The Sensys™ Wireless Vehicle Detection System

925-455-5267

VSN240 Wireless Sensors

The Sensys™ Wireless Vehicle Detection System uses pavement-mounted magnetic sensors to detect the presence and movement of vehicles. The magneto-resistive sensors are wireless, transmitting their detection data in real-time via low-power radio technology to a nearby Sensys access point that then relays the data to one or more local or remote traffic management controllers and systems.

The Sensys Wireless Sensor. A Sensys wireless sensor is a sensitive magnetometer equipped with a low-power radio and packaged in a small, hardened plastic case suitable for pavement mounting.

In typical traffic management applications, a Sensys wireless sensor is placed in the middle of a traffic lane to detect the presence and passage of vehicles. To measure vehicle speeds and length, two wireless sensors are installed in the same lane with the exact distance between them measured and configured in software. The recommended distance between sensors depends on the range of expected speeds to be measured: for typical freeway applications, a separation of approximately 20 to 24 feet / 6.1 to 7.3 meters is recommended; for typical arterial applications, a separation of 10 to 12 feet / 3.1 to 3.7 meters is preferred.

Advanced Magnetometer-Based Vehicle Detection. The state-of-the-art magneto-resistive sensing devices employed in each Sensys wireless sensor measure the x-, y-, and z-axis components of the Earth's magnetic field at a 128 Hz sampling rate. As vehicles come within range, changes in the x, y, or z axes of the measured magnetic field become apparent. When no vehicles are present, each sensor continually measures the background magnetic field to estimate a reference. Each sensor automatically self-calibrates to the specific installation site and to any long-term variations of the local magnetic field by allowing this reference value to change over time.

Types of Wireless Sensors. Sensys currently offers two types of flush-mount wireless sensors:

VSN240-F – flush-mount wireless sensor

- Flush-mount wireless sensor for in-pavement installation
- Suitable for *all* freeway, arterial, and traffic signal control applications

VSN240-T – flush-mount wireless sensor

- Flush-mount wireless sensor for in-pavement installation
- Suitable for traffic signal control applications *only*

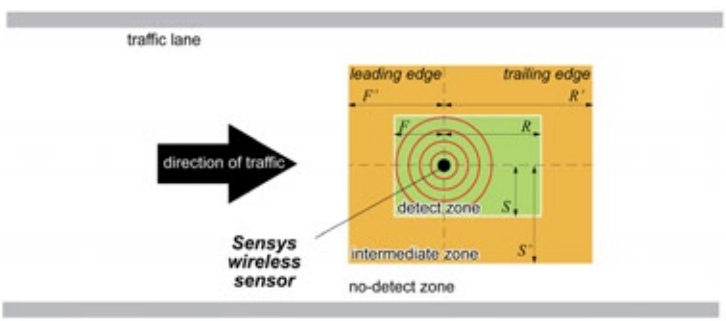
Functions / Features

- **3-axis magnetometer for vehicle detection**
  - 128 Hz sampling rate
  - Count and presence detection modes
  - Modes for bicycle and motorcycle detection
- **Superior accuracy**
- **Exceptional reliability**
- **Flush-mount in-pavement installation with no wires or lead-in cabling**
- **Fast & simple installation**
  - Installs in less than 10 minutes in small hole using a hammer or core drill
    - 4" / 10 cm diameter; 2 ¼" / 5.7 cm deep
    - Covered with fast-drying epoxy
  - Minimal lane closure time
  - No saw cuts
- **Extremely long battery life – average of 10 years**
- **Rugged mechanical design**
- **Auto-calibration**
- **Reliable 2-way radio communications with Sensys access point**
  - Uniquely addressable and configurable
  - Firmware can be upgraded over-the-air
- **Can be readily deployed where other systems cannot be used**
  - Split roadways
  - High water tables
  - Damaged pavement

Functional Specifications

detection technique	3-axis magnetic field sensing
sampling rate	128 Hz
programmable vehicle detection parameters (mode B only)	• Z-axis detect threshold (mG) • Z-axis undetect threshold (mG) • X-axis undetect threshold (mG) • onset filter (ms) • holdover (ms) • auto-recalibration timeout (secs)
over-the-air protocol	Sensys NanoPower (SNP) protocol (TDMA)
physical layer protocol	IEEE 802.15.4 PHY
modulation	Direct Sequence Spread Spectrum Offset Quadrature Phase-Shift Keying (DSSS O-QPSK)
transmit/receive bit rate	250 kbps
frequency band	2400 to 2483.5 MHz (ISM unlicensed band)
frequency channels	16
channel bandwidth	2 MHz
antenna type	microstrip patch antenna (mounted below top surface of sensor)
antenna field of view	±60° (azimuth & elevation)
nominal output power	0 dBm
spurious emissions	• 30 - 1000 MHz: < -56 dBm • 1 - 12.75 GHz: < -44 dBm • 1.8 - 1.9 GHz: < -56 dBm • 5.15 - 5.3 GHz: < -51 dBm
typical receive sensitivity	-95 dBm (PER = 1%)
saturation (max input level)	≥ 10 dBm

Vehicle Detection Zones



	F	*F'*	*R*	*R'*	*S*	*S'*
freeway & arterial applications (typical configuration)	~2 ft / ~0.6 m	~4 ft / ~1.2 m	~4 ft / ~1.2 m	~6 ft / ~1.8 m	~2 ft / ~0.6 m	~4 ft / ~1.2 m
intersection applications (typical configuration for passenger vehicles)	~3 ft / ~0.9 m	~5 ft / ~1.5 m	~3 ft / ~0.9 m	~5 ft / ~1.5 m	~3 ft / ~0.9 m	~5 ft / ~1.5 m

Sensor Modes

mode	application	description
B ***(event)***	count stations; advance detection	• sends timestamped ON and OFF detection events using configurable detection parameters • not supported by VSN240-T
E ***(idle)***	status reporting	disables magnetometer and sends sensor hardware and software version information
STOPBAR-# ***(presence detection)***	stop bar detection; ramp management	sends timestamped *ON* and *OFF* detection events using pre-configured detection parameters

- 16 different stop bar detection modes can be selected
- recommended stop bar detection modes for specific applications:

STOPBAR-0	bicycles/scooters
STOPBAR-2	motorcycles
STOPBAR-5	passenger vehicles (normal recalibration)
STOPBAR-7	passenger vehicles (fast recalibration)
STOPBAR-14	light rail

Power, Physical, & Environmental

power supply	• non-replaceable primary Li-SOCl2 3.6V battery pack • 7.2 Ah (nominal capacity)
dimensions	2.9" x 2.9" x 1.9" / 7.4 cm x 7.4 cm x 4.9 cm
weight	0.6 pounds / 0.3 kg
environmental	• designed for in-pavement mounting • NEMA Type 6P enclosure • IP68 ingress protection
operating temp	-40°F to 176°F / -40°C to +85°C

Compliance

safety	2006/95/EC CE
EMC	• FCC: This device complies with Part 15 of the FCC rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation. • 2004/108/EC CE

SENSYS Networks

925-455-5267

Local Distributor

JAM SERVICES, INC.