Senstar LM100™

Intelligent Perimeter Lighting and Sensing Solution

Product Guide

E8DA0102-001 Rev A
December 11, 2017

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Any changes or modifications to the software or equipment that are not expressly approved by Senstar Corporation void the manufacturer's warranty, and could void the user's authority to operate the equipment.

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

Compliance:

This equipment should be installed and operated such that the transmit antenna is 25 mm (1 in.) or more away from any person during the device's operation.

Canada: Innovation, Science and Economic Development Canada Certification Number:
1454B-LM100 (Senstar LM100 luminaire)

CAN ICES-3B/NMB-3B

This device complies with Innovation, Science and Economic Development Canada license-exempt RSS standard(s). 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.

Ce dispositif est conforme aux normes CNR Innovation, Sciences et Développement économique Canada applicables aux appareils radio exempts de licence. Son fonctionnement est sujet aux deux conditions suivantes : 1) le dispositif ne doit pas produire de brouillage préjudiciable; et 2) il doit accepter tout brouillage reçu, y compris un brouillage susceptible de provoquer un fonctionnement indésirable.

USA: FCC Identification Number: I5TLM100 (Senstar LM100 luminaire)

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

FCC Certification - 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.

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 the equipment 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 between the equipment and receiver.

Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

Consult the dealer or an experienced radio/TV technician for help.

Europe:

This device complies with ETSI standard EN 300 440 for European operation.

The use of shielded cables is required for compliance.

CE

Senstar Corporation's Quality Management System is ISO 9001:2008 registered.

Table of Contents

Related publications:

The following documents, included on the Senstar LM100 CD, contain information that may be applicable to the Senstar LM100 system

- E8DA0103-001 Senstar LM100 quickstart instruction
- 00DA0803-001 Installing the network interface card
- 00DA1003-002 UltraLink I/O
- 00DA1203-001 Installing the network interface unit
- 00DA1503-001 Installing I/O cards
- 00DA0109-001 Network Manager overview
- E7DA0103-001 Wireless Gate Sensor

1 System planning

Description

The Senstar LM100 intelligent perimeter lighting and sensing solution combines high-intensity LED lighting with an accelerometer-based vibration detection sensor. The system is comprised of a distributed set of LM100 luminaires, which include the LED lights and the vibration detecting sensor, a gateway device that processes the signals from the luminaires, and a luminaire AP (access point) that provides an RS-485 half-duplex connection between the RF-based luminaires and the gateway.

The Senstar LM100 luminaires are typically mounted on the perimeter fence, but can also be mounted on walls or other surfaces. The luminaires communicate over a proprietary wireless mesh network transmitting status information and receiving control point commands from the gateway via the hard-wired connection to the luminaire AP. The gateway provides the user interface to the distributed luminaires as well as the interface between the luminaires and a security management system (SMS). The gateway device supports up to 100 luminaires (the luminaire AP is included in the 100 unit limit for each Senstar LM100 system).

Figure 1: luminaires at night

For optimum performance and the highest probability of detection (Pd) the Senstar LM100 luminaires can be mounted on fences up to 3.6 m (12 ft.) high, with up to 6 m (20 ft.) separation between luminaires. With 6 m spacing between luminaires, one Senstar LM100 system can protect up to 600 m (1970 ft.) of perimeter fencing. The luminaires can be mounted at various heights on the fence posts to avoid contact with barbed wire outriggers at the top of the fence.

Note	It may be possible for the Senstar LM100 to protect fences higher than 3.6 m by installing the luminaires at the 3.6 m (12 ft.) point on the fence posts; or by using the minimum separation between luminaires of 3 m. However, Senstar strongly recommends a trial installation and testing the installation thoroughly to ensure the detection sensitivity meets the site requirements.

The Senstar LM100 system can be configured to protect most types of fences with user-configurable detection parameters and light activation controls. Each system supports up to 50 distinct alarm zones and each alarm zone can include from 1 to 100 luminaires. In addition to alarm detection and response, each software defined zone can follow a preset schedule for routine light activation. The luminaire detection parameters and alarm response are configured through the LM100 gateway. The lights can be turned ON, OFF, and Strobed in response to an alarm, individually or grouped by zone. The luminaires can also have their brightness adjusted for both routine lighting and alarm response.

The LEDs on the Senstar LM100 luminaires are optimized to provide full spectrum lighting, to ensure high quality images for CCTV coverage. The LEDs provide uniform directional lighting along the fence line with an elliptical 120º coverage pattern that minimizes light pollution. The LED lights are fully ON or OFF instantly, without a warm-up period and each luminaire consumes only 2.5 W. The Senstar LM100 system is so energy efficient that a complete system with 100 luminaires consumes about the same amount of power as a single high pressure sodium light.

The Senstar LM100 gateway includes ten I/O ports that are individually selectable as inputs or outputs with normally open or normally closed contacts. An I/O option card can be added to the gateway to provide an additional 4 inputs or 4 outputs. The I/O points can be controlled locally by the gateway with the outputs used to signal alarm and supervision conditions, and the inputs used to activate luminaire zones. Alternately, the I/O points can be controlled remotely by a security management system (SMS). In this case the outputs are used to activate auxiliary equipment and the inputs are used to communicate the status of auxiliary devices to the SMS. The outputs are individually configurable and can source up to 100 mA to power auxiliary equipment. The inputs to the gateway must be voltage free. The Senstar LM100 supports the Wireless Gate Sensor (WGS) to provide coverage for up to 4 gates per system. The WGS requires a receiver module which mounts on the gateway circuit card assembly (CCA) and at least one gate sensor for each protected gate.

The Senstar LM100 system can operate as a standalone system which reports alarm conditions via contact closure outputs. Each luminaire can be configured to respond to alarm conditions and to automatically turn ON and OFF according to a user-defined schedule, and to activate other equipment (via gateway outputs). Each luminaire can also be configured to respond to dry contact inputs from other equipment such as a photo cell for routine light activation.

The Senstar LM100 can be part of a Silver Network based security system. In this case the gateway requires a Network Interface Card that connects to a PC running Senstar's Network Manager (NM) service. The NM interfaces between the Senstar LM100 and a security management system such as StarNet 2 or the Alarm Integration Module. The Senstar LM100 can easily be integrated into any SMS that accepts contact closure inputs. There are 16 channels available to prevent interference between closely located Senstar LM100 systems (400 m separation is required between Senstar LM100 systems operating on the same channel).

Senstar LM100 luminaires

The luminaire is both the sensing unit and the lighting unit for the Senstar LM100 system. The luminaires communicate over a wireless mesh network, relaying status information to the gateway via the luminaire AP. Luminaires are usually mounted near the tops of the fence posts, and can also be mounted on walls or other flat surfaces. The luminaire head contains the electronic components (a MEMs sensor, LED lights and a wireless RF transceiver). Each Senstar LM100 gateway supports up to 100 luminaires (1 luminaire AP + 99 luminaires). The luminaires are configured remotely through a UCM connection to the gateway. One or more luminaires can be grouped into segments, and the segments can be grouped into zones (via the UCM software). The detection parameters are set globally for all luminaires. However, each luminaire segment has an independent alarm threshold and each luminaire zone can have independent light activation controls. The global detection parameters include an Event Window, an Event Count and an Alarm Window. There is also a Target Filter which can be used to screen out some sources of environmental and mechanical noise. Each luminaire is supervised to protect against tampering and the removal of the device.

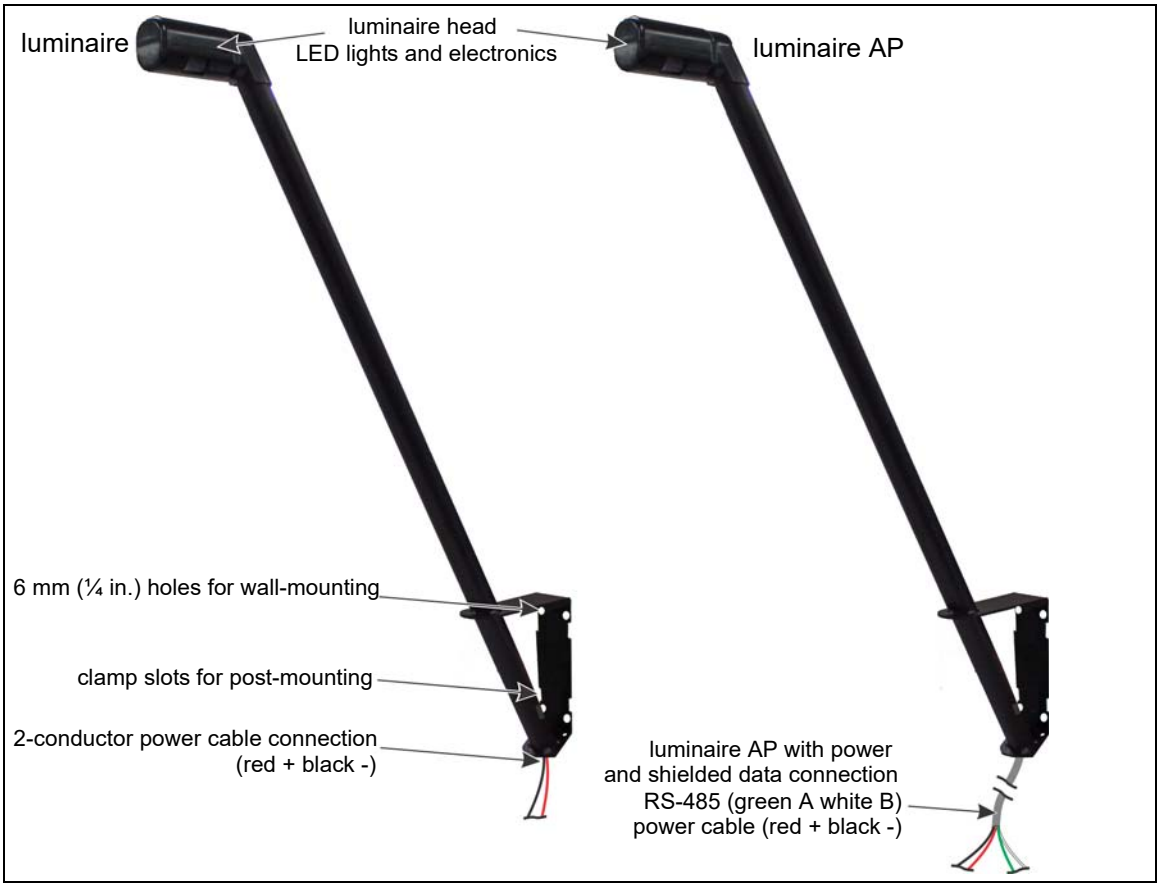


Figure 2: Senstar 100LM luminaire and luminaire AP

The luminaire's lighting properties are also set globally. This includes brightness, and response to alarm conditions. There are 5 selectable luminaire alarm responses. Luminaires can be turned ON, OFF, or strobed individually or in zones. For example, the luminaire that detects an intrusion attempt can be strobed and the zone it is assigned to can be turned ON. It is also possible to configure a luminaire zone to follow a routine lighting schedule, with or without providing intrusion detection. For example, a number of luminaires could be used to provide walkway lighting and building entrance lighting. These luminaires would be scheduled to turn on at dusk and off at dawn. Alarm detection is not desired for these luminaires so the detection for this group of luminaires would be disabled.

Senstar LM100 luminaire AP

The luminaire AP functions as a standard luminaire providing intrusion detection and routine lighting. It also serves as the access point through which the distributed luminaires communicate with the gateway device. A two-wire RS-485 connection between the AP and the gateway enables half-duplex communication between the two devices. Individual luminaires are polled for status information, and when an alarm condition occurs, the luminaire detecting the alarm transmits the status change. This information is passed over the wireless mesh network until it is received by the luminaire AP. The luminaire AP sends the data to the gateway over the RS-485 connection. The gateway processes the received signals and triggers an alarm when the information indicates a valid alarm. The luminaire AP includes a 3 m (10 ft.) 4-conductor cable to make the power and data connection to the gateway. The luminaire AP can be installed up to 100 m (328 ft.) away from the gateway by splicing in a suitable length of data/power cable. To use the extended cable length requires a minimum 24 VDC power supply.

Senstar LM100 gateway

The gateway is the central controller for the Senstar LM100 system. It communicates with the distributed luminaires through a 2-wire RS-485 connection to the luminaire AP. The gateway receives the alarm and status information from the luminaires, and depending on the method of alarm reporting, it either passes the data to the Silver Network Manager (NM) or it activates the onboard outputs to signal alarm conditions and status information. System setup and configuration for the luminaires is done using the Universal Configuration Module (UCM) through either a direct USB connection to the gateway device, or remotely through the Silver Network Manager.

The gateway can be mounted outdoors on a post, either on, or separate from, the fence on which the luminaires are installed. A rigid fixed post is recommended for outdoor applications. The gateway can also be installed indoors or outdoors on a flat stable surface. Post-mounting hardware is supplied for post sizes ranging from 4.5 cm to 12.7 cm (1¾ in. to 5 in.). The hardware required for surface-mounting the gateway is customer-supplied. The gateway enclosure is hinged on one side and includes a lockable latch (padlock not included).

The gateway includes ten input/output (I/O) ports, each of which can be configured as either an input or an output. Option cards are available to provide an additional 4 inputs or 4 outputs. There are two selectable control modes for the gateway's I/O, local control mode and remote control mode. The control mode is set in software, via the UCM. The default setting is local control mode, in which the gateway controls the on-board relays to signal alarm and supervision conditions (user specified relay activation conditions). In local control mode, the inputs are used to activate user-selectable luminaires (i.e., when the input goes high, activate one or more luminaires). In remote control mode, the alarm data is carried over the Silver Network to a host security management system (SMS). Remote control mode enables the security management system (SMS) to control the gateway's relays as output points to operate other security equipment. The input ports provide inputs to the host SMS for reporting the status of auxiliary devices. In both modes, you can configure the gateway's input/output response according to your site-specific requirements.

- **local control mode** - hard-wired contact closure alarm data connections and input wiring connections are made between the gateway and the annunciation equipment (ten I/O ports in any combination of output relays, dry contact inputs) (the optional Relay Output card provides 4 additional outputs for reporting alarm conditions; the optional dry contact input card provides 4 additional inputs)
- **remote control mode** - the alarm data communications are via the Silver Network: RS-422 copper wire data paths, Ethernet cable, or fiber optic cables connect the gateway to the Network Manager, which communicates with a host security management system; the outputs are available as output control points from the host system (the optional Relay Output card provides 4 additional outputs) the dry contact inputs are available for reporting the status of auxiliary equipment to the host system (the optional dry contact input card provides 4 additional inputs)

Note	For the Senstar LM100 to be part of a Silver Network based security system, the gateway requires a network interface card. The gateway can use either an input card or an output card, not both.

The Universal Configuration Module

The Universal Configuration Module (UCM) is a Windows based software application, which serves as the calibration, setup and maintenance tool for the Senstar LM100 system. The UCM communicates with the gateway locally through a USB connection, or remotely via the Silver Network Manager. When the UCM software starts, a window displays that enables you to specify the device to which you are connecting (Senstar LM100).

Alarm communication options

- contact closure alarm communications (local control mode) up to 14 distinct alarm zones per Senstar LM100 system (requires optional relay output card)
- Silver Network data communications using RS-422 copper wire data paths, Ethernet cable, or fiber optic cable

Note	Use individually shielded twisted pair with overall shield for RS-422 data cables.

Note	A Silver Network based Senstar LM100 can use local control mode to operate the gateway's inputs and outputs.

Relay Output Card

The relay output card (ROC) (P/N 00BA2500) includes four relays to supplement the outputs available on the gateway. In local control mode the ROC's outputs indicate user-selectable alarm and supervision conditions. In remote control mode, the host security management system operates the ROC's relays, as output control points, (e.g., to activate sirens, CCTV equipment, etc.). You can configure the relays as latching (ON by command, OFF by command), in flash mode (ON-OFF-ON-OFF, etc. by command, then OFF by command), or pulse mode (ON for a period, then OFF). For flash and pulse modes, the Active/Inactive times are selectable.

Dry Contact Input Card

The dry contact input card (DRIC) (P/N 00BA2400) includes four inputs to supplement the inputs available on the gateway. In local control mode the DRIC's inputs are used to activate user-specified luminaires. In remote control mode, the inputs connect auxiliary devices to the host security management system (e.g., to report the status of other security equipment such as a microwave or magnetic contact). The Filter Window parameter allows you to set the time period for which an input must be active, before an event is reported.

Fail-safe relay operation

In the default configuration, the gateway's relays operate in fail-safe mode. During normal operation, the relays latch in the non-alarm state. In the event of a total gateway failure all relays switch to the alarm state.

Power source and wiring

The Senstar LM100 system can operate on a wide range of input voltages (12 to 48 VDC). A 12 VDC power supply is suitable for powering the gateway and the luminaire AP, or a single luminaire. Outdoor rated low voltage power cable is available in 152 m (500 ft.) reels (P/N: 14/2 GW0337-14, 16/2 GW0337-16). The distance covered by a power supply can be extended by running the power cables in both directions around the perimeter from a central location. The following figure includes the number of luminaires that can be powered based on power supply voltage, wire gauge and distance:

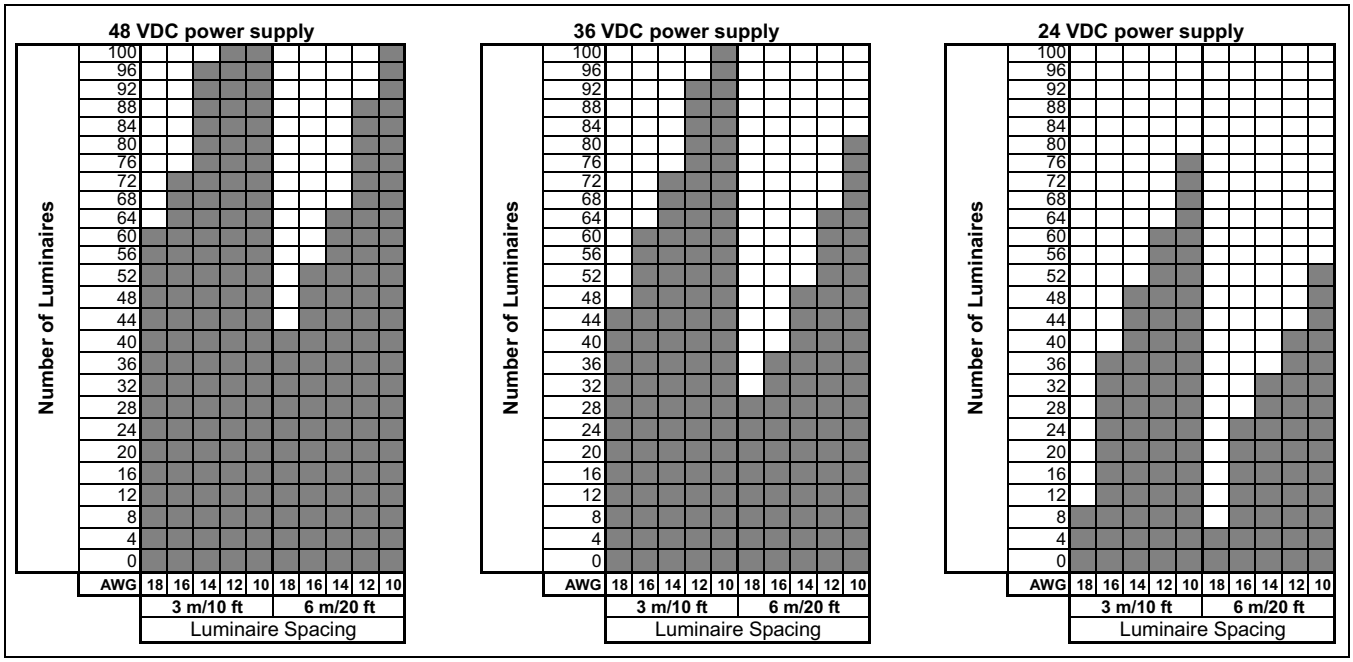


Figure 3: Senstar LM100 luminaire power cable recommendations

Note	In locations where AC power may not be stable or reliable, an uninterruptable power supply (UPS) should be used for primary power.

Auxiliary device output power

The gateway device can source up to 100 mA at the gateway's input voltage via the onboard outputs. The outputs can be used to energize high voltage relays or to activate auxiliary security devices. The gateway's outputs can also sink up to 100 mA from an auxiliary device.

Power over Ethernet

Silver Network based gateways using Ethernet communications have the option of using Power over Ethernet. To use this powering option requires a PoE class 3 switch that is located within 100 m (328 ft.) of the gateway, and minimum Category 5 Ethernet cable. Power over Ethernet is supplied to the gateway's Network Interface card (NIC) and the power output on the NIC is connected to the power input on the gateway. The PoE connection can also supply power to the luminaire AP (but not to any other luminaires). Figure 43: illustrates an Ethernet based Silver Network.

Note	Senstar recommends using a fully managed PoE switch, to supply power to a Senstar LM100 gateway.

Grounding considerations

The Senstar LM100 gateway requires a stable low resistance earth ground connection. Use a short length of heavy gauge copper wire to connect the ground lug on the bottom of the enclosure to an approved low resistance earth ground.

CAUTION	Consult the local electrical code for grounding information.

Alarm monitoring

Alarm monitoring is site specific and depends on whether you are using relay outputs for alarm reporting (standalone system, local control mode) or Silver Network based alarm reporting (networked system, remote control mode). Each gateway has ten user-configurable I/O points (inputs/outputs). In standalone mode, the outputs are used to signal alarm and supervision conditions. For network based gateways, alarm data is carried over the network cables and the outputs are available as output control points from the security management system.

NM Mode alarm reporting

The LM100 gateway can be configured to report alarm and supervision conditions through the UltraLink modular I/O system. The UltraLink I/O processor, operating in NM Mode, functions as a Network Manager, providing alarm outputs for a connected network of up to eight Silver Network compatible devices. In NM Mode, the Silver devices do not require a connection to a PC running Silver Network Manager software. Sensor alarms and supervision conditions are assigned to UltraLink I/O outputs. When an alarm occurs on a connected sensor, the corresponding UltraLink output is activated (see 00DA1003-002 UltraLink I/O for additional details).

Security factors

There are many important factors to consider when planning a perimeter security system:

- Fence height - The fence must be high enough to present an effective barrier to climb-over intrusions. It should also include climb-over deterrent hardware such as barbed wire or razor ribbon (for flexible fences). Rigid fence types should incorporate a climb over deterrent in their design (pointed stakes or pales). Senstar recommends that the minimum fence height for a Senstar LM100 installation on a flexible fence type is 2.5 m (8 ft.). For rigid fence types the minimum recommended fence height is 2 m (6.5 ft.).
- Fence condition - the Senstar LM100 detects intrusions by sensing the minute vibrations caused by an intrusion attempt. Therefore, the fence must be in good condition to prevent any metal on metal contact or vibrations caused by environmental factors. It may be necessary to upgrade or repair the perimeter fence to ensure it presents a sufficient barrier against climb over and crawl under intrusions. If you are not sure of the suitability of your fence for a Senstar LM100 system, Senstar recommends hiring a local fencing contractor to inspect, and if required, repair the fence.
- Fence length - The length of the fence, the number of fence posts and the fence post spacing determine the number of luminaires required to provide adequate coverage. The maximum recommended spacing for luminaires is 6 m (20 ft.). The minimum recommended spacing for luminaires is 3 m (10 ft.). The minimum spacing provides the highest level of security. Exceeding the maximum recommended spacing can result in areas with reduced detection sensitivity and gaps in the lighting.

- Probability of detection (Pd) vs. nuisance alarm rate (NAR) - With a fence-mounted intrusion detection system there is always a trade-off between the probability of detection and the nuisance alarm rate. A properly calibrated system will provide a high Pd while minimizing the NAR.
- Alarm assessment/response - What happens when the system triggers an alarm? Can the alarm be assessed visually? Does the site include CCTV coverage to verify the event? Senstar recommends engaging a security consultant to discuss the available methods of alarm assessment. To ensure maximum confidence in the system you must be able to distinguish between valid alarms and nuisance alarms.
- Deterrence - The Senstar LM100 can activate or strobe lights at the location where an intrusion attempt is detected, while the intruder is still outside the perimeter fence. Brightly illuminating the area of attack serves as a powerful deterrent while also providing high quality light for CCTV coverage.

Fence structures

To ensure consistent detection, the fence panels should be similar in type and size and be in good condition. Ensure that there are no loose panels, fittings or metal parts that can move and cause nuisance alarms. A shake test in which you grip the fence fabric in the middle of a panel and shake it back and forth with an increasing motion will help identify any loose pieces. Listen for metal-on-metal contact and correct any problems found. Verify that there are no washouts or depressions under the fence that could allow an intruder access. Ensure that there is no vegetation or other objects that can make contact with the fence in windy conditions.

Stainless steel post clamps are included for mounting the gateway and the luminaires. The post clamps fit a wide range of post sizes with outside diameters (ODs) from 4.5 to 13 cm (1¾ to 5 in.). The clamps will fit rectangular posts measuring up to 10 cm (4 in.) per side. The recommended luminaire spacing is from 3 to 6 m (10 to 20 ft.) separation. However, The maximum recommended separation between two luminaires is 20 m (66 ft.) to ensure accurate low power RF communication between the devices.

Note	It is also possible to install luminaires by marking the fence posts, drilling four holes and using self-tapping screws.

Standard flexible fence types

Chain-link fence

Chain-link fence is usually comprised of steel wires that are bent lengthwise into zig-zag patterns. The zig-zag wires are vertically woven to form the characteristic diamond pattern. The fence fabric is attached to fence posts approximately 3 m (10 ft.) apart. Tension wires are often used to stiffen the fence fabric at the top, bottom and middle of the fence. Chain-link fences are available in different heights and are sometimes vinyl coated.

Welded-mesh fences

A typical welded-mesh fence section consists of steel wire welded into a grid, with horizontal spacing differing from vertical spacing. These fence sections are secured to fence posts and often include top and bottom rails.

Expanded metal fences

Expanded metal mesh is typically comprised of a metal material with diamond shaped holes. Expanded metal fences are available with a variety of diamond size openings and gauges that can be attached to a typical fence framework of posts and rails.

Figure 4: Standard flexible fence types

Rigid fence types

Palisade fences

A typical palisade fence panel consists of metal pales fastened onto horizontal rails. These fence sections are secured to fence posts which are securely anchored to, or into, the ground.

Figure 5: Rigid fence (palisade)

Climb-over deterrent hardware

Note	The mounting height of the Senstar LM100 luminaires on the fence posts may require adjustment to avoid contact with the climb-over deterrent hardware.

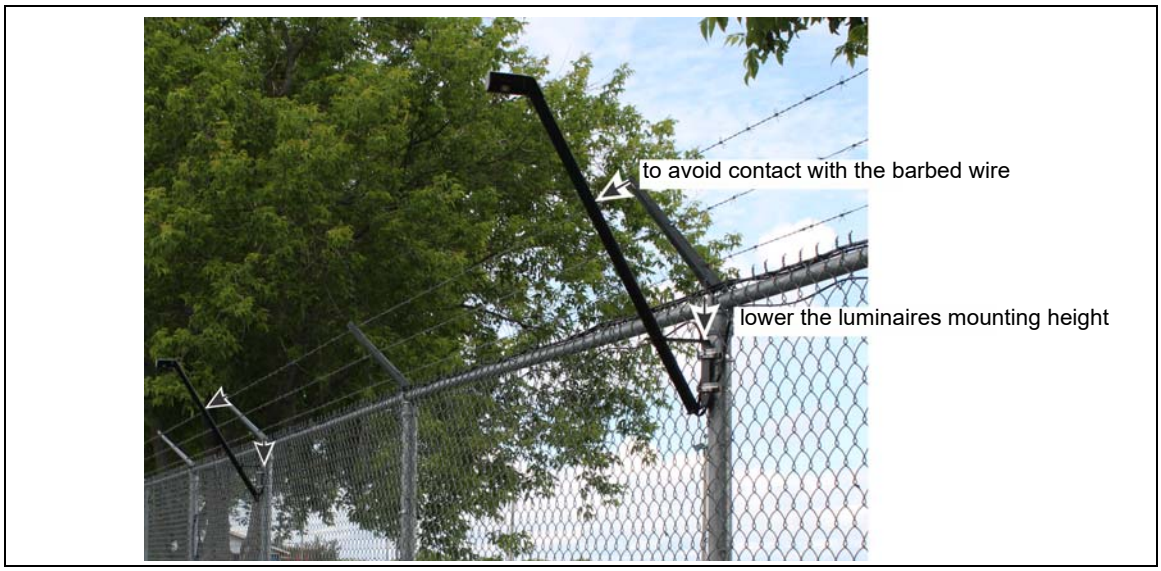


Figure 6: Avoiding contact with barbed wire

Barbed wire

Barbed wire outriggers must be secure to prevent movement due to environmental conditions. Each barbed wire strand should be taut and tightly secured at each support. Any extension arms or outriggers attached to post tops should have a tight press-fit or be spot-welded. Fasten and secure any loose components.

Razor ribbon

The razor ribbon must be secured so that it does not move in the wind. Use bracing wires to secure the coil and to prevent the razor ribbon from separating if it is cut (see Figure 7:).

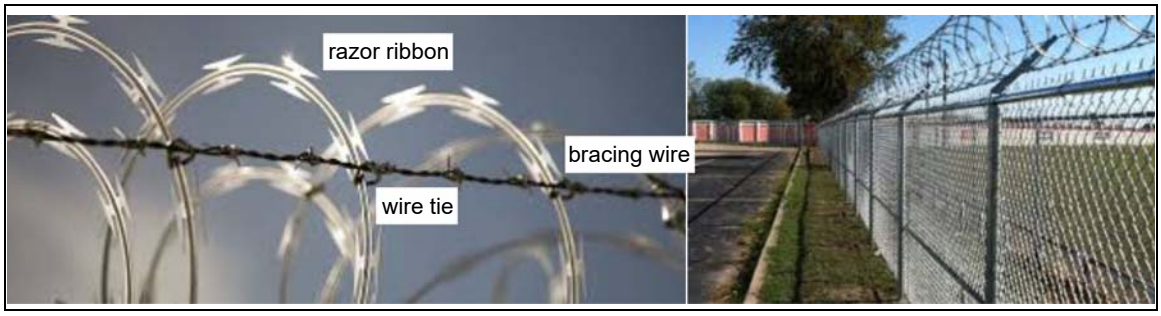


Figure 7: Razor ribbon

Gates

There are generally two types of gates used with fences, swinging gates and sliding gates. The type of gate protection required is determined by:

- the type of gate
- the frequency of gate use
- when the system is active

Gates should consist of fence fabric on a rigid frame that includes horizontal and vertical bracing.

- Firmly attach all gate hardware accessories (minimum free-play).
- Make sure that double gates have travel stops (rigid anchors).
- Prevent locking hardware from moving in the wind.
- Prevent sliding gate track hardware, supports, guides, etc., from rattling in the wind.

There are two ways to protect gates with the Senstar LM100 system:

- The wireless gate sensor (WGS),
- An alternate technology (e.g., a microwave sensor).

Environment

For installations in environments which include hot sunny periods, install a sun shield to protect the enclosure from direct sunlight, or install the enclosure in a shady area, or indoors. Extra care must be taken at sites that experience strong winds on a regular basis. The fence must be well-maintained to prevent any metal on metal contact caused by the wind. Any objects that can make contact with the fence should be removed from the perimeter. Heavy vegetation (thick weeds, brush, trees, etc.) should also be kept away from the fence. Vegetation should not touch or hang over the fence fabric.

Note	The ambient temperature, as measured inside the gateway enclosure, must be within the operational range of -40 to +70º C (-40 to +158º F).

Site Survey

Conduct a site survey to ensure that site conditions are suitable, and to determine the number of luminaires required to cover the perimeter fence. Also include any luminaires that will be used exclusively for lighting purposes. The primary concern of the site survey is the condition of the fence and gates.

Indicate the following on the site plan:

- The locations of existing structures (include fences, fence posts, heavy fence posts, gates, buildings, roads, etc.).
- The locations of obstacles including vegetation and trees.
- The length of the fence that is being protected.
- The number of regular fence posts, heavy gauge fence posts, and the fence post spacing.
- Add any surface-mounted luminaires required at the site (in addition to fence-mounted).

Equipment layout

Depending on the height of the fence and the desired level of security, a luminaire is attached to every fence post (3 m spacing) or every second fence post (6 m spacing). Regardless of the regular spacing, each tension post, corner post and gate support post, should have a luminaire attached as these types of posts are usually made of thicker steel and have a wider outside diameter (OD) than regular fence posts. As a result of the heavier construction, these posts tend to dampen vibrations.

Use a site plan to mark the locations for the Senstar LM100 components:

- LM100 gateway - indicate the location and note the address for network based systems
- LM100 luminaire AP - indicate the location for the Access Point
- LM100 luminaires - indicate the location, the segment groupings, and zone boundaries (on the site plan, number the luminaires in the order that will be used to form segments)
- Power supply - indicate the type and capacity of power supply and the power distribution plan
- Alarm communication wiring - relay output or network alarm communications
- Power cable - indicate the type and length of power cables that will be used
- Wireless Gate Sensor - the number of protected gates and the number of WGSs required to cover them

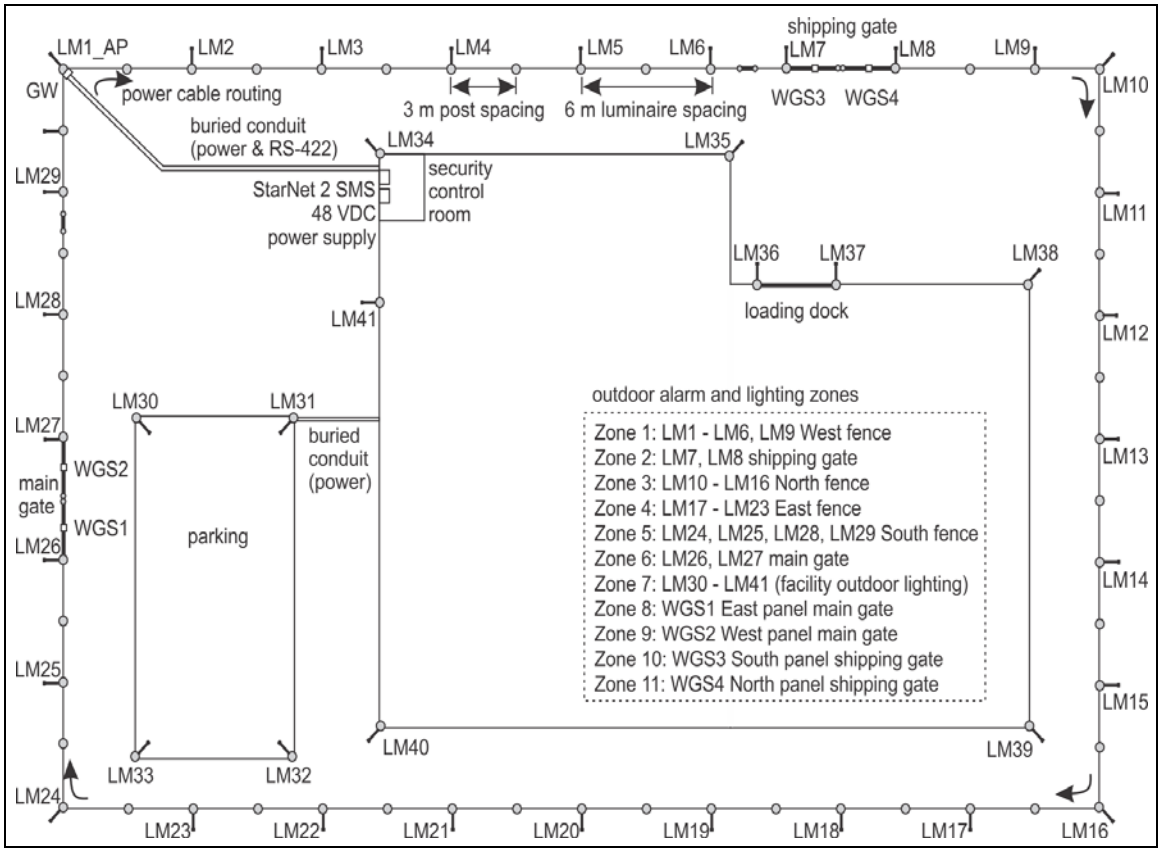


Figure 8: Example site plan

Installation overview

Installing a Senstar LM100 system is a four step process:

1. Inspect and if necessary, repair the fence and the surrounding area.
2. Plan and design the system.
3. Install the Senstar LM100 gateway, luminaire AP and luminaires.
   - ground rod
   - power supply
   - power cable
   - data cable
4. Setup and calibrate the system.

2 Installation

Installing LM100 luminaires

Generally, a luminaire is attached to every second fence post (6 m spacing). In addition, all of the heavier gauge fence posts should have a luminaire (tension posts, corner posts, gate support posts). The luminaires should be installed on the side of the fence that faces the perceived threat. Luminaires are installed so they are perpendicular to the fence line and plumb, with the head facing directly downward.

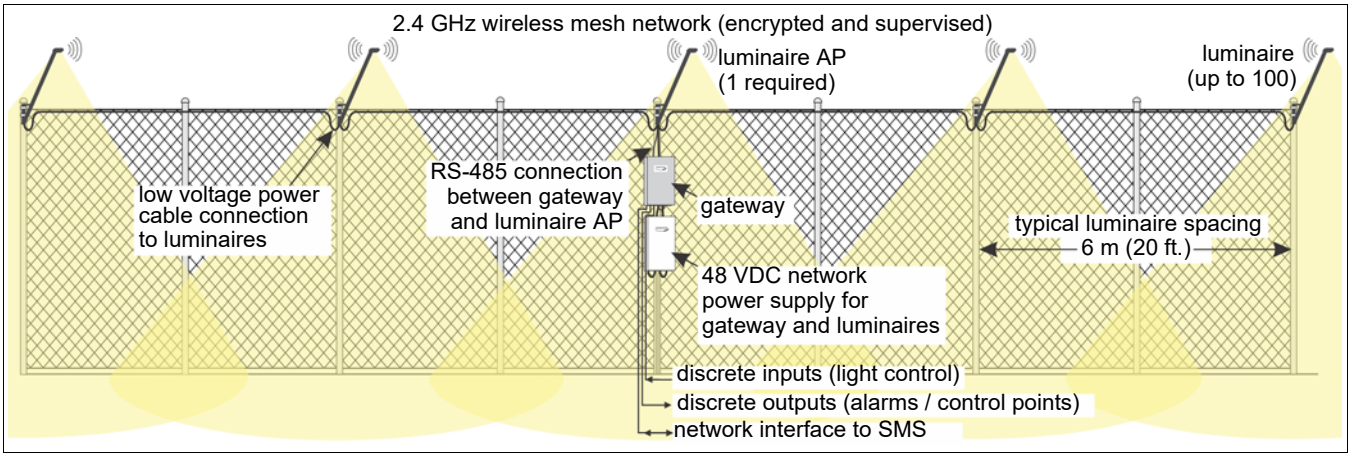


Figure 9: Senstar LM100 concept drawing

The first step is mounting the gateway (or indicate the gateway's installation location if it will be installed later). Begin with the luminaire AP (the luminaire with a hard-wired connection to the gateway).

Tip	Using a quick-grip clamp will simplify the installation of the luminaires.

At regular fence posts

Tools and equipment

- 8 mm (5/16 in.) nut driver or socket (low torque cordless drill with 8 mm socket recommended)
- ladder or scissor lift suitable for fence height

1. Hold the luminaire against the fence post as close to the top of the fence as possible without making contact with the climb over barrier (minimum 25 mm {1 in.} separation between the luminaire and the barbed wire) and mark the locations for the stainless steel post clamps.

Figure 10: Luminaire installation steps 1 & 2

2. Wrap the 2 post clamps around the luminaire and fence post to hold the luminaire in place.
3. Tighten the clamps so they fit into the slots on the luminaire's bracket, and the luminaire is perpendicular to the fence line and plumb to the ground.

Figure 11: Luminaire installation steps 3 & 4

4. If necessary, adjust the position of the luminaire on the fence post and finish tightening the clamps until the luminaire is held securely against the fence.
5. Measure the space between the top of the fence post and the luminaire's bracket and install the remaining luminaires at the same height.

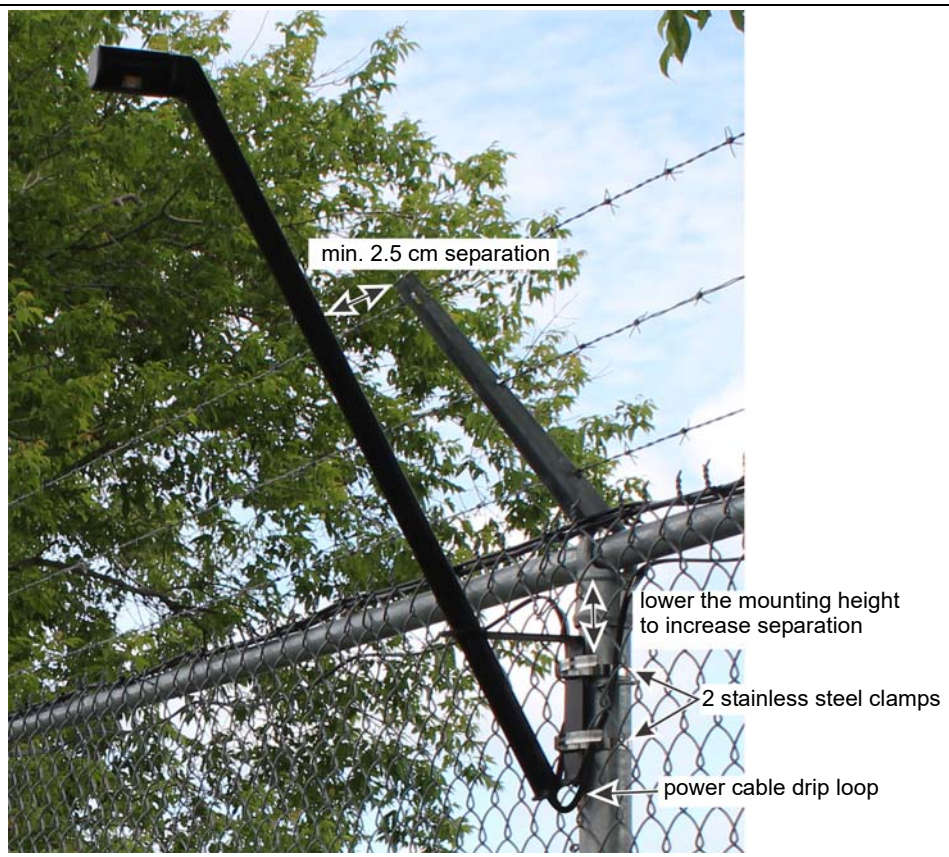


Figure 12: Luminaire installation example

Figure 13: 2.4 m (8 ft.) chain-link fence with luminaires

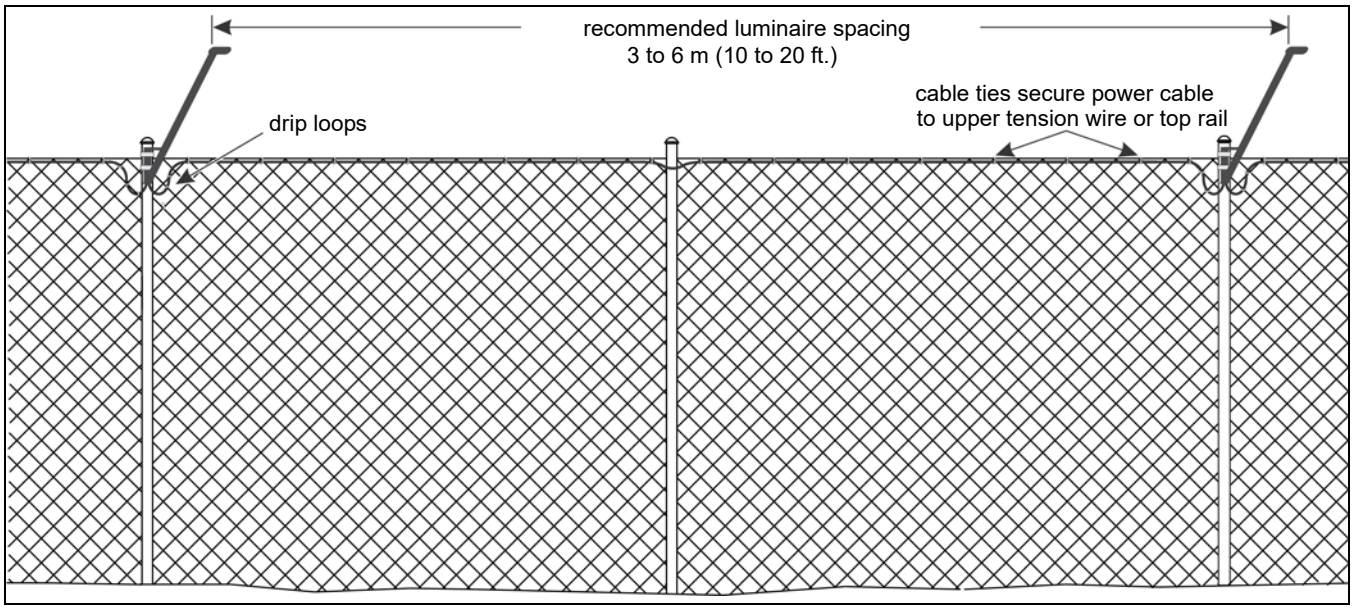


Figure 14: Recommended luminaire spacing

At corners or heavy gauge posts

Follow the directions for regular fence posts and install a luminaire on each heavy gauge fence post.

Figure 15: Luminaire installation on heavy gauge posts

Installing luminaires on welded-mesh fence

Mount the luminaire as high on the fence post as possible on the side of the fence that is facing the threat.

Figure 16: Welded-mesh fence with luminaires

Installing luminaires on rigid fences

The technique used to install luminaires on rigid fences depends on the type, and brand, of fence. Mount the luminaire as high on the fence post as possible on the side of the fence that is facing the threat.

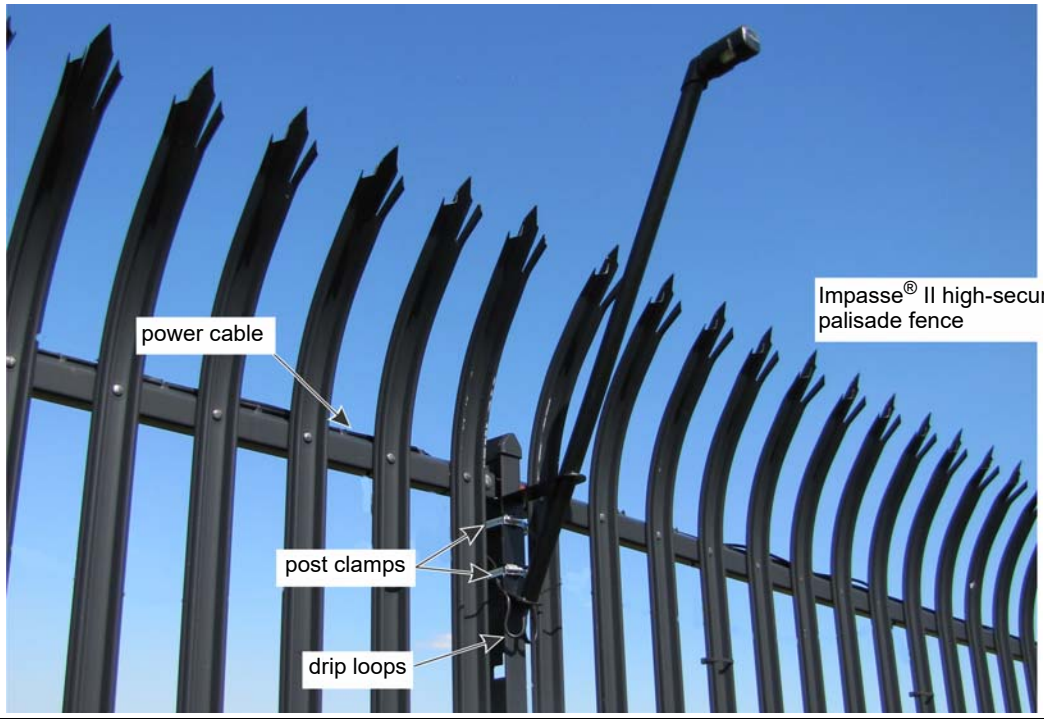


Figure 17: Palisade fence with luminaire

Figure 18: Residential palisade fence with luminaires

Surface mounting luminaires

To surface mount a luminaire, hold the luminaire against the surface straight up and at the desired height. Mark the locations of the four mounting holes on the surface. Drill the 4 holes and using appropriate hardware, fasten the luminaire to the surface.

1. Hold the luminaire against the surface and mark the holes.
2. Drill the holes in the surface.
3. Using appropriate hardware, attach the luminaire to the surface.

The luminaire includes four holes on the bracket for surface mounting. Use 7 mm (¼ in.) hardware that is appropriate for the surface.

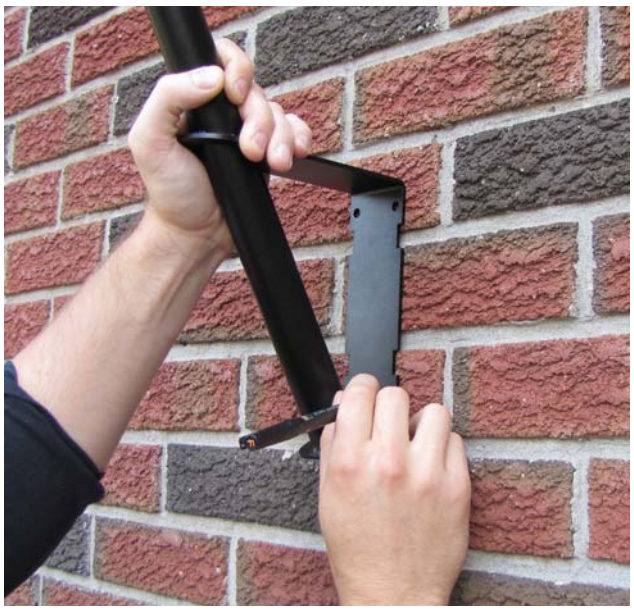


Figure 19: Surface mounting luminaires

Power cable installation

Power cables are typically run along the top of the fence and daisy-chained from luminaire to luminaire. The power cables pass through a grommet at the bottom of each luminaire and are connected to the luminaire's power wires with nylon-insulated, closed-end crimp connectors.

CAUTION	Use power cable that clearly distinguishes the 2 conductors to ensure the correct polarity at each luminaire.

CAUTION	Once the supplied grommet is inserted into the base of the luminaire it is virtually impossible to remove without damaging the grommet. Temporarily apply power and test each luminaire before inserting the grommet.

Note	Molex crimp tool p/n 64001-0600 is recommended for use with the supplied Molex crimp connectors. However, the Klein model 1005 or equivalent crimp tool is suitable for this application.

Note	In harsh weather environments which include wind blown salt water spray, Senstar recommends the use of a protective marine type dielectric grease compound for the electrical connection to the luminaires.

Tools and equipment

Figure 20: Power connection crimp tools

- crimp tool (see Figure 20:)
- wire stripper
- wire cutter
- linesman's pliers
- needle-nose pliers
- ruler
- ladder or scissor lift suitable for fence height

For daisy chain power cable wiring attach the power cable along the top of the fence:

1. Run the 2 sections of power cable from the top of the fence, down past the luminaire, and cut the power cables 30 cm (1 ft.) below the base of the luminaire.
2. Separate the 2 conductors of the power cables for 10 cm (4 in) from the end.

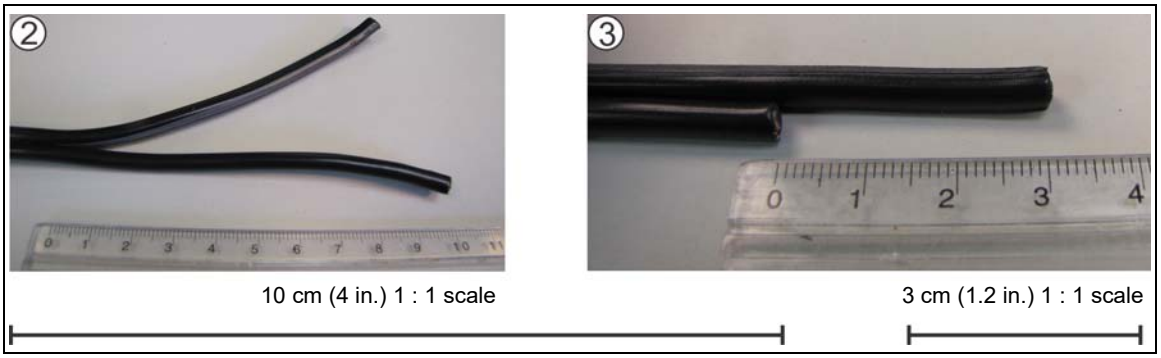


Figure 21: Power cable preparation

3. Cut back the negative lead 3 cm (1.2 in.) to offset each power cable so the positive lead is longer than the negative lead.
4. Remove 2 cm (3/4 in.) of the insulation from both conductors on each power cable, and from both leads of the luminaire.

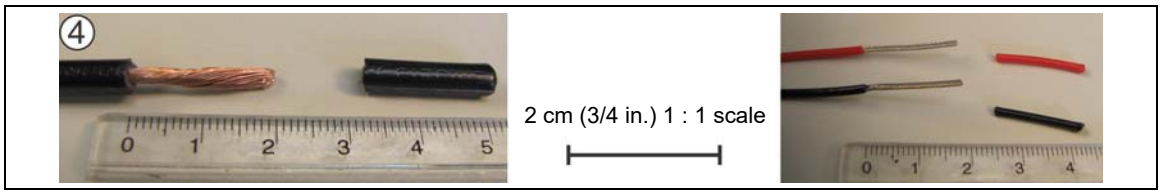


Figure 22: Stripping the leads

5. Tightly twist the 3 wires together to form a single conductor, and trim the single conductor back to 15 mm (3/8 in.) (i.e., 2 negative conductors from power cables and black lead from luminaire; 2 positive conductors from power cables and red lead from luminaire).

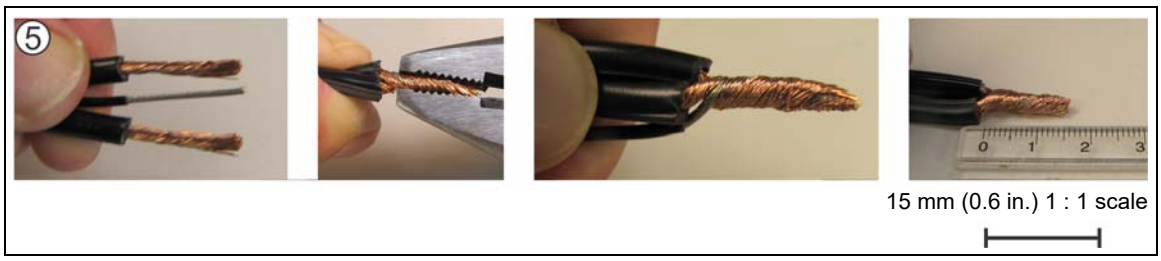


Figure 23: Forming a single conductor

6. Insert the single conductor fully into the open-ended connector and verify through the translucent connector before crimping.

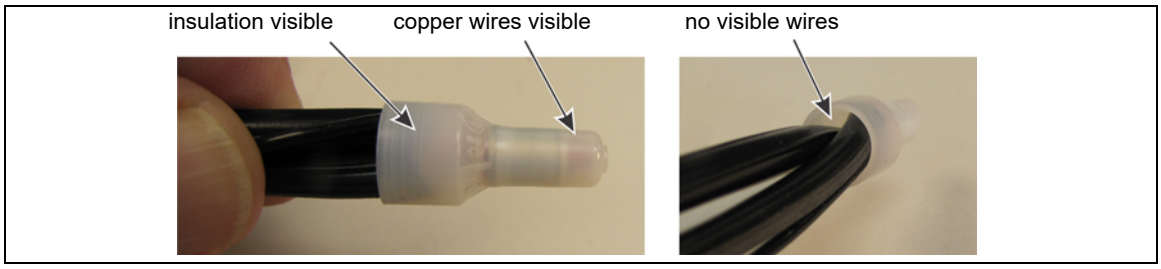


Figure 24: Preparing the splice

7. Make the crimp. If the crimp tool you are using does not cover the full length of the internal crimp ring make a second crimp.

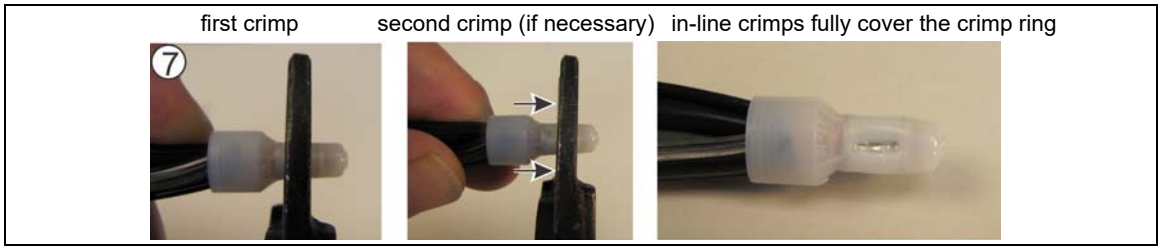


Figure 25: Crimping the splice

8. Repeat this procedure for the power cables' positive conductors and the red lead from the luminaire.
9. Temporarily apply power to test the connection.

10. Push the 2 crimps up into the shaft of the luminaire, ensure that both of the power cables have drip loops and press the grommet into the bottom of the shaft.

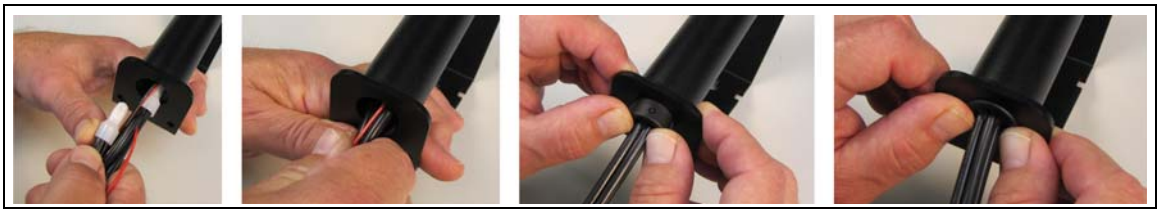


Figure 26: Power connection crimp tools

11. Attach the power cables neatly to the fence with UV resistant cable ties (P/N GH0916 - 1000 pieces) and continue making the power connections.

Installing the luminaire AP

The luminaire AP is usually attached to the same post as the gateway device. Mount the luminaire AP in the same manner as the standard luminaires. The luminaire AP includes a 3 m (10 ft.) power and data cable which is connected to the gateway device. Figure 27: shows an installed luminaire AP and the AP connections to the gateway. See Figure 10: , Figure 11: and Figure 36: for additional installation and connection details.

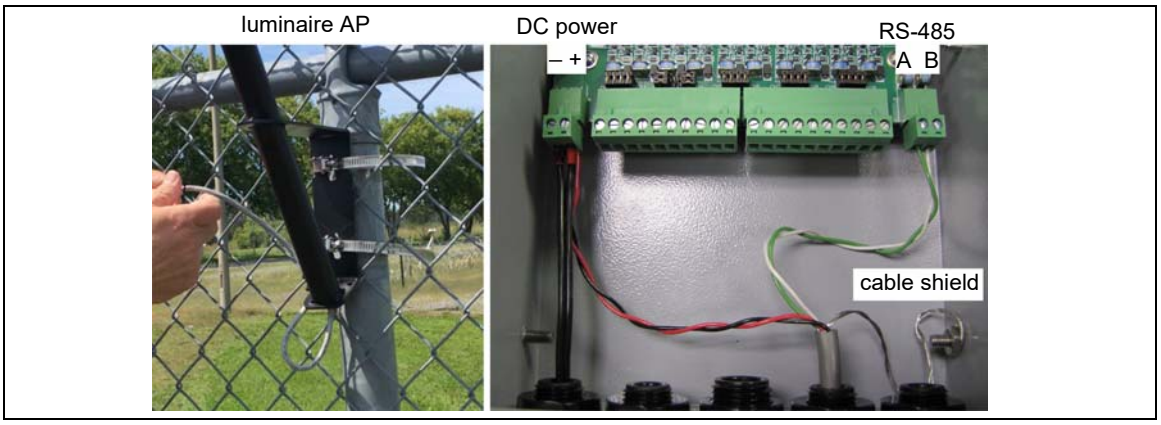


Figure 27: Luminaire AP mounting and connection

Installing the LM100 gateway

The gateway is shipped with two stainless steel clamps that are used for securing the enclosure to a post (OD 4.5 to 12.7 cm). The hardware required to mount the enclosure on another type of surface is customer-supplied. Figure 28: illustrates the gateway features and Table 1 includes feature descriptions. Figure 30: shows a fence-mounted gateway.

Note	The LM100 gateway can be installed up to 100 m (328 ft.) away from the luminaire AP by splicing in a length of suitable power and data cable. In this case, the 3 m cable that comes with the luminaire AP must be shortened so the data and power splices can be fitted into the luminaire AP's shaft. Alternately, an outdoor-rated electrical junction box can be used to protect the splice.

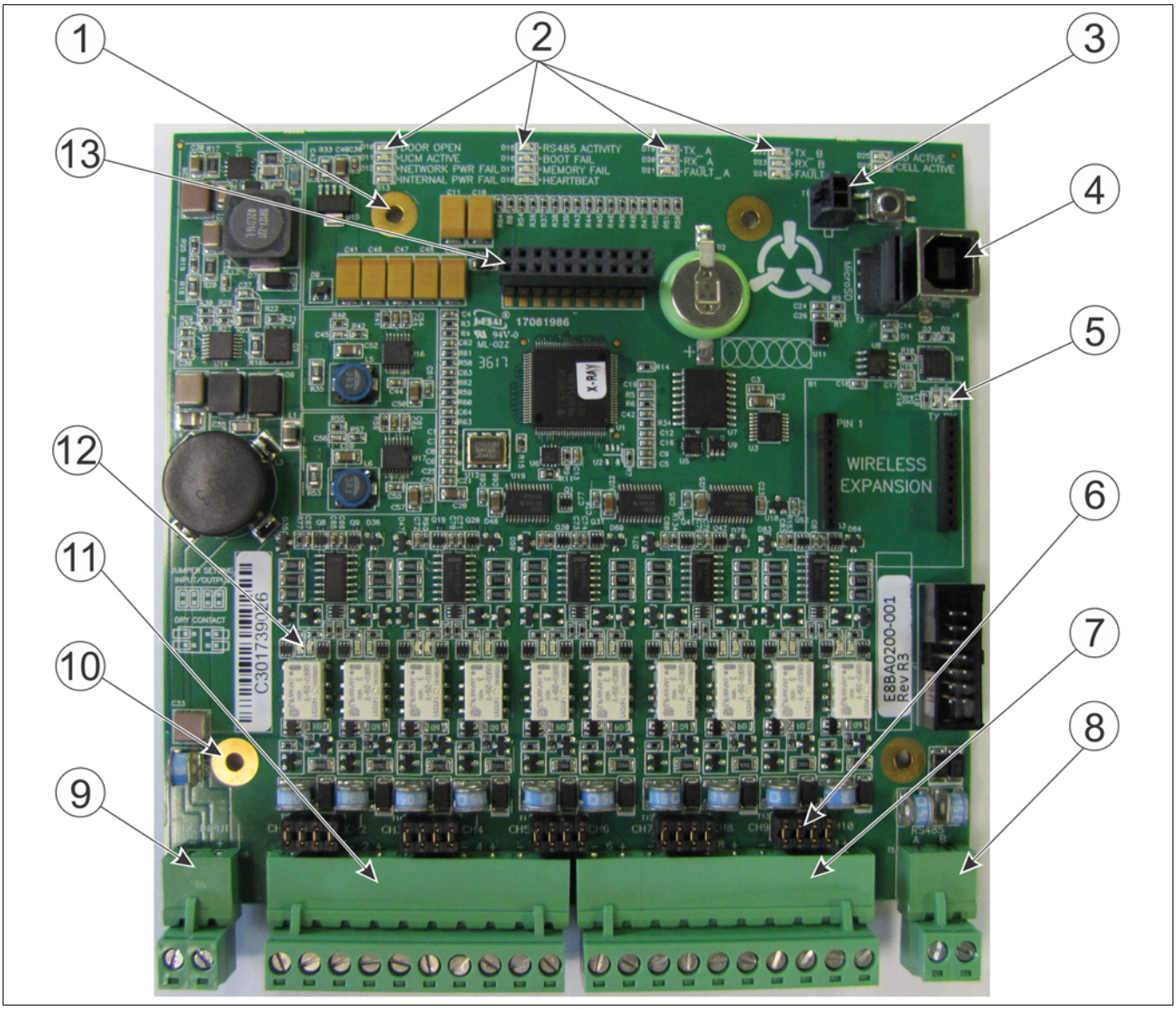


Figure 28: Senstar LM100 gateway features

Item	Description	Item	Description
1	Network interface card mounting hardware (X 2)	7	T8 - I/O ports 6 - 10
2	Activity LEDs - DOOR OPEN, UCM ACTIVE, NETWORK POWER FAIL, INTERNAL POWER FAIL, RS-485 ACTIVITY, BOOT FAIL, MEMORY FAIL, HEARTBEAT, TXA, RXA, FAULT A, TXB, RXB, FAULT B (LED ON = condition)	8	T5 - RS-485 connection to luminaire AP (green A white B)
		9	T6 - power input connection (- +) 12 to 48 VDC (connect power supply leads and luminaire AP power leads)
3	T1 - enclosure tamper input	10	gateway circuit card assembly (CCA) mounting hardware (X 2)
4	T2 - USB connection to UCM PC	11	T7 - I/O ports 1 - 5
5	UCM activity LEDs (TX, RX)	12	I/O port activity LEDs - LED ON = port active
6	Input/Output configuration jumpers	13	T2 - Expansion header for network interface card, gate sensor receiver and I/O card

Table 1 Gateway feature descriptions

Cable entry ports

The bottom of the gateway enclosure includes five cable entry ports fitted with compression glands for the power cable, I/O cable, and RS-485 cable. The central port includes a 12.7 mm (1/2 in.) cable gland, which fits cables ranging between 4.3 - 11.4 mm (0.17 to 0.45 in.). The other four ports (two on each side) provide 9.5 mm (3/8 in.) compression glands, which fit cables ranging between 2.9 - 7.9 mm (0.115 to 0.312 in.). Five plugs are included for instances where not all of the cable entry ports are required. The bottom of the enclosure also includes an exterior ground lug for the earth ground connection.

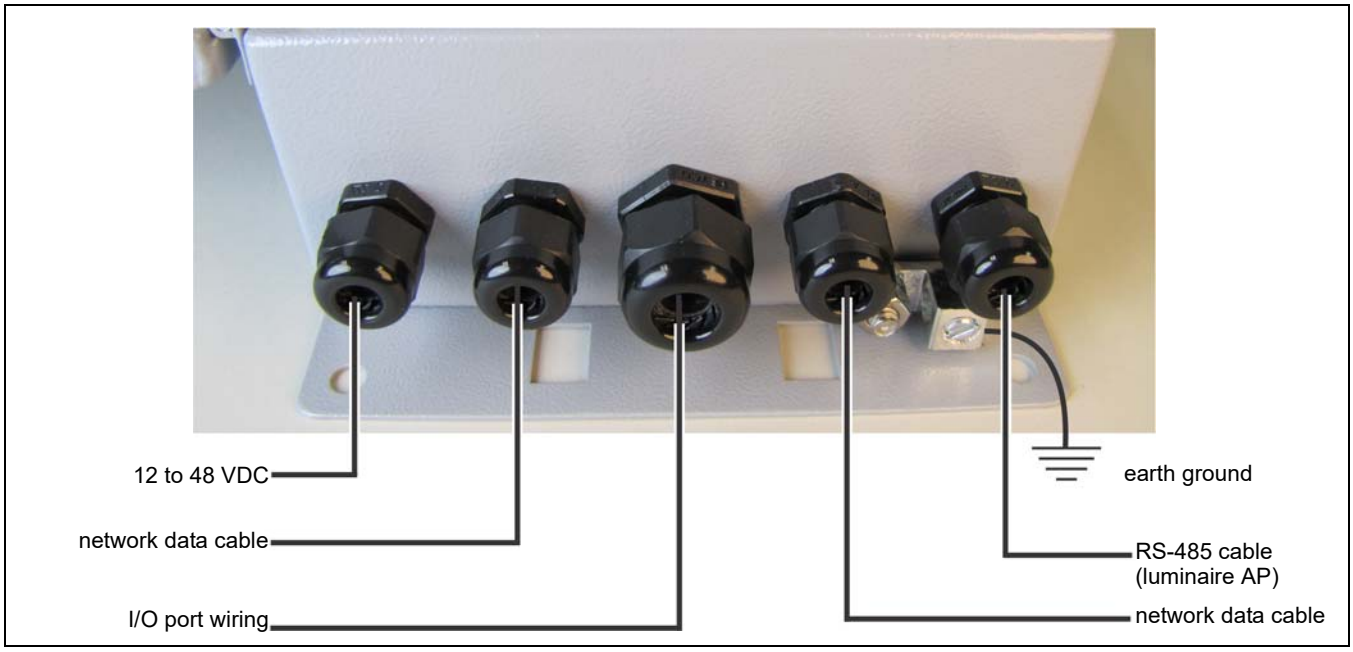


Figure 29: Cable entry recommendations

Free-standing or fence post mounting the enclosure

- Install the gateway near eye-level on the secure side of the perimeter.
  Mounting the enclosure away from the protected fence on the secure side of the perimeter can help prevent tampering.
- Mount the enclosure with the cable entry ports on the bottom toward the ground.
- Install an approved earth ground at the gateway location, if required (see Grounding considerations on page 13).
- If razor ribbon is installed along the bottom of the fence, mount the gateway on the secure side of the perimeter, away from the fence and razor ribbon.

CAUTION	For installations in environments which include hot sunny periods, Senstar recommends that a sun shield be installed to protect the enclosure from direct sunlight, or that the enclosure be installed in a shady area. The maximum operating temperature, as measured inside the enclosure, is 70º C (158º F).

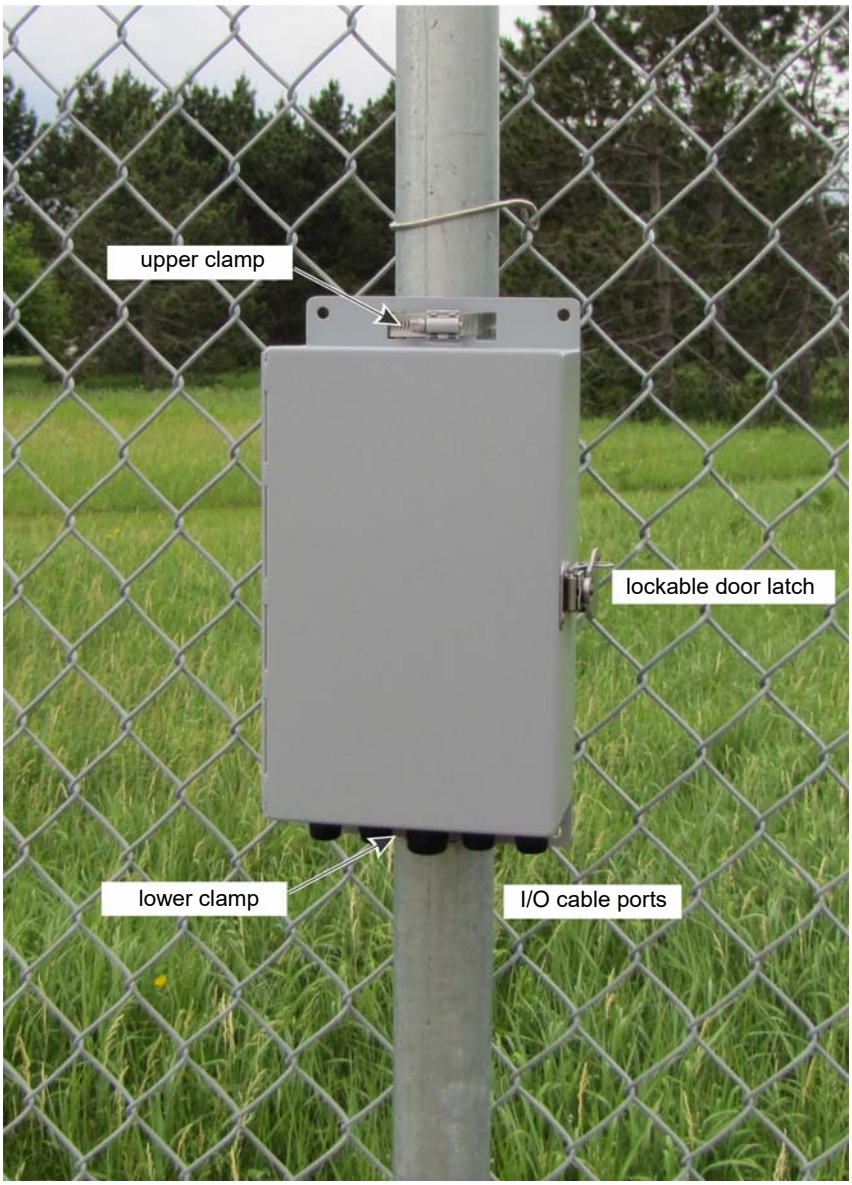


Figure 30: Fence-mounted gateway

1. Hold the enclosure against the fence at the specified installation location.
2. Feed the end of the stainless steel clamp through an upper flange slot, around the fence post, and back through the second slot.
3. Insert the end of the stainless steel clamp into the gear mechanism and tighten the screw.
4. Repeat this with the second clamp on the lower flange at the bottom of the enclosure.

Figure 31: Post-mounting the enclosure (on the fence)

Surface mounting

1. Hold the enclosure against the mounting surface, and mark the positions of the 4 mounting holes.
2. Drill 4 holes in the mounting surface.
3. Using appropriate hardware, mount the enclosure.
   Use 7 mm (¼ in.) hardware.

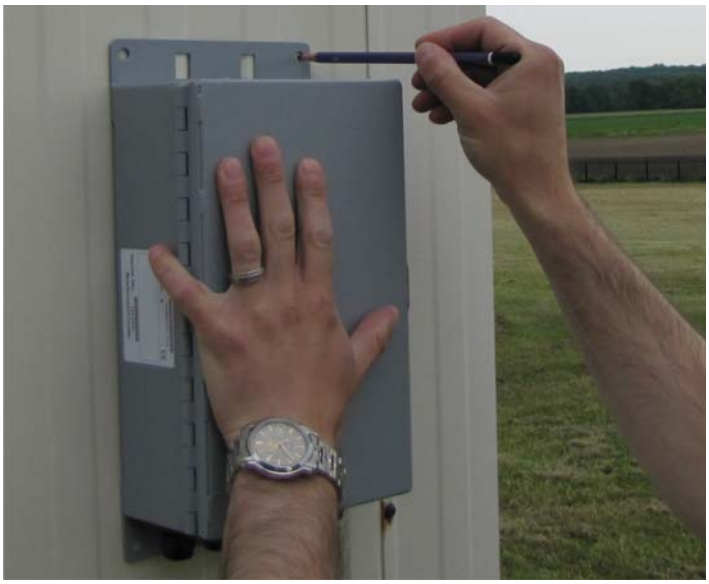


Figure 32: Surface-mounting the enclosure

Grounding

The gateway requires a single ground reference. Connect the ground lug on the bottom of the enclosure to an approved earth ground at the gateway's location. The earth ground connection must be stable and noise free. An improper or unstable earth ground can induce noise in the gateway. Do not use the fence structure as an earth ground. Avoid sharp bends in the ground wire.

Note	Consult the local electrical code for grounding information.

I/O ports

The LM100 gateway includes ten I/O ports that can be configured as either inputs or outputs in any combination. The I/O ports are accessed through removable screw terminal blocks. Each port has an associated LED, which indicates when the port is active (LED ON = port active). The optional dry contact input card includes four additional inputs and the optional relay output card includes four additional relays to supplement the I/O on the gateway.

Note	The gateway can use either an input card or an output card, not both.

I/O port jumpers

Each I/O port includes a pair of configuration jumpers which are set according to the intended use of the port. For ports that will be configured as outputs and will source power to an external device, and for all inputs, install the shunts on the headers. For ports that will be configured as outputs but will not source power (dry contact outputs) park the shunts on a single pin, as indicated in Figure 33: .

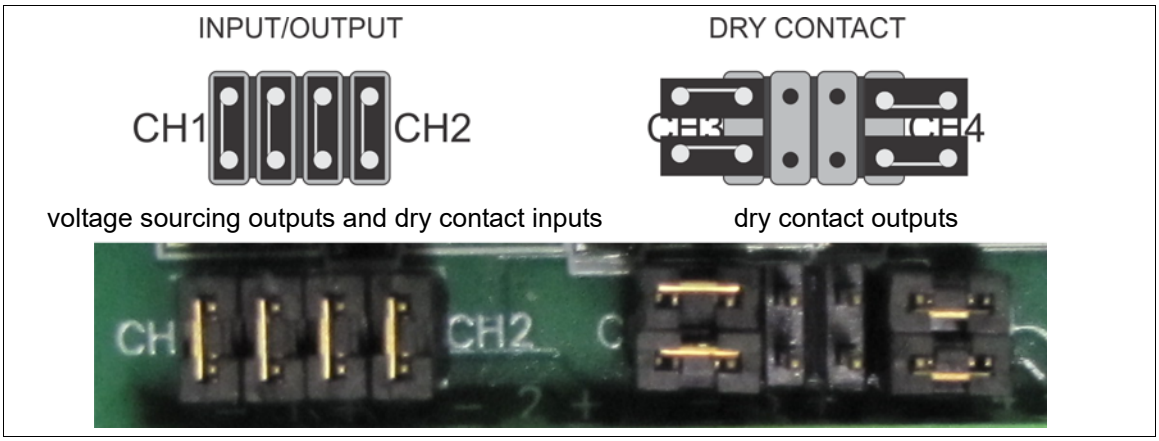


Figure 33: Gateway I/O port jumper settings

Outputs

The gateway's relay outputs can source up to 100 mA at the same voltage as the gateway's input power in the high side drive configuration. The relays can also be configured to sink up to 100 mA as Form A (normally open) or Form B (normally closed) contacts. The capability to source power depends on the capacity of the connected power supply. The gateway's relays can also be configured as Form A or Form B dry contact outputs (no power). Figure 34: illustrates the gateway's five selectable output schematics.

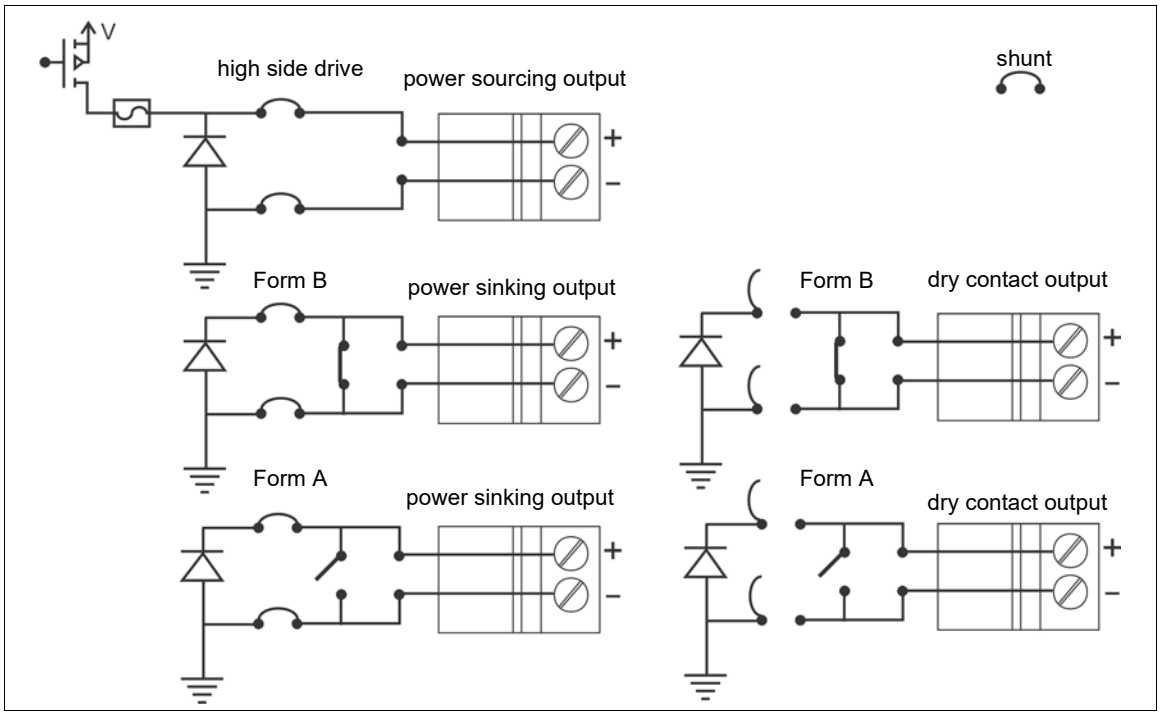


Figure 34: Gateway output schematics

Relay contact ratings

The gateway's relays are latching, and are rated for 30 V @ 1 A max. In Remote control mode, you can configure the relays as latching (ON by command, OFF by command), in flash mode (ON-OFF-ON-OFF... by command, then OFF by command), or pulse mode (ON for a period, then OFF). For flash and pulse modes, the relay Active/Inactive times are selectable.

In Local control mode the relays remain active for the event's duration or for the selectable Hold Time, whichever is longer.

Auxiliary inputs

CAUTION	The contact closure inputs to the gateway MUST be voltage-free.

I/O points defined as inputs are voltage sensing inputs. The gateway determines an input's status via an internal reference voltage, and the configuration of the contact closures and supervision resistors. Figure 35: provides wiring diagrams for auxiliary device inputs.

In Local control mode the inputs are used to activate luminaire zones. When the input goes high, the specified luminaire zone is activated.

In Remote control mode the AUX inputs serve as inputs to the host SMS for reporting the status of auxiliary security equipment.

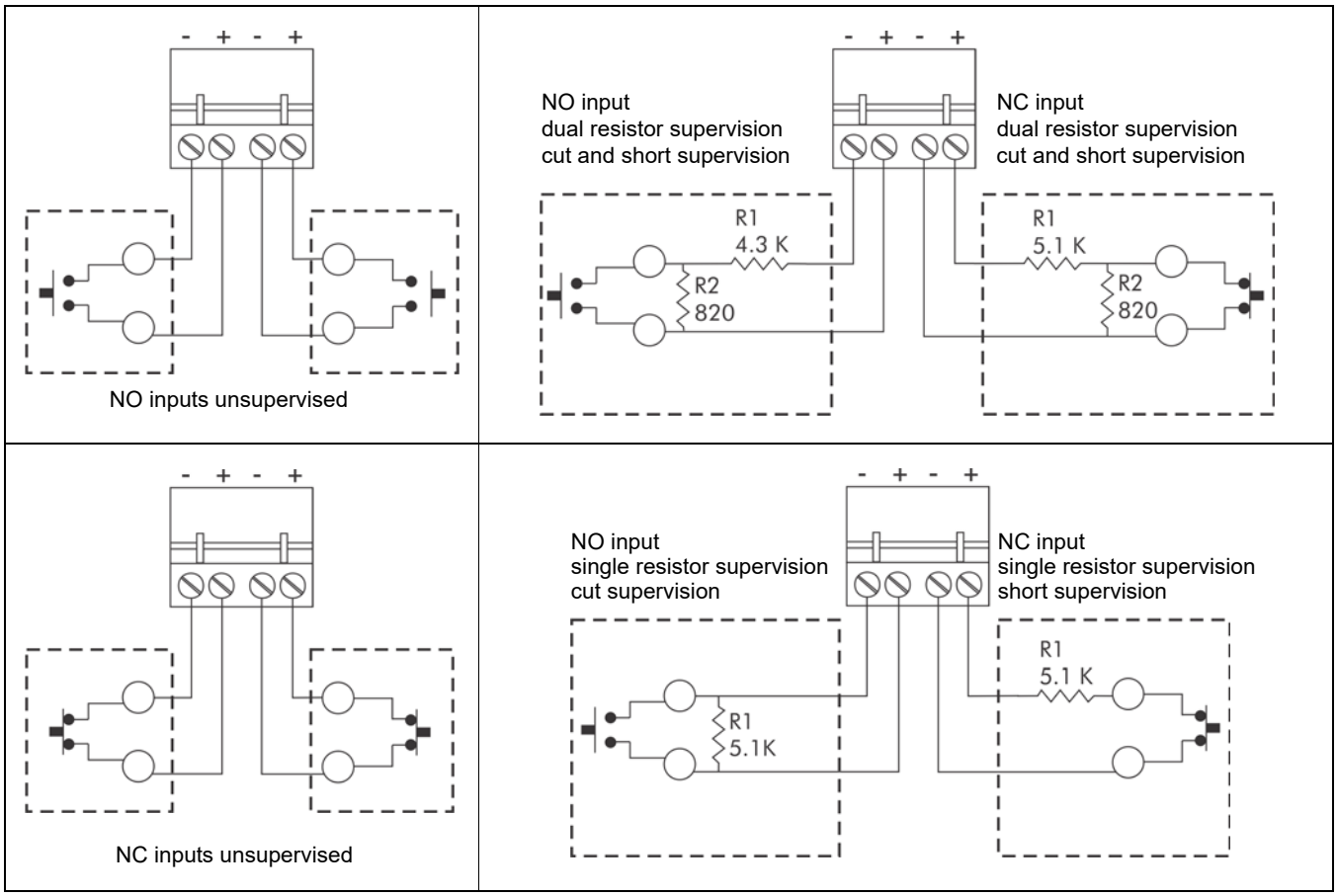


Figure 35: Gateway input wiring examples

Gateway wiring connections

LM100 gateway wiring connections are made on removable terminal blocks. The screw terminals accept wire sizes from 12 to 24 AWG, with a 6.4 mm (¼ in.) strip length. Remove the terminal blocks to make the wiring connections. Reinstall the blocks after the connections are complete, and verified. Figure 36: shows the gateway input wiring connections. Figure 36: and Figure 38: illustrate the gateway wiring connections and the connections to the I/O option cards. Figure 38: to Figure 43: show the Silver Network wiring options.

Note	See instruction sheet 00DA1503 for information about installing the optional relay output card and dry contact input card.

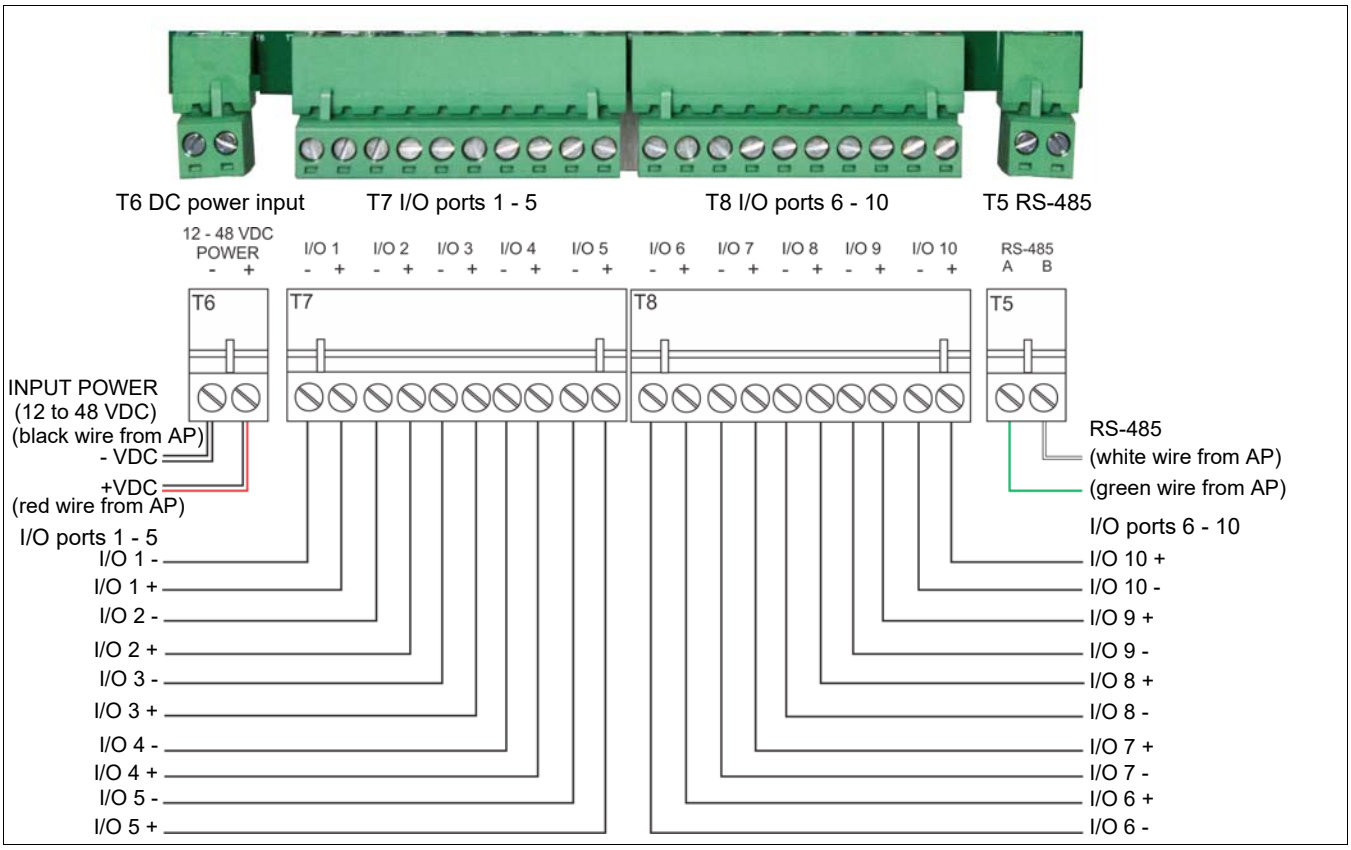


Figure 36: gateway wiring diagram

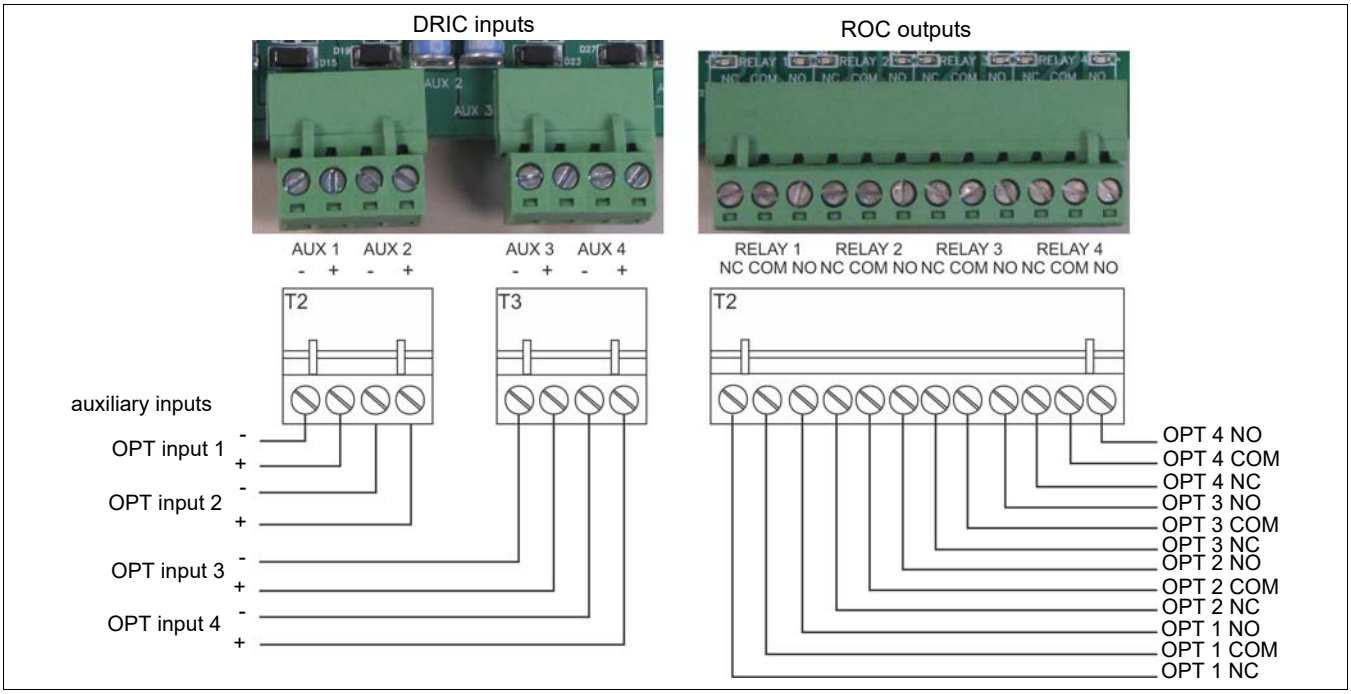


Figure 37: Option card wiring diagram

Silver Network wiring connections

Note	A network interface card is required on the gateway to enable Silver Network communications.

Silver Network specifications

- Data rate - fixed 57.6 k bps
- Maximum 60 devices spread over up to 4 independent network loops
- Two communication Channels (Side A, Side B)
- Response time - 1 second, or less from alarm source to Network Manager (per loop)
- Network termination - not required
- Transmission media/maximum separation distances between gateways:
  - RS-422 copper wire - 1.2 km (0.75 mi.) - 2 pairs per Channel
  - Multi-mode fiber optic cable (820 nm) - 2.2 km (1.4 mi.) - 2 fibers per Channel - optical power budget 8 dB
  - Single-mode fiber optic cable (1310 nm) - 10 km (6.2 mi.) - 2 fibers per Channel - optical power budget 8 dB
  - Ethernet - Category 5 cable, 100 m between PoE switch and gateway location

Note	Use low capacitance shielded twisted pair data cable for RS-422, 62.5/125 multi-mode fiber optic cable, 9/125 single-mode fiber optic cable, and Category 5 Ethernet cable. The maximum separation distances require high quality transmission media and sound installation practices.

CAUTION	Both the gateway and the network interface cards contain static sensitive components. Follow proper ESD handling procedures when handling the cards. Ensure the expansion header on the NIC is properly lined up and fully seated in T2 on the gateway.

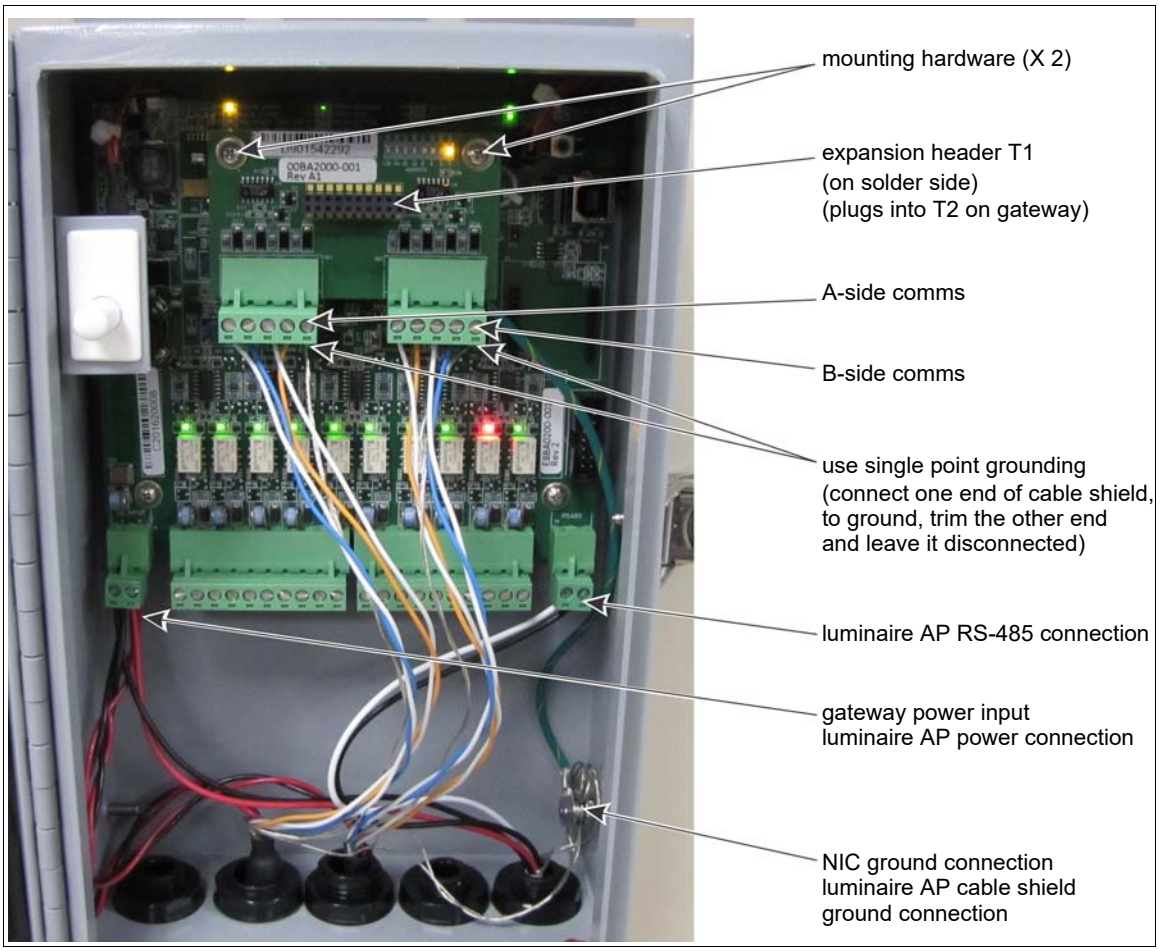


Figure 38: Silver Network RS-422 wiring connections

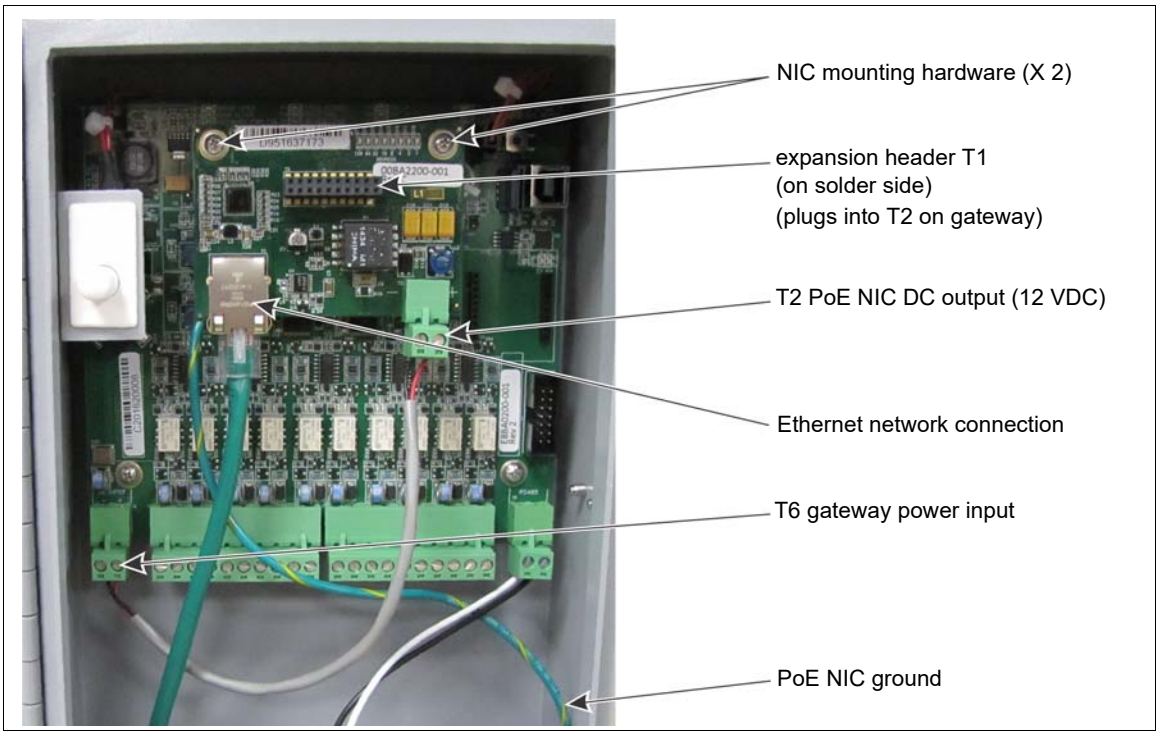


Figure 39: Silver Network Ethernet (PoE) wiring connections

Note	The PoE NIC typically receives power over its Ethernet connection. It provides power to the gateway through T6, the gateway power input. The gateway then supplies power to the NIC through the expansion header. If the PoE NIC does not receive power over its Ethernet connection, the gateway must have another source of DC power connected to T6.

Silver Network data path connections

In the standard Silver Network setup, a point to point loop configuration is used for network communications. Figure 40: shows the network connections for the RS-422 and fiber optic communication options. Figure 41: illustrates an RS-422 based Silver Network and Figure 42: shows a fiber optic based Silver Network. Silver Network's using Ethernet communications use a star configuration. Figure 43: illustrates an Ethernet based Silver Network (Star configuration).

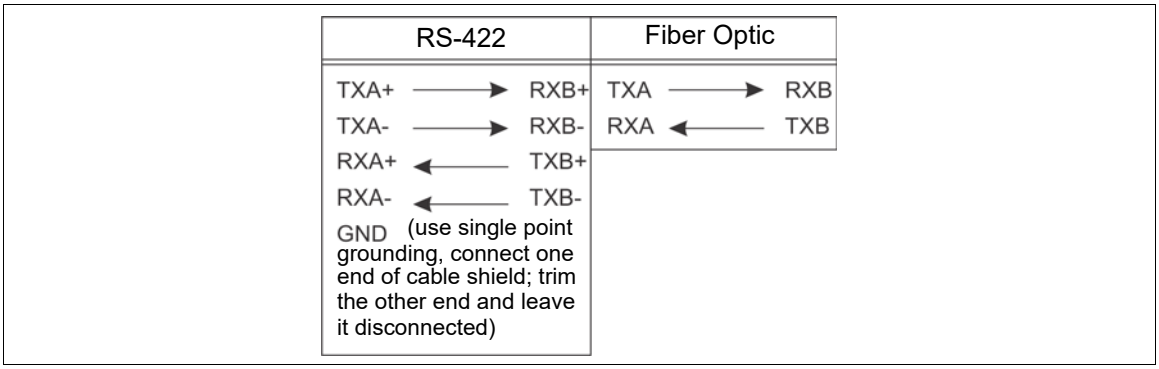


Figure 40: Silver Network data connections (loop configurations)

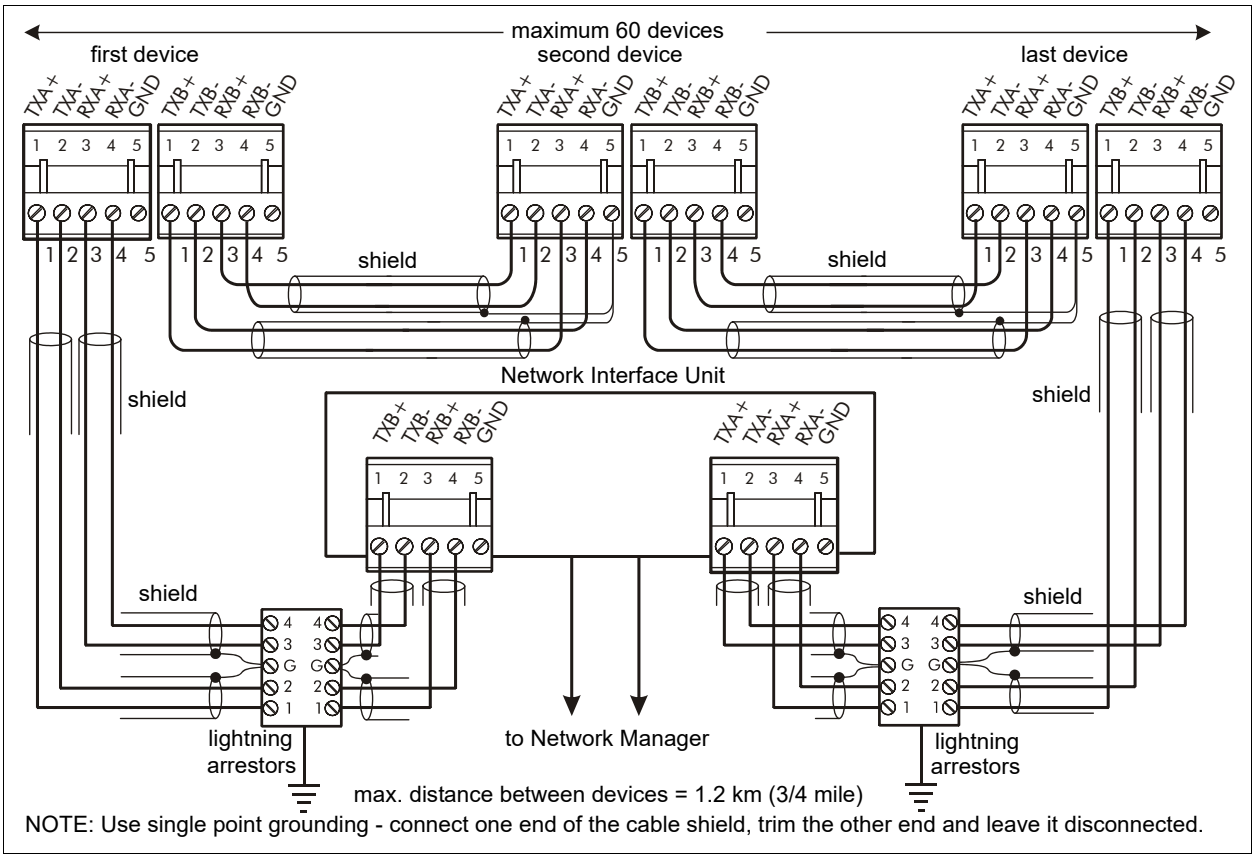


Figure 41: Silver Network RS-422 wiring diagram

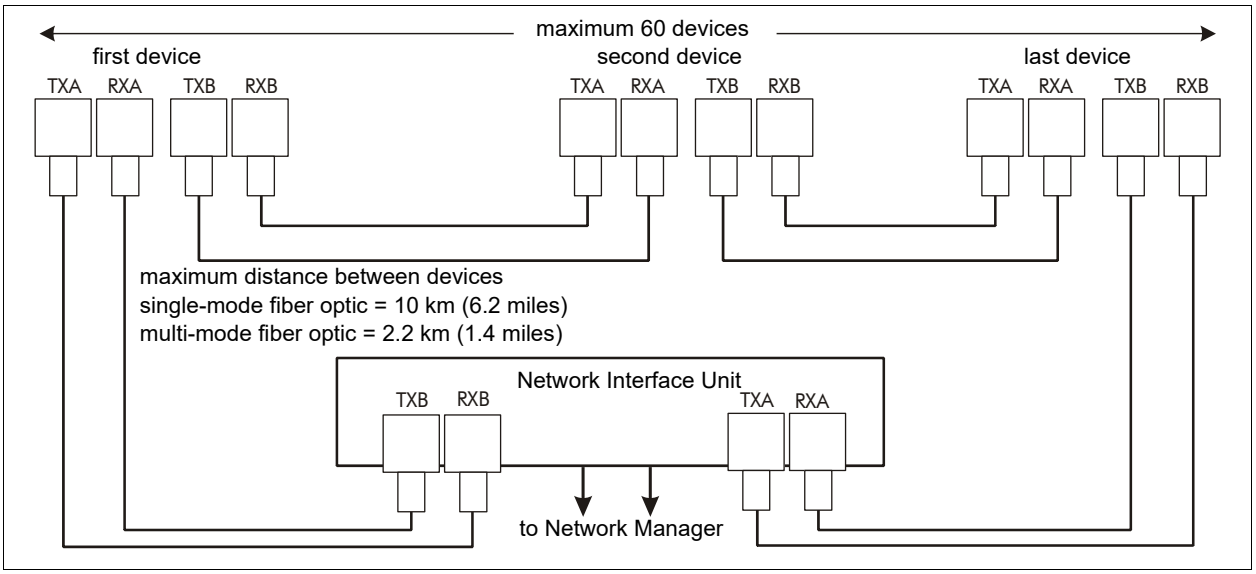


Figure 42: Silver Network fiber optic wiring diagram

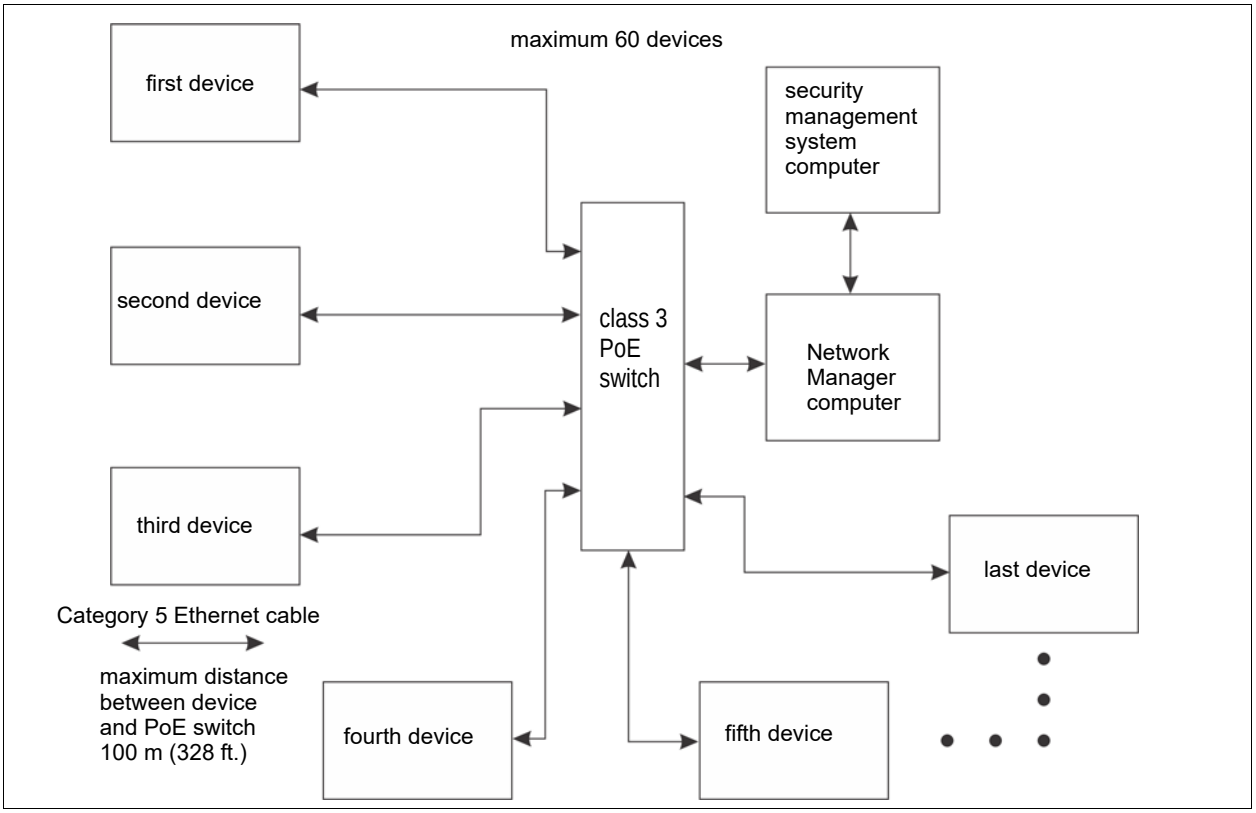


Figure 43: Silver Network Ethernet wiring diagram

Power supply connections

The LM100 gateway operates on 12 to 48 VDC. The power connection is made on removable terminal block T6. In most cases, the luminaire AP's power leads are also connected to T6.

WARNING!	DO NOT bring AC mains power into the gateway enclosure. If a local power supply is being used, it must be installed in its own weatherproof enclosure. Consult the local electrical code for information about the connection of AC mains to your power supply.

Note	When a central low voltage power supply is being used for primary power, it should be powered from an uninterruptible AC power source.

Note	See Figure 28: Figure 29: and Figure 36: for power connection details.

Network power supply

When using a centrally located network power supply, ensure that the supply has sufficient capacity if the gateway's outputs will source power to auxiliary devices.

Local power supply

It is possible to use a local DC power supply when a source of AC power is readily available near the gateway. The DC power supply must be installed in its own weatherproof enclosure. The local supply can be mounted on the same post as the gateway to keep the wire runs to a minimum.

Power over Ethernet

For power over Ethernet, a class 3 PoE switch is required. In this configuration, minimum Category 5 cable must be used and the maximum distance between the gateway and the PoE switch is 100 m (328 ft.). Each gateway receiving PoE requires an earth ground connection. The PoE NIC can also supply power for the luminaire AP. Figure 39: shows a PoE NIC mounted on the gateway CCA.

CAUTION	The PoE NIC is intended to supply power only to the LM100 gateway device on which it is mounted and the luminaire AP. Do not attempt to power additional luminaires, or an auxiliary device, with the PoE NIC.

Backup power

Senstar recommends that the Senstar LM100 system be powered from an uninterruptible power supply (UPS). Connect AC mains to the UPS and the UPS to the DC power source. In this way, if AC power is interrupted, the LM100 can operate on battery power while AC power is being restored.

Using the wireless gate sensor

The wireless gate sensor (WGS) operates in conjunction with the Senstar LM100 system to provide RF-based wireless security protection for gates. The WGS is comprised of two components. The wireless gate sensor module (GSM) is attached to the gate. The GSM analyzes signals picked up from the fence fabric on the gate and will transmit an alarm when it detects vibration, motion, or positional changes. A wireless gate sensor receiver (GSR) mounted on the LM100 gateway circuit card assembly (CCA) receives the transmission and passes on the alarm signal to the gateway. Alarm data communications are via the gateway over the Silver Network or by contact closures.

Note	See E7DA0103 Wireless Gate Sensor for information on installing and configuring the WGS.

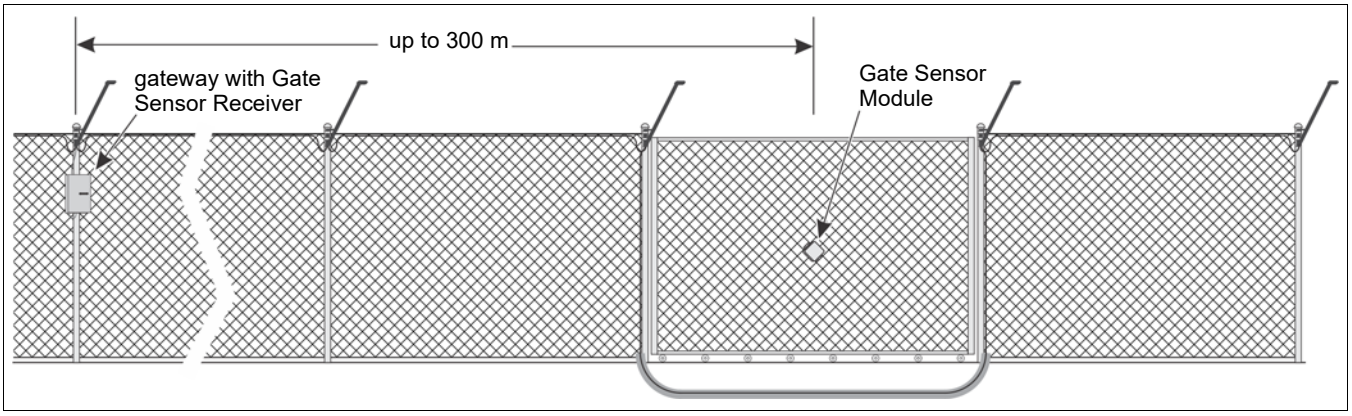


Figure 44: Wireless Gate Sensor example

Figure 45: Solar powered Wireless Gate Sensor with magnetic gate contact

3 Calibration & setup

The Universal Configuration Module

Note	Consult the online help for detailed information on UCM operation.

The Universal Configuration Module (UCM) is a Windows based software application, which serves as the calibration, setup and maintenance tool for the Senstar LM100 system. The UCM communicates with the gateway locally through a USB connection, or remotely via the Silver Network Manager. When the UCM software starts, the Connect window displays:

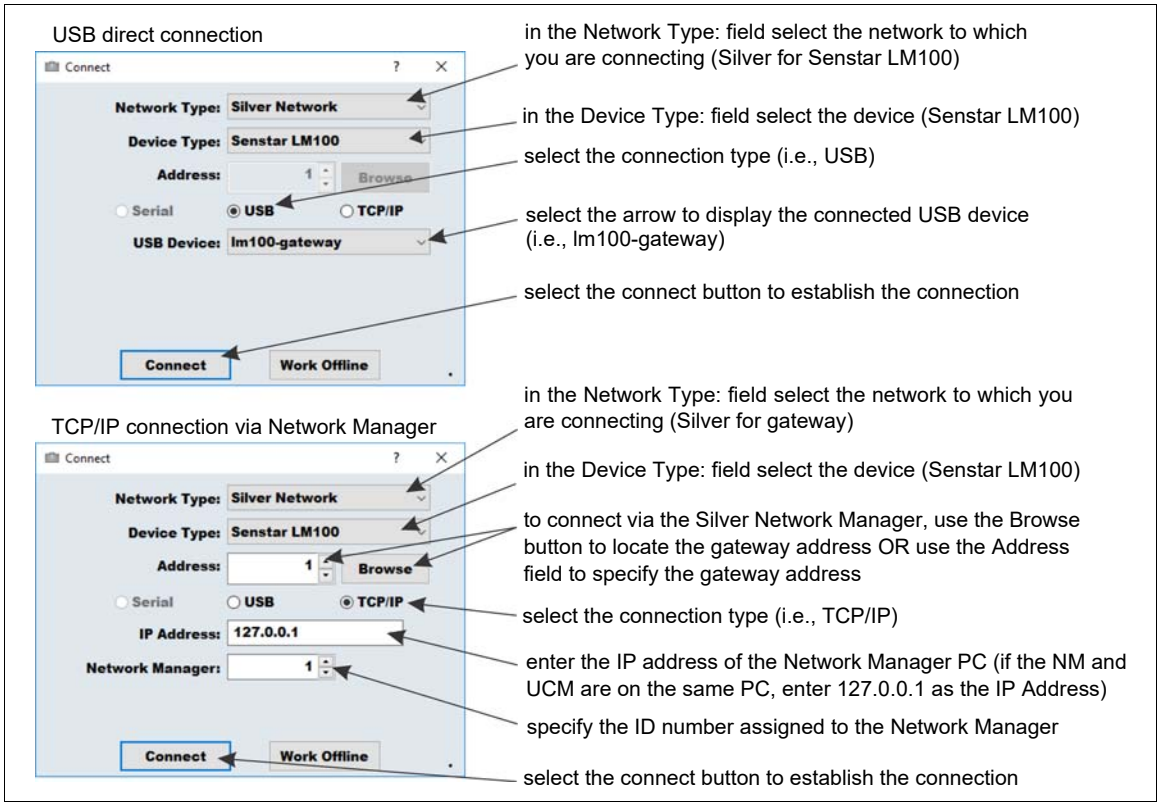


Figure 46: Connecting the UCM

Tip	Save UCM files with a meaningful name, which includes the time and date. The files can then be reopened at a later time (Work Offline).

When you select the Connect button, the UCM status window displays.

Note	Refer to the UCM help file and the appropriate section in this document for additional details on configuring the Senstar LM100 and UCM operation.

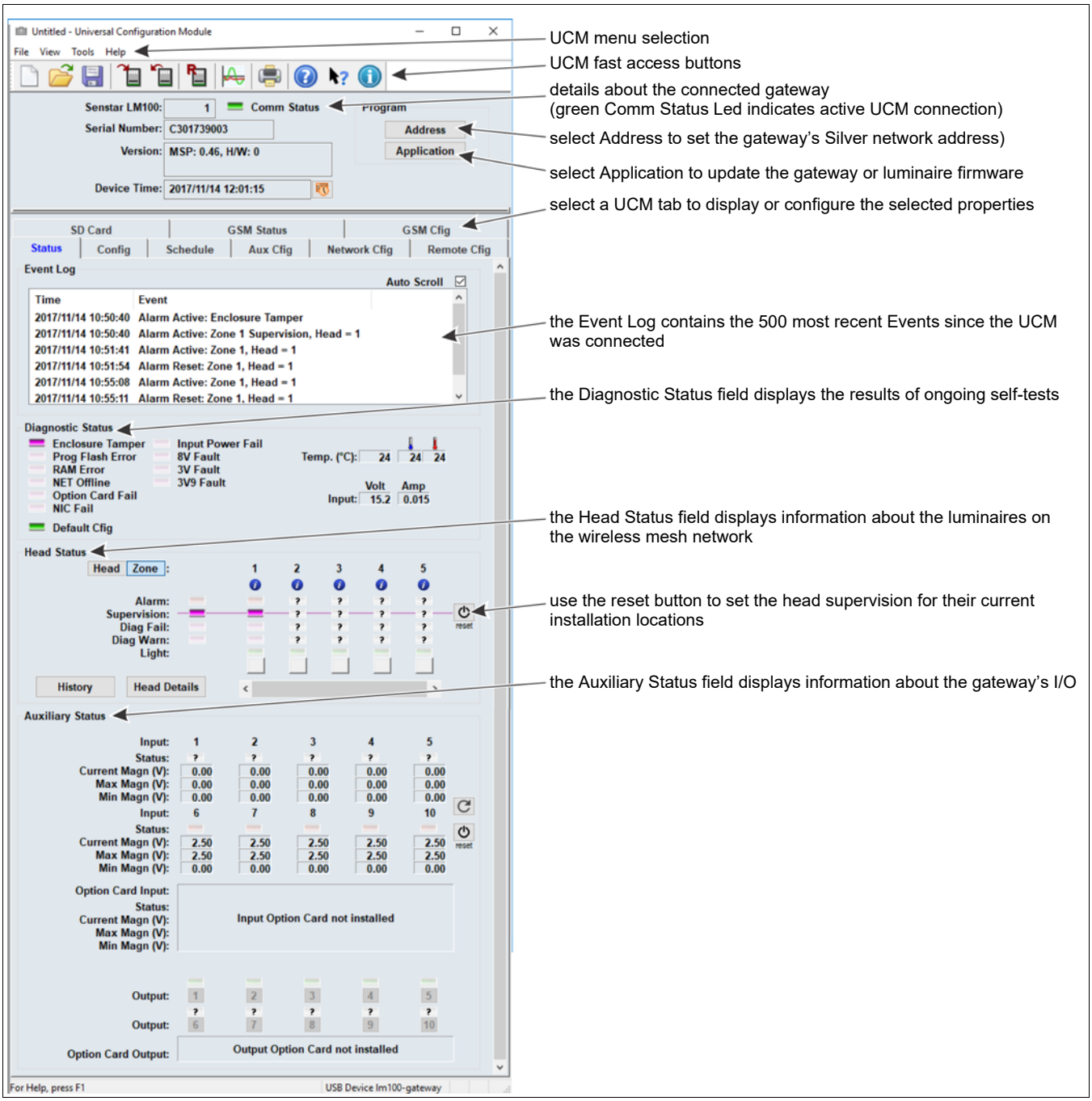


Figure 47: UCM Status window

The following table includes the Senstar LM100 configuration parameters along with a brief description. The Sensor Head Configuration settings apply to all of the installed luminaires, unless the parameter is assigned to a specific segment or zone.

Configuration parameter	Descriptions
Address	Use the *Address* button to assign Silver Network based Senstar LM100 gateway's a unique network address (1 - 60)
Application	Use the *Application* button to update the LM100 gateway or luminaire firmware
Config tab (sensor head configuration, settings apply to all luminaires)	
Comm Channel	If 2 or more Senstar LM100 systems operate within 400 m (1300 ft.) of each other, they must use different *Comm Channels* to prevent mutual interference
Target Filter (Hz)	There are 2 *Target Filters* for adjusting the frequency response of the luminaires (2 - 400 Hz) The high pass filter is used to screen out low frequency vibrations such as the fence motion caused by wind sway and loose fence fabric The low pass filter is used to screen out high frequency vibrations such as the thermal expansion and contraction of palisade fences
Event Window (sec)	Sets the time period after an Event is recorded before the next Event can be recorded (0.5 - 10 seconds) Used to prevent vibrations caused by a single Event from being recorded as subsequent Events
Event Count	When the detection signal exceeds the Threshold setting an Event is recorded and added to the *Event Count*; When the number of recorded Events reaches the *Event Count* setting an alarm is declared (1 - 10)
Alarm Window (sec)	Sets the time period after the first Event is recorded in which the specified number of Events must occur to trigger an alarm (1 - 99 seconds) Each time the *Event Count* is incremented, the *Alarm Window* time begins to count down from the set value; If a subsequent Event occurs before the *Alarm Window* time lapses the *Event Count* is incremented and the *Alarm Window* time begins to count down from the set value; If the *Event Count* setting is reached before the *Alarm Window* time expires, a sensor alarm is declared; The *Alarm Window* resets after each Event; If the *Alarm Window* time lapses before a subsequent Event is recorded both the *Alarm Window* time and the *Event Count* are reset
Normal Light Control - Set the luminaire brightness for routine scheduled operation	
Light Level	Set the *Light Level* (brightness) for regularly scheduled light activation (not alarm activation)
Auto Light Control - Set the luminaire response to alarm conditions	
Mode	Specify the luminaire's lighting activity in response to a sensor alarm (e.g., strobe the luminaire that recorded the alarm and activate all luminaires that are assigned to the same zone)
Duration (min)	The number of minutes the activated luminaires will remain in alarm mode following an alarm (1 - 15 minutes)
Light Level	Set the *Light Level* (brightness) for alarm response light activation

Configuration parameter	Descriptions
Segment Settings and Zone assignments	
Segment	The *Segment* field identifies the currently selected *Segment*; The selected *Segment* is divided into 2 equal *Segment* and the *Segment* number increments when you select the *Split* button; The currently selected *Segment* merges with the previous *Segment* and the *Segment* number decrements when you select the *Delete* button; The LM100 system supports up to 50 segments
Zone	Specify the *Zone* to which the selected *Segment* is assigned; The LM100 system supports up to 50 zones
Relay (Local Control mode)	Specify the *Relay* which will activate in response to an alarm condition in the selected *Segment*
Sequence button	The *Sequence* button is used to setup and define the physical locations of the installed luminaires
Profile button	The Sensitivity *Profile* records the detection signal response magnitude for each luminaire based on a similar disturbance along the full length of the protected fence
Split button	Select the *Split* button to divide the currently selected *Segment* into two equal segments
Delete button	Select the *Delete* button to merge the currently selected *Segment* with the preceding segment
Schedule tab	Setup automatic lighting controls for the defined luminaire zones
SD Card tab	Select the type of data that will be saved to an SD card on the LM100 gateway (troubleshooting feature)
Aux Cfig tab (setup the method of control and the I/O response)	
Aux Control	Select *Local* to have the I/O controlled by the gateway; Select *Remote* to have the I/O controlled by the host security management system
Aux Option Card	Select *Input* if the processor includes an optional input card; Select *Output* if the processor includes an optional output card
Aux type	Specify each of the ten I/O ports as either an *Input* or *Output*
Input Configuration	Setup the gateway's inputs and the optional input card's 4 inputs
Output Configuration	Setup the gateway's relay outputs and the optional output card's 4 outputs
Network Cfig tab	Setup the Silver Network communication parameters
GSM Cfig tab	Setup the parameters for the Senstar Wireless Gate Sensor
Remote Cfig tab	Specify outputs that will activate in response to alarm and supervision conditions for Senstar LM100s that are reporting alarms and supervision conditions through an UltraLink I/O system operating in Network Manager mode

Senstar LM100 configuration overview

To setup and calibrate the Senstar LM100:

1. Set the gateway's Silver Network parameters, if required (see Initial gateway setup on page 49).
   - Silver Network Address
   - Silver Network configuration (Loop or Star)
   - IP settings for Silver Star configuration
2. Setup and define the luminaires wireless mesh network (see Sequencing the heads on page 50).
   - discover the devices in the mesh network
   - order the heads to identify locations
   - sequence the heads for segment and zone setup
3. Reset the Heads supervision (see Figure 47:).
4. Conduct a Sensitivity Profile for the protected fence (see The Sensitivity Profile on page 54).
5. Define the luminaires' segment and zone settings according to the site plan (see Defining the luminaire segments and alarm zones on page 56).
   - assign the luminaires to their specific segments
   - assign the luminaire segments to their specific zones
6. Adjust the luminaires' alarm detection parameters and threshold (see Detection parameter setup on page 55).
   - Event Window
   - Event Count
   - Alarm Window
   - Threshold
7. Setup the luminaires' lighting properties and Schedule (see Scheduling routine light activation on page 61).
   - Normal Light Control
   - Auto Light Control
   - specify up to 8 independent zone-based routine lighting schedules
8. Configure the gateway's input and output (I/O) ports (see Input/output configuration on page 62).
   - define the method of I/O control
   - specify an I/O option card, if required
   - specify each of the 10 I/O ports as either an input or output
   - set the I/O jumpers, if required
   - configure the specified inputs
   - configure the specified outputs
9. Test the installation (see System test procedure on page 65).

Senstar LM100 definitions

- **head** - Head is the term used to describe the electronic components of the luminaire. Each luminaire includes a head. The UCM uses the head to define segments, which are in turn assigned to zones. Each head is identified by a 5-digit mesh network Id (the head network Id is not related to the gateway's Silver Network address).

- **segment** - A segment can be made up of a single head or a contiguous group of heads (numerically sequential). Segments are software-defined during setup, and are assigned to zones for display and control purposes. Each Senstar LM100 system can be comprised of up to 50 segments. A single segment, or multiple segments, can be assigned to one zone. A segment can have a relay associated with it for alarm reporting. Each luminaire segment has an independent event threshold. Segments can also be defined as inactive (no alarm detection) by setting the threshold to the maximum value of 255.
- **zone** - A zone is made up of one or more segments, and is used for the control and annunciation of sensor alarms (graphic map display with target location to the nearest head). There can be up to 50 alarm zones per Senstar LM100 system. Zones are defined in software to match the site-specific zone layout details (e.g., scheduled luminaire activation, CCTV coverage, fence sections, gates, buildings, etc.). Any grouping of segments can be assigned to a zone. The segments do not have to be contiguous, and can come from any combination of heads.
- **threshold** - The threshold defines the received signal strength at which a fence disturbance is added to the Event Count for each head. When the received signal exceeds the threshold, the Event Count is incremented.

Senstar LM100 alarm detection

The luminaires provide the detection for the Senstar LM100 system by evaluating the minute vibrations from the fence to determine whether a disturbance is a valid intrusion or environmental activity. The characteristic signal response of a cut event is a sharp spike with a fast rising edge and fast falling edge. For a climb event, the response includes the fast rising edge caused by the initial contact with the fence, which is followed by a series of peaks and valleys resulting from the continued presence and changing stresses on the fence. Environmental activity is generally of longer duration, lower magnitude, and has more gradual increases and decreases. Each luminaire analyzes the fence disturbance signals from the section of fence it monitors to determine a valid alarm condition. The luminaires communicate over the wireless mesh network and pass the alarm data to the gateway via the luminaire AP. The gateway records and reports the alarm. The gateway can record and report multiple disturbances simultaneously for the full length of the protected fence.

The Threshold defines the signal strength for an Event (disturbance) to be added to the Event Count for each luminaire. An independent Threshold can be set for each defined luminaire segment communicating on the wireless network.

For each luminaire:

- When the received signal exceeds the Threshold setting, the Event Count is incremented.
- The next Event will not be recorded until the period specified by the Event Window has lapsed.
- Once the Event Window has lapsed, the next time the received signal exceeds the Threshold, the Event Count is incremented.
- The Event Count is incremented when the received signal remains above the Threshold for the period specified by the Event Window (i.e., a climbing intrusion).
- Each time the Event Count is incremented, the Alarm Window time is reset and begins counting down.
- When the Event Count setting is reached within the Alarm Window time, a sensor alarm is triggered, and the Event Count is reset to zero.
- If the Alarm Window Time lapses before the Event Count setting is reached, the Event Count is reset to zero without causing an alarm.

Intrusion detection

The Senstar LM100 system guards against three intrusion scenarios:

- An intruder attempting to cut through the fence.
- An intruder attempting to climb over the fence.
- An intruder attempting to crawl under the fence by lifting the fence fabric.

In local control mode, the relay that signals an intrusion alarm resets automatically when the event is over or when the relay Hold Time expires, whichever is longer. The relay Hold Time can be set to values ranging between 125 mS and 10 seconds.

Cut detection

Cutting the fence fabric produces a high amplitude signal that exceeds the Threshold. The first time the detection signal exceeds the Threshold, the Event Count is incremented, and the Alarm Window time count begins. The Event Window time setting must lapse before another Event will be counted. Each time the Event Count is incremented the Alarm Window time count is reset to zero. When the Event Count reaches the specified value within the Alarm Window time setting, the luminaire reports a sensor alarm to the gateway. If a subsequent Event is not recorded before the Alarm Window time runs out, the Event Count and the Alarm Window reset to zero.

Climb detection

When an intruder attempts to climb over the fence, or lift the fence fabric to crawl under, a large number of energy pulses rapidly occur causing the received signal to exceed the Threshold. When the signal first exceeds the Threshold, the Event Count is incremented by one, and the Alarm Window time count begins. Typically, during a climb or lift type intrusion, the received signal remains above the Threshold as a result of the continued flexing and stressing of the fence fabric. The initial contact with the fence activates the Event Window time counter. Each time the Event Window time is reached, and the received signal strength remains above the Threshold, the Event Count is incremented by one. Each time the Event Count is incremented the Alarm Window time count is reset to zero. When the Event Count reaches the specified number within the Alarm Window time period, the gateway reports a sensor alarm at that location.

Initial gateway setup

Senstar recommends that the initial setup be done at the gateway location using a direct USB connection to the UCM.

Note	An enclosure tamper condition must exist to enable UCM communication via a USB connection.

Note	The gateway's Address and Network Configuration settings can be adjusted only through a direct USB connection.

Connecting the UCM via USB

1. Open the enclosure cover and connect the UCM computer to the gateway via USB (T3).
2. Start the UCM software (the UCM Connect dialog displays see Figure 46:).
3. Specify the connection details:
   (e.g., Network Type: = Silver Network; Device Type = Senstar LM100; Address = 1 {default address}; select USB radio button; USB Device = gateway)
4. Select Connect to establish a connection to the Senstar LM100.
   The Senstar LM100 Status window opens.

Setting the gateway's Silver Network address

Note	Senstar LM100 gateways that are on a Silver Network require a unique network address (valid range from 1 to 60). Gateways that are not on a Silver Network can use the default address of 1.

1. In the Program field select the Address button.
   The change Device Address dialog displays.
2. In the Change Device Address dialog, specify the New Address for the connected Senstar LM100 gateway.
3. Select the Program button.
   The new address takes effect when communications are reestablished.

Silver Network configuration

For Senstar LM100 gateways that use Silver Network alarm data communications, you must define the network Protocol under the Network Cfig tab. There are two selectable Protocols based on the network configuration:

- The Silver Star Protocol uses an IP backbone and an Ethernet connection to the gateway. This configuration is often used when the sensor network is distributed over a large area and consists of isolated blocks of sensors with only a few nodes in each block. A PoE switch can be used for communications and to power the gateway and luminaire AP.
- The Silver Loop Protocol uses a ring topology and sends data in both directions around a perimeter to provide communication redundancy. The Silver Loop Protocol can use RS-422 wiring or fiber optic cable to connect the distributed sensors to the Silver Network Manager.

1. Specify the network Protocol - Silver (Loop) or Silver (Star).
2. For the Silver Star configuration, specify the IP address, the subnet mask, the IP address of the switch (gateway) and the Speed and Duplex setting.
3. Save and download the configuration changes to the gateway.

Sequencing the heads

The process of sequencing the heads is used to identify each luminaire by its installation location rather than its 5-digit network Id. Once the locations of the luminaires are known, they can be put into a logical order. The sequenced heads are then organized into segments and zones.

Note	Senstar LM100 heads are organized into segments and zones in the same manner as a FlexZone sensor cable.

Sequencing can be done by 1 person who starts the recording and then does the location tests, or by 2 people with 1 monitoring the UCM and the other doing the location tests. To determine the physical position of each luminaire, and put them into an ordered list, 1 person goes around the perimeter fence causing a disturbance at each luminaire while the results are recorded on the UCM. The luminaire AP is the recommended starting point for the sequencing procedure. However, for your site-specific sensor layout you may prefer to begin at a particular corner or some other identifiable feature.

Note	The Define Head Sequence window includes 3 indicate buttons to assist in identifying specific luminaires. Select a luminaire from a list, select the indicate button below the list, and the specified head will flash 5 times.

Step 1: The Unordered Heads table is populated automatically by selecting the Record button. The Unordered Heads table includes a numbered list of all luminaires that are communicating on the wireless mesh network. Each luminaire is identified by a 5-digit mesh network Id. The Unordered Heads list is based on the luminaires' RF communication pattern rather than the installation locations. This process can take several minutes to complete.

Step 2: The Ordered Heads table is completed by conducting location tests to identify specific luminaires. The luminaires are moved automatically into the Ordered Heads table in the same order as the location tests are conducted. This enables the luminaires to be organized so that numerically sequential luminaires can be assigned to segments, regardless of their communication pattern. The segments are then assigned to zones for alarm reporting and routine scheduled lighting.

Step 3: The Head Sequence table is completed manually by moving the heads from the Ordered Heads table. The Heads Sequence table also includes segment and zone number assignments, once the segments and zones are defined in the segment setting window on the Config tab.

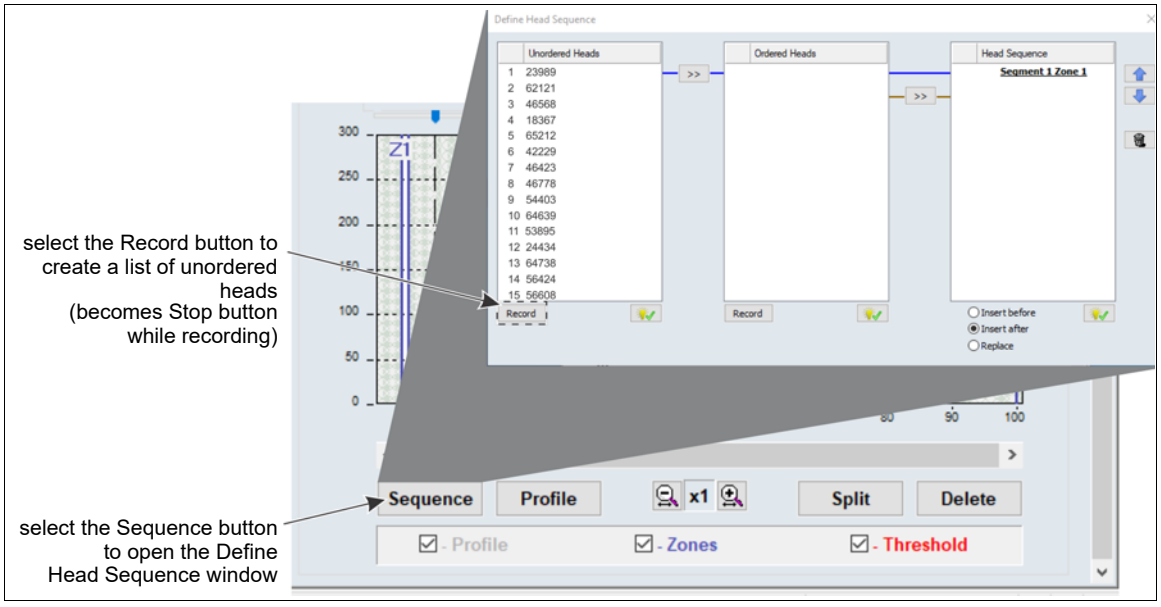


Figure 48: Define head sequence window (Unordered Heads)

Compiling the Unordered Heads list

1. Establish a UCM connection to the gateway (USB or TCP/IP).
2. On the Config tab, select the Sequence button.
3. Select the Record button below the Unordered Heads table and wait for the LM100 gateway to compile the list of unordered heads (this process can take several minutes).
4. Select the Stop button once the compiled list is displayed in the Unordered Heads column. Verify that all of the installed luminaires have been added to the list to ensure that each luminaire in the system is communicating properly (e.g., If there are 38 luminaires in your Senstar LM100 system there should be 38 luminaires in the unordered list.)
   If the unordered list is incomplete, repeat this process extending the wait time, before selecting the stop button. If the list is still incomplete, you must determine which head is not communicating, and rectify the situation.
5. Proceed to Compiling the Ordered Heads list on page 52.

Compiling the Ordered Heads list

Location testing is done to identify the physical location of each installed luminaire. Each luminaire is moved from the Unordered Heads list into the Ordered Heads list in the order that the tests are conducted. To do the location testing, use a screwdriver (or a length of wood like a broomstick) to strike the shaft of the luminaire (if it is not possible to strike the luminaire's shaft, strike the fence post on which the luminaire is mounted). Strike the shaft once firmly, to register the luminaire in the Ordered Heads list. This will cause the luminaire to flash twice, pause for a second, and then flash three times to indicate the luminaire has been moved into the Ordered Heads list. In the Ordered Heads list, the luminaire is identified by a number indicating the test order and by its 5-digit network Id (see Figure 49:).

If the luminaire flashes 4 times, this indicates that a second luminaire has also detected the location test event. In this case, repeat the procedure using less force when striking the shaft.

If the luminaire flashes 5 times, this indicates that the luminaire is already included in the Ordered Heads table. In this case, proceed to the next luminaire and continue the location testing.

Tip	Use a site plan and mark the number down (from the test order) beside each luminaire's location as the tests proceed.

1. Select the Record button below the Ordered Heads table and proceed to the designated first luminaire (usually the luminaire AP).
2. Strike the shaft of the first luminaire firmly once.
   The luminaire will flash twice pause and then flash three times.
   The number one and the luminaire's 5 digit Id are displayed at the top of the Ordered Heads list.
3. Proceed to the second luminaire and strike the shaft of the second luminaire once.
   The luminaire will flash twice pause and then flash three times.
   The number two and the luminaire's 5 digit Id are displayed on the second line of the Ordered Heads list.
4. Proceed around the perimeter doing a location test at each luminaire, thereby, moving each luminaire to the Ordered Heads list in the desired sequence.
5. After conducting the test at the final luminaire on the perimeter, return to the UCM computer and select the Stop button.
6. The Ordered Heads table is now populated by luminaires in the same order that the location tests were done.
7. Proceed to Compiling the Head Sequence list on page 53.

Compiling the Head Sequence list

The Head Sequence list can be compiled one by one, or all of the heads in the Ordered Heads column can be moved to the Head Sequence table at once. To compile the list one head at a time, select a head from the Ordered Heads list then select the double arrow beside the Head Sequence column. To move all of the heads to the Head Sequence table at once, select the first luminaire in the Ordered Heads list, hold down the shift key and select the last luminaire in the Ordered Heads list to highlight all of the luminaires. Next, select the double arrow button to move the Ordered Heads list to the Head Sequence list in the same order.

The Head Sequence list is used to setup segments and zones. To be a part of a segment, the position numbers of the heads must be sequential. For example, if six heads in the Ordered Heads list will make up a segment covering the South-West section of fence, then the six heads must be sequential in the Head Sequence list.

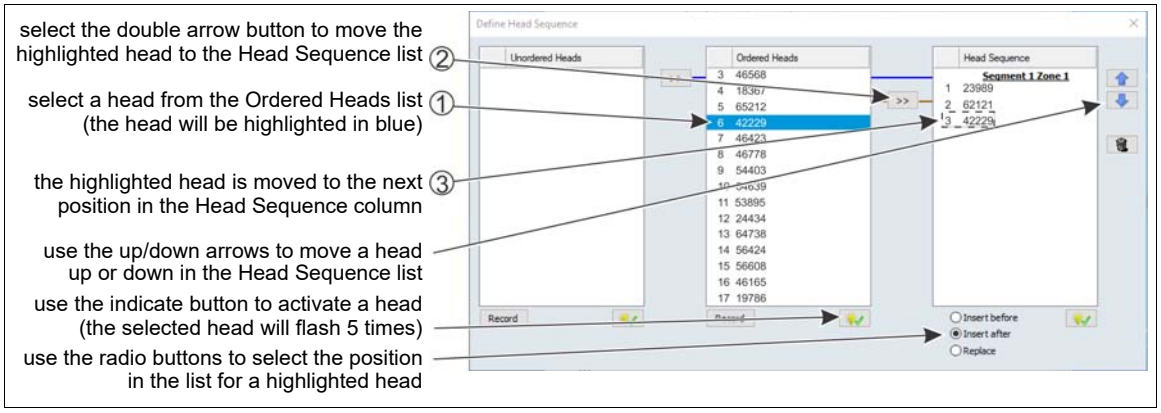


Figure 49: Define Head Sequence window (Head Sequence)

1. Select the first luminaire from the Ordered Heads list and move it to the Heads Sequence column by selecting the double arrow button.
2. Select the second (sequential) luminaire from the Ordered Heads list and move it to the Head Sequence column by selecting the double arrow button.
3. Continue this process until all of the heads are moved to the Head Sequence table in the desired order.
4. If necessary, move the heads around the Head Sequence list by selecting a head and using the up down arrows to move the selected head's position in the list.
5. Close the Define Head Sequence window and select the Yes button to save the changes.
6. Save the UCM file and download the configuration changes to the LM100 gateway.

Note	Once the segment and zone assignments are made on the Config tab, the Head Sequence table will include the segment and zone information with the heads that are assigned to them.

Senstar LM100 calibration

When calibrating the Senstar LM100 for the first time, begin with the detection parameters in the default settings.

The Sensitivity Profile

A Sensitivity Profile should be recorded for the full length of the protected fence. The Sensitivity Profile records each luminaire's measured response to a consistent fence disturbance. The profile will verify the luminaire's detection performance and can identify problems on the fence, or problems with a luminaire's attachment.

Recording the Sensitivity Profile

The recommended method for creating the Sensitivity Profile is to drag a screwdriver or similar instrument along the fence fabric at a consistent height below, the luminaires. Beginning at the luminaire AP (or the designated first luminaire according to the Head Sequence table) place the screwdriver against the fence fabric and apply consistent pressure as you walk along the side of the fence. Keep the pressure steady and maintain a uniform pace as you drag the screwdriver along the fence fabric. When you reach the first fence post, lift the screwdriver over the post. Continue dragging the screwdriver along the fence fabric maintaining a consistent distance below the luminaires and lifting the screwdriver over each fence post until you reach the end of the protected fence. Keep the pressure of the screwdriver and your walking pace as consistent as possible. Repeat this process from the end of the protected fence back to the start point.

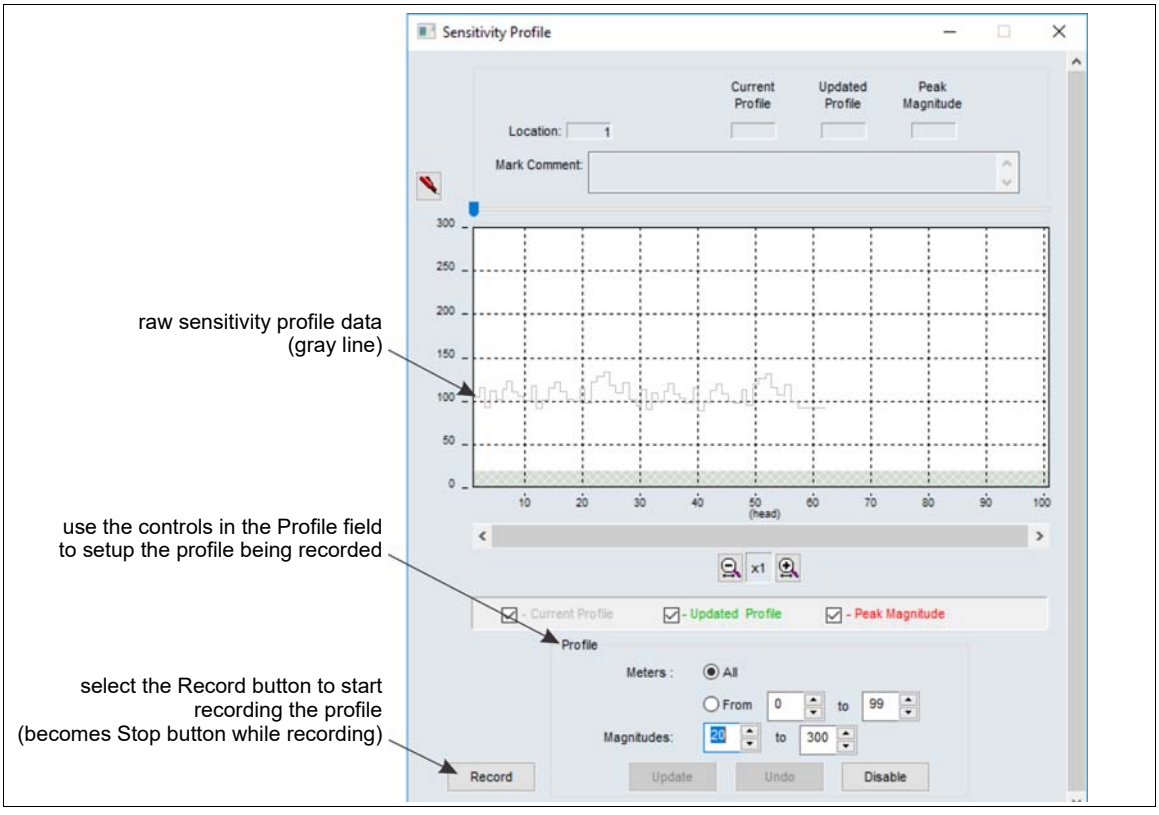


Figure 50: Sensitivity Profile

Note	If a sensitivity profile indicates a drop of 50 units within a 10 m length of the fence, it indicates that there is likely a problem at that location either with a luminaire or with the fence condition at that location (e.g., loose, sagging, stretched).

Tip	Senstar recommends that you save a UCM file that includes the recorded sensitivity profile. This can be useful for future maintenance and troubleshooting activities.

1. Establish a connection between the UCM and the gateway.
2. On the Config tab, select the Profile button.
3. Verify that the All radio button is selected, and then select the Record button to begin recording the Sensitivity Profile.
4. At the luminaire AP, begin dragging the screwdriver along the fence fabric. Lift the screwdriver over the post at each fence post (i.e., do not strike the fence posts with the screwdriver).
5. Maintain consistent pressure and a steady pace and continue dragging the screwdriver along the fence fabric at the same level height until reaching the end of the protected fence.
6. Repeat this process, dragging the screwdriver from the end point back to the start point.
7. Select the Stop button to stop recording the Sensitivity Profile.
8. Review the Sensitivity Profile to verify that it was successful.
9. Once you are satisfied with the profile, select the Update button to load the Sensitivity Profile data. If the recorded Sensitivity Profile is not acceptable, select the Undo button and repeat the profile procedure.
10. Close the Profile window and download the Sensitivity Profile data to the gateway.

Detection parameter setup

The Senstar LM100 detection parameters are setup globally through the gateway, and are applied to all of the luminaires. Senstar LM100 detection parameters include the Event Window, the Event Count and the Alarm Window. The Threshold is set independently for each defined luminaire segment.

Each LM100 installation includes many site-specific factors. Therefore, the system should be calibrated to meet the site's detection requirements:

- Adjust the Threshold to increase or decrease the detection sensitivity of the selected segment.
- Specify the number of Events required to trigger an alarm.
- Specify the period of time that must lapse before a subsequent Event will be recorded at the same location.
- Specify the period of time in which a subsequent Event must occur.

Note 	The LM100 UCM Config tab includes an indicate button to assist in identifying specific luminaires. Select a luminaire, or a defined segment, select the indicate button, and the selected luminaire, or all of the luminaires in a segment, will flash 5 times.

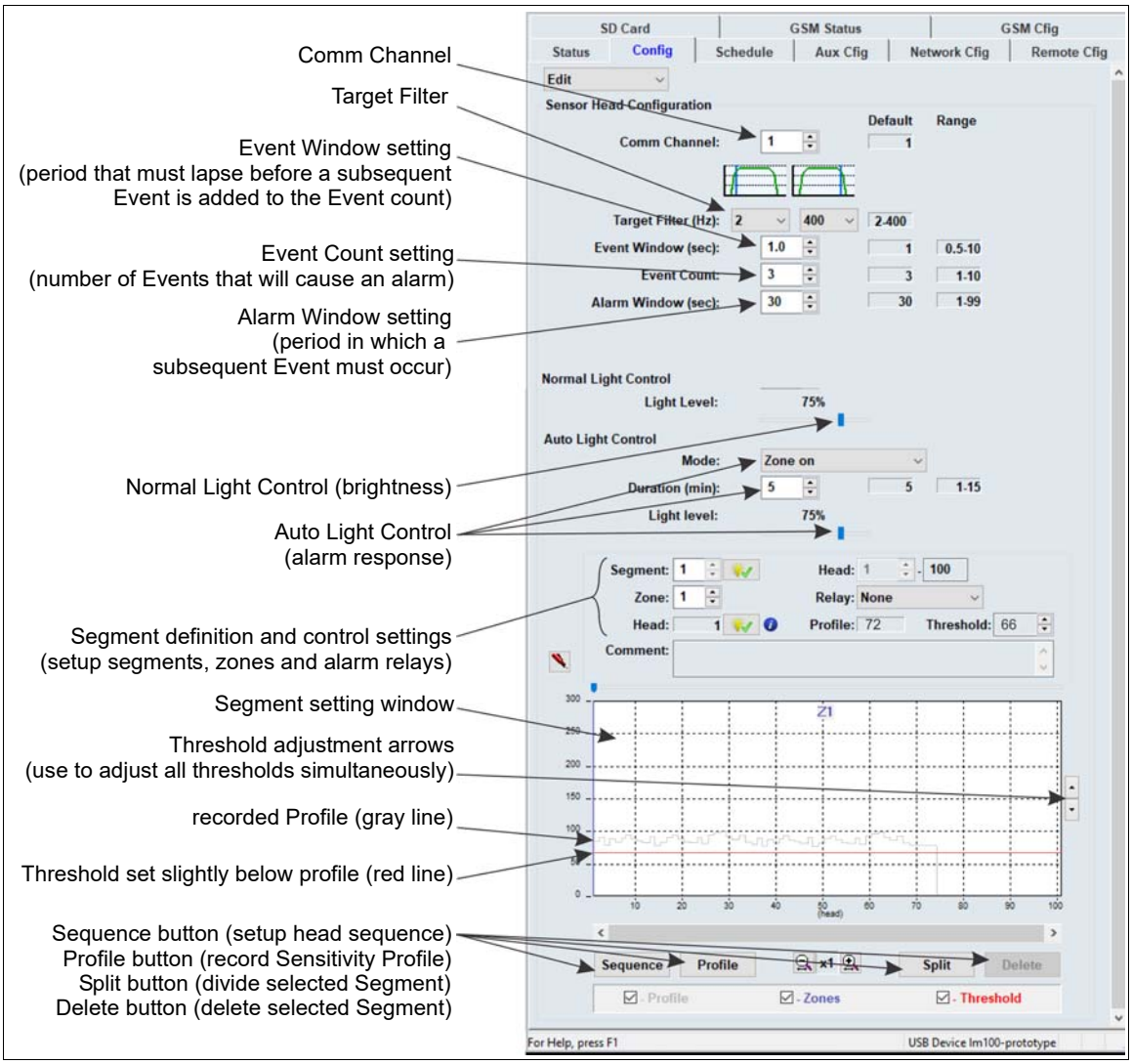


Figure 51: LM100 Config tab

Defining the luminaire segments and alarm zones

Each Senstar LM100 system can be organized into up to 50 segments. The defined segments can then be assigned to as many as 50 distinct alarm zones. Use the UCM software to organize the luminaires into segments, according to the site's requirements for alarm detection and response. The segments are then assigned to zones to fit the alarm zone layouts for display and control, and routine lighting. Once the segments and zones are setup, you adjust the Threshold independently for each defined segment to match the sensors response to the fence conditions and to increase or decrease the detection sensitivity for that segment.

Note	Luminaires must be numbered sequentially in the Head Sequence list to be assigned together in a segment (e.g., heads 4, 5, 6, 7 could be assigned to a segment, but heads 4, 5, 6, 9 could not).

Note	Any luminaires that are used only for lighting purposes (e.g., to light a walkway or entrance) should be assigned to a segment in which the threshold is set to maximum. This enables routine scheduled lighting control and disables alarm detection.

Defining the initial zone

When the sequencing procedure is completed, the segment setting window on the Config tab will have one segment which is assigned to zone 1 (see Figure 51:).

Defining the segments

The first segment, Segment 1, Zone 1 includes Head: 1 to 100 (even if the system does not include 100 luminaires). Select the Split button and there will be 2 segments, with both assigned to Zone 1. Segment 1 includes luminaires 1 - 50 and Segment 2 includes luminaires 51 - 100. (Each time you select the split button, you divide the selected segment into two equal sections.) Next, specify the luminaire that will be the start point of the second segment. (e.g., If the first segment will include luminaires 1 to 7, then the second segment will start with luminaire 8.) Next, assign the defined segment a zone number for alarm reporting and lighting control. Each LM100 can include up to 50 segments and up to 50 distinct alarm zones.

Note	You can use the horizontal magnification button to provide a closer view.

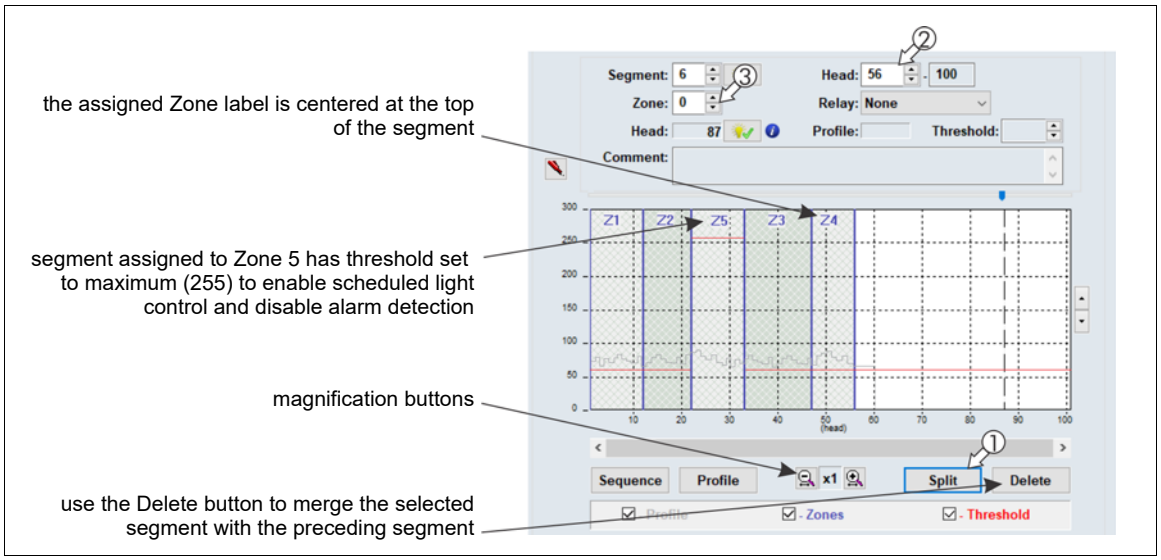


Figure 52: Defining luminaire segments

1. Below the segment setting window, select the Split button.
   The selected segment is divided into 2 sections, the white section is the currently selected segment.
2. Left-click the boundary line and drag the zone boundary to the appropriate point in the segment setting window (or use the Head: field spin control to enter the number of the luminaire that represents the start of the currently selected segment).
3. Use the Zone: spin control to assign the segment to an alarm zone (label the zone according to the site plan; multiple segments can be assigned to one zone).
4. Repeat this procedure to define each luminaire segment and zone, as specified in the site plan.
5. Save the UCM file and download the configuration data to the gateway.

Verifying the luminaire segment boundaries

Note	Senstar recommends marking a site plan (or a table) with numbered luminaire locations, the segments to which the luminaires are assigned and the alarm zones to which the luminaire segments are assigned. The initial segment begins with luminaire 1 (by default).

Note 	You can use the indicate button to identify boundary locations by activating the head that represents the boundary.

1. Establish a UCM connection to the LM100 gateway and select the Config tab.
2. Select File > Response Plot and set the Senstar LM100 response plot so the Display Format is Magnitude vs Location, the Heads: All radio button is selected, and the Peak Capture checkbox is selected.
3. Select the Record button to start the plot.
4. Have the tester tap the fence post of the luminaire that is defined as the start point of the second segment with the blade of a screwdriver (or similar object). Use consistent force and tap 3 times waiting 2 seconds between each tap.
5. On the UCM, verify that the alarm was reported by the luminaire defined as the second segment's start boundary.
6. Move along and continue tapping fence posts to mark the start points of the designated segment boundaries.

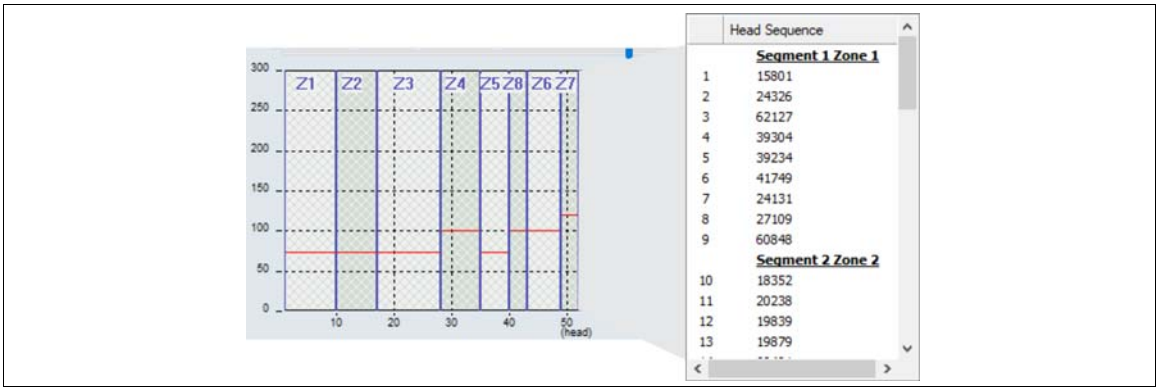


Figure 53: Segment and zone assignments on the Head Sequence window

Setting the Threshold

The Threshold represents the received signal strength at which the Event Count is incremented. An independent Threshold can be set for each of the defined segments. Thresholds can be adjusted for any high risk or low threat areas, as well as any areas that may be subject to a higher NAR such as an open stretch of fence that is regularly exposed to strong winds. The Threshold can also be used to disable alarm detection in a segment by setting the Threshold to the maximum value of 255. Reducing the Threshold in high risk areas will increase the Pd in that area. However, a lower Threshold setting may increase the nuisance alarm rate. For an area where the threat is considered low, increasing the Threshold will reduce the chance of nuisance alarms occurring while still providing an acceptable Pd.

The Threshold is usually set with respect to the recorded Sensitivity Profile. Select a segment, then use the Threshold: spin controls to set the Threshold for that segment. A good starting point is to set the Threshold just below the recorded Sensitivity Profile in each segment. You can use the up down arrows beside the segment setting window to lower, or raise the Threshold for all defined segments.

Segment threshold setting procedure

Note	Left-clicking in the Segment window and using the up and down arrows on the keyboard, or the mouse wheel will also adjust the Threshold.

Note	Set the Threshold after the Sensitivity Profile is completed and downloaded to the gateway.

Note	Intrusion testing is used to verify the Threshold settings.

1. Establish a UCM connection to the gateway and select the Config tab.
2. Select a segment then use the Threshold: spin controls to set the Threshold for that segment.
3. Repeat for each defined segment.
4. Use the Threshold adjustment arrows to adjust the Threshold for all installed luminaires, if desired.
5. Save the UCM file and download the configuration data to the gateway.

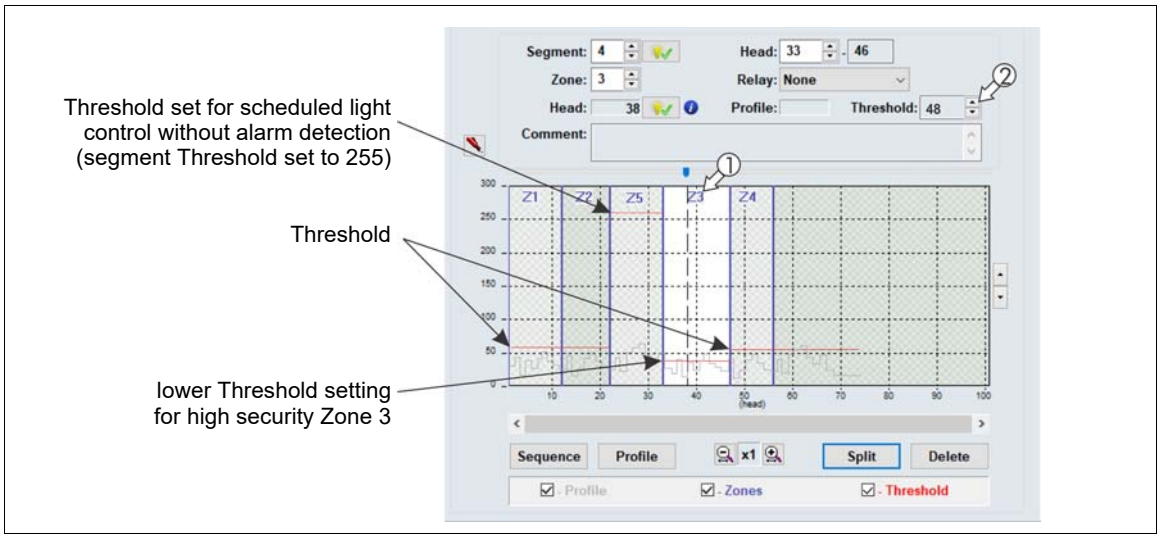


Figure 54: Setting the segment Thresholds

Figure 54: illustrates a Segment setting window for an LM100 system, which has been split into 6 segments and 5 zones. Segments 1, 2, 4 and 5 (Zones 1, 2 and 4) use the same Threshold setting. Segment 4 (Zone 3) is considered a high threat area and the Threshold has been set to a lower value to increase the detection sensitivity in that zone. Segment 3 represents a group of luminaires that are used exclusively for lighting purposes (no alarm detection required) so the segment Threshold is set to the maximum value of 255.

Intrusion simulations

Conduct simulations for both cut and climb intrusions to test the Senstar LM100 system. The easiest method for simulating a cut intrusion is to firmly tap the fence with the blade of a medium sized screwdriver. Hold the screwdriver by the handle, and flip your wrist to bring the blade into contact with the fence. The metal on metal contact generates an impulse that is similar to the cutting of a fence wire.

Weaving a length of fence wire into the fence fabric and then cutting the inserted wire can also simulate a cut intrusion. Both methods generate a signal that is similar to the response of an actual cut intrusion. An actual fence cut also creates a significant amount of secondary fence noise as the cut section of wire pulls apart.

For a simulated climb intrusion, the best method is to actually climb the fence. It is not necessary to climb over the fence. The tester simply needs to climb on the fence for a period that exceeds the Event Window time setting X the Event Count setting (e.g., 1 second X 3 Events = 3 seconds). If climbing on the fence is not possible, dragging a screwdriver across the surface of the fence can be used as a climb simulation. Place the blade of a screwdriver against the fence fabric and drag the screwdriver back and forth across the fence panel while applying light pressure. Continue this for the Event Window time setting X the Event Count setting.

Start a UCM magnitude response plot and then thoroughly test the detection along the full length of the protected fence, while running the plot. Adjust the detection parameters if any of the test intrusions fails to report an alarm simulation. Next, run a long term UCM magnitude response plot to monitor the system for nuisance alarms, especially during periods of inclement weather. Adjust the detection parameters if bad weather causes an unacceptable nuisance alarm rate. Once the system is detecting all intrusion simulations and the NAR is at an acceptable rate, the system is properly calibrated for the site. Save a UCM file that includes the gateway’s current settings.

Scheduling routine light activation

Once the segment and zone assignments are made, a schedule can be setup for routine light activation. The Senstar LM100 enables up to 8 independently scheduled light activations for defined luminaire zones. Set the light level (brightness) for normal light control on the Config tab. Specify the time at which the lights turn on, the time at which the lights turn off, the days of the week on which the activations occur, and the zone to which the schedule applies, on the Schedule tab.

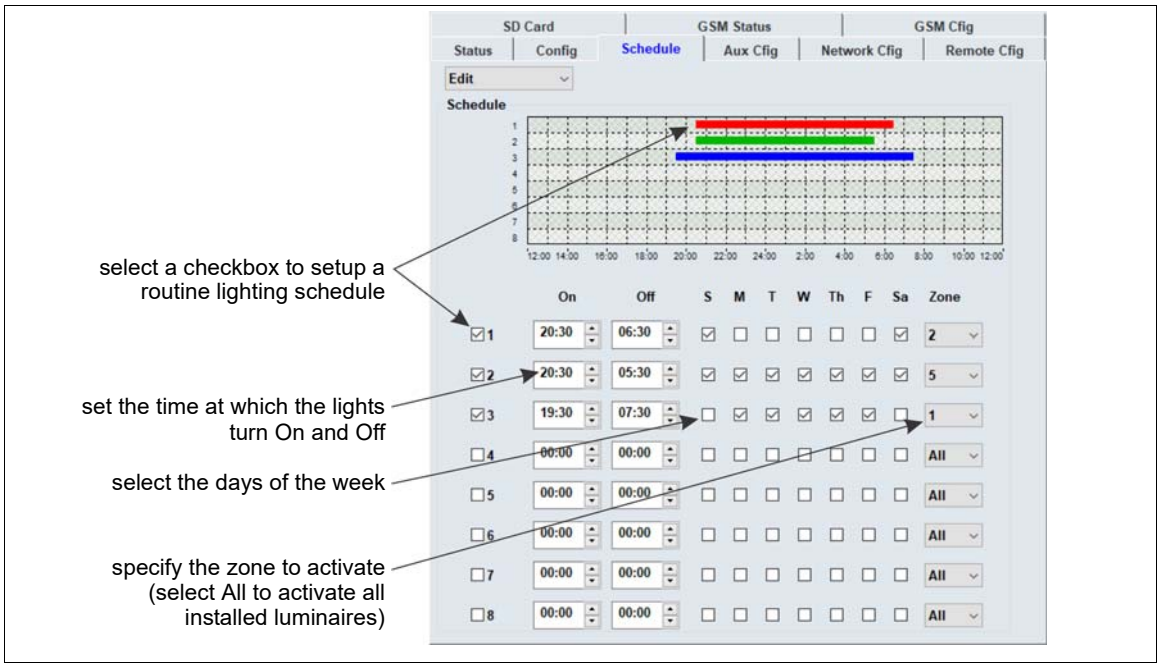


Figure 55: Setting individual segment Thresholds

Scheduling routine luminaire activation

1. On the Config tab, use the slider in the Normal Light Control section to set the brightness of the luminaires that will be activated by the schedule.
2. Select the Schedule tab and select (check) the first scheduling checkbox.
3. Set the time at which the luminaire(s) will turn ON.
4. Set the time at which the luminaire(s) will turn OFF.
5. Choose the days of the week that the activation will occur.
6. Choose the luminaire zone that will activate according to the schedule.
7. Save the UCM file and download the configuration changes to the LM100 gateway.

Input/output configuration

This section details the procedures for configuring the gateway's inputs and outputs (I/O) for Local control and Remote control operation.

Note	See document # 00DA1003-002 for details on using the UltraLink modular I/O system to report Senstar LM100 alarm conditions.

Specifying the Auxiliary I/O control mode, I/O type and option card

1. On the Aux Cfig tab select the Arrow beside the Aux Control: field.
2. Specify the control mode for this gateway (Local or Remote).
3. If the gateway includes an option card, specify the type (Input or Output).
4. Use the 10 Aux Type radio buttons to set each I/O point as either an input or an output.
5. Save the UCM configuration file and download the configuration changes to the gateway.

use the radio buttons to specify each port's function

Figure 56: Aux Type settings

Auxiliary (Aux) inputs

The I/O points specified as inputs on the gateway are voltage sensing inputs. The gateway determines an input's status via an internal reference voltage, and the configuration of the contact closures and supervision resistors. Input contact closures MUST be voltage-free. Define the inputs as normally open (NO) or normally closed (NC) with single resistor supervision, dual resistor supervision, or unsupervised. The Filter Window parameter enables the setting of the time period for which an input must be active, before the gateway reports an event.

Note	The four inputs on the (dry contact input card) DRIC function the same as the inputs on the gateway. Follow the directions for setting up the gateway's AUX inputs to setup the inputs on the DRIC (if applicable).

Local control mode

In local control mode, the Aux inputs are used to activate luminaire zones in response to the inputs of auxiliary security equipment. Select the input, specify the input's parameters, and then specify which luminaire zone will be activated when the input is activated.

Remote control mode

In Remote control mode, the Aux inputs serve as auxiliary device inputs to the host Security Management System (SMS). The inputs are available for reporting the status of other security devices. The gateway reports any change of an input's state to the SMS via the Silver Network Manager.

Remote light activation

In both local control mode and remote control mode, the LM100 can be configured to have specific luminaires activated from remote locations. In local control mode, a simple on/off switch in a central control room can be connected to an Aux input on the gateway. When the switch is turned on the aux input goes high and the luminaire zone that is specified to activate in response turns on (Zone Light Activate on the Aux Config tab). In remote control mode a command from the host SMS can activate a luminaire zone.

Input wiring configurations

CAUTION The I/O port configuration jumpers must be correctly set according to the specific function of each port (see I/O port jumpers on page 32).

Table 2: includes the selectable Aux input wiring configurations, and Table 3: includes the selectable supervision resistor values.

Note Use ¼ W 1% supervision resistors (see Table 3: for recommended resistor values).

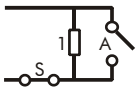
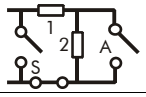
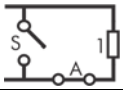
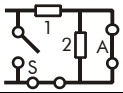
Input option	UCM selection	Alarm relay	Supervision	R1	R2
unsupervised		NO	---	---	---
single resistor supervision		NO	cut	5.1 k	---
dual resistor supervision		NO	cut & short	4.3 k	820
unsupervised		NC	---	---	---
single resistor supervision		NC	short	5.1 k	---
dual resistor supervision		NC	cut & short	5.1 k	820

Table 2: Selectable input configurations

R1 values (single resistor supervision)	R1 values (double resistor supervision)	R2 values (double resistor supervision)
820	1.1 k	820
1 k	2.2 k	1.1 k
1.1 k	4.3 k	2.2 k
1.2 k	4.7 k	3.3 k
1.5 k	5.1 k	5.6 k
2.2 k	5.6 k	
3.3 k		
4.7 k		
5.1 k		
5.6 k		

Table 3: Selectable resistor values

Input configuration procedure

1. Select the Aux Cfig tab on the UCM window.
2. From the Supervision drop down, select the desired supervision scheme for the input.
3. Select the Resistor 1 value, if applicable.
4. Select the Resistor 2 value, if applicable.
5. Set the Noise Tolerance, if required.
6. Set the Line Drop, if required.
7. Set the Filter Window.
8. For Local Control mode, specify the luminaire zone to activate when the input is activated.
9. Repeat this procedure for each input.
10. Save the UCM configuration file and download the configuration changes to the gateway.

Output relays

CAUTION	The I/O port configuration jumpers must be correctly set according to the specific function of each port (see I/O port jumpers on page 32).

Note	The four outputs on the ROC are Form C (selectable as N.O. or N.C.). The ROC outputs cannot source or sink power.

Note	To use the onboard relays, the gateway ports must be configured as outputs via the Aux Type radio buttons.

Output relay setup (Local control mode)

Note	To assign relays to specific zones, see Linking segments to relays (local control mode) on page 65.

In Local control mode, the Aux outputs are setup via the Local Aux Control Activation check boxes to report alarm and supervision conditions. The outputs are then controlled by the gateway to activate on the user-specified conditions. The outputs remain active for an event's duration or for the selectable relay Active Time, whichever is longer.

1. Use the Output selection arrows to select a relay.
2. Select the relay's function: high side drive power sourcing; Form A (N.O.) or Form B (N.C.) power sinking (up to 100 mA power sourcing/sinking); or dry contact Form A or Form B.
3. Specify the Hold/Active Time parameter.
4. Specify the conditions from the Local Aux Control Activation field under which this relay will activate. Zone alarms are assigned on the segment setting window on the Config tab.
5. Repeat this procedure for each defined output.
6. Save the UCM configuration file and download the configuration changes to the gateway.

Output relay setup (Remote control mode)

In Remote control mode, the relays are controlled by the host SMS to operate auxiliary equipment as output control points (e.g., to activate lights, doors, sirens, CCTV equipment, etc.). The relays are configured to respond to commands from the host computer. Configure the relays as latching (ON by command, OFF by command) or in flash mode (ON-OFF-ON-OFF etc. by command, OFF by command) or in pulse mode (ON for a period, then OFF). For flash and pulse modes, the ON-OFF time duration is configurable.

1. Use the Output selection arrows to select a relay.
2. Select the relay's function: high side drive power sourcing; Form A (N.O.) or Form B (N.C.) power sinking (up to 100 mA power sourcing/sinking); or dry contact Form A or Form B.
3. Select the type of relay Activation (latching, or flash mode, or pulse mode).
4. Select the Hold/Active Time parameter, if applicable.
5. Select the Inactive Time parameter, if applicable.
6. Repeat this procedure for each defined output.
7. Save the UCM configuration file and download the configuration changes to the gateway.

Linking segments to relays (local control mode)

The gateway's outputs and the four relays on the ROC (OPT 1, OPT 2, OPT 3, OPT 4) can be linked to the defined luminaire segments. This provides up to 14 relays per gateway, for signaling alarm conditions.

1. Under the Config tab, on the Segment Settings window, select the segment to which a relay will be associated.
2. From the pull down menu, select the relay which will be associated with the segment (the selected relay activates to signal an alarm in the luminaire segment).
3. Repeat steps 1 and 2 until the defined segments have associated relays, as required.
4. Save the UCM configuration file and download the configuration changes to the gateway.

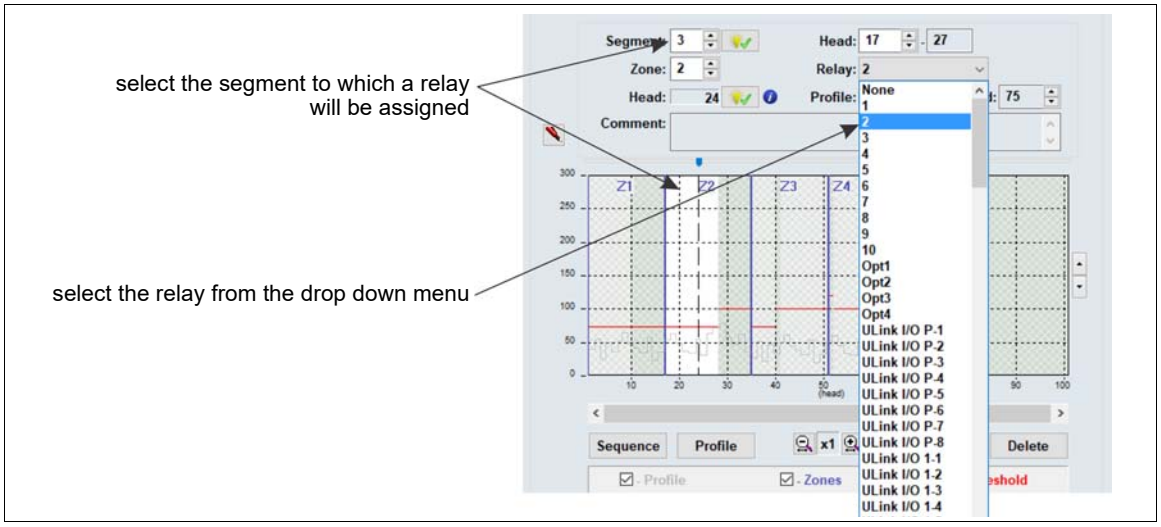


Figure 57: Linking relays to segments

System test procedure

Once the system is setup and calibrated, conduct a series of tests to verify detection. Run a UCM Response plot during the testing. Network based gateways can be tested over the network to verify network communications.

Note	The following tests can be used to verify gateway system operation. The tests are described in a generic manner, which does not take into account site specific details.

- **Cut detection** - Use the tap test, or weave a piece of scrap fence wire into the fabric of the fence and cut the scrap wire. Test each zone in at least three separate locations.
  At each location, tap the fence fabric, or cut the scrap wire, the number of times specified by the Event Count parameter + 1. Wait at least 2 seconds between taps.

  PASS ____ FAIL____

- **Climb detection** - Have a tester climb on the fence fabric for at least as long as it would take to climb over the fence (or use the screwdriver drag method). Repeat the climb simulation in at least three locations per zone.

  PASS ____ FAIL____

- **Fence lift detection** (This test may not be possible on a number of fence types. Use care to ensure that the fence is not damaged during this test) - Have a tester lift or pry up the bottom the fence fabric for a minimum of the Event Time X the Event Count (depending on the amount of fence noise being generated, the test may have to exceed the Event Time setting by several seconds). Repeat the lift test in at least three locations per zone.

  PASS ____ FAIL____

- **Enclosure tamper** - Open the gateway's enclosure. The DOOR OPEN LED (D1) turns ON, and the UCM Enclosure Tamper indicator turns ON, and the Event log reports an Enclosure Tamper alarm. If a relay is configured to activate for an enclosure tamper, the designated relay activates.

  PASS ____ FAIL____

- **Auxiliary inputs** - For Local control mode the Aux inputs activate luminaire zones. In this case, activate the input, and verify that the specified luminaire zone activates in response.
  For Remote control mode, the Aux inputs serve as auxiliary device inputs to the host Security Management System. In this case, activate the connected device, and verify the status change is reported by the host SMS. Repeat for each configured input.

  PASS ____ FAIL____

- **Relay outputs** - For Local control mode the relay outputs are used to report events. Cause an event, and verify that the configured relay activates for a minimum of the relay hold time. Verify that the connected device activates. Repeat this procedure for each specified event.
  For Remote control mode, the relays serve as output control points for the host SMS. Send an activation command from the host SMS to a relay and verify that the relay activates. Verify that the connected device activates. Repeat this procedure for each relay.

  PASS ____ FAIL____

- **Normal Light Control** - If a schedule has been setup to activate luminaire zones at specific times on specified days, verify that the luminaire zones activate and deactivate according to the schedule.

  PASS ____ FAIL____

- **Auto Light Control** - For luminaire zones that are setup to activate in response to alarm conditions, simulate an alarm and verify that the luminaire zone activates as specified.

  PASS ____ FAIL____

4 Maintenance

Recommended maintenance

The Senstar LM100 system requires minimal maintenance to ensure proper operation. However, setting up and following a maintenance schedule based on your site-specific requirements can ensure proper detection performance, prevent nuisance alarms and extend the operational lifetime of the system. The frequency at which the maintenance should be scheduled depends on the site's security requirements and on the installation environment. This section includes the recommended maintenance activities along with suggested intervals.

1. Perform a visual inspection of the installation (once per month). Check for the following:
   - fence condition - ensure the fence is in good condition and that there are no loose panels, loose fittings or metal bits that can move with the wind and cause nuisance alarms (a shake test in which you grip the fence fabric in the middle of a panel and gently shake it with an increasing motion can help identify any loose pieces)
   - there are no washouts or depressions under the fence
   - vegetation beside and above the fence is cut back and cannot make contact with the fence or the luminaires, and there is no debris or loose material close to the fence
   - there are no loose clamps; each luminaire is held tightly against the fence post
   - power cables are neatly installed and are held securely by the cable ties
   - there is no corrosion or moisture inside the gateway enclosure
   - the ground connection is tight
   - there are no vehicles or equipment close enough to the fence to be used as bridging aids
2. Physically test the system (once per week).
   - use a screwdriver to simulate a series of cut intrusions and verify that alarms are declared and accurately located each time
   - climb the fence at several locations and verify that alarms are declared and accurately located each time
3. Record a UCM LM100 response plot (quarterly).
   Connect the UCM to the gateway and record a sensor response plot while conducting tap tests along the protected fence. Note the environmental conditions at the time of the recording. Review the plot to examine the response and the ambient noise level, and compare the plot to any previously recorded plots. Depending on the weather conditions, the recorded plots should be quite similar. During inclement weather the noise level will be higher, and during good weather with very little wind, the noise level should be extremely low.

4. Snow removal (as required)
   If the weather conditions at your site include snow falls, the fence should be kept clear of accumulating snow. If snow accumulates against and around the fence, it will absorb and dampen the vibrations caused by an intrusion attempt. In addition, if there is significant snow accumulation, the snow can serve as a bridging aid to defeat the system.

Preventing weather related nuisance alarms

If your Senstar LM100 system is having a problem with nuisance alarms during inclement weather, connect the UCM to the gateway and review the alarm history to try to determine the source of the nuisance alarms. Investigate the areas near the luminaire(s) with the highest alarm count. Inspect the fence to ensure it is in good condition and there are no loose fittings that can cause metal on metal contact. Check the attachment and test the detection of any luminaire(s) with a higher than average nuisance alarm rate.

For network based systems, run a UCM response plot through the Network Manager during periods of inclement weather. If the weather causes an unacceptable number of nuisance alarms, review the plot and the processor history and adjust the Threshold to mitigate the effects of the weather. For standalone systems that encounter an unacceptable number of nuisance alarms during inclement weather, connect the UCM to the gateway, review the processor history and adjust the Threshold to mitigate the effects of the weather.

Note	After adjusting the Threshold, retest the system to ensure that the detection meets the site's security requirements.

To determine if there are any loose fittings or parts of the fence that can cause nuisance alarms in windy weather, grip a fence panel in the middle and push and pull on the fence with an increasing motion. Run a response plot to record the shake tests, and listen for any metal on metal contact. Review the plot, looking for any response spikes that are over the threshold. If the shake test causes metal on metal contact, or generates response spikes over the threshold, locate and correct the problems on the fence. This will help to prevent weather related nuisance alarms.

Adjusting the Target Filters

The gateway includes both a high pass and a low pass filter which can be used to screen out some sources of nuisance alarms. Before adjusting the Target Filters, verify that the fence is not loose and that there are no objects or vegetation that may be contacting the fence in strong winds. The default value for the high pass filter is 2 Hz, the default value for the low pass filter is 400 Hz.

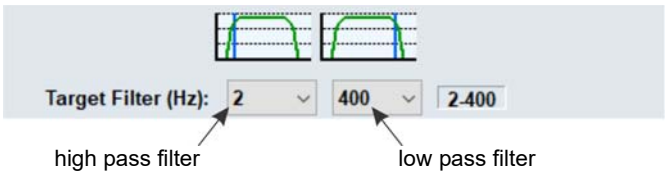


Figure 58: Target Filters

- If the site is encountering an unacceptably high NAR during moderate to strong winds, increase the high pass filter setting slightly to lessen the effects of wind sway and continue monitoring for nuisance alarms.
- If the site is encountering detection problems (low sensitivity) rather than nuisance alarms, the most likely source of the problem is loose fence conditions. Repeat the profiling procedure and compare it to the original sensitivity profile. Once the location of the low sensitivity has been determined, correct the problem by repairing the damaged section of fence.
  If the fence has been restored to the fullest extent possible and the sensitivity problems persist, it may be necessary to install additional luminaires in this area.

Note	Always reprofile and retest the fence if the Target Filters are adjusted or fence repairs are made

Replacing the gateway

The gateway PCB is mounted inside the enclosure on four standoffs.

CAUTION	The gateway and the NIC include static sensitive components. Follow proper ESD handling procedures when working on the electronics. Place both circuit card assemblies (CCA) into anti-static bags once they are removed from the enclosure. Disconnect all power sources before removing the gateway from the enclosure.

Removing the gateway assembly

1. Label and disconnect the removable terminal blocks.
2. Disconnect the tamper switch connector from the gateway.
3. If required, remove the network interface card.
4. Remove and retain the mounting hardware from the gateway CCA (2 standoffs, 2 machine screws + washers) (see Figure 28:).
5. Lift the gateway CCA out of the enclosure. Place the CCA into an anti-static bag.

Replacing the gateway assembly

1. Fit the replacement gateway inside the enclosure so the 4 mounting holes are lined up with the standoffs.
2. Use the retained mounting hardware to secure the CCA to the enclosure.
3. If required, replace the network interface card.
4. Reconnect the tamper switch connector.
5. Reinstall the removable terminal blocks.
6. Apply power to the gateway, connect the UCM and download the replaced gateway's configuration file to the replacement gateway.
7. Retest the protected fence.

Updating the Senstar LM100 Firmware

To update the Senstar LM100 device firmware (gateway, luminaire, wireless gate sensor) select the Application button in the Program field at the top of the UCM screen. The following example will illustrate updating the luminaire firmware, which can take up to 30 minutes to complete due to the distributed locations of the luminaires, and the low power RF transmissions. Begin by obtaining the firmware upgrade from Senstar Technical Services. Save the firmware file to a known location (e.g., a folder on your desktop). Save a UCM file with your current settings as a safety backup before proceeding with the update.

1. Select the Application button in the Program field at the top of the UCM screen.

2. Specify the device firmware being updated and select OK (i.e., MSP for gateway, Heads for luminaires, GSM Base for wireless gate sensor receiver, GSM Sensor for gate sensor module).
3. Select the Use: Current Active configuration after programming unit radio button, then select the Browse button.
4. Navigate to the location of the firmware file and select the appropriate .XDU file.
   If you select an incorrect .XDU file, the UCM will not allow the installation.
5. Select the Program button on the Program Device dialog.
   A series of progress windows will be displayed as the firmware is loaded into the devices.
6. When the programming Complete window is displayed, select OK.
7. Reset or restart the gateway.

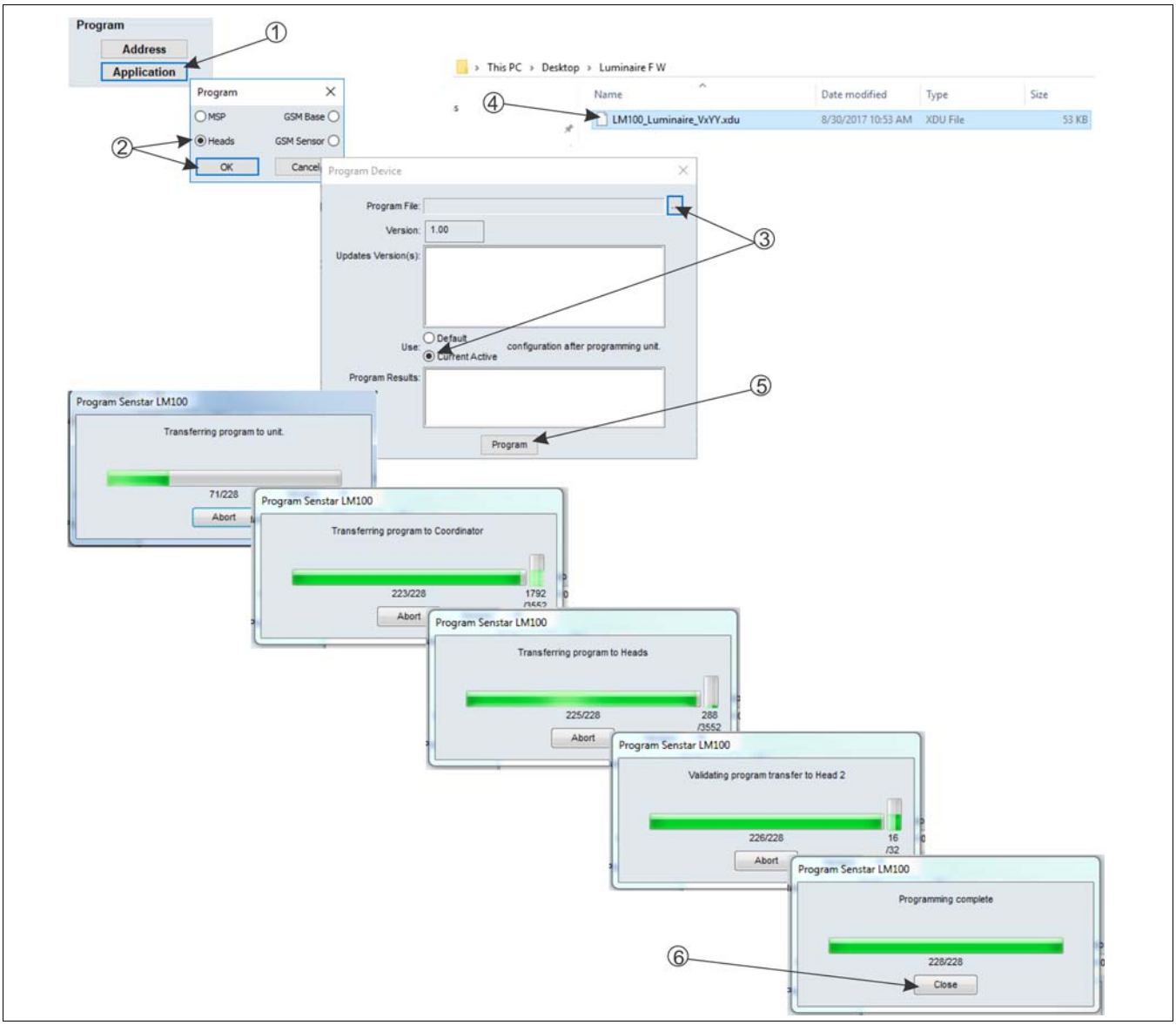


Figure 59: Target Filters

a Parts list

Component	Part Number	Description
Senstar LM100		
Senstar LM100 gateway and enclosure	E8EM0300	gateway mounted in an outdoor rated painted aluminum enclosure, provides electronic processing for up to 100 luminaires on up to 600 m (1970 ft.) of fence
Senstar LM100 gateway and luminaire AP	E8FG0300	gateway in enclosure with luminaire AP and documentation CD
Senstar LM100 gateway	E8BA0200	gateway circuit card (spare with no enclosure)
Senstar LM100 luminaires		
Senstar LM100 luminaire AP	E8FG0110	luminaire AP with 3 m (10 ft.) RS-485 comm/power cable for hard-wired connection to gateway (1 required per Senstar LM100 system)
Senstar LM100 luminaire	E8FG0210	1 luminaire with post clamps, power cable crimps and grommet
Senstar LM100 luminaire	E8FG0250	5 luminaires with post clamps, power cable crimps and grommets
Senstar LM100 luminaire	E8FG0220	20 luminaires with post clamps, power cable crimps and grommets
Senstar LM100 accessories		
UV resistant cable ties	GH0916	UV resistant polypropylene cable ties for power cable installation, 1000 piece bag
stainless steel clamps	GH1080	stainless steel post clamps for post mounting gateway/luminaire (fits 4.5 to 12.7 cm; 1¾ to 5 in. OD post size)
power cable (14/2)	GW0337-14	152 m (500 ft.) reel of 14 AWG, 2 conductor, outdoor rated, low voltage power cable
power cable (16/2)	GW0337-16	152 m (500 ft.) reel of 16 AWG, 2 conductor, outdoor rated, low voltage power cable
power cable crimps	GX0310	manual installation tool for stainless steel cable ties
luminaire grommet	GH1095	grommet used to secure the power cable inside the base of the luminaire
Molex crimp tool	G6KT0300	recommended crimp tool for power cable crimps
Klein crimp tool	G6KT0300	suitable crimp tool for power cable crimps
input card	00BA2400	plug-in option card provides 4 dry contact (voltage sensing) inputs

Component	Part Number	Description
output card	00BA2500	plug-in option card provides 4 relay outputs
Gate accessories		
wireless gate sensor module (GSM)	E7EM0201	battery powered wireless gate sensor module mounts on gate and communicates via RF with plug-in module on the gateway
wireless gate sensor module (GSM)	E7EM0202	solar powered wireless gate sensor module mounts on gate and communicates via RF with plug-in module on the gateway
gate sensor receiver card for WGS	E7FG0301	plug-in module for Senstar LM100 gateway, communicates via RF with GSM
Network accessories		
Silver Network Interface Unit	00EM0200	Silver Network data converter for RS-422 and multi-mode fiber optic applications
Silver Network Interface Unit	00EM0201	Silver Network data converter for RS-422 and single-mode fiber optic applications
Mini Silver Network Interface Unit	00EM1301	Silver Network data converter for USB to RS-422 and multi-mode fiber optic applications DIN rail mount
Mini Silver Network Interface Unit	00EM1302	Silver Network data converter for USB to RS-422 and single-mode fiber optic applications DIN rail mount
Data converter	GB0360-ST	Ethernet to dual RS-422 data converter (0 to 60º C operating temp)
Data converter	GB0360-ET	Ethernet to dual RS-422 data converter (-40 to +75º C operating temp)
Data converter mounting kit	GB0360-MK	35 mm DIN rail mounting kit for Ethernet to dual RS-422 data converters
Network Interface Card (multi-mode fiber)	00BA1901	Network interface card for multi-mode fiber optic communications
Network Interface Card (RS-422)	00BA2000	Network interface card for copper wire communications
Network Interface Card (single-mode fiber)	00BA2101	Network interface card for single-mode fiber optic communications
Network Interface Card (Ethernet PoE)	00BA2200	Power over Ethernet network interface card for Ethernet communications
UCM software		
UCM cable	GE0444	UCM interface cable, 3 m, USB (connects PC running UCM to gateway)
UCM	00SW0100	Universal Configuration Module software, Windows-based application, setup, calibration and diagnostic tool
UltraLink CD Network Manager service software	00FG0220	Network Manager service software CD for Silver Network plus Alarm Integration Module software (requires hardware key for operation)
AIM hardware key	00SW0230	USB security dongle for AIM software operation

b Specifications

gateway	**Model**	• gateway circuit card and enclosure
	PCB dimensions (L x W)	• 13.2 x 14.5 cm (5.2 x 5.7 in.)
	Quantity	• one gateway per Senstar LM100 system
	Enclosure	• IP66/NEMA 4 painted aluminum, outdoor rated • L x W x D 26 cm (+2.5 for cable glands) x 16 cm x 9 cm 10.25 in. (+1 for cable glands) x 6.3 in. x 3.5 in. • 4 holes for flat surface mounting, use 7 mm (¼ in.) hardware
	Cable entry ports	• 4 small cable ports (17 mm, 0.67 in.) fitted with 9.5 mm (3/8 in.) compression glands: cable range: 2.9 - 7.9 mm (0.115 to 0.312 in.) • 1 large cable port (22.2 mm, 0.875 in.) fitted with compression gland: cable range: 4.3 - 11.4 mm (0.17 to 0.45 in.)
	Probability of detection	• 95% with a 95% confidence factor for cutting the fence, lifting the fence fabric, or climbing over the fence unaided (based on a high quality chain link fence, and following manufacturers' installation and calibration recommendations)
	Maximum recommended fence coverage (per system)	• 600 m (1970 ft.) max. recommended fence length • 100 luminaires (including luminaire AP)
	Power consumption	• 0.5 W nominal; 1.0 W nominal with NIC and option card
	Power input	• 12 to 48 VDC (nominal) • absolute minimum 10 VDC • absolute maximum 60 VDC
	Connectors	• removable terminal block for power input • removable terminal block for input/output connections • removable terminal block for RS-485 cable input • USB port for UCM connection • 20-pin socket for network interface card/option card/wireless gate sensor receiver • micro SD card slot

gateway	**Controls**	• calibration adjustments via the Universal Configuration Module (Windows-based software application)
	Inputs	• up to 10 user-configured voltage sensing auxiliary device inputs (in combination with outputs)
	Outputs	• up to 10 user-configured relay outputs rated 30 VDC @ 1 A maximum, non-inductive load (in combination with inputs) • high side drive sourcing up to 100 mA @ the gateway's input voltage level; • Form A/B dry contact relays; • Form A/B power sinking up to 100 mA; • user-configurable relay response
	LED indicators	• power • one per I/O point • UCM connected • Enclosure door open • diagnostic activity
	Supervision	• mechanical enclosure tamper switch • luminaires • gateway operation
	Temperature	• -40º to +70ºC (-40º to +158º F) (as measured inside the enclosure)
	Relative humidity	• 0 to 100%
luminaire/luminaire AP	**Controls**	• light intensity (normal lighting) • light intensity (alarm response lighting) • alarm response activity and duration • routine lighting schedule
	power input	• 12 - 48 VDC
	power consumption	• 2.5 W nominal
	Supervision	• installed orientation and communication of each luminaire
	Temperature	• -40º to +70ºC (-40º to +158º F)
	Relative humidity	• 0 to 100%