



## The Sensys™ Wireless Vehicle Detection System

### RP240B Repeater

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 Repeater.** In cases where one or more installed Sensys wireless sensors are out of range of the nearest access point, one or more Sensys repeaters can be used to provide a two-way relay between the out-of-range sensors and the access point. As many as two repeaters operating in tandem can be installed between a sensor and the access point. To simplify its deployment, a repeater is battery-powered and thus requires no wires or cabling.

**Extended Range and Coverage.** A Sensys repeater extends the range and coverage of an installation's access point. Mounted by the roadside on a pole or other structure, the Sensys repeater must be positioned so that both the sensors to be supported by the repeater and the communicating repeater or access point are within view and within range.

The access point and repeater antennas each provide a 120° field of view, allowing considerable flexibility. For example, a repeater can be installed approximately 1000 feet (305 meters) meters from the access point, where each device can then support wireless sensors within 75 – 150 feet (23 – 46) meters. Alternatively, a repeater can be mounted on the same pole or mast as the access point, separated by 2 to 4 feet (0.6 to 1.2 meters) to ensure that they can communicate, but pointed in the opposite direction. The access point would then support the sensors and repeaters directly in front of it, while the repeater pointing in the opposite direction would support its own sensors as well as another repeater and its sensors.

**Types of Repeaters.** Sensys currently offers two types of repeaters:

#### RP240-B

- Nominal battery capacity of 57 Ah
- Recommended battery replacement every 2 years

#### RP240-B-LL

- Nominal battery capacity of 171 Ah
- Recommended battery replacement every 8 years



### Functions/Features

- **Relay of Sensys radio communications**
  - To/from Sensys wireless sensors
  - To/from Sensys access point
  - To/from another Sensys repeater
- **Extension of range and coverage of the Sensys access point**
  - Can be operated in tandem – one repeater and its supported sensors can communicate with another repeater and then to the access point
  - Maximum single-hop range of ~1000 feet (305 meters) from supporting access point or repeater
- **Fully wireless operation – no cable connections**
  - Battery-powered
  - Low power consumption
- **Radio signal quality measurements (of each link to wireless sensor or tandem repeater)**
  - Receive Signal Strength Indicator (RSSI, in dBm)
  - Link Quality Index (LQI, figure of merit 40-99)
- **Firmware upgrades over-the-air from access point**
- **Simple installation**
  - Any roadside location that provides adequate signal coverage to sensors and the access point or repeater
  - No special requirements regarding setback, relative angle of the sun, or mounting stability
- **No calibration or adjustment required**

## Functional Specifications

<b>interfaces</b>	<ul style="list-style-type: none"> <li>to/from sensors via 802.15.4 PHY radio</li> <li>to/from another repeater via 802.15.4 PHY radio</li> <li>to/from access point via 802.15.4 PHY radio</li> </ul>
<b>over-the-air protocol</b>	Sensys NanoPower (SNP) protocol (TDMA)
<b>physical layer protocol</b>	IEEE 802.15.4 PHY
<b>modulation</b>	Direct Sequence Spread Spectrum Offset Quadrature Phase-Shift Keying (DSSS O-QPSK)
<b>transmit/receive bit rate</b>	250 kbps
<b>frequency band</b>	2400 to 2483.5 MHz (ISM unlicensed band)
<b>frequency channels</b>	16
<b>channel bandwidth</b>	2 MHz
<b>antenna type</b>	microstrip patch antenna (behind front face panel)
<b>antenna field of view</b>	±60° (azimuth & elevation)
<b>nominal output power</b>	0 dBm
<b>spurious emissions</b>	<ul style="list-style-type: none"> <li>30 - 1000 MHz: &lt; -56 dBm</li> <li>1 - 12.75 GHz: &lt; -44 dBm</li> <li>1.8 - 1.9 GHz: &lt; -56 dBm</li> <li>5.15 - 5.3 GHz: &lt; -51 dBm</li> </ul>
<b>typical receive sensitivity</b>	-95 dBm (PER = 1%)
<b>saturation (max input level)</b>	≥ 10 dBm

## Power, Physical, & Environmental

<b>power supply</b>	<ul style="list-style-type: none"> <li>user-replaceable primary Li-SOCI2 3.6V battery pack (battery must be ordered from Sensys Networks) <ul style="list-style-type: none"> <li>— nominal capacity: 57 Ah</li> </ul> </li> </ul>
<b>recommended battery replacement</b>	<ul style="list-style-type: none"> <li>Every 2 years</li> </ul>
<b>dimensions</b>	<ul style="list-style-type: none"> <li>4.72" x 3.54" x 3.15" (12 cm x 9 cm x 8 cm)</li> </ul>
<b>weight</b>	<ul style="list-style-type: none"> <li>1.8 lbs (0.8 kg)</li> <li>mounting kit: add'l 1.2 lbs (0.5 kg)</li> </ul>
<b>environmental</b>	<ul style="list-style-type: none"> <li>designed for weatherproof, outdoor operation</li> <li>NEMA Type 4x enclosure</li> <li>IP67 ingress protection</li> </ul>
<b>operating temperature</b>	-40°F to 176°F / -40°C to +80°C

## Compliance

<b>safety</b>	2006/95/EC <b>CE</b>
<b>EMC</b>	<ul style="list-style-type: none"> <li>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.</li> <li>2004/108/EC    <b>CE</b></li> </ul>



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