

**Architectural/Engineering Specification for a
Microwave Perimeter Intrusion Detection System**

UltraWave™

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Architectural & Engineering Specification for UltraWave™

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PART 1 GENERAL - MICROWAVE PERIMETER INTRUSION DETECTION SYSTEM

1.1 SYSTEM SUMMARY

- A The contractor shall install a microwave electronic perimeter intrusion detector to protect the perimeter of the facility from unauthorized intrusions. The system shall be a bi-static microwave system consisting of separate microwave transmitter and receiver assemblies which between them create a roughly cylindrical zone of detection. The system shall detect intruders by sensing variations in the strength of the microwave signal arriving at the receiver when an intruder attempts to pass through the detection zone. The system shall be integrated into the facility's Security Management System.

1.2 SUBMITTALS

- A Contractor submittals to the facility owner ("Owner") shall include the following as a minimum:
 - .1 Site conditions report per article 3.1
 - .2 Configuration and calibration settings for each microwave pair (transmitter and receiver unit) in the system after installation and calibration are complete per article 3.3
 - .3 Representative response plots for each microwave zone in the system per article 3.3
 - .4 All manufacturer-supplied calibration and operating software for the system

1.3 SPARES

- A The contractor shall deliver to the Owner spare system components consisting of:
 - .1 For each system component a minimum quantity of one or 10% of the number that comprise the system, whichever is greater

1.4 PRODUCT SUPPORT

- A The product shall be under warranty for a minimum of three years from the date of purchase.
- B The end-user shall have the option of extending the warranty to five years without additional fees.
- C The supplier shall warrant that the product shall be supported by repair services and spare parts and assemblies for a minimum of 10 years from date of purchase.

PART 2 PRODUCTS - MICROWAVE PERIMETER INTRUSION DETECTION SYSTEM

2.1 MICROWAVE PERIMETER INTRUSION DETECTION SYSTEM

- A The contractor shall supply a microwave Perimeter Intrusion Detection System (PIDS). The microwave PIDS shall detect intruders attempting to cross the detection zone in any manner including walking, running, crawling, rolling, and jumping.

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2.2 MANUFACTURERS

- A The UltraWave™ system from Senstar Corporation (www.senstar.com) meets the requirements stated herein for a microwave PIDS and shall be the basis of design.

2.3 REGULATORY REQUIREMENTS

- A The system shall be FCC certified.
- B The system shall comply with CE regulations as a Class 1 device and bear the CE mark.

2.4 SYSTEM MANUFACTURING QUALITY REQUIREMENTS

- A The manufacturer's quality management system shall be certified as conforming to ISO 9001:2015.
- B All microwave units shall be conformal coated and units shall be tested during manufacture over their entire operational temperature range on a sample basis.

2.5 STANDALONE MICROWAVE UNITS

- A The microwave unit shall have the following detection capabilities:
 - .1 Process the signal received at the receiver to detect intruders attempting to cross the detection zone
 - .2 Use digital signal processing techniques
 - .3 Utilize rule-based algorithms in the detection process to optimally discriminate between actual intrusions and environmental activity such as rain
 - .4 At ranges up to 200m the system shall detect a 35kg. (77 lbs) human walking, running or jumping
 - .5 At ranges up to 150m the system shall detect a 35kg. (77 lbs) human walking, running, hands and knees crawling or jumping
 - .6 At ranges up to 100m the system shall detect a 35kg. (77 lbs) human walking, running, hands and knees crawling, prone crawling, rolling, or jumping
 - .7 Detect intruders with velocities between 3 cm/sec to 15m/sec (0.1 ft/sec to 50 ft/sec)
 - .8 Probability of detection (PD) shall be 99% with a 95% confidence factor when the system is installed in accordance with the manufacturer's recommendations
- B False Alarm Rate
 - .1 The maximum rate for alarms generated by internal electronic processes of a microwave transmitter-receiver pair shall be less than one per zone per year, averaged over the total number of zones in the system.
- C Standalone Processor Alarm Outputs
 - .1 The microwave receiver shall have a minimum of two Form C relay outputs to indicate sensor alarm and system alerts. Each relay shall be rated to at least 1A at 30V. For each relay it shall be possible to assign one or more conditions under which the relay will activate from the following list:
 - a. Sensor alarm
 - b. Enclosure tamper on either receiver or transmitter

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- c. Loss of received microwave signal or transmitter mismatch
 - d. Receiver input power fail
 - e. Internal hardware fault on either receiver or transmitter
 - f. Fail safe
- .2 The microwave transmitter shall have a minimum of two Form C relay outputs to indicate system alerts. Each relay shall be rated to at least 0.5A at 30V. For each relay it shall be possible to assign one or more conditions under which the relay will activate from the following list:
- a. Enclosure tamper on transmitter
 - b. Transmitter input power fail
 - c. Internal hardware fault on transmitter
 - d. Fail safe
- .3 It shall be possible to adjust the relay hold time from 0.125 to 10 seconds.

D Calibration and Diagnostic Capabilities

- .1 For calibration and diagnostic purposes the microwave receiver and transmitter shall each provide a standard USB connector for attachment of a Windows laptop.
- .2 It shall be possible to adjust the receiver detection threshold to adapt to the zone length and site characteristics.
- .3 It shall be possible to view and record real-time sensor response data
- .4 Each of the transmitter and receiver shall maintain a log of up to 1,024 events such as sensor alarms and diagnostic alerts
- .5 It shall be possible to upload all configuration settings to a file and to download a previously saved configuration
- .6 It shall be possible to remove the cover to gain access to the USB connector without affecting the unit's alignment

E Automatic Gain Control

- .1 The microwave system shall incorporate automatic gain control (AGC) to adjust receiver gain as required for different transmitter-receiver spacing and for environmental effects such as rain, snow or fog.

F Transmitter-Receiver Wireless Communications Link

- .1 The microwave system shall include a transmitter-receiver wireless communications link that communicates complete transmitter status to the receiver including tamper status, input voltage, operating temperature, and internal voltage rail levels.

G Anti-Spoofing

- .1 To protect against deliberate spoofing or an unintended Tx-Rx pairing the microwave receiver shall be configured during installation with the serial number of the transmitter that it is intended to be paired. The receiver shall generate a

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transmitter mismatch status alarm if it receives a microwave signal from a transmitter with a different serial number.

H Operating Channels

- .1 There shall be 10 field-selectable operating channels provided.
- .2 Channel isolation shall be sufficient to allow a transmit-receive pair to operate successfully when the receiver is within the transmit beam of one or more other transmitters operating on different channels.

I Stacking

- .1 It shall be possible to stack multiple microwave units without any further mechanical or electrical adjustments other than selecting different operating channels – it shall not be necessary to use different polarizations or use microwaves of different frequency bands (i.e., K and X).
- .2 It shall be possible to co-locate all the receivers of a stacked zone at one end of the zone, with the transmitters at the other end of the zone.

J Mounting Provisions

- .1 The microwave units shall be provided with a universal mounting kit that can be used on poles sizes from 5 to 11.4 cm. (1 7/8 to 4 1/2 in.) and be capable of being used for wall mounting.

K Environmental Operating Range

- .1 The system shall operate within specifications under the following environmental conditions:
 - a. Temperatures between -40° C (-40° F) and 70° C (158° F)
 - b. Relative humidity between 0 and 95%, non-condensing

L Standalone Processor Input Power

- .1 The microwave receiver and transmitter when used in a standalone mode (no network) shall accept DC power ranging from 12 to 48VDC and require less than 2.0 watt each.

M Processor Reliability and Maintainability

- .1 Each of the microwave transmitter and receiver shall have a predicted mean time between failures (MTBF) of greater than 100,000 hours when calculated per Telcordia Reliability Prediction Procedure, Parts Count Method, at 70°C. The processor shall have a mean time to replace (MTTR) of less than 15 minutes.

N Lightning Protection

- .1 The processor shall provide both transorb and gas discharge devices on all inputs and outputs including power.

O Ease of Installation

- .1 The system shall be simple to install and shall have the following characteristics as a minimum:
 - a. Configuration and calibration shall be accomplished via a Windows-based software tool with an intuitive graphical user interface

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- b. Other than the laptop configuration software, installation shall not require any special tools
- c. All electrical connections to the microwave units shall be made with screw-terminals on removable connectors
- d. Cable ingress/egress shall be accommodated by cable glands that require no additional sealing compounds to provide an environmental seal
- e. It shall be possible to store processor configuration and calibration settings to a computer file for record keeping and to use the stored file to configure other processors and/or a replacement processor
- f. The laptop configuration software shall calculate the recommended microwave mounting height based on the transmitter-receiver separation and other site conditions

2.6 NETWORKING CAPABILITIES

- A When a network-capable system is required the requirements of this section shall apply.
- B The microwave receivers shall be capable of communicating alarm, status, and configuration information to and from a central location over an integrated sensor network.
- C Multi-Sensor Compatibility
 - .1 The network supported by the microwave receiver shall be one that is common to a family of sensors including a buried cable sensor, fence sensor, and electrostatic sensor.
- D Physical Media Options
 - .1 The microwave receivers shall provide the following physical media options for the sensor network:
 - a. EIA-422 capable of point-to-point runs of up to 1.2 km (4,000 ft.)
 - b. Multi-mode fiber optic capable of point-to-point runs of up to 2.2 km (7,200 ft.)
 - c. Single-mode fiber optic capable of point-to-point runs of up to 10 km (32,000 ft.)
 - d. Ethernet with POE capability
- E Redundant Network Communications
 - .1 The sensor network shall be capable of being connected in a loop configuration and of being polled from both ends of the loop to provide redundant communications paths to each processor.
- F Network Management
 - .1 The system shall include network management software to manage the communications over the sensor network. The network management software shall be capable of running on a standard Windows PC.
- G Network Management Software Interfaces
 - .1 The system's network management software shall provide the following interfaces:

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- a. A TCP/IP-based interface for communicating alarm, status, and configuration data to and from security management systems. The system supplier shall furnish a complete Software Development Kit (SDK) to facilitate integration with the security management system. The SDK shall include as a minimum complete documentation of the interface, simulator software to create interface messages equivalent to those created when connected to actual microwave units, and example software code
 - b. A TCP/IP-based interface to be used by the system's PC-based software calibration and configuration tool
- H Centralized Calibration and Diagnostics
- .1 Once the device address is set at the microwave receiver all further calibration and diagnostics can be performed from one central location using the same Windows-based tool as used when directly attached to the processor through USB.
- I Network Manager Tools
- .1 The system's network management software shall provide the following tools to facilitate system commissioning and trouble-shooting:
 - a. System status tool that provides a visual display of the status of all processors in the system
 - b. System event log tool that provides a searchable log of system events
 - c. System plot tool that can display, store, and recall the real-time response data for all networked sensors and display a plot of the real-time response for a minimum of 8 sensor zones simultaneously
- J Networked Processor Dry Contact Inputs
- .1 In networked mode the microwave receiver shall provide a supervised general-purpose dry-contact input and the state of the dry contact inputs shall be communicated over the network.
- K Networked Processor Relay Outputs
- .1 In networked mode the processor relay outputs shall function as general-purpose outputs and the state of the relay outputs shall be controlled via the network.
- L Networked Processor Input Power
- .1 The processor when used in networked mode (with network card installed) shall accept 12 to 48V DC and require less than 2.5 watt.
- M Network Compatibility to Senstar Crossfire Network
- .1 The system processors shall be capable of interfacing to the Senstar Crossfire network and provide the full range of communications capabilities as provided by that network.

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PART 3 EXECUTION - MICROWAVE PERIMETER INTRUSION DETECTION SYSTEM

3.1 SITE ASSESSMENT

- A Before installation begins, the installation contractor shall provide a report to the Owner documenting any site conditions that may prevent the system from operating satisfactorily. Examples of such conditions include uneven terrain, tall vegetation in the detection zone, and loose fencing.

3.2 SYSTEM INSTALLATION

- A The system shall be installed in accordance with the manufacturer's recommended procedures as defined in the manufacturer's Product Guide for the system.

3.3 SYSTEM CALIBRATION

- A The installation contractor shall calibrate the system in accordance with the manufacturer's recommended procedures as defined in the manufacturer's Product Guide. The installation contractor shall submit to the Owner the calibration and configuration settings for each microwave unit in the system. For each microwave zone in the system the installation contractor shall submit to the Owner a number of representative response plots showing the sensor real-time response when the detection field is crossed.

3.4 TRAINING

- A The installation contractor shall train the Owner's maintenance personnel in the calibration and system maintenance procedures as given in the manufacturer's Product Guide.