Frequently Asked Questions (FAQs) about the **SAS-1 Passive Acoustic Sensor**

1. How many lanes can SAS-1 monitor?

   The SAS-1 is currently configured to monitor five lanes. We limit the number of reported lanes due mainly to a practical limit of mounting height necessary to prevent occlusion of the far lanes in a multi-lane situation. The practical limit for the farthest lane being observed by the SAS-1 is approximately 90-100 feet from the sensor. Given a typical 20 to 30 foot offset from the road for mounting, trying to observe more than 5 lanes would increase count and speed errors beyond an acceptable level for most applications.

2. Can it detect vehicles traveling in opposite directions, say in two lanes in each direction on a four-lane highway?

   Yes. The sensor does not differentiate the direction of vehicles in its normal configuration, yet provides the same information for all lanes. It is advisable to follow the guidelines for the observation of the farthest lane, especially if a wide median is involved, making sure that lane number 4 is observable from the sensor as indicated in the set up tables.

3. Can it detect stopped vehicles?

   Yes. It detects vehicles that are stopped as long as they remain at idle. If the driver turns the engine off and there is no other source of sound energy from the vehicle, the vehicle ceases to be detectable. The sensor is a passive acoustic device, meaning it collect sound which is emitted from the source. The source of detect is primarily tire noise at highway speeds, but as vehicles slow, the dominant source becomes the engine noise.

4. What is the slowest speed that the SAS-1 can detect?

   Vehicles are detected from highway speeds down to being stopped under the sensor. The SAS-1 reports all speeds down to 0 for a stopped vehicle via direct connection. The slowest reported speed via “dual loop” relay contact closure is 1.5 miles per hour. This is due to the physical constraint of having to provide an output from a detection that ends for the first or lead contact prior to the second contact of the two relays being activated.

5. Can the SAS-1 detect speeds less than 30 miles per hour, such as a stop and go condition during rush hour?

   Yes. The SAS-1 can provide vehicle speeds down to idle in a direct connect mode or as stated above, reports speeds down to 1.5 miles per hour using contact closures in stop and go situations.

6. Can the SAS-1 be used as a counter?

   Yes. The SAS-1 can count and store 5 lanes worth of data, recording data for up to 15 days, depending on the recording interval. The production SAS-1’s memory can be upgraded to increase the recording period to up to 60 days upon request. The data stored is lane count, vehicle classification to three levels as explained below, lane occupancy and average speed for the interval.

7. Can the SAS-1 provide classification?

   Yes. The SAS-1 can provide three classification levels based on length of the vehicle. These lengths are setup at the time a count header is set up and uploaded into the SAS-1 using the companion software included with each sensor. Typically, users collect car, delivery vehicle/light truck, and semi-tractor trailer count information during data collection periods.

8. What is the minimum mounting height for the sensor on a three-lane highway?

   We recommend that the sensor be mounted at least 28 feet above the roadway for a typical three-lane installation, with that value increasing as the sensor is moved away from the edge of the road. This is to minimize occlusion in the out lanes. A full table of recommended mounting heights is posted on our website at www.smarteksys.com/document.htm.

9. How far from the road can the sensor be mounted?

   The maximum distance recommended is 40 feet, with the appropriate height at this distance being on the order of 40 feet. Again, this is to prevent occlusion of the lanes by vehicles in the first couple being observed.

10. Can the sensor be used for stop line detection at intersections?

    Yes. It is a true presence detector. A longer detection zone is provided for stop a line application that is about double of the standard detection zone. When the sensor is in intersection mode, it is not recommended that it be used as a counter as multiple vehicles may enter the zone or be repeatedly detected while at idle with in the zone.

11. Can the sensor be used for advanced detection for intersections?

    Yes. This is one of the most effective uses for the sensor. Utilizing its wireless connectivity option, and powering the sensor either from a light pole or solar power, the advanced sensors provide the inputs to an intersection controller without the need for homerun wires. Up to 6 sensors can be run in dual loop mode to a common wireless cabinet receiver – seven sensors if a single relay output is used or practically unlimited if a direct RS-232 messaging scheme is employed.

12. Does it matter what type of mounting structure is used to support the SAS-1? What about support structure motion? How does structure motion affect detection?

    As long as the SAS-1 has an unobstructed view of the traffic lanes being monitored, one can mount from bridges, signs, light posts, overhead sign bridges, buildings, etc. One of the concerns many users have expressed is that most roadside structures are not stationary and they worry about how the structure motion affects the accuracy of the SAS-1. We have not observed any ill effects from sensor motion on the order of upwards of +/- 1 foot on the end of a mast arm for a stop line configuration. This is the most demanding environment for the sensor – detecting quiet idling cars at an intersection with no false detection from an adjacent lane due to sensor motion. Typical highway structures only move an inch or so with passing traffic or gusts of wind, which affects the detection zone only to a minor extent. The signal processing and sampling of the incoming signals is much quicker than the sensor motion, even on a vibrating support structure.

13. What kind of radar is the SAS-1?

The SAS-1 is not based upon radar technology. SAS-1 is the implementation of US Patent Number 5,798,983 which calls for the use of the passive acoustic means of detecting multiple lanes of traffic. SAS-1 does not radiate energy in the form of radar or sonic pulses like other technologies. Instead, it listens to the road bed with its array of microphones and processes the acoustic energy radiated from the vehicles as they pass. For more detailed information on the SAS-1 capabilities, please refer to Chapter A of the SAS-1 user manual found at www.smarteksys.com/document.htm.

Because the SAS-1 is a passive detector, it uses significantly less energy than an active sensor such as a radar detector would. This lower power budget is a significant factor when choosing sensors for solar powered deployments as the solar cell size and battery can be reduced by at least one half utilizing the SAS-1 over current multilane radar detectors.