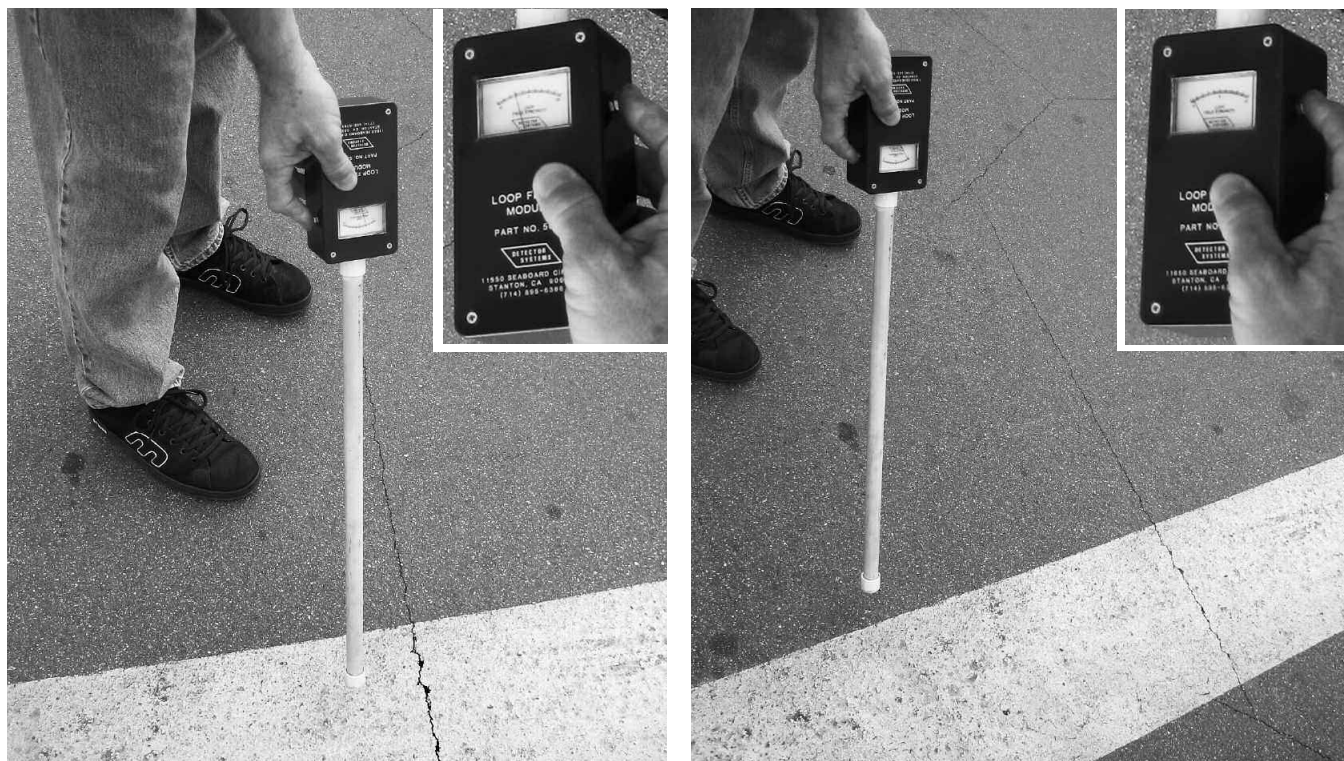
The biggest challenge, if the street has been recently resealed or repaved, is merely finding the detector, then positioning your bike properly. Even if you can't see the cut for the detector,

follow the rule of placement: about one foot into the crosswalk or one foot behind the crosswalk, means that your engine will likely be right over the front or the back of the detector's wiring.

Slaying another common myth, he said it also doesn't matter whether the metal on the underside of a bike contains iron. Anything big enough to cause a disturbance in the magnetic field can trip the detector.

If you are unable to go straight through an intersection because you are not detected, simply turn right and then make a U-turn and another right, he said. Better than risking a ticket for running a red light.

Left-turn-only lanes, which we have in abundance here in south Orange County, are frequently the harder ones to trip, partly because they contain loop detectors sometimes made as a large figure 8 that's 5' x 50'. That arrangement is inherently weaker than the 6' x 6' squares or the 6' diameter circles, Dexter said, as it only generates a field that rises 1' above the pavement, as opposed to 3' for the circles or squares. For that reason, Irvine usually sets the loops' sensitivity higher on left



Left: The loop detector's magnetic field is strongest between six inches and one foot away, as indicated by the reading on the loop finder module (inset). Right: The field is virtually non-existent about two feet away.

turn lanes, so that their sensitivity can match that of the adjoining straight lanes. Because of this weakness, the city has stopped putting the large figure 8 loops in new intersections and is instead putting a number of smaller loop detectors to ensure better detection.

A detector's sensitivity can be set anywhere on a scale of 1 to 7, with 7 being the most sensitive, Dexter said. Most of the ones in Irvine are set to 4, with the left turns with figure 8 detectors set to 5. Higher than that, he said, and you can frequently get "crosstalk"—the loops setting each other off.

An occasional problem with loop detectors is caused by worn or broken pavement around them. Once water from rain or from another source begins to surround a loop, it essentially shorts out and stops working, Dexter said. Breaks in the wires can naturally also cause the detector to stop working.

Otherwise, if you live in an older city without loop detectors, signals are generally on a fixed timer, with each direction given a certain amount of time, regardless of the traffic flow. Much of Milwaukee and older cities in the Northeast have signals that work on a fixed pattern, said Bob Bryson of the city of Milwaukee.

Left-turn signals have been retrofitted with loop detectors in Milwaukee, but they wouldn't be used to control the entire intersection, Bryson said.

Video Detection

There are other detection technologies that have come into vogue. One of the main ones is video detection. A video camera mounted on the light pole (putting it higher than the traffic signal) examines one direction of traffic, comparing it to a

picture without cars. If it detects an image that's different from its default, then the camera trips the sensor, telling the light to turn green.

There are two big problems with the video detection: first is fog. Obviously, in dense fog, a camera cannot "see" anything, rendering its detection useless.

The more common one is cars that are the same shade of gray as the asphalt. The cameras detect in black and white, so if a silver car or dark gray car pulls up to a traffic signal with a video detector, the camera may not "see" that vehicle, because it blends into the pavement color. This can even happen with cars that are not truly gray—if a vehicle's color value is the same as the pavement, then it would "see" it the same way it views the pavement and not sense that a car or motorcycle is there.

At night, the video camera works on light, but because a motorcycle usually only has one headlight, that may not be enough to trip the video detection.

Word Of Caution

Emergency vehicles (fire trucks, ambulances and police) are equipped with a device called an Emergency Vehicle Pre-empt Emitter, which uses either infrared signals or a strobe light to turn a signal green when rushing to a call. In Irvine, as in other cities, a cylindrical receiver sits on top of the traffic signal arm to receive these signals. Frequently the signals with these receivers are at major intersections.



Inside the loop detectors' control box: Each light turns on when a vehicle is detected. The bottom sensor, for a left turn signal, is set to be slightly more sensitive because of a weaker field.

Remember that fact when you hear a siren approaching, as the traffic light that just turned green for you may immediately turn red to let an emergency vehicle pass. Be prepared.

Also, a favorite trick of law enforcement is to hide out of sight, use the EVPE to signal a light to turn red and see if the approaching driver stops. When this happens at a remote intersection that has no cross traffic waiting, don't be tempted to run the light (and don't ask how we know).

Also, the last federal transportation bill made sale and use of these signal pre-empt devices a crime if used by anyone other than a law enforcement officer or an emergency responder. 🚓



Left: Duane Dexter shows where to ideally place your tire for detection. If your tire is there, he figures your engine will be right over the loop detector's sensitive spots (right), causing the most disturbance in the magnetic field and tripping the detector.