Architectural & Engineering Specification for

Microwave outdoor intrusion detection sensor

Purpose of document

This document is intended to provide performance specifications and operational requirements for the Series 24000™ Microwave Intrusion Detection Sensor. It is written in a generic format without referring to the system by name or by specific identifiers. This specification may be copied verbatim to form a generic procurement specification for a microwave intrusion detection system.

Classification of equipment

The Series 24000 is a volumetric electromagnetic field sensor employing microwave radar technology for outdoor perimeter intrusion detection.

Disclaimer

Contents

1.0 General performance specifications

1.1 System description

The system shall be a modular microwave outdoor intrusion detection sensor based on microwave radar technology. The detection field shall be formed by radio frequency (RF) signals, in the K band, carried between a transmitter and a receiver. The RF signals shall form an invisible electromagnetic detection field that can detect the presence of an intruder crossing it.

A transmitter shall create the RF signals that form the detection field. A receiver shall house the necessary electronics to monitor the detection field and to raise an alarm when an intruder enters the field. The transmitter and receiver shall be powered individually, as a standalone unit.

1.2 System technology

1.2.1 Microwave

The system shall operate in the K band of the electromagnetic spectrum at a frequency of 24.125 ± 0.050 GHz, or as approved by local authorities for this band, with Class A2 modulation at one of six (6) selectable crystal-controlled frequencies.

1.2.2 Electromagnetic wave

An electromagnetic wave is emitted by the antenna of the transmitter and received by the antenna of the receiver. The receiver shall detect changes to the wave that are caused by the presence of an intruder.

1.3 Detection properties

1.3.1 Detection sensitivity

The system shall detect moving intruders having a significant electromagnetic cross-section (e.g. humans, vehicles, and other large conductive objects) while rejecting other environmental stimuli.

1.3.2 Detection performance

1.3.2.1 Probability of detection (PD)

The probability of detecting a human intruder weighing more than 34 kg (75 lb.) walking across the detection zone at random locations shall be 99% with a 95% confidence factor.

1.3.2.2 Velocity response

The system shall be capable of detecting human intruders moving through the detection field at speeds ranging from 0.025 m/sec. (1.0 in./sec.) to 8 m/sec (26 ft./sec.), regardless of the direction of motion.

1.3.2.3 Crossing types

The system shall be capable of detecting human intruders who walk, crawl, roll, jump, or run through the detection field.

1.3.3 False/nuisance alarms

False and nuisance alarms are divided into the two categories listed below.

1.3.3.1 System-generated alarms (false alarms)

Alarms generated by internal electronic processes (cables excluded) shall not occur at a rate greater than one per zone per month, averaged over the total number of zones in the system.

1.3.3.2 Environmental alarms (nuisance alarms)

The system shall operate within specifications in typical outdoor environments. The system must be installed in accordance with the manufacturer's recommendations in order to maintain the full PD for valid intruders while minimizing false alarms from the following stimuli:

- Vegetation up to 30 cm (1 ft.) high
- Rain
- Sunrise/sunset
- Wind
- Temperature changes
- Snow
- Hail
- Fog
- Sandstorms
- Motion of nearby objects (vehicles, etc.)
- Motion of surface or underground water
- Nearby radio-frequency sources
- Seismic vibration
- Acoustic or magnetic effects

Before installation, the installer shall alert the customer, in writing, as to all site-specific conditions, which may contribute to an increased nuisance alarm rate. The customer shall decide whether to remedy the situation or accept the nuisance alarm sources without any further responsibility on the part of the installer or the manufacturer.

1.4 Sensor characteristics

1.4.1 Zone length

The system shall be capable of providing detection coverage at distances ranging between a minimum of 3.0 m (10 ft.) and a maximum of 305 m (1000 ft.) per zone.

1.4.2 Antenna

The transmitting and receiving antennae shall be vertical E-plane polarized. The antennae shall be field adjustable to three different patterns (11^{o}, 16^{o} and 24^{o}) to optimize sensitivity to zone length. There shall be a horizontal E-plane antenna polarization available as an option.

1.5 Performance history

1.5.1 Previous installations

The system shall have been installed in at least ten similar configurations. A list of these projects shall be available.

1.5.2 Customer references

The vendor shall submit the names and telephone numbers of at least four users who shall serve as references for the satisfactory performance of the equipment. These users shall have a minimum performance experience of one year with the equipment.

2.0 Sensor processor specifications

2.1 Processor description

The receiver shall contain the necessary electronics to perform the signal processing for the detection zone. The transmitter and receiver shall be operated as a standalone unit with independent power and data. Both the transmitter and receiver shall be installed in weatherproof enclosures, when mounted outdoors.

2.2 Signal processor operation

2.2.1 Distributed processing

Transmitter-receiver pairs distributed along a perimeter shall provide extended range and fail-safe operation. The failure of one pair shall not affect the coverage of the remainder of the perimeter.

2.2.2 Total perimeter length

Total perimeter length shall be expandable from the 305 m (1000 ft.) maximum coverage for a single zone, to an unlimited length using multiple pairs. There shall be no gap of detection between the individual zones.

2.2.3 Alarm outputs

The signal processor shall identify intrusion and tamper/fail alarms locally, at the transmitter or receiver, via dry relay contacts.

Intrusion in the detection zone shall be identified independently by sealed relay (2 each NO and NC contacts) rated at 2 A, 28 VDC. The relay shall have an adjustable latch time of between 0.5 s and 10.0 s.

An alarm caused by opening the outer enclosure of the transmitter or receiver shall be identified as a tamper alarm. Tamper alarms shall be distinctive from intrusion alarms.

Alarms caused by power failure or internal electronic failure shall be identified as fail alarms. Fail alarms shall be distinctive from intrusion alarms.

The tamper/fail alarm shall be identified by a sealed relay (NO and NC contacts) rated at 1 A, 28 VDC. Tamper/fail alarms shall continue until the fault is corrected.

2.2.3.1 Self-test

The system shall be capable of self-test by local and remote activation. The self-test feature shall cause a complete internal test of the system, at the sensitivity level required of the zone

2.2.3.2 Audio Assessment

Audio assessment of intrusion signals shall be possible through a built-in 1/8-in. phone jack on the receiver.

2.3 Environmental operating range

2.3.1 Temperature

The transmitter and receiver shall operate within specifications at temperatures between –40ºC (–40ºF) and 66ºC (150ºF).

2.3.2 Humidity

The transmitter and receiver shall operate within specifications at relative humidity levels between 0 and 95%, non-condensing.

2.4 Powering Requirements

The transmitter shall operate at voltages between 11 and 15 VDC, at 100 mA maximum current. The receiver shall operate at voltages between 11 and 15 VDC, at 50 mA maximum current.

2.5 Reliability/maintainability

The transmitter and receiver shall have a mean time between failure (MTBF) of greater than 40,000 hours, and a mean time to replace (MTTR) of less than 30 minutes.

As an option, a model of the system shall be available that has been subjected to a completely documented and traceable acceptance test program. The program shall include, but not limited to, complete testing at high and low temperature extremes and operational “burn-in” at high temperature to ensure field reliability.

2.6 Physical installation criteria

2.6.1 Physical installation

The transmitter and receiver shall each be mounted on a 8.9 cm (3.5 in.) diameter metal post, with a concrete foundation. The mounting height shall be determined on site, but is typically 61 cm (24 in.). The transmitter and receiver must always be facing each other, directly. Optional wall mounts shall be available upon request.

2.6.2 Determination of zone length

The length of the zone shall be determined by the level of security required and the physical zone boundaries on site, to a maximum zone length of 305 m (1000 ft.).

2.6.3 Location of transmitter and receiver

The transmitter and receiver shall each be offset by 4.9 m (16 ft.) from the outside boundaries of the zone to provide complete and uniform coverage.

2.6.4 Enclosures

The transmitter and receiver shall be housed in weatherproof enclosures that can withstand temperatures between -40º and 66º C (-40º and 150º F) and relative humidity between 0 and 95%. The enclosure package shall be all-weather polymer ROVAL with aluminum and /or stainless steel mounting hardware.

Each enclosure shall contain RFI (radio frequency interference) shielding as standard. Each enclosure shall include mounting hardware suitable for mounting on an 8.9 cm (3.5 in.) metal post.

2.7 Sensor calibration

Each detection zone shall be capable of being calibrated from its receiver.

2.7.1 Sensitivity adjustment

Detection sensitivity for each zone shall be continuously adjustable at the receiver and shall not affect sensor alignment. Access to the local calibration controls shall require opening the enclosure of the receiver. This action shall cause a tamper alarm to be generated.

2.7.2 Audio sideband

An audio zone monitor with an output that is proportional to the size and velocity of the intruder shall be available as a setup aid.

3.0 System installation and commissioning

The system shall be installed and commissioned in accordance with the manufacturer's recommended procedures as defined in the product's installation and setup guides.

Prior to installation, the installer shall have completed a manufacturer's training program and be certified by the manufacturer. Alternatively, the installer shall be required to have the manufacturer, or their designate, provide qualified technical support for installation and commissioning.

Acceptance tests shall be performed in accordance with standard procedures available from the manufacturer.

4.0 System maintenance and repair

4.1 Recalibration requirements

There shall be no requirement to recalibrate the system after initial calibration.

4.2 Product support

The supplier shall warrant that the product shall be supported by spare parts and assemblies for a minimum of 10 years from the date of purchase.

5.0 Product certifications

The product shall be manufactured in accordance with ISO 9002 standards.

The system shall have the specific regulatory approval for the operation of a radio-frequency-radiating device, within the country of use.

For European applications, the product must carry the CE mark.

6.0 System availability

An acceptable product that meets or exceeds this specification is the Series 24000 Microwave Intrusion Detection system, available from:

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