The Sensys™ Wireless Vehicle Detection System

AP240 Access Point

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 Access Point. A Sensys access point is an intelligent device operating under the Linux operating system that maintains two-way wireless links to an installation's sensors and repeaters, establishes overall time synchronization, transmits configuration commands and message acknowledgements, and receives and processes data from the sensors. The Sensys access point then uses either wired or wireless connections (or both) to relay the sensor detection data to a roadside traffic controller or remote server, traffic management system, or other vehicle detection application.

Types of Access Point. An access point uses a single cable to support 10Base-T Ethernet communications as well as DC power input and, in some versions, serial communications to the Sensys contact closure card that furnishes the interface to standard traffic controllers. An integrated radio modem can also be ordered as an access point option to provide IP connectivity using either GSM-based or CDMA-based cellular data services.

AP240-S

- RJ45 port supports serial interface to Sensys contact closure Master Card (CC card) for relay of vehicle detections output; supports Ethernet interface for field configuration only (via Sensys AccessBox)
- No statistics processing of sensor detection data (relay to traffic controller only)
- 48VDC power input from Sensys CC card via RJ45 port

AP240-E

- RJ45 port supports Ethernet interface for relay of detection data and field configuration
- AP processor supports statistics-processing and VPN functionality
- Can be ordered with either 48VDC or 12VDC power input via RJ45 port
- **S option**: RJ45 port simultaneously supports serial interface to Sensys CC card and Ethernet interface for relay of detection data (paths split via Sensys AccessBox)
- **G or C option**
  - **G**: integrated GPRS cellular data modem for relay of detection data via GSM cellular data services
  - **C**: integrated 1xRTT cellular data modem for relay of detection data via CDMA cellular data services (different versions for different service providers)

Functions/Features

- **Sensys radio communications**
  - To/from Sensys wireless sensors
  - To/from Sensys repeaters

- **Relay of sensor data**
  - Via contact closure signals to traffic controller
  - Via IP connectivity (wired or wireless) to traffic management systems, upstream servers, etc.
  - Optional integrated cellular data modem

- **Processing of sensor data**
  - Per-lane or per-vehicle data
  - Data binning over selectable time intervals
  - Data filtering (e.g., adaptive holdover)

- **Storage of sensor data**
  - Data buffering (event caching)
  - Data storage (processed data)

- **Master timebase for all supported wireless sensors**
  - Common clock for sensor timestamps
  - Can be synchronized to NIST timing signals

- **Radio signal quality measurements**
  - Receive Signal Strength Indicator (RSSI, in dBm)
  - Link Quality Index (LQI, figure of merit 40-99)

- **Firmware upgrades**
  - Can be upgraded via IP connectivity or via local PC connection
  - Can deliver upgrades to all other Sensys devices

- **Simple installation**
  - Any roadside location that provides adequate signal coverage to sensors/repeaters
  - No special requirements regarding setback, relative angle of the sun, or mounting stability

- **Low power consumption**

- **No calibration or adjustment required**

Functional Specifications

interfaces	• to/from sensors via 802.15.4 PHY radio • to/from repeaters via 802.15.4 PHY radio • to/from configuration device (PC) via TCP/IP over 10Base-T Ethernet • to roadside traffic controller via Sensys CC card • to/from central network management / data collection facilities via TCP/IP — 10Base-T Ethernet — cellular data modem
IP connectivity	• Telnet, FTP, HTTP, PPP, PPTP, optional encryption over tunnel • 10Base-T via RJ45 connector (10 Mbps) • GSM GPRS connectivity (optional) — dual-band 850/1900 MHz GSM (N. American version) — dual-band 900/1800 MHz GSM (int'l version) — up to 85.6 kbps • CDMA2000 1xRTT connectivity (optional) — dual-band 800/1900 MHz CDMA (per specific cellular service provider) — up to 153.6 kbps
per-lane data processing	• counts (volume) • occupancy • average and median speeds • binned speeds and vehicle lengths over selectable time intervals
per-vehicle data processing	• initial vehicle detect time • gap • speed • length
data storage	• ~130 kB for event caching • ~500 kB for processed data storage
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 (behind front face panel)
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

Types of Access Points

	stats processing capability	power options		detection data interfaces			
		48 VDC	12 VDC	contact closure	10Base-T	GSM GPRS	CDMA2000 1xRTT
AP240-S		●		●			
AP240-E	●	●	●		●		
AP240-ES	●	●		●	●		
AP240-EG	●	●	●		●	●	
AP240-EC	●	●	●		●		●
AP240-ESG	●	●		●	●	●	

Power, Physical, & Environmental

input voltage	• via PoE cable to RJ45 connector • 36-58 VDC (48 VDC nominal) • 10-20 VDC (12 VDC nominal)
power consumption	• AP240-S, -E, -ES: 2 W • AP240-EG, -EC, -ESG, -ESC: 3.5 W
dimensions	6 ¼" x 6 ¼" x 3 ½" / 15.9 cm x 15.9 cm x 8.9 cm
weight	• AP240-S, -E, -ES: 1.9 lbs / 0.9 kg • AP240-EG, -EC, -ESG, -ESC: 2.1 lbs / 0.9 kg • mounting kit: add'l 1.2 lbs / 0.5 kg
environmental	• designed for weatherproof, outdoor operation • NEMA Type 4x enclosure • IP67 ingress protection
operating temp	-40ºF to 176ºF / -40ºC to +80ºC

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

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