Perimitrax®

Buried Cable Intrusion Detection Sensor

Site planning guide

A3DA0102-002, Rev P
Second edition
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SENSTAR™

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Patents

Canada no.: 1332185, 2202117, 2204485 U.S. no.: 5834688
U.K. no.: 2318689
Patents also issued or pending in other countries.

Approvals

Canada: *Sensor Module model SM100-1, SM100-2 and SMDT01* Industry Canada Certification Number: CAN 1454 102 239
Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference including interference that may cause undesired operation of the device.

This class B digital apparatus meets all requirements of the Canadian Interference - Causing Equipment Regulations.
Cet appareil numérique de la classe B respecte toutes les exigences du Règlement sur le matériel brouilleur du Canada.

This device conforms to CSA standard C22.2 no. 950.

USA: *Sensor Module model SM100-1, SM100-2 and SMDT01* FCC Identification Number: I5T-BCIDS001
This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Any changes or modifications not expressly approved by Senstar Corporation could void the user's authority to operate the equipment.

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning off and on, the user is encouraged to try to correct the interference by one or more of the following measures:
- Reorient or relocate the receiving antenna.
- Increase the separation distance between the equipment and the receiver.
- Connect the equipment into a outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

This device conforms to UL standard 1950.

Europe: *Sensor Module models SM100-1, SM100-2 and SMDT01*

This device complies with EN50081-1, EN50130-4 and EN60950+A1+A2 standards as outlined in council directives 89/336/EEC and 73/23/EEC on the approximation of the laws of member states relating to Electromagnetic compatibility and low voltage directive, as amended by directive 93/68/EEC.

Radiocommunication Agency Certificate of type approval # 13657
Radiocommunication Agency Certificate of EC type Examination of Electromagnetic compatibility # 13658
Unit marked with CE and CEPT SRD 1dGB
Senstar Corporation's Quality Management System is ISO 9001:2000 registered.

Related publications

Perimitrax® Installation guide (A3DA0202):

Provides instructions for installing the Perimitrax system and system components.

Sennet® product guide (M0DA0302):

Describes Sennet system features and provides system planning, installation and setup guidelines.

Intelli-FLEX™ product guide (multiplex version) (C6DA0402):

Describes Intelli-FLEX multiplex version features, operation, components and applications. It also provides instructions for planning, installing and setting up an Intelli-FLEX multiplex version system.

Service statement - We ensure that our products are correctly applied to achieve the maximum benefits for the end-user. We work hand-in-hand with our customers and remain accessible through all stages of a project - from concept to deployment to long-term support. We provide design assistance, site surveys, installation support, comprehensive documentation, training, post-installation annual calibration and maintenance visits, electronics and software extended warranty, rapid factory repair service and on-call/emergency service. Contact Senstar to inquire about how a package can be customized for your unique applications.

Using this guide

This guide provides the information necessary to design a Perimitrax security system.

Chapters 1 and 2 are brief introductions to perimeter security as it relates to Perimitrax and some of the applicable scenarios for its use as a detection system; chapter 3 provides an overview of the steps involved in implementing a Perimitrax system; chapters 4 and 5 provide detailed explanations of the system and its various components; chapter 6 describes site analysis information and chapter 7 details the information required to adequately design your Perimitrax system. The appendices provide sample configurations, system component ordering information and component specifications.

Figures

The figures contained in this document are for illustration purposes only, they may differ from the actual equipment.

Throughout this guide the illustrations show the SC1 sensor cable layout, unless otherwise stated. SC2 sensor cable layouts are similar to the SC1 layouts with the exception that the SC2 systems use 2 cables instead of 1.

Abbreviations

The following abbreviations are used throughout this guide:

- CCTV - closed circuit television
- FAR/NAR - false alarm rate/nuisance alarm rate
- LTU - Sennet® Large Transponder Unit
- NC - Sennet® Network Controller
- n.c. - normally closed
- n.o. - normally open
- Pd - probability of detection
- RF - radio-frequency
- SC - sensor cable
- SM - Perimitrax® Sensor Module
- TU - Sennet® Transponder Unit

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1 Perimeter security

Perimeter security overview

Enhance your total security

Providing an effective security system for most facilities usually requires a combination of intrusion detection sensors. In many cases, the use of outdoor perimeter intrusion detection sensors will greatly enhance your total security.

Interior security sensors that detect intruders at your front door or inside your building can be very effective. However, in many high security applications it may be more advantageous to detect intruders at the perimeter before they enter your building, or in case of correctional facilities, before an inmate escapes.

Outdoor perimeter intrusion detection sensors provide advance warning for response forces. Outdoor sensors also provide substantial cost savings by reducing risk, losses and the number of staff required.

Outdoor sensors are commonly used in conjunction with fences or walls, and provide reliable 24 hour security under all environmental conditions.

Senstar's outdoor sensors are unique and are renowned for their exceptional performance, reliability and low false and nuisance alarm rates.

Goals of perimeter security

Perimeter intrusion detection sensors detect people or vehicles entering or leaving a secured area. A comprehensive perimeter security system includes the following elements:

- deterrence
- detection
- delay
- assessment
- response

A perimeter security sensor system, such as Perimitrax, ensures effective detection under difficult environmental conditions.

Factors affecting perimeter sensor selection

The decision to use perimeter sensors, and the selection of a particular type of sensor, depends on the following factors:

- degree of protection desired (whether the site is low, medium, or high-security)
- physical barriers used
- the threat
- cost of the sensor technology versus the alternative (guards, or ignoring the threat)
- site perimeter properties
- level of alarm assessment present
- life cycle cost
- site appearance

Life cycle cost

When comparing different perimeter detection systems, it is important to consider more than just the initial acquisition cost. The cost of installation, training, operation, spares, and maintenance must also be considered. The life-cycle cost is the total of all of these costs over the life of the system. A significant part of this cost is the cost of false alarms.

Be sure to consider all of the relevant factors when selecting a perimeter security system.

Site appearance

Do you want your site to look like a fortress? Tall fences topped with barbed wire have a definite deterrent effect, but they may not provide the type of image that you wish to project.

A covert system may be the answer.

Perimitrax - the security solution

Perimitrax is Senstar Corporation's high-security perimeter intrusion detection sensor system. It is based on ported 'leaky' coaxial cable technology. Sensor cables buried around the perimeter of a site carry radio-frequency (RF) signals along the path of the cables. These signals form an invisible electromagnetic detection field around the cables that can detect the presence of an intruder crossing it. Sensor Modules house the necessary electronics to monitor the detection field created by the RF signals and to raise an alarm if an intruder enters the detection field.

2 Applications

The sites shown on the following pages will provide ideas for utilizing the various Perimitrax components. Keep in mind that these are only examples. There are many ways of applying Perimitrax to specific site requirements.

Possible applications

The following is a list of possible applications for the Perimitrax buried cable systems.

Government

- heads of state residences
- borders
- sensitive facilities

Military

- missile sites
- weapons depots
- barracks
- communications facilities
- secure building complexes
- parked aircraft

Aviation

- airports and working ramp areas
- helicopter pads
- executive aircraft and general aviation
- large and small aircraft
- fuel storage

Institutions

- correctional facilities
- halfway houses
- schools
- university campuses
- mental health facilities

VIPs

- embassies, consulates, trade missions
- residences
- private clubs
- resort complexes
- gated communities

Transportation

- trucking depots
- moving and storage companies
- warehousing and drop shipping companies

Energy

- nuclear and conventional power generation plants
- petroleum refineries and terminals
- oil and gas production, storage and distribution facilities
- compressor and metering stations
- hydroelectric dams
- electrical transformer stations
- storage yards

Industry

- manufacturing plants and distribution centers
- hazardous chemical material dumps and storage
- research labs
- pharmaceutical testing facilities

Communications

- satellite receiving stations
- microwave relay stations
- telephone company substations
- cable television company equipment yards
- service vehicle yards

Construction

- construction sites
- building materials supply yards
- equipment and material storage yards

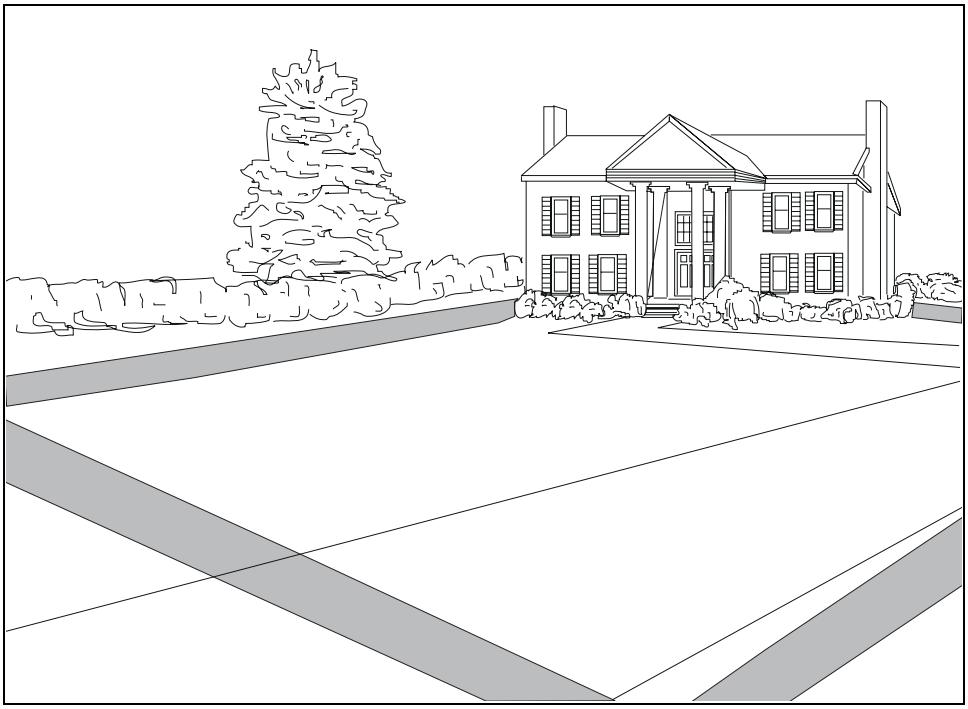
Automotive

- new and used car dealers
- rental agency car lots
- "aftermarket" installers (custom vans, undercoating, radios)
- impoundment lots

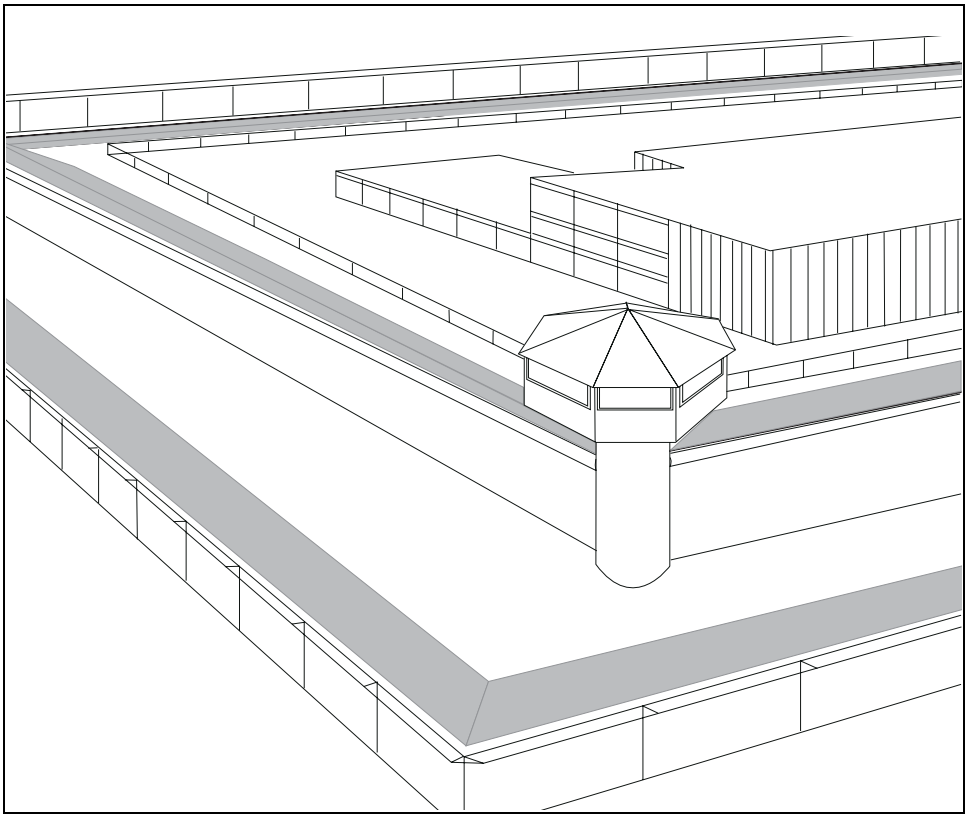
Heads of state residences

VIP residences need protection against possible theft, vandalism or kidnapping of residents.

Perimitrax provides covert, terrain-following protection. The buried cables are invisible - they can be installed without affecting the landscape, and risk of tampering is minimized.



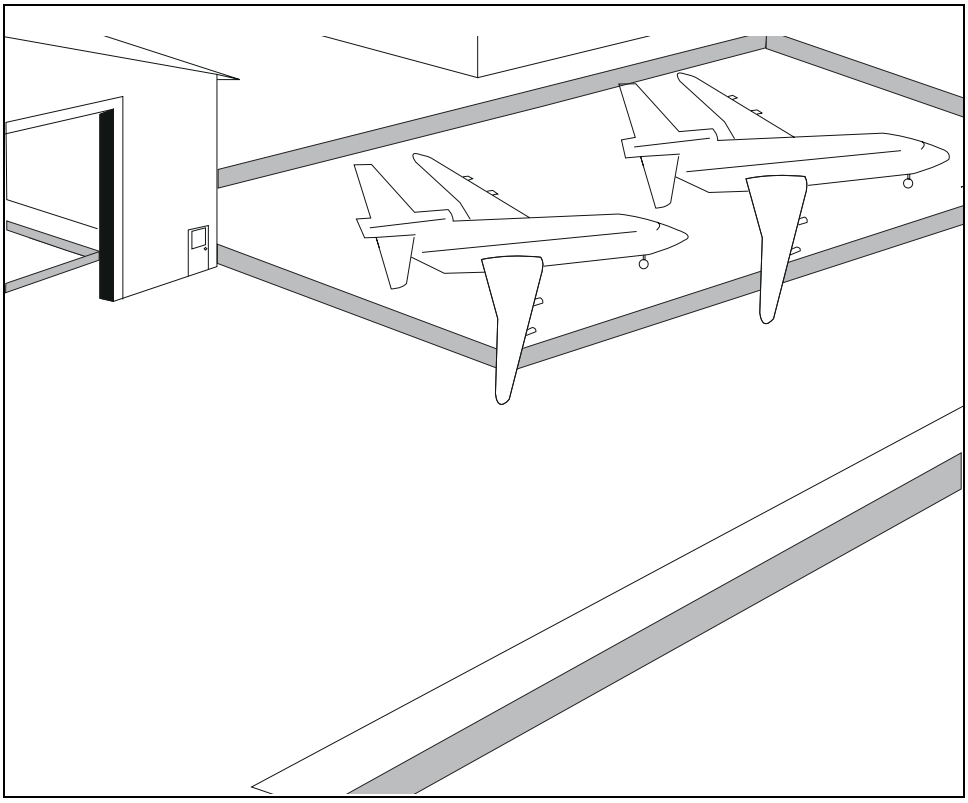
Correctional facilities



Correctional facilities need to guard against prisoner escapes. Guard patrols are costly and time-consuming.

Perimitrax buried cable perimeter systems provide covert, tamper-proof perimeter protection. The sensor is cost-effect, as it reduces the number of guards and guard towers needed. For added protection, a video intrusion detection sensor connects to the existing CCTV cameras and provides constant surveillance while eliminating operator fatigue.

Airports - hangars and parking areas



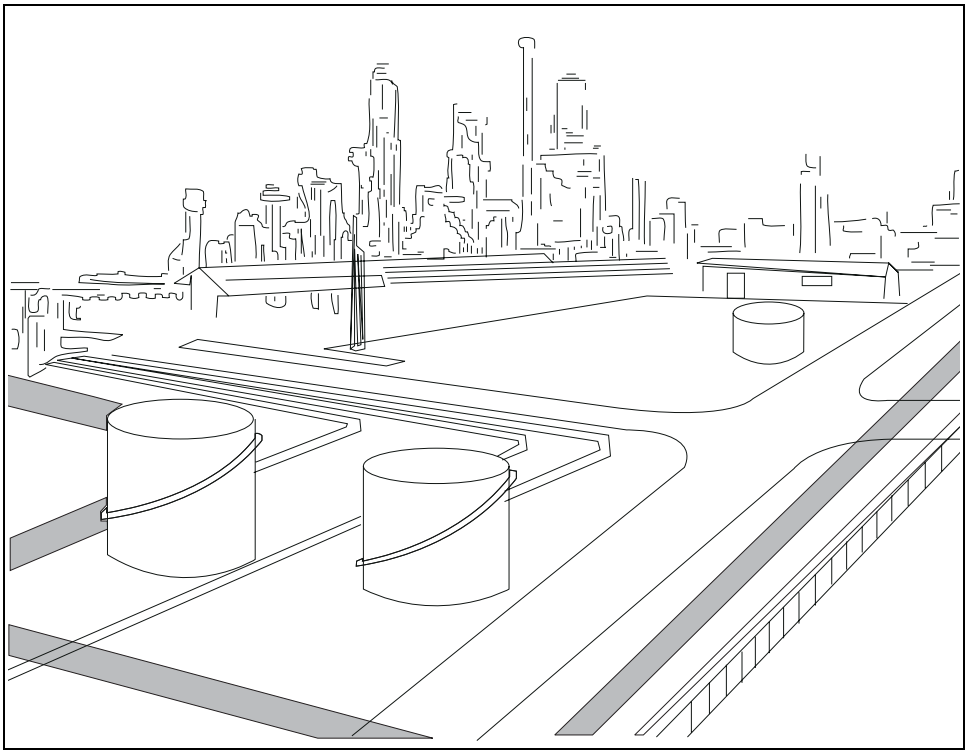
Aircraft need to be protected against sabotage or theft. Protection is also required for airport parking areas, hangars and ramp areas.

Perimitrax buried cable perimeter systems provide protection while remaining unaffected by the airport environment - noise, vibration, radar, etc. Because the cables are buried in the concrete, they don't obstruct operations. Perimitrax can provide security for individual aircraft or the entire area.

Oil and gas

Fuel storage facilities can be dangerous, and a liability if fire or explosion results from sabotage.

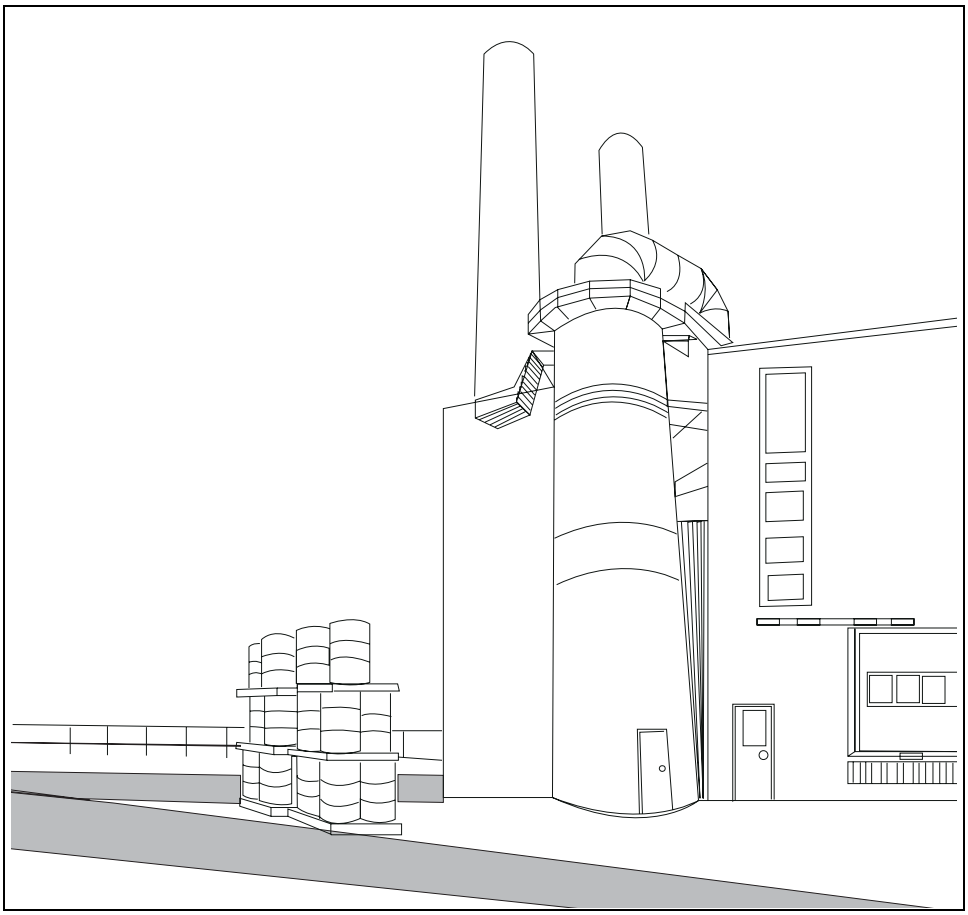
Perimitrax protects oil or gas distribution facilities from intruders, and reduces guard patrol costs.



Toxic materials and facilities storage

Facilities that have hazardous materials have two security needs - protection of temporary hazardous waste storage, and protection of the facilities from sabotage and liability.

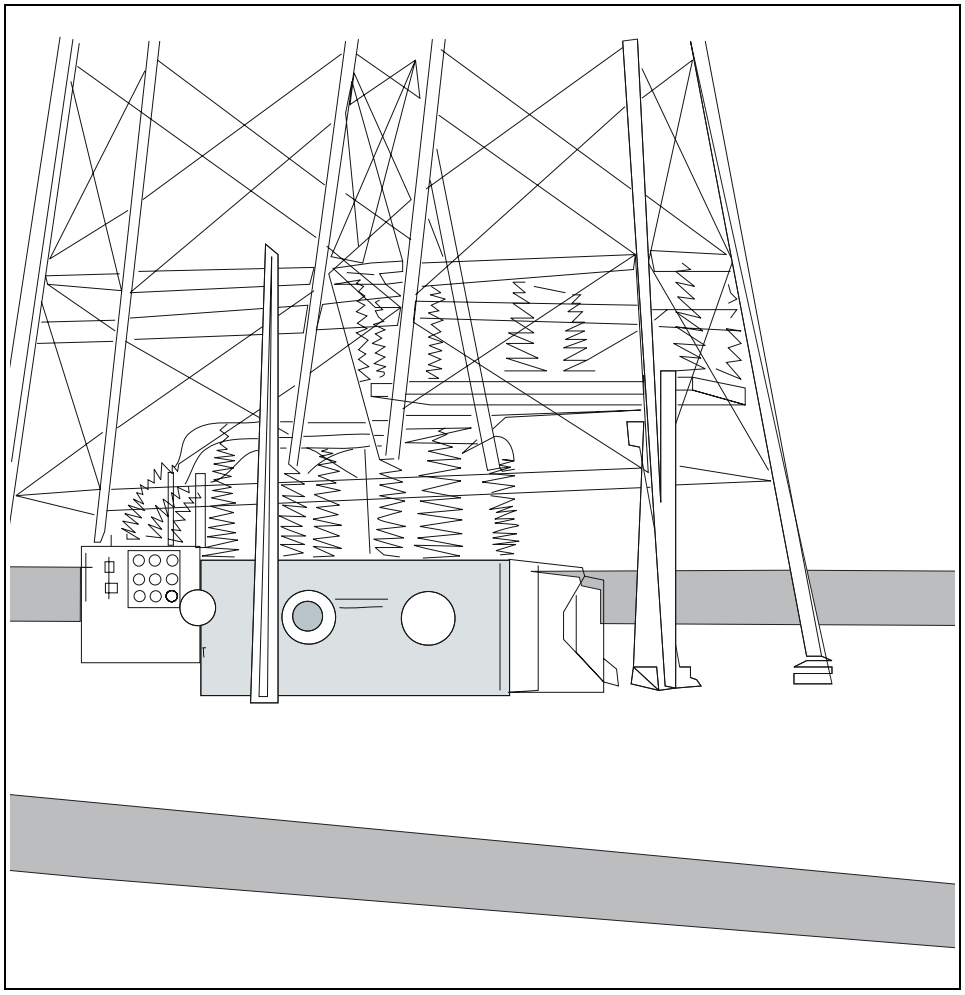
Perimitrax can be used to secure the entire perimeter.



Utilities

Remote facilities such a electrical sub-stations are prone to theft and sabotage. Guard protection may not be a feasible solution.

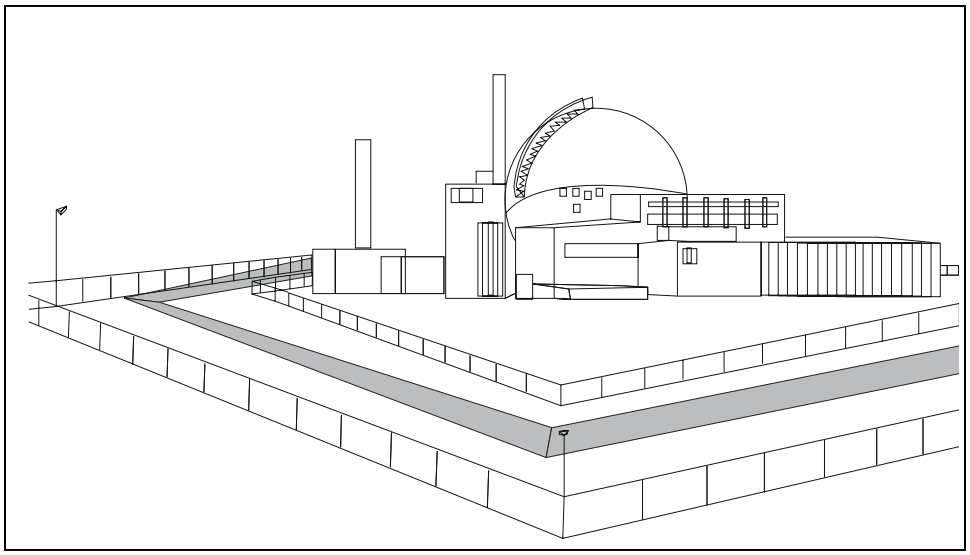
Perimitrax completely surrounds the site to provide a high level of security while reducing the need for guards. Alarm data can be transmitted to a central station via RF links.



Power generating facilities

High risk resources such as nuclear power generating facilities need a high level of security to protect against sabotage and liability. Large facilities are often difficult and costly to protect.

The 99% Pd combined with very low FAR/NAR ensures that dangerous resources are well secured.



3 Planning and installation overview

The purpose of this guide

The purpose of this guide is to enable you to determine if your site is compatible with a Perimitrax installation and to provide you with the information required to select and design an appropriate perimeter security system for your site. This guide focuses on the Perimitrax sensor cable systems. It includes:

- an overview of typical applications
- an overview of system technology
- detailed system components descriptions
- site analysis guidelines
- equipment requirements guidelines
- available equipment listing
- sample configurations
- component specifications

This chapter contains a planning and installation overview which lists the main steps that must be taken to successfully install Perimitrax, and references to the appropriate chapters.

If you have any questions regarding the design, layout and selection of equipment for a potential site contact Senstar Customer Service or your authorized Perimitrax dealer. Our Customer Service representatives are available to assist in any way from over the phone design support to on-site design and installation services.

In this guide

Research	**Plan a Perimitrax system**	Chapter 5 System components
	Familiarize yourself with Perimitrax installation components.	
Observe	**Examine your site**	Chapter 6 Site analysis
	Tour your site, take photographs and measurements. Collect information on installation mediums, location of objects and obstructions. Identify any potential problems.	
Design	**Develop a site plan**	Chapter 7 System design
	Develop a detailed site plan showing the cable path and the locations of all Perimitrax components, as well as all buildings fences, roads, and other obstructions.	
	Determine the length of each zone; determine cable layout at the Sensor Modules, decouplers, and head end system (if used).	
	Develop electrical interconnection diagrams showing all cable connection details.	
	Select the SC1 or SC2 cable system based on site requirements.	
Components	**Order system components**	Appendix b System component list
	Select and order the components for your installation.	

In other guides

Install system	**Install your system**	Perimitrax Installation guide (A3DA0202)
	Install and test cables.	
	Install Sensor Modules and Field Power Modules.	
	Complete Sensor Module settings in accordance with site plan.	
	Calibrate your standalone system	
	Install Network Controller	Sennet® product guide (M0DA0302)
Commission system	**Calibrate your network system**	Universal Configuration Module online help
	Power up system.	
	Calibrate each zone; check operation of each Sensor Module; set Sensor Module threshold levels.	
	Test entire system to ensure adequate detection and that alarms report properly.	
Completion	**System is fully operational**	Display and control system documentation
	Turn over system to trained operators.	

4 System overview

Introduction

Perimitrax is a high-security perimeter intrusion detection sensor system. It is based on ported 'leaky' coaxial cable technology. Sensor cables buried around the perimeter of a site carry radio-frequency (RF) signals along the path of the cables. These signals form an invisible electromagnetic detection field around the cables that can detect the presence of an intruder crossing it. Sensor Modules house the necessary electronics to monitor the detection field created by the RF signals and to raise an alarm if an intruder enters the detection field.

Perimitrax can use either a separate pair of sensor cables (SC2) or a single sensor cable (SC1), depending on site and performance requirements.

Perimitrax provides the following features:

- covert operation
- greater than 99% probability of detection
- low false and nuisance alarm rate
- perimeters are terrain following
- tamper resistance
- integral power and data distribution (optional)
- integral support of other sensor types (optional)

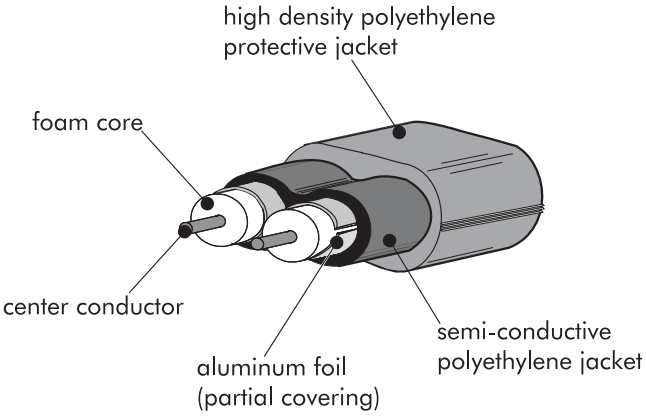
Sensor cables

The Perimitrax systems are based on ported 'leaky' coaxial cable technology. On the exterior, the sensor cables appear identical to standard coaxial transmission cables. However, the patented Perimitrax sensor cables are designed to permit RF signals to leak through an opening in the outer shield. They are quite different from standard coaxial cables that have a complete shield to contain the signals within the cable.

The signals leak through the opening to form an electromagnetic detection field outside the cable. If another ported cable is placed within the detection field, an RF current is induced in its center conductor, because the signals pass inward through the opening in its shield.

The Perimitrax system offers two ported coaxial cable alternatives.

The SC1 is a single, twin-coaxial cable with one transmit side and one receive side, covered by a protective outer jacket.

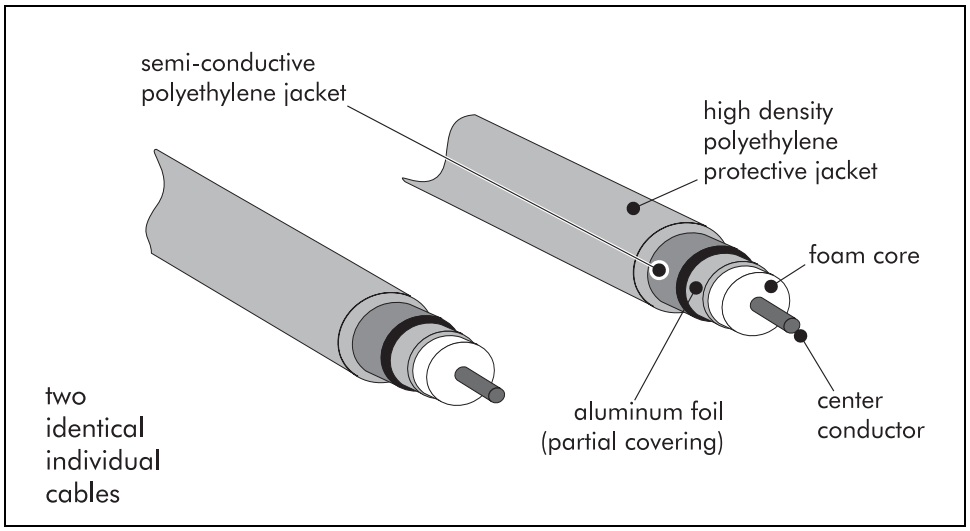


SC1 sensor cable

The SC2 consists of two individual cables (one transmit, one receive) buried in parallel around the site perimeter.

Because both the SC1 and SC2 sensor cables are buried and the detection field is invisible, the system is covert. Intruders have no way of knowing where the detection field lies.

Perimitrax cables can be laid to follow any terrain, even around corners and up and down hills. Because the detection field surrounds and follows the cables, it also follows the terrain. This means that the Perimitrax systems are not limited to line-of-sight applications with smooth surface requirements.



SC2 sensor cable

When to use SC1 and SC2

The SC1 and SC2 sensor cables are similar in technology, function and quality, however, each one is more suited to different situations.

SC1

The SC1 sensor cable provides the same level of detection as the SC2 sensor cables when they are spaced 1 m (3.3 ft.) apart.

SC1 is typically the best choice for general use, particularly when there are space limitations due to physical barriers such as buildings, walls or fences.

The installation cost for a single cable SC1 system is less than for a dual cable SC2 system with a similar perimeter. The main reason for this is that the SC1 system needs only one trench, whereas the SC2 system needs two trenches for a successful cable installation.

SC2

The two cables in a dual cable SC2 system can be moved farther apart to obtain a wider detection field.

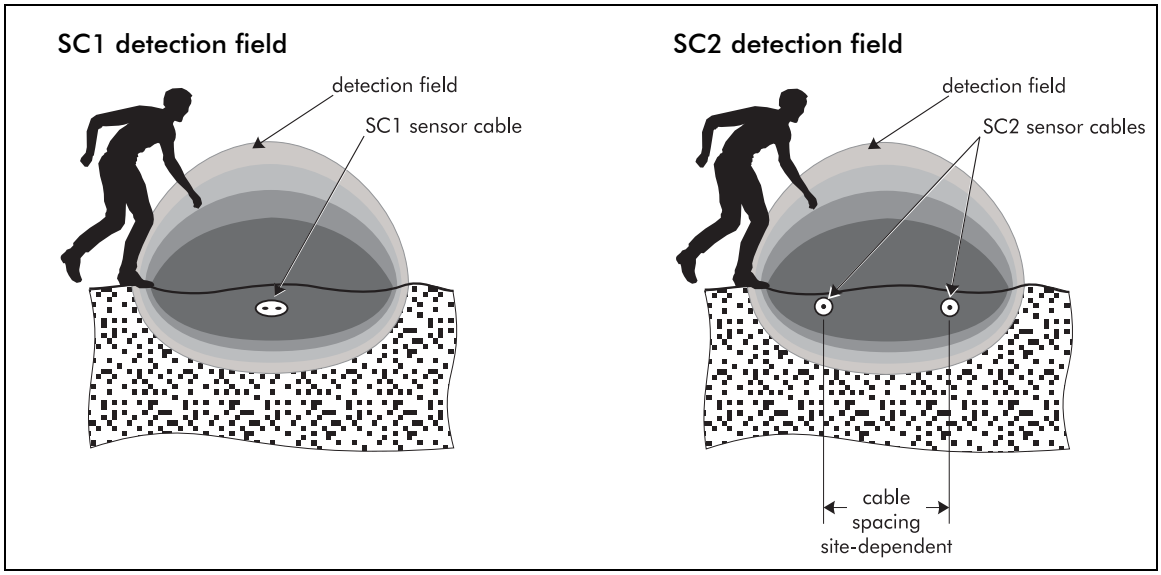
This feature is particularly effective in situations where wider detection zones will provide the added level of security that may be required, for instance in areas where there are wide open spaces with no nearby physical barriers.

See *Sensor cable sets* on page 5-8.

Detection field

The sensor cables are buried around the perimeter of the site and connected to the Sensor Module (Models SM100-1 and SM100-2) transmit and receive cable connectors. The Sensor Module generates the detection field along the length of the cables.

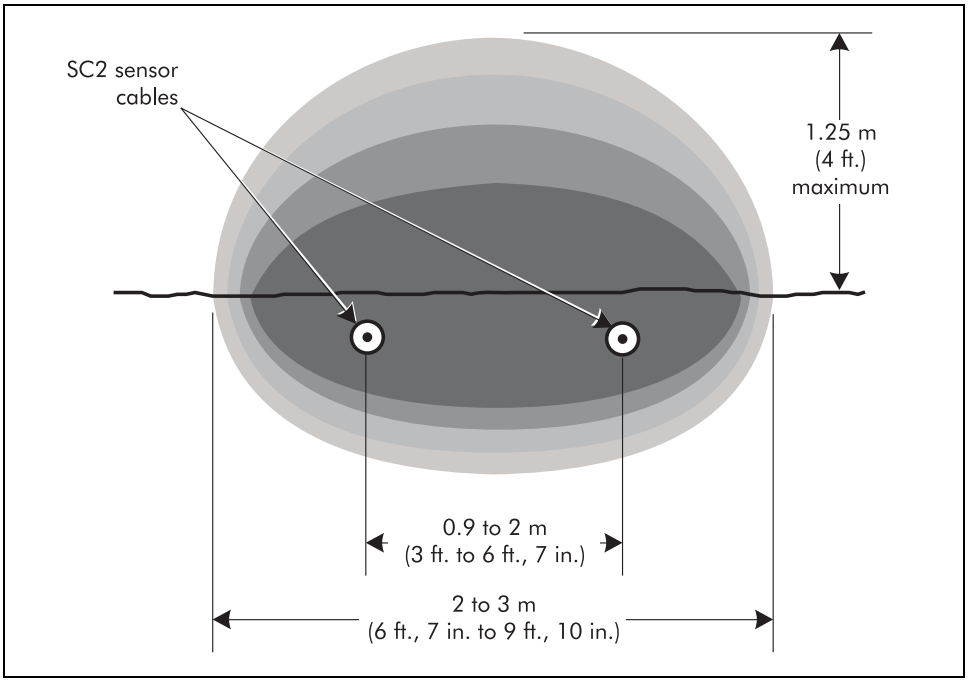
When properly installed and calibrated, SC1 and SC2 systems are nearly impossible to defeat by unaided human intruders.



Sensor cable detection field

NOTES

1. The SC1 detection field is similar to the SC2 detection field when the SC2 cables are spaced 1.25 m (4 ft.) apart.
2. Detection field dimensions depend on the cable spacing, installation medium and the Sensor Module threshold settings.
3. For the SC2 sensor cables, the detection field size also depends on the cable spacing.



Typical detection field dimensions for SC2 sensor cables

Systems can be configured to suit a variety of applications.

System configurations

There are 2 basic configurations for a Perimitrax system - standalone and network. The most simple system consists of a single Sensor Module set up as a standalone unit. A more complex system could include multiple network Sensor Modules, auxiliary sensors, Sentient™ Security Mangement Systems, multiple networks, etc.

This section illustrates basic standalone and network configurations.

Standalone configurations

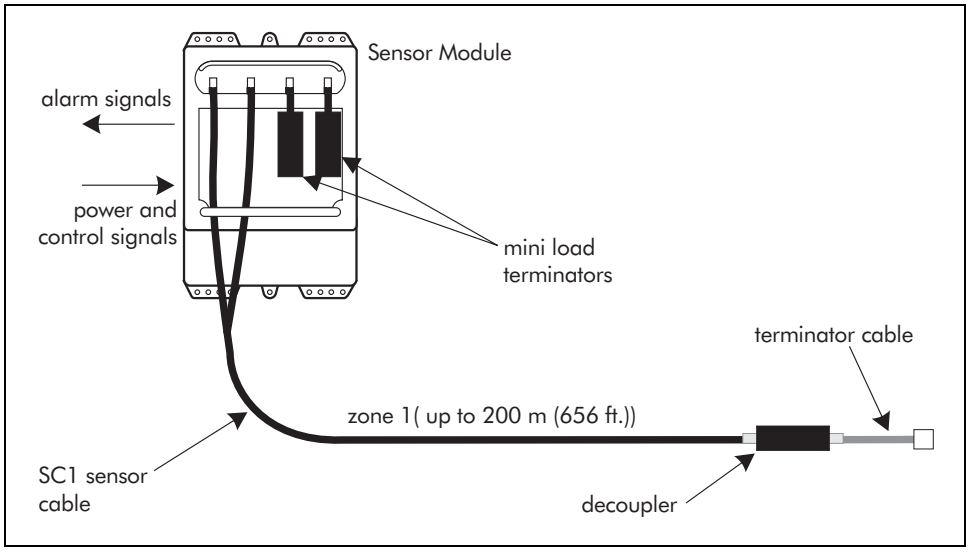
The smallest Perimitrax system is a standalone configuration. It consists of a single Sensor Module, its associated sensor cable(s) and a power supply. This single Sensor Module configuration can provide intrusion detection for perimeters from 10 m (33 ft.) to 400 m (1,312 ft.) long.

Multiple Sensor Module configurations can also be created to provide intrusion detection for longer perimeters.

Readings are taken and adjustments are made using a portable computer and Network Controller temporarily connected to the Sensor Module, or manually using an optional local interface assembly.

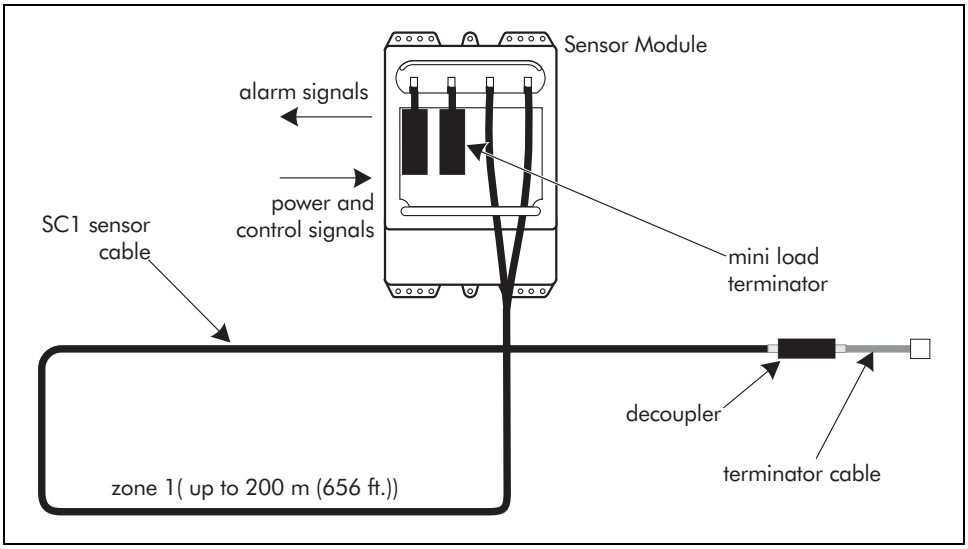
Single Sensor Module standalone configurations

This configuration is used when only one zone is required.



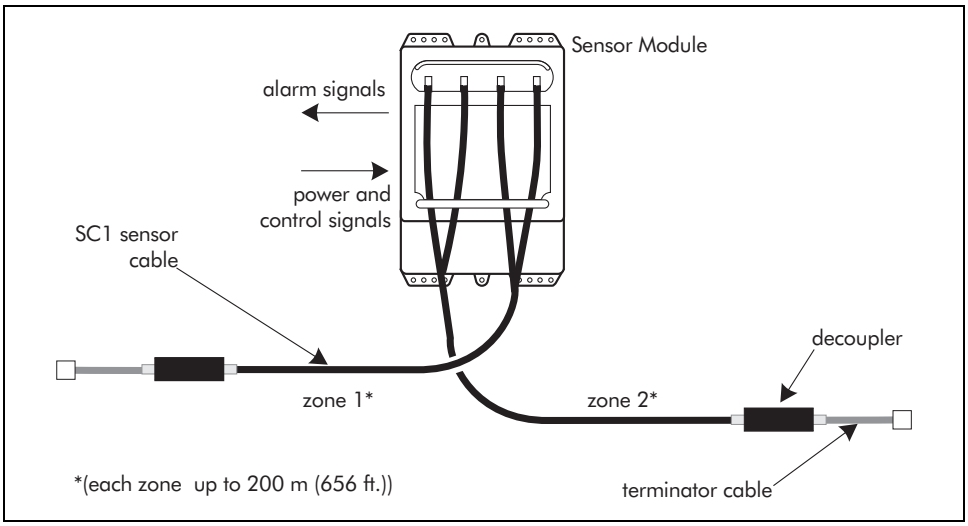
Single zone open loop configuration

This configuration is used when only one zone is required, but the area to be protected must be fully enclosed.



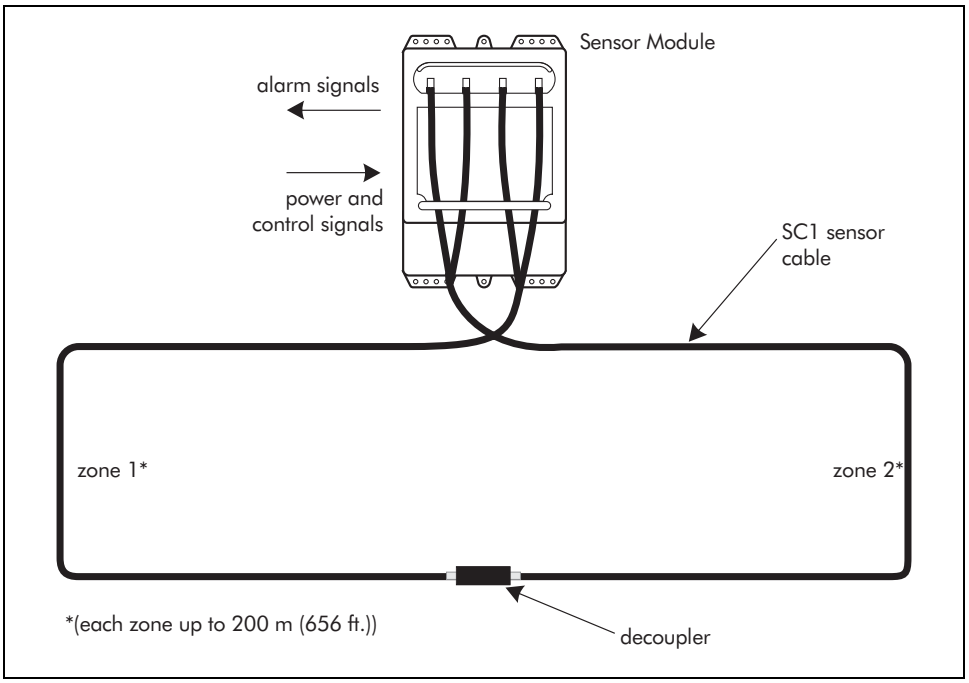
Single zone closed loop configuration

This configuration is used when the maximum linear perimeter length is required or whenever two zones are needed. Two sets of decouplers and terminator cables are required to set up this configuration.



Dual zone open loop (linear) configuration

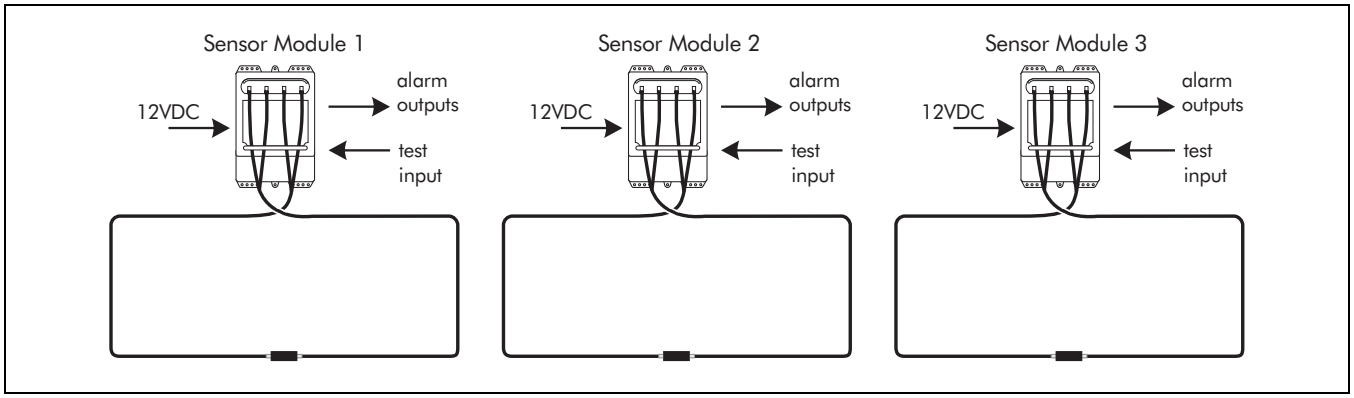
This configuration is used when two enclosed zones are required. This is the most economical configuration for this type of application because only one decoupler set is required. No terminators are required.



Dual zone closed loop configuration

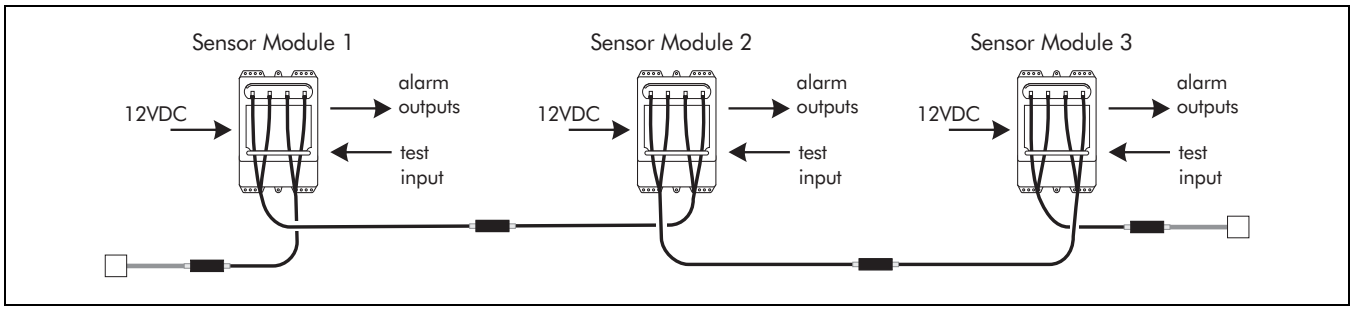
Multiple Sensor Module standalone configurations

Single sensor, dual zones can be clustered together to protect specific areas of a site, such as individual planes.



Clustered Sensor Modules

An unlimited number of Sensor Modules can be interconnected to create a continuous detection field around a longer perimeter.



Interconnected Sensor Modules

In this case it may be more cost effective and efficient to set up a network configuration.

Network configuration

In a network configuration components such as the field power module can be shared between multiple Sensor Modules. A Sentient Security Management System, Network Manager software and Network Controller assist in the operation of the system.

The Sentient/Network Manager/Network Controller combination can be connected at any point along the chain of Sensor Modules.

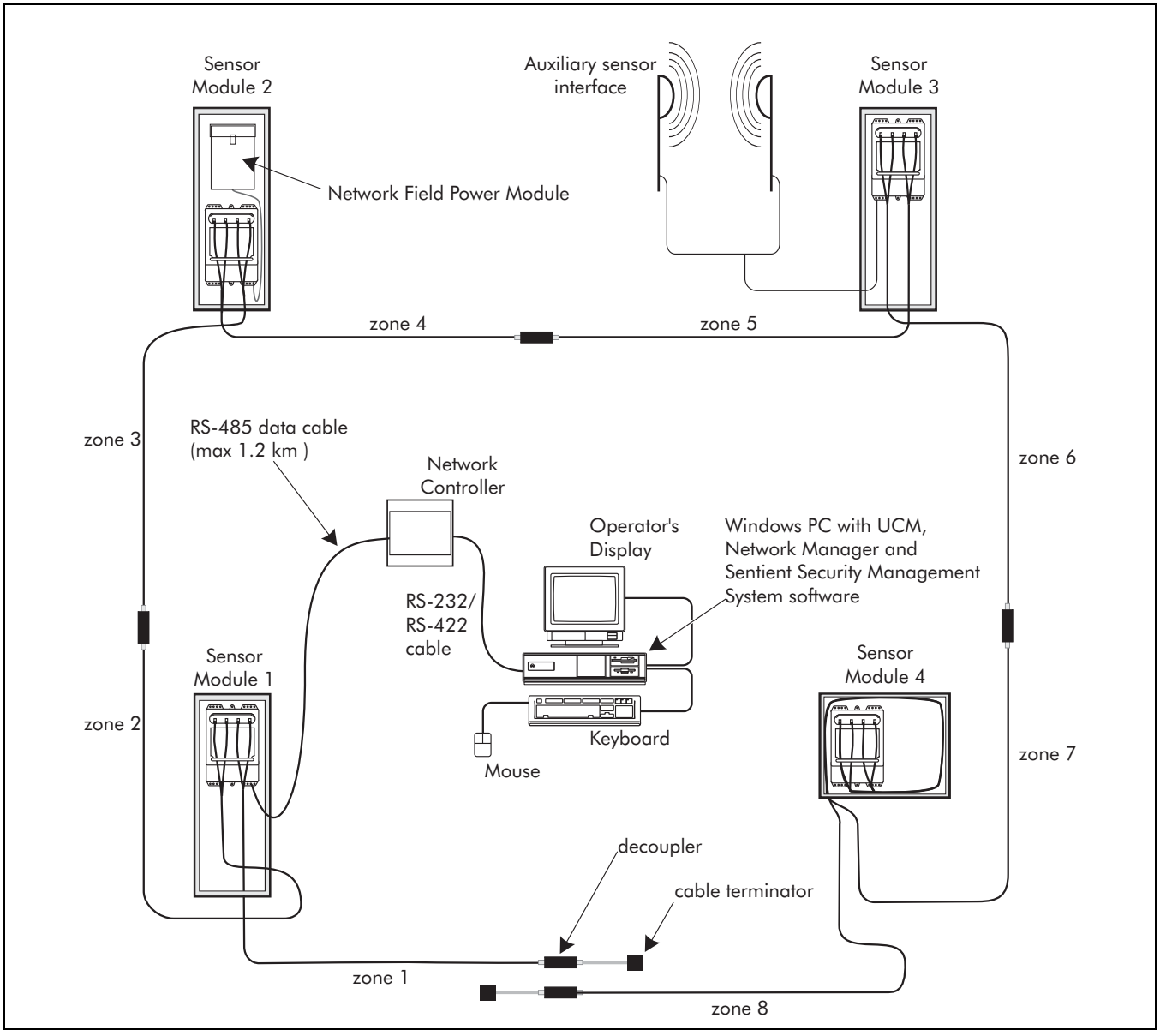
The Sentient Security Management System can be used to monitor the Sensor Modules, to display alarm conditions, and for system maintenance and troubleshooting. The graphic display capabilities of Sentient enable the operator to control and monitor the security system using a map of the perimeter.

One network can consist of up to 62 Sensor Modules or 124 detection zones. Sensor Modules are connected in blocks, each having a maximum length of 2800 m (3062 yards).

A block is a group of Sensor Modules that share a network field power module. The number of Sensor Modules in a block and the length of the block are determined by power and data distribution requirements. In general, the most efficient way to power a block is to locate the network field power module in the electrical center of the block. The blocks of Sensor Modules are connected using a communication cable. (*System powering and data communication* on page 7-16.)

It is also possible to integrate other sensors into the Perimitrax systems (see *chapter 5, System components*, for details).

Very long perimeters can be protected using several network systems and multiple instances of the Network Manager reporting to a Sentient Security Management System.



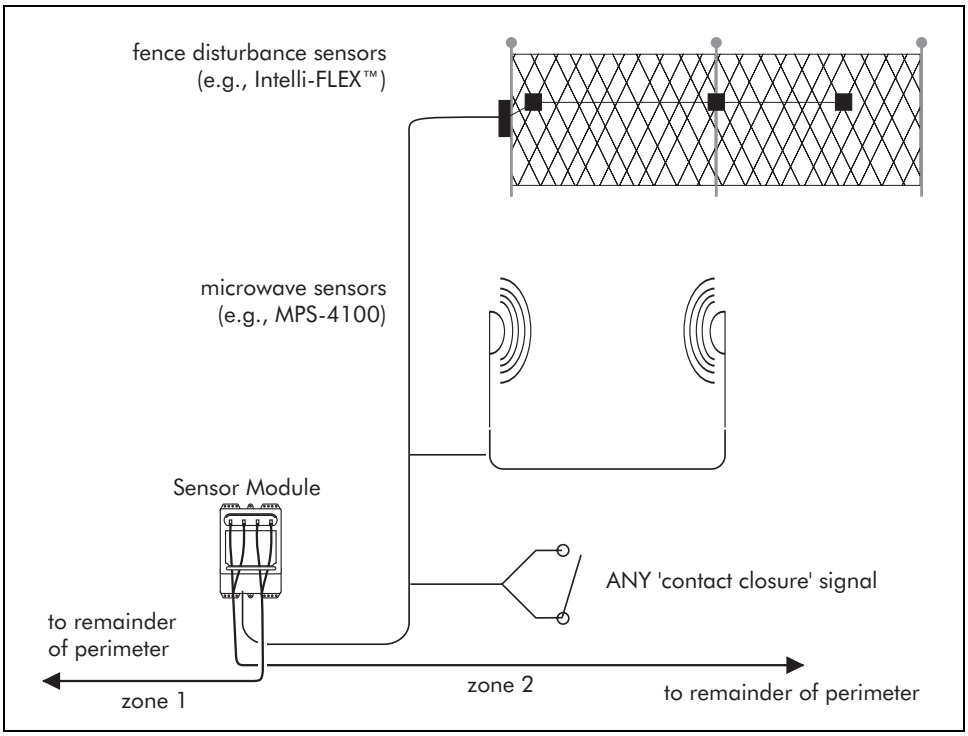
Sample network configuration

Auxiliary sensor interface

Each Sensor Module in a network system may be used to collect alarm and tamper information from other security sensors, such as microwave sensors (MPS-4100) or fence detection systems (Intelli-FLEX™), or to drive external devices such as lighting or sirens.

Eight independent analog inputs on each Sensor Module may be configured for normally open (n.o.) or normally closed (n.c.) operation, as well as for single or dual resistor line supervision.

The Sensor Module can also provide a maximum power of 12 VDC, 150 mA to auxiliary sensors. It can also activate up to 4 relay output contact devices such as lights or sirens, or control or test auxiliary sensors.



Auxiliary sensor interface feature

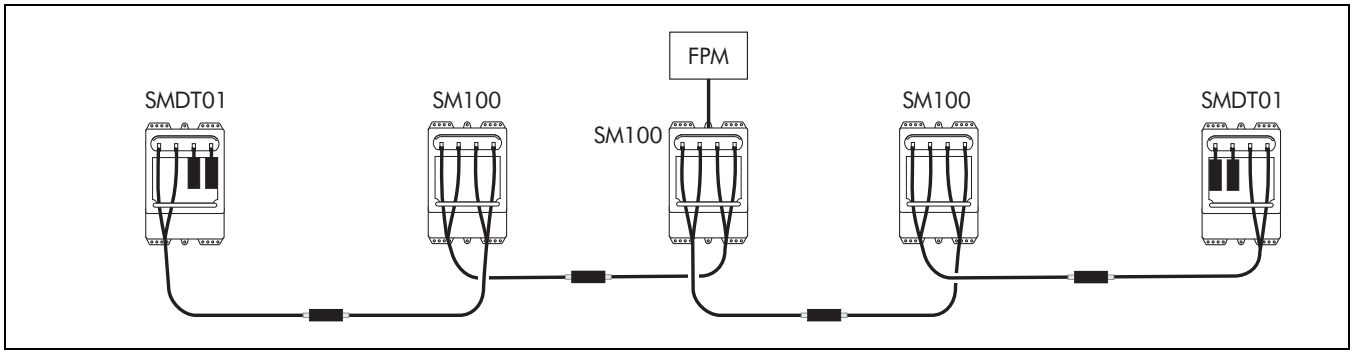
To function as a network, a Perimitrax system requires that a Sentient Security Management System be connected. A basic system can be expanded by adding:

- Sennet standard Transponder units, which will each accommodate 16 inputs/ 8 outputs; or
- Sennet Large Transponder units, each of which has connections for 256 inputs and 256 outputs.

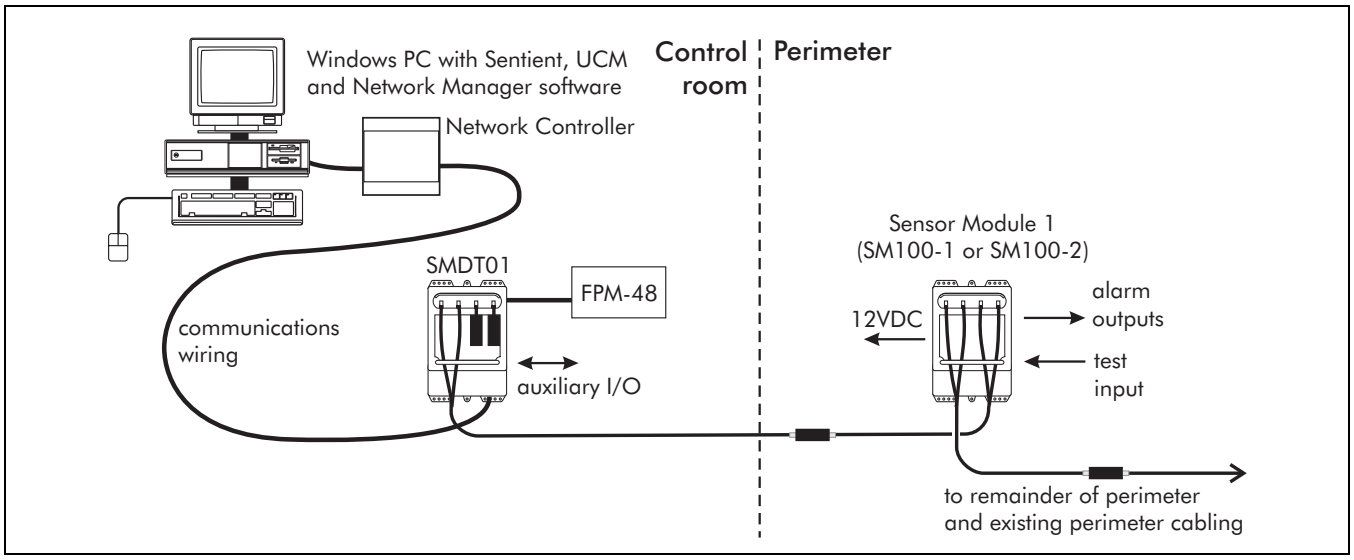
SMDT01 Sensor Module

In addition to being used to accommodate auxiliary sensors, the SMDT01 Sensor Module can also be used to:

- provide added protection to the end zones in a perimeter



- and to retro fit existing Sentrax/S∞Trax cables into a Perimitrax system



See *Data Module - Sensor Module model SMDT01* on page 5-5 for details.

5 System components

Introduction

A complete Perimitrax system includes a combination of the following components:

- Sensor Modules
- enclosures
- sensor cable sets
- decouplers
- cable terminators
- power supply (including Field Power Modules)
- (optional) Local interface assembly
- (optional) Network Controller
- (optional) Sentient Security Management Systemand Network Manager software
- (optional) Universal Configuration Module software
- (optional) printer
- (optional) repeaters
- (optional) Intelli-FLEX™ multiplex version processors

A small system, for example, may use one or two cable sets and a single Sensor Module connected to external alarm annunciation equipment. A larger system may include all of the components.

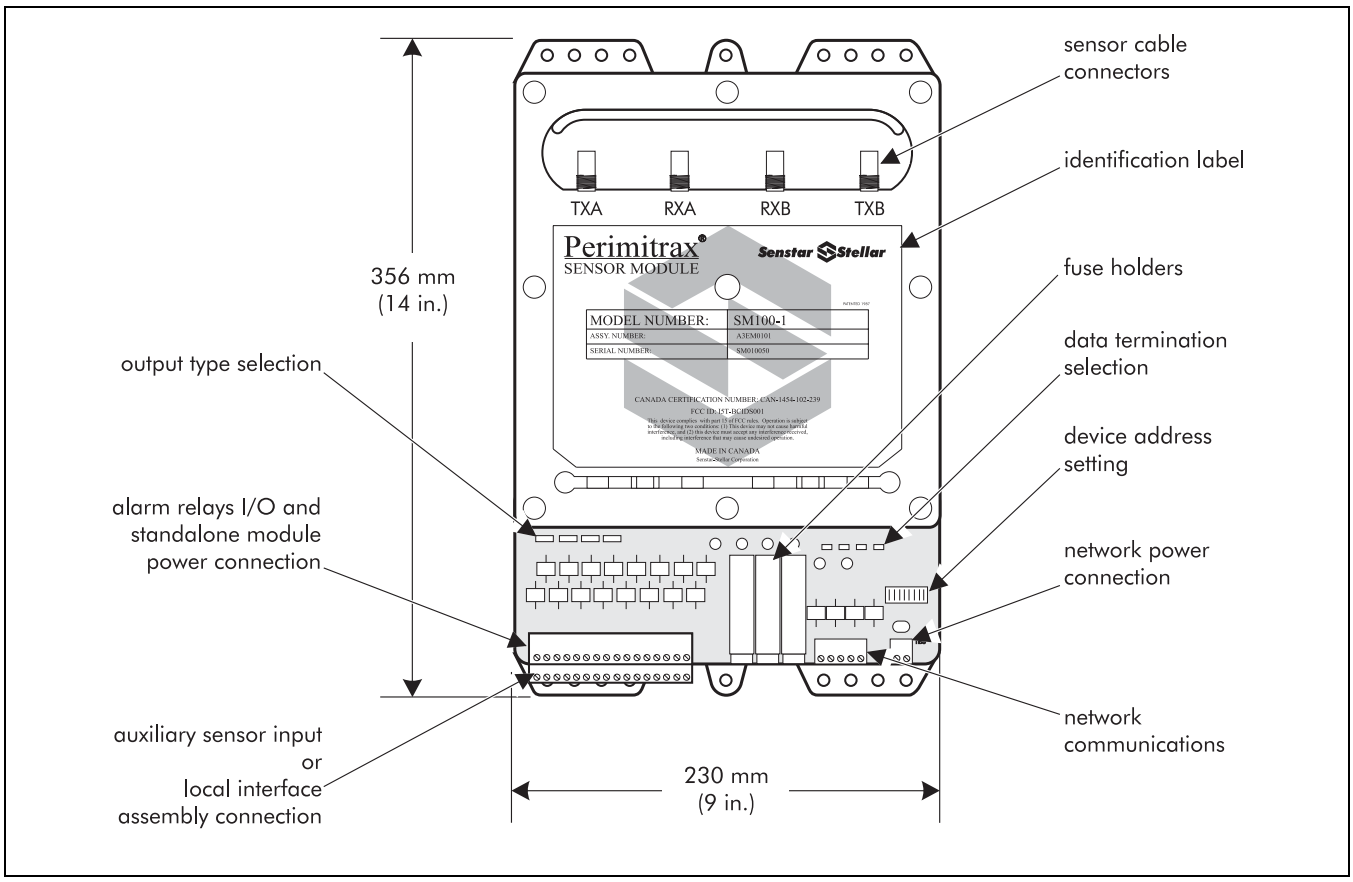
This chapter contains details about the components available for use in the Perimitrax systems. This information is meant as a guideline to familiarize you with selecting the appropriate components to install a Perimitrax buried cable system at your site.

A list of available components is included in *Appendix B, System Component List*. System components should be selected on the basis of information gathered in *chapters 6, Site analysis* and *7, System design*.

Sensor Modules

Full featured - Models SM100-1 and SM100-2

The Sensor Module, Models SM100-1 and SM100-2, house the electronics required to generate, receive and process the radio-frequency signals that create the detection field.

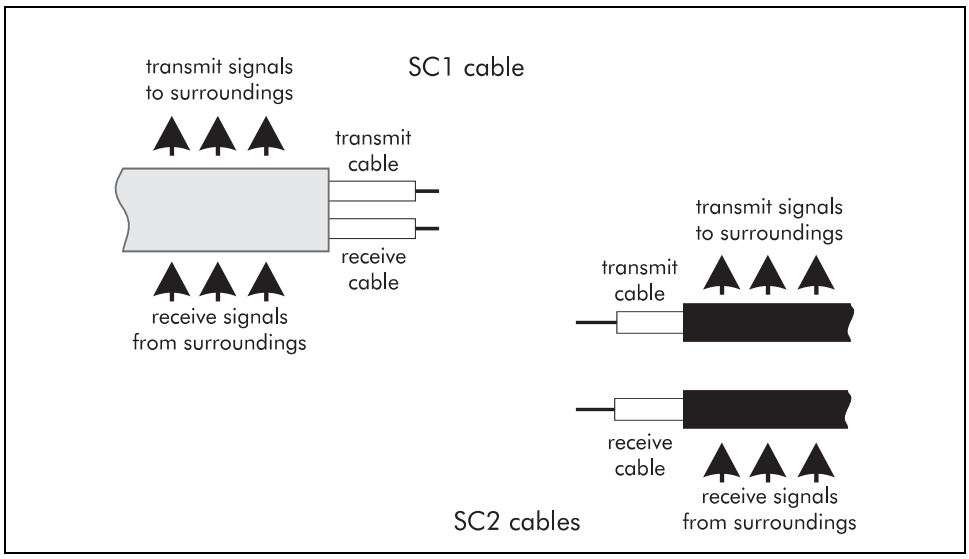


Sensor cables are connected to the Sensor Module. The Sensor Module transmits radio-frequency signals on one cable (or on one side of the cable in the case of the SC1 cable) and receives radio frequency signals on the other cable (or on the other side of the cable in the case of the SC1 cable).

Each Sensor Module has an on-board microprocessor that monitors changes in the detection field and identifies disturbances that could signify an intruder. The Sensor Module houses both the transmitter and receiver circuits. This configuration ensures greater reliability, a higher probability of detection and fewer false and nuisance alarms.

Adjustment controls allow you to set the detection threshold for each sensor zone. This enables the system to compensate for zone-to-zone sensitivity and

variations due to soil properties. It also enables the system to reject the detection of invalid targets.



In a network configuration the threshold adjustments can also be made via the Universal Configuration Module (UCM). In a standalone configuration the adjustments can be made using a portable computer and network controller temporarily connected to the Sensor Module, or manually by using the optional local interface assembly.

Perimitrax systems have the capability of operating in combination with Senstar's Sennet® and Intelli-FLEX™ systems as well as other manufacturers' security systems. Sensing systems that are used to provide an additional level of security to that provided by the Sensor Modules can generally be easily integrated into Perimitrax systems as auxiliary sensors.

Features

- The Sensor Module can be used alone in a single module small perimeter application, or for larger applications, one Sensor Module can operate with additional Sensor Modules.
- Alarms can be annunciated locally through devices, such as sirens, loudspeakers, or floodlights that are connected to the Sensor Module's local alarm interface.
- Relay contacts for sensor alarms and fail and tamper alarm outputs can be set to normally open (n.o.) or normally closed (n.c.).

Intrusion detection

Each Sensor Module provides intrusion detection for two sensor zones, usually designated A and B.

Each sensor zone can be a maximum of 200 m (656 ft.) in length, enabling one Sensor Module to monitor a perimeter up to 400 m (1,312 ft.) in length.

Longer perimeters can be protected by using multiple Sensor Modules connected in blocks.

Alarm types

Each Sensor Module identifies three alarm conditions: sensor, tamper, and fail.

- *Sensor alarms* occur when the Sensor Module identifies a disturbance in the detection field such as that caused by an intruder.
- *Tamper alarms* are generated when the optional weatherproof enclosure is opened or when the external tamper switch opens.
- *Fail alarms* are generated for any of the following conditions:
    - memory device errors
    - power goes outside the valid range
    - sensor cable open or a cable short occurs

Alarm annunciation

Sensor Modules annunciate alarms either via the terminal strips on the front panel or via the sensor and data cables to the Sentient Security Management System.

Power source

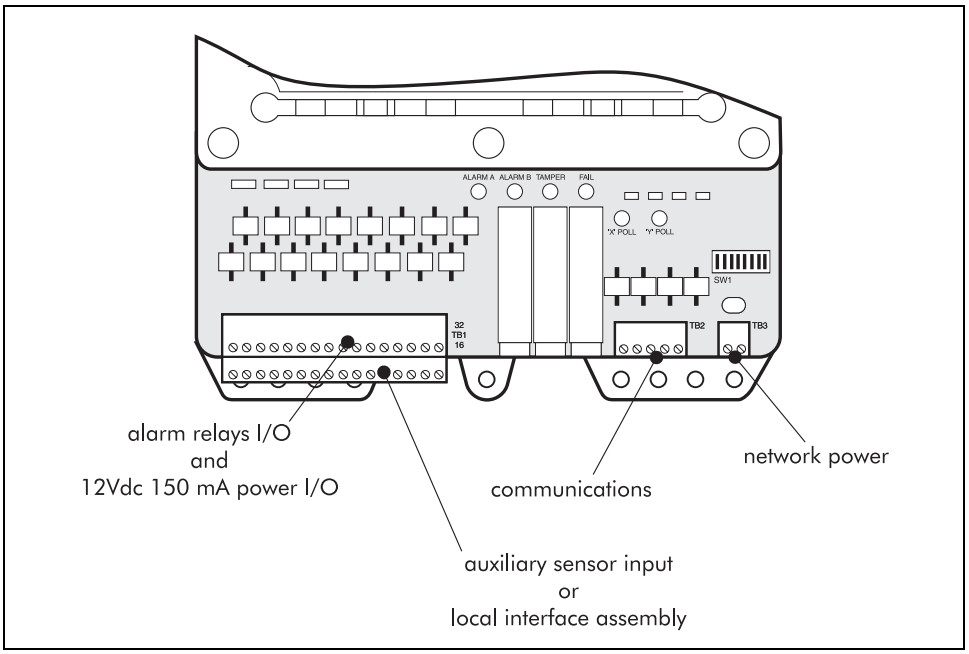
Power is obtained either from a 12 VDC standalone field power module located at each Sensor Module or through the sensor cable from a 48 VDC network field power module located around the perimeter. Senstar offers both versions of power source, however, if you are supplying your own power supply, the following specifications must be met:

- for a standalone configured Sensor Module - 12 VDC ± 10% regulated, 500 mA minimum, maximum output 15 W.
- for a network configured Sensor Module - 48 VDC ± 5% regulated with isolated outputs (floating ground), minimum output 150 W.

Input/output connections

The Sensor Module has three terminal connector strips.

The top tier of the two tier, 16-position terminal strips house the connection ports for the Alarm A and B, tamper and fail relay outputs, analog A and B outputs, tamper input and 12 VDC, 150 mA power output, 500 mA input.



The bottom tier of the two tier, 16-position terminal strips house the connection ports for either 8 point auxiliary sensor input or connection to a local interface assembly.

The 5-position terminal strip accommodates the network communications connections.

The 2-position terminal strip accommodates the network power connections.

Data Module - Sensor Module model SMDT01

The main purpose of the SMDT01 Sensor Module is to allow the integration of auxiliary sensors into the Perimitrax systems without adding Perimitrax sensor cables. It can also be used in retrofit situations, for instance, to replace the Control Module in Senstar Sentrax/S∞Trax installations, or to add security to Perimitrax systems with additional protection at the physical ends of the perimeter.

This Sensor Module performs the same functions as the auxiliary sensor input functions on the network configuration of the SM100-1 and SM100-2 Sensor Modules, however, it does not have RF detection capabilities. This unit can accommodate 8 auxiliary inputs/4 outputs and provide 12 VDC power to the devices. It is mounted in exactly the same manner and in the same types of enclosures as the full-featured Sensor Modules.

Alarm conditions detected by the auxiliary sensors are sent through the Perimitrax cables from the SMDT01 to the Sentient Security Management System, where the alarm is annunciated.

Enclosures

When installed outdoors, Sensor Modules must be installed in enclosures. The enclosure's purpose is to protect the Sensor Module from the environment and from possible tampering. An enclosure can disguise the appearance of a unit and therefore discourage tampering.

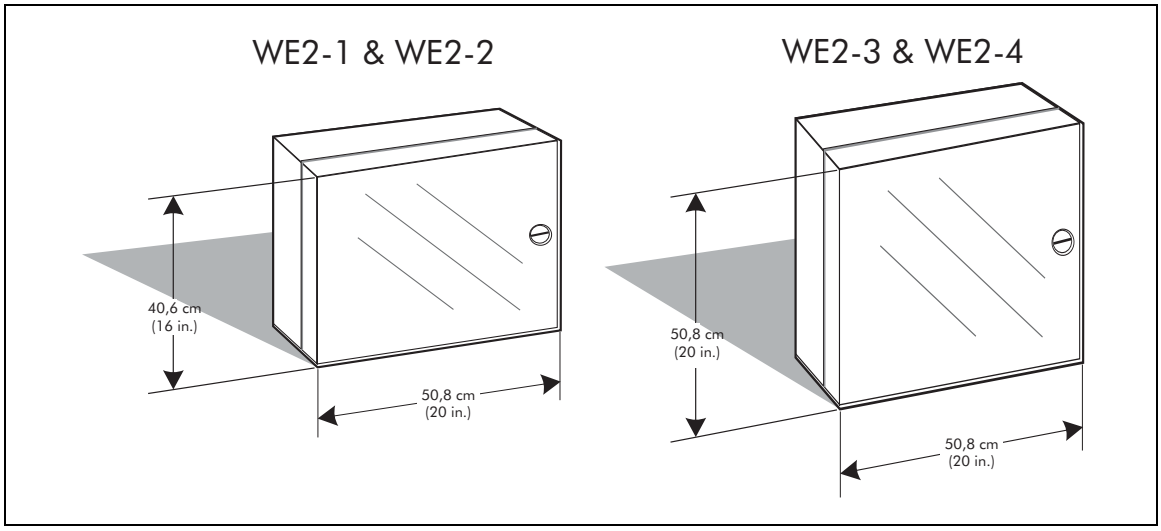
If a Sensor Module is being installed indoors, in a secure area it is not necessary to install it in an enclosure.

Two types of standard enclosures are available to protect Sensor Modules from the environment and from tampering.

All Sensor Modules and enclosures should be individually grounded in accordance with local safety regulations. Senstar Corporation recommends using a 5 Ω or better ground to provide maximum protection against lightning.

For installations in environments which include hot sunny periods, Senstar Corporation recommends that a sun shield be installed to protect the enclosure from direct sunlight.

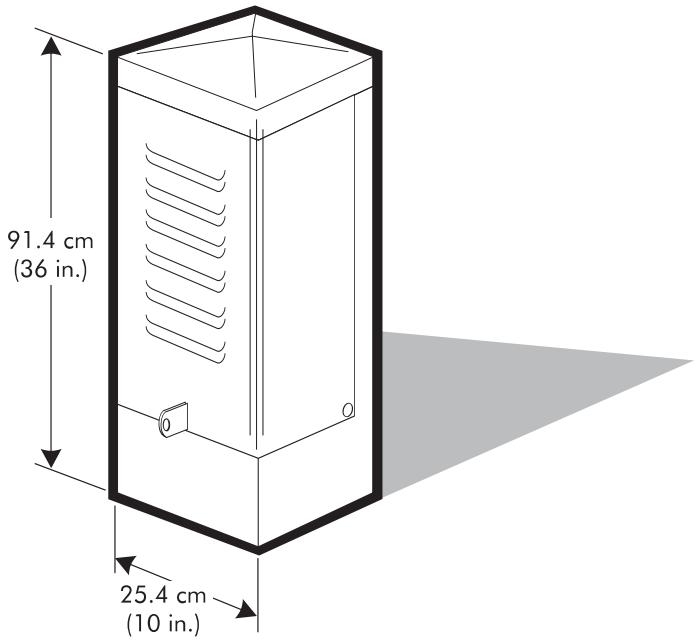
Weatherproof enclosures



The NEMA4/IP 66 rated weatherproof enclosures come in two sizes and can be used in any environment, indoor or outdoor, where the temperature range (measured inside the enclosure) is between -40° and 70°C (-40° and 158°F) and humidity between 0% and 95%.

Each enclosure has a built-in tamper switch mechanism and includes the hardware required to mount a Sensor Module. If the padlock handle has been installed on the enclosure, it is also lockable (lock not provided).

Telecom style protective enclosure

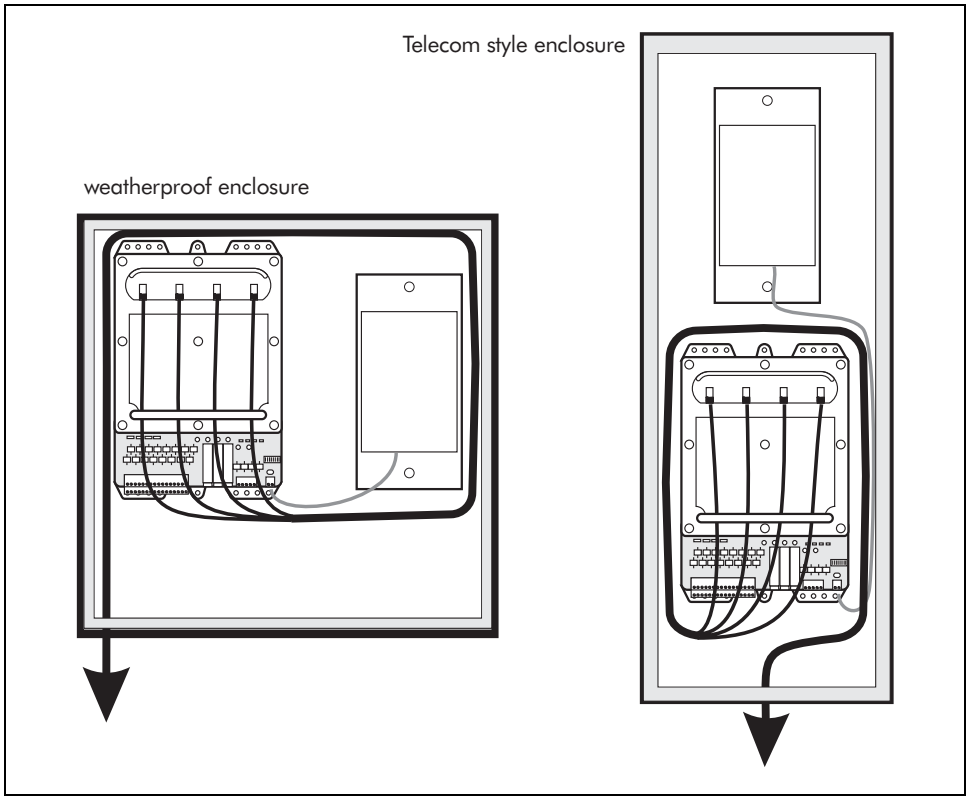


In addition to protecting the Sensor Module from the environment, the Telecom style protective enclosures help to disguise the sensor units. This is because the enclosure is identical to enclosures often used for telephone and cable television installations.

The 91.4 x 25.4 x 25.4 cm (36 x 10 x 10 in.) enclosure is normally mounted in a concrete base.

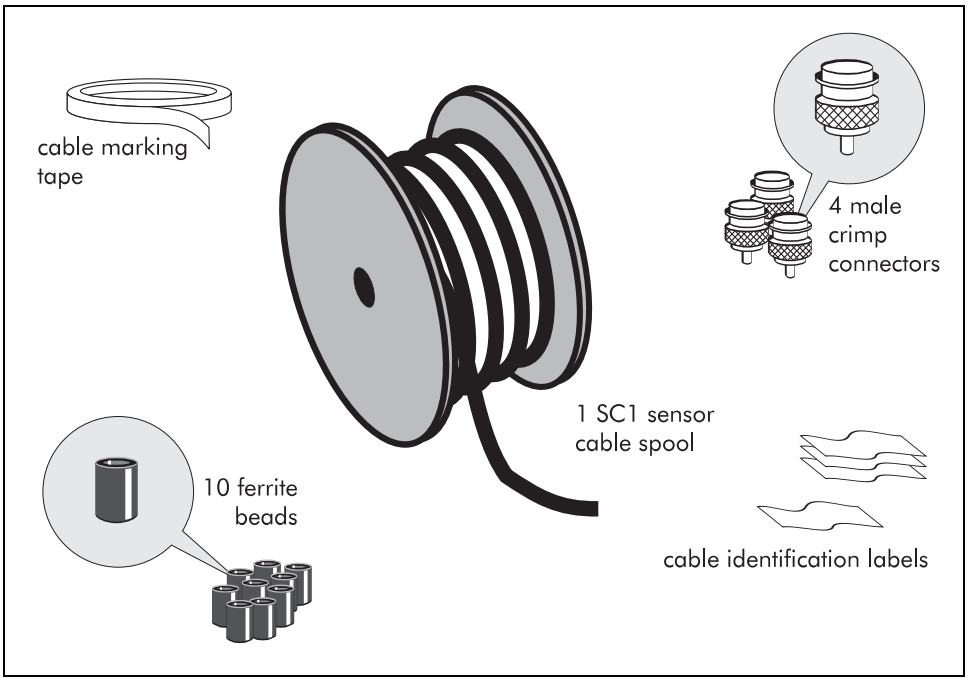
Each protective enclosure includes a mounting stake and all hardware necessary to secure the Sensor Module. The enclosure is tamper protected and can be locked (lock not provided).

Both enclosures can accommodate a Sensor Module with a service loop, and an optional Field Power Module.



Sensor cable sets

SC1 sensor cable sets



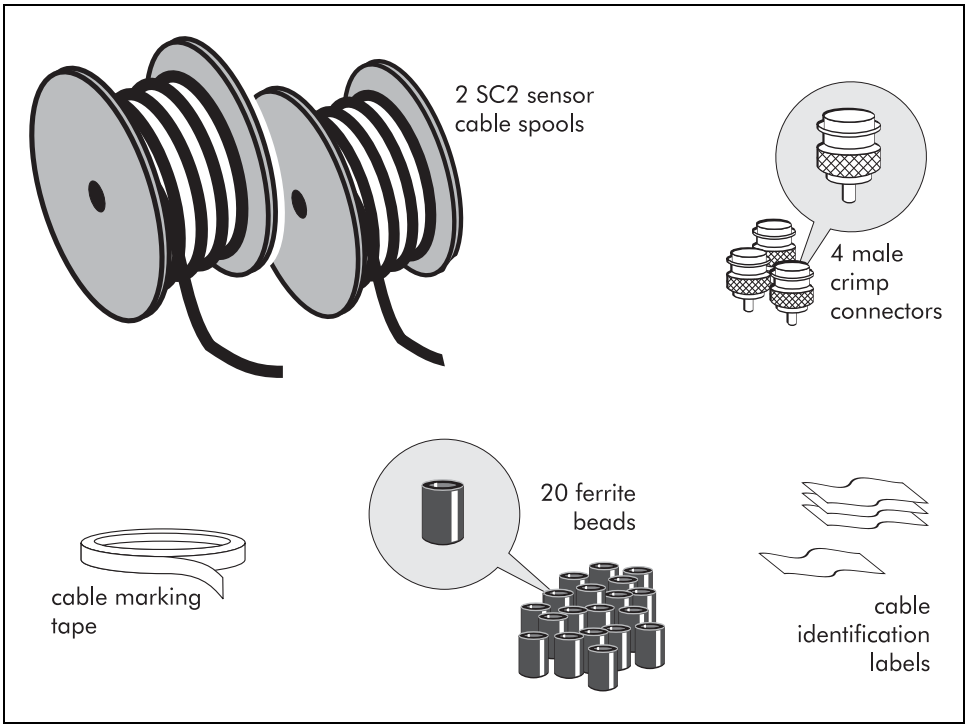
The SC1 sensor cable consists of a twin ported coaxial cable with one transmit side and one receive side.

The sensor cable is ridged on one side and smooth on the other. The ridged side should always be specified as the transmit cable. There is no physical difference between the transmit and receive sides of the cable, but for cable installation and fault-finding it is important to know which side is performing each function.

Each SC1 sensor cable set includes:

- one SC1 sensor cable with 20 m (66 ft.) of integral lead-in cable available in detecting lengths of 50, 100, 150, and 200 m (164, 328, 492, and 656 ft.)
- 10 ferrite beads
- four male crimp TNC connectors with copper filler strip (not shown)
- cable identification labels
- cable marking tape

SC2 sensor cable sets



In an SC2 sensor cable system two sensor cables are buried in parallel around the site. One cable serves as the transmit cable and the other serves as the receive cable.

Each SC2 sensor cable set includes:

- two SC2 sensor cables with 20 m (66 ft.) of integral lead-in cable available in detecting lengths of 50, 100, 150, and 200 m (164, 328, 492, and 656 ft.)
- 20 ferrite beads
- four male crimp TNC connectors with copper filler strip (not shown)
- cable identification labels
- cable marking tape

Sensor cable description

The sensor cables are buried around the site and are connected to the Sensor Modules. The cables carry radio-frequency signals generated by the Sensor Modules.

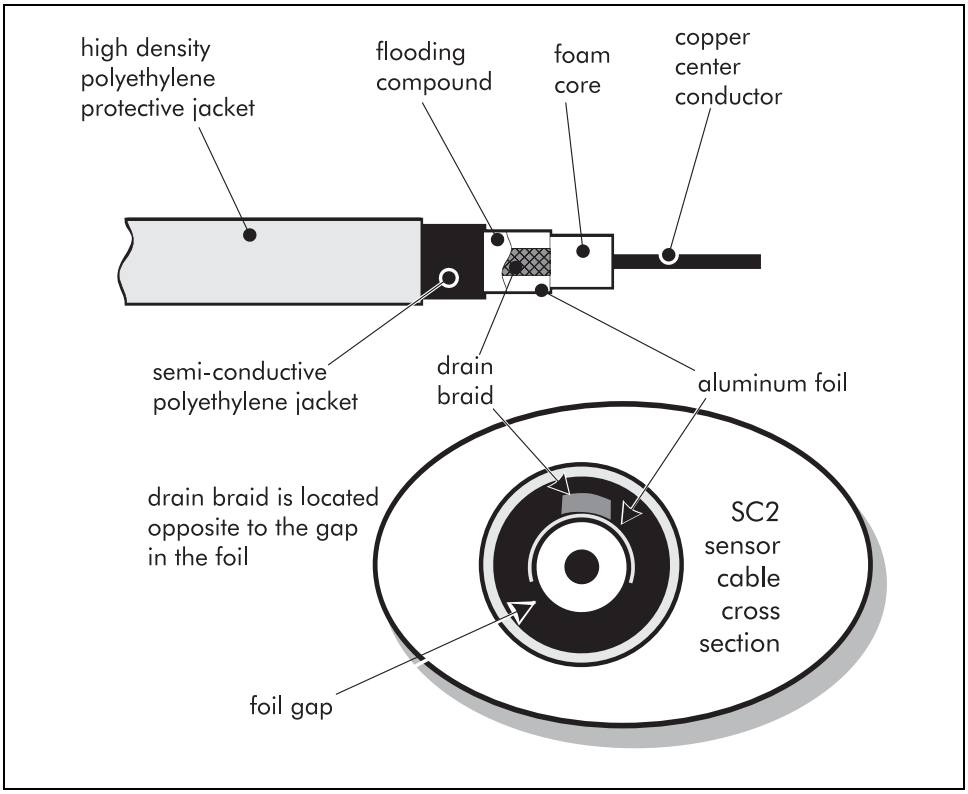
The sensor cables also carry:

- power to the Sensor Modules (optional), and
- alarm and diagnostic information between the Sentient Security Management System and Sensor Modules via the Network Controller.

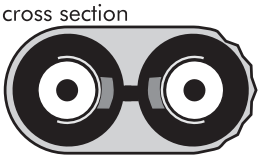
The sensor cables are normally cut to suit the individual sensor zone lengths on site during the installation process.

Sensor cable assembly

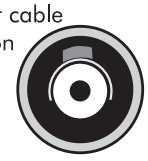
Both the SC1 and the SC2 cables consist of the same components. However, the outer grey jacket covers one cable assembly for the SC1 cable and two cable assemblies for the SC2 cable.



SC1 sensor cable cross section



SC2 sensor cable cross section



The cable is made up of a copper center conductor that is surrounded by a foam core. The foam core is wrapped in aluminum foil.

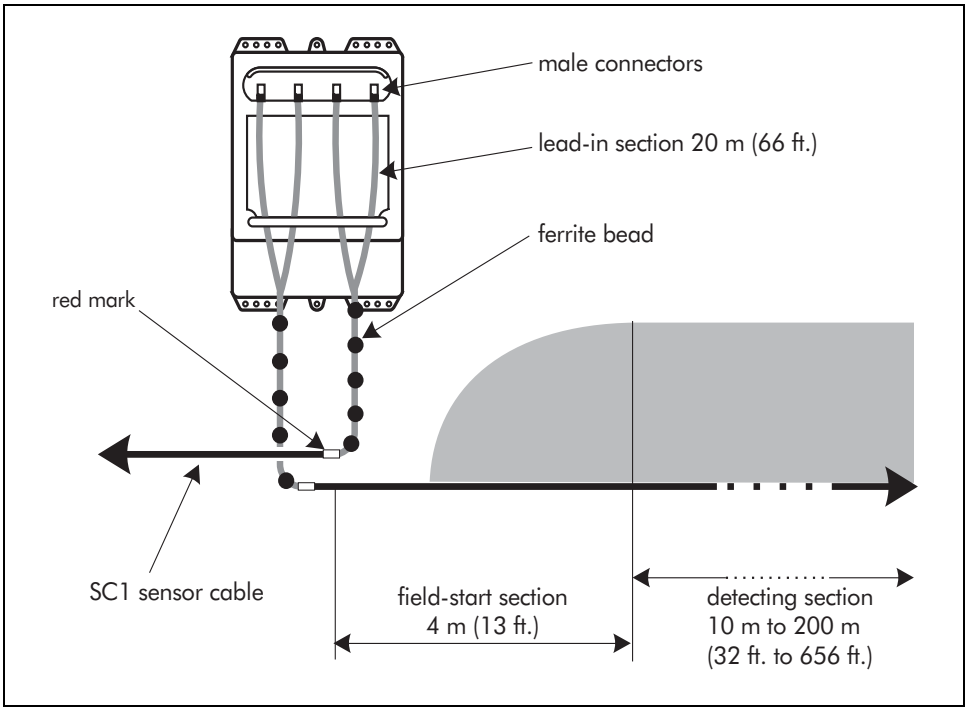
The foil prevents signals from leaking out of the cable, therefore, in the detecting section of the cable the foil has a gap so that the signals can leak out of the cable to form the detection field.

The drain braid is located opposite to the gap in the foil layer so that it does not interfere with the detecting capabilities of the cable.

This assembly is covered first with a semi-conductive black jacket, then with a durable grey jacket.

Perimitrax cables are comprised of 3 distinct sections.

- lead-in section
- field-start section
- detecting section



Lead-in section

The first 20 m (66 ft.) of the sensor cable is a non-detecting lead-in section. This section of the cable carries the RF signals between the alarm electronics and the detection field. The lead-in is identical to the detecting cable except that it has a full aluminum foil covering. This covering prevents the radio-frequency signal from escaping from the cable, and prevents the detection field from being formed.

Lead-in cable is used at the beginning of a sensor zone to prevent the Sensor Module from being included in the detection field. It is also used in other special circumstances, such as where a segment of a sensor zone must be bypassed.

Lead-in cable is manufactured as an integral part of the sensor cable. A red band on the cable marks where the lead-in stops and the field-start section begins.

Bulk lead-in is available separately in standard lengths.

Field-start section

The next 4 m (13 ft.) of the cable is the field-start section, where the detection field first forms. In this section the detection field is building up to full strength and therefore will provide only partial protection. An intruder may or may not be detected in this section. However, a 4 m (13 ft.) overlap between adjacent zones at the Sensor Module prevents any loss of detection in this section.

An extra 4 m (13 ft.) of detecting cable is provided with each cable set to accommodate the field start section. For example, a 100 m (328 ft.) cable set will include at least 104 m (341 ft.) of detecting cable in order to yield a detection zone of 100 m (328 ft.)

Detecting section

The detecting section of the cable consists of:

- a center conductor
- surrounding dielectric
- partial aluminum foil covering
- a drain braid
- flooding compound
- an inner semi-conductive, black polyethylene jacket
- an outer high-density, gray polyethylene protective jacket

The aluminum foil shield in the detecting section only partially covers the underlying dielectric. This creates an axial gap in the foil, which allows the RF signals to leak in and out of the cable and form a detection field.

To compensate for losses in the cable, the gap in the shield increases in width the farther it gets from the non-detecting end. This grading of the opening ensures that the detection field is uniform for the entire length of the sensor cable.

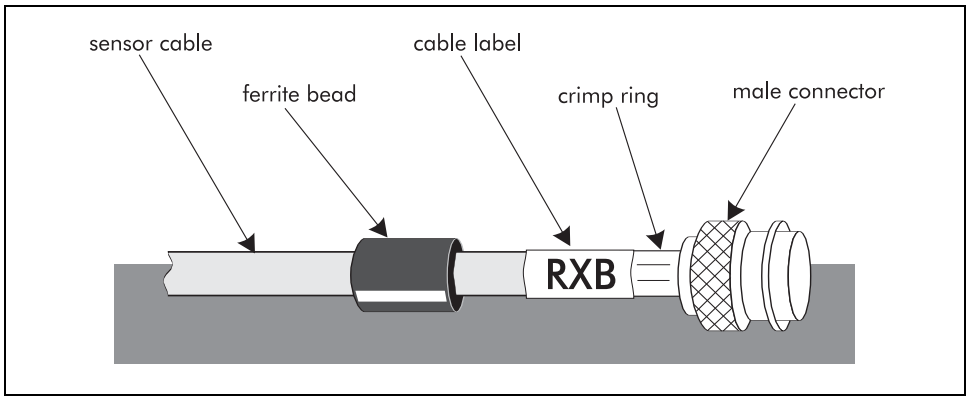
Cable lengths

Unless stated otherwise, references to cable lengths reflect the maximum detection zone length. The detecting section is available in lengths of 50 m (164 ft.), 100 m (328 ft.), 150 m (492 ft.) and 200 m (656 ft.).

An extra 4 m (13 ft.) is included to accommodate the field-start section. The non-detecting, lead-in section is supplied as a 20 m (66 ft.) length.

Cables are supplied in standard lengths, however, the lead-in and detecting sections can be cut to any length to suit the requirements of the site.

For special length requirements, contact Senstar or your local authorized dealer.



Ferrite beads

Ferrite beads prevent the detection field from following the lead-in cables back to the Sensor Module. Ten beads are installed on each lead-in cable on the SC2 or the SC1.

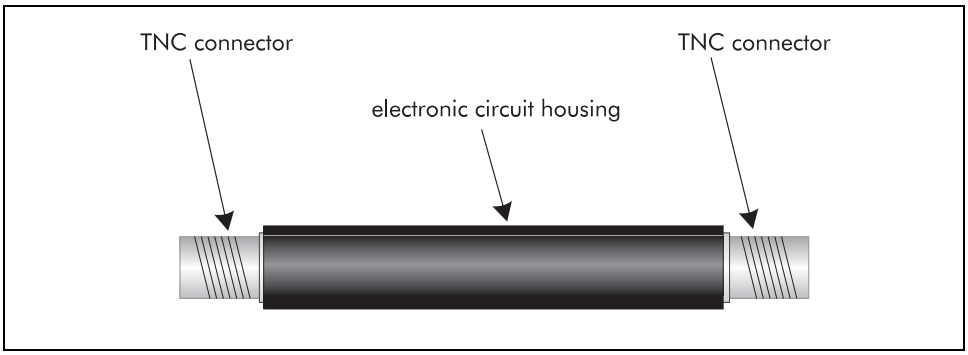
Male connectors

Male connectors are used to connect lead-in cables to Sensor Modules and sensor cables to decouplers.

Cable labels

Cable labels identify the TXA, RXA, TXB, and RXB sensor cables.

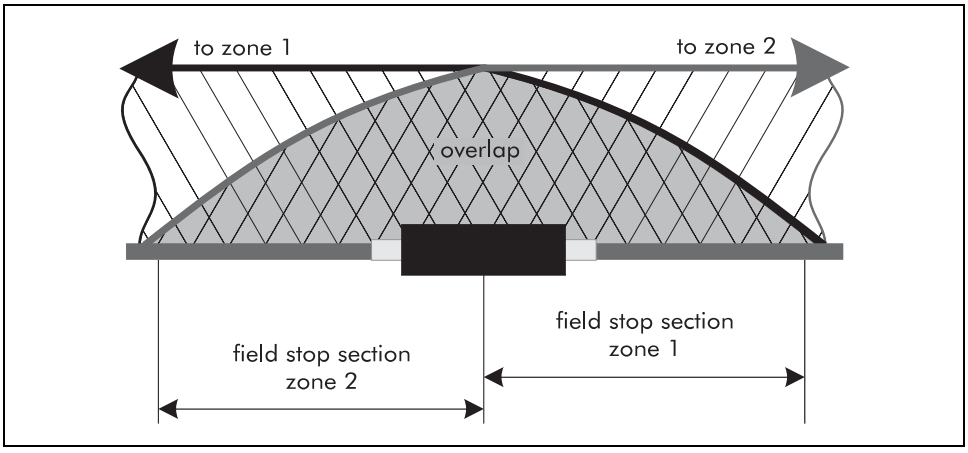
Decouplers



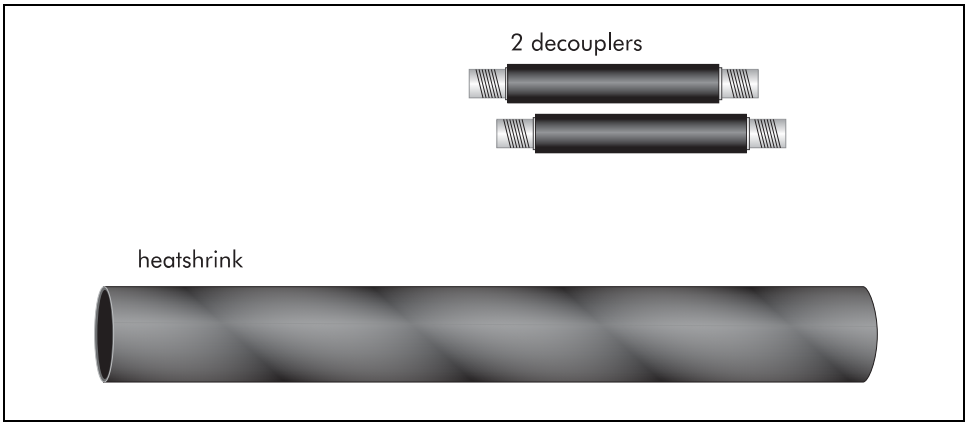
A decoupler is an electronic device. It consists of an electronic circuit housed in a cylinder and 2 integrated TNC connectors. Each end of the decoupler is identical so it can be installed in either orientation.

The decoupler terminates the RF signals in each transmit and receive sensor cable and can connect the sensor cables of two adjacent zones together.

Decouplers stop the detection field from continuing along the cable path. However, the detection field continues for 2 to 3 m (6 ft., 10 in. to 9 ft., 10 in.) beyond the decoupler, therefore, creating a natural overlap in the detection field between the two zones.



Decoupler kit



There are four decoupler kits available for use with the Perimitrax system. Generally, a decoupler kit includes:

- two decouplers
- heatshrink

The length and diameter of the heatshrink will depend on whether the decoupler kit is for the SC1 cables or the SC2 cables.

Network decoupler

There are two network decoupler kits available. One is to be used only with the SC1 cable and the other is to be used only with the SC2 cable.

These decoupler kits are used in all network installations. They terminate RF signals while allowing power and data to be transferred along the sensor cable.

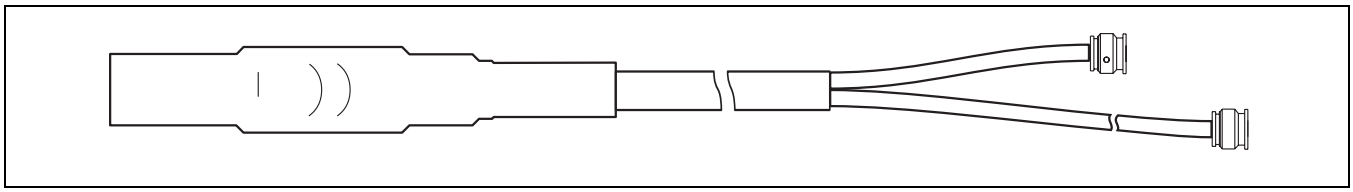
Standalone decoupler

There are two standalone decoupler kits available. One is to be used only with the SC1 cable and the other is to be used only with the SC2 cable.

These decoupler kits are used in all standalone installations, and to separate blocks of network powered Sensor Modules. For the standalone system, the decoupler provides a cable supervision resistance for cable fault detection, while allowing the RF signals to terminate and data to pass through. Power (DC) will not pass through a standalone decoupler.

Cable Terminators

A cable terminator terminates data signals at the ends of a perimeter. Terminators must be attached to decouplers at any zone end which is not connected to another zone.

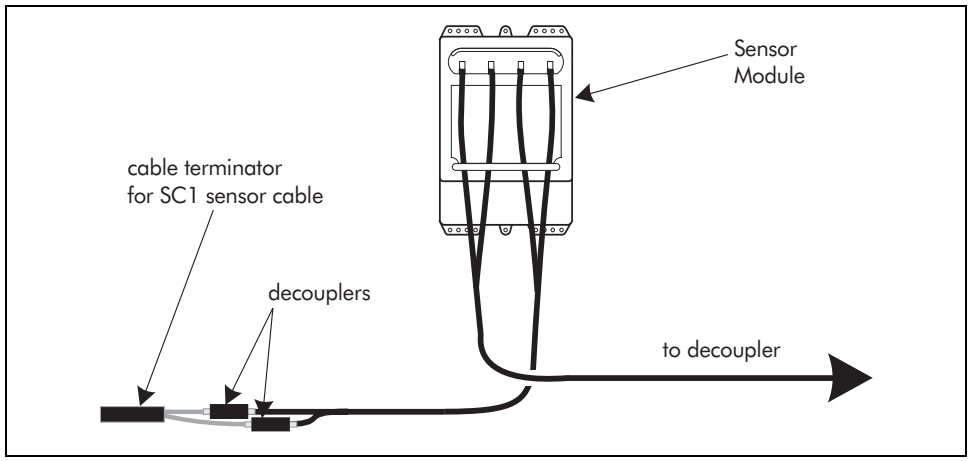


Single cable, detection zone terminator

Detection zone terminator kits incorporate a length of coaxial cable which has sufficient physical length to terminate the RF detection zone which exists outside the cables. The mini load terminator resembles a decoupler in size.

Three terminator kits are available:

- single cable, detection zone terminator (one terminator cable)
- dual cable, detection zone terminator (two terminator cables)
- mini load terminator (two terminators)

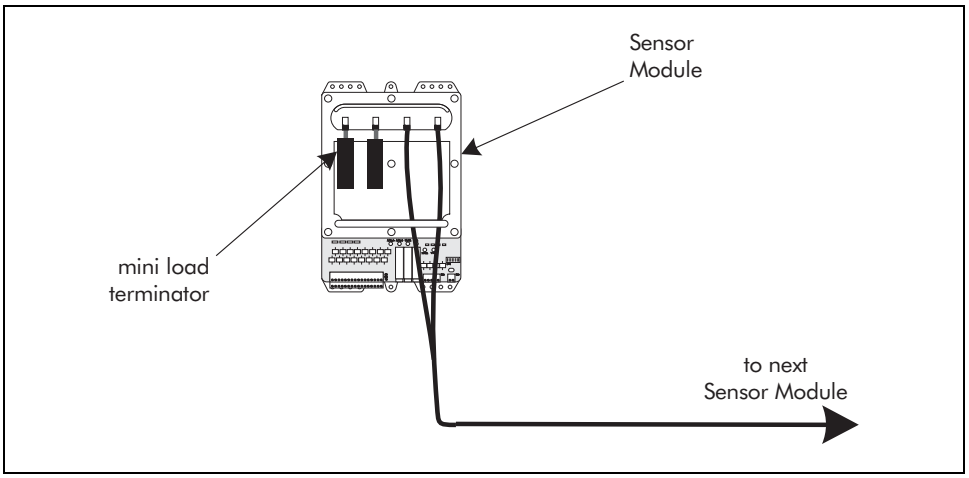


The single and dual cable terminators are 4 m (13 ft.) long. One terminator is attached to each decoupler on the last zone of a perimeter to terminate the data signals and to ensure that the detection field dissipates in a controlled manner.

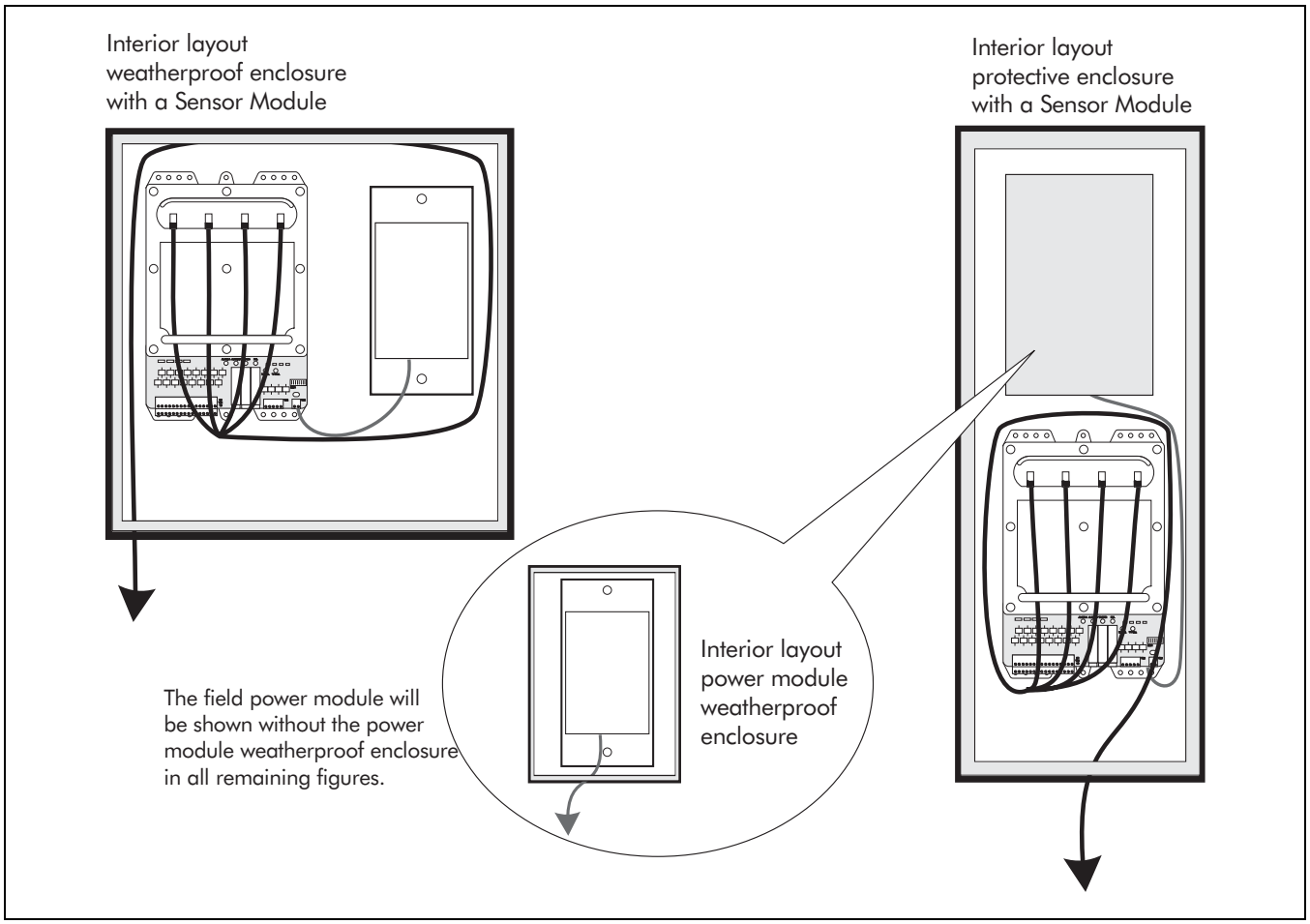
Terminators are not required, in a standalone configuration, when a single sensor perimeter forms a closed loop and the sensor cables can be joined at the decouplers. In this case each zone serves as the terminator for the other.

Mini load terminator

The load terminator is attached directly to the Sensor Module. It terminates RF signals and network data signals, and provides EOL resistance, which is important for the single unit operation.



Power supply



The Sensor Modules can be powered in two ways, locally as a standalone unit, or as part of a network. The remaining components of the system such as the Sentient Security Management System or the Network Controller contain their own power supply units.

Either the standalone or network field power module can be mounted in the NEMA enclosure along with a Sensor Module, in a weatherproof enclosure in the Telecom enclosure with a Sensor Module, or separately in a weatherproof enclosure.

Local power

A 12 VDC standalone field power module is connected directly to a Sensor Module when a local power option is selected. This option could be used in applications where there is a perimeter within a perimeter, parked aircraft, or a single unit perimeter (i.e., 2 zones). This power option requires that an AC power circuit be run directly to the Sensor Module if the 12 VDC standalone field power module is co-located with the Sensor Module.

A customer supplied power supply must meet the following specifications - 12 VDC ± 10% regulated, 500 mA minimum, maximum output 15 W.

Network power

In a network, Sensor Modules are powered in blocks. Blocks are connected using data communication cable. The cables allow the data to continue through to the next Sensor Module block, while the power remains within the block.

Network configurations can be set up to have single direction powering, redundant powering and dual direction, redundant powering. Both the redundant and dual direction, redundant power configurations provide added security against interruptions in power to the network.

In a Sensor Module block the 48 VDC network field power module is connected to any of the Sensor Modules as long as there is a maximum of 4 Sensor Modules or 1400 m (1531 yds.) running from either side of the Sensor Module where the field power module is connected. (i.e., In a Sensor Module block having 9 Sensor Modules the field power module is connected to the center Sensor Module.) The maximum power consumption is 200 W/block. See *System powering and data communication* on page 7-16.

The power provided by the network field power module runs through the sensor cables to each of the Sensor Modules and any of the auxiliary sensors in the block. This power option requires that an AC mains be run only to the Sensor Module where the network field power module is connected.

This power setup is the more economical choice when installing more than one Sensor Module or auxiliary sensors as fewer power supplies and fewer AC mains are required than for a system that is powered locally.

A customer supplied power supply must meet the following specifications - 48 VDC ± 5% regulated with isolated (floating) outputs, minimum output 150 W.

Backup power supply (UPS)

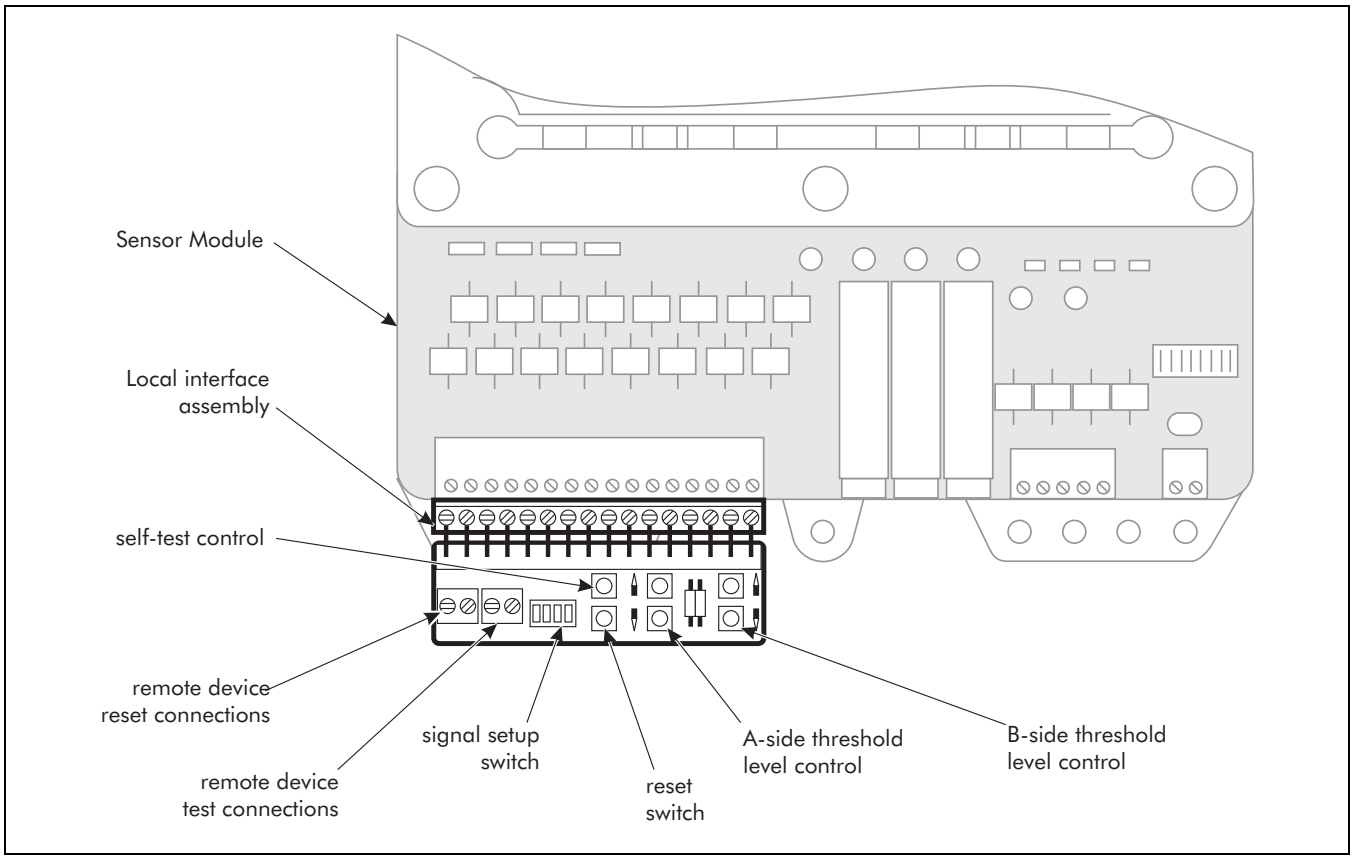
Requirements for a UPS backup power supply are dependent on the specific site requirements. The following information must be considered in selecting an appropriate UPS:

- What are the local electrical specifications?
- Will the UPS be located indoors or out-of-doors?
- What is the required run-time for your site?
- What is the required recharge time for the UPS?
- Is the UPS being connected to a local or network system?

Combined local and network power

Perimitrax systems can also use a combination of local and network powering. This option may be used in a situation where an auxiliary sensor draws a significant amount of power. In this instance, the Sensor Module block is powered by a network field power module and the auxiliary sensor is powered by a standalone field power module. The Sensor Module block and the auxiliary sensor are powered independently of each other.

Local interface assembly



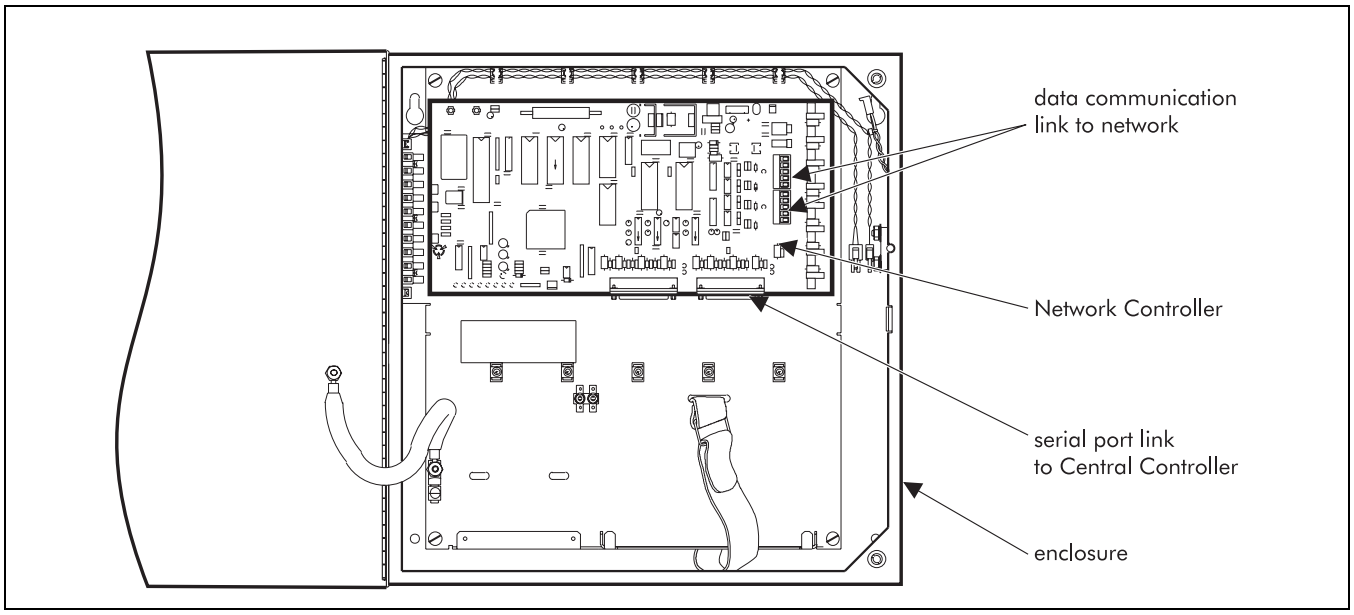
The local interface assembly provides a basic user interface for the Sensor Module. The assembly is required for calibrating standalone Sensor Modules.

This assembly can be removed after the Sensor Module has been calibrated, thus allowing you to use one local interface assembly for several Sensor Modules. The alternative is to equip each Sensor Module in a standalone based system with its own local interface assembly.

The local interface assembly can also be used in network systems to enable you to perform initial calibration on the system before the UCM has been connected.

Finally, the local interface assemble can be used to perform sensor testing at specific Sensor Modules in a network system as required.

Network controller



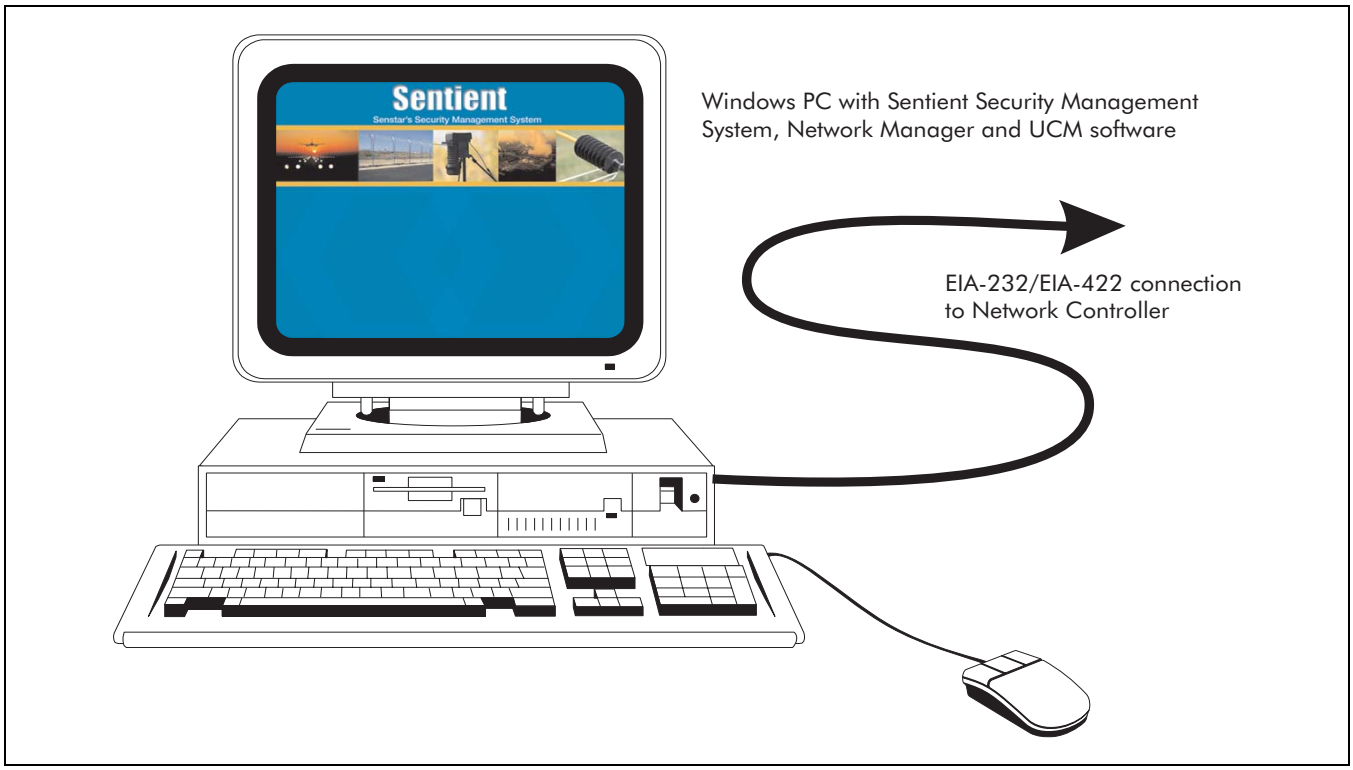
The network controller acts as the traffic director for the network. It manages all information which passes between the host system and the network. One host system may support several networks.

Options for annunciation systems include the Sentient Security Management System, or a user supplied annunciator.

The network controller supports up to 62 network devices using dual redundant RS-485 data lines and provides RS-232/422 ports for communication with alarm annunciation systems. The network controller accepts 12 VDC or 16 VAC power input. AC operation provides a charger to support UPS operation with an optional battery. This circuit card must be mounted in an enclosure.

Refer to the *Sennet product guide (M0DA0302)* for more information.

Sentient Security Management System



The Sentient Security Management System is a Winows PC-based security monitoring and control system, that can be used as the primary operator interface or as a backup sub-system operator interface. The Sentient Security Management System allows an operator to monitor and control the entire security system from a single location using a color graphics display terminal and a mouse, a keyboard or an optional touch sensitive monitor.

From the Sentient Security Management System, the operator can:

- view the current status of all sensors;
- process alarms;
- secure or access sensors;
- view an optional customized map of the site that shows the on-site locations of all sensors; and

the maintenance personnel can:

- edit operator alarm prompts, checklists and passwords; and
- define and report on alarm causes feature.

The UCM software enables maintenance personnel to:

- perform maintenance and diagnostic activities;
- perform calibration and optimization of system performance.

Senstar or your authorized dealer can provide a customized, site specific map and database on request. This option is recommended if the Sentient Security Management System is to be used as the primary operator interface, especially for larger systems.

When used as a backup system operator interface the Sentient Security Management System can be integrated into the primary alarm management system using a TCP/IP interface and the Network Manager software.

Alarm processing

The Sentient Security Management System can annunciate three different alarm conditions: sensor, tamper, and fail alarms. Alarm conditions detected by Sensor Modules, auxiliary sensors or other network devices are reported at the Sentient Security Management System's graphic display.

The Sentient Security Management System polls each Sensor Module. Each Sensor Module responds with alarm and status information. If a Sensor Module does not respond after a set number of attempts, the Sentient Security Management System signals an alarm indicating that the unit has failed.

System maintenance and testing

Testing, maintenance and troubleshooting operations can be performed from the Universal Configuration Module (UCM) a Windows based software application.

The following reports can be generated by the Sentient Security Management System or UCM either on the monitor or output to an optional printer:

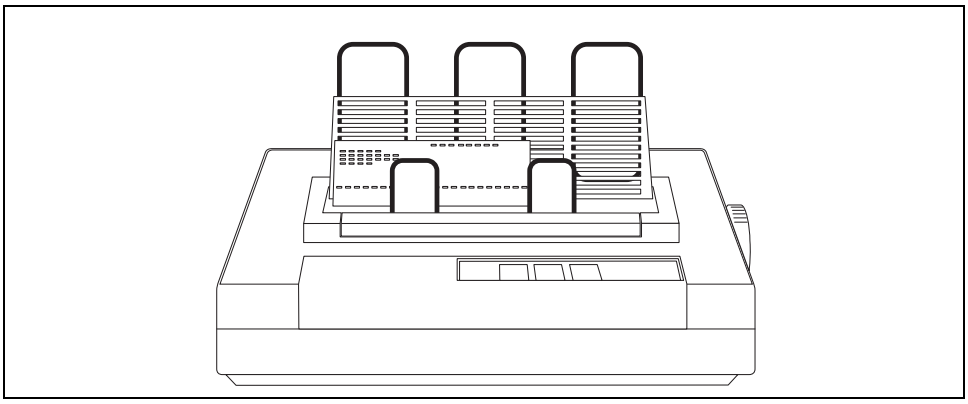
- event log
- status report
- test report
- calibration plots

The event log is a printed record of system events (e.g., zone status, alarms, operator responses to alarms, etc.) and the date and time they occurred. The event log is printed automatically.

The other reports enable technicians to:

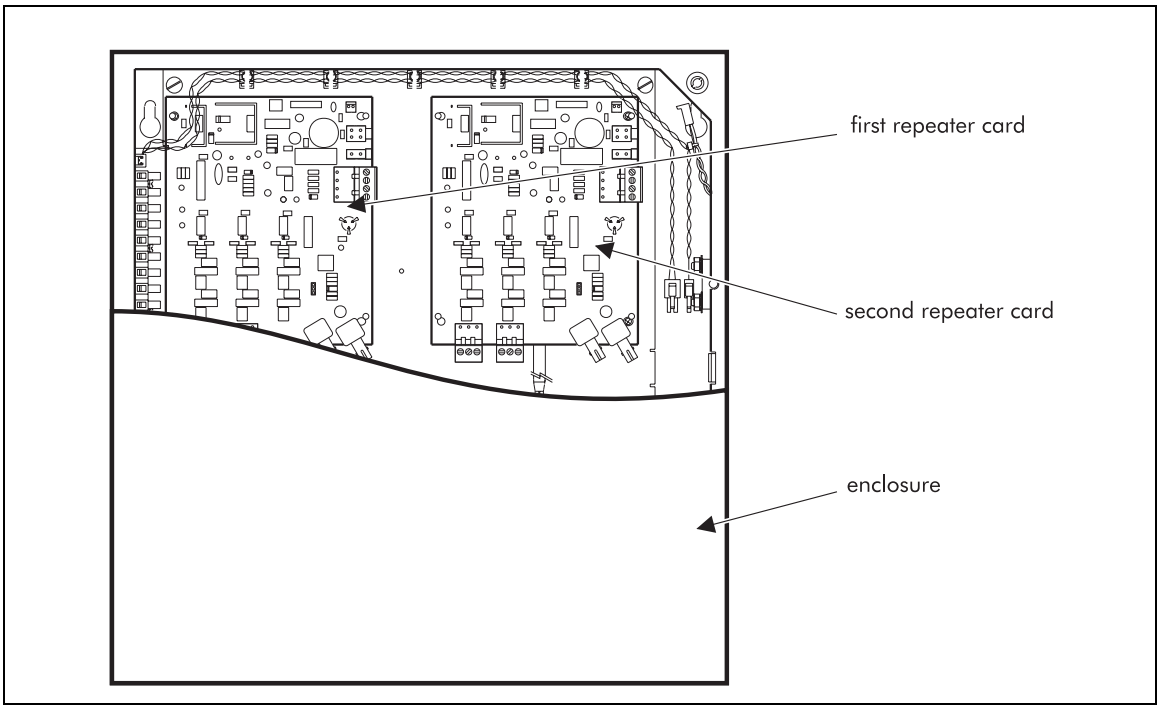
- calibrate Sensor Modules
- check system operation
- isolate equipment faults or failures

Printer



A printer can provide a printed record of system events (e.g., zone status, operator responses to alarms) and the dates and times that they occurred. The printer can also print calibration plots and maintenance and troubleshooting reports. The printing option operates with a standard Windows printer.

Repeater



In a Perimitrax system the repeater has 4 uses:

- to extend copper twisted pair wiring from the Network Controller to a Sensor Module when the distance exceeds 1.2 km (3/4 mile);
- if the number of devices on the network exceeds 27;
- between groups of sensor modules interconnected via RS-485 data lines where length limitations are exceeded. One repeater supports a single RS-485 line, two are required for dual redundant configurations; and
- to connect the copper compatible Sensor Modules to a fiber optic network.

The repeater uses the same enclosure and powering options as the Network Controller. One enclosure can accommodate two repeaters if required.

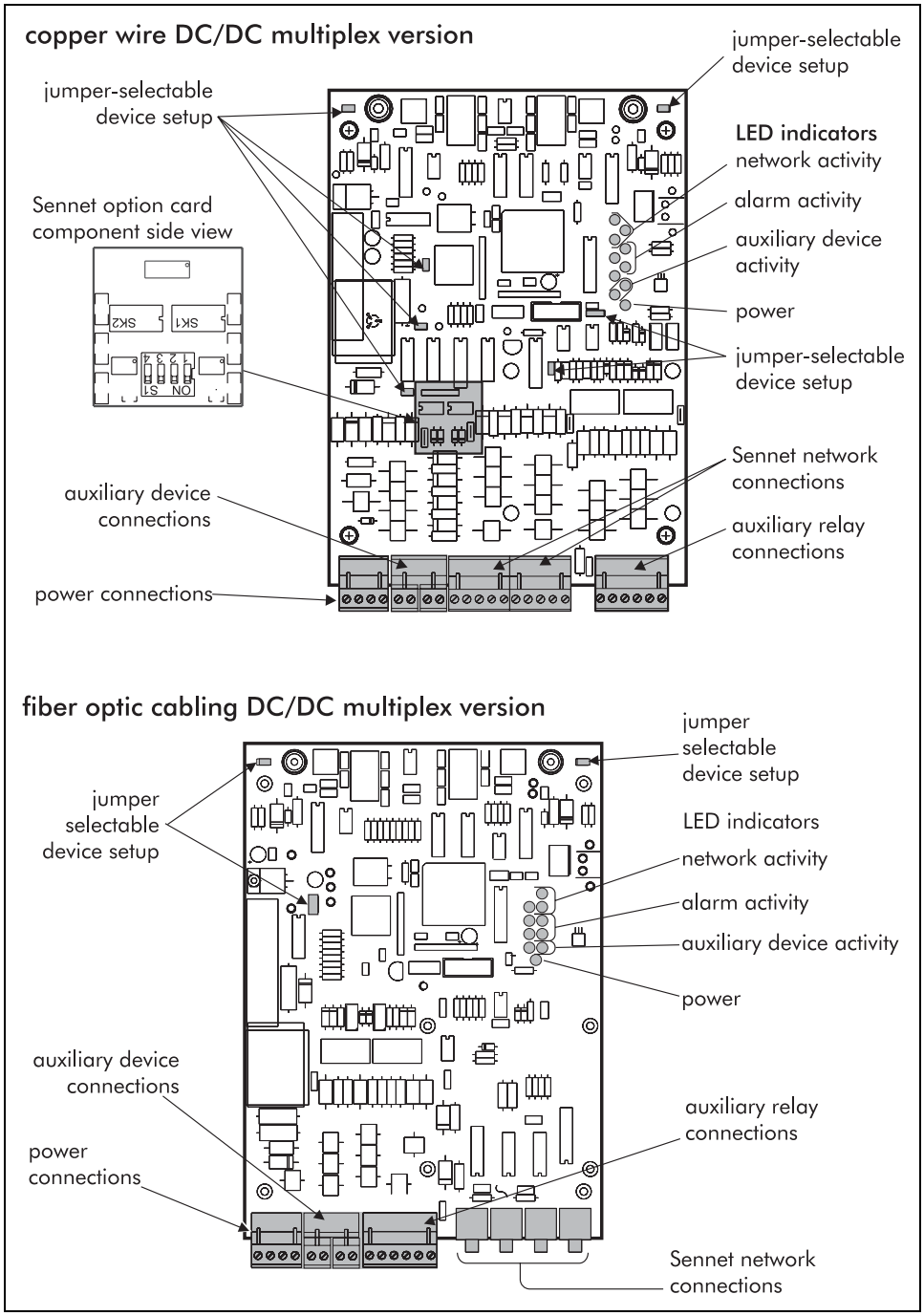
Refer to the *Sennet product guide, M0DA0302* for more information.

Intelli-FLEX™ Multiplex version processor

The Intelli-FLEX™ multiplex version processor is a Perimitrax-compatible device. As such, this processor can be integrated into any Perimitrax network. This feature allows the direct integration of fence-mounted microphonic intrusion detection capabilities into the Perimitrax system. For more information refer to *Intelli-FLEX ™ product guide - multiplex version (C6DA0402)*.

features

- 2 auxiliary device inputs
- 2 built-in auxiliary control relays
- lightning, EMI and RFI protection
- network end-of-line termination circuits - jumper-selectable
- quick connection to network - removable terminal blocks
- LED lighting option - jumper-selectable
- 12V low supervision indication - jumper-selectable
- half duplex communication option - jumper-selectable
- 3 LEDs - communication activity indicators
- 6 LEDs - alarm activity indicators
- 1 LED - power activity indicator



6 Site analysis

Introduction

Every outdoor intrusion detection system site has particular conditions that affect the configuration and placement of the components. This is true of Perimitrax for the sensor cables and sensor electronic modules. How some of these conditions can affect the application of this sensor is explained in this chapter.

This chapter serves as a guideline to analyzing features that commonly appear in a buried cable system site. A checklist has been provided to assist you with your research.

Chapter 7, System design, illustrates how to deal with features that may be found during the site analysis.

Checklist - Site analysis

Required tools

- copy of checklist
- copy of site survey
- camera or camcorder (optional)
- measuring tape
- paper and pen

✓	Description	Reference
	Obtain a site plan	See *Site records*, page 6-3
	photographs or video recording of site	See *Site photographs*, page 6-3
	measurements	See *Measurements*, page 6-3
	description of local weather conditions	See *Weather conditions*, page 6-4
	indicate proposed cable path on site survey	
	Indicate all installation mediums	See *Installation medium*, page 6-5
	locate places where installation medium changes	See *Installation medium*, page 6-5
	soil	See *Soil*, page 6-5
	concrete or asphalt	See *Concrete or asphalt*, page 6-5
	crushed stone or rock	See *Crushed stone or rock*, page 6-6
	landfill	See *Landfill*, page 6-6
	grade changes	See *Grade changes*, page 6-6
	locate all obstacles on site survey	See *Obstacles*, page 6-7
	fences	See *Fences*, page 6-7
	buildings, gateways and other structures	See *Buildings, gateways and other structures*, page 6-7
	moving objects	See *Moving objects*, page 6-8
	water	See *Water*, page 6-8
	pipes, conduits and electrical cables	See *Metallic objects or obstructions*, page 6-8

Site records

The first step in installing a Perimitrax system is to have a site survey completed. The survey will assess site conditions in order to determine where and how the system should be installed and whether an SC1 or a SC2 system is more appropriate.

Site survey

Obtain a survey of the site drawn to scale. The survey should show the exact location of:

- buildings and other structures
- roads and driveways
- fences
- underground pipes
- electrical conduits
- water and drainage pipes
- bodies of water (pools, ponds, etc.)
- proposed location of cable path

Site photographs

If possible, take photographs or a video recording of the proposed sensor cable path paying special attention to any irregularities, obstacles, or limitations along the proposed cable path. These features may affect the design and installation of the system. In order to provide complete coverage of the proposed cable path, photographs should be taken in sequence with slightly overlapping views. A measuring stick could be included in the photographs to provide scale. The photographs should be numbered so they can be kept in the correct sequence.

Measurements

If measurements are not indicated on the site survey, take measurements along the perimeter. Include the size, spacing, and location of fences, buildings, roads, and other obstructions on the proposed cable path. Record these measurements on the site survey.

Weather conditions

Severe changes in weather may affect the system. You should be aware of seasonal patterns in the region. Inquire with local authorities about the weather conditions. Note such details as temperature range and monthly average rainfall and snowfall.

Completing the site survey

Tour the site and review the site survey, photographs, and measurements. Verify the accuracy of the site survey and the measurements. Walk along the proposed cable path. Mark on the site survey any relevant information about the installation mediums, obstacles, and surface grading, according to the guidelines in the following sections.

Using the site analysis checklist as a guide make sure that all applicable areas have been reviewed. See *Checklist - Site analysis*, page 6-2.

Contact Senstar or your authorized Perimitrax dealer for any questions that you may have regarding a Perimitrax system.

Installation medium

The Perimitrax systems can be installed in most natural ground environments. However, the size and field strength level of the detection field generated by the sensor cables can vary in different installation mediums. In general, the detection field is larger with a higher field strength in light soils, asphalt, and concrete, and more compact with a lower field strength in heavy soils. Heavy soils, however, normally yield the most uniform installed system performance.

All installation mediums (concrete, asphalt, gravel and soil, etc.) located on the proposed path of perimeter, and the locations of their boundaries, must be recorded on the site survey. The rough composition of the soil and the presence of any vegetation should also be recorded.

Soil

Soil types can vary from dry, sandy soil to heavy clay. Sand is considered a light soil because it does not have any appreciable electrical properties. Clay is considered a heavy soil because it has significant electrical properties, including a high conductivity and/or a high relative dielectric. See *Soil*, page 7-3 for layout guidelines.

Extremes of natural soil types such as very dry sand and moisture saturated heavy clay may require variations in the installation method.

See application notes 7, 8 and 9 (A3DA0709, A3DA0809 and A3DA0909) or contact Senstar Customer Service for information about installing Perimitrax cable in extreme soil types.

Concrete or asphalt

When surveying the site, watch for slab joints and cracks. Mark the location of all cracks and joints on the site survey.

Also attempt to determine the presence and depth of any re-bar or screening that may be present in concrete media.

See *Concrete or asphalt*, page 7-4 for layout guidelines.

Crushed stone or rock

Clear crushed stone or natural rock larger than 1 cm (3/8 in.) can damage installed cables. These mediums can also cause nuisance alarms during heavy rains because rainwater drains rapidly through the rocks, much like running water.

Consequently, crushed stone that extends from the surface to the sensor cable burial depth is not recommended as a burial medium. If this condition exists at a site, a sand topping and sand backfill in trenches can be used to protect the cables and fill the voids in the medium to provide better rainfall rejection.

Crushed stone as a topping or surface treatment is acceptable so long as its depth is less than approximately one-half of the sensor cable burial depth.

See *Crushed stone*, page 7-5 for layout guidelines.

Landfill

Avoid laying the cables in areas that are filled with debris containing large metallic objects.

See *Landfill*, page 7-5 for layout guidelines.

Grade changes

The surface grade along the proposed cable path must not change by more than 30 degrees within 4 m (13 ft.). If the change in the surface level is too great, fill or grade the terrain to meet the prescribed limit.

See *Grade changes*, page 7-6 for layout guidelines.

Obstacles

The presence of obstacles on the site can affect the routing of the sensor cable path and the detection field. These obstacles include, but are not limited to:

- fences
- buildings or other structures
- roads, walkways, or parking areas
- surface water (including water that collects after a rainfall)
- underground pipes, conduits or electrical cables.
- large metallic objects

Anything that could be seen as an obstacle should be noted on the site survey.

Fences

The type of fence as well as the distance of the cable path from the fence is important. The Perimitrax sensor cables must be kept certain distances away from fences of the different classes.

Intermittent electrical contacts made at metallic junctions and wind motion of the fence itself can cause nuisance alarms because of poor quality fencing.

See *Fences*, page 7-8 for layout guidelines.

Buildings, gateways and other structures

If the detection field is allowed to encroach upon the wall, the system may detect moving occupants or objects inside the building resulting in nuisance alarms. If protection is required to close upon a wall, an auxiliary sensor such as a microwave, or active or passive Infrared system must also be used to augment the Perimitrax detection zone at that location.

See *Buildings, gateways, and other structures*, page 7-10 for layout guidelines.

Moving objects

If a detection field is located too close to an area where there are large moving objects such as vehicles, medium or large animals, nuisance alarms could result. This could include areas such as roads, walkways or parking areas, and wooded areas.

See *Moving objects*, page 7-12 for layout guidelines.

Water

Water that accumulates in puddles (standing water) or water flowing through underground, non-metallic pipes can cause nuisance alarms. Ensure that there is adequate drainage around the perimeter and that water does not accumulate on the proposed cable path. If the local climate includes a rainy season, check with local authorities to determine the effects of heavy rainfall on the site surface.

See *Water*, page 7-15 for layout guidelines.

Metallic objects or obstructions

Metallic objects located near the sensor cables can distort the detection field, causing uneven sensitivity. Differences in soil composition make it difficult to predict the precise effect at a particular site.

See *Metallic objects or obstructions*, page 7-12 for layout guidelines.

7 System design

The next step is the actual design of the system. The information gathered in chapter 6, Site analysis, is used to make the decisions that are necessary to provide the most appropriate cable path. It will also be used to determine the system components and their quantities that are required to build an effective Perimitrax system for your site.

This chapter provides a guideline to use this information.

A checklist has been provided to assist in system design.

Checklist - system design

Required information

- clean copy of site survey
- information obtained from Site analysis, chapter 6
- System design checklist, chapter 7
- System component list, appendix b

Procedure

✓	Description	Reference
	Adjust proposed cable path to accommodate:	
	Changes in installation medium	See *Installation mediums*, page 7-3
	Locations of obstacles	See *Obstacles*, page 7-7
	Zone layout details	
	Indicate total perimeter size (length) and the beginning and end of the perimeter	See *Starting the perimeter*, page 7-24
	Indicate physical zone boundaries	See *Sensor zone boundaries*, page 7-25
	Indicate length of each sensor zone	See *Sensor zone length*, page 7-24
	Indicate locations and sizes of corners	See *Corners*, page 7-30
	Indicate burial depth of cables in each zone	See *Sensor cable burial depth*, page 7-28
	Indicate cable spacing in each zone (if using SC2 cables)	See *Sensor cable spacing (SC2)*, page 7-29
	Equipment location	
	Indicate location of Sensor Modules, decouplers, terminators, power modules, network controller, Sentient Security Management System, repeaters, printer, etc.	See *Equipment location*, page 7-35, *Placement of decouplers*, page 7-29, *Sentient Security Management System and display terminal location*, page 7-36, *Printer location*, page 7-36, and *System powering and data communication*, page 7-16
	Prepare interconnect diagram	See *Electrical interconnection diagram*, page 7-37
	Equipment requirements	
	Fill out Site planning equipment checklist	
	Prepare revised site drawings	See *Site plan*, page 7-37

Installation mediums

In order to obtain the best performance for a given detection threshold setting the cable should be buried in zones consisting of a single installation medium wherever possible.

Sensor cable burial depth varies according to the installation medium. See *Sensor cable burial depth*, page 7-28.

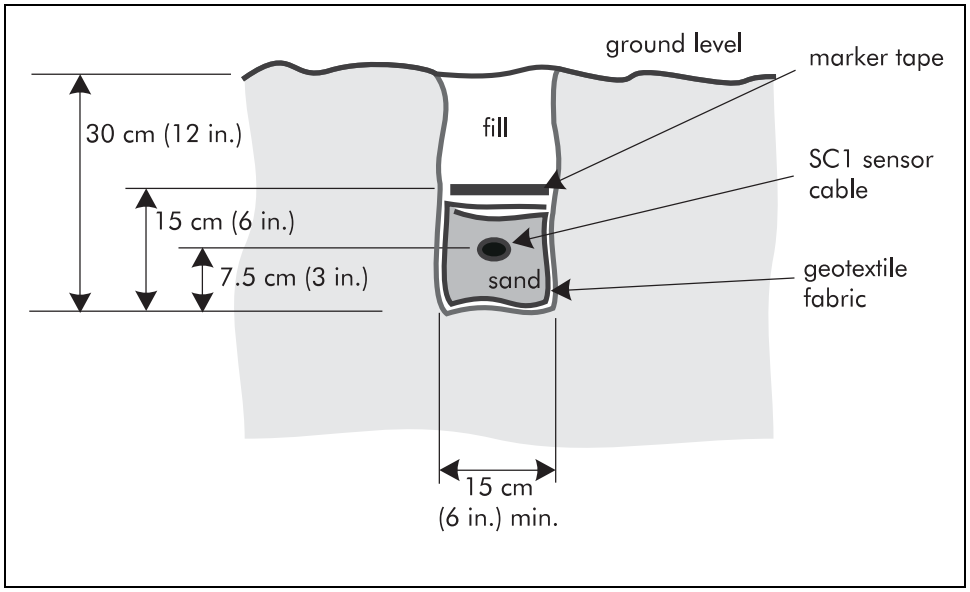
Soil

Perimitrax cables are buried in soil, sand, and clay in trench(es) normally dug to a depth of 30 cm (12 in.).

Extremes of natural soil types such as very dry sand and moisture saturated heavy clay may require variations in burial depths and installation methods.

See application notes 7, 8 and 9 (A3DA0709, A3DA0809 and A3DA0909) or contact Senstar Customer Service for information about installing Perimitrax cable in extreme soil types.

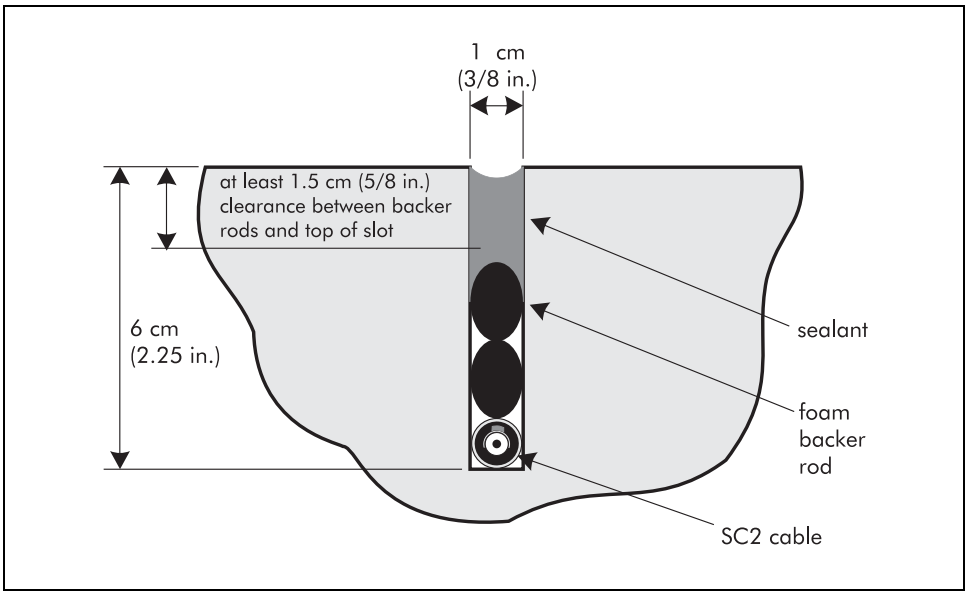
The SC2 cables require two parallel trenches, the SC1 cable requires one trench.



Sensor cable installation in soil

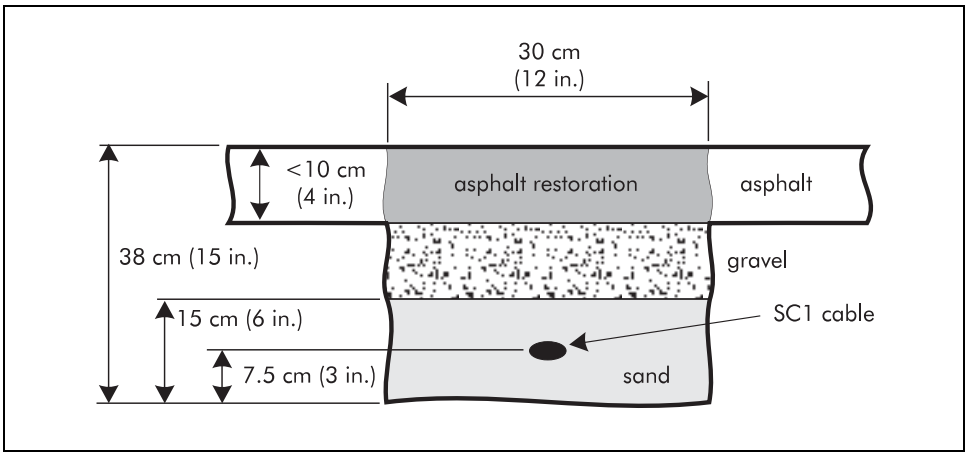
For a premium quality installation, each trench should be lined with geotextile fabric to protect the cable and its sand buffer from erosion and physical damage.

Concrete or asphalt



SC2 sensor cable installation in concrete or asphalt more than 10 cm (4 in.) thick

In concrete or asphalt that is more than 10 cm (4 in.) thick, the cables are typically installed in slots 6 cm (2.25 in.) deep and 1 cm (0.375 in.) wide. A backer rod is installed over the cable, then the slots are filled with sealant.



SC 1 sensor cable installation in asphalt less than 10 cm (4 in.) thick

In concrete or asphalt that is less 10 cm (4 in.) thick the cables are typically buried at a depth of 38 cm (15 in.). The cable is then laid on 7.5 cm (3 in.) of sand. It is covered with an additional 7.5 cm of sand and up to 13 cm (5 in.) of gravel before the 10 cm (4 in.) slab of concrete or asphalt is restored.

Cables can be installed in metal reinforced concrete. However, the cables must be installed above the metal by at least one-half of the burial distance. For example, if the cable is to be buried 6 cm (2.25 in.) deep in metal reinforced concrete, the metal must be at least 9 cm (3.75 in.) deep.

Avoid routing the sensor cables through cracks and joints. However, if this is not possible, it is recommended that the cables meet joints in concrete or asphalt at angles greater than 30 degrees.

Crushed stone

Crushed stone as a topping or surface treatment is acceptable so long as its depth is less than approximately one-half of the sensor cable burial depth.

Installation in clear crushed stone which is deeper than the cable burial depth is not recommended. This is due to the fact that water can rapidly flow in the media near the sensor cables causing a nuisance alarm state.

If this situation cannot be avoided, use geotextile fabric and sand in the trench to surround and protect the cable(s). The geotextile fabric will keep the sand in place around the cable. Sand applied over the zone as a topping will further improve detection performance during rain.

Landfill

Decaying metallic objects can cause nuisance alarms, because their electrical properties can alter sporadically as ground conditions change. The metal objects can also cause variations in sensitivity and the size of the detection field.

If the area appears to have been filled with debris, use a metal detector to check for metallic material. Verify and remove any significant findings where possible.

If it is suspected that the soil has been significantly altered by chemical contaminants, a soil analysis for electrical and chemical properties should be done.

Contact Senstar or your authorized Perimitrax dealer for assistance in interpreting the test results.

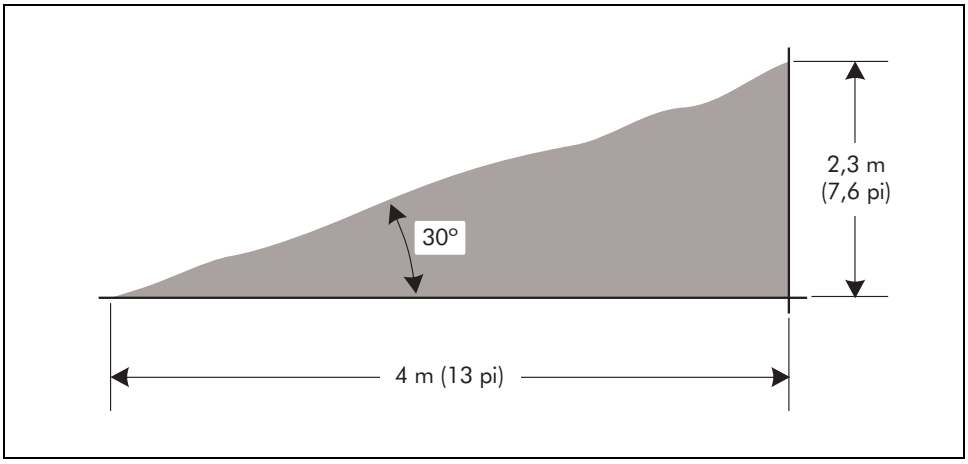
If an area is filled with slag, or crushed metallic ores take some soil samples and examine them for metallic material content. Check the samples with a magnet to determine if magnetic properties exist.

If significant metallic content is suspected or found, contact Senstar or your authorized Perimitrax dealer for applications advice.

Other objects located below the ground and near the surface may cause nuisance alarms. These should be located, on the site survey and identified if possible.

Grade changes

For optimal detection performance the surface grade along the proposed cable path must not change by more than 30° within a 4 m (13 ft.) incline. If a change in the surface level is too great, fill or grade the terrain to be as gradual a change as possible.



Grade changes

Obstacles

Special attention should be paid to obstacles when designing the site.

Obstacles located on or near the proposed cable path can cause security problems. If the obstacle is tall, for example, it may be used to attempt to defeat the security system.

Also consider the presence of obstacles on the perimeter when designing the cable spacing. Identify the perimeter obstructions indicated on your site plan and ensure that the recommended space is left between the sensor cable(s) and each obstruction.

The following information serves as a guideline for dealing with obstacles.

If your installation includes obstructions that present a special case not described in this manual, contact Senstar or your authorized Perimitrax dealer. Include sketches that show dimensions in the problem areas and photographs, if possible.

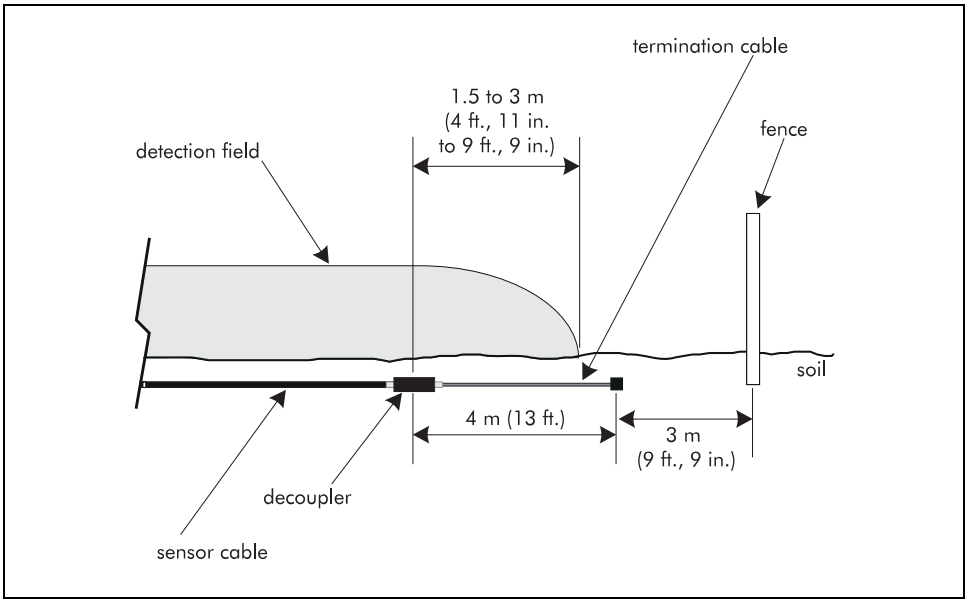
Keep the sensor cable(s) as far away as possible from all above and below ground obstacles. The minimum recommended separation distance between the cable route and any obstacle is 1.5 m (4 ft., 5 in.). The separation distance is measured from the centerline of the detection zone to the object.

In all cases the separation distance between the sensor cables and the obstacle is dependent on the type of obstacle being avoided and the installation medium where the sensor cables will be installed.

Decouplers and obstacles

Where decouplers are installed, make sure there is both sufficient detection and enough distance for the detection field to dissipate, especially if the perimeter ends near an obstacle. In medium and heavy soils, the detection field dissipates in 2 to 3 m (6 ft., 7 in. to 9 ft., 10 in.) past the decouplers. In light soils, the detection field can continue for greater distances past the decouplers.

Make sure there are no obstacles that could cause nuisance alarms in the area beyond the decouplers.



Decoupler located near obstacle

Fences

Sensor cables cannot be installed under chain-link fences. The fence disrupts the detection field, resulting in an area of low sensitivity before and after the fence line. It can also be a source of nuisance alarms. If the sensor must cross a metallic fence line, the segment of the fence over the sensor cables must be replaced with a non-metallic material (e.g., plastic or fibreglass fabric, a polycarbonate sheet, etc.) which will provide an adequate physical barrier.

A detection field can cross a fence line in one of two ways:

- Replace the metallic fence fabric with a non-metallic barrier where the cable crosses the fence-line.
- Inhibit the Perimitrax system in the vicinity of the crossing fences. An auxiliary sensor can be used to provide coverage in the area of the crossing. The area covered by the auxiliary sensor should overlap the Perimitrax system coverage.

Sensor cables can be installed between parallel fences using the cable spacing and separation distances described in the following table.

Obstacles	Light soil (e.g., sand, gravel)	Asphalt/concrete	Medium soil (e.g., loam)	Heavy soil (e.g., clay)
High quality fence (e.g., welded wire)	3 m (9 ft., 9 in.)	2.5 m (8 ft.)	2.5 m (8 ft.)	2 m (6 ft., 6 in.)
Medium-quality fence (e.g., chain link)	3.5 m (11 ft., 4 in.)	3.2 m (10 ft., 5 in.)	3.2 m (10 ft., 5 in.)	3 m (9 ft., 9 in.)
Low-quality fence (e.g., vinyl coated chain link, razor wire)	5.5 m (18 ft.)	4.5 m (14 ft., 8 in.)	3.5 m (11 ft., 4 in.)	3 m (9 ft., 9 in.)
Cables installed parallel to a building	3 m (9 ft., 9 in.)	2.5 m (8 ft.)	2.5 m (8 ft.)	2 m (6 ft., 6 in.)
Cables terminating perpendicular to a fence or building	7 m (23 ft.)	7 m (23 ft.)	7 m (23 ft.)	7 m (23 ft.)
Moving metallic objects (e.g., cars, bicycles, trucks)	5.5 m (18 ft.)	5.5 m (18 ft.)	5 m (16 ft., 3 in.)	4.5 m (14 ft., 8 in.)
Portable objects (e.g., lumber, cable spools, pipes)	1.5 m (4 ft., 5 in.)	1.5 m (4 ft., 5 in.)	1.5 m (4 ft., 5 in.)	1.5 m (4 ft., 5 in.)
Standing surface water	1.5 m (4 ft., 5 in.)	1.5 m (4 ft., 5 in.)	1.5 m (4 ft., 5 in.)	1.5 m (4 ft., 5 in.)

High quality fence. A very rigid structure with no possibility of intermittent electrical contacts (e.g., a welded metal fence with concrete poles).

Medium-quality fence. A rigid structure, such as a standard chain-link fence, that moves less than 1.3 cm (0.5 in.) at a height of 2.5 m (8 ft.) above ground under worst-case wind conditions. Fence fabric is normally tensioned for less than 1.3 cm (0.5 in.) movement under a 13.6 kg (30 lb.) pull.

Low-quality fence. All other categories of stationary metallic objects (e.g., vinyl coated fence, loose support wires, loose fabric chain-link fences).

Light soil. Soil with low electrical conductivity generally with little vegetation, i.e., sandy soil, gravel.

Asphalt or concrete. Most similar to a light soil with moderate electrical conductivity, i.e., roadway, sidewalk.

Medium soil. A soil with moderate conductivity that generally supports vegetation, i.e., loam.

Heavy soil. A soil with high alkaline content, sticks to feet when wet, baked solid when dry, i.e., heavy clay with little sand content.

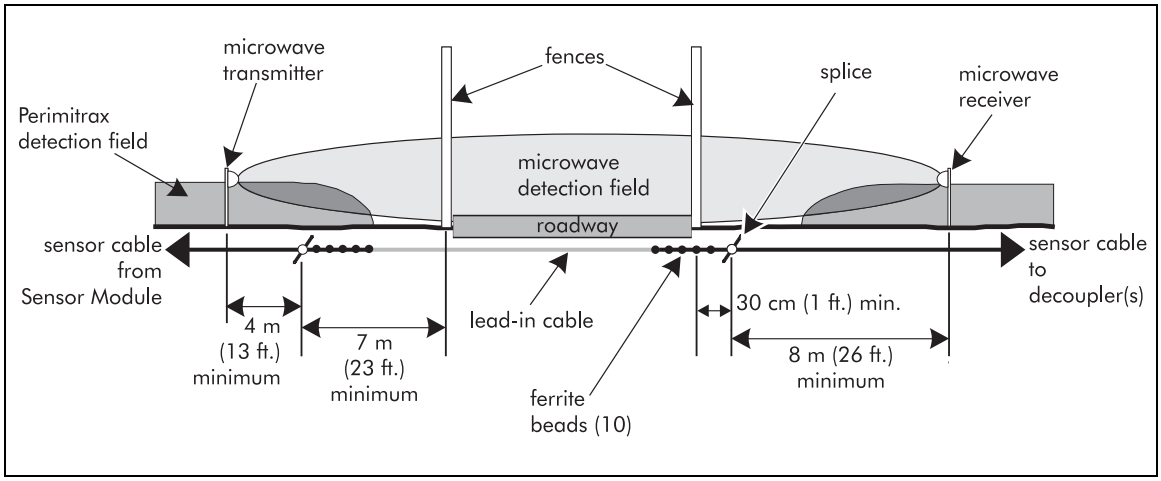
Buildings, gateways, and other structures

If the cable path approaches a building straight-on (ends perpendicular to a building), the sensor cables must be decoupled at least 7 m (23 ft.) away from the wall. If the detection field is allowed to encroach upon a building wall, the system may detect moving occupants or objects inside the building resulting in nuisance alarms.

The Perimitrax detection zone SHOULD NOT be used to attain closure to a building or any other obstacle.

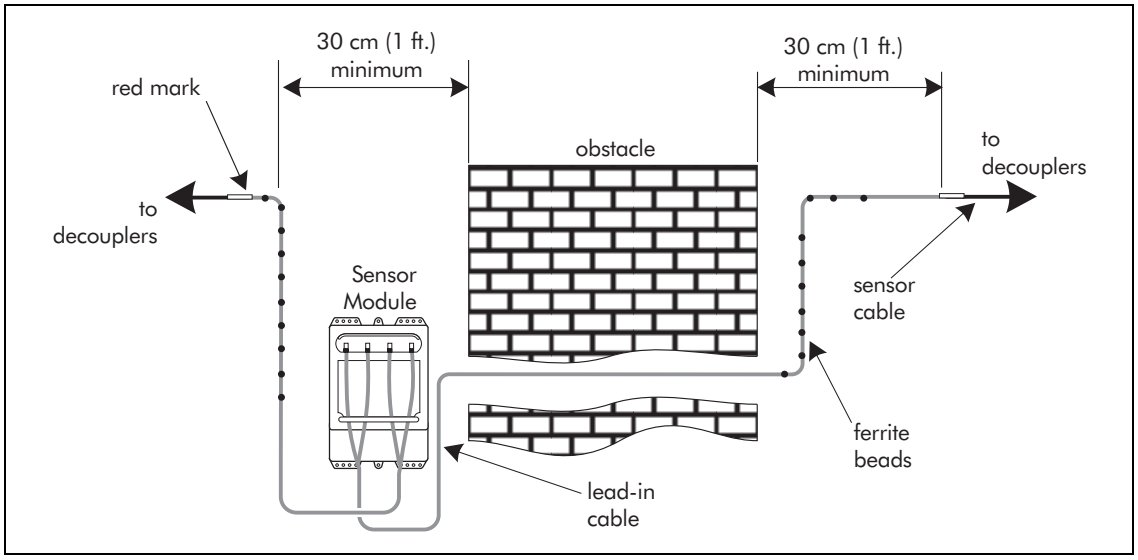
If protection is required to close upon a wall, an auxiliary sensor such as a microwave sensor, or active or passive Infrared system should be used to augment the Perimitrax detection zone at that location.

A Perimitrax system can be designed to bypass buildings, gateways, and other structures. The gate bypass example illustrates one method of providing a complete detection system over the gate area by combining the Perimitrax detection zone with an auxiliary sensor, a microwave in this application.



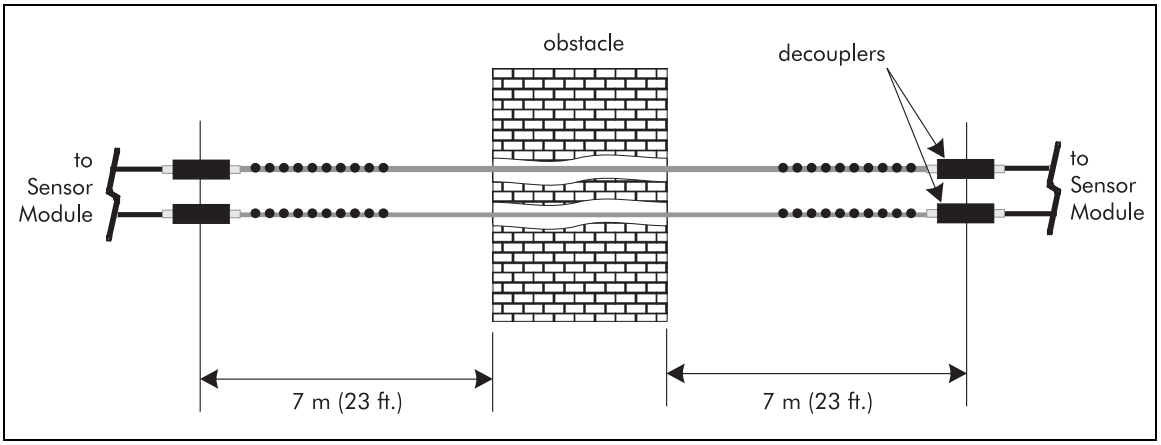
Gateway bypass

A Sensor Module can be positioned near the obstacle so that the zones start on either side of the obstruction.



Zones begin on both sides of the obstacle

Lead-in cable can be spliced into the sensor cable in the area of the obstruction. If this method is being used, an equivalent length of sensor cable must be removed to ensure that the correct portion of the sensor cable is used for the remainder of the zone. (When splicing lead-in cable between active sensor cable sections, mark the section of sensor cable that is removed so that it isn't accidentally used as lead-in cable.) When the obstacle is located between the end of two zones, decouplers are placed on either side of the obstacle. The standard dimensions for ending a zone apply.



Obstacle is located between the ends of two zones

If a road crossing through a zone in soil does not need to be bypassed or masked as a separate zone from alarms, simply dig the required number of trenches across the road and bury the sensor cables 30 cm (12 in.) below the road surface. The installation depth in this case is greater than normal, because of an expected higher sensitivity over the zone caused by the underlying gravel road bed.

Moving objects

The required separation distance between the sensor cables and moving vehicles depends on the burial medium.

When Perimitrax is properly calibrated, small animals weighing 5 kg (11 lb.) or less are unlikely to be detected. Avoid areas where medium or large animals (over 5 kg) are not controlled. Animals in this size category will have some probability of being detected. The detection probability generally increases with size.

Extremes of natural soil types such as very dry sand and moisture saturated heavy clay may require variations in burial depths and installation methods.

See application notes 7, 8 and 9 (A3DA0709, A3DA0809 and A3DA0909) or contact Senstar Customer Service for information about installing Perimitrax cable in extreme soil types.

Type of object	Burial medium			
	Light soil (sandy)	Asphalt	Medium soil (loam)/concrete	Heavy soil (clay)
Moving metallic objects (e.g., cars, bicycles, trucks)	5.5 m (18 ft.)	5.5 m (18 ft.)	5 m (16 ft., 3 in.)	4.5 m (14 ft., 8 in.)

Metallic objects or obstructions

Metallic objects in or near a zone will not necessarily affect the performance of the system. You may need to address any resulting variations in sensitivity due to the presence of the object.

- electrical contacts to be avoided
- check for containment (redirection of a detection field)
- beware of variations in sensitivity - check detection

Use the following guidelines to assist in planning for and overcoming the effects of metallic objects.

Pipes, conduits, and electrical cables

If a pipe, conduit, or electrical cable is buried in the zone it may have an affect on the system. To be assured of trouble-free operation objects should be separated from the sensor cables by the distances listed in the following table. The separation distances indicated are minimum requirements. If more space is available, separation distance should be increased.

Non-metallic pipes or conduit that are shielded or wrapped with foil are equivalent to metallic pipes or conduit.

If replacing an older leaky cable system, the old cables should be removed. If this is not possible, the new cable must have a minimum separation distance of 3 m (9.8 ft.) from the old cable.

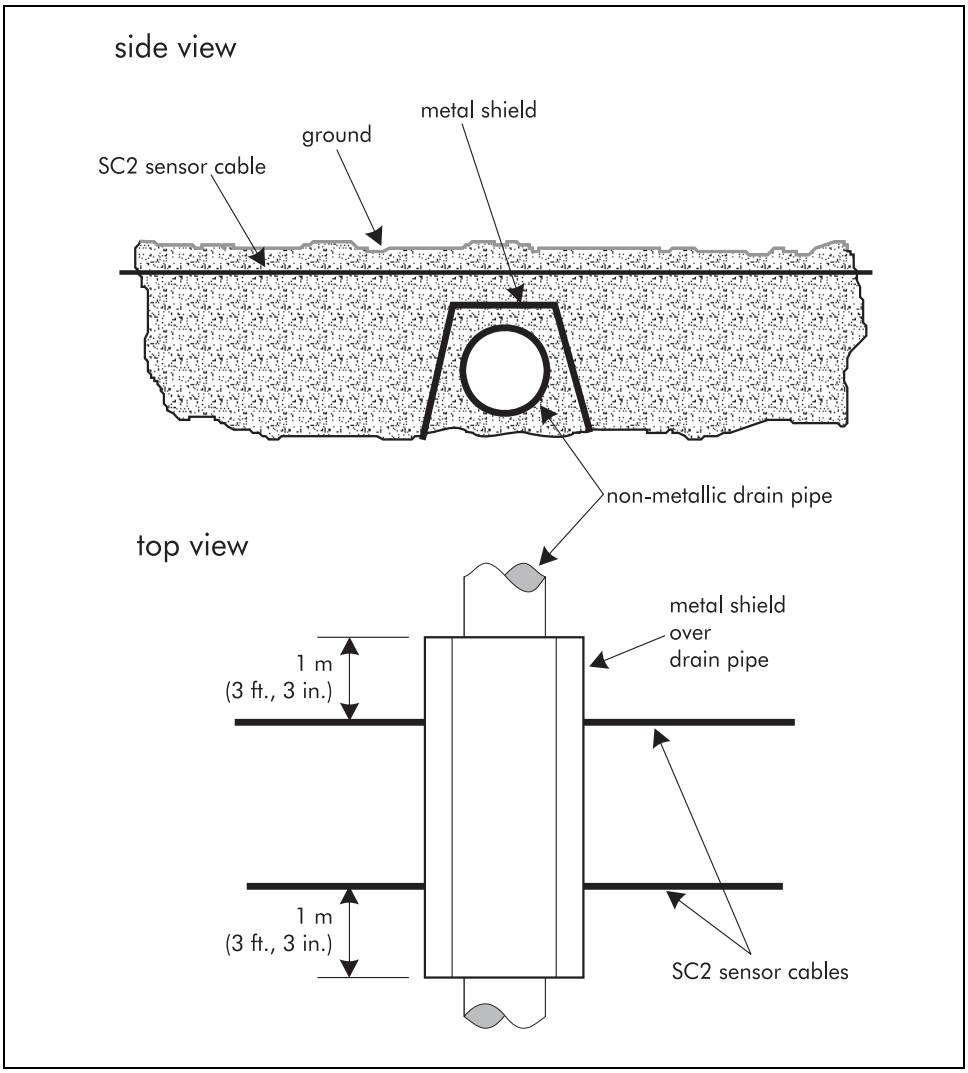
Metallic pipes crossing the sensor cable path should not have any joints or breaks. Check that the pipe has no loose fittings. If a pipe is no longer in use, it is recommended that it be removed from the zone.

Pipe/cable, orientation and size	Minimum separation distance
Metallic pipe or electrical cable up to 10 cm (4 in.) diameter parallel to the cable path	lesser of 61 cm (24 in.) from sensor cable or 1 m (3 ft., 3 in.) from detection field center line 61 cm (24 in.) below the cable burial depth for pipe or cable located between the SC2 cable pair
Metallic pipe or electrical cable up to 10 cm (4 in.) diameter perpendicular to the cable path	5 cm (2 in.) from sensor cable (above or below) *High voltage lines may require a larger separation distance to comply with local electrical codes.*
Metallic pipe more than 10 cm (4 in.) diameter parallel or perpendicular to the cable path	61 cm (24 in.) 61 cm (24 in.) below the cable burial depth for pipe or cable located between the SC2 cable pair
Non-metallic pipe or conduit up to 10 cm (4 in.) diameter may contain wires or running water	61 cm (24 in.)
Non-metallic pipe more than 10 cm (4 in.) diameter containing wires or running water	1 m (3 ft., 3 in.) (shielding recommended)
Non-metallic pipe carrying water (non-draining sprinkler pipes), parallel to cable path	30 cm (12 in.)
Non-metallic pipe carrying water (non-draining sprinkler pipes), perpendicular to cable path	5 cm (2 in.) from sensor cable (above or below) (shielding recommended)
Aerial pipes or wires suspended over detection field	2 m (6.5 ft.)
Pipes or electrical wires on the ground surface parallel to the sensor cable path	2 m (6.5 ft.)
Buried leaky sensor cables that are not being used	3 m (9.8 ft.)

Drainage culverts

Culverts or pipes buried 1 m (3 ft., 3 in.) or more below the surface should not cause any problems. Pipes less than 1 m below the surface should be of metallic construction, to reduce the potential for nuisance alarms from water flowing in the pipe. Metallic culverts must be of continuous construction where they cross the sensor cables to avoid intermittent electrical contacts.

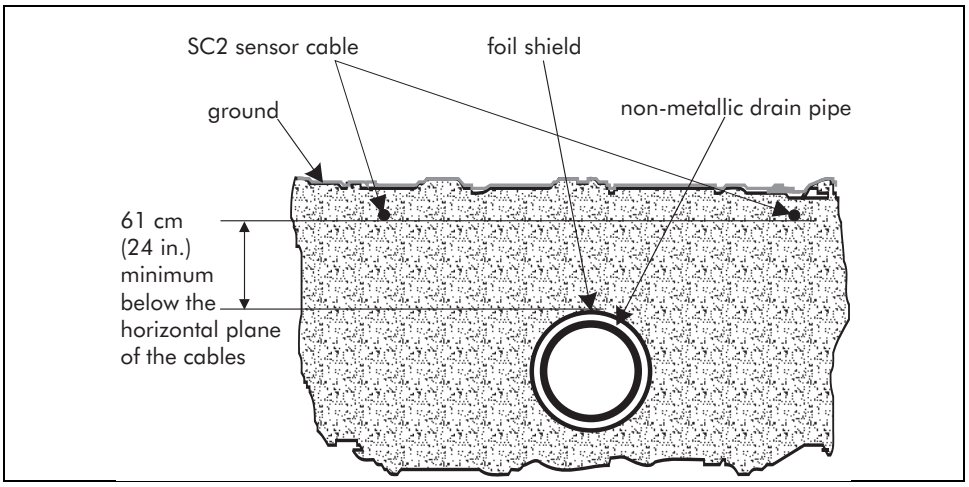
Shallow buried pipes made of concrete or plastic can be covered with a metallic shield plate or metallic foil in the vicinity of the sensor cables. The pipe can then be treated as a metallic pipe, and the separation distances for metallic pipes apply. The shield or foil will reduce the potential for nuisance alarms that can occur from water flow in the pipe.



Buried cables with metallic shield

Instead of a metallic shield, a metallic foil can be used. Use a metallic foil that is designed for direct burial to ensure that it won't degrade in the soil.

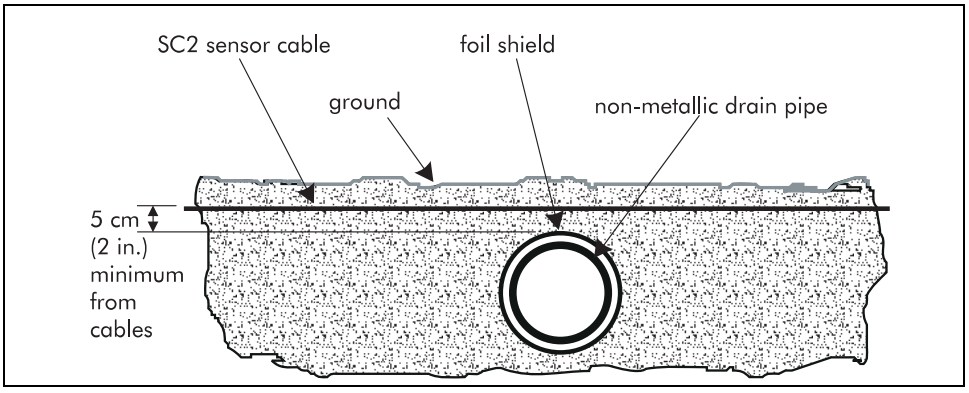
For a non-metallic pipe, up to 10 cm (4 in.) in diameter, lying parallel to the cable path the foil should be wrapped around the pipe for the full length of the cable path. The pipe must be at least 61 cm (24 in.) below the cable depth. Secure the foil in place with plastic tie wraps or electrical tape.



Pipe buried parallel to sensor cables

For a non-metallic pipe, up to 10 cm (4 in.) in diameter, lying perpendicular to the cable path the foil should be wrapped around the pipe such that the foil extends for at least 1 m (3 ft., 3 in.) beyond both sides of the cable path. Secure the foil in place with plastic tie wraps or electrical tape.

After the foil is installed containment and sensitivity tests should be performed in the area. The foil might cause some distortion of the detection field, or it might cause a narrow area of low sensitivity to appear.



Buried pipes with foil shield

Water

Do not route the sensor cables where rainwater collects near a building.

- avoid areas of standing water/ puddles, in detection field.
- final grade after installation should avoid standing water
- avoid extensive running water from ground surface drainage or building 'down spouts'.

System powering and data communication

A network system is powered by network field power modules that are connected to blocks of Sensor Modules. Power and data run through the same wiring in this type of system. The power can be routed to be single direction, redundant or dual direction, depending on your site requirements. The data can be routed to be single or dual direction.

In some cases, the load on the Field Power Module can be reduced by supplying local power to auxiliary functions. This will depend on the site layout and the local constraints present at the site.

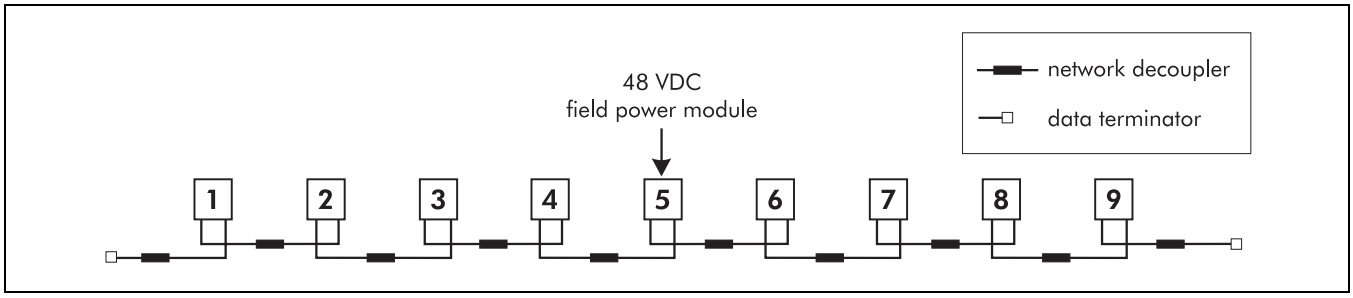
General system powering rules

In general, a Field Power Module can power up to 9 Sensor Modules or 2800 m (3062 yds.) of cable, whichever occurs first. See *Power supply*, page 5-17.

- The Field Power Module can be connected to any network Sensor Module in the system however, if there are 9 Sensor Modules in the block the Field Power Module must be connected to the center Sensor Module.
- If more than 9 Sensor Modules are required for the system, a second block of Sensor Modules must be connected to the first block using a data communication cable.
- If less than 9 Sensor Modules are required for the system, there must be no more than 4 Sensor Modules or 1400 m (1531 yds.) running from either side of the Sensor Module.(ie, the Field Power Module is located at the fifth Sensor Module in the block.)

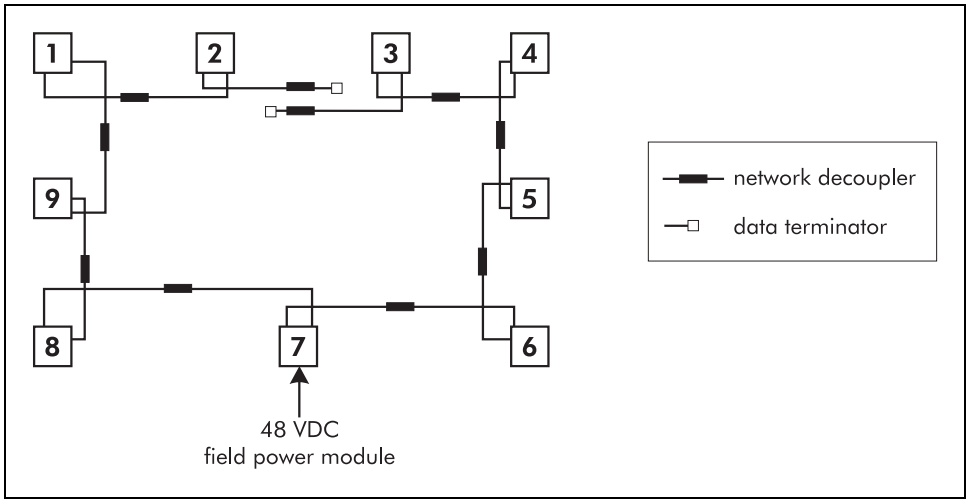
System powering configurations

One field power module can be used to provide power for up to 9 Sensor Modules (18 zones).



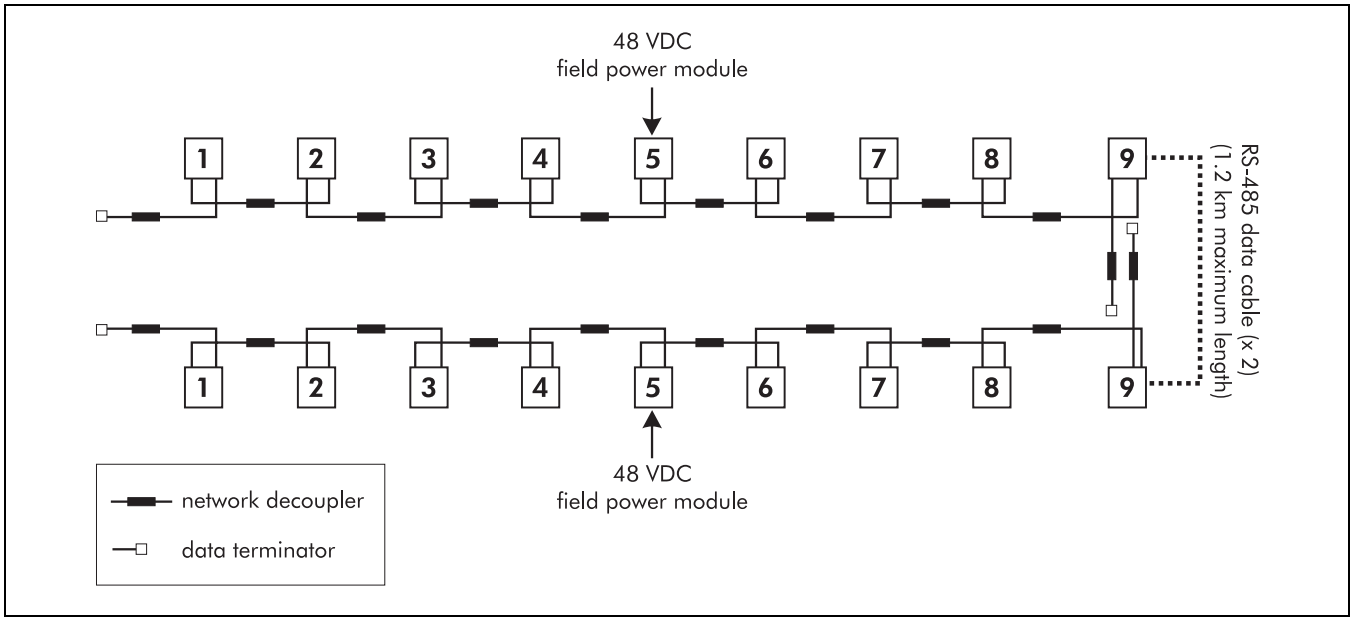
Open-loop, single block configuration

The one field power module, single block configuration can be laid out in a straight line or as a closed loop.



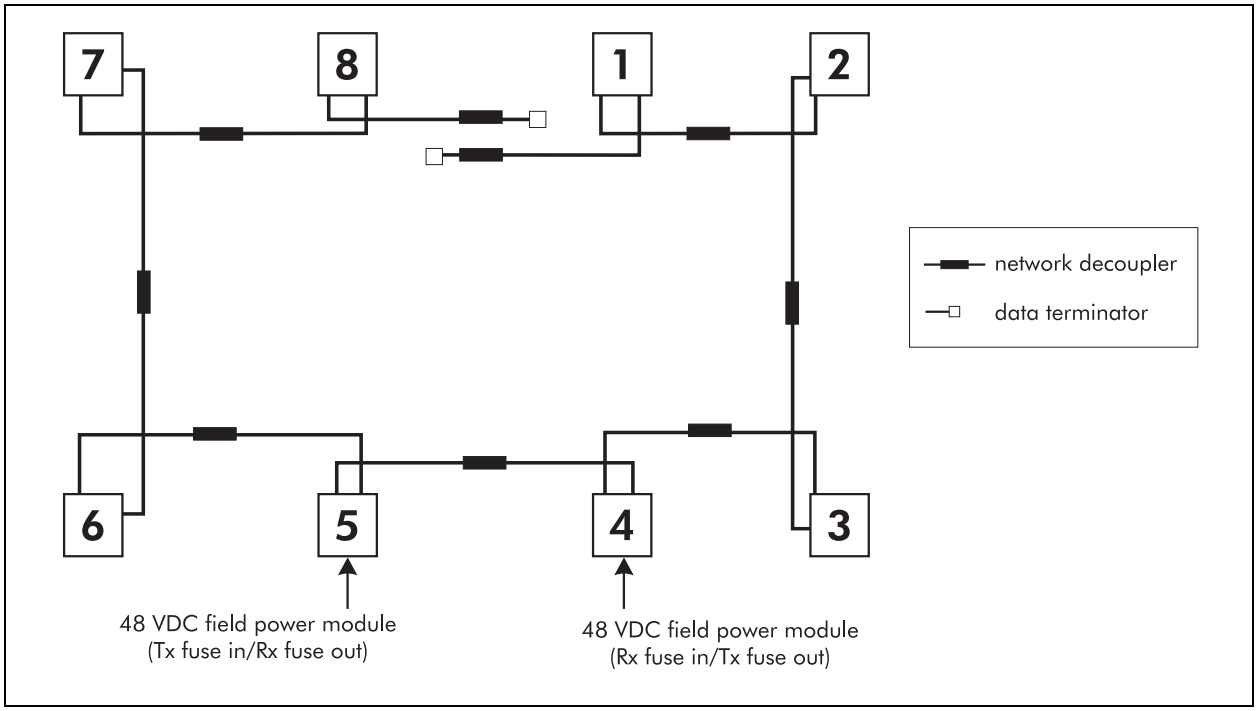
Closed-loop, single block configuration

A multi-block configuration is used whenever there is a requirement to provide power to more than 9 Sensor Modules or 2800 m (3062 yds. of sensor cable). One FPM-48 is used to power each Sensor Module block. The data connection between the blocks can be made at any Sensor Module



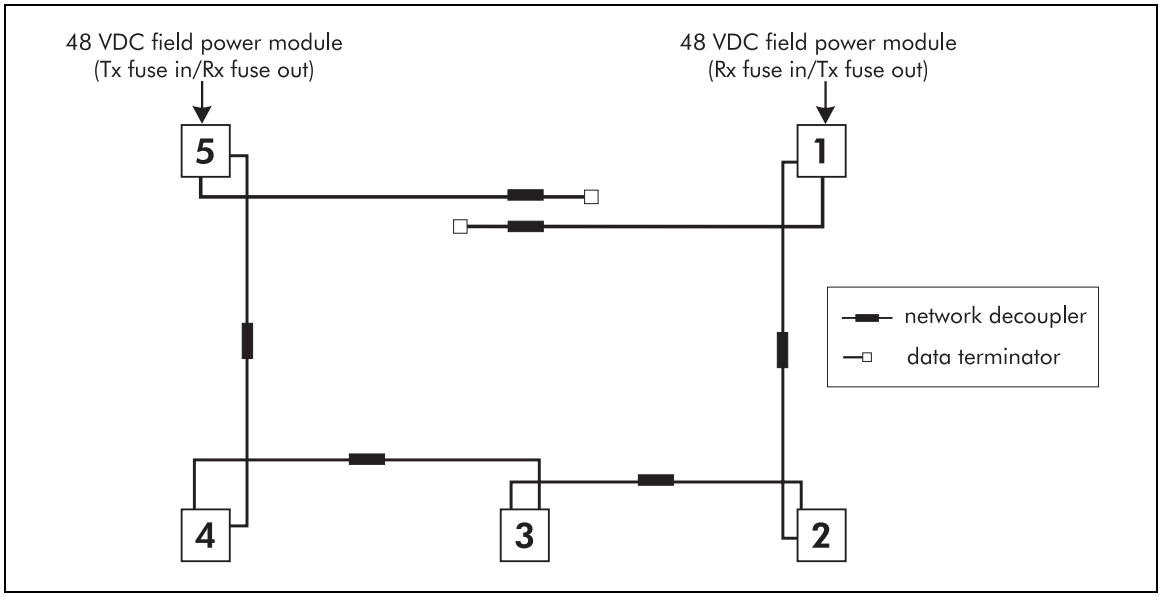
Multi-block configuration

Two FPM-48 field power modules are required to create power redundancy. The advantage of this system is that the system will remain operational even if one power supply fails.



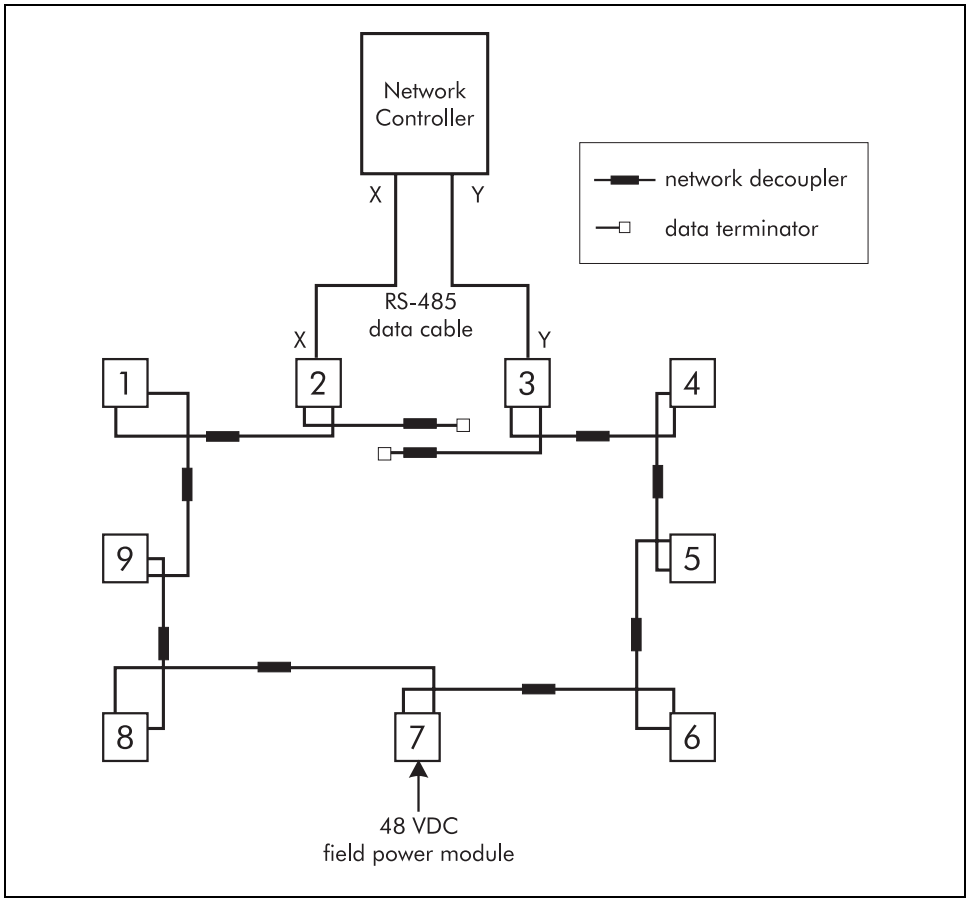
Redundant powering configuration

In a redundant powering configuration, if the field power modules are located at the ends of the block, the system will remain operational even if both sensor cables are cut.



Redundant/Dual direction powering configuration

In a configuration that is set up for dual direction data redundancy the X-side data path is connected to one Sensor Module and the Y-side data path is connected to a second Sensor Module. This enables the data to flow in 2 directions. Because of this, 2 cable cuts will not disable the entire system.

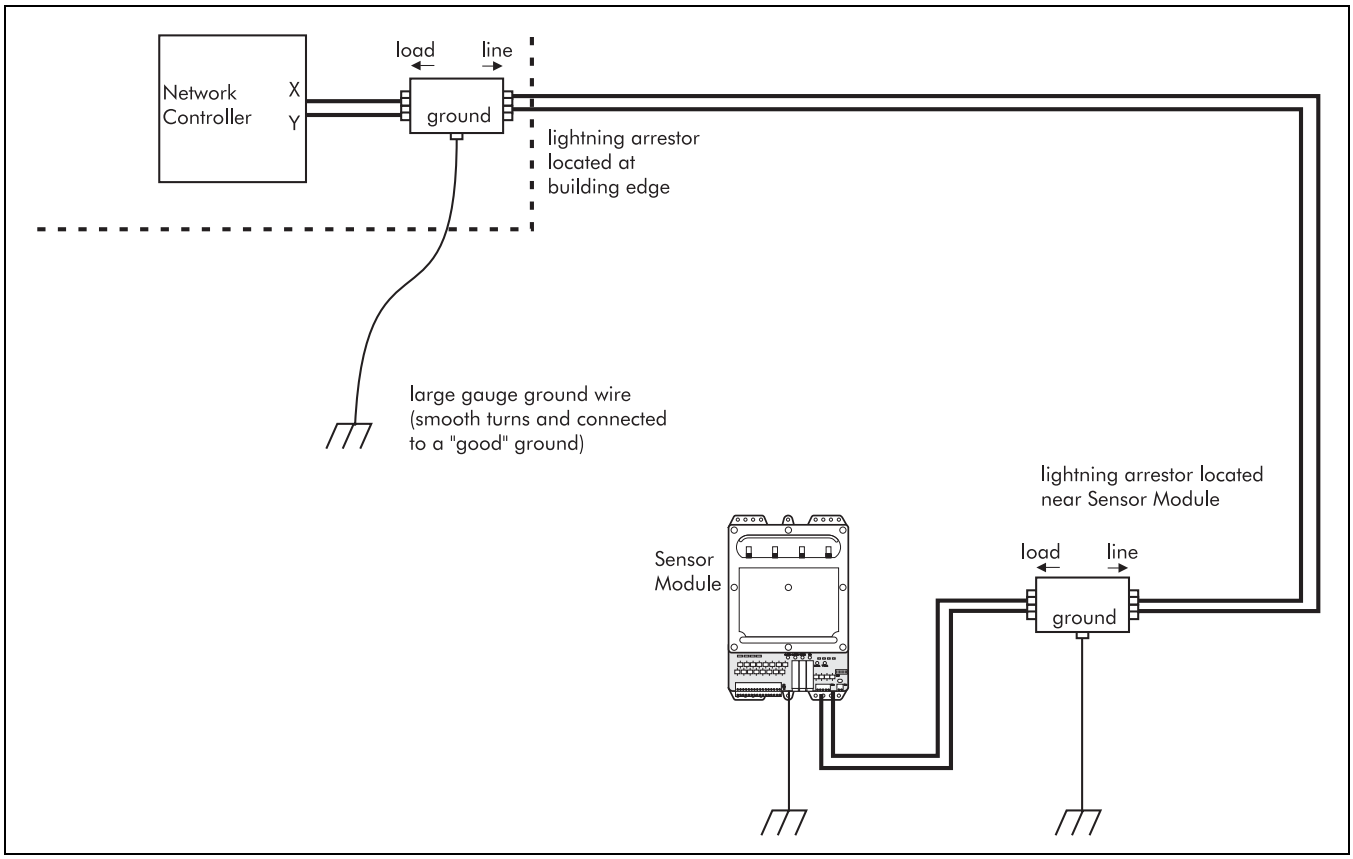


Dual direction data redundancy

Data link lightning protection

The lightning protection devices are used to protect the data communication circuits between the Sennet Network Controller and the Sensor Modules. It is recommended that you install these devices:

- whenever the RS-485 data signals travel outdoors for more than 50 m (166 ft.); and
- where there is a high incidence of lightning activity (indoors and outdoors).



Data link lightning protection

Sensor Module addressing

The Sentient Security Management System continuously interrogates each Sensor Module on the perimeter. A unique address number must be assigned to each Sensor Module so that Sentient can distinguish it from other Sensor Modules in the system. Assign address number one to the Sensor Module at the beginning of the perimeter. Assign other Sensor Modules sequential numbers in either a clockwise or counterclockwise direction around the perimeter. Record the address numbers on the site plan.

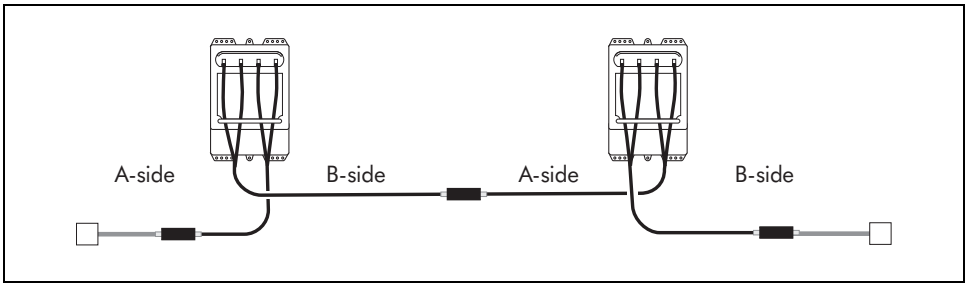
The installers will set the address numbers on each Sensor Module using DIP-switch SW1. Detailed instructions for setting the DIP-switch can be found in the *Perimitrax Installation guide (A3DA0202)*.

Sensor Module frequencies

In order for a Perimitrax perimeter to operate properly, electromagnetic interference between any two adjacent zones must be prevented. To accomplish

this the Perimitrax Sensor Module has 2 different operating frequencies. These are generally referred to as the A-side and B-side frequencies.

When planning a Perimitrax perimeter the zones must alternate between A-side and B-side frequencies to prevent electromagnetic interference.

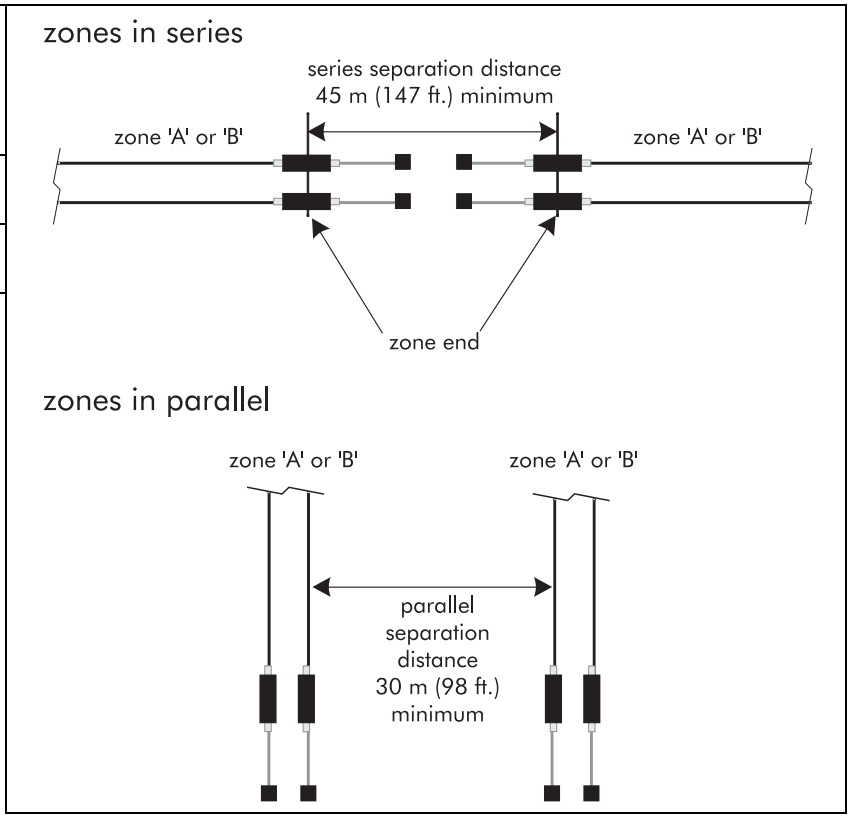


Two different operating frequencies

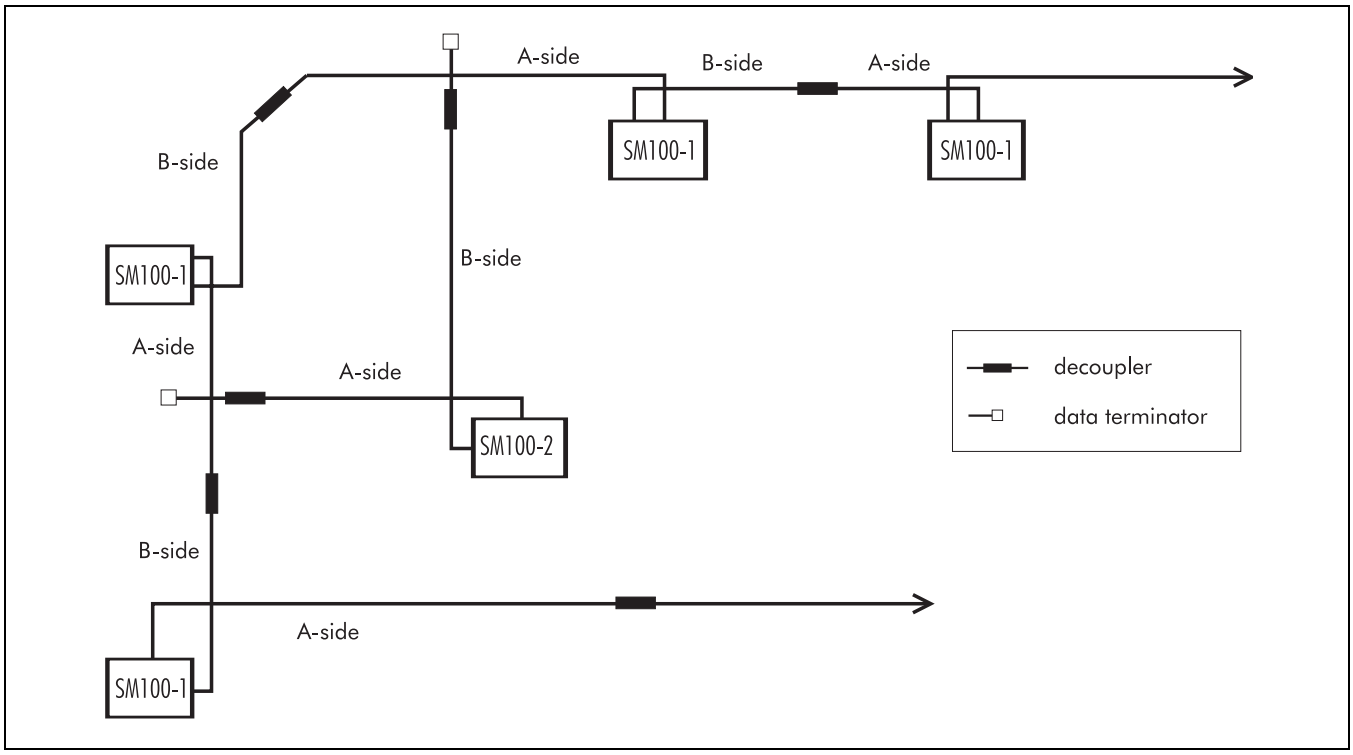
Zone separation

If two zones that are operating on the same frequency must be located close to each other, a minimum separation distance must be maintained between the two zones to prevent them from interfering with each other. The following figure and table illustrate this concept.

Configuration	Series separation distance	Parallel separation distance
Two 'A' zones or two 'B' zones	45 m (147 ft.)	30 m (98 ft.)
One 'A' zone and one 'B' zone	0 m (0 ft.)	30 cm (12 in.)



An alternate frequency SM100-2 is available for use in instances where 2 A-zones or 2 B-zones must be located closer than the recommended separation distances.



Configuration using alternate frequency Sensor Module

Alarm and control wiring

Include details of your alarm system and Sensor Module control wiring in the site drawings.

Drawings should indicate, for each Sensor Module, all connections to and from the terminals. Refer to the *Perimitrax Installation guide (A3DA0202)* for wiring details.

See *Appendix A, Sample site drawings*.

Perimeter layout

This section will help to define the specific details of your installation. The information obtained in the site survey will help to determine the exact perimeter layout. Start by compiling a new, comprehensive site plan that will be used to show the layout of all equipment (sensor cables, Sensor Modules, decouplers, etc.).

Guidelines

Sensor Module	Each Sensor Module can provide two zones of buried cable detection (A and B) that extend from the Sensor Module.
Multiple Sensor Modules	On perimeters that require more than one Sensor Module, connect zone B cables from the first Sensor Module to zone A cables of the second Sensor Module, and so on through decouplers.
Sensor cables	Each zone can be cut to any length between 10 and 200 m (33 and 656 ft.) to match the site requirements.
Installation Medium	Where possible, route the cables of each zone through only one burial medium. Break physical zones into several sensor zones where possible where multiple mediums are present.
Cable burial depth	Cables must be buried at a prescribed depth. The depth depends on the installation medium.
Layout at corners	There are special requirements for laying out the cable path at corners, at zone boundaries where Sensor Modules or decouplers are located, and at the end of the perimeter.
Additional sensors	Perimitrax has been designed to support the integration of additional sensors to provide a complete security solution.
Samples	Sample layouts.

Starting the perimeter

To begin site design indicate the location of each physical zone on your site plan. Allocate sensor zones to match the site's physical zones based on the following guidelines.

Selection of Perimitrax cable type

The cable designs are identical except that one, the SC1, consists of two coaxial cables extruded into a single protective jacket.

The detection field can be enlarged by increasing the separation between the cables. This makes the SC2 the preferred choice in the absence of physical barriers when enhanced detection is required. Cable separations used for SC2 are generally greater than one meter (3.3 ft.). See *Sensor cable spacing (SC2)*, page 7-29.

The detection field of SC2 cables with a separation of 1 m (3.3 ft.) is similar to that of the SC1 cable.

SC1 and SC2 can be mixed in the same perimeter depending on site requirements. However, interconnected sensor zone pairs between Sensor Modules must be of the same type.

Sensor zone length

The sensor zone can vary in length from 10 to 200 m (33 to 656 ft.). A sensor zone is bounded by the Sensor Module on one end and a decoupler on the other end. Sensor cables are available in standard lengths of 50 m (164 ft.), 100 m (328 ft.), 150 m (492 ft.) and 200 m (656 ft.), and are cut to length on-site during installation.

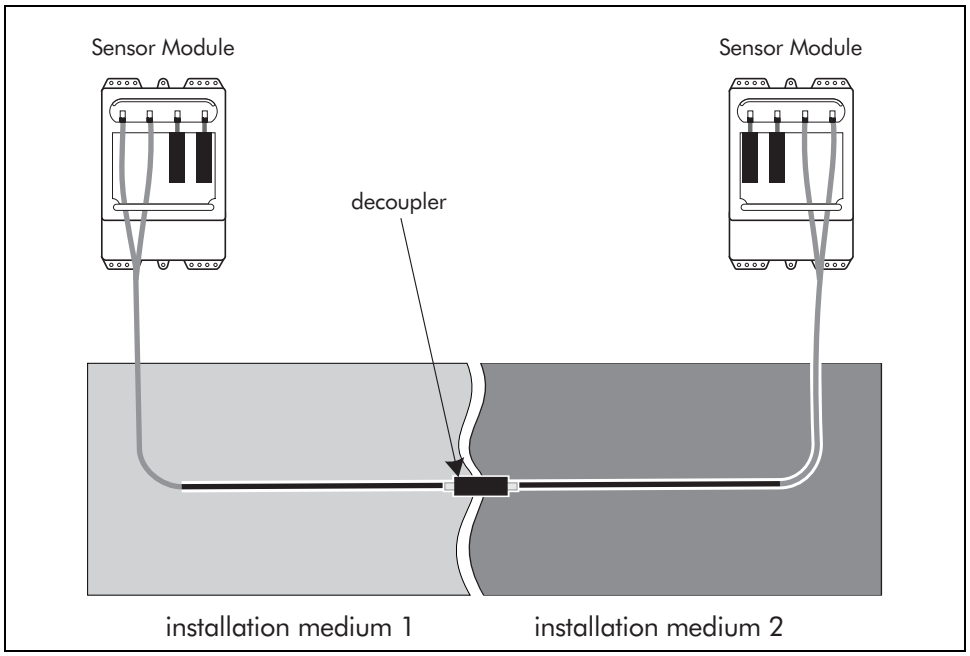
Be sure to specify the next longest standard length for each sensor zone. Due to environmental factors and installation variances, the maximum usage from a Perimitrax cable set is typically 95% of the actual cable length.

Each sensor cable has 20 m (66 ft.) of lead-in cable attached to the sensor cable. This lead-in cable is also cut to length as required. This is normally done when the Sensor Modules are being installed. It is advisable to have enough cable to create a service loop. This makes any future maintenance that may be required much easier. Extra lead-in cable can be spliced to standard cable if required. However, the total physical length of any sensor zone must not exceed 220 m (722 ft.). As such, the lead-in cannot be extended on the 200 m (656 ft.) cables.

Sensor zone boundaries

A sensor zone boundary is a location in the Perimitrax system where detection transitions from one sensor zone to another. Sensor zone boundaries occur at Sensor Module locations and at decoupler locations, in between Sensor Modules.

Where possible, place sensor zone boundaries where natural changes occur in the installation medium (e.g., soil to concrete, asphalt to soil, etc.). This will make it possible to set better Sensor Module thresholds in each zone. The result will be a better performing system with lower FAR/NAR rates.

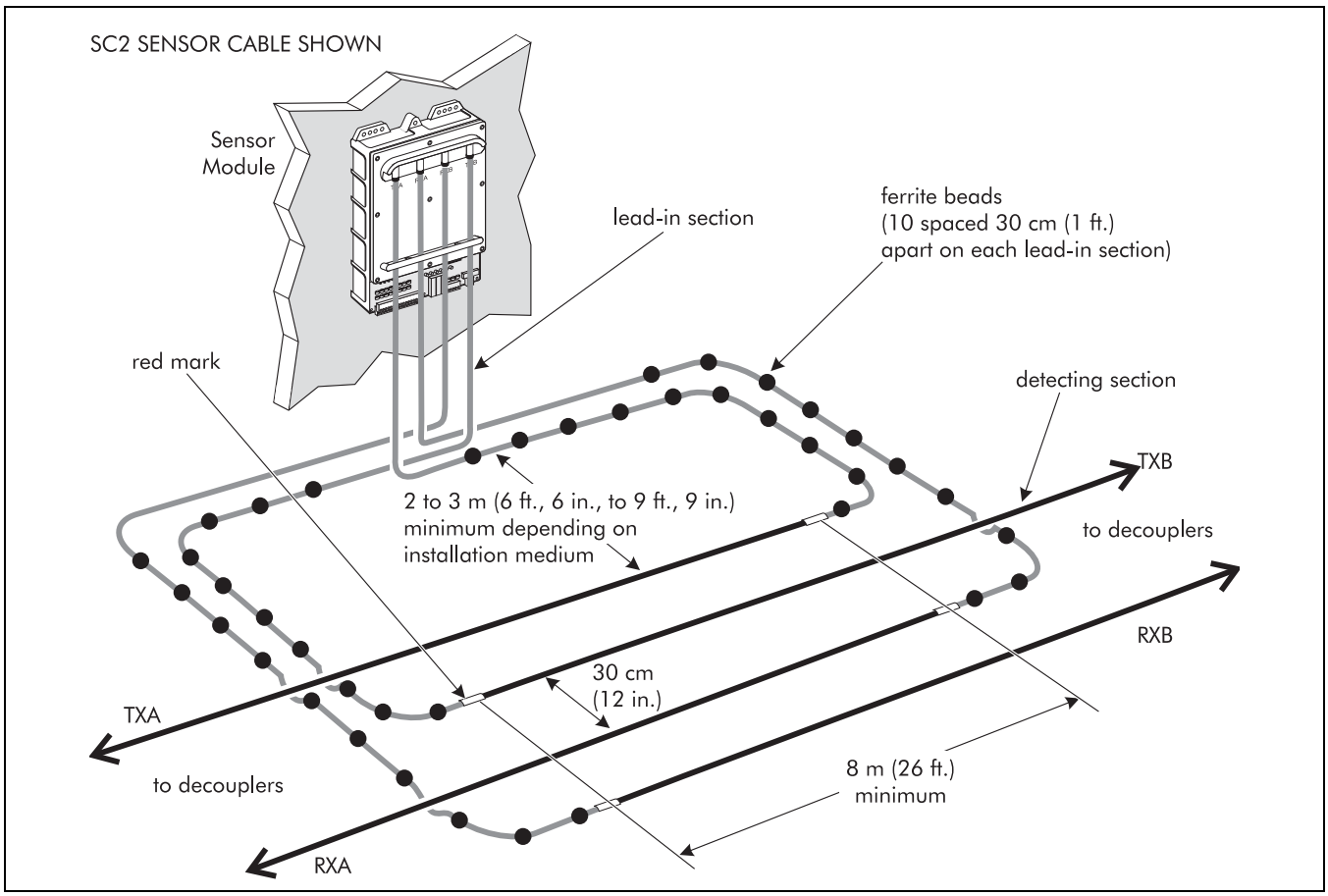


Sensor zone boundaries at a natural change in the installation medium

If you must have more than one medium in a zone, try to route the cables first through heavy media, then through light media. With the installation done in this manner any future adjustment that may be required can be made more easily. Avoid having reinforced and non-reinforced concrete in the same zone, where possible. Place a zone boundary where the change from non-reinforced concrete to reinforced concrete occurs. Mark each sensor zone boundary on the site plan.

Cable layout at Sensor Modules

The following figure illustrates the recommended method of laying out SC2 sensor and lead-in cables at a Sensor Module:



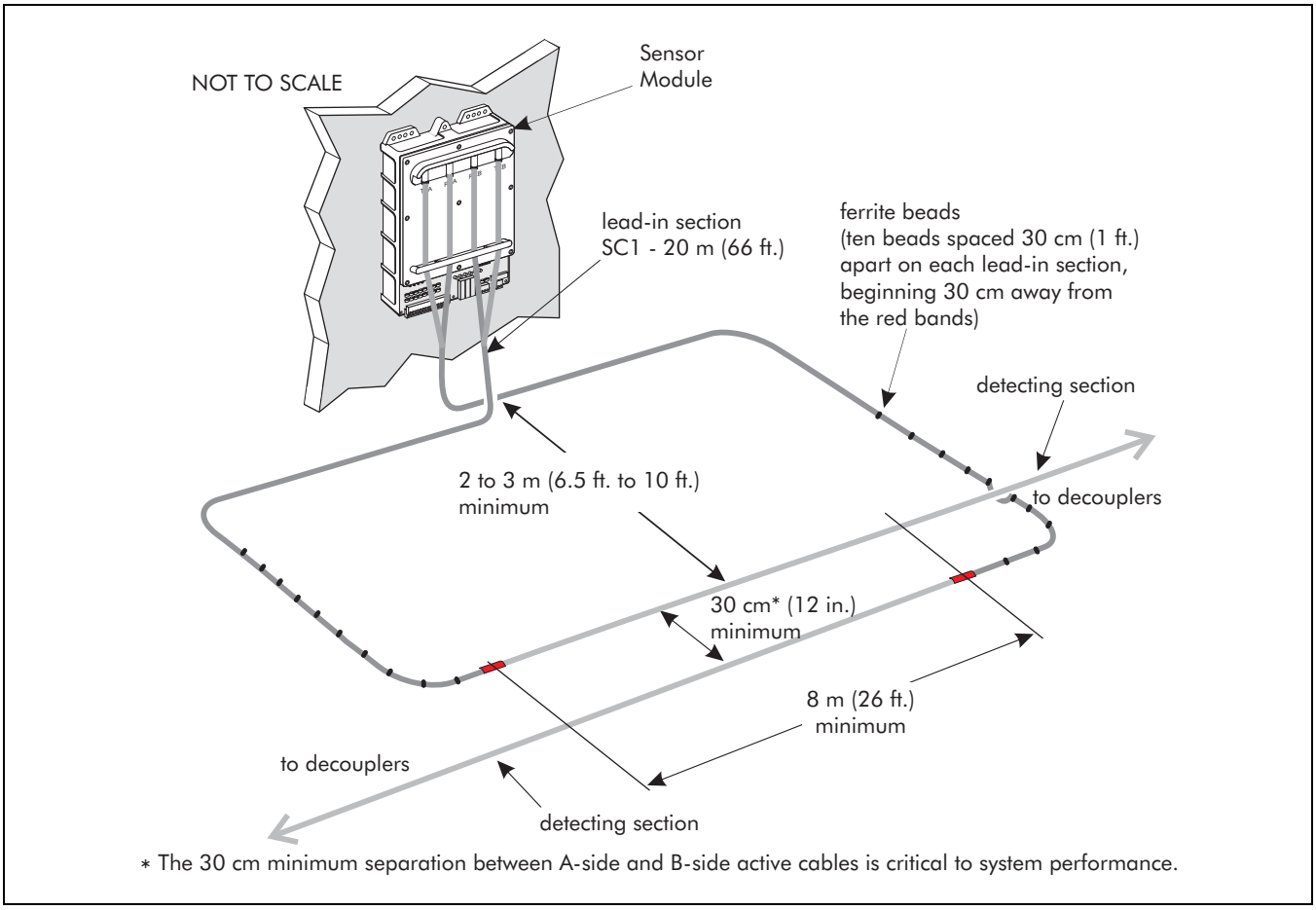
Cable layout at Sensor Module

To ensure continuous coverage where the two zones come together the following guidelines should be met:

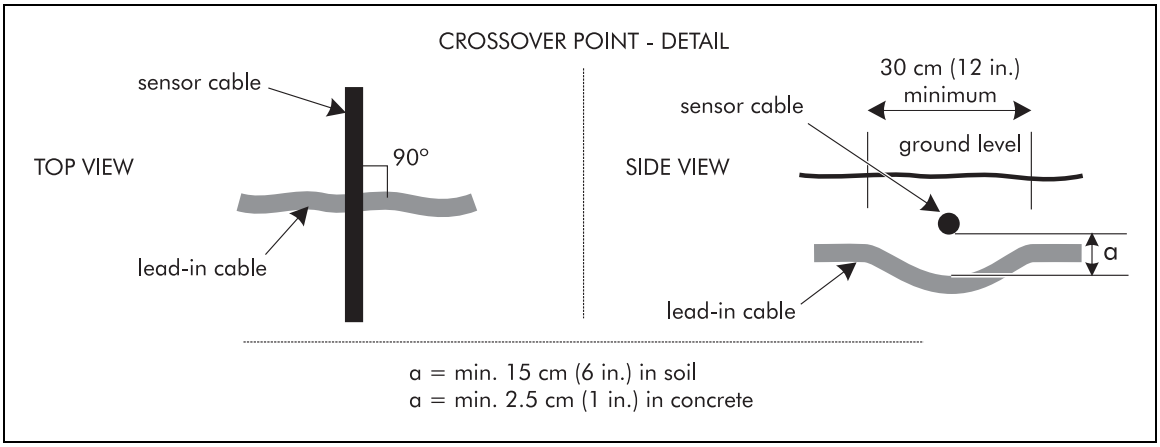
- Sensor zones are physically overlapped at Sensor Modules.
- Sensor cables are shipped a minimum of 4 m (13 ft.) longer than the specified detection zone length. For example, the cable for a 200 m (656 ft.) long detection zone is actually 204 m (669 ft.) long.
- The detection field requires a distance of 4 m (13 ft.) from the beginning of the zone (i.e., the red mark at the junction between lead-in and sensor cable) to reach full strength.
- To compensate for the build-up of the detection field in this area, the zones should overlap at the beginning of each zone.

An intruder who crosses the cables where they overlap may be detected in both zones.

The following figure illustrates the recommended method of laying out SC1 sensor and lead-in cables at a Sensor Module:



Cable layout at Sensor Module



Crossover point detail

Where a lead-in cable crosses a sensor cable separate the cables by at least two-thirds of the burial depth of the sensor cable. For example, if sensor cables buried 6 cm (2.25 in.) deep intersect with lead-in cables, separate the cables by 4.3 cm (1.70 in.) where they cross. Where two sensor cables cross in soil, separate them

by at least 15 cm (6 in.). This can be achieved by gradually raising one cable 7.5 cm (3 in.) and lowering the other one 7.5 cm over a short distance where they cross.

Sensor cable burial depth

The depth at which the sensor cables are buried is determined by the installation medium and perimeter obstacles. Standard depths are shown in the following table:

Medium	Nominal burial depth
soil	23 cm (9 in.)
gravel	23 cm (9 in.)
asphalt (up to 10 cm (4 in.) thick)	23 cm (9 in.); increase to 30 cm (12 in.) when crossing driveways in a zone buried in soil at 23 cm (9 in.)
asphalt (more than 10 cm (4 in.) thick)	slots - 6 cm (2.25 in.)
non-reinforced concrete (up to 10 cm (4 in.) thick)	23 cm (9 in.)
non-reinforced concrete (more than 10 cm (4 in.) thick)	slots - 6 cm (2.25 in.)
reinforced concrete (any thickness)	slots - 6 cm (2.25 in.)

Cables should be buried at a uniform depth throughout each medium. The better the consistency of the burial depth, the better the system will perform. Typically a tolerance of 10% of the burial depth or better is desirable. If the burial depth must be changed, do so gradually. If the surface grade changes by more than 30° in a distance of 4 m (13 ft.), even it out.

Cables can be installed in metal reinforced concrete, however, the cables must be installed above the metal by at least 1/2 the burial distance.For example, if the cable is to be buried 6 cm (2.25 in.) deep in metal reinforced concrete, the metal must be at least 9 cm (3.75 in.) deep.

Sensor cable spacing (SC2)

SC2 transmit and receive cables must be installed parallel to each other around the site perimeter. The horizontal distance between the transmit and receive cables must be constant within sensor zone pairs between sensor modules. However, site conditions and security requirements may require different cable spacings in different zone levels around the perimeter.

Detection field dimensions depend on the cable spacing, installation medium, and Sensor Module threshold setting.

Cable spacing affects the size and shape of the detection field, i.e. wider cable spacing, those greater than 1 m (3.3 ft.), produce a wider detection field.

The following cable spacings are recommended for a SC2 zone:

Standard cable spacing 1.5 m (4 ft., 11 in.)	Use it wherever possible.
Narrow cable spacing 1 m (3 ft., 3 in.)	Separation distance between sensor cables and metallic objects cannot be accommodated using 1.5 m spacing. If the minimum separation between sensor cables and metallic objects cannot be met using this spacing, contact Senstar or your authorized Perimitrax dealer for advice. *Equivalent to SC1 cable detection field.*
Wide cable spacing 2 m (6 ft., 7 in.)	This spacing is typically used in open spaces where the motions of an intruder are not limited by physical barrier.

Placement of decouplers

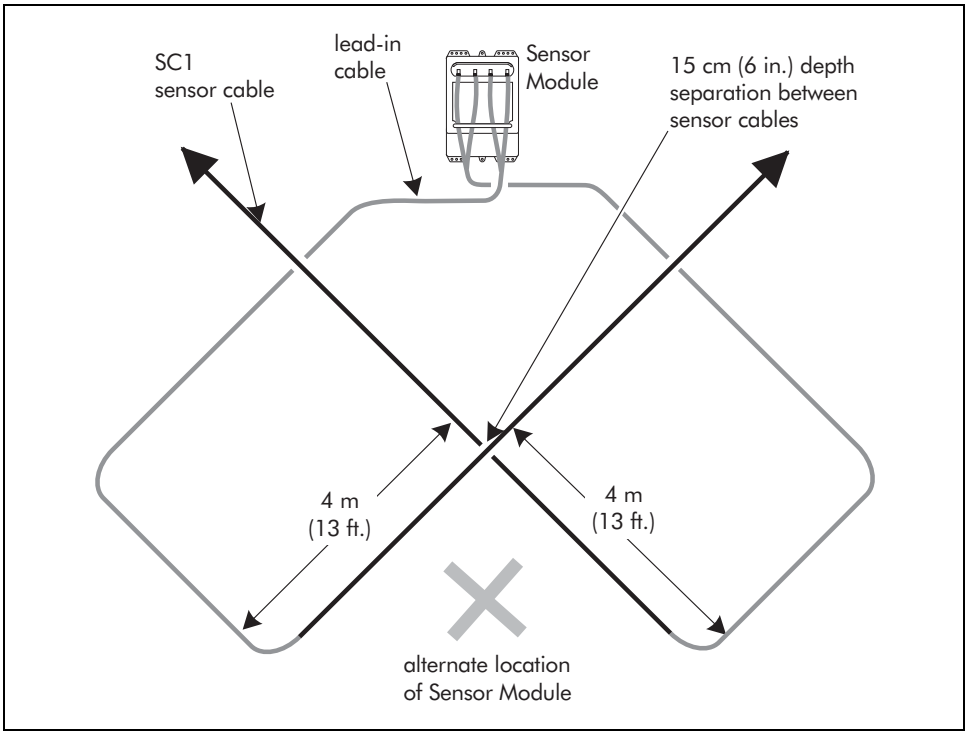
Decouplers are installed at the ends of detection zones. Their purpose is to terminate the radio frequency signal in the cables which form the detection field. The decoupler also allows network power and data to pass through unaffected. Typically, the detection field continues 2 to 3 m (6 ft., 7 in. to 9 ft., 10 in.) past the decouplers, providing a natural and fail-safe overlap between the sensor zones. Install the decouplers opposite from each other and at the same uniform depth as the cables.

The transmit cables from two adjacent zones are connected using decouplers as are the corresponding receive cables.

See *Decouplers*, page 5-14.

Corners

Sensor cables can follow almost any path as long as they are not turned too sharply. The minimum bend radius is 7.0 m (23 ft.). Corners can be placed anywhere in a zone. Sensor Modules or decouplers can be placed at corners.

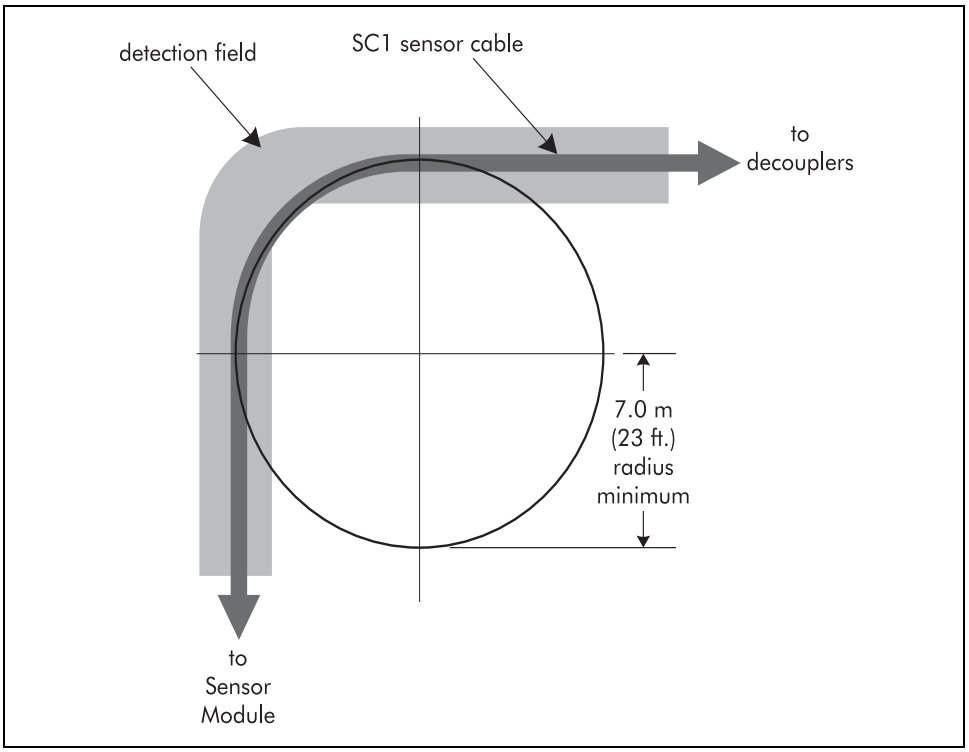


Sensor Module installed in 90° corner

The detection field tends to shift outward over a gradual corner. It can even overshoot the corner, as the following figure shows. If a fence or other object is near the corner, the field may detect the object's motion and cause false alarms. This problem can be overcome by maintaining the minimum separation distances (see *chapter 6, Site analysis*), or by installing a Sensor Module in the corner.

Sensor cables must be routed in smooth curves. If they are routed at a sharp angle the detection field may be disrupted. The radius of the zone centerline must be greater than 7.0 m (23 ft.).

Always measure the radius from the centerline of the detection zone. This is located between the cables for SC2, and on the cable for SC1.



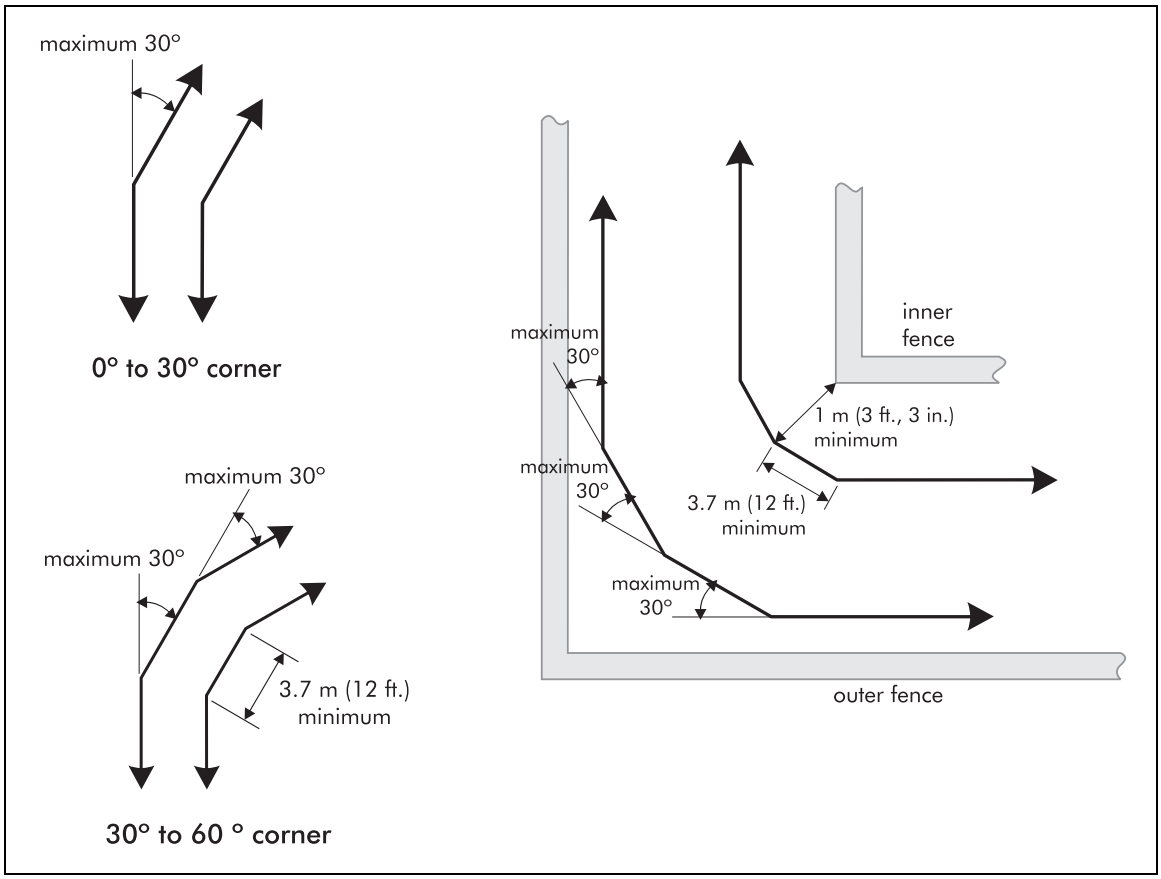
Sensor cable routed around a corner

When installing cables in concrete or asphalt, cut the slots in a series of short lengths, in as smooth an arc as possible. The following figure illustrates this concept.

If cables are routed between two fences, the cable must be a minimum of 1 m

(3 ft., 3 in.) from the inside fence at the closest point.

To prevent false alarms from occurring, the radius of the corner can be decreased slightly so that the inner cable will be farther away from the fence.



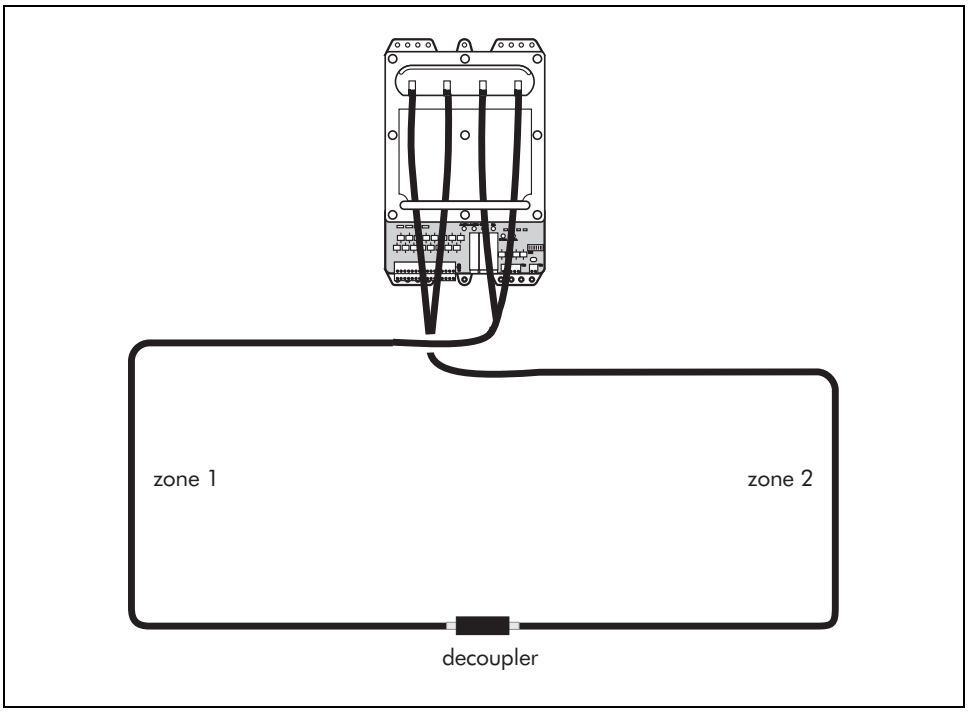
Sensor cable installed around corners in concrete or asphalt

Ending the perimeter

Decouplers terminate the radio-frequency signals within the cables that create the detection field.

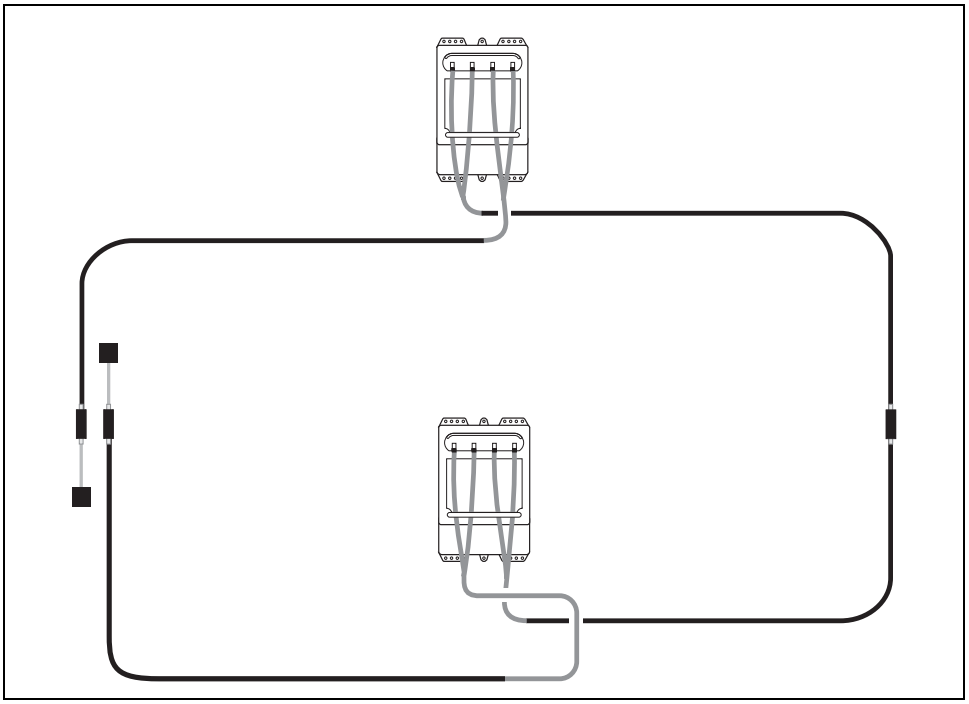
Terminators electrically terminate the data signals that are carried within the sensor cables as well as detection signals that flow outside the cable(s) and are available in SC1 or SC2 format.

In small closed perimeters consisting of one Sensor Module and two zones, the zone ends may be simply connected together through a decoupler.



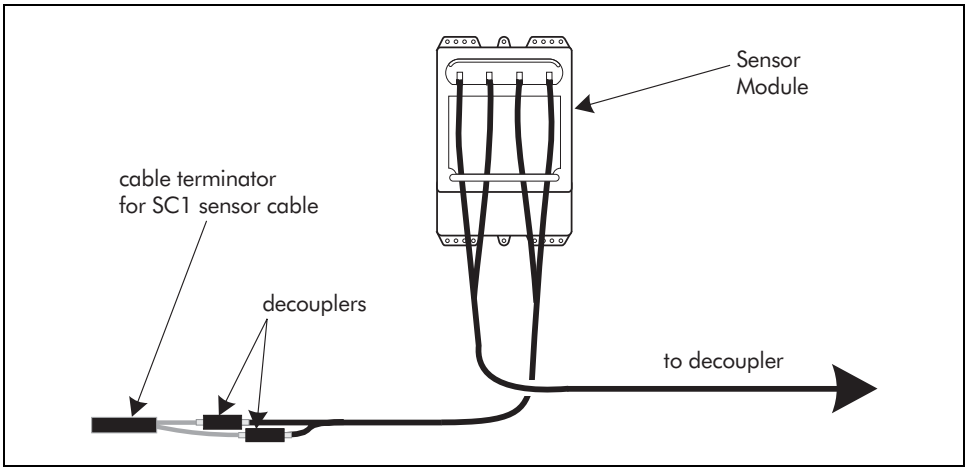
Small closed-loop perimeter

For closed perimeters of more than one Sensor Module and for all other perimeters, two termination kits are required. One is used for each end of the linked Sensor Modules.



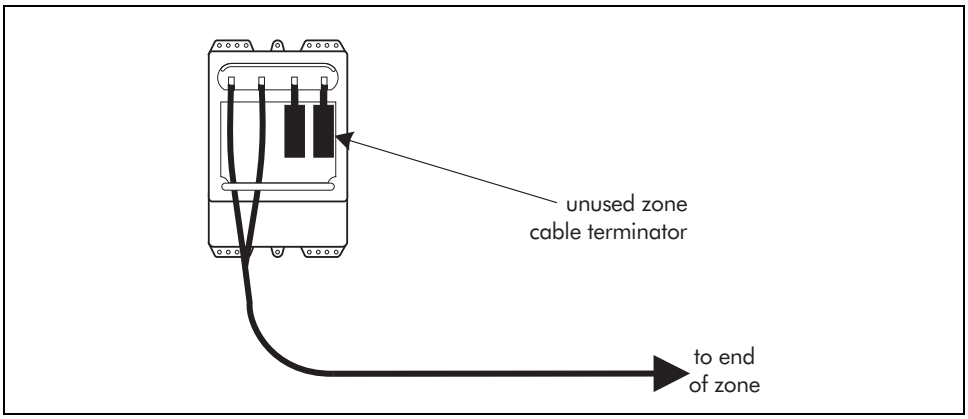
Multiple Sensor Module, closed-loop perimeter

In an open-loop Perimitrax system that uses one or more Sensor Modules, terminators must be connected to the decouplers at opposite ends of the cables.



Open-loop perimeter

Where a Sensor Module has only one zone, a small short terminator for terminating the unused zone is available. It attaches directly to the Sensor Modules TX and RX connectors.



Unused zone, cable terminator

Equipment location

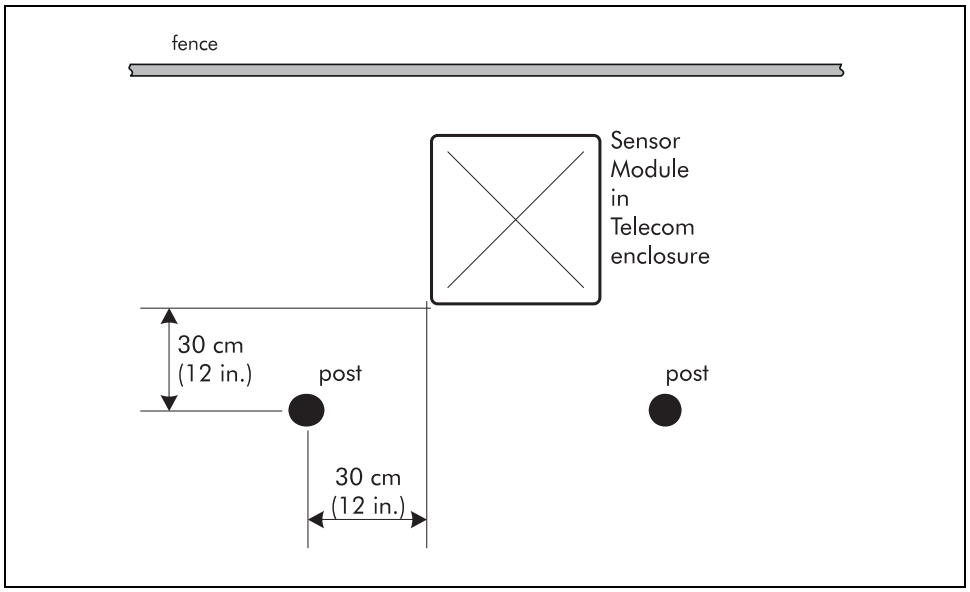
The Sensor Module location is determined by the zone layout. Sensor Modules are always located at the junction of two zones.

Consider the following guidelines when determining the Sensor Module location:

- The Sensor Modules should be located on the secure side of the perimeter to reduce the risk of tampering.
- Each sensor cable starts with 20 m (66 ft.) of lead-in cable. The Sensor Module can be placed some distance away from the detection field. If your site requires that the Sensor Module be farther away, extra lead-in cable can be purchased, by the meter, and spliced onto the existing lead-in cable.
- Sensor Modules can operate in temperatures (measured inside the enclosure) ranging from -40° to 70°C (-40° to 158°F) and humidity between 0% and 95%.
- Sensor Modules can be housed in a variety of enclosures to protect them from environmental conditions, mounted in enclosures on existing structures either indoors or outdoors. For additional protection, an optional protective enclosure is available from Senstar Corporation.
- The Sensor Module location should be easily accessible.

Indicate the exact location of each Sensor Module on the site plan.

Protective posts



Protective posts

If the Sensor Module will be located in an area that is subject to damage by service or other vehicles, install posts (bollards) to protect it. Use 6.3 cm (2.5 in.) diameter (approximate) galvanized steel pipe for each post. Fill each post with concrete and anchor it in a concrete base.

Sentient Security Management System and display terminal location

The Sentient Security Management System is located indoors, generally in the area from which the system will be operated. It is important that the Sentient System is easily accessible for system operation, maintenance, and troubleshooting.

If the Sentient System is not used as an operator interface, it may be placed in an equipment room or other location convenient for use as a maintenance terminal and for system interconnection to a host display.

The Sentient Security Management System is connected to the Network Controller. The maximum allowable distance between the two components is approximately 15 m (50 ft.). The Network Controller is connected to a Sensor Module with an EIA-485 data link by way of data grade or shielded twisted-pair cable. The Network Controller can be located up to 1200 m (1312 yds.) from the Sensor Module that it is connected to. A repeater can be connected to the system that will amplify the data signal so that the distance between the Network Controller and the Sensor Module can be extended beyond 1200 m.

Printer location

The printer is connected to the Sentient Security Management System. It can be located up to 3 m (9.8 ft.) away from the Sentient Security Management System or display terminal with the supplied cable.

If your site requirements exceed these limitations, contact Senstar or your authorized Perimitrax dealer.

Drawings

Site plan

Prepare a large-scale site plan that shows the location of all Perimitrax equipment, the exact routing and length of the sensor and lead-in cables, and the locations of the red marks. Label the transmit and receive cables in each zone and indicate the zone numbers, Sensor Module address numbers, and frequencies.

Prepare separate drawings that show the installation details at each Sensor Module, at corners, and at any other portion of the perimeter where the installers will require specific details. See the sample plans in *Appendix A, Sample site drawings*.

Electrical interconnection diagram

Prepare an interconnection diagram that shows all cable connections between system components. See the sample diagrams in *Appendix A, Sample site drawings*.

Residential and commercial applications

The installation recommendations described in this section are intended for sites that do not have what is commonly referred to in the security industry as a sterile zone, where the space available for the sensor cable is often at the limit of the recommended minimum distances as shown in the table *Obstacles*, page 7-9. (i.e., residences) These recommendations are additional to those already described in this guide.

Irrigation and extensive landscaping activities confront the installer with a challenge in the selection of the optimum position for the sensor cable. Landscaping activities following the installation also create a risk of sensor cable damage. With careful planning the Perimitrax system can be successfully installed and maintained in any residential perimeter application.

For non-sterile zone applications the following points must be carefully examined with respect to the site conditions:

- single (SC1) vs dual (SC2) sensor cable selection
- sensor cable burial depth
- sensor cable path selection
- buried water pipe and electrical cable avoidance
- protection against gardening and landscaping damage

Single (SC1) vs dual (SC2) sensor cable selection

In applications where the available space is limited and the sensor cable must follow a meandering, sometimes uneven route, it is recommended that the Perimitrax SC1 single sensor cable be used.

SC2 dual sensor cable configurations are not recommended for such installations.

Sensor cable burial depth

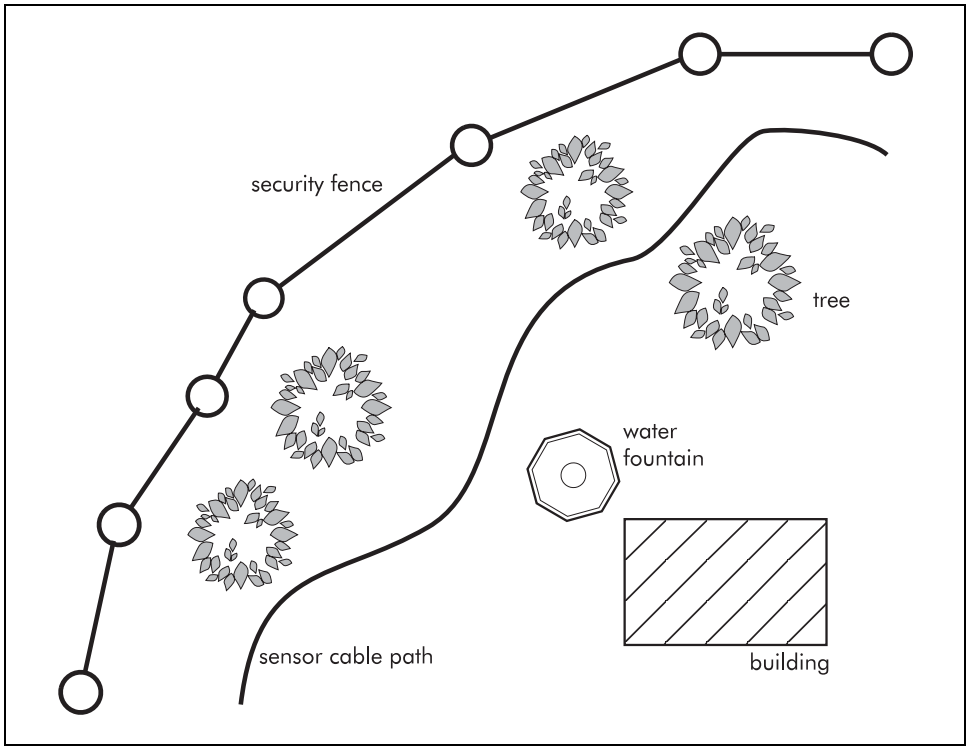
For natural soil areas, including lawns a nominal burial depth of 23 cm (9 in.) is recommended. A shallower burial depth may not seem to alter the system's detection performance, however, it may make the system more sensitive to small animals. Most importantly, it places the sensor cable at greater risk to damage from surface activities including soil aeration, weed removal, and general gardening.

Where the cable burial depth has to be raised slightly to avoid a pipe or cable, the change in depth should be made gradually over a distance of 1 m (3 ft., 3 in.) to avoid sensitivity disturbances.

The accuracy of the burial depth should be monitored closely during the sensor cable installation.

Sensor cable path selection

A compromise must sometimes be made between the need for a detection zone which affords the maximum advanced warning, and the avoidance of obstacles which can impair the system's performance.



Adapting the sensor cable path to the environment

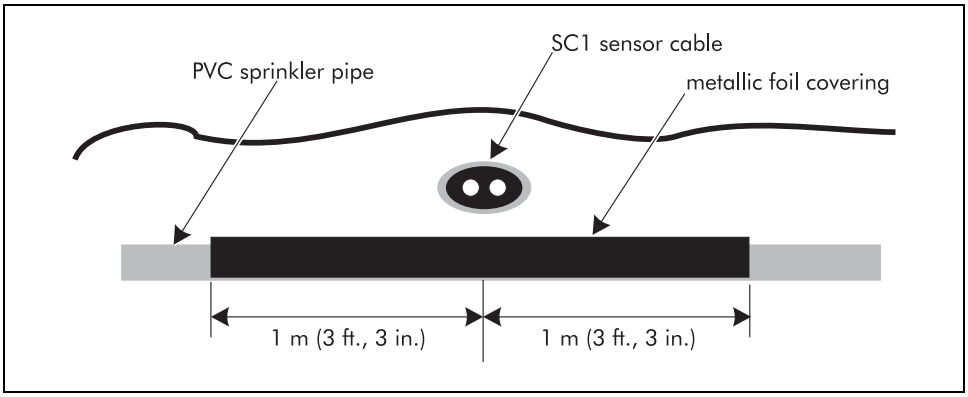
The Perimitrax sensor cable can be adapted easily to corners and grade changes allowing the system to be installed around bushes, full-sized trees, and man-made obstacles. The covert nature of the system hides the true detection zone location. A meandering cable path can be regarded as an extra advantage, as even an informed intruder cannot possibly predict the exact location of the detection field.

Buried water pipe and electrical cable avoidance

Where possible, the sensor cable path should avoid irrigation pipes or electrical cables. By working with the Landscape Planner prior to the layout of the irrigation pipes and control cables, the Perimitrax sensor cable can be afforded a reasonably clear path without compromising the irrigation coverage.

Avoid running sensor cables parallel to irrigation pipes and across sprinkler pipes as much as possible.

If this is not possible, the pipes must be shielded to prevent the detection field from "sensing" the moving water.



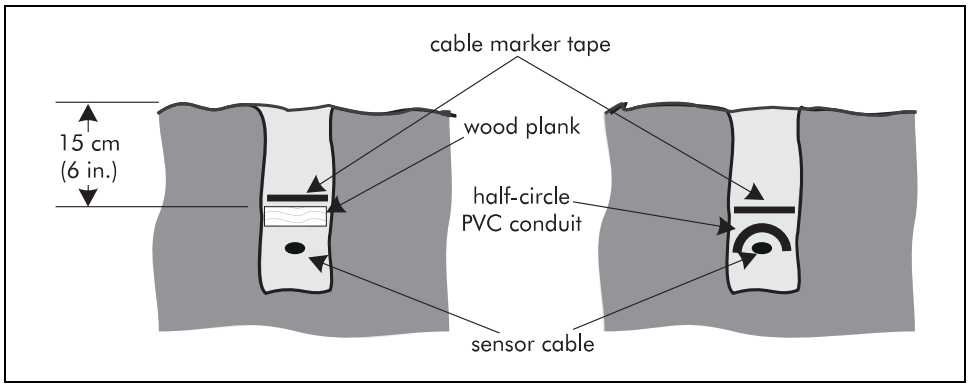
Shielding of sprinkler pipes

When the pipe crosses above or below the cable, it must be wrapped, in metallic foil specified for direct burial, for a distance of approximately 1 m (3 ft., 3 in.) on both sides of the sensor cable. Parallel running pipes which are within 30 cm (12 in.) of the sensor cables should also be shielded.

Protection against gardening and landscaping damage

Protection of the sensor cable against damage from landscaping activities throughout the life-span of the system is an important factor in maintaining proper performance.

Where there will be no further landscaping activities and minimal surface maintenance the recommended burial depth of 23 cm (9 in.) will provide adequate long term protection. However, in areas where planting will be an on-going activity, or where future irrigation changes are anticipated, the sensor cable should be protected with some form of non-metallic barrier.



Protecting the sensor cable from surface damage

Pressure-treated wood planking laid over the cables, or PVC conduit cut lengthwise in a half-circle will provide the necessary protection.

Installation of the full length of a zone in conduit of any kind is not recommended. However, for roadway and sidewalk crossings the sensor cable can be placed in PVC conduit as follows:

- Conduit should be no longer than 7.0 m (23 ft.)
- Sections should be separated by 1 m (3 ft., 3 in.).
- No more than 3 sections of conduit should be placed in any one zone.
- Conduit should be sealed at both ends to prevent internal water flow.

This conduit is normally installed during construction of the roadway or sidewalk to simplify future sensor cable installation.

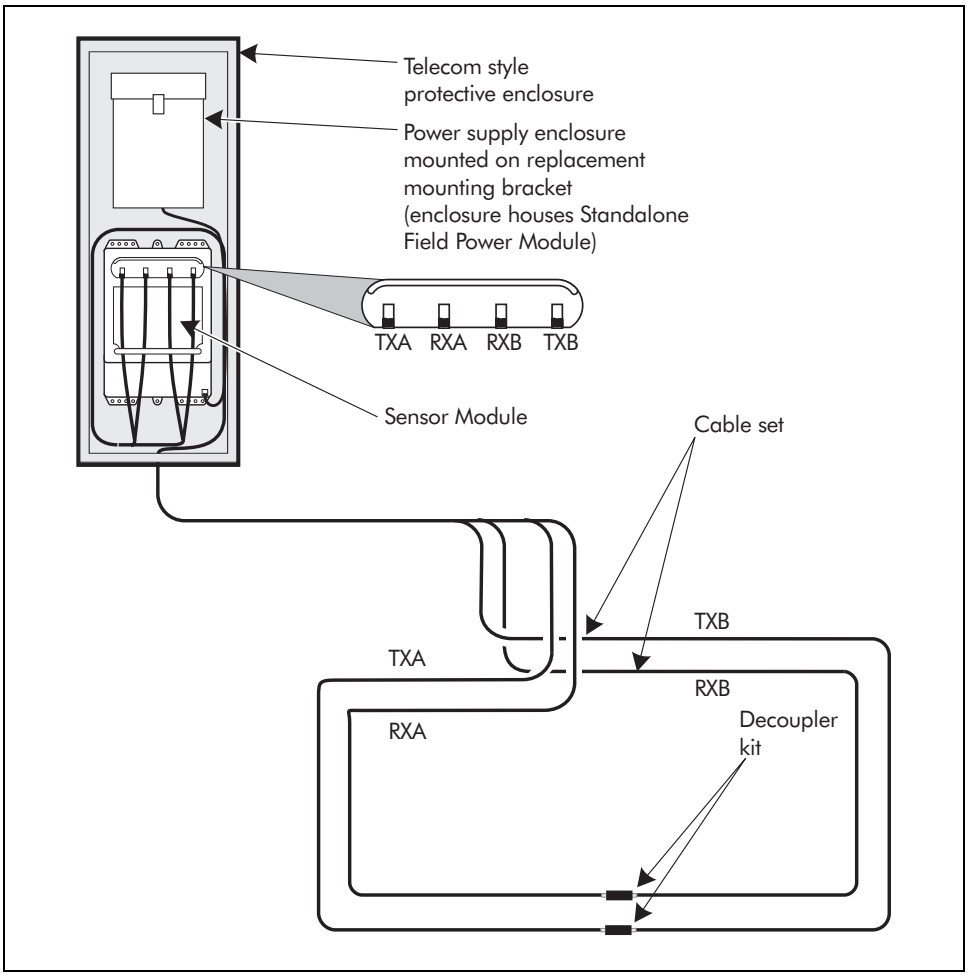
a Samples

Sample installations

The samples illustrated in this appendix are by no means the limit of how a Perimitrax system can be laid out. The appendix should be used as a guideline to assist you in determining your own site layout requirements.

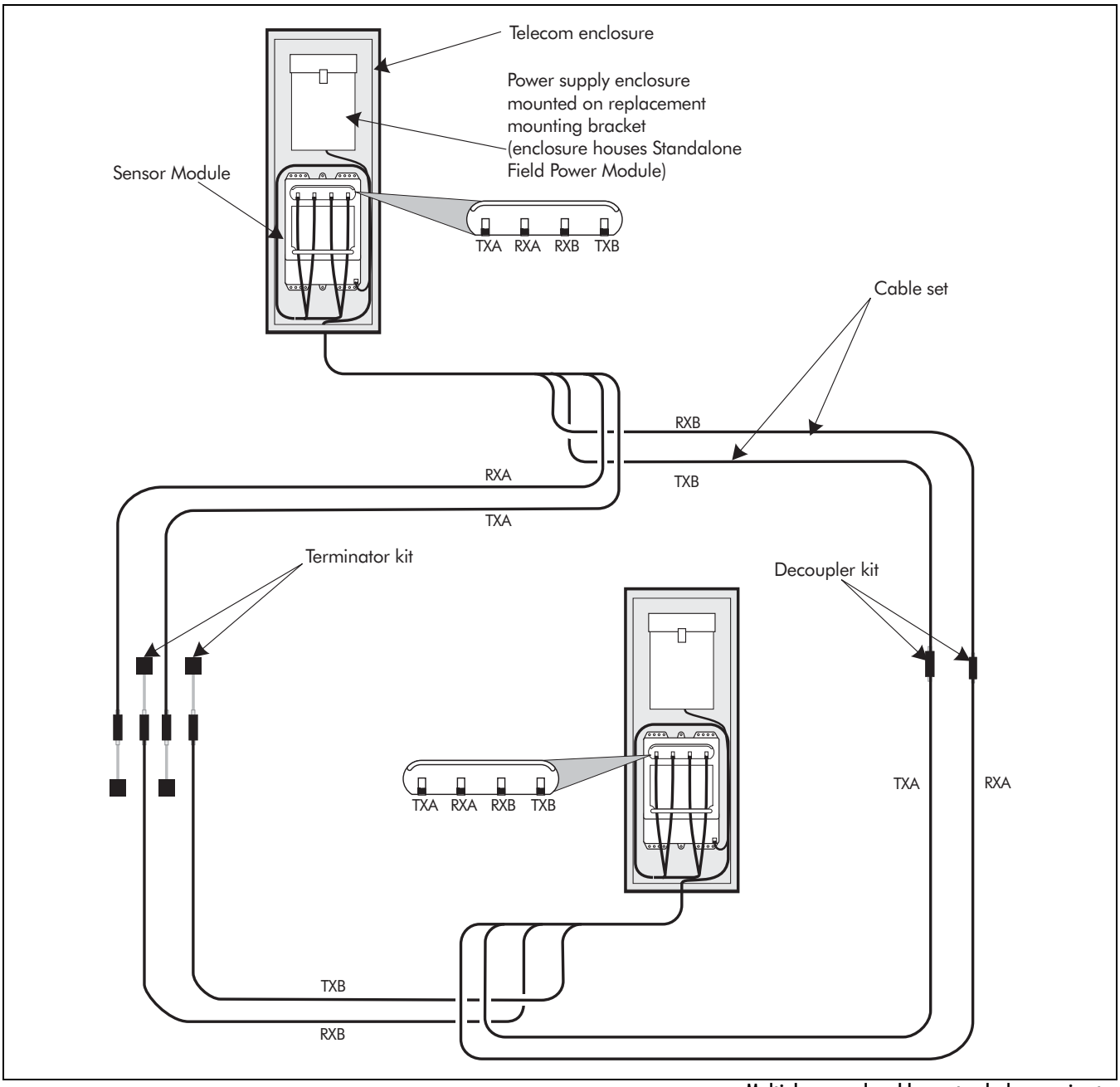
Possible equipment requirements

The following samples list the possible equipment requirements for various layouts. Details of each part are listed in chapter 5, System components.



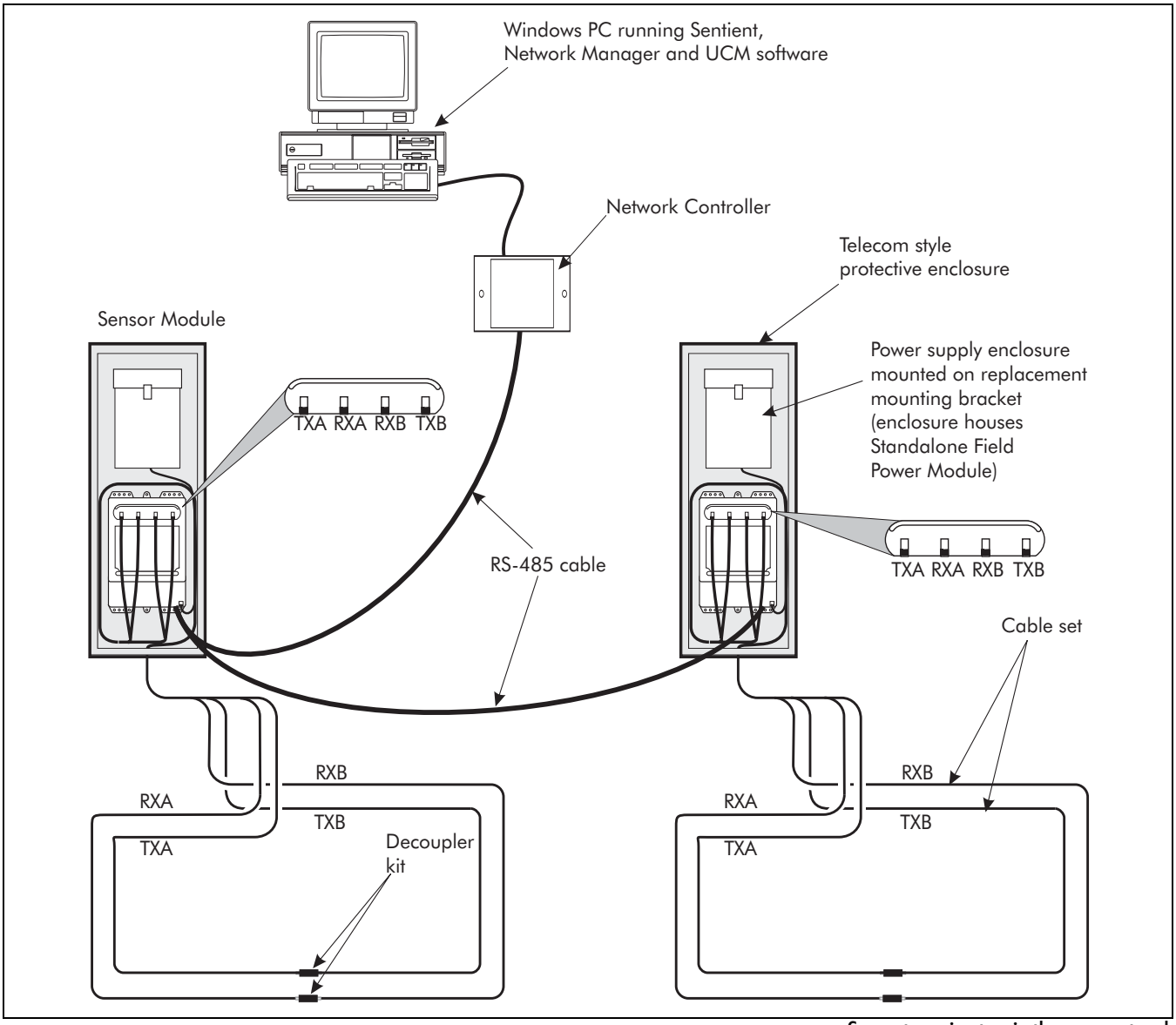
Two-zone, closed loop, standalone perimeter

Description	Model number		Quantity
	SC1 layout	SC2 layout	
Connector tool kit	CT3-3	CT3-3	1
Sensor Module	SM100-1	SM100-1	1
Telecom enclosure	PE2-1	PE2-1	1
Sensor cable set	SC1-50	SC2-50	2
Standalone decoupler kit	DK1-1	DK2-1	1
Standalone field power module	FPM-12	FPM-12	1
Power supply enclosure	WE1-4	WE1-4	1
Replacement mounting bracket	RB1-1	RB1-1	1



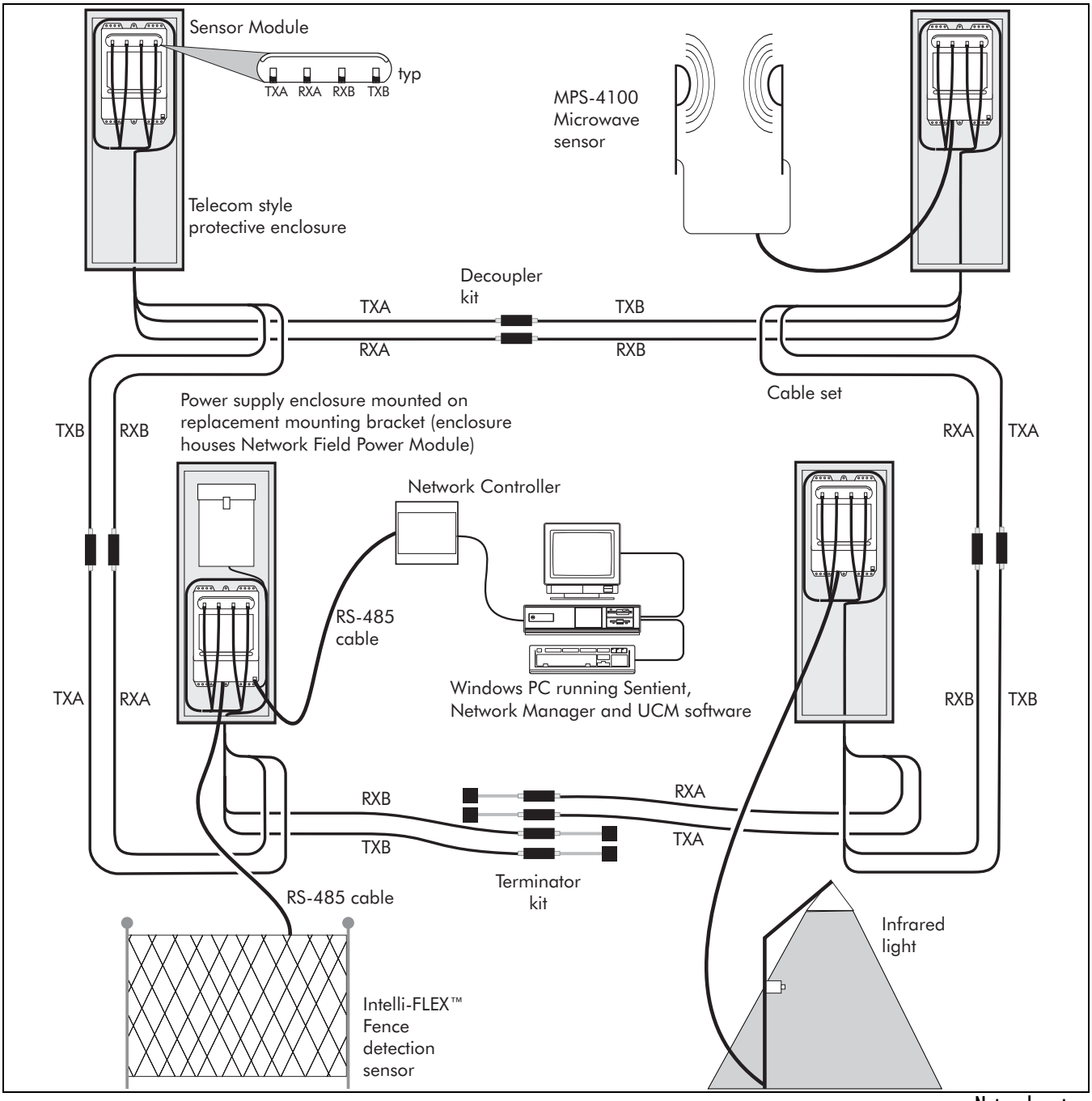
Multiple zone, closed loop, stand-alone perimeter

Description	Model number		Quantity
	SC1 layout	SC2 layout	
Connector tool kit	CT3-3	CT3-3	1
Sensor Module	SM100-1	SM100-1	2
Telecom enclosure	PE2-1	PE2-1	2
Sensor cable set	SC1-50	SC2-50	4
Standalone decoupler kit	DK1-1	DK2-1	3
Terminator kit	TK1-4	TK2-4	2
Standalone field power module	FPM-12	FPM-12	2
Power supply enclosure	WE1-4	WE1-4	2
Replacement mounting bracket	RB1-1	RB1-1	2



Separate perimeters in the same network

Description	Model number		Quantity
	SC1 layout	SC2 layout	
Connector tool kit	CT3-3	CT3-3	1
Sensor Module	SM100-1	SM100-1	2
Telecom enclosure	PE2-1	PE2-1	2
Sensor cable set	SC1-50	SC2-50	4
Standalone decoupler kit	DK1-1	DK2-1	2
RS-485 cable	NW-30, NW-150, or NW-300	NW-30, NW-150, or NW-300	ar
Sentient Security Management System, Network Manager, UCM and Network Controller	CC100-1	CC100-1	1
Standalone field power module	FPM-12	FPM-12	2
Power supply enclosure	WE1-4	WE1-4	2
Replacement mounting bracket	RB1-1	RB1-1	2



Network system

Description	Model number		Quantity	Description	Model number		Quantity
	SC1	SC2			SC1	SC2	
Connector tool kit	CT3-3	CT3-3	1	RS-485 cable	NW-300, NW-150, or NW-30	NW-300, NW-150, or NW-30	ar
Sensor Module	SM100-1	SM100-1	4				
Telecom enclosure	PE2-1	PE2-1	4				
Sensor cable set	SC1-50	SC2-50	2	Sentient Security Management System Kit	CC100-1	CC100-1	1
Sensor cable set	SC1-150	SC2-150	6	Network decoupler kit	DK1-2	DK2-2	5
Network field power module	FPM-48	FPM-48	1	Terminator kit	TK1-4	TK2-4	2
Power module enclosure	WE1-4	WE1-4	1	Replacement mounting bracket	RB1-1	RB1-1	1

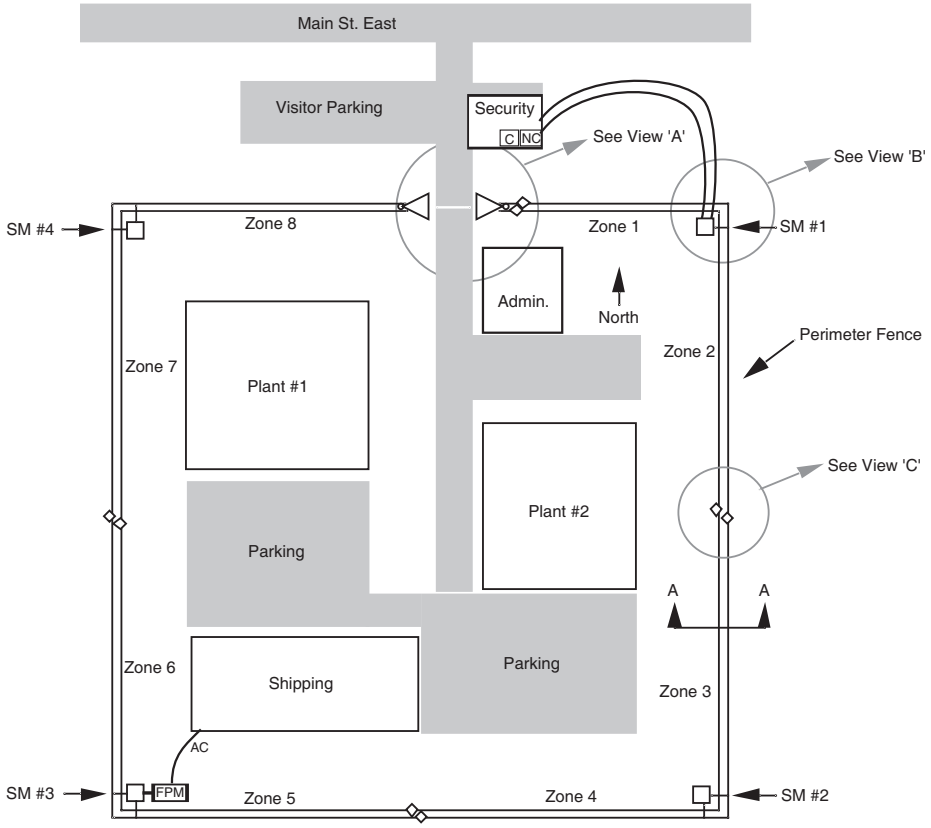
Sample site drawings

The following pages include a sample site plan and some sample electrical interconnection diagrams. The site depicted in the sample has eight zones covered by four Sensor Modules and an integrated microwave system. The Sentient Security Management System is located in the administration building.

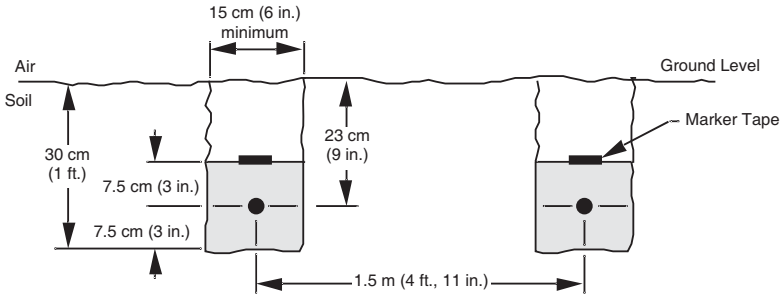
The site drawings should include this information

- location of all buildings, fences, obstacles, and SC1/SC2 system components
- details of cable layout at Sensor Modules, Network Controller, Sentient Security Management System, corners, and anywhere that installers will require specific details
- sensor and lead-in cable identification at Sensor Modules and Sentient Security Management System, including positions of white marks
- Sensor Module terminal connections

LTR	DESCRIPTION	DATE	APPD
—	CONFIGURATION BASELINE		



SECTION A-A



LEGEND	
SYMBOL	**MEANING**
SM#	SENSOR MODULE
FPM	FIELD POWER MODULE
NC	NETWORK CONTROLLER
C	SENTIENT SYSTEM
	MICROWAVE
	DECOUPLER
	TERMINATOR
Tx/Rx-n	CABLE ID

SAMPLE PERIMITRAX SC2 SITE PLAN (4 SENSOR MODULES AND ONE MICROWAVE SYSTEM)

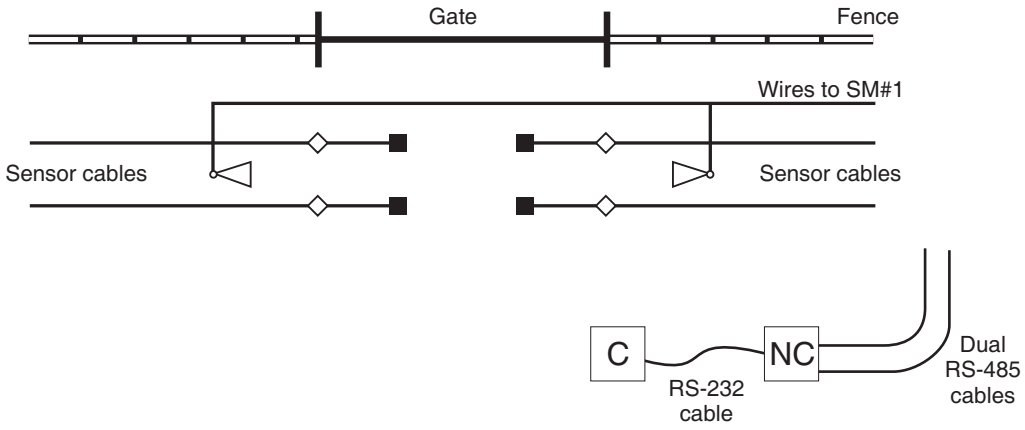
SIZE	FSCM No.	PART NUMBER	
B			
		DRAWING NUMBER	VAR.
SCALE		SHEET 1 OF 4	

2. Refer to site survey for distance measurements.
1. Fences are 7.5 m apart; cables are buried 1.5 m apart.

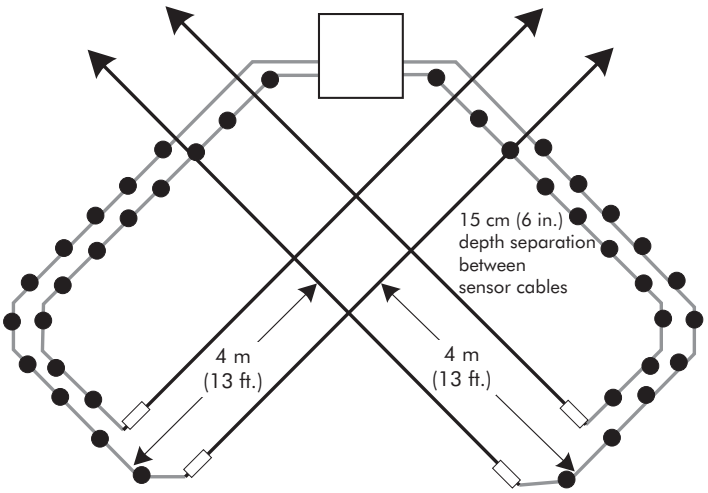
NOTES:

LTR	DESCRIPTION	DATE	APPD
—	CONFIGURATION BASELINE		

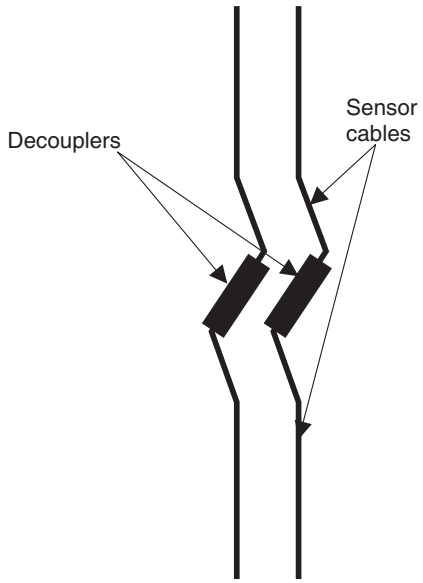
VIEW 'A'



VIEW 'B'



VIEW 'C'



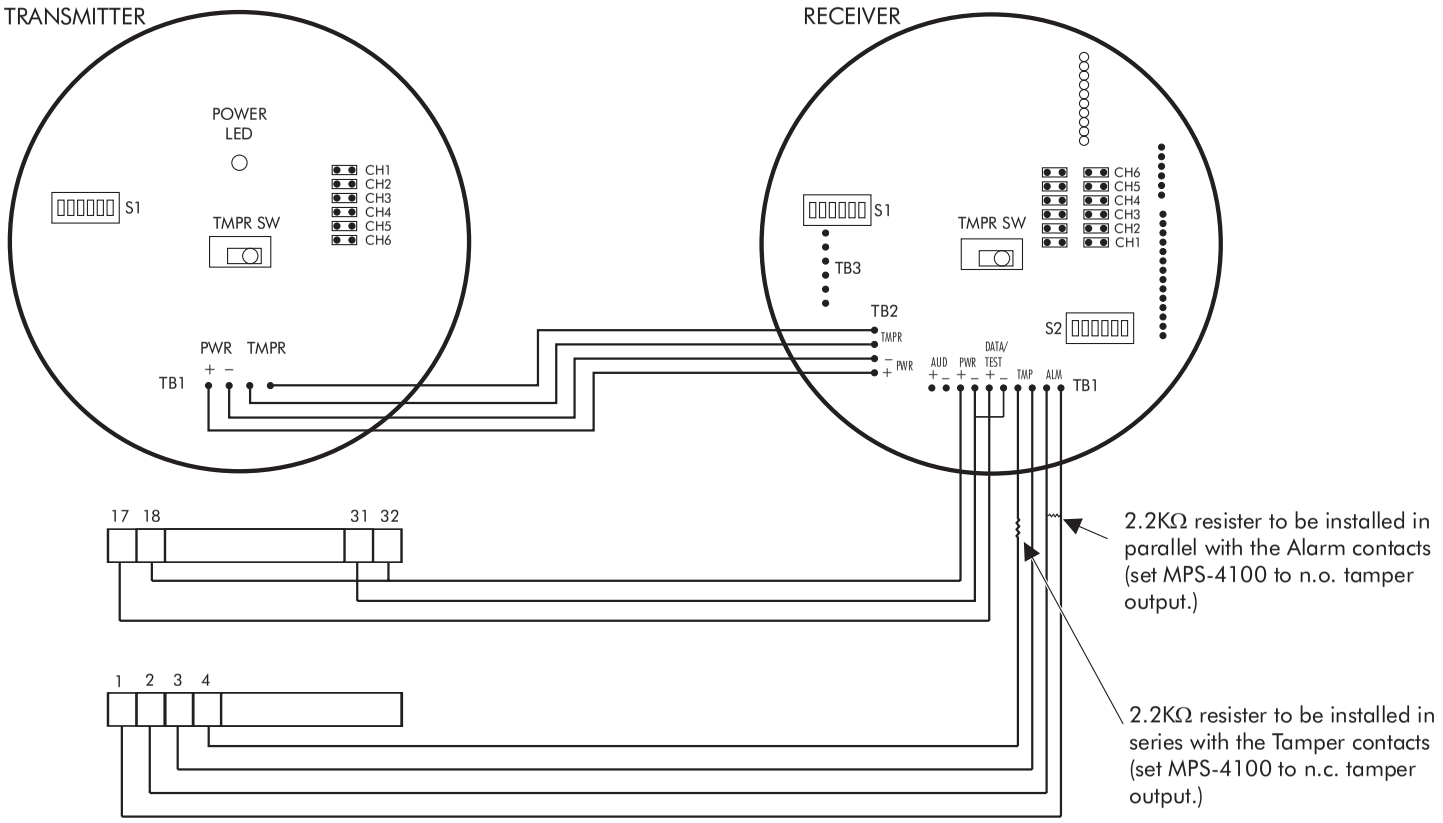
LEGEND	
SYMBOL	**MEANING**
SM#	SENSOR MODULE
FPM	FIELD POWER MODULE
NC	NETWORK CONTROLLER
C	SENTIENT SYSTEM
	MICROWAVE
	DECOUPLER
	TERMINATOR
Tx/Rx-n	CABLE ID

SAMPLE PERIMITRAX SC2 SITE PLAN
(4 SENSOR MODULES
AND ONE MICROWAVE SYSTEM)

SIZE	FSCM No.	PART NUMBER	
B			
		DRAWING NUMBER	VAR.
SCALE		SHEET 2 OF 4	

LTR	DESCRIPTION	DATE	APPD
—	CONFIGURATION BASELINE		

INTERCONNECTION DRAWING
PERIMITRAX SENSOR MODULE INTERFACE
TO MPS-4100 MICROWAVE LINK

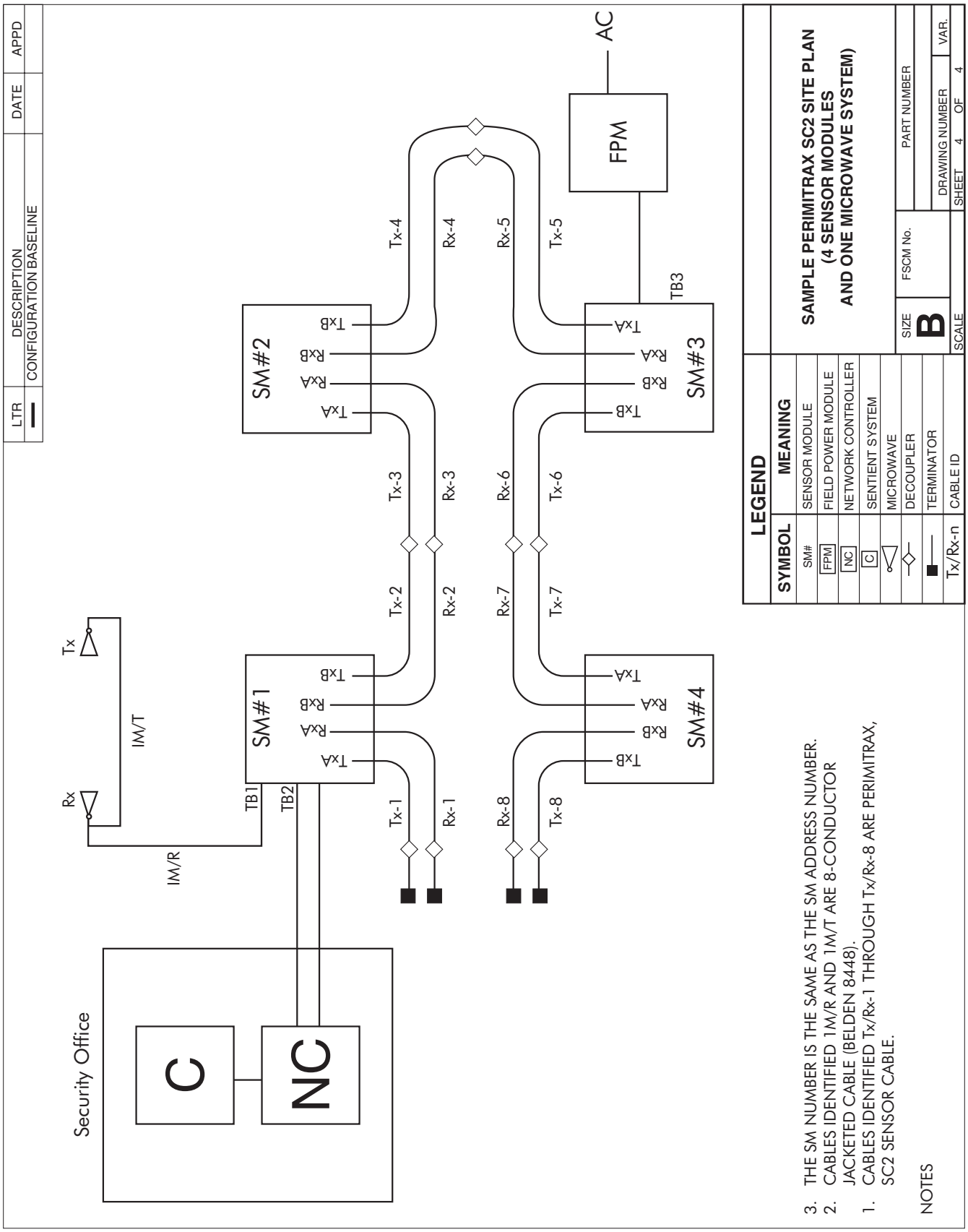


LEGEND	
SYMBOL	MEANING
SM#	SENSOR MODULE
FPM	FIELD POWER MODULE
NC	NETWORK CONTROLLER
C	SENTIENT SYSTEM
	MICROWAVE
	DECOUPLER
	TERMINATOR
Tx/Rx-n	CABLE ID

SAMPLE PERIMITRAX SC2 SITE PLAN
(4 SENSOR MODULES AND ONE MICROWAVE SYSTEM)

SIZE	FSCM No.	PART NUMBER	
B		DRAWING NUMBER	VAR.
SCALE		SHEET 3 OF 4	

NOTE: The Sentient System database should be programmed to momentarily close Relay 1 during a sensor test. This relay must be open at all other times.


LTR
DESCRIPTION
DATE
APPD
—
CONFIGURATION BASELINE
Security Office
C
NC
Tx
Rx
IM/T
IM/R
TB1
TB2
SM#1
SM#2
SM#3
SM#4
TxA
TxB
RxA
RxB
Tx-1
Rx-1
Tx-2
Rx-2
Tx-3
Rx-3
Tx-4
Rx-4
Rx-5
Tx-5
Rx-6
Tx-6
Rx-7
Tx-7
Rx-8
Tx-8
FPM
AC
TB3
LEGEND
SYMBOL
MEANING
SM#
SENSOR MODULE
FPM
FIELD POWER MODULE
NC
NETWORK CONTROLLER
C
SENTIENT SYSTEM
MICROWAVE
DECOUPLER
TERMINATOR
Tx/Rx-n
CABLE ID
SAMPLE PERIMITRAX SC2 SITE PLAN
(4 SENSOR MODULES
AND ONE MICROWAVE SYSTEM)
SIZE
B
FSCM No.
PART NUMBER
DRAWING NUMBER
VAR.
SCALE
SHEET 4 OF 4
NOTES
1. CABLES IDENTIFIED Tx/Rx-1 THROUGH Tx/Rx-8 ARE PERIMITRAX, SC2 SENSOR CABLE.
2. CABLES IDENTIFIED 1M/R AND 1M/T ARE 8-CONDUCTOR JACKETED CABLE (BELDEN 8448).
3. THE SM NUMBER IS THE SAME AS THE SM ADDRESS NUMBER.

b System component list

Requirements	Model Number	Part Number	Description	Reference page
Sensor module	SM100-1	A3FG0101	Standard	See *Sensor Modules* on page 5-2.
	SM100-2	A3FG0102	Alternate RF frequency set	
	SMDT01	A3EM0103	Data module	
Sensor module accessories (for processor versions prior to Revision F)	SMCF-2A	A3SP1101	Crystal filter, external, for EMI suppression, for SM100-2, A-side, 40.665 MHz.	
	SMCF-1A	A3SP1102	Crystal filter, external, for EMI suppression, for SM100-1, A-side, 40.675 MHz.	
	SMCF-1B	A3SP1103	Crystal filter, external, for EMI suppression, for SM100-1, B-side, 40.685 MHz.	
	SMCF-2B	A3SP1104	Crystal filter, external, for EMI suppression, for SM100-2, B-side, 40.695 MHz.	
Field power modules and options	FPM-12	A3EM0201	Standalone DC power supply, 115/230 VAC, 50/60Hz input, 12 VDC @ 8A output. Includes hardware for mounting in Sensor Module or power supply NEMA rated enclosures.	See *Power supply* on page 5-17.
	FPM-12R	A3EM0202	Same as above but with Hi-Rel option, 50 W output.	
	FPM-48	A3EM0304	Network power supply, 115/230 VAC, 50/60Hz input, 48 VDC @ 150 W output. Includes hardware for mounting in Sensor Module or power supply NEMA rated enclosures.	
	FPM-48R	A3EM0302	Same as above but with Hi-Rel option, 150 W output.	

Requirements	Model Number	Part Number	Description	Reference page
Field power modules and options (cont'd)	WE1-4	M0706	Power supply NEMA rated enclosure. Required for standalone or Telecom style enclosure. Includes mounting hardware. In Telecom enclosure must be used in conjunction with A3MD0300	See *Power supply* on page 5-17.
	RB1-1	A3MD0300	Replacement bracket for Telecom style enclosure. Replaces the bracket shipped with the Telecom enclosure.	
Enclosure options & accessories	WE2-1	A3MA0101	Lockable outdoor NEMA 4/IP 66 rated enclosure with integral tamper switch. Internal mounting plate includes hardware to mount Sensor Module and optional standalone or network power supply. Gray enamel finish, steel construction, 410 x 510 x 150 mm (16 x 20 x 6 in.).	See *Enclosures* on page 5-6.
	WE2-2	A3MA0102	Stainless Steel Lockable outdoor NEMA 4/IP 66 rated enclosure with integral tamper switch. Internal mounting plate includes hardware to mount Sensor Module and optional standalone or network power supply. Gray enamel finish, steel construction, 410 x 510 x 150 mm (16 x 20 x 6 in.). (* special order item, not stocked)	
	WE2-3	A3MA0501	Lockable outdoor NEMA 4/IP 66 rated enclosure with integral tamper switch. Internal mounting plate includes hardware to mount Sensor Module and optional standalone or network power supply. Gray enamel finish, steel construction, 510 x 510 x 150 mm (20 x 20 x 6 in.).	
	WE2-4	A3MA0502	Stainless Steel Lockable outdoor NEMA 4/IP 66 rated enclosure with integral tamper switch. Internal mounting plate includes hardware to mount Sensor Module and optional standalone or network power supply. Gray enamel finish, steel construction, 510 x 510 x 150 mm (20 x 20 x 6 in.). (* special order item, not stocked)	
	PE2-1	A3MA0300	Telecom style protective enclosure for above ground field mounting of Sensor Module. Includes tamper switch, mounting hardware and ground stake. Removable, lockable cover (lock not supplied), light green enamel 254 x 254 x 910 mm (10 x 10 x 36 in.).	

Requirements	Model Number	Part Number	Description	Reference page
Enclosure options & accessories (cont'd)	PK1-1	M0703	Pole mounting kit, NEMA enclosure	See *Enclosures* on page 5-6.
	HP1-1	M0704	Handle, padlock, NEMA enclosure	
	FP1-1	M0705	Composite mounting foot kit, NEMA enclosure	
Cable sets (SC1)	SC1-50	A3FG0201	50 m (164 ft.) single cable set	See *Sensor cable sets* on page 5-8.
	SC1-100	A3FG0202	100 m (328 ft.) single cable set	
	SC1-150	A3FG0204	150 m (492 ft.) single cable set	
	SC1-200	A3FG0211	200 m (656 ft.) single cable set	
Cable sets (SC2)	SC2-50	A3FG0301	50 m (164 ft.), dual cable set	
	SC2-100	A3FG0302	100 m (328 ft.) dual cable set	
	SC2-150	A3FG0304	150 m (492 ft.) dual cable set	
	SC2-200	A3FG0311	200 m (656 ft.) dual cable set	
Spare Lead-in cable (SC1)	LC1-25	A3CA0601	25 m (82 ft.), single cable lead-in	See *Lead-in section* on page 5-11.
	LC1-50	A3CA0602	50 m (164 ft.), single cable lead-in	
	LC1-100	A3CA0603	100 m (328 ft.), single cable lead-in	
Spare Lead-in cable (SC2)	LC2-25	A3CA0701	25 m (82 ft.), dual cable lead-in	
	LC2-50	A3CA0702	50 m (164 ft.), dual cable lead-in	
	LC2-100	A3CA0703	100 m (328 ft.), dual cable lead-in	
Spare ferrite beads	FB1-2	A3KT0300	Single cable ferrite bead kit (50)	See *Ferrite beads* on page 5-13.
	FB2-2	A3KT0400	Dual cable ferrite bead kit (50)	
Cable installation tools	CT3-3	A0KT1500	Connector tool kit	

Requirements	Model Number	Part Number	Description	Reference page
Cable splice kits	RK1-1	A3KT0500	Single cable splice kit	
	RK2-1	A3KT0800	Dual cable splice kit	
Cable connectors	TNC-F	A0SP0600	TNC female connector	See *Male connectors* on page 5-13.
	TNC-M	A0SP0700	TNC male connector	
Adapter	TNC-NF	T0600	TNC male to N female connector	
	TNC-FF	T0395	TNC female to female ended adapter	
	TNC-MM	T0421	TNC male to male ended adapter	
Heatshrink	HS1-1	W0214	Heatshrink tubing for SC1 sensor cable, 61 cm (24 in.) long	
	HS2-1	W0215	Heatshrink tubing for SC2 sensor cable, 41 cm (16 in.) long	
Decoupler kits	DK1-1	A3KT0601	Single cable standalone decoupler kit (use with SC1 sensor cable)	See *Decouplers* on page 5-14.
	DK1-2	A3KT0701	Single cable network decoupler kit (use with SC1 sensor cable)	
	DK2-1	A3KT0602	Dual cable standalone decoupler kit (use with SC2 sensor cable)	
	DK2-2	A3KT0702	Dual cable network decoupler kit (use with SC2 sensor cable)	
Terminator kits	TK1-4	A3CA0100	Single cable long terminator kit	See *Cable Terminators* on page 5-16.
	TK2-4	A3KT0100	Dual cable long terminator kit	
	ML1-1	A3KT0200	Mini load terminator for unused zones kit	
Lightning protection	LA1-5	E0310	External lightning arrestor. (Requires LA1-R)	
	LA1-R	E0311	Gas pellet replacement for lightning arrestor	

Requirements	Model Number	Part Number	Description	Reference page
Network controller options & accessories	SN-CN1	M0KT0310	Network controller circuit card assembly	See *Network controller* on page 5-21.
	SN-PW1	M0KT0100	Line powering. Selectable 115/230 VAC, 50/60 Hz input, provides 16 VAC for use with Network Controller.	
	BA-1	00KT0100	Battery, 12 VDC, 6AH. Minimum 8 hours back-up	
	SN-EN1	M0KT1000	Mounting plate, for use in OEM enclosures	
	SN-EN2	M0KT0800	Indoor enclosure with tamper switch and mounting plate. Lockable (padlock not included). For general indoor use.	
	SN-EN3	M0KT0900	NEMA 4/IP 66 rated enclosure with tamper switch and mounting plate. Lockable (padlock not included)	
	SN-LN1	E0302	Lightning protection device for data lines	
System cabling	PC-NC1	A3CA0901	3 m (10 ft.), RS-232 cable, network controller to PC	
	PC-NC2	A3CA0902	7.5 m (25 ft.), RS-232 cable, network controller to PC	
	PC-NC3	A3CA0903	15 m (50 ft.), RS-232 cable, network controller to PC	
	NW-30	W0222	30 m (100 ft.), data grade cable for RS-485 network wiring, one pair	
	NW-150	W0223	150 m (500 ft.), data grade cable for RS-485 network wiring, one pair	
	NW-300	W0224	300 m (1000 ft.), data grade cable for RS-485 network wiring, one pair	
Sentient Security Management System, Network Manager, Universal Configuration Module	Windows based alarmdisplay and control system software; Windows based alarm data mangement software; Windows based maintenance and calibration software; Contact the factory for details			
Interface option	SA1-1	A3BA0400	Local calibration interface assembly used with Sensor Modules in standalone configurations. Allows local manual setting of alarm thresholds.	See *Local interface assembly* on page 5-20.

Requirements	Model Number	Part Number	Description	Reference page
Printers	PR2-1	OI-200056-01	80 column printer, parallel, 115V, 60 Hz version, includes 3 m (9 ft., 10 in.) parallel interface cable	See *Printer* on page 5-24.
	PR2-2	OI-200056-02	80 column printer, parallel, 230V, 50 Hz version, includes 3 m (9 ft., 10 in.) parallel interface cable	
Power cords	PC-UK	E0321	UK, 250 VAC, 10 A, 2.5 m	
	PC-EC	E0322	European, 250 VAC, 10 A, 2.5 m	
	PC-AS	E0323	Australian, 250 VAC, 10 A, 2.5 m	
	PC-IT	E0324	Italian, 250 VAC, 10 A, 2.5 m	
	PC-XT	E0325	Extension, IEC 320, jumper, 2.5 m	
Tape	RT1-1	X0217	Amalgamating tape	
	MT1-1	X0191	Mastic tape	
	VT1-1	X0190	Vinyl tape	
Manuals		A3DA0102	Perimitrax Site planning guide	
		A3DA0202	Perimitrax Installation guide	
		M0DA0302	Sennet product guide	

C Specifications

Sensor Module (SM100)	**Model**	• SM100-1 • SM100-2
	Dimensions (LxWxD)	• 360 x 230 x 100 mm
	Weight	• 4.5 kg (10 lbs.)
	Quantity	• one per 2 zones
	Probability of detection	• greater than 99% for walking intruder weighing more than 34 kg
	Inputs	• 8 relay inputs (supervised) 2.2 k ohm
	Outputs	• 4 relay outputs 24 VDC maximum, 350 mA DC maximum • 2 analog calibration outputs for voltmeter or chart recorder
	Number of devices	• one network controller and up to 27 devices per network without repeaters; up to 62 devices with repeaters
	Zone length	• minimum - 10 m • maximum - 200 m
	Power output	• power available for external sensors - 11.5 VDC ± 5%, 150 mA maximum
	Controls	• DIP-switch for setting network address and unit configuration
		• jumper selectable RS-485 termination
		• jumper selectable relay contact configuration
		• adjustable detection threshold for each zone
		• 2.5 cm/s to 15 m/s adjustable velocity response
		• internal self-test - activated at CC or SM
	Connectors	• right angle TNC coaxial connectors for sensor cables • removable terminal block for network power
		• removable terminal block for redundant RS-485 connections
		• stacked removable terminal block for analog inputs, relay and analog outputs, tamper input and 12 VDC input/output
	Temperature	• -40º to +70ºC (as measured inside the enclosure)
	Relative humidity	• 0 to 95%, non-condensing
	Enclosure options	• IP33 rated outdoor protective enclosure, lockable, with tamper switch
		• IP66/NEMA 4 rated weatherproof outdoor enclosure, lockable, with tamper switch
	Operating frequency	• SM100-1 - 40.675 MHz (zone A), 40.685 MHz (zone B)
		• SM100-2 - 40.665 MHz (zone A), 40.695 MHz (zone B)
	Power input options	• 12 VDC, 500 mA maximum • 48 VDC, 175 mA maximum

Sensor Module (SMDT01)	**Model**	• SMDT01
	Dimensions (LxWxD)	• 360 x 230 x 100 mm
	Weight	• 4.5 kg (10 lbs.)
	Quantity	• one per 2 zones
	Inputs	• 8 relay inputs (supervised) 2.2 k ohm
	Outputs	• 4 relay outputs 24 VDC maximum, 350 mA DC maximum
	Number of devices	• one network controller and up to 27 devices per network without repeaters; up to 62 devices with repeaters
	Power output	• power available for external sensors - 11.5 VDC ± 5%, 150 mA maximum
	Controls	• DIP-switch for setting network address and unit configuration
		• jumper selectable RS-485 termination
		• jumper selectable relay contact configuration
	Connectors	• right angle TNC coaxial connectors for sensor cables • removable terminal block for network power
		• removable terminal block for redundant RS-485 connections
		• stacked removable terminal block for analog inputs, relay and analog outputs, tamper input and 12 VDC input/output
	Temperature	• -40º to +70ºC (as measured inside the enclosure)
	Relative humidity	• 0 to 95%, non-condensing
	Enclosure options	• IP33 rated outdoor protective enclosure, lockable, with tamper switch
		• IP66/NEMA 4 rated weatherproof outdoor enclosure, lockable, with tamper switch
	Power input options	• 12 VDC, 125 mA maximum • 48 VDC, 75 mA maximum

Sensor Cable (SC1 & SC2)	**Model**	• SC1	• SC2
	Dimensions (Length)	• available in 50, 100, 150 and 200 m detection lengths (each cable includes a 20 m non-sensitive section)	
	Operational Temperature	• -40º to +70ºC (-40º to +158ºF)	
	Storage Temperature	• -50º to +85ºC (-58º to +185ºF)	
	Dimensions (outside diameter)	• 8.5 x 15 mm (0.335 x 0.590 in.)	• 8.0 mm (0.315 in.)
	Weight	• 38.6 kg (85 lbs.) maximum	• 25 kg (53.5 lbs.) maximum
	Reel diameter	• 508Ø x 330 mm wide	• 406Ø x 330 mm wide

Network controller (NC)	**Model**	• SN-CN1
	Dimensions (LxWxD)	• card only - 152.4 x 317.5 x 44.4 mm (6 x 12½ x 1¾ in.) • card in indoor enclosure - 400 x 375 x 120 mm (15¼ x 14¾ x 4¾ in.)
	Weight	• 9 kg (20 lbs.) - card in indoor enclosure with AC power option and no battery
	Quantity	• one per network
	Host	• Sentient Security Management System
	Host interface	• RS-232/RS-422 serial data link
	Speed	• up to 19,200 baud, using StarCom II protocol
	Controls	• DIP-switch for setting host baud rate • reset switch • diagnostic test switch
	LED indicators	• network transmit and receive • host transmit and receive • self-test status
	Connectors	• removable terminal blocks for network wiring • 2 RS-232 or RS-422 serial ports for connection to host
	Temperature	• 0ºC to 55ºC (32ºF to 131ºF) (as measured inside the enclosure)
	Relative humidity	• 5 to 95%, non-condensing
	Enclosure options	• weatherproof outdoor NEMA 4 or indoor, lockable, with tamper switch, IP66 rated
	Power input options	• 12 VDC, 500 mA maximum • 16 VAC, 20 VA • 110-120 VAC, 60 Hz/220-240 VAC, 50 Hz power module • optional backup battery (AC power module)

Protective enclosure	**Model**	• PE2-1
	Dimensions (LxWxD)	• 254 x 254 x 910 mm (10 x 10 x 36 in.)
	Weight	• 17 kg (37 lbs.)
	Quantity	• one per SM
	Rating	• IP33/NEMA 3R

Outdoor enclosure	**Model**	• WE2-1 & WE2-2
	Dimensions (LxWxD)	• 410 x 510 x 150 mm (16 x 20 x 6 in.)
	Weight	• 13 kg (29 lbs.)
	Quantity	• one per SM
	Rating	• IP66/NEMA4

Outdoor enclosure	**Model**	• WE2-3 & WE2-4
	Dimensions (LxWxD)	• 510 x 510 x 150 mm (20 x 20 x 6 in.)
	Weight	• 15 kg (33 lbs.)
	Quantity	• one per SM
	Rating	• IP66/NEMA4
Standalone power supply	**Model**	• FPM-12
	Weight	• 1.8 kg (4 lbs.)
	Quantity	• one per SM
	Power input	• 115/230 VAC, 60/50 Hz, 200W
	Power output	• 12 VDC, 8A maximum, 100W
Standalone power supply (Hi-rel option)	**Model**	• FPM-12R
	Weight	• 1.8 kg (4 lbs.)
	Quantity	• one per SM
	Power input	• 115/230 VAC, 60/50 Hz, 200W
	Power output	• 12 VDC, 4A maximum, 50W
Network power supply	**Model**	• FPM-48
	Weight	• 2.3 kg (5 lbs.)
	Quantity	• one per 9 SMs or 2800 m of perimeter
	Power input	• 115/230 VAC, 60/50 Hz, 200W
	Power output	• 48 VDC, 3A maximum, 150W
Network power supply (Hi-rel option)	**Model**	• FPM-48R
	Weight	• 2.3 kg (5 lbs.)
	Quantity	• one per 9 SMs or 2800 m of perimeter
	Power input	• 115/230 VAC, 60/50 Hz, 200W
	Power output	• 48 VDC, 3A maximum, 150W

Glossary

ACCESS a flag on the Sentient Security Management System that shows when a sensor zone is in the Access State

Access state a condition in which alarms are not annunciated by the Sentient Security Management System

ACKNOWLEDGE an indicator that appears on the Sentient Security Management System monitor whenever an alarm occurs. Acknowledging an alarm stops audible annunciation of the alarm and lets you begin processing it

Alarm threshold see *Thresbold*

A-side zone odd-numbered zones that extend to one side of the Sensor Module. The B-side zone extends from the opposite side of the Sensor Module

Auxiliary sensor another sensor, such as a microwave sensor or a fence disturbance sensor, that can be integrated into the SC2/SC1 power and data network via connections to Sensor Module front panel terminals. (i.e., Intelli-FLEX™)

Auxiliary sensor alarm an alarm generated by an auxiliary sensor

B-side zone even-numbered zones that extend to one side of the Sensor Module. The A-side zone extends from the opposite side of the Sensor Module

Burial depth the distance between the sensor cables and the surface of the medium in which the cables are installed

Cable fault a fail alarm condition detected by the Sensor Module. Cable faults are either open circuits or short circuits

Cable path the route that the sensor cables follow along the perimeter of a site

Cable set one transmit and one receive cable used in an SC2 zone or the twin coaxial cable used in a SC1 zone. The SC2 cable set consists of two separate coaxial cables, male crimp connectors, ferrite beads and marking tape. The SC1 cable set consists of one twin coaxial cable, male crimp connectors, ferrite beads and marking tape

Cable spacing the lateral distance between the transmit and receive cables in an SC2 zone

Cable terminator a device attached to the decoupler on the last zone or zones of a perimeter, or on a sensor module at an unused zone. Terminators reduce the strength of the detection field by dissipating its power over their length, and providing a matched load for the data-link signal

Calibration plot a printout that records the peak detection signal of sensor zones at the rate of once per second. Calibration plots can be produced on printers connected to the Sentient Security Management System

Clutter the signal that is always present on the receive cable. It originates from the signal transmitted by the transmit cable, and is affected by the installation medium and stationary objects (vehicles, buildings, etc.) in the detection field and, in the case of SC2 cables, cable spacing. You can measure the clutter level at the Sensor Module. The clutter level is usually different for every

zone

Containment walk — a particular type of walk test performed on the perimeter to determine the extent of the detection field. See *Walk Test*

Sentient Security Management System — a color-graphics alarm-processing system that can display information about the sensors on a protected perimeter. The terminal of the Sentient Security Management System can portray system status in both map and text form, and allows an operator to respond to events by entering commands from a keyboard

Data link — communications between the Sentient Security Management System and the Sensor Modules via the sensor cables

dB — decibel, a measure of signal strength

Decoupler — a device installed in line with a sensor cable to define the end of a zone. A decoupler is a passive electronic device that stops radio-frequency signals, and therefore the detection field, from continuing along the cable path. The decoupler is connected between the sensor cables in two zones, or to a terminator at the end of the perimeter

Detection field — the area filled by radio-frequency signals around the sensor cables in which an intruder can be detected. The detection field extends above and below the ground and has an oval-shaped cross-section

Detection signal — the signal received by the Sensor Module on the receive cables. It is measured in decibels (dB) and increases when an intruder causes an electromagnetic disturbance in the detection field

Detection signal plot — a printout that simultaneously records the peak detection signal of multiple sensor zones. Two types of plots are the calibration plot and the peak-magnitude plot. Plots can be produced on printers connected to the Sentient Security Management System

Display zone — information shown on the operator display terminal. The display zone may be comprised of more than one alarm, i.e., one display zone may consist of a Sensor Module detection zone, a microwave detection zone, and surveillance cameras, etc.

Dual-direction powering — a Perimitrax system configuration that features redundancy of the power and data network. If both cables in a zone are cut, the detection capabilities in that zone will be lost, but the operation of other zones will be unaffected

Electromagnetic field — the field created by the radio-frequency signals in the sensor cables. See *Detection field*

Enclosure — any type of housing used to protect the Sensor Module or Network Controller from the weather and from tampering

Event log — a printed record of system events and operator actions. The log records events automatically as they occur whenever a printer is connected to the Sentient Security Management System

External tamper switch — a customer-supplied, normally-open switch. The switch can be connected to the external tamper plug on a Sensor Module. A tamper alarm is generated when the switch's electrical contacts open

Fail alarm — an alarm generated when the Sensor Module senses a fail condition. Fail alarms are displayed on the Sentient Security Management System

Fail-safe condition — the condition in which the fail-safe relay is energized in the non-alarm state

False alarm — a sensor alarm with no observable physical cause

Ferrite beads — ferrite rings that are installed at 30 cm (12 in.) intervals along the lead-in cables between the detection field and the Sensor Module. They prevent the detection field from following the

lead-in cable back to the Sensor Module

Heavy soil a clay-like soil

Intrusion alarm see *Sensor alarm*

Lead-in cable the portion of the sensor cable that connects the sensor cables to the Sensor Module. Lead-in cables are completely shielded to prevent radio-frequency signals from escaping, so they prevent the detection field from forming near the Sensor Module. Lead-in cable is 20 m (66 ft.) long. See *Ferrite beads*

Leaky cable a term describing the type of sensor cable used in the Perimitrax system. Leaky cable is like ordinary coaxial cable except that the braided shield surrounding the cable conductor is incomplete. Openings in the shield allow a portion of the radio-frequency signal to escape and form the detection field around the cable. See *Sensor cable*

Light soil a sandy soil

Medium soil a normal soil such as loam, half-way between a light, sandy soil and a heavy, clay soil

Network a Perimitrax system configuration comprising a Sentient Security Management System and one or more Sensor Modules connected together by sensor cables

Nuisance alarm a sensor alarm caused by an object or disturbance other than a valid target

Operator key the keys used by operators to perform functions from the Sentient Security Management System

Peak-magnitude plot a printout that records Sensor Module detection signals at intervals between five seconds to five minutes, at ±32 dB relative to the individual zone threshold level. The peak-magnitude plot can be produced on a printer attached to the Sentient Security Management System

Physical zone term generally used when laying out a perimeter. The physical zone consists of the linear measurement zone. See also *zone*

Protective post a concrete-filled post that prevents vehicles from running into field-mounted Sensor Modules

Receive cable the sensor cable that picks up radio-frequency signals emitted by the transmit cable and returns them to the Sensor Module

Red mark a piece of red tape is affixed to the sensor cable to show where the lead-in cable stops and the sensor cable starts. Lead-in cable is 20 m (66 ft.) long; sensor cable is 50, 100, 150, or 200 m (164, 328, 492, or 656 ft.) long

Relay output card an optional card in the Sentient Security Management System that provides relay closure outputs for the annunciation of Perimitrax sensor cable and auxiliary sensor alarms

RESET input an input point on the Sensor Module used to clear the Sensor Module detection filter

SECURE a flag on the Sentient Security Management System that shows when the zone indicated in the right-hand display is in the Secure State

Secure state a condition in which alarms will be annunciated by the Sentient Security Management System

Sensor alarm an alarm generated when an intruder enters a Sensor Module's detection field or when an intruder sets off an auxiliary sensor connected to a Sensor Module. Sensor Modules transmit sensor alarms to the Sentient Security Management System via the sensor cables

Sensor cable the buried intrusion-sensing element of the Perimitrax system. Cable is available in sets of various lengths. Each SC2 cable set contains a pair of cables. Each SC1 cable set contains a

	single twin coaxial cable. One SC2 cable, or one side of the SC1 cable, transmits a radio-frequency signal and the other SC2 cable, or the other side of the SC1 cable, receives it. Sensor cables are connected to the Sensor Module via lead-in cable. See also *Leaky cable; Lead-in cable; Zone*
Sensor Module	a microprocessor-controlled device that serves as the sensor unit of the Perimitrax system. Each unit is connected to one or two sets of sensor cables and provides intrusion detection for two zones. The Sensor Module contains electronic circuitry, controls, and cable connectors. When alarm conditions are detected, an alarm signal is sent to the Sentient Security Management System
Sensor test	an activity in which Sensor Module test targets and auxiliary sensor test functions are activated remotely from the Sentient Security Management System
Single-direction powering	a Perimitrax network system configuration in which the sensor cables operate without redundancy in the power and data network
Status report	a report containing information on the current status of Sensor Modules. It is similar to the Perimitrax test report
SC1	the brand name of the twin coaxial sensor cable manufactured by Senstar Corporation for the Perimitrax perimeter intrusion detection system
SC2	the brand name of the dual coaxial sensor cable manufactured by Senstar Corporation for the Perimitrax perimeter intrusion detection system
Tamper alarm	an alarm that indicates tampering with a sensor
Tamper switch	a mechanical switch that, when opened will generate a tamper alarm
Telecom enclosure	the Telecom protective enclosure is identical to enclosures used in many telephone and cable television installations. This enclosure provides protection against the elements and serves to camouflage the Sensor Module
Terminator	a device attached to the decoupler on the last zone or zones of a perimeter. Terminators reduce the strength of the detection field by dissipating its power over their length. They also terminate data signals that are carried on the sensor cables
Threshold	the level that the detection signal, received by the Sensor Module on the receive cable, must exceed to cause an alarm condition. It is measured in decibels
Threshold adjustment control	controls that allow you to adjust the threshold level. There are separate controls for zones A and B. They are calibrated in decibels
Threshold margin	the difference between the threshold value and the detection signal generated by a 70 kg (154 lb.) person crossing the detection field at the least sensitive point in a zone
Transmit cable	the sensor cable that emits the radio-frequency signals generated by the Sensor Module. The radio-frequency signals form the detection field
Walk test	a procedure in which the user tests the operation of the Perimitrax system by walking along the center line of the sensor cables in a zone. The results of the test are used when setting the threshold for each zone
Weatherproof enclosure	a gray, metal, weatherproof box that protects the Sensor Module
Zone	a general term referring to the area in which a security sensor is desired to detect targets. Perimitrax Sensor Modules provide two zones of perimeter protection and are capable of integrating additional zones of supporting sensors. See also *physical zone*

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