VSN240-M-2 MicroRadar® Sensor

Sensys Networks VSN240-M-2 MicroRadar® sensor incorporates an extremely low power, wide-band, fixed-position radar with a Sensys NanoPower (SNP) Protocol radio. The compact in-ground sensor works using the same principle as any other radar. High frequency RF pulses are transmitted, reflected off a target object, and the return pulses are measured by a time-gated RF mixer. RF reflections are analyzed to produce presence, distance, and motion measurements. The M-2 version incorporates a higher sensitivity radar design and a modified case with tabs to aid installation flush with the road surface.

MicroRadar® sensors are installed very close to the roadway surface and are capable of detecting trains, cars, trucks, and bicycles. MicroRadar® sensors are also capable of detecting and distinguishing large objects from small objects. MicroRadar® sensors have a programmable detection range between 4' (1.2 m) and 10' (3 m). The elevation of a detection zone is approximately 90 degrees and the azimuth is approximately 180 degrees.

Advanced MicroRadar®-Based In-Road Detection

MicroRadar® sensors can detect bicycles that are stopped at a stop bar and differentiate between a vehicle and a bicycle. The basic method to differentiate bicycles from vehicles is based on measuring the breadth of the returned RF signal. Bicycles yield relatively small breadth values while vehicles generate both small and large values depending on the location of the vehicle.

Object in Detection Zone	Object Type Detected
Bicycle	Small
Vehicle	Large
Bicycle and Vehicle	Large
Partial Vehicle	Small

Functions/Features

Fully wireless operation – no cable connections

- Battery powered
- Up to eight year battery life depending on mode of operation
- Low power consumption

Functions/Features (cont.)

Compatible with VSN240 magnetometer sensors

- MicroRadar® sensors can be used in conjunction with VSN240 magnetometer sensors, and can be used in both dedicated and shared lanes
- Installs seamlessly as a supplement to an existing primary detection system

In-road detection

- In-road detection capable of detecting bicycles and vehicles
- Detection modes differentiate between vehicles and bicycles

Detection area

- User programmable detection area
- 1 Hz default sampling rate for in-road detection
- Selectable sampling rate of 1/2, 1, 2, 4, and 8 Hz

Simple installation

- Installs in less than 10 minutes using a core drill
- Cored hole 4" (10.2 cm) diameter, 3" (7.6 cm) deep
- Installed flush to the road surface
- Covered with fast-drying epoxy
- Minimal lane closure time
- No saw cuts

Ability to enable temperature reporting

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Functional Specifications

Radio Specifications

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	ceramic patch antenna (mounted below top surface of sensor)
antenna field of view	±60° (azimuth & elevation)
nominal output power	+3 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	-101 dBm

Power, Physical, & Environment

power supply	• non-replaceable primary Li-SOCl2 3.6V C-cell battery • 7.2 Ah (nominal capacity)
dimensions	2.9" x 2.9" x 2.6" (7.4 cm x 7.4 cm x 6.6 cm) (excluding tabs)
weight	0.6 pounds / 0.3 kg
environment	• designed for in-pavement mounting • 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

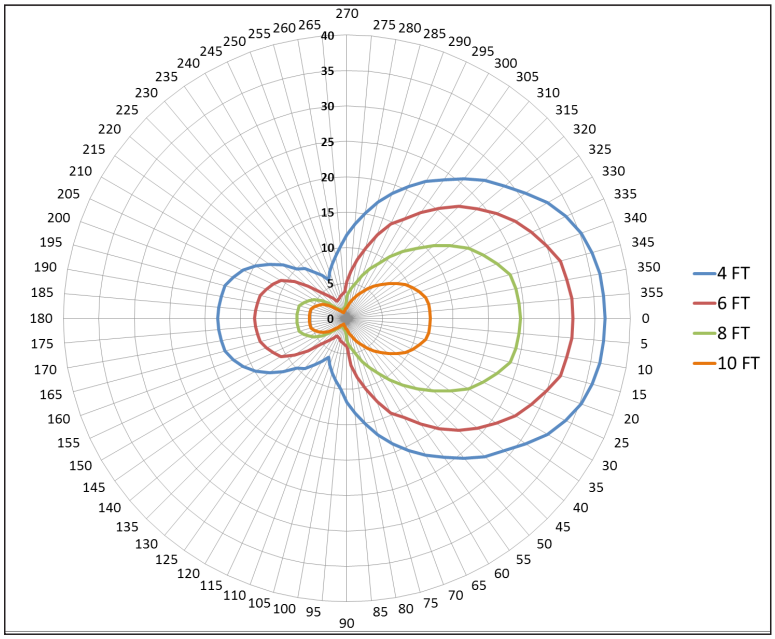
Radar Specifications

frequency	6.3 GHz
bandwidth	>500 MHz
radiated power	within FCC class B limits
radar field of view	±90° (azimuth), 20° - 90°(elevation)
maximum range	4' (1.2 m) to 10' (3 m) (selectable)
calibration	self calibrating
sample rate	1/2, 1, 2, 4, and 8Hz (selectable)

Expected Battery Life (Years)

Range	Sampling Rate (Hz)				
	½	1	2	4	8
4' (1.2 m)	8+	8+	8+	8+	5
6' (2 m)	8+	8+	8+	8	4
8' (2.4 m)	8+	8+	8+	6	3
10' (3 m)	8+	8+	8	4	2

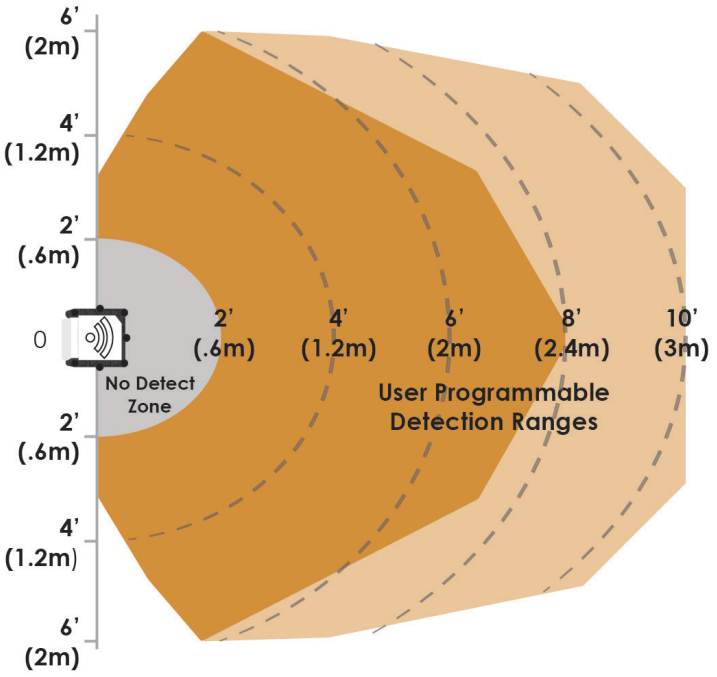
Radar Gain Pattern[1]



[1] Target used is corner cube with radar cross-section equivalent to vehicle

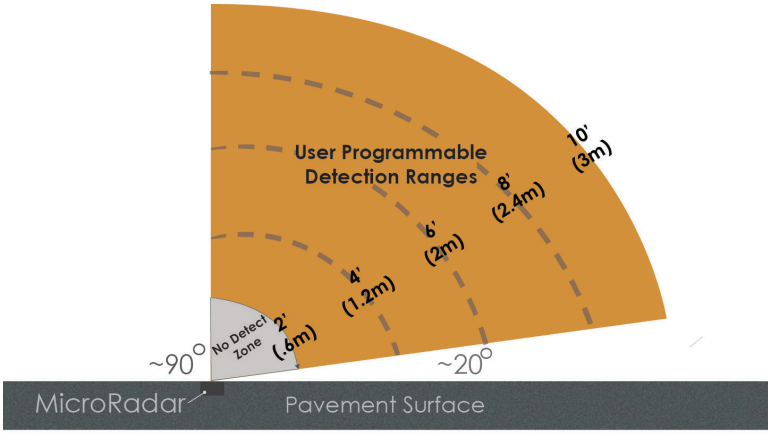
Functional Specifications (cont.)

In-Road Detection Zone (Azimuth Plane)



Adjustable radar detection zone: The grey area depicts a 2' (0.6 m) no detect zone around the sensor. The dark colored area depicts the sensor detection zone for all vehicles (including bicycles). The light colored area depicts the sensor detection zone for large vehicles. The 4' (1.2 m), 6' (2 m), 8' (2.4 m), and 10' (3 m) arcs represent detection range settings.

In-Road Detection Zone (Elevation Plane)



Note: Radar sensitivity configured to eliminate radar back lobe. The detection zone can be modified by changing the radar sensitivity configuration.

Compliance

safety	2006/95/EC
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 • IC: This device complies with Industry Canada licence-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device. • IC : Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes : (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.