Kansas
LTAP Fact Sheet
A Service of The University of Kansas Transportation Center for Road, Street & Bridge Agencies

Which Traffic Counter Works Best for You? A Comparison

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This article describes the pro and cons of the over-roadway option of microwave radar recorder devices, available for use on Kansas local roads through Kansas LTAP's Equipment Loan Program at no cost. Microwave radars are one of the traffic data collection devices recommended by the Federal Highway Administration.

Introduction

To understand traffic patterns and volumes in any location, we need to collect traffic data in the location. Several types of sensors can help traffic engineers and other related parties in this process. These sensors are divided into two categories based on their installation locations: in-roadway technologies (also called intrusive), and over-roadway technologies (also called non-intrusive) [1, 2]. Each category involves different equipment to collect traffic data as shown in Table 1. In-roadway sensors are those sensors placed on or into the road pavement in the travel way and can cause disruption to traffic operation during installation, operation, and/or maintenance. Over-roadway sensors are devices that are placed above the roadway surface or away from the travel lanes and cause minimal disruption to traffic operation during installation, operation, and/or maintenance [3].

Table 1. Available Technologies for Traffic Data Collection [1].

Category	Technology
In-roadway sensors	Pneumatic road tubes
	Inductive loop detectors
	Magnetic sensors
	Piezoelectric sensors
Over-roadway sensors	Video Image Processors (VIP)
	Microwave radars
	Infrared sensors
	Ultrasonic sensors
	Passive acoustic sensors

Microwave Radar

In this article, the focus is on the radar recorder device as a type of microwave radars. Microwave radar uses radio waves to detect moving objects. Radar was first developed in the early 1900s and its first main use was in World War II [3].

Radars transmit electromagnetic energy from an antenna towards vehicles traveling the roadway. When a vehicle passes through the antenna beam, a portion of the transmitted energy is reflected back towards the antenna. The energy then enters a receiver where the detection is made. Traffic flow data are calculated using the Doppler Principle, which measures the amount of time that it takes for the energy to travel to a vehicle and back [1, 4]. The radar recorder represents one of the most accurate devices in traffic volume and speed detections [5]. Mohammed [1] and Chang [3] listed several advantages and disadvantages of radar recorders for the traffic data collection.

The advantages are:

- The portable light devices are non-intrusive and can be installed along the roadway up to 80 feet from the far lane of traffic and installed at a 45-degree angle to the roadway using the provided mounting bracket;
- They can collect highly accurate traffic data such as volume, speed, gap, and vehicle classification on multiple road lanes;
- They do not use visual imaging and, thus, are insensitive to inclement weather conditions such as rain, snow, ice, and fog; and
- Collected data are downloaded by two provided options; direct cable connection or by wireless technologies such as Bluetooth and cell phones. The wireless option allows users to download the collected data inside their vehicle and avoid the exposure to adverse weather conditions.

The listed disadvantages are:

- They are pole-mounted radar sensors, which means installing these devices depends on the existence of poles (see Figure 1);
- They must be configured in the targeted area with a laptop, and that process can be time-consuming. This process includes a calibration to verify that the device detects all vehicles on the correct lanes. This is a challenge for unpaved roads and/or where the traffic flow is low. The best time to set up the radar recorder in these areas is during peak hours;
- Even though it is a non-intrusive technology, on-site personnel must enter the roadway to determine the distance to configure the radar;
- Most models are powered by batteries and each battery can operate for seven-to-ten days. Therefore, a second battery should be

Figure 1. Radar Recorder [1].

added for two weeks or more of data collection; and

- They are not able to detect vehicles that are not moving. This means some errors in collected data are expected when they reinstalled in congested roads and where lines of stopped traffic may exist.

How to Use Radar Recorders

The University of Kansas Transportation Center (KUTC) has two radar recorders (model named Black Cat) manufactured by JAMAR Technologies, Inc. The Black Cat is a non-invasive data collector that uses radar to gather accurate traffic data for either bidirectional roads or two lanes going the same direction.

Kansas LTAP has the TRAXPro software required to collect the data from the Black Cat. LTAP will provide free installation of the radar devices at your location and free analysis of the data collected when the agency returns the loaned Black Cat equipment.

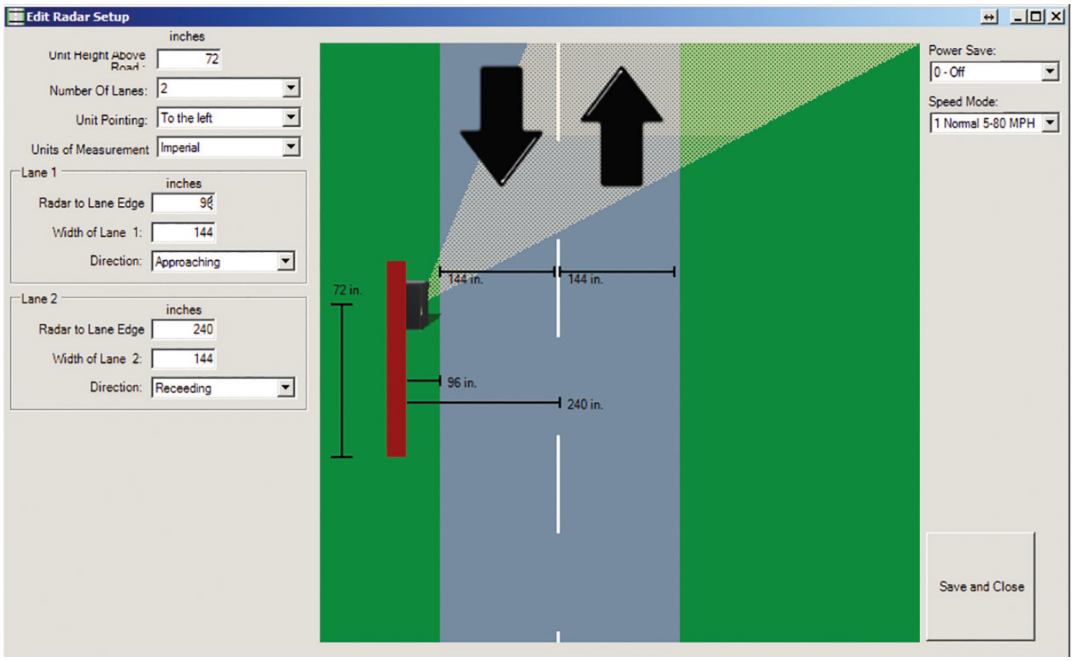
For the best results, a Black Cat should be installed six-to-ten feet away from the road and at least six feet above the ground. Radar units should face at a 45-degree angle to the flow of traffic, and the far-side lane of the road should not be greater than 50 feet away (See Figure 2).

Black Cats need to be set up in locations where traffic is free-flowing.

Radar units should not be installed at intersections, near parking lots or pedestrian crossing, or where the view between the radar and traffic lanes is obstructed. When choosing a location to install a Black Cat, remember that it will need to be mounted to a pole (typically a utility pole) or tree, so the site must have one of these available [6]. The user manual that KUTC provides with the Black Cat equipment illustrates the installation process step-by-step, using an installation kit that is also included with the radar unit.

The manufacturer recommends manual set up for installation of a Black Cat, which means the geometric measurements of the target location should be entered manually into the radar throughout the TRAXPro software. The measurements include the height of the radar above the road level, the number of road lanes, and the direction and width of each lane, as shown in Figure 2. To get these measurements, on-site personnel must enter the roadway to determine the distance to configure the radar. If using loaned LTAP equipment, LTAP staff will provide all the set-up.

Figure 2. Manual Set-up of the Black Cat Radar Recorder [6].



The current cost of a radar recorder is more than $7,000. The Kansas LTAP has two Black Cat radar recorders available for loan as part of its Equipment Loan Program for local agencies. There is no cost to agencies for the use of the equipment and the analysis of the data.

For more information on the Kansas LTAP Equipment Loan Program or to request an equipment loan, go to https://kutc.ku.edu/equipment-loan-program.

References

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Kansas LTAP Newsletter – July 2019