

# Architectural & Engineering Specification for

# Digital Microphonic Cable Fence Disturbance Sensor

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## **Purpose of document**

This document is intended to provide performance specifications and operational requirements for the Intelli-FLEX™ II digital microphonic cable fence disturbance sensor. It is written in a generic format without referring to the Intelli-FLEX II system by name or by specific identifiers. These specifications may be copied verbatim to form a generic procurement specification for a digital microphonic cable fence disturbance sensor.

## **Classification of equipment**

The Intelli-FLEX II system is a digital microphonic cable fence disturbance sensor, used in conjunction with fences, for outdoor perimeter intrusion detection. The Intelli-FLEX II system functions as a standalone system or as an integral component of a centralized control and maintenance facility.

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## 1.0 General performance specifications

### 1.1 System description

The digital microphonic cable fence disturbance sensor shall function as an electronic perimeter intrusion detector. The system shall be used in conjunction with fences to protect the perimeter of a site. The system shall consist of an ultraviolet resistant triboelectric transducer cable, and a microprocessor based dual zone digital signal processor. The system shall be capable of monitoring different styles of metal fabric fencing such as chain-link, expanded-metal or welded-mesh fence. The sensor shall detect intruders by utilizing signals generated by the minute flexing of the triboelectric transducer cable, caused by attempting to cut, climb, or raise the fence fabric. The system shall be capable of functioning as either a standalone system or as an integral part of a centralized control and maintenance facility.

### 1.2 System technology

The digital signal processor shall analyze the signals from the triboelectric transducer cable and shall detect minute vibrations in the fabric of the fence. The processor shall utilize adaptive algorithms, ambient signal compensation and selectable common-mode rejection, to discriminate between actual, false and nuisance alarms, without lowering the probability of detection. The processor shall identify, by type, a cut intrusion and a climb intrusion. The sensor shall have independent adjustments and thresholds for each type of intrusion and shall have the capability to completely mask climb or cut alarms.

#### 1.2.1 Microphonic cable

The cable transducer shall be an ultraviolet resistant triboelectric sensor cable and shall be attached to the fence by means of ultraviolet resistant cable ties. The cable shall generate signals when an attempt is made to cut, climb, or lift the fence fabric.

#### 1.2.2 Signal processing algorithms

The system shall utilize digital signal processing techniques that employ adaptive algorithms, capable of adapting to specific fence types and environmental conditions.

## 1.3 Detection properties

### 1.3.1 Detection sensitivity

The system shall detect intruders climbing, lifting or cutting the fence while rejecting other environmental stimuli. The sensitivity level shall be adjustable for each zone's specific conditions.

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## 1.3.2 Probability of detection

The probability of detection (PD) for an intruder cutting the fence, and for unaided climbing attempts shall be 95% with a 95% confidence factor.

## 1.3.3 False and nuisance alarms

### 1.3.3.1 System-generated alarms (False alarms)

The maximum rate for alarms generated by internal electronic processes (cables excluded) shall be less than one per zone per year, averaged over the total number of zones in the system.

### 1.3.3.2 Environmental alarms (Nuisance alarms)

The system shall operate within specification in typical outdoor environments. The system shall be installed in accordance with the manufacturer's recommendations to minimize the probability of alarms from the following factors while maintaining the full PD for valid intruders:

- precipitation including rain, snow, hail and fog
- sunrise/sunset
- wind
- temperature changes
- sandstorms
- motion of nearby objects (vehicles, etc.)
- motion of surface or underground water
- nearby vegetation up to 30 cm (1 ft.) high
- nearby sources of radio-frequencies and electro-magnetic interference
- seismic vibration
- acoustic or magnetic effects

### 1.3.3.3 Notification of environmental concerns

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

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## 1.4 Sensor characteristics

### 1.4.1 Zone length

The maximum length of each zone shall be 305 m (1000 ft.) of sensor cable. Individual zone length shall be determined by the physical boundaries of each zone. The sensor cable shall be supplied in rolls of 305 m (1000 ft.) and shall be cut to the correct length at the time of installation.

### 1.4.2 Fence height

For regular chain-link (i.e. not vinyl-coated), welded-mesh, palisade, barbed wire, and concertina fences the following requirements shall apply:

- For fence heights up to 2.5 m (8 ft.) high, a single cable, attached at the midpoint of the fence, shall be adequate for intruder detection.
- For fence heights between 2.5 m (8 ft.) and 4.88 m (16 ft.), the cable shall be deployed in a double pass, with the cables spaced evenly from each other and the top and bottom of the fence.
- For fence heights greater than 4.88 m (16 ft.), the cable shall be deployed in a triple pass with the cables spaced evenly from each other and the top and bottom of the fence.

Depending on the height and type of fence, and the level of security required, it may be necessary to increase the number of cable passes.

### 1.4.3 Gates

The sensor shall be capable of monitoring or bypassing swinging and sliding gates by using a Gate Bypass Module. The system shall be capable of placing monitored gates in access mode (no alarm when the gate is used), or secure mode within a secure zone, by either local or remote command. The status of the gate (secure or access) shall be communicated by relay contacts.

## 2.0 Signal processor specifications

### 2.1 Signal processor description

Each digital signal processor shall be capable of monitoring one or two detection zones. The processor shall operate either as a standalone unit with local alarm relays, or as an integral component of a centralized control and maintenance facility. The processor shall include internal circuitry to protect against lightning and voltage transients.

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## 2.2 Signal processor operation

### 2.2.1 Distributed processing

The signal processors distributed along the perimeter shall receive and process the signals from the sensor cables while providing fail-safe operation. The failure of one processor shall not affect the signal processing of the other processors along the perimeter.

### 2.2.2 Total sensor cable length

Total sensor cable length shall be expandable from the 610 m (2000 ft.) maximum using one signal processor to an unlimited length using multiple processors. The detection zone shall be continuous and uniform, and there shall be no gap between the individual zones, when installed in accordance with the manufacturer's recommendations.

### 2.2.3 Alarm outputs

The digital signal processor shall identify intrusion, and supervision alarms locally by relay contacts. Each alarm zone shall include one intrusion alarm relay and one supervisory alarm relay. Each dual zone processor shall include four alarm output relays.

Alarms caused by climbing, cutting, or otherwise disturbing the fence fabric shall be identified as intrusion alarms. Intrusion alarms shall activate their respective alarm relay (zone 1 or zone 2) and shall be distinguished from supervisory alarms.

Alarms caused by power failure, low input voltage, internal electronic fault, or opening the outer enclosure (tamper) shall be identified as supervisory alarms. These supervisory alarms shall activate both of the dual zone processor's supervisory alarm relays. Alarms caused by cable faults shall be identified as supervisory alarms. Cable fault supervisory alarms shall activate their respective supervisory alarm relay (zone 1 or zone 2). Supervisory alarms shall be distinguished from intrusion alarms.

The local alarm outputs shall be form C relays with n.o./n.c. contacts rated at 0.5 A, 30 VDC.

## 2.3 Environmental operating range

The system shall operate within specifications under the following environmental conditions:

- temperatures between -40° C (-40° F) and 70° C (158° F)
- relative humidity between 0 and 95%, non-condensing



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## 2.4 Powering options

The processor shall operate at 12 VDC, and shall accept input power from two types of supplies, a DC power/float charger or a centrally located low voltage DC power source.

### 2.4.1 DC power/float charger

A DC power/float charger shall be provided to supply 13.5 VDC to the processor and to charge a back-up battery. The float charger shall be available in 115 VAC, 60 Hz or 230 VAC, 50 Hz. The float charger shall be capable of being plugged into a standard AC power source.

### 2.4.2 Back-up battery

The processor shall include a rechargeable 12 VDC, 0.8 amp hour, gel-cell, back-up battery. The back-up battery shall be capable of being charged by the DC power/float charger.

### 2.4.3 Centrally located low voltage DC power source

For multiple processors deployed around a large perimeter, or a single processor that requires a long power feed cable, a centrally located DC power source shall be a viable power supply option. The processor shall be capable of receiving DC power from 18 VDC, 50 mA (minimum) to 56 VDC, 15 mA (maximum) sources. A 24 VDC power supply (85 to 245 VAC, 50/60 Hz @ 1.25 A) shall be available as an option.

## 2.5 Reliability/maintainability

The signal processor shall have a mean time between failures (MTBF) of greater than 40,000 hours and a mean time to replace (MTTR) of less than 10 minutes.

## 2.6 Physical installation criteria

When installed outdoors, the signal processor shall be mounted in a weatherproof, fiberglass, NEMA 4 rated enclosure. The processor shall be properly grounded with a user-supplied ground rod that is separate from the fence or pole upon which the processor is mounted. The enclosure shall include a hinged cover that is capable of being locked by a user-supplied pad lock. The enclosure shall include a tamper device. The enclosure shall include mounting feet that can be installed on the enclosure to suit the size and type of mounting pole or surface.

### 2.6.1 Mounting location

The enclosure shall be mounted on a wall, fence, or pole, separate from the fence on which the sensor cables are mounted, on the secure side of the perimeter.

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## 2.7 Sensor calibration

Each sensor zone shall be capable of being calibrated from its respective signal processor. Sensor calibration shall be made using a configuration module, which shall allow the technician to adjust and monitor the response of each zone. The configuration module shall be detachable via a snap-in connector and shall be capable of calibrating each of the processors in the system. The configuration module shall receive power from the processor and shall not require batteries, calibration or maintenance. Accessing the snap-in connector shall require the opening of the processor's enclosure. This action shall cause a tamper alarm to be generated.

### 2.7.1 Calibration parameters

The following system parameters shall be adjustable by the user:

- **Cut detection:** independent threshold, count and time per zone
- **Climb detection:** independent threshold, duration and time per zone
- **Preamp gain:** to match the fence to the sensor

### 2.7.2 Restricted calibration parameters

The following system parameters shall be adjustable by the user, through the use of a restricted pass-code. These parameters shall only require adjustment for highly specialized applications:

- **Ambient compensation:** enable/disable, level (for background effects)
- **Common mode rejection:** enable/disable (for environmental effects)
- **Peak trigger value:** to identify intrusion over background
- **Cut profile value:** to better define a cut event over environmental effects
- **Alarm output relay activation time:** between 0.5 s and 5.0 s

## 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.

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## **4.0 System maintenance and repair**

### **4.1 Recalibration requirements**

There shall be no need to recalibrate the system after initial calibration except as the fence condition deteriorates (loose fence elements or wires).

### **4.2 Sensor cable repair**

If the sensor cable is cut or damaged, it shall be capable of being repaired using additional cable, if required, and an appropriate splice kit. The splice kit shall require the use of only standard tools (i.e. slot screwdriver, wire strippers, wire cutters).

### **4.3 Product support**

The product shall carry a minimum one-year warranty from the date of purchase.

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

## **5.0 Product certifications**

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

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## 6.0 System availability

A product that meets or exceeds this specification is the Intelli-FLEX™ II digital microphonic cable fence disturbance sensor, available from:

Senstar Corporation  
119 John Cavanaugh Drive  
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