SECTION 28 16 43

perimeter INTRUSION DETECTION SYSTEM

Fiber optic – rack mount – single cable sensor

1. GENERAL
   * + 1. SCOPE OF WORK
          1. It is the intent of the Owner to purchase all the necessary components for a complete, installed and operable fiber optic-based fence line intrusion detection system.
          2. The perimeter intrusion detection system shall be as described herein specified and indicated on any attached drawings, which define the general scope of the required services.
       2. GENERAL PERFORMANCE REQUIREMENTS
          1. SYSTEM DESCRIPTION

The system shall be a fiber optic, based on a multimode sensor with DSP-based Alarm Processing Unit (PU), designed and configured for fence line or wall intrusion detection applications. The PU fits in a standard 19” rack and is 2U in height.

The fiber optic intrusion detection system shall function as a perimeter intrusion detector. The multimode fiber optic sensor cable shall be designed for encasement in flexible conduit and mounting on a perimeter fence. The basic system shall consist of a fiber optic backbone cable, fiber optic sensor cables, insensitive lead-in cables, flexible conduit and an Alarm Processing Unit supporting up to 25 sensor zones. An insensitive fiber optic lead-in cable shall be used to facilitate remote location of the PU from the sensor cable assembly.

The system shall provide intruder detection on various types of fencing such as chain link, expanded-metal, palisade or welded-mesh fabric.

The system shall detect intruders and generate an alarm based on changes created in the sensor cable’s optical signal by any intruder action that causes vibration or motion. These actions are characteristic of an egression of a fence barrier in any of the following manners: fence climbing, post climbing, cutting, lifting of fence fabric and ladder assisted vaulting or other fence contact bridging methods.

The system shall be capable of integration into a central control system by a TCP/IP interface and/or alarm/fault relay output contacts for each zone, depending on requirements of the alarm monitoring system.

The performance criteria required for this project shall meet that provided by fiber optic intrusion detection system as provided by the original equipment manufacturer.

* + - 1. SUBMITTALS

The Contractor shall submit the following documents for review and approval prior to any shipment of components:

* + - * 1. Installation/operation manuals and instructions for all equipment furnished under this system.
        2. An overall perimeter site plan showing the fence dimensions and detection zone layout.
        3. Site-specific layouts shall be provided showing major components and interconnections located on the perimeter.
        4. Standard system and sensor cable layout drawings shall be provided to the installer.
      1. SYSTEM TECHNOLOGY
         1. Alarm Processor

The Processing Unit (PU) is designed for a 19” rack, and shall analyze the signals from the fiber optic sensor cable and shall detect vibration or motion acting on the fence. The processor shall use adaptive algorithms to determine actual alarms versus false or nuisance alarms.

The light source shall be a LASER or equivalent optical source providing sufficient coherent light to meet the system’s performance requirements.

Each PU shall support a maximum of 25 zones.

Each PU shall support a maximum protected perimeter length of up to 5 kilometers (16,400 feet) for fence installations and 3 kilometers (9,842 feet) for buried installations.

The maximum sensor cable length per zone shall be 500 m.

Each PU shall support insensitive lead-in cable length of up to 5 kilometers (16,400 feet) for fence and 3 kilometers (9,842 feet) for buried installations.

Detection sensitivity shall be fully linear across each sensor zone in the system, and the performance of each zone shall be independently adjustable to match the physical requirements of the zone.

Signal Processing Algorithms

The system shall use digital signal processing and advanced algorithms capable of adjusting the performance to specific fence types and environmental conditions. Each available zone of the PU shall have two parallel internal processor channels - Processor 1 (“Climb”) and Processor 2 (“Cut”) - where a separate calibration is allowed for either processor providing detection for two distinctly different intrusion scenarios. Either processor may be turned ON or OFF. If they are both on, they are logically OR gated so that an ALARM will occur if the conditions for either Processor 1 or Processor 2 are satisfied.

* + - * 1. Relay Module

A Relay Module shall be used if Alarm and Fault relay outputs for each zone, up to 25 zones per module, is desired. The Relay Module shall be typically mounted to the rear panel of the rack-mounted PU and shall be connected to the PU using an ACC Bus cable. The relay module shall be located up to 25 ft. from the PU for the customer’s convenience, and includes self-test capability for both the module and its PU interface. The architecture of the Relay Module and PU interface supports the possibility of future increases in the number of zones.

* + - * 1. Fiber Optic Cable

The fiber optic sensor shall be made of glass not plastic and shall be compatible with LASER light sources. Jacketing shall be outdoor rated and with UV resistant polyurethane composite. Its purpose should be designed for direct deployment on chain-link, welded mesh and expanded metal fence fabrics with UV resistant nylon cable ties.

* + - * 1. Laser Monitoring

Each Processing Unit zone shall monitor the returning laser power and generate a fault alarm if power for that zone falls below a predetermined value.

* + - 1. SYSTEM PARAMETERS
         1. Processor Adjustments

Both internal processors in each available zone shall have the following adjustments, menus or entries available for tuning and setting up the system.

System: (general parameters)

Gain (an adjustment to sensitivity)

Comb (filter harmonics from an acoustic waveform)

Software based wind-dependent processing

Wind Reject enable/disable

Reject (wind rejection factor)

Pre-filter enable/disable and select degree of pre-filter

Pre-filter (High pass digital filter for acoustic waveform)

Sensitivity (amplification of incoming signal)

Tamper switch enable/disable

Processor 1: (climb detection)

Enable/disable

Level of signal

Lowest frequency

Highest frequency

Duration of signal

Low level tolerance

Event count

Event window

Event mask time

Processor 2: (cut detection)

Enable/disable

Level of signal

Lowest frequency

Highest frequency

Duration of signal

Low level tolerance

Event count

Event window

Event mask time

Each of the sensor zones shall be capable of being grouped into Hyperzones, thereby enabling zones along different areas of the perimeter to be tuned using the same parameters without the need to tune each zone independently.

* + - * 1. Perimeter Maximum Sensor Cable Length

Each Processing Unit shall support a maximum protected perimeter length of up to 5 kilometers (16,400 feet). The maximum sensor cable length shall be 500 m per zone. The minimum zone length shall be greater than 1 m. Multiple Processing Units and sensing cables shall be capable of protecting a longer perimeter by using the sensor cables in tandem. For example, using a 5 km of insensitive lead and 5 km maximum backbone length, a total perimeter of 20 km can be protected using 4 Processing Units installed at one location with sensing cables going in both directions.

* + - 1. DETECTION PROPERTIES
         1. Detection Sensitivity

Detection sensitivity shall be fully linear across each sensor zone in the system, and the performance of each zone shall be independently adjustable to match the physical requirements of the zone. Detection sensitivity shall be similar for all zones.

* + - * 1. Probability of Detection

A properly installed system shall be capable of achieving a Probability of Detection (PoD) rate for a zone of not less than 0.95 at the 90 % level of confidence.

The PoD and error rate is not fixed and is a function of the parameter settings of the Processing Unit, the sensor cable configuration and the condition and quality of the fence platform.

PoD for an installed system cannot be stated without site and zone specific configuration testing to determine the PoD.

The more areas tested and the stricter the written test procedure used, the better the confidence level and more accurate the PoD result will be.

Testing procedures shall match the security level of the installation, which shall match the facility’s security level requirements. Stealthy or mechanically assisted climbing on low security installations would be inappropriate.

Inappropriate testing for the security level or procedures, and test results not documented or approved by the manufacturer for the installation, shall be given no credence.

* + - * 1. False and Nuisance Alarms

The system shall be set up to minimize both false and nuisance alarms by use of all the adjustments available. The fence shall be subsequently tested and inspected to determine if any problems exist that may cause these types of alarms. See section 1.05A.

System Internally-Generated Alarms (False Alarms)

False alarms are those alarms for which no cause can be immediately determined but later prove to be caused by something other than intrusion. In this case it will refer to those alarms generated by a properly functioning processor and attached sensor due to an internal processing error.

The maximum allowable False Alarm Rate (FAR) for a processor due to internally generated alarms shall be less than one per Processing Unit per year.

Environmental Alarm (Nuisance Alarms)

Nuisance alarms are defined as those alarms generated by a properly functioning Processing Unit and attached sensor cable, where the cause is known or suspected, and is not an intentional intrusion attempt (e.g. animals, wind-blown debris, etc.).

The system shall operate as specified when installed properly to the manufacturer’s recommendations in outdoor environments. The system shall be installed and the site and fence prepared before installation in such a manner as to minimize the Nuisance Alarm Rate (NAR) from the following possible causes and corrections:

Precipitation

Seismic activity acting on the fence

Ground vibration from nearby trains or heavy vehicle traffic near the fence line may cause nuisance alarms. These causes shall be filtered out through calibration of the system.

Wind-blown objects

Vegetation, including trees, shrubs or extremely long ground cover striking the fence at intermittent intervals as the result of wind may cause nuisance alarms. These potential sources shall be trimmed, cut or otherwise prevented from contacting the fence.

Fence Vibration

Fence-mounted signs and other loose materials or fence hardware shall be secured in place or removed as needed to prevent banging against the fabric or moving it. The fence fabric shall be consistently taut throughout the perimeter.

Any site specific concern, or any unusual application or condition that may lead to an unacceptable false or nuisance alarm rate or other system problems, shall be communicated to the factory for analysis before ordering or installing any system.

Such concerns are best resolved by submitting photos and detailed synopses to the factory. Solutions to potential problems can usually be found through subsequent site work recommendations and selection of equipment designed to address concerns.

* + - 1. SENSOR CABLE

The sensor cable shall have a polyurethane outer jacket that is resistant to cuts, abrasions, UV radiation and chemicals. The cable shall have 2 sensing cores and 4 single mode insensitive cores combined into one cable assembly. The cable shall be attached with UV resistant nylon cable ties directly to the fence spaced approximately 12 inches (30 cm) apart.

* + - * 1. Sensor Cable Types

The sensor cable system shall be constructed as follows:

The sensor elements shall be supplied from the manufacturer.

Each sensor cable element will provide linear sensor coverage for one (of up to 25) sensor zones for each system, up to a maximum length of 500m per zone.

* + - * 1. Perimeter Lengths

Each system shall provide intrusion detection coverage for a perimeter length of up to 5000 meters (16,400 feet).

* + - * 1. Zone Lengths

Zone lengths shall be determined by the physical shape of the perimeter, means of alarm assessment and the security level required by the facility. The maximum sensor cable length per zone shall be 500m. The minimum zone length shall be greater than 1m.

* + - 1. FENCE CONSTRUCTION
         1. Fence Material

The factory shall be consulted if fence materials other than chain link, expanded metal, welded-mesh fabric or wrought iron decorative fence are to be used. The factory shall be consulted if the fence height is comprised of any material other than chain link, expanded metal, decorative wrought iron or welded mesh.

* + - * 1. Fence Height

The following configurations are for comparison only. The factory shall be consulted for actual layout configurations for any fence in excess of 12 feet (3.5 meters) in height. Layout of the sensor cable is strongly influenced by the security level desired, and should be designed accordingly. Contact the factory for assistance with high-level security design layouts.

A chain link fence comprised of hot-dipped galvanized steel, or steel with an electroplated applied coating, shall be 7 feet ( 2.1 meters) tall for a minimum single run of sensor cable mounted at the mid-point of the fence.

For the same fence material of 8 to 15 feet (2.4 to 4.6 meters) in height, a double run, or “loopback” configuration, shall be used, with mounting heights spaced from the top and bottom equal to one-fourth of the total fence height.

For the same fence material in excess of 15 feet (4.6 meters) in height, a triple run or double loop configuration shall be used, with mounting heights equally spaced from top, center, and bottom equal to one-third of the total height.

1. PRODUCT
   * + 1. ALARM PROCESSOR, RELAY MODULE, and SENSOR CABLE SPECIFICATIONS
          1. Processing Unit (PU)

Each Processing Unit and sensor shall conform to the following specifications as a minimum.

Each Processing Unit (PU) shall support 25 zones with up to the maximum allowable perimeter length of 5 kilometers (16,400 feet). Each Processing Unit shall also support up to 5 kilometers (16,400 feet) of insensitive lead-in cable between the Processing Units optical connection and the sensing cable system.

The Processing Unit shall be capable of connection to and functioning as an integrated member of a centralized alarm-reporting network utilizing multiple Processing Units

The Processing Unit is designed to fit in a 19” rack and occupy 2U rack height. The Processing UnitU shall be configured using the USB port located in the front panel of the Processing Unit.

The front panel of the Processing Unit shall have three LED indicators per zone corresponding to Normal, Alarm, and Fault states. In addition, the front panel shall have six system LEDs corresponding to system Tamper, ACC BUS Fault, Cable Fault, Alarm, Event, and Power.

The Processing Unit shall support mixed fence and buried zones in the same Processing Unit-cable system.

The Processing Unit shall be capable of integration into a central control system by a TCP/IP interface and/or Relay module relay output contacts for each zone, depending on requirements of the alarm monitoring system.

The Processing Unit circuitry shall be protected from lightning or other voltage surges on all wired connections.

* + - * 1. Relay Module (RLM)

A Relay Module shall be used if Alarm and Fault relay outputs for each zone, up to 25 zones per module, is desired.

Each Relay Module is connected to the PU using ACC Bus Cable (Cat 5 or similar) cable through RJ45 jacks (ACC BUS) on both PU and Relay Module.

Relay Module shall be powered by the PU using the ACC Bus Cable.

Relay Module shall have two LED indicators – a green Power (and basic system function) LED, and a red Accessory Bus fault LED.

The architecture of the Relay Module and PU interface supports the possibility of future increases in the number of zones.

* + - * 1. Processing Unit and Relay module (RLM) Mounting

The Processing Unit shall be mounted in a 19” rack and shall occupy 2U rack height.

The Relay Module shall be typically mounted to the rear panel of the rack-mounted Processing Unit and shall be connected to the Processing Unit using a Relay module interconnect cable.

The relay module could be located up to 25 ft. from the Processing Unit for the customer’s convenience, and includes self-test capability for both the module and its Processing Unit interface.

* + - 1. SIGNAL PROCESSOR OPERATION
         1. Independent Processing

Stimulus or damage to any Zone shall have no effect on any other Zone.

Signal processing of each Zone shall be independent of every other Zone.

* + - 1. ALARM OUTPUTS
         1. Alarm Relay Outputs

A Relay Module (RLM) is provided with Alarm and Fault relay outputs for each zone (up to 25 zones per module) rated at 100 mA and 24 VDC. The alarm relays have both normally-open and normally-closed contacts accessible, while the fault relays have normally-closed contacts. The alarm relays shall activate when an intrusion alarm is generated, while fault relays shall activate when a fault condition exists, such as a break in the cable.

* + - * 1. Alarm and Control TCP/IP Interface

The Processing Unit shall provide alarm type distinction between intrusion attempts and fault conditions for each zone and tamper conditions for relay modules, when integrated with central station equipment via the Processing Units TCP/IP port using XML interface.

* + - 1. OPTICAL POWER MONITORING

In each available Processing Unit’s zone, the optical power level shall be monitored and a fault condition shall be reported if the level drops below a preset value.

* + - 1. SYSTEM CALIBRATION
         1. All system performance variables described in Section 1.05 of this document shall be adjustable using standard portable, Windows®-based personal computer using system calibration software provided by the manufacturer.
      2. PRODUCT SPECIFICATIONS

|  |  |
| --- | --- |
| Maximum Number of Zones | 25 |
| Minimum Event Location Accuracy | +/- 5 meters |
| Maximum Protected Perimeter Length | 5km (16,400 feet/ 3.1 miles) |
| Maximum Cable Length/Zone | 500m |
| Maximum Insensitive Lead-in Cable Length | 5Km |

* + - 1. Processing Unit ELECTRICAL SPECIFICATIONS

Each Processing Unit shall conform to the following input/output specifications as a value or range.

|  |  |
| --- | --- |
| Voltage | 90 to 250 VAC |
| Maximum Power | 17.0 Watts at 25°C |
| Connector Strip | 24 to 16 AWG |
| Communication Port | USB |
| Network Port | Ethernet 10 Base -T/100 Base-TX (RJ-45) |
| Tamper Switch Contacts | Min. External Switch ratings 5VDC @ 1mA |
| Fuse Rating | 1.25A |

* + - 1. Processing Unit ENVIRONMENTAL SPECIFICATIONS

Each Processing Unit shall conform to the following specifications as a value or range.

|  |  |
| --- | --- |
| Operating Temperature | 0°C to 55°C (32°F to 131°F) |
| Relative Humidity | 0 to 95% Non-condensing |

* + - 1. Processing Unit PHYSICAL SPECIFICATIONS

Each Processing Unit shall conform to the following specifications as a minimum value or range.

* + - * 1. Processing Unit (PU)

PU Dimensions

Height – 3.5 inches (8.89cm)

Width – 19 inches (48.26cm)

Depth – 16.625 inches (42.23cm) with Relay Module and 16 inches (40.64cm) without Relay Module

* + - 1. RLM-RELAY MODULE ELECTRICAL SPECIFICATIONS

Each Relay Module shall conform to the following input/output specifications as a value or range.

|  |  |
| --- | --- |
| Voltage | 6 to 28 VDC |
| Maximum Power | 2.0 Watts at 25°C |
| Connector Strip | 24 to 16 AWG |
| Relay Contacts | 100mA, 24 VDC Non-inductive |
| Contact Isolation | 125 VAC |
| Serial Port | CAN bus |
| Tamper Switch Contacts | Min. External Switch ratings 5VDC @ 1mA |

* + - 1. SYSTEM AVAILABILITY

A product meeting or exceeding this specification is manufactured by:

Fiber SenSys

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Hillsboro, OR 97124 USA

TEL: +1-503-692-4430

FAX: +1-503-692-4410

E-mail: info@fibersensys.com

http: www.fibersensys.com

1. EXECUTION
   * + 1. TESTING, GUARANTEE, AND SERVICE
          1. The system shall be free from defects in workmanship and materials, under normal use and service, for a period of two years from the date of shipping.
          2. The local service organization servicing the warranty period for the above equipment shall become certified in its use before installation of the equipment.
          3. Any equipment shown defective in workmanship or material shall be repaired, replaced, or adjusted free of charge.