

VSN240-MP MicroRadar™ Sensor for Parking

Extensive testing has shown that wireless magnetometer and infrared sensors are not the best solutions for static parking applications, as neither provides consistent parking data in all conditions. The magnetic nulls and electromagnetic interference can cause limitations for wireless sensors, and infrared sensors are susceptible to dirt or oil.

After years of research and development, and with multiple patents pending, Sensys Networks announces the ultimate solution for a wireless parking sensor: MicroRadar™.

	MicroRadar™	Magnetometer	InfraRed
Immunity from vehicles adjacent to empty space	✓	⊗	✓
Robust RF performance	✓	⊗	⊗
Ignores nearby double parked vehicles	✓	⊗	✓
Accommodates dirt, dust, or oil on sensor	✓	✓	⊗
Not vulnerable to electromagnetic interference	✓	⊗	✓
Consistent performance in all lighting conditions	✓	✓	⊗
Maintains state reliably during long-duration session	✓	⊗	✓
Unaffected by slow-moving queues of nearby vehicles	✓	⊗	✓

Sensys Networks MicroRadar™ incorporates an extremely low power, wide-band radar with a Sensys Networks Nano-Power Protocol radio. This compact in-ground sensor works on the same principle as any other radar. High frequency RF pulses are transmitted, bounced off a target object, and measured by a time-gated return RF mixer. RF reflections are analyzed to produce presence, distance, and motion measurements.

MicroRadar can precisely detect the onset of parking events and the clearance of cars from spaces. The radar is tuned for offset, minimum range, and maximum range based on installation configuration.



Features and Functions

Simple installation, long life

- Sensors install flush to pavement in about 10 minutes
- Eight year battery life

On-street, off-street, truck parking and top-deck applications

- Actively measures presence of vehicles
- Parameters for range and off-set optimize any configuration
- Differentiates between large and small, stationary and moving
- Retains state no matter how long the parking event
- Precisely measures start of parking and end of parking
- Differentiates between transient detections and parking events

Data for parking guidance and guided enforcement

- XML interfaces to parking guidance web sites and smart phone applications
 - Parkopedia, ParkMe
- SNAPS and Parking Session servers manage thousands of deployed sensors, archive data, and monitor system health
- Optional guided enforcement application
 - Supports Windows Mobile hand-held and Android tablets

Functional Specifications

Radio Specifications

over-the-air-protocol	Sensys Networks 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	ceramic patch antenna (mounted below top surface of sensor)
antenna field of view	±60° (azimuth & elevation)
nominal output power	+3 dBm
spurious emissions	<ul style="list-style-type: none"> 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	-101 dBm

Radar Specifications

frequency	6.3 GHz
bandwidth	>500 MHz
radiated power	within FCC class B limits
maximum range	4' (1.2 m) to 10' (3 m) (selectable)
calibration	self calibrating
sample rate	1/2, 1, 2, 4, and 8Hz (selectable)

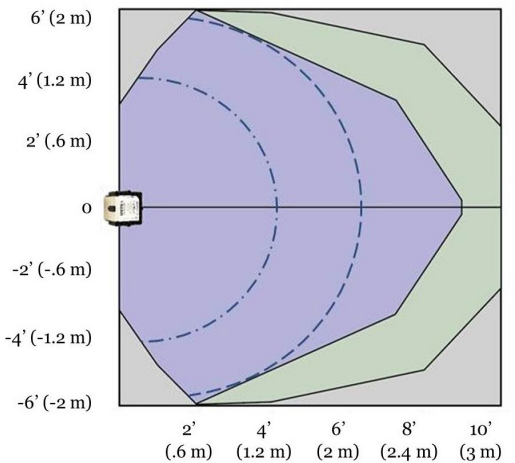
Power, Physical, & Environment

power supply	<ul style="list-style-type: none"> non-replaceable primary Li-SOCI23.6V battery pack 7.2 Ah (nominal capacity)
dimensions	2.9" x 2.9" x 2.3" (7.4 cm x 7.4 cm x 5.8 cm)
weight	0.6 pounds / 0.3 kg
environment	<ul style="list-style-type: none"> designed for mounting in-pavement or above ground/on a pole performance diminishes in standing water and in slushy conditions NEMA Type 6P enclosure IP67 ingress protection
operating temp	-40°F to 176° / -40°C to +85°C

Sensor Location Specification

<p>Single Car Parallel Parking: with Space Markings</p> <p>For a parallel parking space with pavement markings, measure 2' from the rear demarcation line and locate the sensor one-half of the width of the space from the curb. Direct the sensor toward the front of the space.</p>	<p>Parallel Parking: without Space Markings</p> <p>For a parallel parking space with no pavement markings measure out one-half of the width of the space from the curb and direct the sensor toward the front of the space. Locate each successive sensor 12' apart.</p>
<p>Diagonal Parking</p> <p>For diagonal parking into a space, measure 14' out from the passenger side demarcation line of the space and locate the sensor in the center of the space, measured perpendicular to the demarcation line. Direct the sensor toward the front of the space parallel to the demarcation lines.</p>	<p>Perpendicular Parking</p> <p>For perpendicular parking into a space, measure 14' out from the demarcated front of the space (curb or painted line) and locate the sensor in the center of the space. Direct the sensor toward the front of the space.</p>

In-Road Detection Zone



The purple and green areas depict sensor detection zones. The arcs represent range settings.

Compliance

safety	2006/95/EC
EMC	<ul style="list-style-type: none"> 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

Local Distributor

Access Point Controller Card (APCC)

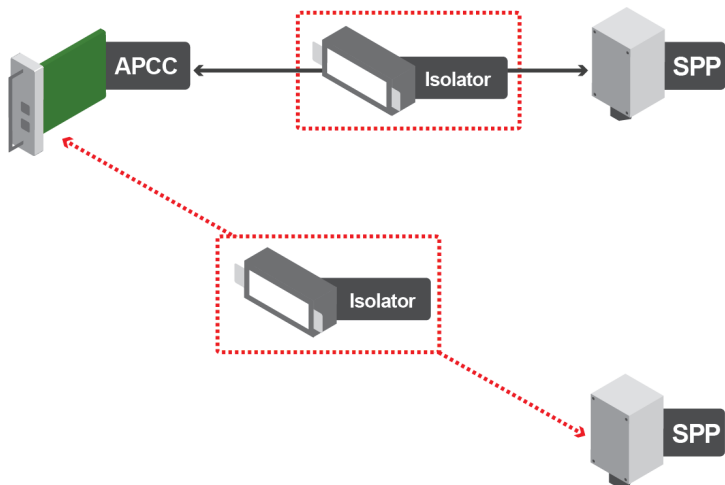
The Sensys Networks Access Point Controller Card (APCC) is a second generation controller card that maintains low power consumption, supports multiple radios, and allows for additional communication and processing power. The APCC, which is compatible with all of Sensys Networks VDS240 Wireless Vehicle Detection System products, receives and processes data from the sensors. The APCC then relays the sensor detection data to a roadside traffic controller or remote server traffic management system.

SPP Radio

The SPP is a low powered radio that maintains two-way wireless links to an installation's sensors and repeaters. The SPP establishes overall time synchronization, transmits configuration commands and message acknowledgements, and receives and processes data from the sensors. The SPP then uses wireless connections to relay the sensor detection data to the APCC.

Isolator

An isolator isolates and routes power from the APCC to the SPP and provides up to 2000 cable feet of communication for the APCC to and from the SPP at RS422 capabilities.



The minimum APCC system consists of an APCC, one SPP radio, and an isolator. The system can also consist of two SPP radios with an isolator for each SPP radio that offers electrical isolation up to 1500V, surge protection up to 1500V, and AC power cross protection.

Types of APCC configurations

The APCC single-slot configuration consists of dual SPP radio ports, Sensys Networks expansion (EX) port, and contact closure interface via backplane to a traffic controller. It also has dual USB 2.0 full speed host ports and 10/100Base-T network access. The APCC dual-slot configuration adds an SD memory card, real-time battery-backed clock, optional dual serial (DB9) interface*, and an optional second serial port or built in cellular modem.

* Full handshake control - COMM1 only



Functions / Features

Sensys Networks radio communications

- To/from Sensys Networks sensors
- To/from Sensys Networks 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.
- Integrated cellular data modem (optional)

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) 500 K
- Data storage (processed data) 1 M
- MMC/HCSD retractable memory (optional)

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)

Firmware upgrades

- Can be upgraded via IP connectivity or via local PC connection
- Can deliver upgrades to all other Sensys Networks 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	<ul style="list-style-type: none"> communicates with traffic controller via 2x22 pin edge connector to backplane (2) RS-422 full duplex to SPP radio(s) via RJ45 connector (2) USB 2.0 full speed RS-485 full duplex to EX cards via RJ45 connector 10/100Base-T network access via RJ45 connector to/from configuration device (PC) via TCP/IP over 10/100Base-T Ethernet to/from central network management / data collection facilities via TCP/IP <ul style="list-style-type: none"> – 10/100Base-T Ethernet – cellular data modem
IP connectivity	<ul style="list-style-type: none"> HTTP, PPP, PPTP, SSH, optional encryption over tunnel 10/100Base-T via RJ45 connector GSM GPRS connectivity (optional) <ul style="list-style-type: none"> – 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) <ul style="list-style-type: none"> – dual-band 800/1900 MHz CDMA – (per specific cellular service provider) – up to 153.6 kbps
per-lane data processing	<ul style="list-style-type: none"> counts (volume) occupancy average and median speeds binned speeds and vehicle lengths over selectable time intervals
per-vehicle data processing	<ul style="list-style-type: none"> initial vehicle detect time gap speed length
memory processor	<ul style="list-style-type: none"> 400 MHz ARM9 processor Linux 2.6 operating system 1 GB Flash 64 MB RAM
over-the-air protocol	Sensys Networks 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	Up to 16
channel bandwidth	Up to 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	<ul style="list-style-type: none"> 30 - 1000 MHz: < -36 dBm 1 - 12.75 GHz: < -30 dBm 1.8 - 1.9 GHz: < -44 dBm 5.15 - 5.3 GHz: < -47 dBm
typical receive sensitivity	-101 dBm (PER ≤ 1%)
saturation (max input level)	≥ 10 dBm

Power, Physical, & Environmental

input voltage	<ul style="list-style-type: none"> 22-26 VDC (24VDC nominal) 9-15 VDC (12 VDC nominal)
power consumption	less than 700 mW (min w/out cell modem)
dimensions	<ul style="list-style-type: none"> single-slot: 7" x 4.5" x 1.1" (18cm x 11.4 cm x 3 cm) double-slot: 7" x 4.5" x 2.3" (18 cm x 11.4 cm x 6 cm) (optional) APCC-SPP: 4.7" x 3.5" x 2.4" (12 cm x 9 cm x 6 cm) Isolator: 6.5" x 3" x 1.3" (17 cm x 8 cm x 3 cm)
weight	<ul style="list-style-type: none"> single-slot: 7.9 oz (224 g) double-slot: 10.5 oz (298 g) (optional) APCC-SPP: 14.1 oz (400 g) Isolator: 5.6 oz (159 g)
operating temp	industrial -40°C to 80°C
SPP enclosure rating	NEMA 4X

APCC Front Panel User Interface

controls	<ul style="list-style-type: none"> MASTER RESET: reset board CHANNEL RESET: ignore events and clear pending events (all channels)
LEDs	<ul style="list-style-type: none"> CH1, CH2, CH3, CH4: on/vehicle present or no sensors detected; off/vehicle not present or channel disabled; blinking: vehicle detected LINK: on/operational; off/no link; blinking/active FAULT: on/an enabled channel has a fault
switches	<ul style="list-style-type: none"> RX termination for SPP ports shelf and slot address

Available Products

Products	Description	Detection Data Interfaces		
		10/100 Base-T	GSM/GPRS	CDMA200 1xRTT
APCC-M	APCC Module	●		
APCC-M-E	APCC Module with Enhanced Ethernet	●		
APCC-MP-E	APCC Module, Peripheral Support (I/O Board without modem)	●		
APCC-MP-EA	APCC Module Peripheral Support	●		●
APCC-MP-EG	APCC Module Peripheral Support	●	●	
APCC-MP-EV	APCC Module Peripheral Support	●		●
APCC-R	APCC Module for Re-ID			
APCC-WF	Wi-Fi Radio for APCC-R			
APCC-BT	Bluetooth® (BT) Radio for APCC-R			
APCC-ACC-1	APCC Accessory Isolator			
APCC-SPP	APCC Serial Port Protocol (Digital Radio)			

Compliance

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