OmniSense Wireless Sensor Networks for Facility Monitoring

Prevent Structural Damage Before it Starts

OmniSense S-900-1 Wireless Sensor Product Brief

Overview

The S-900-1 Wireless Sensor monitors moisture content, temperature and relative humidity. It combines a powerful 16 bit RISC microcontroller, 915 MHz wireless modem, environmental sensors, and battery into a compact enclosure designed to be embedded into structures at common points of moisture failure. Sensors are small enough to be mounted anywhere and their ultra long (15+ year typical) battery life mean the sensors can be mounted in areas that are inaccessible after construction is complete. Typically sensors are mounted to the exterior sheathing on the lower corners of window and door frames, near flashed openings in roofs or exterior walls, under plumbing fixtures, under air conditioner condensate plumbing etc. The Sensor's enclosure integrates 1.5" mounting standoffs such that when mounted to a surface the sensor is positioned well away from nails which may come through the surface during construction. Sensors are programmed to periodically wakeup from an ultra low power sleep state, take measurements, and open a communication session with the gateway such that the gateway can read the measurement data out of the sensor. The Gateway can also update the Sensor's time of day, read out the Sensor's stored GPS position[1], and even perform an in-service firmware upgrade of the Sensor's operating firmware.

Sensors

The S-900-1 Sensor incorporates highly accurate sensors which measure:

- The moisture content of the substrate the sensor is screwed into. Moisture content is measured from 7 to 40 percent and is fully temperature compensated. The data can be calibrated to multiple different types of references the most common of which USDA standard Douglas Fir.
- Temperature is measured from -40 to +85 °C.
- Humidity is measured from 0-100% RH, non-condensing.
- Sensor battery voltage.

[1] Permanently stored by the OmniSense Installer at time of installation

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Microcontroller

The S-900-1 Sensor incorporates a powerful 5 MHz 16 bit RISC microcontroller with 8kB of reprogrammable FLASH memory. The sensor's firmware image can be upgraded while the sensor is in service over the wireless link from the OmniSense FMS web site.

Wireless Link

The S-900-1 Sensor uses the 915 MHz frequency band which the FCC permits unlicensed use for Industrial, Scientific and Medical (ISM) purposes under FCC Part 15.247. Within that band the S-900-1 uses a technique known as Frequency Hopping Spread Spectrum (FHSS) to minimize the chance of interference with other devices sharing the same frequency band. The use of 127 different hopping channels helps establish an error free link between a Sensor and Gateway even in the presence of other devices sharing the same frequency band. The system uses both a Network Address (like your zip code) which is common to all Sensors and Gateways at a site and a Device Address (like your street address) which is unique to every Sensor and Gateway. The combination of addresses ensures a reliable, secure, error free link between Sensors and Gateways.

Battery

The S-900-1 Sensor utilizes the latest in Lithium battery technology and an ultra low current CMOS microprocessor to maximize battery life. Under typical operating conditions the battery is expected to last longer than 15 years making it possible to permanently install sensors inside walls, floors and roofs without requiring future access for battery replacement. Sensors also monitor their own battery voltage so that users can be alerted if a Sensor's battery is approaching the end of its life.

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Specifications

Parameter	Min	Typ	Max	Units
Operating Temperature	-40	25	85	°C
Storage Temperature	-40		85	°C
Operating Humidity	0		100	%RH[2]
Operating Voltage	2.5		3.7	Vdc
Operating Current Active		27		mA
Operating Current Standby		3.0		uA
Temperature Measurement range	-40		85	°C
Temperature Measurement Accuracy		±0.5[3]	±2	°C
Moisture Range[4]	7		40	%
Humidity Measurement Range	0		100	%RH
RH Absolute Accuracy		±3.5	±5.0	%RH
Battery Type		ER14505		
Battery Voltage		3.6		Vdc
Battery Capacity		2.0		Ah
Battery Life		15	45	Years[5]
Sensor Length		2.4		Inches
Sensor Width		1.6		Inches
Sensor Height		2.5[6]		Inches
Sensor Weight		2		ounces
Reporting Period		60		minutes
Wireless Frequency Band	902		928	MHz
Wireless Transmit Power		10		dBm
Wireless Range		100[7]		m
Wireless Channels		127		Channels
Wireless Channel Separation		200		KHz

[2] Non-condensing
[3] @ 25 °C
[4] When calibrated to USDA Douglas Fir
[5] @ 25 °C and a 1 hour reporting interval. Theoretical calculations of battery life are used to predict the maximum 45 year life under these conditions.
[6] Excludes antenna
[7] Varies based on many factors including the presence of obstacles such as concrete walls and interference from other electronic equipment

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