µltraWave™

Microwave Detection Sensor

Product Guide

E4DA0402-001, Rev B
April 10, 2012

SENSTAR™

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Website: www.senstar.com
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E4DA0402-001, Rev B
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Senstar Corporation's Quality Management System is ISO 9001:2008 registered.

Compliance:

Canada: Industry Canada Identification Number: transmitter 1454B-E4EM0101; receiver 1454B-E4EM0201

This device complies with Industry 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 d'Industrie 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: transmitter 15T-E4EM0101; receiver 15T-E4EM0201
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

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

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1 System planning

The µltraWave Microwave Detection Sensor is designed for exterior perimeter intrusion detection applications. µltraWave consists of a microwave transmitter and receiver, which detect motion in a defined area (see Figure 1). The transmitter emits microwave energy, which the receiver constantly monitors and measures. Any motion in the detection zone causes a variation in the received signal. The signal variations are detected and processed by the receiver, which declares a sensor alarm when the received signal meets the criteria for a valid target.

The transmitter and receiver units are housed in weatherproof enclosures. Each enclosure contains electronic circuitry and an antenna. Both units can report enclosure tamper alarms.

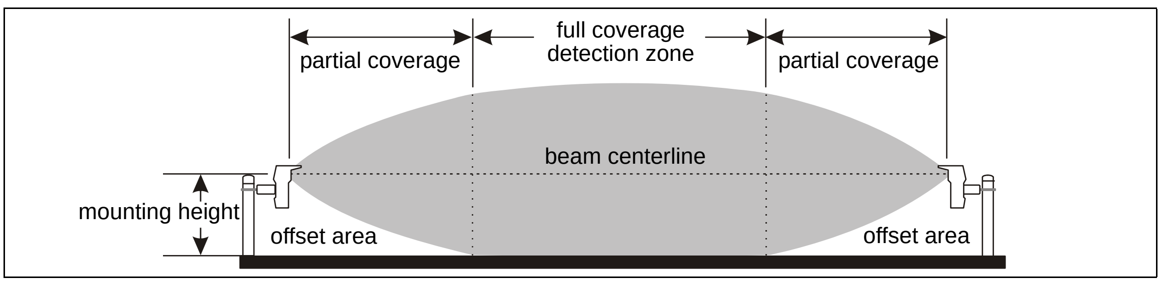


Figure 1 **µltraWave** microwave detection sensor

Site planning & design

The amount of site preparation depends on the required level of security. High security applications require more stringent specifications than do applications where only a beam-break alarm is required. Use the following definitions to determine the level of security:

- High Security Zone - detection of an intruder military-style stomach-crawling perpendicular to the beam; log rolling parallel to the beam.
  - maximum transmitter/receiver separation distance of 100 m (328 ft.)
  - maximum detection zone length of 90.5 m (297 ft.)
  - terrain must be level to grade ± 7.5 cm (3 in.)
  - terrain covered with a 10 cm (4 in.) layer of crushed stone (2 cm {0.75 in.} max.) or a paved zone free of vegetation
- Medium Security Zone - detection of an intruder crawling on hands and knees.
  - maximum transmitter/receiver separation distance of 150 m (492 ft.)
  - maximum detection zone length of 144.2 m (473 ft.)

- terrain must be level to grade ± 15 cm (6 in.)
- terrain covered with crushed stone, OR a paved surface, OR closely mowed grass (max 7.5 cm, 3 in.), OR hard packed dirt or clay

- Low Security Zone - detection of an upright intruder (beam-break alarm).
  - maximum transmitter/receiver separation distance of 200 m (656 ft.)
  - maximum detection zone length of 200 m (656 ft.)
  - terrain must be level to grade ± 23 cm (9 in.)
  - terrain covered with crushed stone, OR a paved surface, OR closely mowed grass (max 7.5 cm, 3 in.), OR hard packed dirt or clay

Site planning

Conduct a site survey in which you note the physical features of the zone and surrounding area. Include accurate measurements on a detailed drawing. The following is a list of rules to follow when planning a microwave zone:

- Line of sight - A direct, unobstructed line of sight is required between the transmitter and receiver.
  - Depressions and deviations in terrain - Drainage ditches and gullies must be avoided or filled in. These depressions can allow undetected access by an intruder, and occasional water flow can cause nuisance alarms. Significant deviations from level grade can result in gaps in the detection zone and detection shadows. Gaps and detection shadows create unmonitored areas in the zone.
  - Vegetation - Trees, bushes, shrubs, tall grass and weeds within the detection zone will increase the sensor's nuisance alarm rate and reduce the probability of detection.
  - Objects - Any objects (posts, light standards, stored material, parked vehicles, etc.) within the detection zone can result in gaps in the microwave field and detection shadows.
  - Ensure that there is adequate separation from any object that could be used to jump over or bridge the detection zone (e.g., fences, trees, storage sheds, etc.).
- Motion - Movement within the detection zone can cause nuisance alarms (vehicles, buildings, fences, materials, trees, brush, shrubs, weeds, etc.).
  - The detection zone must not include water, which can cause nuisance alarms when moving (e.g., puddles, ponds, streams, lakes).
  - The detection zone must be fenced in to prevent nuisance alarms caused by animals (cats, dogs, rabbits, deer, livestock, etc.).
- Ground surface - The type of ground surface in the detection zone affects the sensor's operation:
  - Crushed stone is the optimum ground cover. Crushed stone disperses rain and helps to prevent the formation of puddles. In addition, microwave energy reflects off the rocks, thereby increasing the zone's sensitivity.
  - Paved surface - A paved surface is recommended for detection zones that require snow removal. Accumulated snow changes the characteristics of the detection zone and can provide cover for a burrowing intruder.
  - Other acceptable surfaces for medium and low security applications include closely mowed grass (7.5 cm {3 in.} or less) and hard-packed dirt or clay.

Site design

Prepare detailed site drawings for the μltraWave system after completing the site survey. Include dimensions, elevations and the locations of any objects noted during the survey. Once the site drawings are complete, carefully plot each microwave zone. Zone placement, zone length, and offsets are critical factors in the design of a microwave sensor system.

Note	The Universal Configuration Module (UCM) includes a height calculator tool that determines microwave offsets, mounting heights, beam width, and clearance requirements, based on unit separation. Use the Height Calc tool when planning an μltrawave zone.

The UCM Height Calculator tool

To use the Height Calculator tool, start the UCM application for the μltrawave sensor, select the Config tab, and select the Height Calc button. Specify the configuration (single stack, double stack, or triple stack), choose the units of measurement (meters or feet) and then enter the separation distance between the transmitter and receiver units. The Height Calculator tool provides the recommended unit mounting height, the detection zone width, the required offset area, the mounting angle, and the level of security for the microwave pair. Average snow accumulation can be specified, and the Height Calculator tool will use the entered snow accumulation data as a factor in making the calculations. When you close the Height Calculator tool, it makes recommendations for the optimum Threshold settings. Figure 2 illustrates the Height Calculator tool.

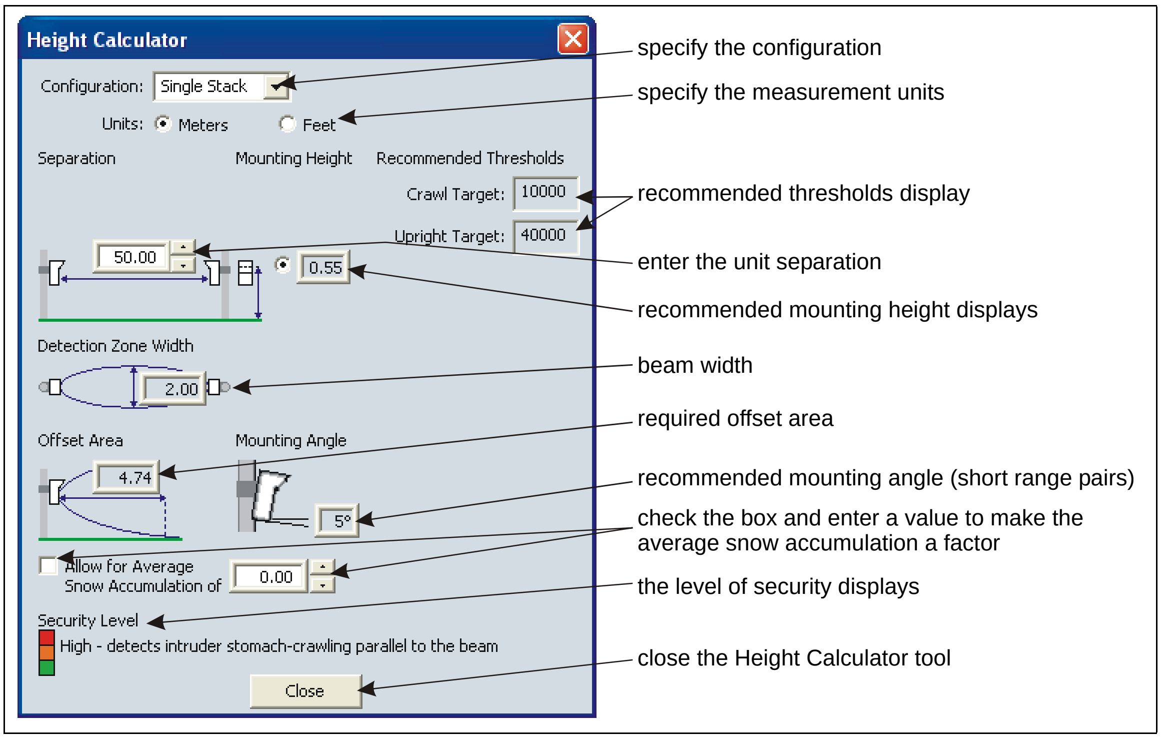


Figure 2 **UCM Height Calculator tool**

Zone placement

The µltrawave system requires a straight, flat, detection zone free of obstacles and depressions. The minimum distance between the beam centerline and any object (fences, buildings, vehicles, trees, bushes, shrubs, etc.) is outlined in Table 1. Separation distances are based on typical conditions and can vary depending on site conditions including zone length, unit mounting height, ground cover, type of obstacle, etc. The following separation distances are minimum values. Increase the separation distance between the beam centerline and any objects whenever possible.

transmitter/receiver separation	min. required clearance (beam centerline to object)	midpoint zone width
30 m (98 ft.)	0.6 m (2 ft.)	1.2 m (4 ft.)
50 m (164 ft.)	1.0 m (3.3 ft.)	2.0 m (6.6 ft.)
75 m (246 ft.)	1.5 m (5 ft.)	3 m (10 ft.)
90 m (295 ft.)	1.8 m (6 ft.)	3.6 m (12 ft.)
100 m (328 ft.)	2.0 m (6.6 ft.)	4.0 m (13.2 ft.)
125 m (410 ft.)	2.5 m (8.2 ft.)	5.0 m (16.4 ft.)
150 m (492 ft.)	3.0 m (10 ft.)	6.0 m (19.7 ft.)
200 m (656 ft.)	4.0 m (13.2 ft.)	8.0 m (26.3 ft.)

Table 1 Unit separation/minimum clearance

You can calculate the required minimum clearance between the beam centerline and an object by using the following formula:

(transmitter/receiver separation) X 0.02 = (min. distance between beam centerline and object)

The formula can also be used to calculate the maximum separation between the transmitter and receiver when you know the available clearance between the beam centerline and the nearest object:

(transmitter/receiver separation) = (min. distance between beam centerline and object) / 0.02

Zone length

The optimum length of each zone depends on several factors:

- the required level of security
- physical constraints (terrain, trees, fences, buildings, etc.)
- available space for the detection zone

For a high security zone, the maximum zone length is 90 m (295 ft.) and the maximum distance between the transmitter and receiver is 100 m (328 ft.).

For a medium security zone, the maximum zone length is 140 m (459 ft.) and the maximum distance between the transmitter and receiver is 150 m (492 ft.).

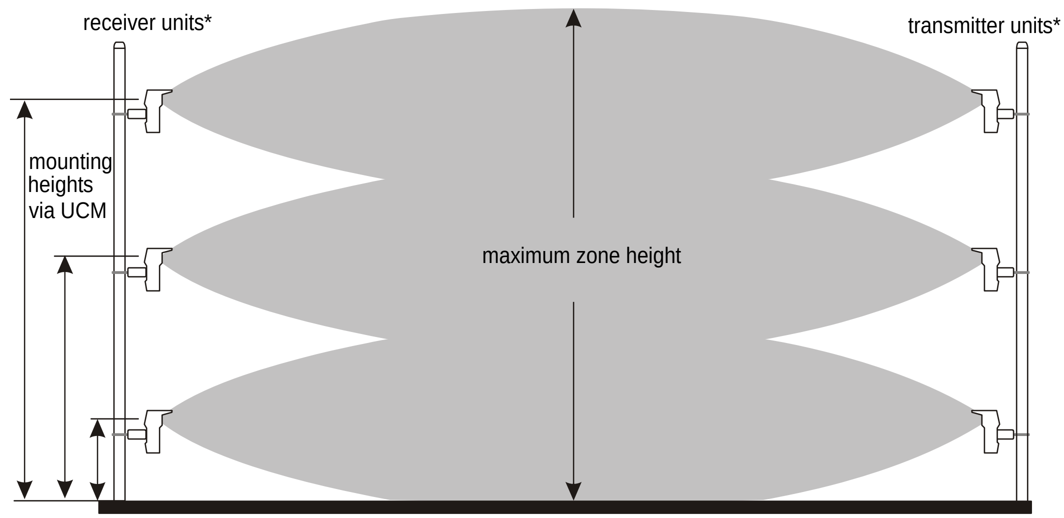
For a low security zone, the maximum zone length is 200 m (656 ft.) and the maximum distance between the transmitter and receiver is 200 m.

Zone height

The height of the microwave field is approximately equal to the minimum required clearance between the beam centerline and an object (see Table 1) plus the unit mounting height (e.g., for a microwave pair with a unit separation of 75 m the zone height is approximately 1.5 m + 0.47 m = 1.97 m or 6.46 ft.). For applications that require additional zone height it is possible to stack two, or three µltraWave units on one mounting post. Table 2 provides approximate zone heights based on Height Calculator tool recommendations. Figure 3 illustrates a triple stacked µltraWave configuration. Open the UCM Height Calculator tool and select Double Stack, or Triple Stack configuration. Enter the unit separation and the Height Calculator tool will provide the installation details.

Tx/Rx separation	configuration	approximate zone height
50 m (164 ft.)	single stack	1.5 m (5 ft.)
	double stack	2 m (6.6 ft.)
	triple stack	2.4 m (7.9 ft.)
100 m (328 ft.)	single stack	2.5 m (8.2 ft.)
	double stack	3 m (9.8 ft.)
	triple stack	3.5 m (11.5 ft.)

Table 2 High security mounting height examples



* When specifying the Frequency Pairs for stacked µltraWave sensors do not use consecutive, adjacent numbers. (e.g., Use Frequency Pairs 1, 3, 5 rather than 1, 2, 3 to ensure optimal signal isolation for each sensor pair.)

Figure 3 Stacking µltraWave units

Mounting angle

For microwave pairs with a unit separation of 50 m or less, the microwave units are mounted with a 5° pitch (toward the ground). This provides the optimum signal strength, when combining the direct signal and the reflected signal at the receiver unit (see Figure 8).

Microwave offsets

The areas immediately above and below the transmitter and receiver antennas are not exposed to the microwave energy. A microwave offset is used to prevent this unmonitored area from being vulnerable to undetected intrusions (see Figure 4). Offsets prevent intruders from crawling under or jumping over a microwave unit to gain access to the protected area. The offset distances in the example drawings are based on a 100 m separation between the transmitter and receiver and a mounting height of 55 cm (21.5 in.) center of antenna to ground. As the mounting height increases a longer offset is necessary. Different types of offsets are shown in Figure 5.

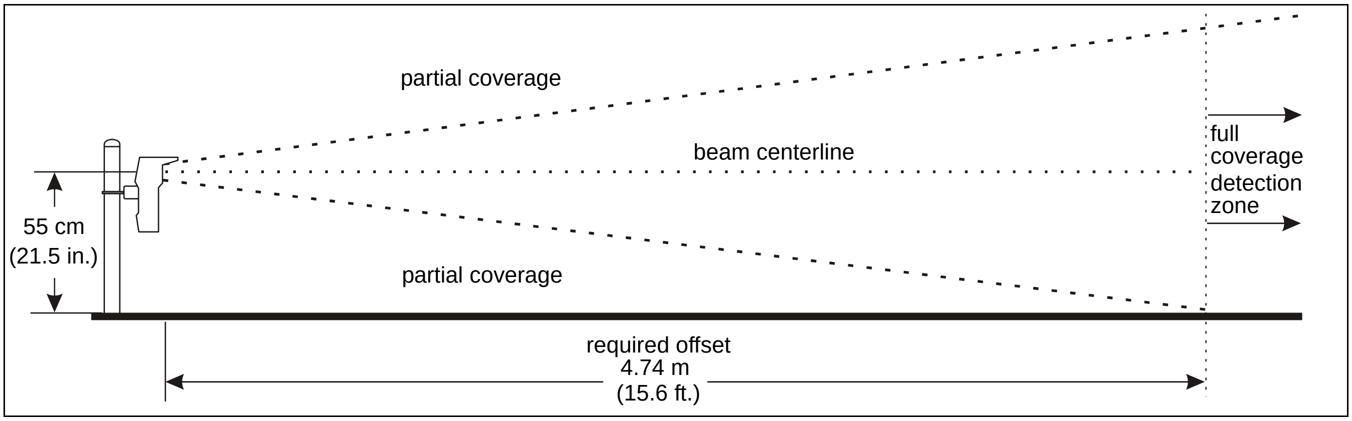
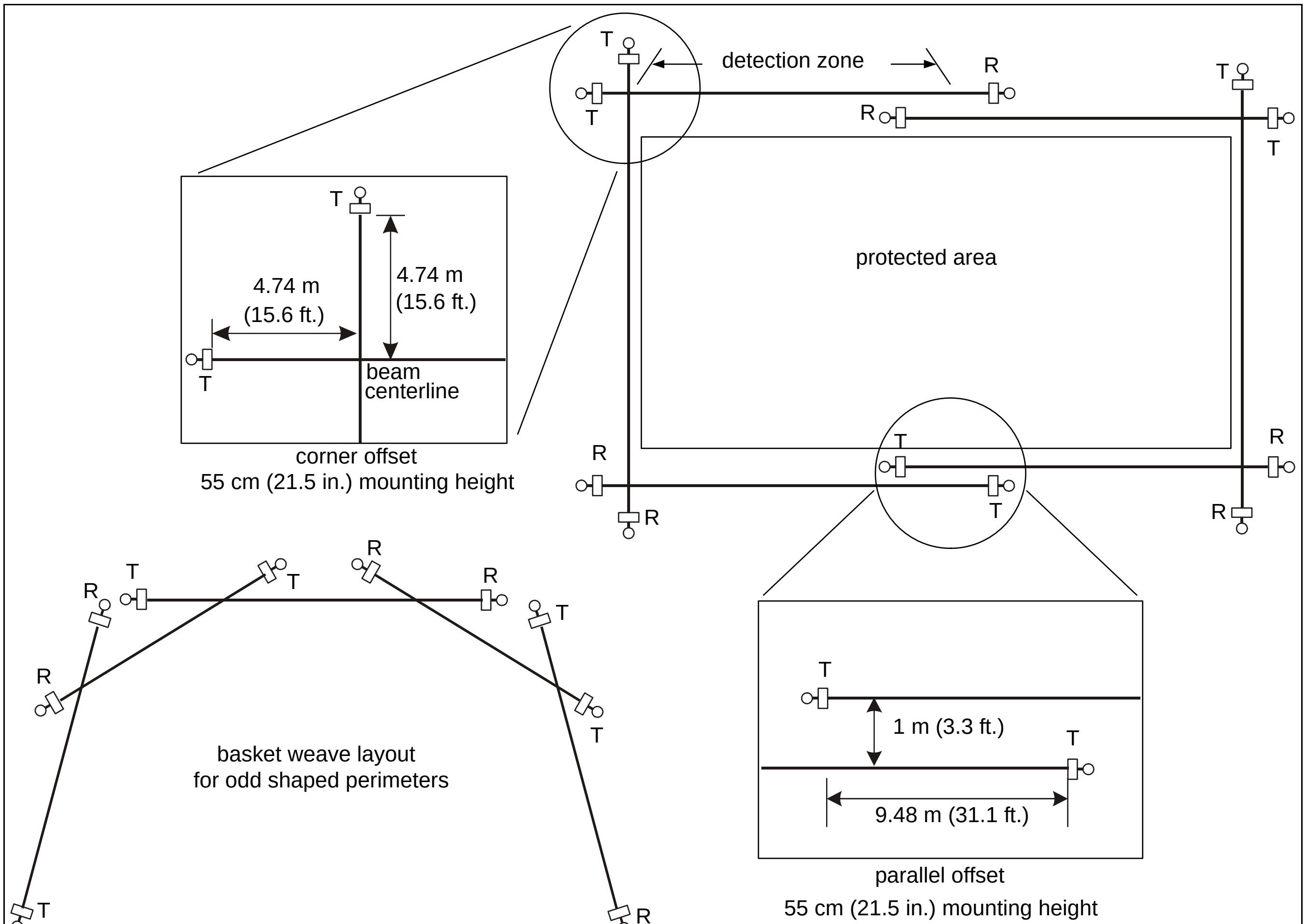


Figure 4 Offset area



NOTE: When specifying the Frequency Pairs for µltraWave sensors that are in close proximity to other µltraWave sensors, do not use consecutive, adjacent numbers (e.g., use Frequency Pairs 1, 3, 5, 7, 9 rather than 1, 2, 3, 4, 5 to ensure optimal signal isolation for each sensor pair.).

Figure 5 Offset arrangement examples

Mounting heights

The recommended method for determining the µltraWave unit mounting height is to use the UCM Height Calculator tool. The mounting height chart (see Figure 6) is not as precise as the Height Calculator tool, but it can also be used to determine the mounting height for the transmitter and receiver units. The horizontal axis of the chart represents the separation distance between the transmitter and receiver. The vertical axis represents the height of the transmitter and receiver from the center of the antenna to the ground's surface.

The node curves (N1, N2, N3, N4, N5 and N6) indicate the recommended locations for coordinating distance (horizontal axis) to mounting height (vertical axis). Coordinate lines that meet on the node curves provide the highest received signal strength. Avoid the mounting height and distance coordinates between the node curves. For high security applications, a mounting height at N1 will provide optimum system operation.

Example:

The distance between the transmitter and receiver is 75 m (246 ft.). Locate this distance on the height chart's horizontal axis. Plot a vertical line from this distance point across the node curves. These height measurements represent the best theoretical mounting heights for this example. They are 47 cm (18.5 in.) for the N1 curve, 66 cm (26 in.) for the N2 curve, 82 cm (32.3 in.) for the N3 curve, etc.

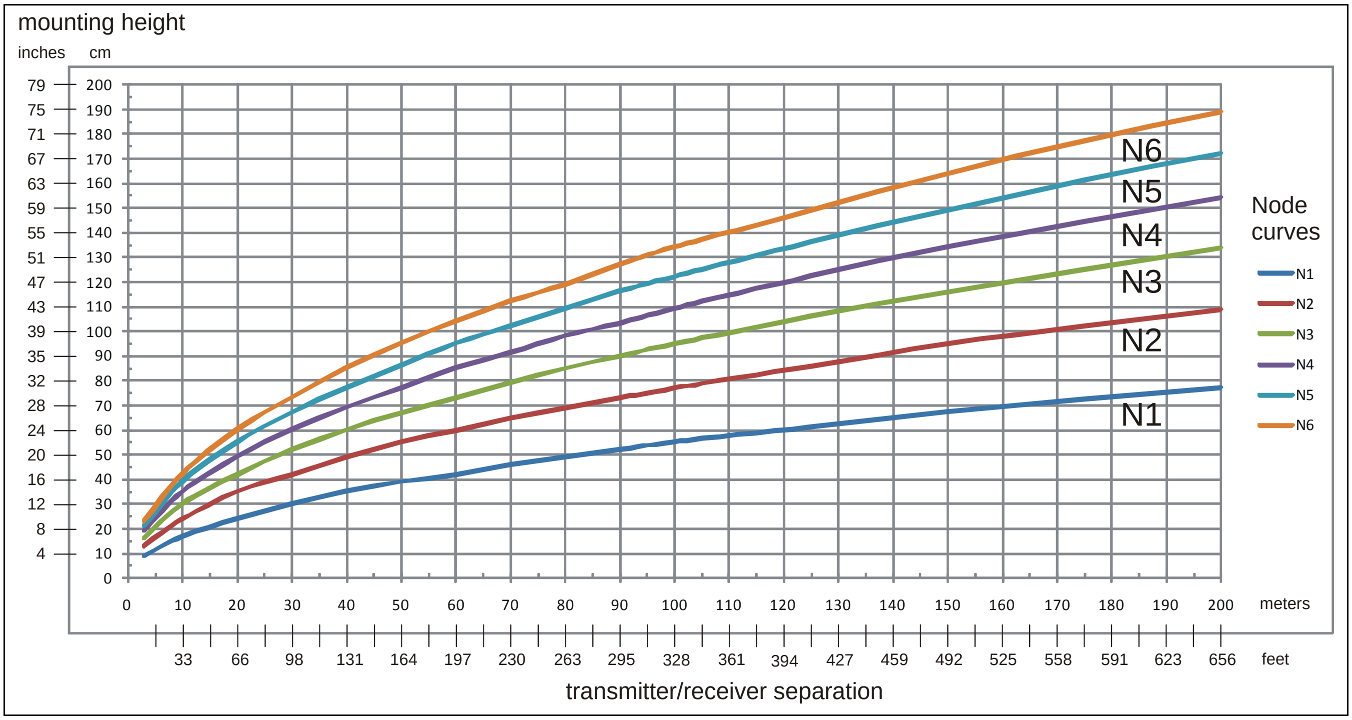


Figure 6 Mounting height chart

Power and ground requirements

The µltraWave sensor system consumes 4 W with a network interface card installed on the receiver, or 3.7 W without one. Both the transmitter and receiver can operate on a wide range of input voltages (12 to 48 VDC). The required gauge of the power cable depends on the power supply capacity, the number of µltraWave units being powered and the lengths of the power cable runs. In locations where AC power may not be stable or reliable, an uninterruptable power supply (UPS) is recommended for primary power. Each µltraWave unit requires a nearby connection to a low resistance earth ground. The following tables include power cable/load recommendations for 24 VDC and 48 VDC power supplies. The tables assume a maximum power consumption of 4.05 W per µltraWave pair (with NIC). The numbers in the tables are based on the power supply being connected at one end of the perimeter, and run around in a single direction. Figure 7 illustrates a 24 VDC power supply with 16 AWG power cables in a 360 m high-security µltraWave perimeter.

Note	Senstar recommends installing a low resistance (5Ω or less) earth ground at each unit. Consult the local electrical codes for grounding information.

Note	The perimeter length can be doubled by connecting the power supply to the central μltraWave pair and running the power cables in both directions around the perimeter.

unit separation (Rx/Tx)	detection zone length	wire gauge (AWG)	power supply output voltage	number of μltraWave pairs	perimeter length
100 m (328 ft.)	90 m (295 ft.)	18 AWG	24 VDC	not recommended	N/A
			48 VDC	8	720 m (2362 ft.)
150 m (492 ft.)	144 m (472 ft.)	18 AWG	24 VDC	not recommended	N/A
			48 VDC	6	864 m (2834 ft.)
200 m (656 ft.)	200 m (656 ft.)	18 AWG	24 VDC	not recommended	N/A
			48 VDC	5	1000 m (3280 ft.)

Table 3 Power supply/power cable loads - 18 AWG (power supply connected to one end of perimeter)

unit separation (Rx/Tx)	detection zone length	wire gauge (AWG)	power supply output voltage	number of μltraWave pairs	perimeter length
100 m (328 ft.)	90 m (295 ft.)	16 AWG	24 VDC	4	360 m (1181 ft.)
			48 VDC	10	900 m (2952 ft.)
150 m (492 ft.)	144 m (472 ft.)	16 AWG	24 VDC	3	432 m (1417 ft.)
			48 VDC	8	1152 m (3779 ft.)
200 m (656 ft.)	200 m (656 ft.)	16 AWG	24 VDC	not recommended	N/A
			48 VDC	7	1400 m (4593 ft.)

Table 4 Power supply/power cable loads - 16 AWG (power supply connected to one end of perimeter)

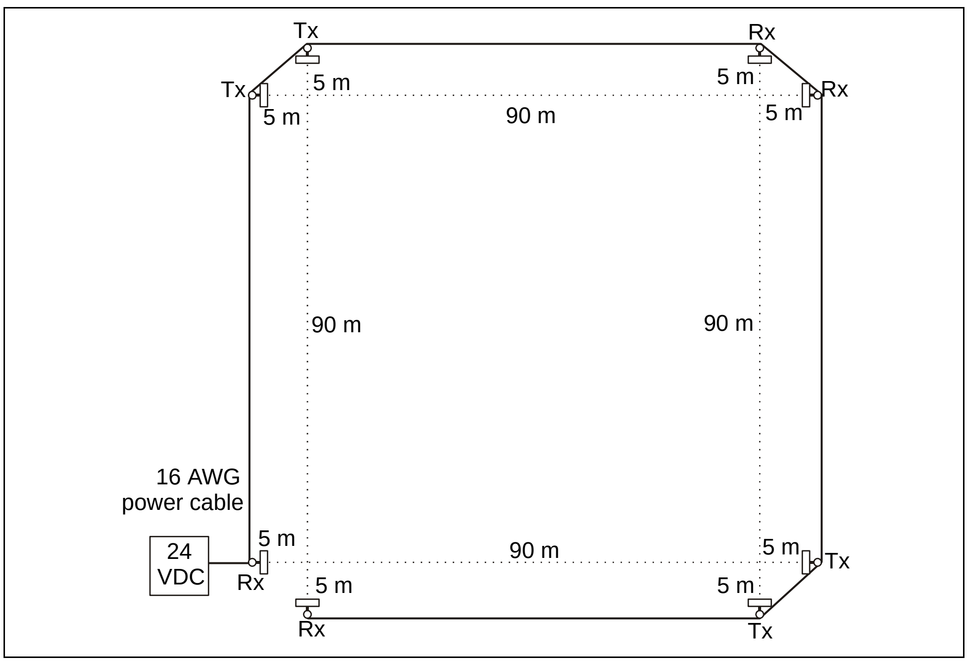


Figure 7 24 VDC power distribution example (high-security closed perimeter)

Alarm data communications

Note	The transmitter sends the following status information to the receiver, over the microwave link: Frequency Pair, Locale, Transmitter serial number, Temperature, Firmware version, Run time, Boot count, Enclosure tamper status, Program Flash error, Default config, Internal rail voltage status, Internal rail current status.

Alarm monitoring is site specific and depends on whether you are using the onboard relay outputs to signal alarm and supervision conditions (Local control mode) or network based alarm communications (Remote control mode). Each unit (transmitter and receiver) has two user-configurable Form C relay outputs. Each receiver unit also includes an input. The transmitter unit operates in Local control mode only, and does not have an input.

Local control mode

In Local control mode, the receiver's two outputs can be configured to signal Microwave Alarm, Tx Comm Link Fail, Transmitter Mismatch and Input Power Fail for the receiver unit; as well as Enclosure Tamper, Hardware Faults and Fail Safe (system fail) for both the transmitter and receiver units. The receiver's input is used to activate an electronic self-test. The transmitter unit's two outputs can be configured to signal Enclosure Tamper, Input Power Fail, Hardware Faults and Fail Safe (system fail).

CAUTION	Tx Comm Link Fail, Input Power Fail, and Fail Safe conditions all indicate that the µltraWave sensor is not operational.

Remote control mode

In Remote control mode, alarm and supervision data is carried over the network cables and the receiver's two relays are available as output control points for the security management system (SMS). The receiver's supervised input can be used to report the status of an auxiliary security device to the SMS. The transmitter unit does not operate in Remote control mode (Local control mode only). To communicate on the Silver Network, a network interface card (NIC) must be installed on the receiver PCB. There are five variants of the NIC available: EIA-422, multimode fiber optic, singlemode fiber optic, mixed media EIA-422 and multimode, and mixed media EIA-422 and singlemode.

Note	You can setup a Silver Network to enable calibration, maintenance and diagnostic access to your µltrawave units from a central control facility, and select Local control mode to use the receiver's two relay outputs to signal alarm and supervision conditions.

Receiver unit self-test

In Local control mode, a momentary switch input to T6 (pins 7 and 8) activates an electronic self-test of the receiver unit. In Remote control mode, a receiver self-test is initiated by a command from the SMS. The transmitter unit does not include self-testing capabilities (Tx comm link fail is reported by the receiver unit).

Silver Network specifications

Note	A network interface card must be installed on the receiver PCB to enable network communications.

- Data rate - fixed 57.6 k bps
- Maximum of 60 devices per Network Manager
- One to four separate network loops per Network Manager
- Two channels (Side A, Side B)
- Transmission media/maximum separation distances between processors:

  EIA-422 copper wire - 1.2 km (0.75 mi.) - 2 pairs per Channel

  Multimode fiber optic cable (820 nm) - 2.2 km (1.4 mi.) - 2 fibers per Channel - optical power budget 8 dB

  Singlemode fiber optic cable (1310 nm) - 10 km (6.2 mi.) - 2 fibers per Channel - optical power budget 8 dB

Note	Senstar strongly recommends the use of low capacitance shielded twisted pair data cable for EIA-422, 62.5/125 multimode fiber optic cable, and 9/125 singlemode fiber optic cable. The maximum separation distances require high quality transmission media and sound installation practices.

Relay contact ratings

The dry contact relays are Form C, rated for 30 V @ 1 A maximum, non-inductive load. In Remote control mode, you can configure the relays as steady ON, flash mode (ON-OFF-ON-OFF, etc.), 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.

Cable ports

Each µltraWave unit includes two 21.5 mm (0.844 in.) cable ports. The post-mounting kit (E4KT0300) includes two compression glands for cable sizes 4.3 mm to 11.4 mm (0.17 in. to 0.45 in.). If required, the enclosure can be fitted with 13 mm (1/2 in.) conduit, in place of the compression glands.

Note	Conduit and conduit fittings are not included.

Mounting posts/surfaces

The µltraWave units mount easily on posts with an outside diameter ranging between 4.8 cm and 11.4 cm (1.875 in. and 4.5 in.). The posts must be plumb, firmly set in the ground, and unable to rotate or move. For areas where the ground freezes, the posts must be protected against potential frost heaving. A 2.5 m (8 ft.) post is generally used with 91 cm (3 ft.) of the post buried in a concrete footing. Figure 8 is an illustration of a post-mounted µltraWave unit.

Note	Senstar recommends hiring a local fencing contractor to install the µltraWave mounting posts. Consult the local building code for information on installing mounting posts.

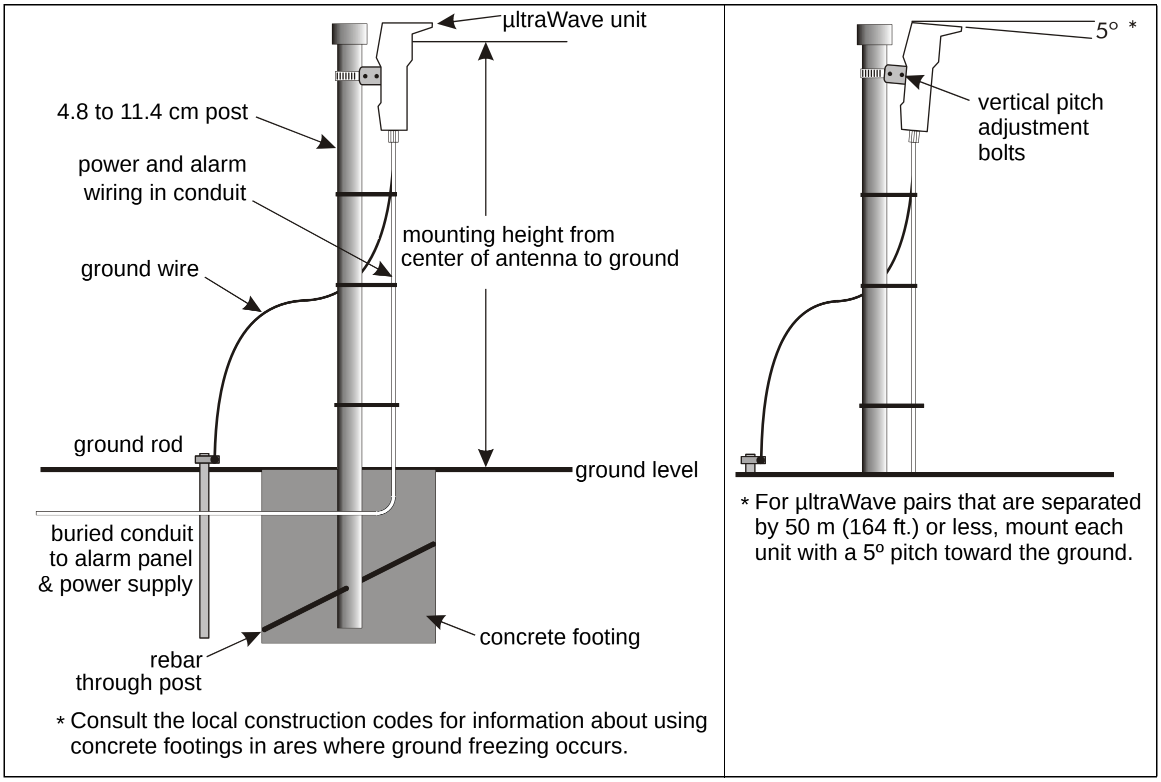


Figure 8 Post installation and unit mounting

Surface-mount applications

The post-mount bracket can also be used to mount an µltraWave unit on a fixed stable surface. The hardware required for fastening the bracket to the surface is not included. If you are considering a surface mount application, the transmitter receiver alignment must be carefully planned, as the mounting bracket cannot be easily adjusted in the horizontal plane for surface mount applications. Figure 9 illustrates a surface mount µltraWave application.

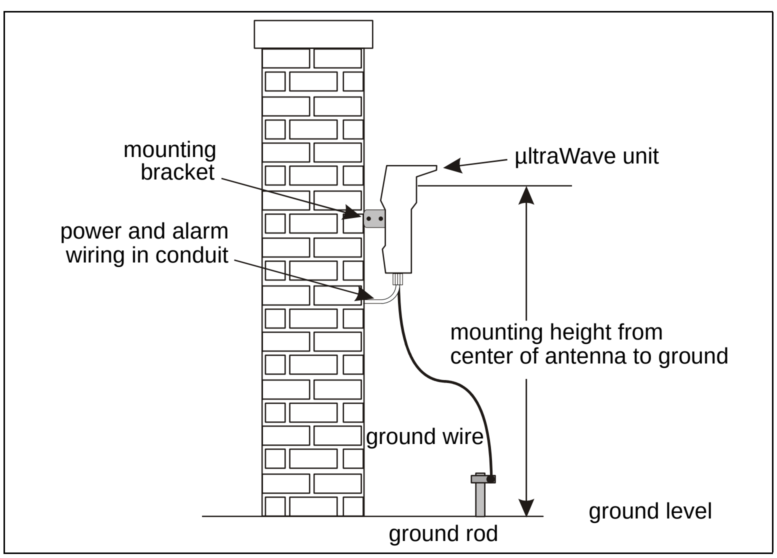


Figure 9 Surface mounting example

µltraWave alarm reporting

The µltraWave system reports a sensor alarm when a valid target creates a disturbance in the microwave field. If a target (e.g., a vehicle) enters the microwave field, the µltraWave sensor reports an alarm when the object first enters the field. If the object remains stationary and blocks the transmitted signal for 30 seconds or longer, the sensor will report a second alarm when the object moves out of the field. The receiver unit also signals a Tx Link Fail when the microwave signal is blocked for approximately 30 seconds.

Note	The µltraWave sensor will not report an alarm if an object enters the microwave field while the signal is being blocked.

Automatic gain control

The µltraWave microwave sensor system employs automatic gain control (AGC) to ensure the received signal remains at an optimal level. If the receiver detects an increase, or attenuation of the transmitted signal the AGC gradually adjusts the signal gain to maintain proper detection.

Note	If the µltraWave signal is blocked continuously for a period that exceeds 30 seconds, the system may be prone to nuisance alarms or have a reduced probability of detection for 30 seconds after the blocking object leaves the microwave field.

2 Installation

The µltraWave transmitter and receiver units are almost identical, with only minor differences in component layout. Figure 10 shows an µltraWave receiver and illustrates the unit's features. The receiver's diagnostic activity LEDs are listed in Table 5 .

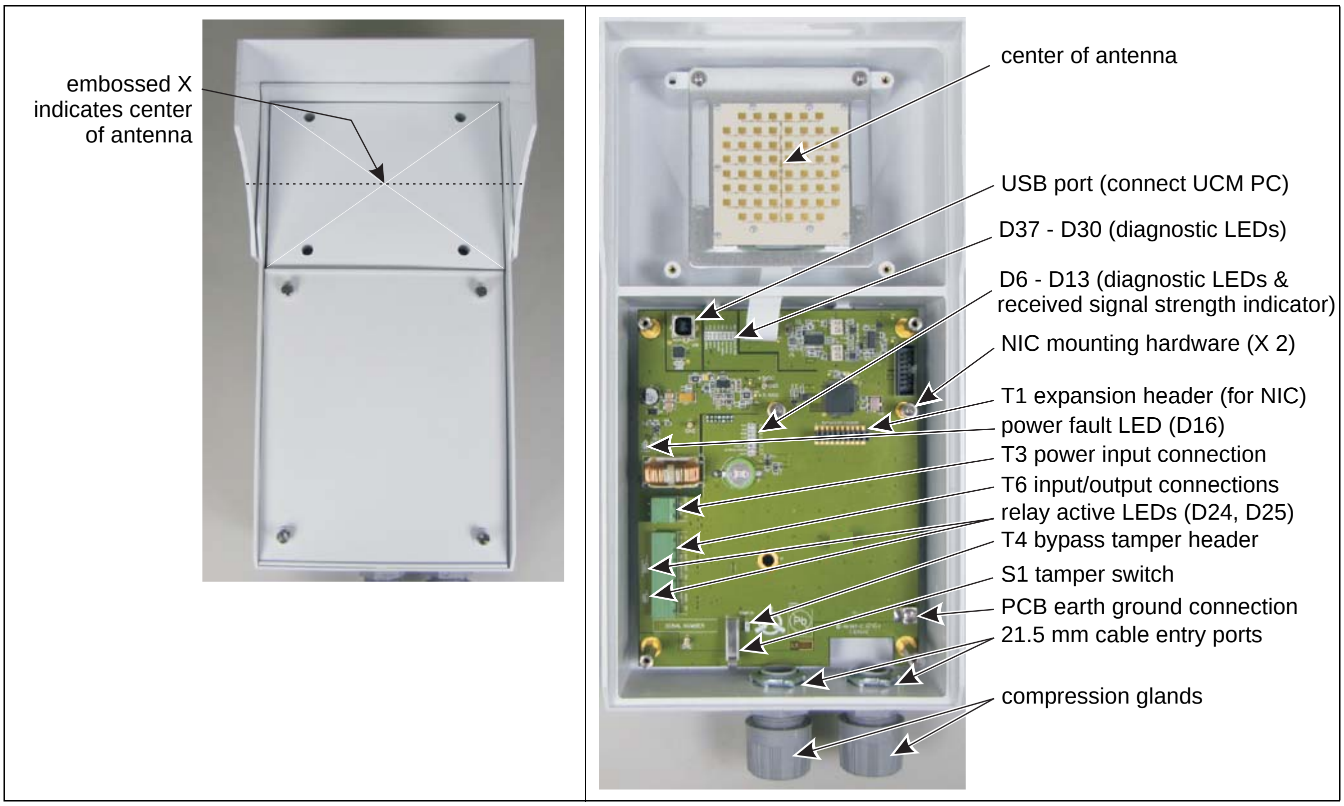


Figure 10 µltraWave receiver unit

LED #	Description	LED #	Description
D37	POWER LED ON = DC input Power ON	D6	RXA LED ON = receiving A-side network comm
D35	ALARM LED ON = microwave sensor alarm	D7	TXA LED ON = transmitting A-side network comm
D34	DOOR LED ON = enclosure tamper condition	D8	RXB LED ON = receiving B-side network comm
D33	MEMORY LED ON = internal memory fault	D9	TXB LED ON = transmitting B-side network comm
D36	POWER FAIL LED ON = power rail fault	D10	FAULT A LED ON = A-side communication fault
D32	RESERVED	D11	FAULT B LED ON = B-side communication fault
D31	RESERVED	D12	NETWORK POWER LED ON = NIC power ON
D30	UCM ACTIVE LED ON = UCM connected	D13	BOOT LED ON = NIC initialization failure
D24	ALARM LED ON = output 2 activated (sensor alarm by default/configurable in Local control)	D16	POWER LED ON = input power fault
D25	SUPERVISION LED ON = output 1 activated (supervision alarm by default/configurable in Local control)		

Table 5 µltraWave diagnostic activity LEDs

Note	LEDs D6 to D13 also function as a received signal strength indicator (RSSI) to aid in the final alignment of the µltraWave system.

Mounting the µltraWave units

Mount the transmitter and receiver units on their respective posts, using the hardware provided in the post-mounting kit (p/n E4KT0300, see Figure 11). The mounting height of the transmitter and receiver units is measured from the center of the antenna to the ground's surface. As an alignment aid, the cover over the antenna includes an embossed X-pattern, that indicates the center of the antenna (see Figure 10).The µltraWave units can also be mounted on a wall or other flat stable surface (see Figure 12). Both the transmitter and receiver units must be mounted at the same height above ground. After mounting, the two units must be aligned to point directly at each other.

For microwave pairs that are separated by 50 m (164 ft.) or less, each µltraWave unit should be mounted with a 5º pitch (toward the ground). The 5º pitch combines the reflected signal and the direct signal to create the strongest received signal possible for short range applications (see Figure 8 and Figure 14). The calibration testing will determine if the mounting angle is correct for your installation.

Note	Senstar recommends hiring a local fencing contractor to install the µltraWave mounting posts.

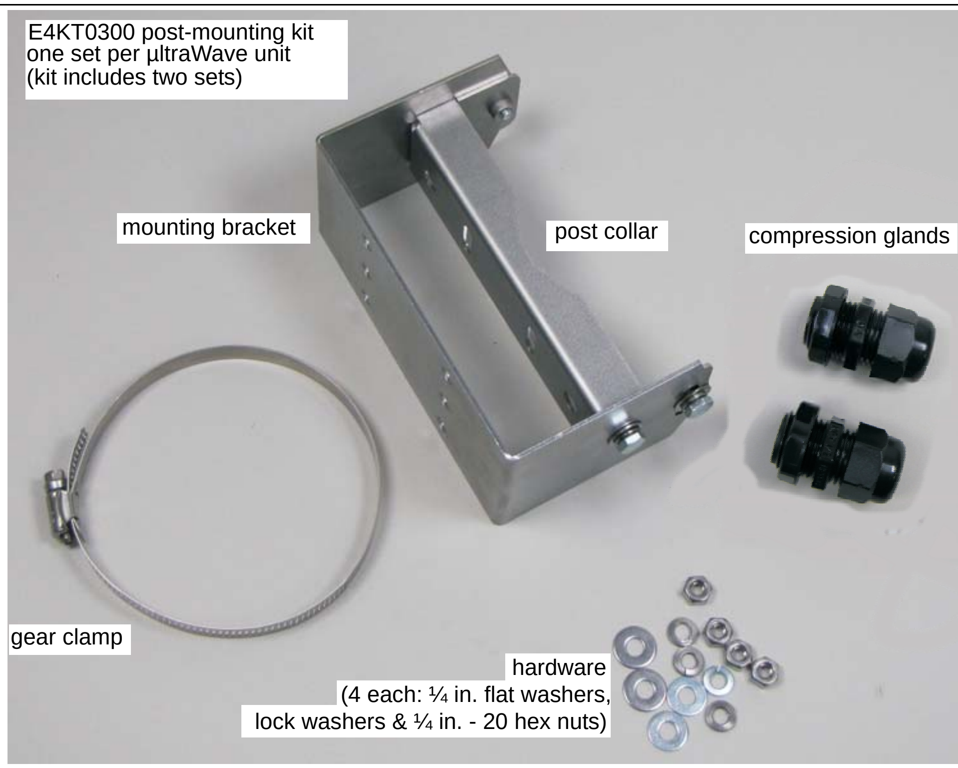
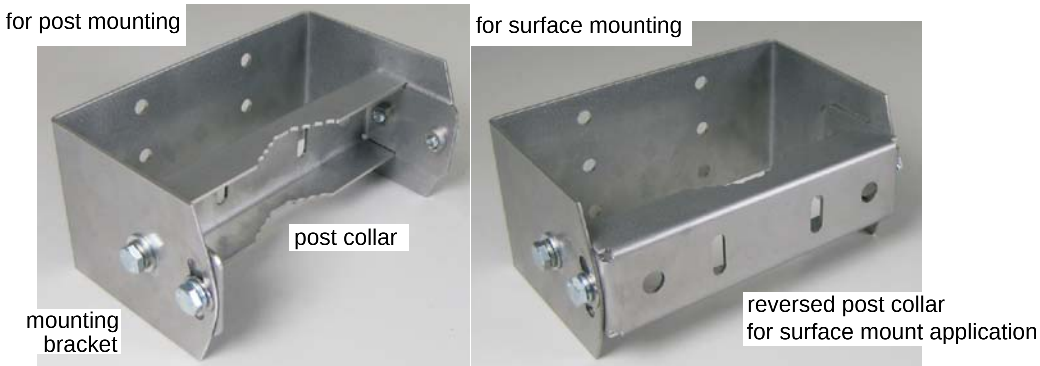


Figure 11 Mounting hardware kit



The mounting kit comes with the post collar attached to the mounting bracket with finger tight hardware. To use the mounting bracket for a surface mount application, reverse the post collar so the flat side of the collar will be against the mounting surface.

Figure 12 Post mounting/surface mounting setup

Post-mounting procedure

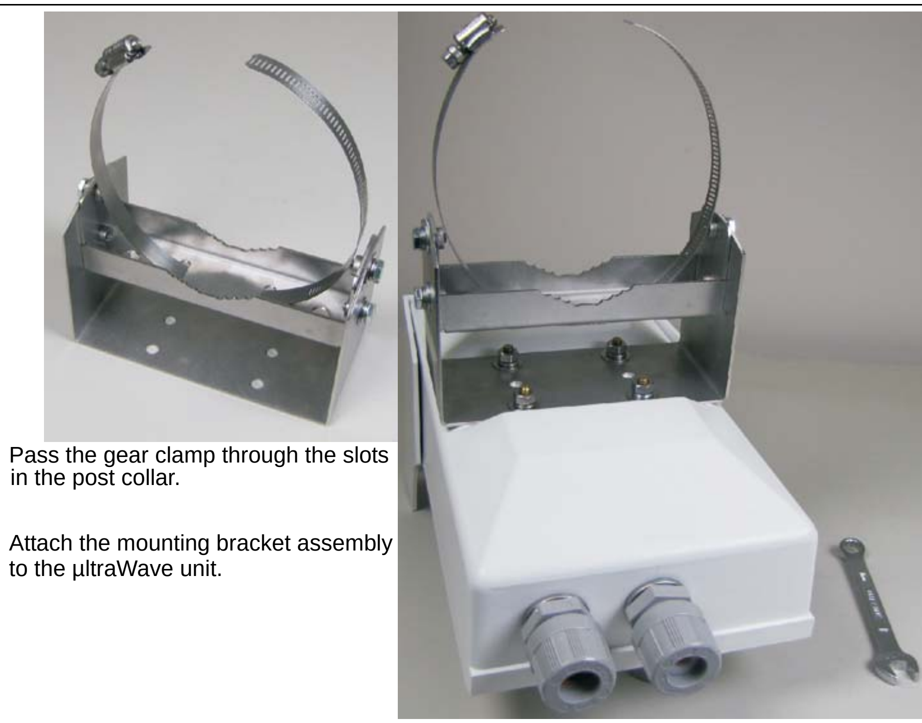


Figure 13 Post-mounting procedure

1. Pass the gear clamp through the slots in the post collar.
2. Using an 11 mm (7/16 in.) wrench and the supplied hardware (hex nut, lock washer, flat washer - X4) attach the mounting bracket assembly to the µltraWave unit (see Figure 13).
3. Wrap the gear clamp around the post and measure the mounting height of the µltraWave unit from the center of the antenna (see Figure 14) to the ground's surface.
4. Aim the µltraWave unit at the second mounting post, and using an 8 mm (5/16 in.) nut driver or socket, tighten the gear clamp with the µltraWave unit at the specified height.
5. Measure and verify the mounting height.
6. Using an 11 mm wrench, tighten the hardware attaching the post collar to the mounting bracket.

7. Repeat for the second µltraWave unit.

Note	If the microwave pair is separated by 50 m or less, adjust the vertical pitch of both units to a 5° angle (toward the ground).

Initial post-mount alignment

For optimal performance, ensure that the µltraWave transmitter and receiver are aimed directly toward each other, and that the mounting height is correct for both units (see Figure 14).

Note	The µltraWave receiver includes a received signal strength indicator, which serves as an aid during final alignment.

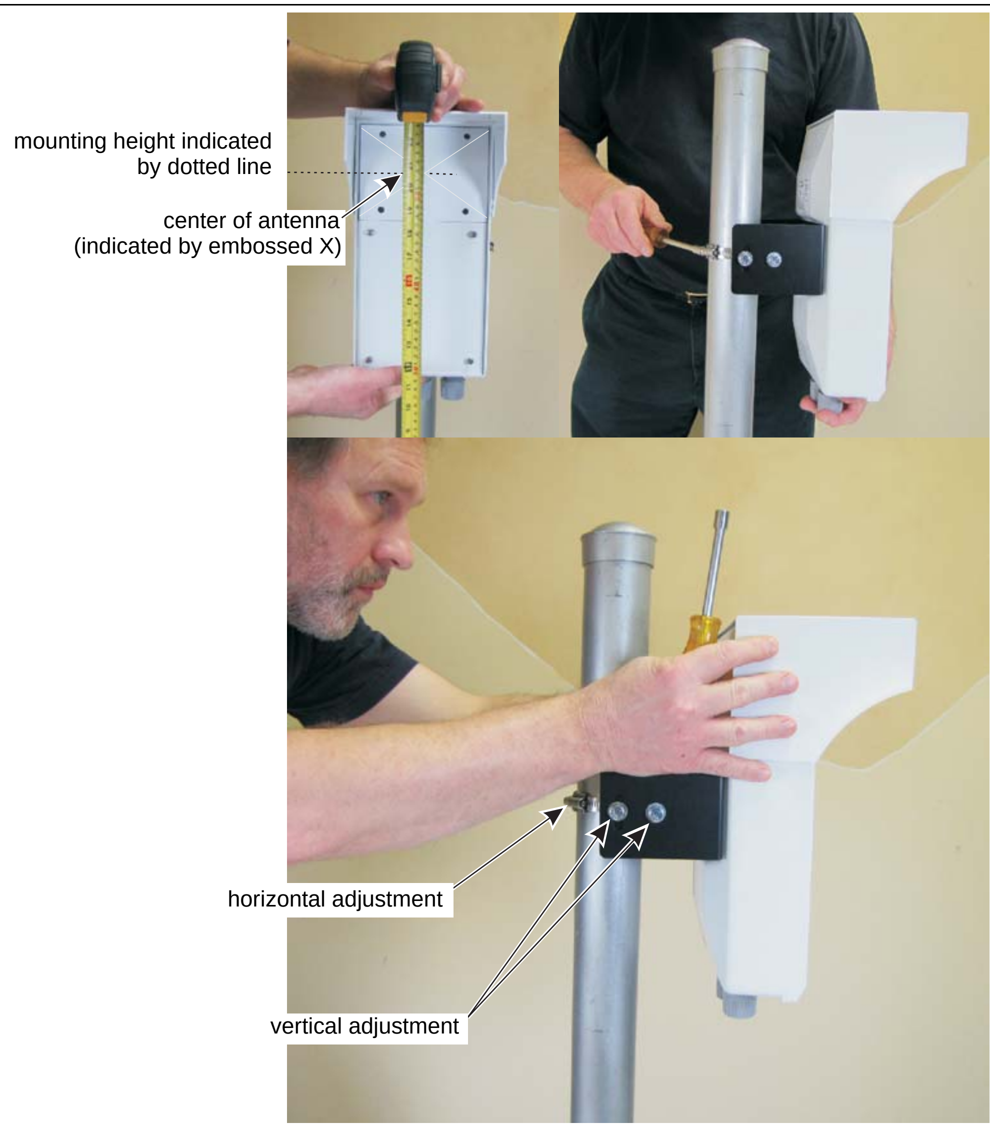


Figure 14 µltraWave alignment

1. Measure and verify the mounting heights of both units.
2. If required, loosen the transmitter's gear clamp slightly, and then carefully aim the transmitter directly at the receiver.
3. Tighten the transmitter's gear clamp.

4. If required, loosen the receiver's gear clamp slightly, and then carefully aim the receiver directly at the transmitter.
5. Tighten the receiver's gear clamp.
6. If required, loosen the four bolts that attach the post collar to the mounting bracket and tilt the units (in the vertical axis) toward each other. Re-tighten the bolts.

   For µltraWave units that are separated by 50 m or less, adjust the pitch of both units to a 5° angle toward the ground.

Surface-mounting

CAUTION	For surface mount applications, the two mounting surfaces must face toward each other. Surface mounted µltraWave units cannot be rotated in the horizontal axis. If required, use shims to adjust the horizontal alignment of surface mounted units.

The µltraWave mounting kit can be used to surface mount the transmitter and/or receiver. The post collar is reversed on the mounting bracket assembly so the flat side is facing outward toward the mounting surface (see Figure 15). Customer-supplied hardware (7 mm, 1/4 in.) is used to attach the assembly to the mounting surface.

Surface mounting procedure

1. Using an 11 mm (7/16 in.) wrench, remove the hardware attaching the post collar to the mounting bracket.
2. Reverse the post collar so the flat side of the collar is to the outside, and reattach the post collar to the mounting bracket.

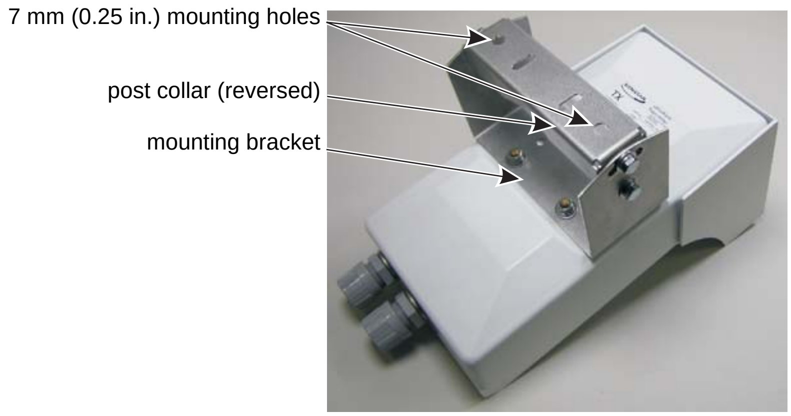


Figure 15 Surface mounting setup

3. Hold the µltraWave unit against the mounting surface and measure the mounting height of the unit from the center of the antenna to the ground's surface (see Figure 9). Mark the mounting surface at the centers of the two holes in the post collar.
4. Drill two holes in the mounting surface.
5. Remove the post collar from the mounting bracket, and use appropriate fasteners to attach the post collar to the mounting surface.
6. Re-attach the mounting bracket and µltraWave unit to the post collar.
7. Measure and verify the mounting height.

8. Mount the second μltraWave unit.

Initial surface-mount alignment

To ensure optimal performance, it is critical that the μltraWave transmitter and receiver are aimed directly toward each other, and that the mounting height is correct for both units.

1. Verify the mounting heights of both units.
2. If required, loosen the mounting hardware on the post collars, and install shims so that the μltraWave transmitter and receiver point directly at each other (horizontal adjustment).
3. Tighten the mounting hardware.
4. If required, loosen the four bolts attaching the post collar to the mounting bracket and aim the units toward each other (in the vertical axis). Re-tighten the bolts.

Note	If the microwave pair is separated by 50 m or less, adjust the pitch of both units to a 5° angle (toward the ground).

Transmitter/receiver wiring connections

The μltraWave wiring connections are made on removable terminal blocks. The screw terminals accept wire sizes from 12 to 24 AWG, with a 6.4 mm (0.25 in.) strip length. Remove the terminal blocks to make the wiring connections. Reinstall the blocks after the connections are complete, and verified. The DC power input is made on T3 and the input/output connections are made on T6. The receiver's auxiliary (AUX) input is available when using Remote control mode (network alarm data communications). The receiver's self-test input is available in Local control mode (relay output alarm signaling). The transmitter unit does not include an input. Refer to Figure 16 for an illustration of μltraWave relay output wiring and ground connection details. Figure 17 illustrates the input output wiring connection details for both Local control mode and Remote control mode.

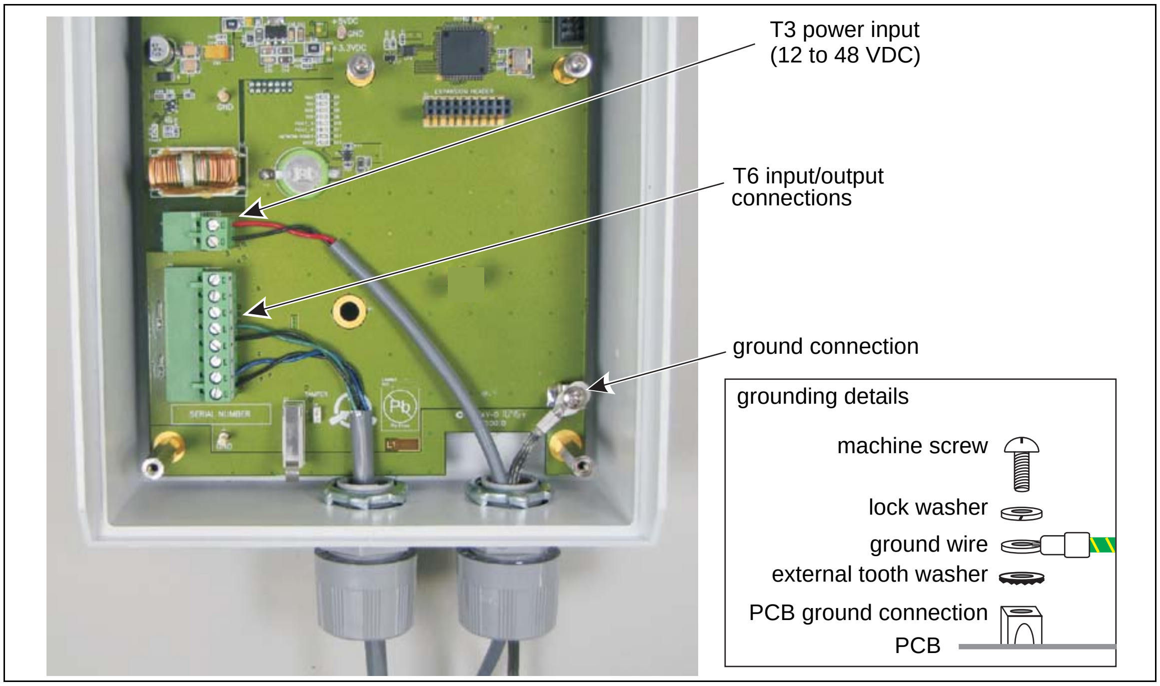
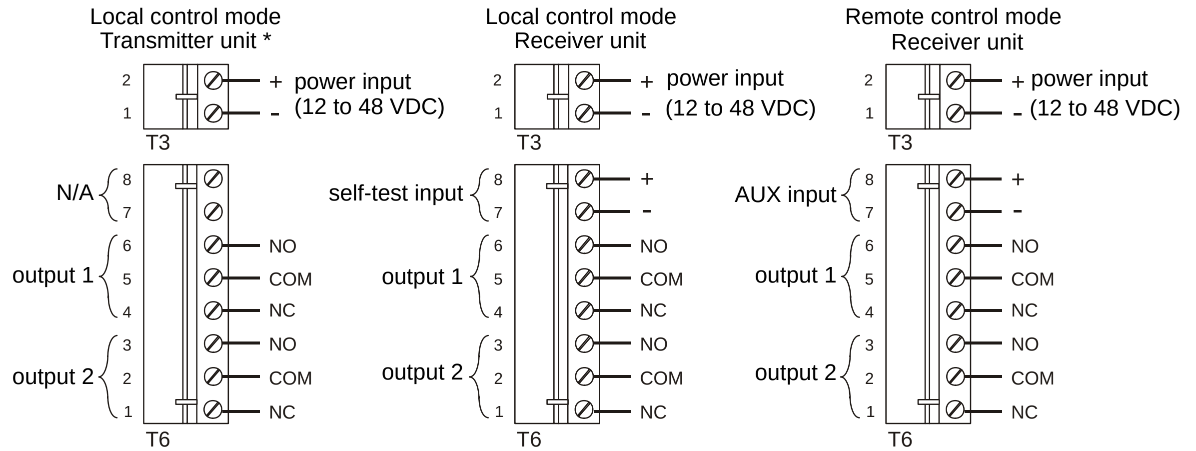


Figure 16 Relay output, power input and ground connection wiring (Rx & Tx)



* The transmitter unit operates in Local control mode only.
In Local control mode the default setting for output 1 is ON = sensor alarm, and for output 2 ON = supervision alarm.
In Local control mode you can use the UCM to specify the conditions which will activate output 1 and output 2.

Figure 17 Transmitter/receiver wiring connections

T3 - power input

The µltraWave units require 12 to 48 VDC to operate. Pin 1 is negative and pin 2 is positive.

T6 - receiver unit inputs/outputs

T6 connects to output 1, output 2 and an auxiliary (AUX) or self-test input (see Figure 17 for connection details). In Local control mode, the two outputs can be configured via the UCM to report user-specified alarm conditions (see Alarm data communications on page 11). A momentary switch input to the self-test input activates an electronic test of the receiver unit. Self-test activation requires a normally open, unsupervised momentary switch input. The momentary switch input must be closed for a minimum of the time specified in the Filter Window parameter (via the UCM). See Table 7: for example input wiring diagrams and supervision resistor values.

In Remote control mode, the two outputs are used by the security management system (SMS) as output control points. The AUX input is available to report the status of an auxiliary security device to the SMS.

T6 - transmitter unit outputs

The transmitter unit operates only in Local control mode. T6 connects to output 1 and output 2 (see Figure 17 for connection details). You can use the UCM to specify the conditions that will activate the two outputs (see Alarm data communications on page 11). The transmitter unit does not include an input.

Relay contact ratings

The dry contact relays are Form C rated for 30 V @ 1 A maximum, non-inductive load.

Auxiliary input

In Remote control mode, the receiver's AUX input provides an auxiliary device input for the security management system. The receiver determines the input's status via an internal reference voltage, and the configuration of the contact closures and supervision resistors. Any change in the input's status is reported to the SMS.

Note	The contact closure input to the AUX input must be voltage-free.

Cable ports

Each µltraWave unit includes two 22 mm (0.875 in.) cable ports and two compression glands. Pull the cables through the compression glands and into the enclosure, and then install the compression glands in the cable ports. After making the wiring connections, hand-tighten the compression glands to provide weather protection and strain relief.

Making the I/O wiring connections

1. Pull the data cable into the enclosure.
2. Prepare the data cable - strip length = 6.4 mm (0.25 in.).
3. Remove the terminal block from T6, make the wiring connections, and then replace the terminal block (see Figure 16).

Enclosure tamper switch

Each µltraWave unit includes a mechanical tamper switch (closed = secure, open = tamper) to indicate if the enclosure cover is removed. Placing a shunt on header T2 overrides the tamper switch (shunt ON = secure).

Transmitter/Receiver grounding

Note	Senstar recommends using a low resistance (5Ω or less) earth ground connection at each unit. Consult the local electrical codes for additional grounding information.

1. Connect an approved ground wire to a properly installed ground rod at the µltraWave unit's installation location.
2. Connect the ground wire to the ground lug on the transmitter/receiver PCB (see Figure 16).

Power supply connection

WARNING!	DO NOT bring AC mains power into the µltraWave 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.

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

- To power the system from a central source, run the power distribution cable around the perimeter and tap off to each µltraWave unit.
- At each µltraWave unit, splice the power cable to a lighter gauge pigtail that is approximately 30 cm (12 in.) long. Connect the negative lead to T3-1 (-) and connect the positive lead to T3-2 (+) (see Figure 16).

Local power supply

To use a local DC power supply, the power supply must be outdoor rated and installed in its own weatherproof enclosure. The local supply can be mounted on the same post as the µltraWave unit to keep the wire runs to a minimum. Connect the negative lead to T3-1 (-) and connect the positive lead to T3-2 (+) (see Figure 16).

Silver Network alarm data communications

Note	A network interface card must be installed on the µltraWave receiver to enable network communications.

Installing the Network interface card (NIC)

1. Remove the lower cover from the receiver enclosure.
2. Disconnect the power at T3.
3. Remove and retain the hardware from the two standoffs on the receiver circuit card.
4. Insert the 20 pin expansion header on the solder side of the NIC into T1 (the 20 pin socket) on the receiver. Ensure that all pins are seated correctly, and the two mounting holes on the NIC align with the two standoffs on the receiver.
5. Using the retained hardware, secure the NIC to the standoffs.
6. Connect the NIC ground strap to the receiver PCB ground connection.
7. Make the network wiring connections (see Silver Network connections on page 24).
8. Reconnect the power and replace the enclosure cover.

Figure 18 Receiver unit Silver Network wiring connections

Silver Network connections

The following connection diagrams illustrate an EIA-422 based Silver Network, a fiber optic based Silver Network and a mixed media Silver Network. Figure 19 shows the network connections and data flow directions for the EIA-422 and fiber optic communication options:

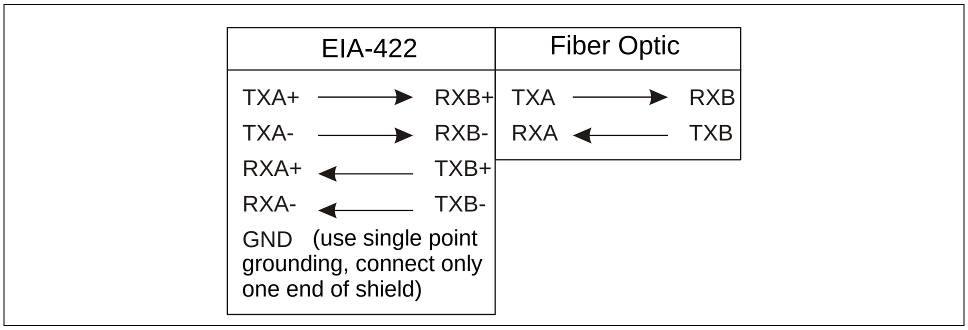


Figure 19 Silver Network connections

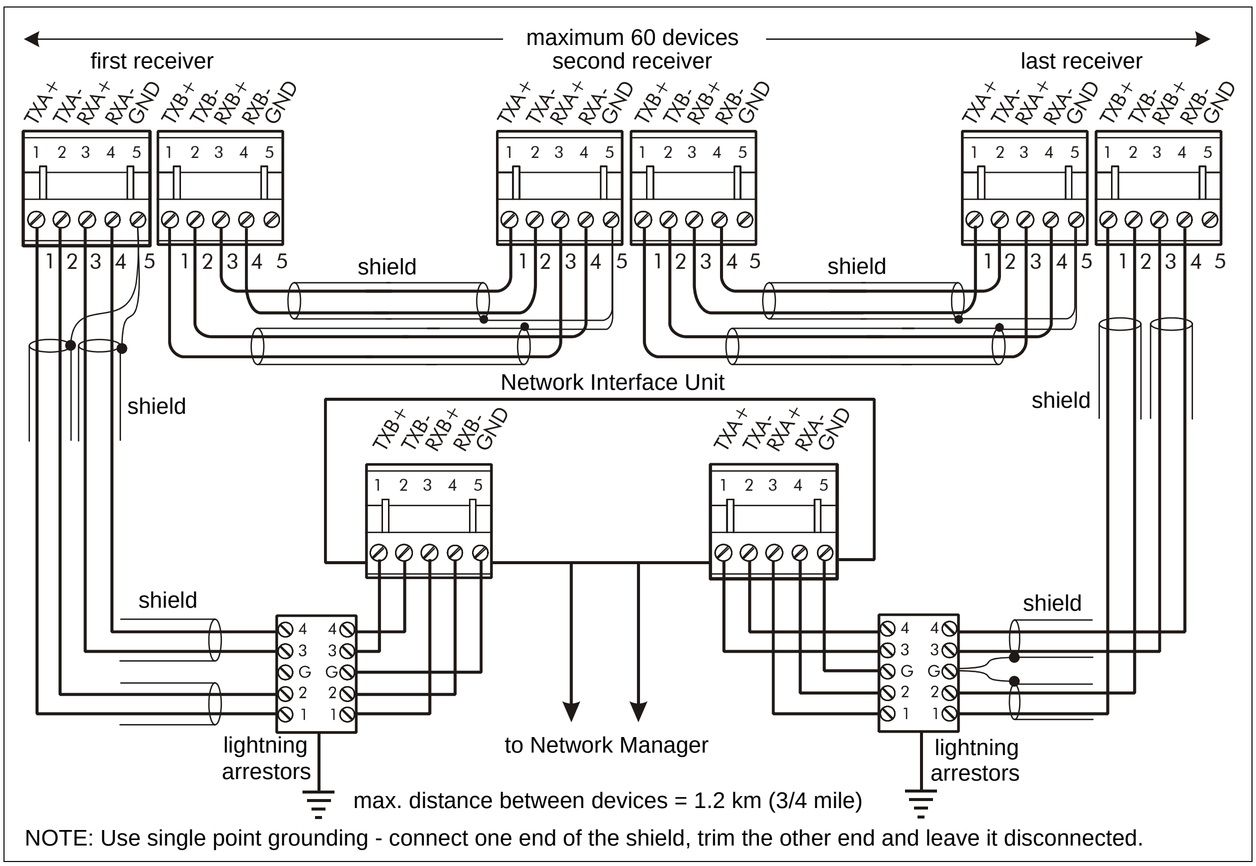


Figure 20 Silver Network EIA-422 wiring diagram

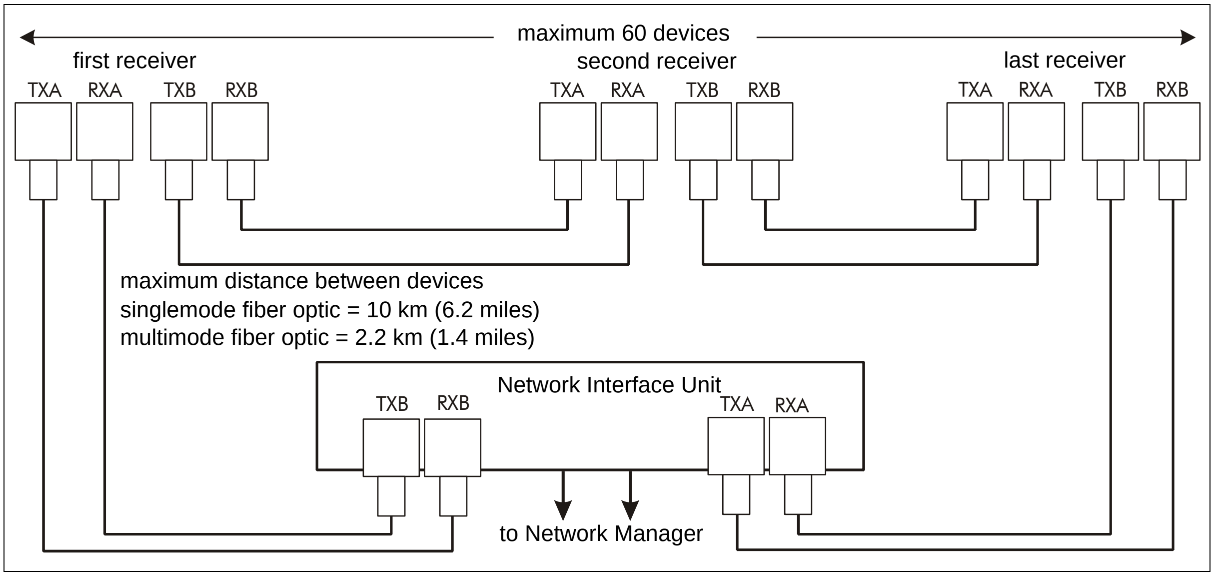


Figure 21 Silver Network fiber optic wiring diagram

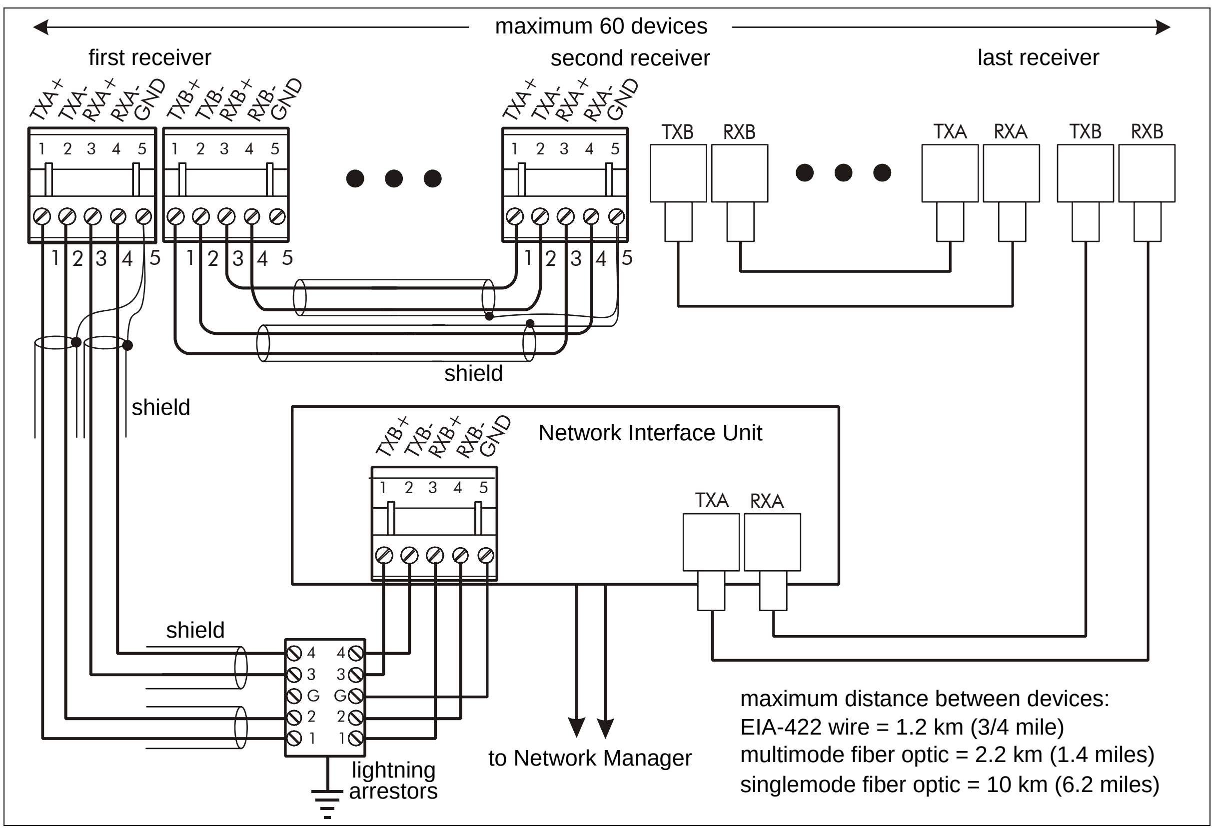


Figure 22 Mixed media EIA-422/fiber optic wiring diagram

Stacking µltraWave units

To increase the height of the microwave field, it is possible to stack two, or three, µltraWave units on one mounting post. Use the UCM Height Calc tool to determine the required mounting heights and mounting angles for the stacked units. Each µltraWave sensor must use a different Frequency Pair. To ensure maximum signal isolation, use Frequency Pairs that are at least two numbers apart. Do not use Frequency Pairs that are adjacent, consecutive numbers (e.g., use Frequency Pairs 1, 3, 5, rather than 1, 2, 3). To facilitate the wiring connections, it is recommended that the receivers be mounted on one post, and the transmitters be mounted on another post. Figure 23 illustrates the wiring connections for a double stacked µltraWave configuration. Figure 3 illustrates a triple stack ultraWave system.

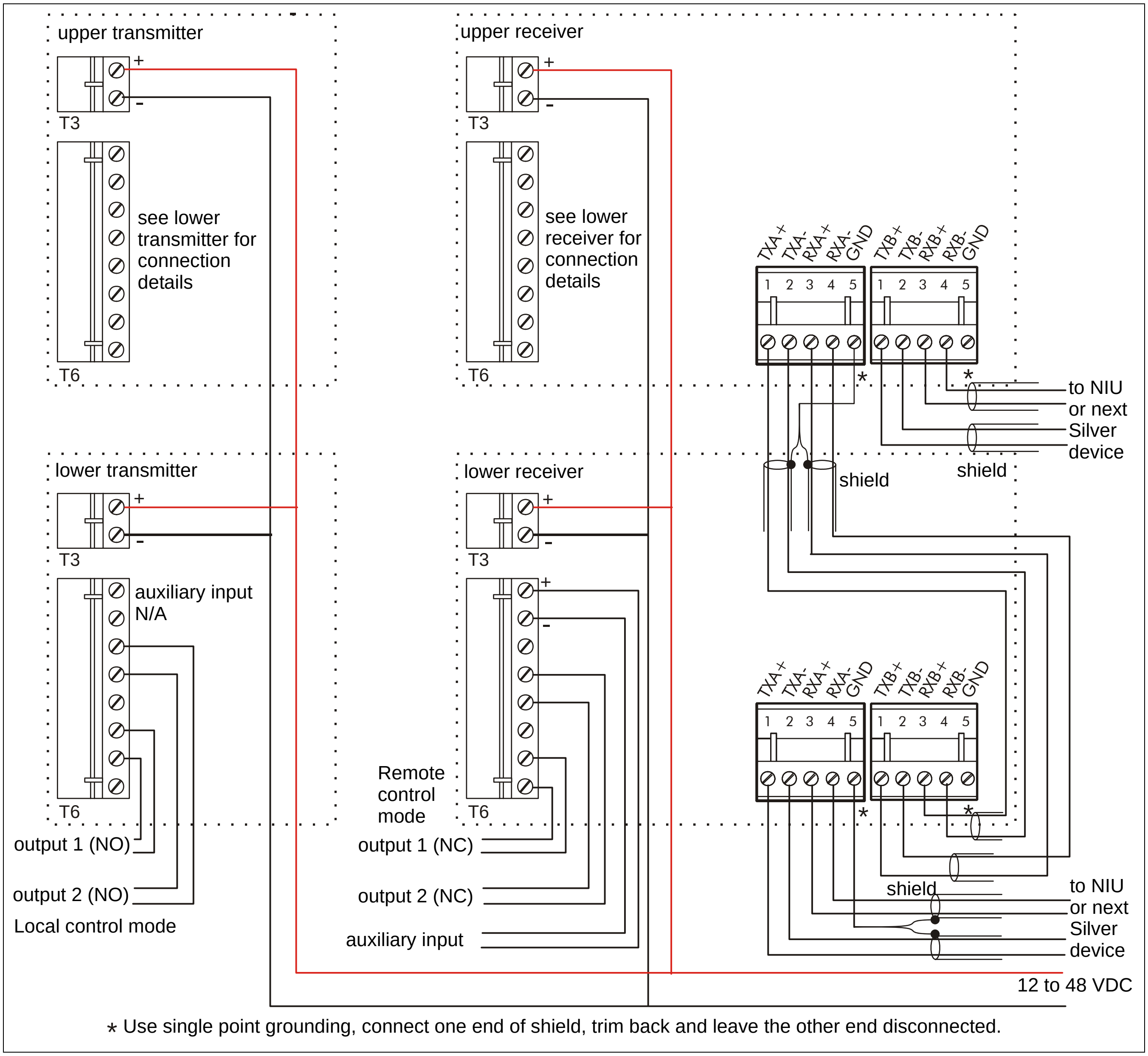


Figure 23 Double stack µltraWave wiring diagram

3 Setup and calibration

µltraWave setup and calibration is done using Senstar's Universal Configuration Module (UCM). The UCM is a Windows-based software application that performs the calibration, setup, maintenance and diagnostic functions for Senstar's line of intrusion detection sensors. The UCM connects directly to the µltraWave unit via USB. Network based µltraWave receivers can also connect remotely via the Silver Network Manager.

Senstar recommends that the initial calibration be done at the µltraWave unit using a direct USB connection to the UCM.

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

The µltraWave receiver setup requires the following configuration settings:

- specify the **Locale - FCC** for North American applications, **ETSI** for European applications (transmitter and receiver settings must match)
- specify the **Frequency Pair** (transmitter and receiver settings must match)
- enter the **Transmitter Serial Number**
- set the detection **Thresholds** (use the UCM Height Calculator tool to determine the optimum detection Thresholds)

The µltraWave transmitter setup requires the following configuration settings:

- specify the **Locale - FCC** for North American applications, **ETSI** for European applications (transmitter and receiver settings must match)
- specify the **Frequency Pair** (transmitter and receiver settings must match)

Once the µltraWave transmitter and receiver are properly installed and configured, you can calibrate the receiver unit. On the receiver's UCM Status tab, select the recalibrate button and the µltraWave receiver will auto-calibrate to provide the best possible received signal strength (see Receiver calibration on page 34).

Setup

Note	µltraWave setup and calibration must be performed by a qualified technician.

Connect the UCM and specify the Locale

1. Remove the lower cover from the µltraWave transmitter unit enclosure and use a USB cable to connect the UCM computer to the USB port on the PCB.

2. Start the UCM application and establish a connection.

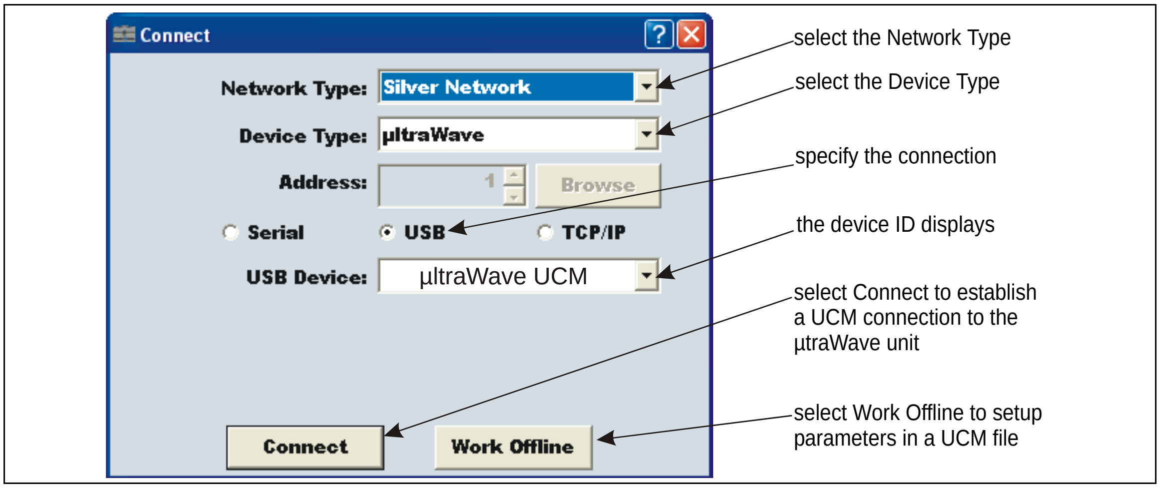


Figure 24 Connecting the UCM

Note The first time the UCM connects to the transmitter/receiver units, you are prompted to select the sensor's Locale (region of operation - FCC for North American operation, or ETSI for European operation). Make the selection based on the country in which the unit is installed. The µltraWave will not operate until both the transmitter and receiver have the Locale specified.

The µltraWave Microwave Detection Sensor complies with FCC standard 15.245 for North American operation, and with ETSI standard EN 300 440 for European operation. Table 6 includes the European countries in which the standard is recognized (CEPT group of nations with the EU members listed in parenthesis). If the country in which you are installing the µltraWave is not included in the table, contact the local Certification Authority before installing the system.

Albania	France (EU)	Montenegro	Switzerland
Andorra	Georgia	Netherlands (EU)	Turkey
Austria (EU)	Germany (EU)	Norway	Ukraine
Azerbaijan	Greece (EU)	Poland (EU)	United Kingdom (EU)
Belarus	Hungary (EU)	Portugal (EU)	Vatican
Belgium (EU)	Iceland	the former Yugoslav Republic	Bosnia and Herzegovina
Ireland (EU)	Romania (EU)	Bulgaria (EU)	Italy (EU)
Russian Federation	Croatia	Latvia (EU)	San Marino
Cyprus (EU)	Liechtenstein	Serbia	Czech Republic (EU)
Lithuania (EU)	Slovakia (EU)	Denmark (EU)	Luxembourg (EU)
Slovenia (EU)	Estonia (EU)	Malta (EU)	Spain (EU)
Finland (EU)	Moldava	Sweden (EU)	

Table 6 European nation groups

3. Select the Config tab and specify the Locale (FCC or ETSI).
4. Repeat this procedure for the receiver unit.

Setting the transmitter unit's Frequency Pair

Note	Both the transmitter and receiver must use the same Frequency Pair. Nearby µltraWave sensors and stacked configurations must use different Frequency Pairs. Do not assign consecutive Frequency Pairs to µltraWave sensors that are in close proximity to other µltraWave sensors (e.g., use Frequency Pairs 1, 3, 5, rather than 1, 2, 3).

1. With the UCM connected to the transmitter unit, select the Config tab.

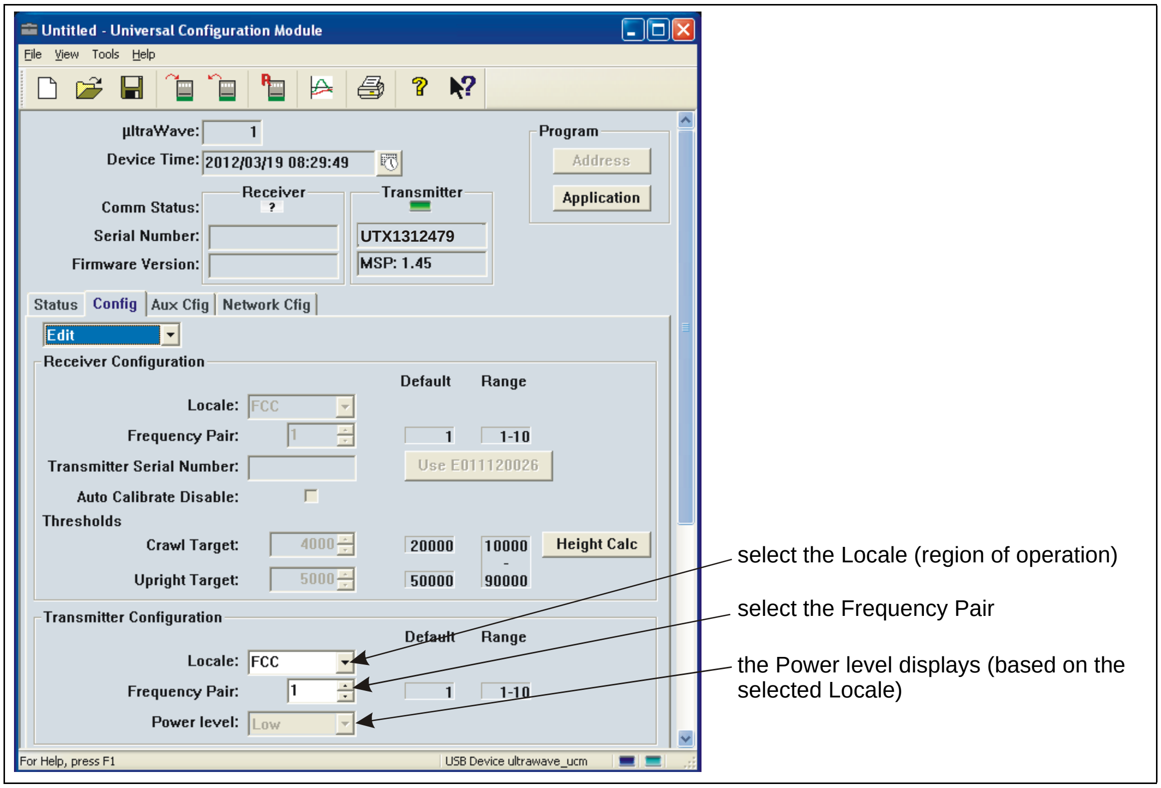


Figure 25 UCM Config tab (transmitter unit)

2. If required, use the arrows to specify the Locale for this µltraWave sensor (transmitter and receiver).
3. In the Frequency Pair field, use the arrows to specify the Frequency Pair that will be used for this µltraWave sensor (transmitter and receiver).
4. Save and download the configuration changes to the transmitter unit.
5. Repeat this procedure for the receiver unit.

Receiver setup

After setting the transmitter's Locale and Frequency Pair, the receiver can be setup and calibrated.

Note	During the receiver calibration process, the transmitter and receiver units must not be moved, and nothing may interfere with the microwave signal (i.e., nobody walks between or near the units).

1. With the UCM connected to the receiver unit, select the Config tab.

2. Set the receiver's Locale and Frequency Pair to match the transmitter's settings.
3. Download the configuration changes to the receiver unit.

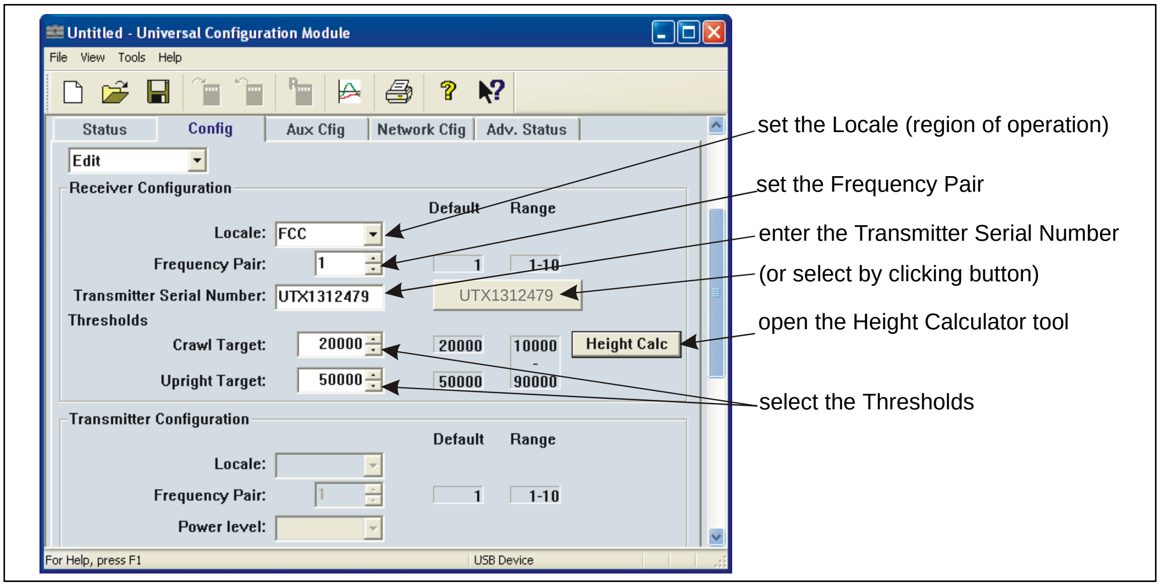


Figure 26 UCM Config tab (receiver unit)

4. In the Transmitter Serial Number field, enter the serial number for the paired transmitter unit. (If the receiver is communicating with the transmitter unit, click the serial number button beside the Transmitter Serial Number field to enter the Tx serial number.)
5. Specify the Thresholds (Crawling Target and Upright Target).
   Use the UCM Height Calc tool to determine the optimal detection Thresholds.
   The Thresholds can be adjusted later, if required, during the system verification tests.

Note	You can raise an alarm Threshold to decrease the sensitivity to the specified type of intrusion, or you can lower a Threshold to increase the sensitivity. To determine the settings that are appropriate for your site, adjust the Thresholds, and then perform detection tests. Custom Threshold settings can provide a good probability of detection and a very low nuisance alarm rate.

6. Save and download the configuration changes to the receiver unit.

Setting the receiver's address

The receiver address can be set only by using a direct USB connection between the UCM computer and the USB port on the receiver. Only network-based µltraWave sensors require unique address settings. Systems that do not use network communications can use the default address of 1. The transmitter unit does not require an address setting.

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 receiver.
3. Select the Program button.
   The New Address takes effect when communications are re-established.
4. Save the configuration changes.

Network configuration

For µltraWave receivers that use network alarm data communications, you must define the network type under the Network Cfig tab. The network configuration can be set only by using a direct USB connection between the UCM computer and T3, the USB port on the processor.

1. Specify the type of alarm data network (Silver or Crossfire).
2. For the Crossfire network you must specify the baud rate (all devices on a Crossfire network must communicate at the same baud rate).
3. Save and download the configuration changes to the processor.

Specify the Auxiliary I/O control mode

Specify the control mode for the µltraWave units (Local control or Remote control).

1. Select the Aux Cfig tab.
2. Use the Aux Control arrow to specify the control mode (Local or Remote).
3. Save and download the configuration changes to the µltraWave unit.

Auxiliary/self-test input

In Remote Control mode, the receiver's AUX input is used to report the status of an auxiliary device to the security management system. In Local control mode, the input is used to activate an electronic self-test of the receiver unit. The receiver determines the 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.

For Remote control mode applications, you define the input as normally open (NO) or normally closed (NC) with single resistor supervision, dual resistor supervision, or unsupervised. For Local control mode, the input requires a normally open unsupervised momentary switch input. The Filter Window parameter allows you to set the time period for which an input must be active before the receiver reports an event, or activates a self-test. Table 7: includes the selectable Remote Control input wiring configurations, and Table 8: includes the selectable supervision resistor values.

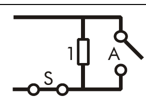
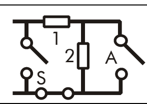
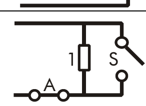
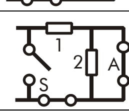
Input option	UCM selection	Alarm relay	Supervision relay	R1	R2
unsupervised		NO	---	---	---
single resistor supervision		NO	NC	5.1 k	---
dual resistor supervision		NO	NO/NC	4.3 k	820
unsupervised		NC	---	---	---
single resistor supervision		NC	NO	5.1 k	---
dual resistor supervision		NC	NO/NC	5.1 k	820

Table 7: Selectable input configurations

R1 values (single resistor supervision)	R1 values (dual resistor supervision)	R2 values (dual 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	5.1 k	5.6 k
1.5 k	5.6 k	
2.2 k		
3.3 k		
4.7 k		
5.1 k		
5.6 k		

Table 8: Selectable resistor values

Input configuration procedure (Local control mode)

1. Select the Aux Cfig tab on the UCM window.
2. Set the Filter Window.
3. Save and download the configuration changes to the receiver.

Input configuration procedure (Remote control mode)

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. Save and download the configuration changes to the receiver.

Output relays

Output relay setup (Local control mode)

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

Note	Senstar recommends that the relay outputs be configured to report Tx Comm Link Fail, Input Power Fail, and Fail Safe conditions, in addition to Microwave Alarms.

1. Select a relay (the parameters listed below a relay apply only to that relay).
2. Specify the Hold/Active Time parameter.
3. Specify the conditions from the Local Aux Control Activation field under which this relay will activate.

4. Repeat this procedure for the second relay.
5. Save and download the configuration changes to the μltraWave unit.

Output relay setup (Remote control mode)

In Remote control mode, the receiver's relays are controlled by the security management system to operate auxiliary equipment as output control points (e.g., to activate lights, doors, sirens, CCTV equipment, etc.). The transmitter's relays operate only in Local control mode. You configure the relays response to commands from the host computer. You can configure the relays as steady ON, or in flash mode (ON-OFF-ON-OFF etc.) or in pulse mode (ON for a period, then OFF). For flash and pulse modes, the ON-OFF time duration is configurable.

1. Select a relay (the parameters listed below a relay apply only to that relay).
2. Select the type of relay Activation (steady ON, or flash mode, or pulse mode).
3. Select the Hold/Active Time parameter, if applicable.
4. Select the Inactive Time parameter, if applicable.
5. Repeat this procedure for the second relay.
6. Save and download the configuration changes to the receiver.

Receiver calibration

Once the µltraWave transmitter and receiver are setup and configured, perform the receiver calibration.

CAUTION	Ensure that the microwave detection zone is not disturbed during the calibration process.

1. On the receiver's UCM Status tab, select the Recalibrate button.
   The receiver performs a self-calibration.

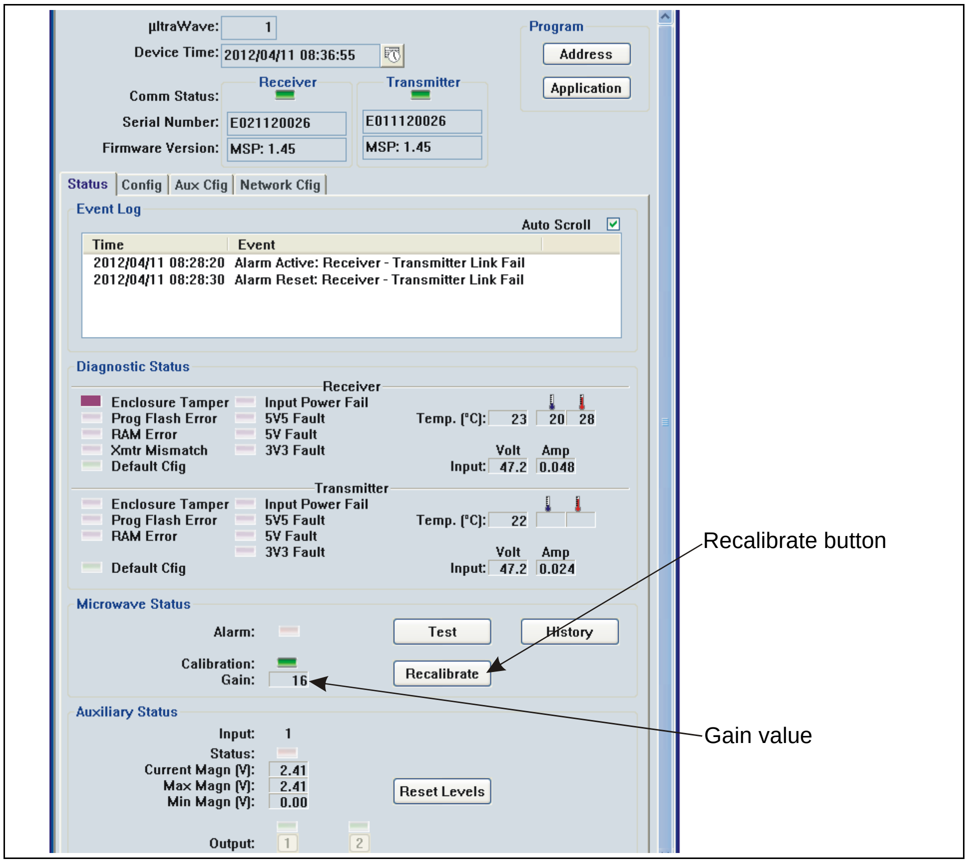


Figure 27 UCM Status tab

Optimizing the alignment

Typically, the initial alignment of the µltraWave sensor provides a strong received signal and good detection sensitivity. However, it may be possible to improve the received signal by adjusting the transmitter and receiver units' alignment.

1. Note the receiver's displayed Gain value once the self-calibration is complete.
2. Adjust the horizontal and/or vertical alignment of the receiver unit slightly.
3. After adjusting the receiver, select the Recalibrate button on the UCM. Once the self-calibration is complete, check the Gain value to determine if it is at a lower level than the original value. A lower displayed Gain value indicates an improved received signal.
4. Adjust the horizontal and/or vertical alignment of the transmitter unit slightly.

5. After adjusting the transmitter, select the Recalibrate button on the UCM. Once the self-calibration is complete, check the Gain value to determine if it is at a lower level than the original value.

Note	Ensure that the final displayed Gain value is less than or equal to the initial Gain value (step 1).

System verification tests

Once the setup and calibration procedures are completed, test and verify the µltraWave sensor. The type of tests recommended to verify the proper operation of the µltraWave system depends on the type of installation, and your site specific security requirements (see Site planning & design on page 3). The following table lists the types of tests and the levels of security to which they apply:

Test	Speed	high security	medium security	low security
log roll parallel to the beam and through the zone	Slow	✓	X	X
	Fast	✓	X	X
military style stomach crawl perpendicular to the beam and through the zone	Slow	✓	X	X
	Fast	✓	X	X
hands and knees crawl or duck walk (low crouch) through the zone	Slow	✓	✓	X
	Fast	✓	✓	X
upright walk	Slow	✓	✓	✓
upright run	Fast	✓	✓	✓

Table 9 Recommended tests

Running a UCM Response plot during the testing will provide a record of the test results along with an indication of the signal magnitude created by the test subject. Typically, the Crawl Target Threshold is exceeded first as the test subject enters the microwave field. The Upright Target Threshold may also be exceeded, depending on the type of test. Figure 28 is a flow chart of µltraWave calibration testing.

1. Start the UCM and establish a connection to the µltraWave receiver.
2. Start a UCM Magnitude Response plot.
3. Perform the tests recommended for your level of security while recording the plot.
   If each test results in an alarm, use the current Threshold settings and monitor the system for nuisance alarms.
   If the nuisance alarm rate (NAR) is acceptable use the current settings.
4. If any test does not cause an alarm, reduce the Crawl Target Threshold 1 level (500 units per level) and then repeat the tests.
   If any subsequent test does not cause an alarm, reduce the Upright Target Threshold 1 level and then repeat the tests.

5. Continue this process until you get an alarm with each test.
6. When each test results in an alarm, use the current Threshold settings and monitor the system for nuisance alarms.
   If the NAR is acceptable, use the current Threshold settings.

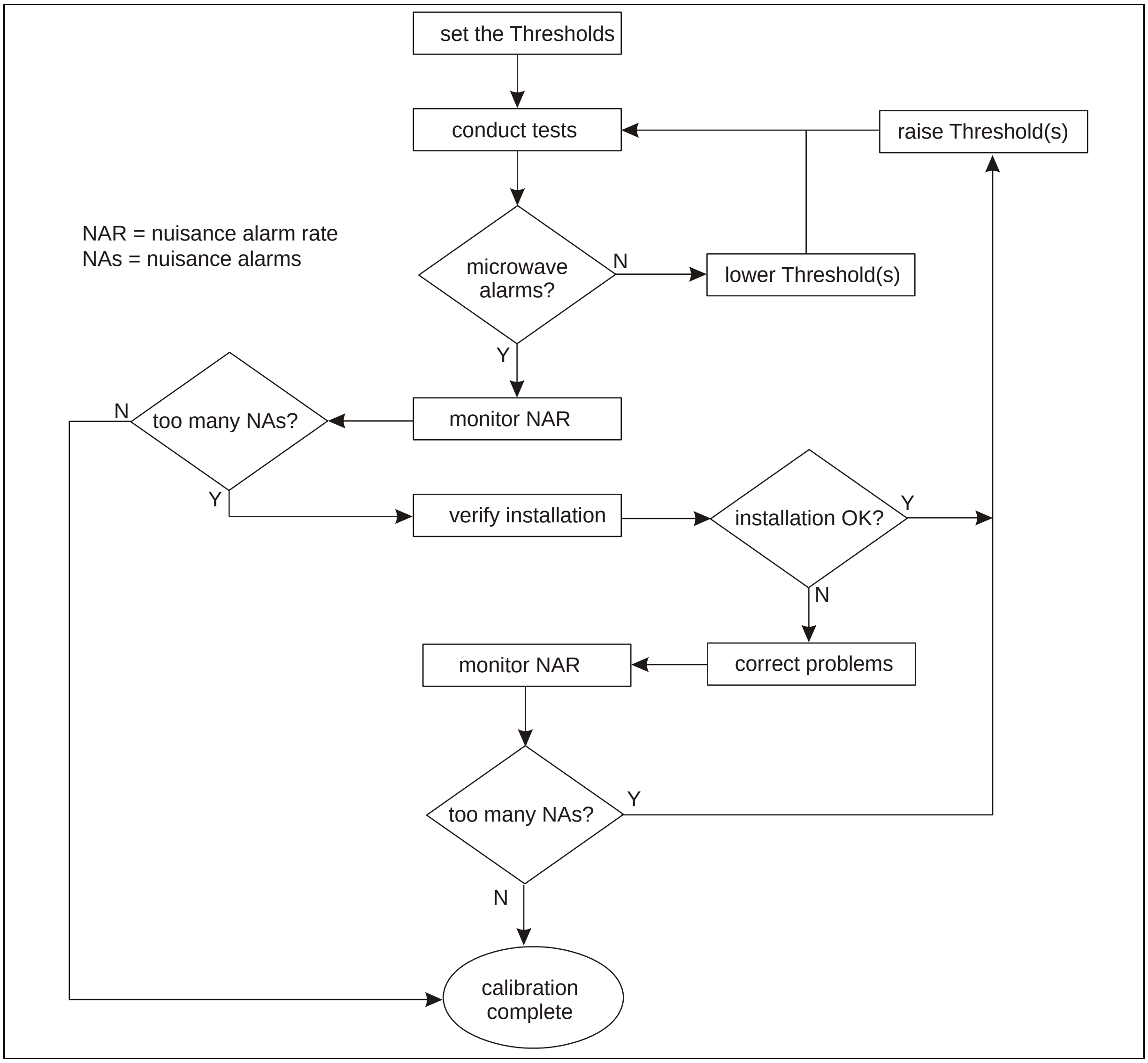


Figure 28 µltraWave verification test flow chart

4 Maintenance

This section details the recommended µltraWave unit maintenance, site maintenance and testing required to ensure proper operation.

µltraWave unit maintenance

Twice per year following major seasonal changes, inspect and clean the microwave units:

- Use a soft cloth and a mild detergent to wipe off the antenna covers.
- Verify the mounting hardware and ground connection are tight and corrosion free.
- Ensure that the mounting post is firmly anchored and plumb.
- Open the enclosure and verify that there is no contamination or moisture inside.
- Ensure that all wiring connections are tight and corrosion free.
- Connect a PC running the UCM application and perform a recalibration of the receiver unit (select the Recalibrate button).

µltraWave site maintenance

After major seasonal changes, and following periods of severe weather:

- Verify that there are no objects within the microwave zone, or inside the required area of clearance.
- Ensure that standing water cannot accumulate within the microwave zone (i.e., puddles) and that running water cannot flow through the zone.
- Check the line of sight to ensure there are no significant deviations from level grade, and that the microwave units are aimed directly at each other.
- Inspect the perimeter fences to verify that there are no access points that would allow ingress to small animals.

As often as site conditions require:

- Keep any vegetation within the microwave zone cropped to a maximum height of 7.5 cm (3 in.).
- For sites with significant snowfall, ensure that the snow is cleared to prevent the possibility of a burrowing intruder gaining undetected access.

µltraWave testing

The amount and type of testing depends on your security requirements and installation.

- High Security Zone - detection of an intruder stomach-crawling perpendicular to the beam, and log rolling parallel to the beam.
- Medium Security Zone - detection of an intruder crawling on hands and knees.
- Low Security Zone - detection of an upright walking intruder (beam-break alarm).

To ensure the required level of detection, you should simulate the worst case scenario for your type of installation following the semi-annual recalibration (see System verification tests on page 35).

Beam-break alarm test

Depending on your site-specific security requirements, Senstar recommends conducting a beam-break alarm test:

- daily for high security applications,
- weekly for medium security applications,
- monthly for low security applications.

To conduct a beam-break alarm test walk through the µltraWave zone at any point in the zone. The test is successful if the receiver unit signals a microwave alarm in response to the test.

Remote self-test

If your µltraWave system is configured for remote self-test, the self-test should be activated at least once per day.

For µltraWave systems that operate in Local control mode, press and hold the momentary switch input for approximately two seconds (the switch must be closed for a minimum of the time specified in the Filter Window parameter). The self-test is successful if the receiver signals a microwave alarm.

For µltraWave systems that operate in Remote control mode, use the security management system to activate the self-test input. The self-test is successful if the receiver signals a microwave alarm.

Note	The µltraWave self-test verifies alarm communications. However, it does not verify antenna operation. Conduct a beam-break alarm test to verify the antenna operation of the µltraWave units.

Correcting nuisance alarm problems

If an µltraWave system is encountering a high nuisance alarm rate (NAR) you need to determine the source of the alarms and correct the problem. Begin by reviewing the site planning and design section in Chapter 1. Ensure that the installation rules have been followed, and the mounting height, mounting angle, and required area of clearance for the detection zone are correct.

After verifying that installation problems are not the source of the nuisance alarms, connect the UCM to the receiver unit and record a magnitude response plot. Review the plot to determine the signal levels at which the nuisance alarms are occurring and raise the Crawl Target Threshold to prevent the alarms. After adjusting the Threshold, repeat the recommended system verification tests to ensure adequate detection, and continue monitoring for nuisance alarms.

Verifying the µltraWave alignment

If the µltraWave sensor is encountering detection problems it is possible that one of the unit's may be out of alignment. The µltraWave receiver includes a received signal strength indicator (RSSI) as an alignment aid (LEDs D6 - D13).

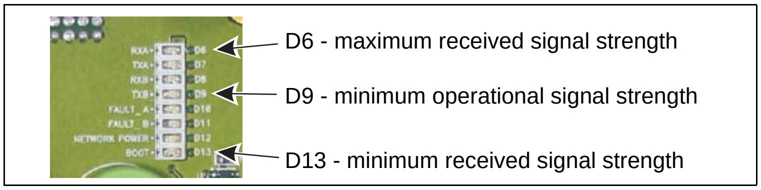


Figure 29 LEDs D6 - D13 RSSI alignment aid

1. Remove the lower cover from the receiver unit.
2. Press and hold the tamper switch, while observing the RSSI (LEDs D6 - D13). Do not obstruct the receiver's antenna while observing the RSSI.
3. Note the received signal strength (e.g., LED D7 ON).
4. Adjust the horizontal and vertical alignment of the receiver unit slightly to determine if the received signal can be improved. Recheck the RSSI level.
5. Adjust the horizontal and vertical alignment of the transmitter unit slightly to determine if the received signal can be improved. Recheck the RSSI level at the receiver unit.
6. Once the alignment is complete, connect the UCM and select the Recalibrate button.
7. Replace the lower cover on the receiver unit.

a Specifications

General	**Power consumption**	• @ 12 VDC, 292 mA - transmitter unit 1.1 W, receiver unit 1.95 W, receiver unit with NIC 2.4 W • @ 24 VDC, 152 mA - transmitter unit 1.2 W, receiver unit 2.05 W, receiver unit with NIC 2.45 W • @ 48 VDC, 84 mA - transmitter unit 1.45 W, receiver unit 2.26 W, receiver unit with NIC 2.6 W
	Operating range	• 5 m to 200 m (16.4 ft. to 656 ft.)
	Beam width	• 20 cm to 8 m (8 in. to 26.24 ft.)
	Velocity response	• 3 cm/sec to 15 m/sec (1.2 in./sec to 50 ft./sec)
	Dimensions	• width - 16 cm (6.25 in.) • depth - 9 cm (3.375 in.) • height - 31 cm (12.25 in.)
	Weight	• 0.9 kg (2 lbs.) each unit
Transmitter/Receiver	**Operating voltage**	• 12 - 48 VDC
	Microwave carrier frequency	• ETSI - 24.150 - 24.250 GHz • FCC - 24.075 - 24.175 GHz
	Separation distance (max.)	• transmitter/receiver - high security 100 m (328 ft.) • transmitter/receiver - medium security 150 m (492 ft.) • transmitter/receiver - low security 200 m (656 ft.)
	Detection zone length (max.)	• high security 90.5 m (297 ft.) • transmitter/receiver - medium security 144.2 m (473 ft.) • transmitter/receiver - low security 200 m (656 ft.)
	Antenna pattern	• 13° (horizontal) • 13° (vertical)
	Operating temperature	• -40° to +66°C (-40° to +150° F)
	Output relays (2 per unit)	• 2 form C relay outputs 30 VDC @ 1 A maximum, non-inductive load
	Auxiliary input (1 per receiver unit)	• Local control mode - self-test input • Remote control mode - auxiliary device input

Parts list

Component	Part Number	Description
µltraWave microwave sensor system		
complete µltraWave sensor system	E4FG0101	µltraWave transmitter and receiver pair with two mounting kits and four cable glands
µltraWave transmitter unit		
transmitter unit	E4EM0101	replacement transmitter unit with mounting kit and two cable glands
µltraWave receiver unit		
receiver unit	E4EM0201	replacement receiver unit with mounting kit and two cable glands
µltraWave accessories		
mounting kit	E4KT0300	two mounting kits and four cable glands
UCM	00SW0100	Universal Configuration Module software, Windows-based application, setup, calibration and diagnostic tool
UCM cable	GE0444	UCM interface cable, 3 m, USB (connects PC running UCM to processor)
Network accessories		
Silver Network Interface Unit	00EM0200	Silver Network data converter for EIA-422 and multimode fiber optic applications
Silver Network Interface Unit	00EM0201	Silver Network data converter for EIA-422 and singlemode fiber optic applications
Network Manager	00FG0200	Network Manager CD containing Network Manager application software for the Silver, Crossfire, MX, VoE, and Sennet networks (Windows application)
µltraLink	00FG0220	µltraLink CD containing Network Manager service software for the Silver Network (Windows Service)
Alarm Interface Module	00SN0230	Security Management System (Windows application) for use with Network Manager requires USB security key
Network Interface Card (multimode fiber)	00BA1901	Network interface card for multimode fiber optic communications
Network Interface Card (EIA-422)	00BA2000	Network interface card for copper wire communications
Network Interface Card (singlemode fiber)	00BA2101	Network interface card for singlemode fiber optic communications
Network Interface Card (EIA-422 & multimode fiber)	00BA1902	mixed media network interface card for copper wire and multimode fiber optic communications
Network Interface Card (EIA-422 & singlemode fiber)	00BA2102	mixed media network interface card for copper wire and singlemode fiber optic communications
µltraWave documentation		
documentation CD	E4DA0120	µltraWave product documentation CD