UltraWave®

Microwave Detection Sensor

Product Guide

E4DA0402-001, Rev F
June 23, 2022

SENSTAR®

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

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 I5T-E4EM0101; receiver I5T-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 UltraWave Microwave Detection Sensor is designed for outdoor perimeter intrusion detection applications. UltraWave 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.

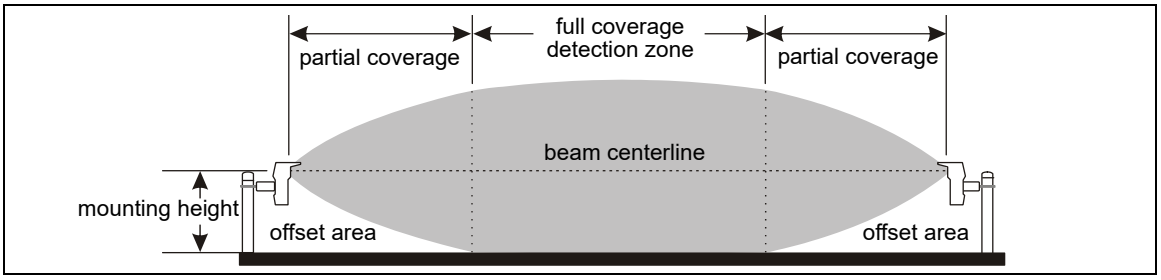


Figure 1 UltraWave microwave detection sensor

Site design

Prepare detailed site drawings for the UltraWave 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.

The UltraWave system requires a straight, flat, detection zone free of obstacles and depressions. The zone must be completely free of standing water. 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.). The terrain must be level to grade ± 7.5 cm (3 in.) and the surface must be free of vegetation and either paved, or covered with a 10 cm (4 in.) layer of crushed stone (2 cm {0.75 in.} max.).

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.). The terrain must be level to grade ± 15 cm (6 in.) and the surface must be paved, or covered with crushed stone, or hard packed dirt or clay, or closely mowed grass.

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. The terrain must be level to grade ± 23 cm (9 in.) and the surface must be paved, or covered with crushed stone, or hard packed dirt or clay, or closely mowed grass.

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 UltraWave units on one mounting post. Table 2 provides approximate zone heights based on Height Calculator tool recommendations. Figure 3 illustrates a triple stacked UltraWave 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.

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 UltraWave zone.

The UCM Height Calculator tool

To use the Height Calculator tool, start the UCM application for the UltraWave 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.

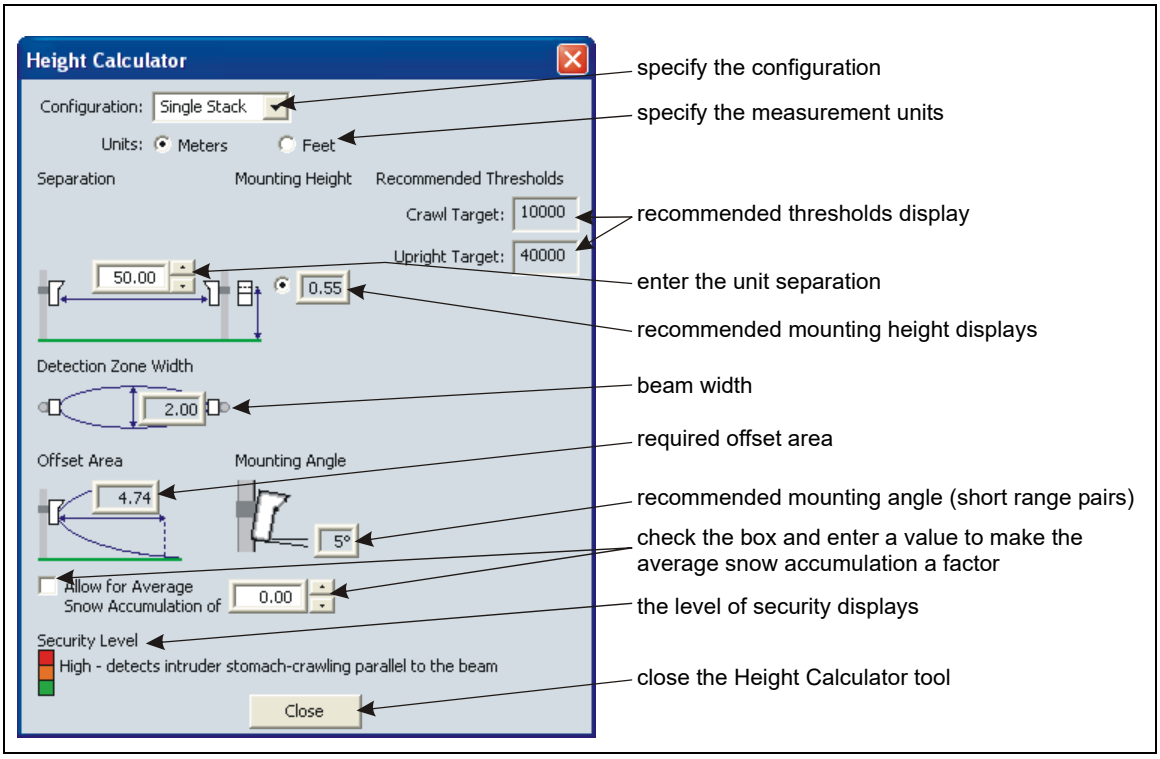


Figure 2 UCM Height Calculator tool

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

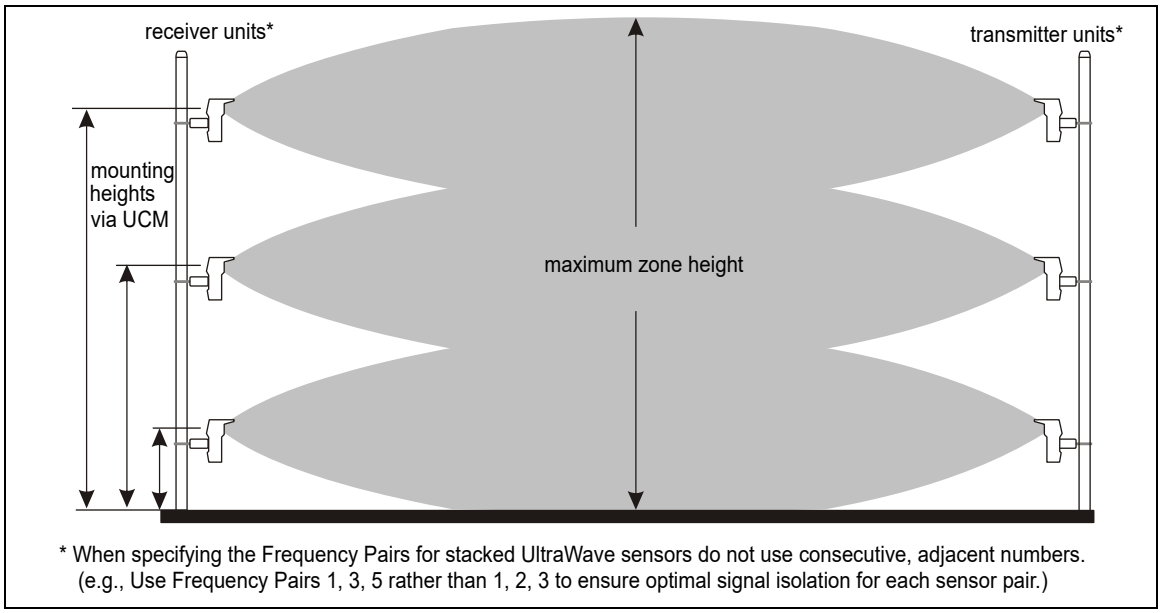


Figure 3 Stacking UltraWave units

Mounting angle

For microwave pairs with a unit separation of 50 m or less, the microwave units are mounted with a 5º 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.

Note	The microwave Offset Area describes the distance from the unit's mounting position to the point where the beam reaches the ground's surface. Only partial coverage is provided inside the Offset Area. Full coverage begins where the Offset Area ends.

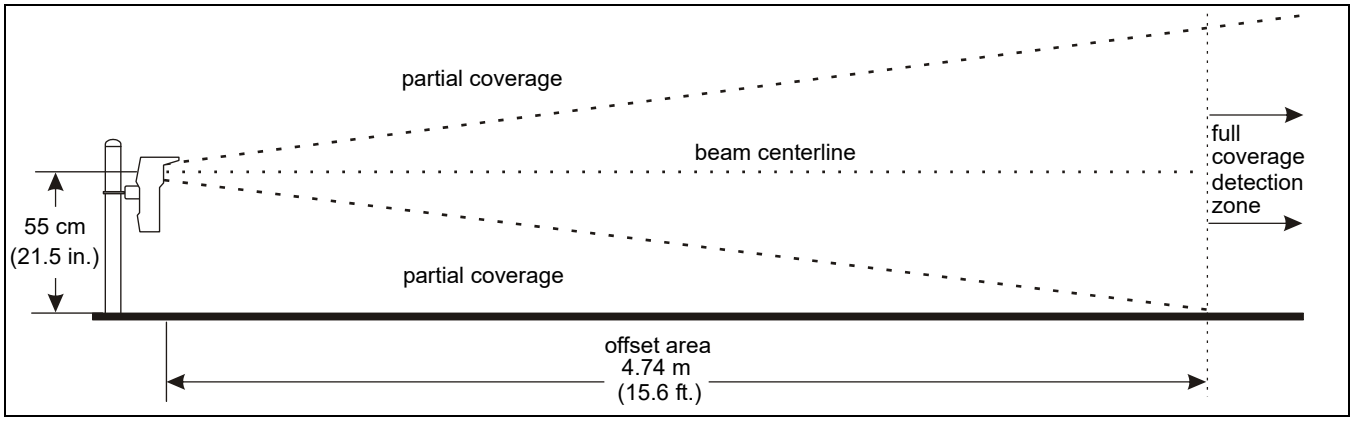


Figure 4 Offset area

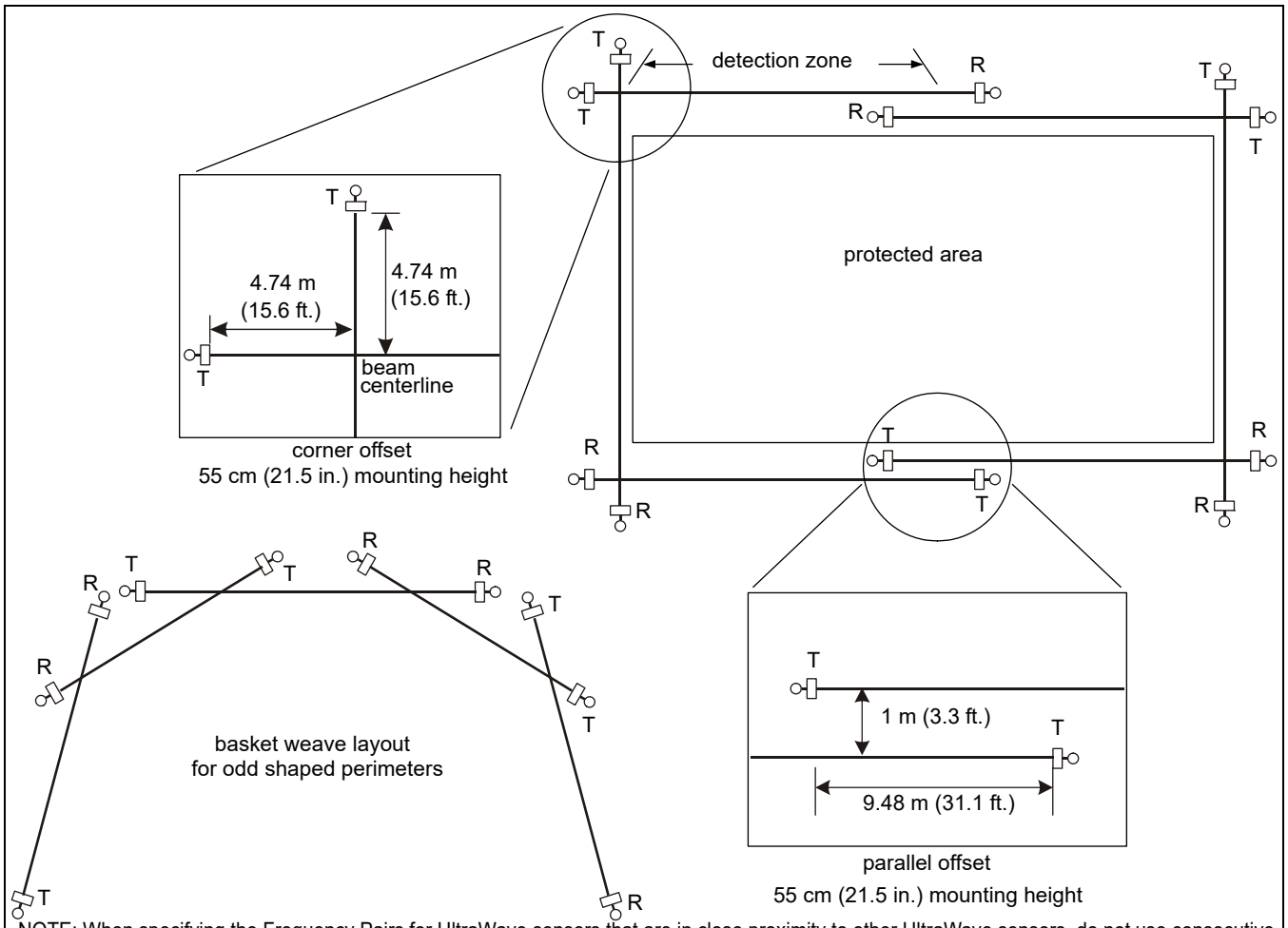


Figure 5 Offset arrangement examples

Power and ground requirements

The UltraWave sensor system consumes 4 W (nominal) 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 UltraWave 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 UltraWave 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 W per UltraWave 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 6 illustrates a 24 VDC power supply with 16 AWG power cables in a 360 m high-security UltraWave 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 UltraWave 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 UltraWave 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 UltraWave 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)

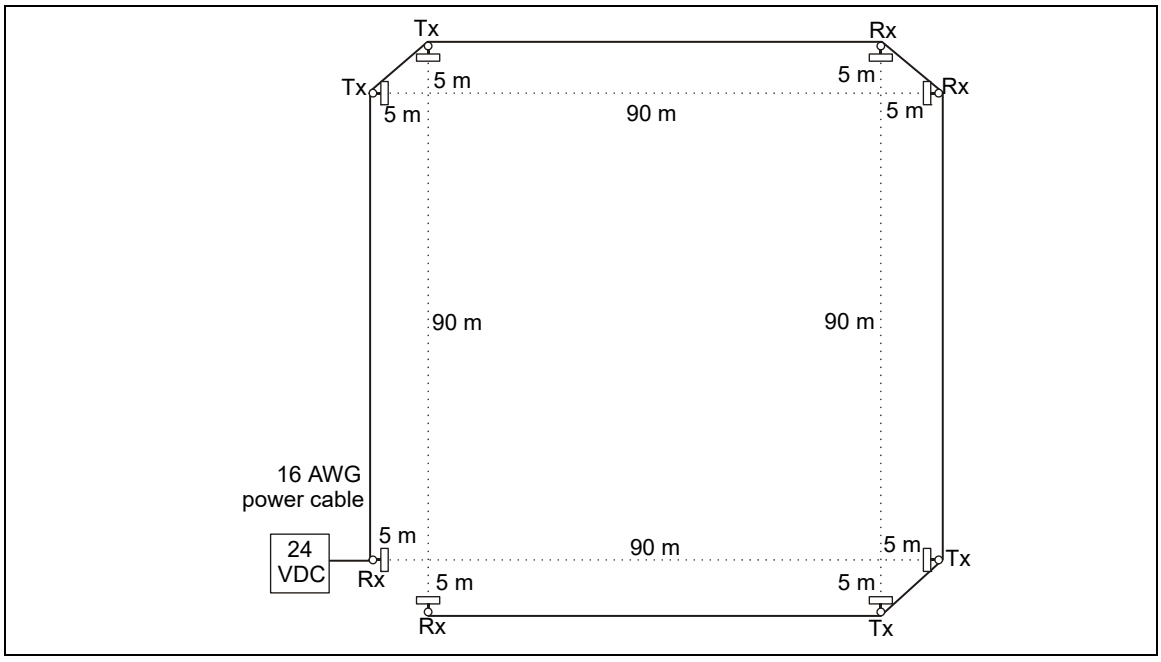


Figure 6 24 VDC power distribution example (high-security closed perimeter)

Power over Ethernet

Silver Network based UltraWave pairs 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 transmitter/receiver, and minimum Category 5 network cable. Power over Ethernet is supplied to the Network Interface card (NIC) and the power output on the NIC is connected to the power input on the transmitter/receiver. Each unit receiving PoE requires an earth ground connection.

Note	Senstar recommends using a fully managed PoE switch, to supply power to the UltraWave transmitter/receiver.

Alarm data communications

UltraWave alarm data communications can be provided in three ways, Local control mode, Remote control mode and Network Manager mode (NM mode).

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.

Each unit UltraWave (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. A momentary switch input to the receiver's input (T6 pins 7 and 8) is used to activate an electronic self-test of the receiver unit. The transmitter unit's two outputs can be configured to signal Enclosure Tamper, Input Power Fail, Hardware Faults and Fail Safe (system fail). The transmitter unit does not include self-test capabilities (Tx comm link fail is reported by the receiver unit). Figure 7 shows the selectable input/output (I/O) parameters for Local control mode.

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

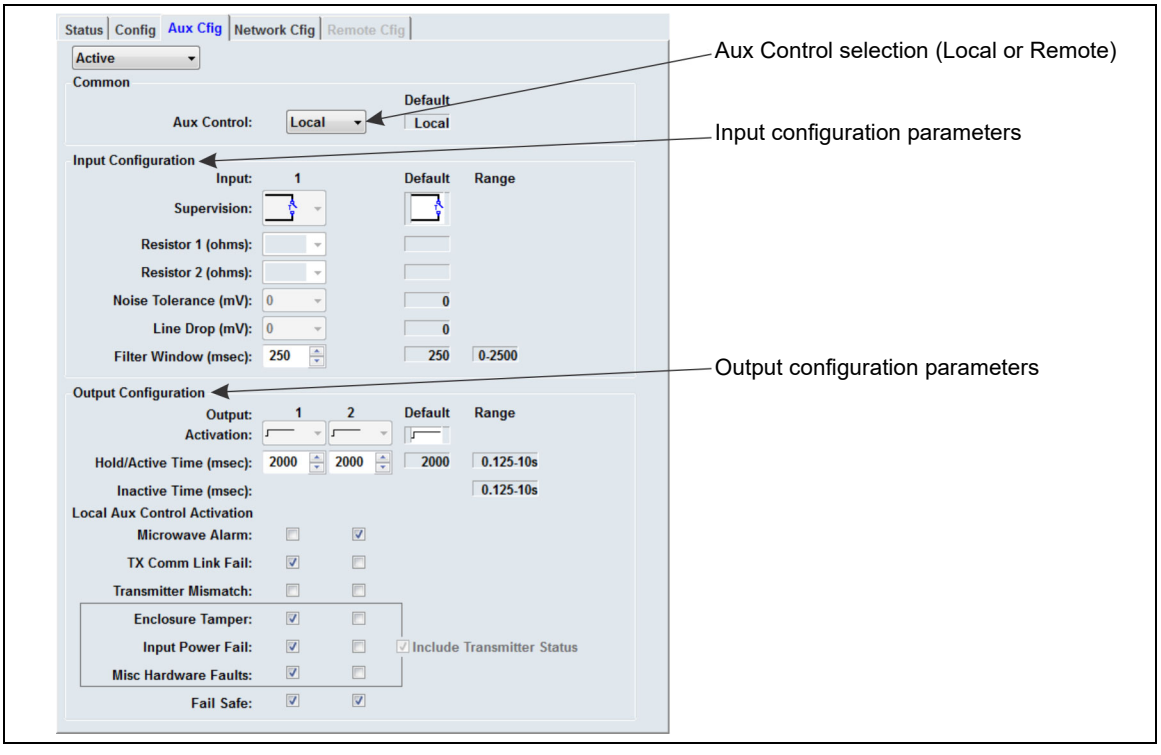


Figure 7 Local control mode I/O configuration parameters

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. In Remote control mode, a receiver self-test is initiated by a command from 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 six variants of the NIC available: EIA-422, multimode fiber optic, singlemode fiber optic, mixed media EIA-422 and multimode, mixed media EIA-422 and singlemode, and Ethernet (PoE).

Note	You can setup a Silver Network to enable calibration, maintenance and diagnostic access to your UltraWave 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.

NM Mode

The UltraWave microwave sensor can be configured to report alarm and supervision conditions through the UltraLink modular I/O system. In NM Mode, the UltraLink I/O processor functions as the Network Manager, providing alarm outputs for a connected network of up to eight Silver 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 (relay or open collector). When an alarm occurs on a connected sensor, the corresponding UltraLink I/O output is activated (see NM Mode on page 49 for additional details).

Silver Network specifications

Note	A network interface card must be installed on the receiver PCB to enable 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 receiver units:
  - EIA-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 microwave receiver

Note	Use low capacitance shielded twisted pair data cable for EIA-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.

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 UltraWave 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 UltraWave 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 UltraWave unit.

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

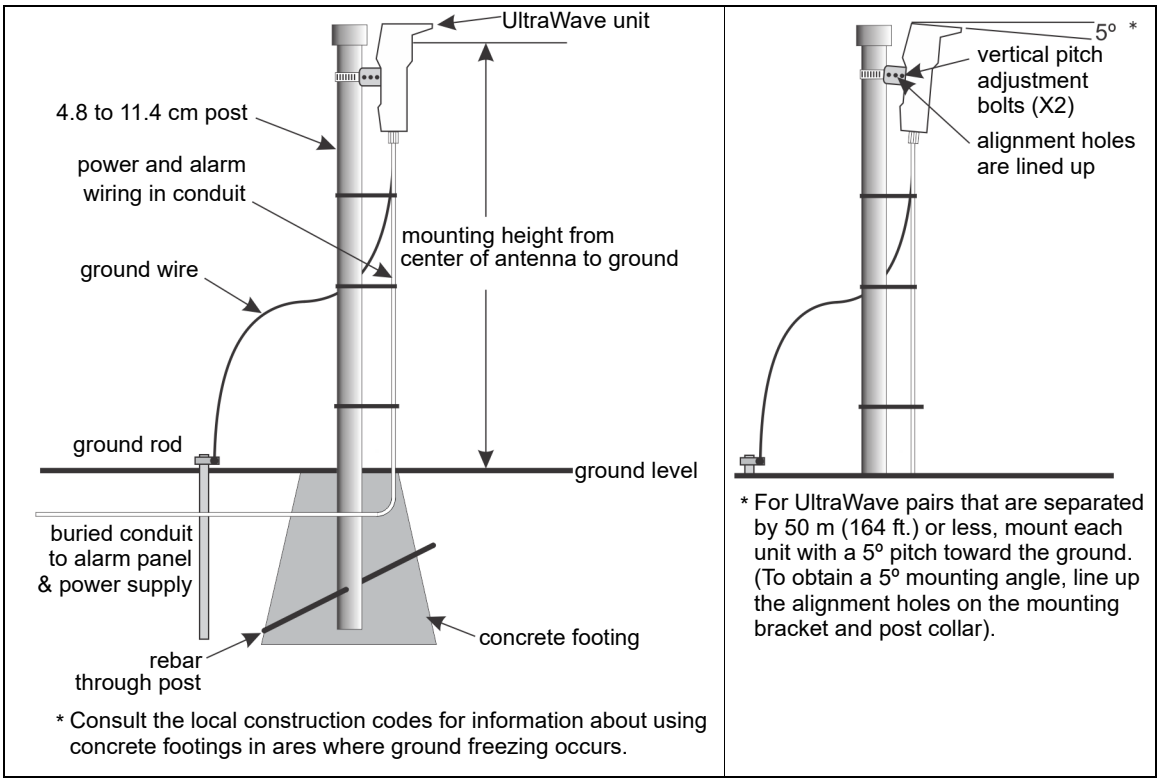


Figure 8 Post installation and unit mounting

Surface-mount applications

The post-mount bracket can also be used to mount an UltraWave 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 UltraWave application.

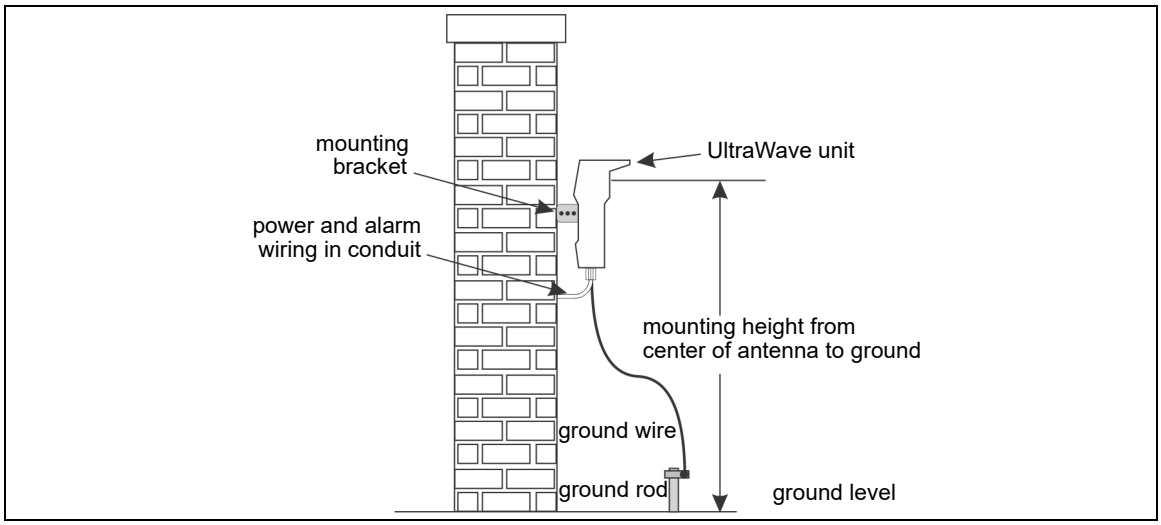


Figure 9 Surface mounting example

UltraWave alarm reporting

The UltraWave system reports a sensor alarm when a valid target creates a disturbance in the microwave field. If a large target (e.g., a vehicle) enters the microwave field and blocks the beam, the UltraWave sensor goes into alarm and continues the alarm until the object leaves the field. If the calibration parameters are outside the valid range at startup, or during operation, the UltraWave system goes into constant alarm until the calibration problem is corrected. The receiver unit also signals an alarm if it does not see the transmitter on startup.

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

Fast Alarm Response

The UltraWave receiver includes a Fast Response channel that bypasses the sensor's advanced signal processing algorithms, when enabled. This causes the UltraWave receiver to function like a classic analog microwave sensor. With Fast Response enabled, UltraWave will trigger an alarm as soon as the microwave signal exceeds the Threshold setting. The Fast Response channel provides early alarm notification, but can also cause an increase in the nuisance alarm rate (NAR). Fast Response is intended for use in high-security applications that include a sterile zone. However, Fast Response should NOT be used in Sally Port areas.

Automatic gain control

The UltraWave 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 UltraWave 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

There are two covers on the UltraWave enclosure: the antenna cover and the circuit card cover. The antenna cover is secured with four inset screws that are factory installed to a finger-tight torque specification. There are no user-serviceable components in the antenna compartment and the cover should not be removed for any reason. The circuit card cover is secured with four thumb screws that are removed to access the circuit card assembly for setup and calibration purposes.

Note	DO NOT remove or tighten the four screws on the antenna compartment. To access the transmitter/receiver circuit card assembly, remove the four screws on the circuit card cover. When replacing the circuit card cover, tighten the screws until finger-tight. DO NOT over tighten the circuit card cover screws.

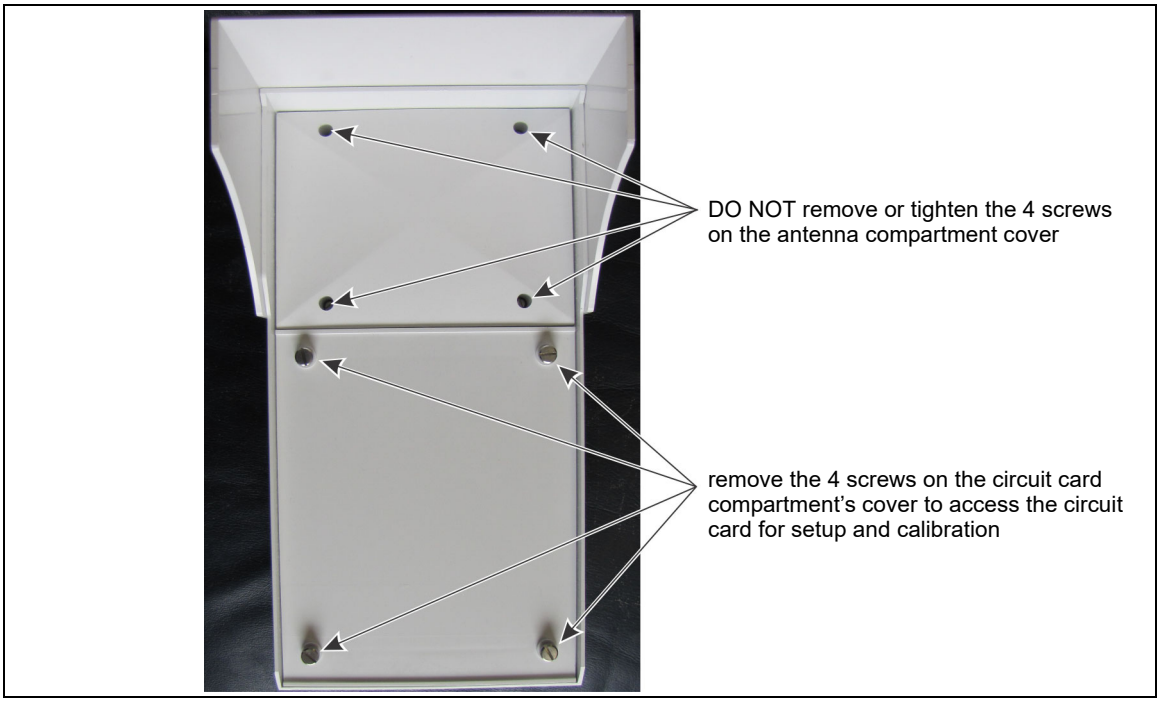


Figure 10 Opening the UltraWave enclosure

The UltraWave transmitter and receiver units are almost identical, with only minor differences in component layout. Figure 11 shows an UltraWave receiver and illustrates the unit's features. The receiver's diagnostic activity LEDs are listed in Table 5.

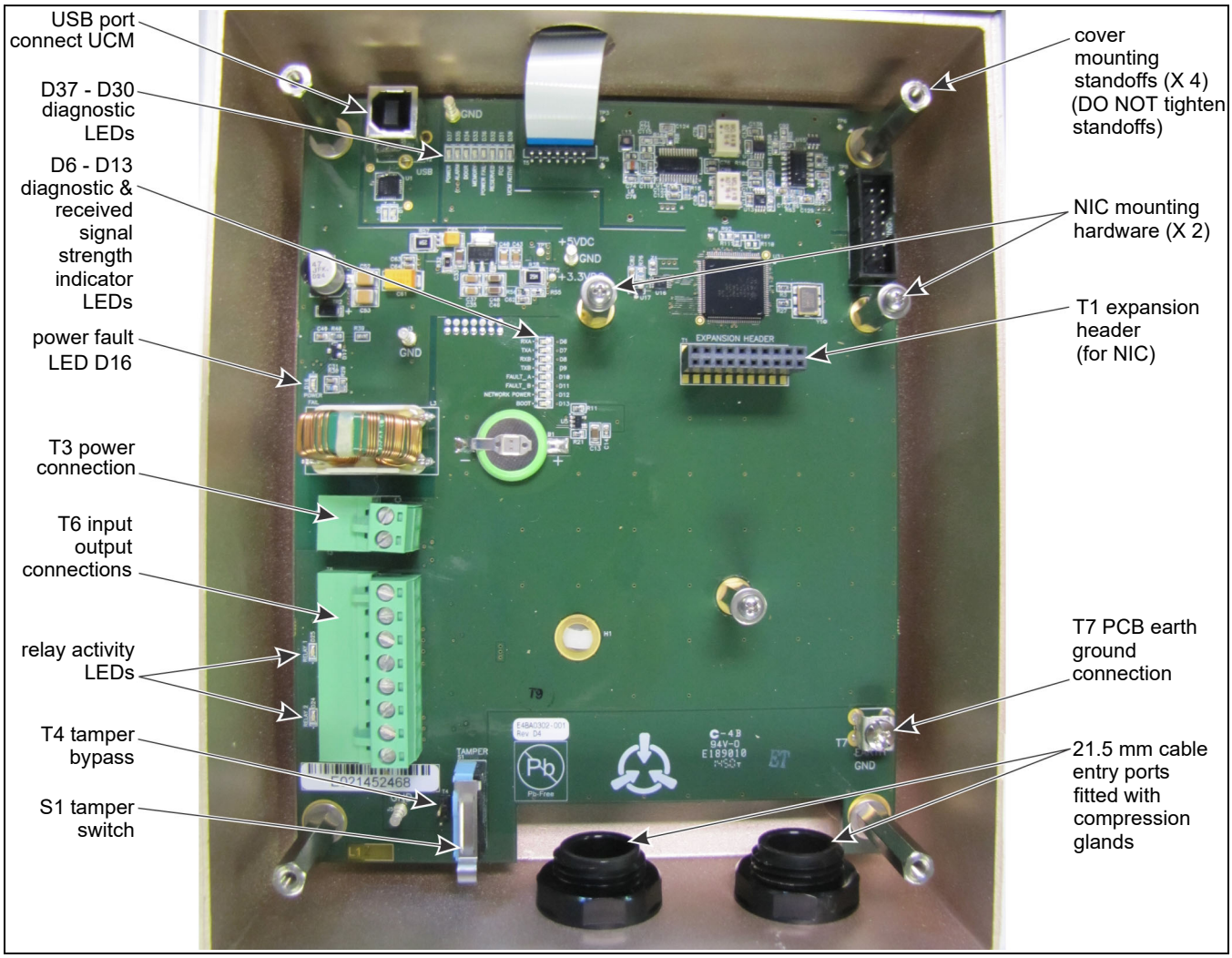


Figure 11 UltraWave receiver unit

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 UltraWave diagnostic activity LEDs

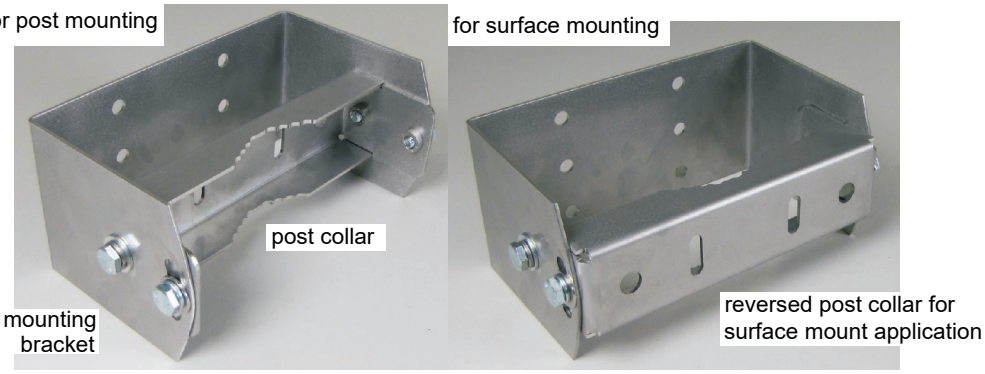
Note	LEDs D6 to D13 also function as a received signal strength indicator (RSSI) to aid in the final alignment of the UltraWave system. The tamper switch must be pressed or the shunt must be installed on T4 to enable the RSSI LED function.

Mounting the UltraWave 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 13). 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 16).The UltraWave 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 UltraWave 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 16). The mounting bracket and the post collar each include a central alignment hole, that when lined up, create a precise 5º angle. 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 UltraWave mounting posts.



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

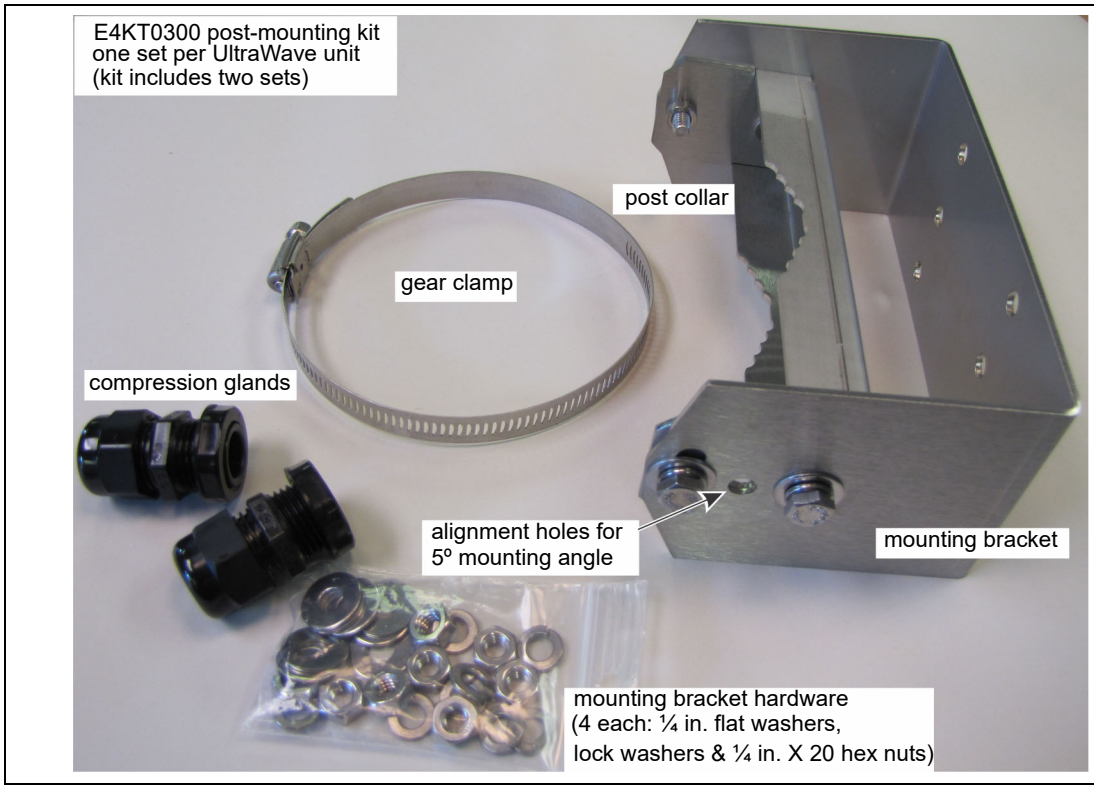
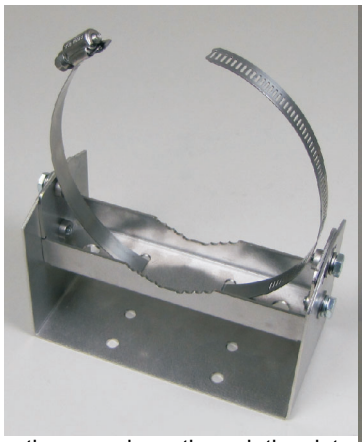


Figure 13 Mounting hardware kit

Post-mounting procedure



Pass the gear clamp through the slots in the post collar.

Attach the mounting bracket assembly to the UltraWave unit.

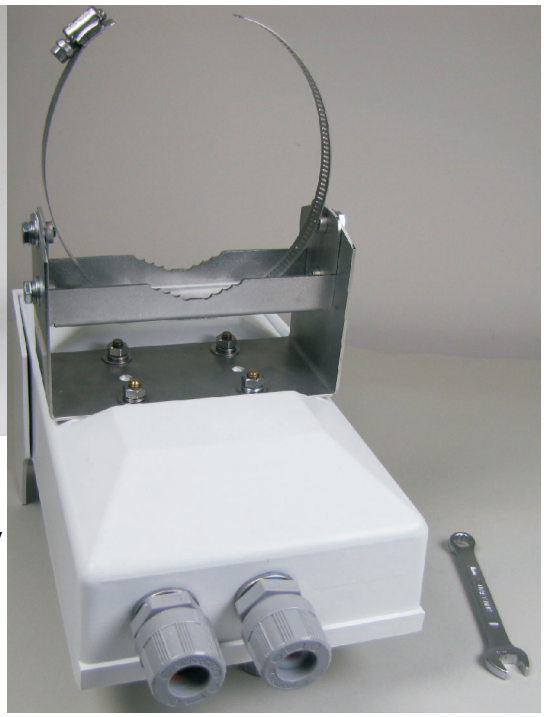


Figure 14 Post-mounting procedure

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 UltraWave unit (see Figure 14).
3. Wrap the gear clamp around the post and measure the mounting height of the UltraWave unit from the center of the antenna (see Figure 16) to the ground's surface.
4. Aim the UltraWave unit at the second mounting post, and using an 8 mm (5/16 in.) nut driver or socket, tighten the gear clamp with the UltraWave 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. For UltraWave units that are separated by 50 m or less, use the alignment holes and adjust the pitch of both units to a 5º angle toward the ground (see Figure 15).

For a 5º mounting angle:

1. Loosen the 4 vertical adjustment bolts.
2. Line up the 2 alignment holes in the post collar and mounting bracket (example uses a pen).
3. Tighten the 4 vertical adjustment bolts.

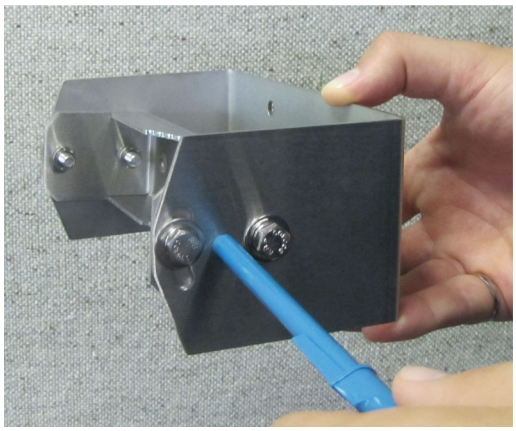


Figure 15 UltraWave mounting with a 5º angle

8. Repeat for the second UltraWave unit.

Initial post-mount alignment

For optimal performance, ensure that the UltraWave transmitter and receiver are aimed directly toward each other, and that the mounting height is correct for both units (see Figure 16).

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

1. Measure and verify the mounting heights of both units (center of antenna to ground).
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.

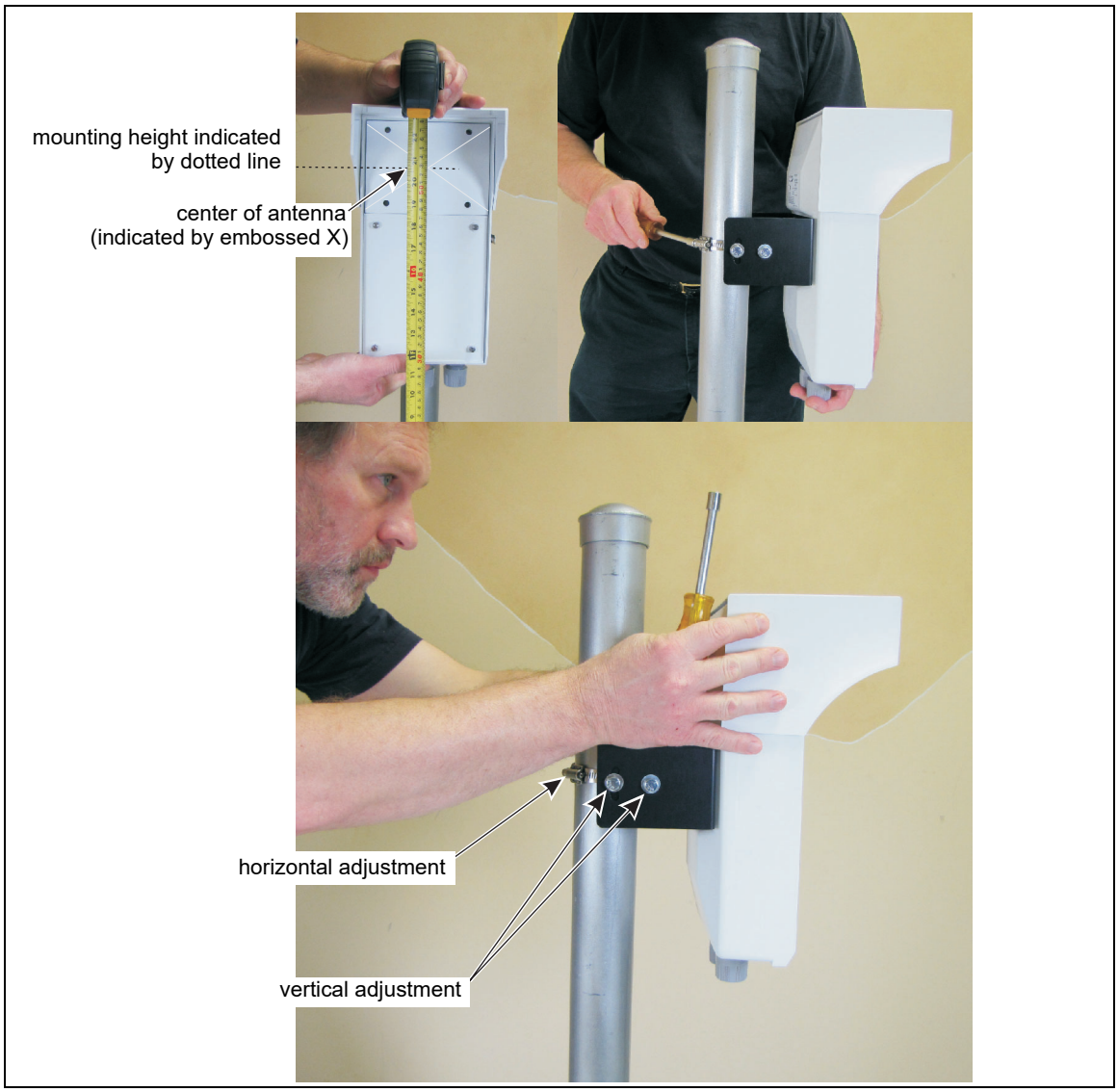


Figure 16 UltraWave alignment

Surface-mounting

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

The UltraWave 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 17). 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.

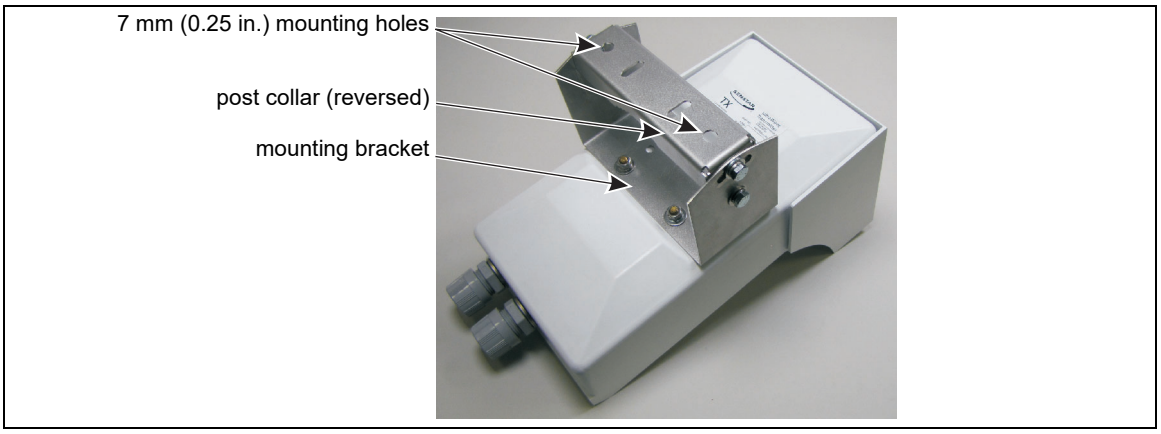


Figure 17 Surface mounting setup

3. Hold the UltraWave 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 UltraWave unit to the post collar.
7. Measure and verify the mounting height.
8. Mount the second UltraWave unit.

Initial surface-mount alignment

To ensure optimal performance, it is critical that the UltraWave 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 UltraWave 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 5º angle (toward the ground).

Transmitter/receiver wiring connections

The UltraWave 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 18 for an illustration of UltraWave relay output wiring and ground connection details. Figure 19 illustrates the input output wiring connection details for both Local control mode and Remote control mode.

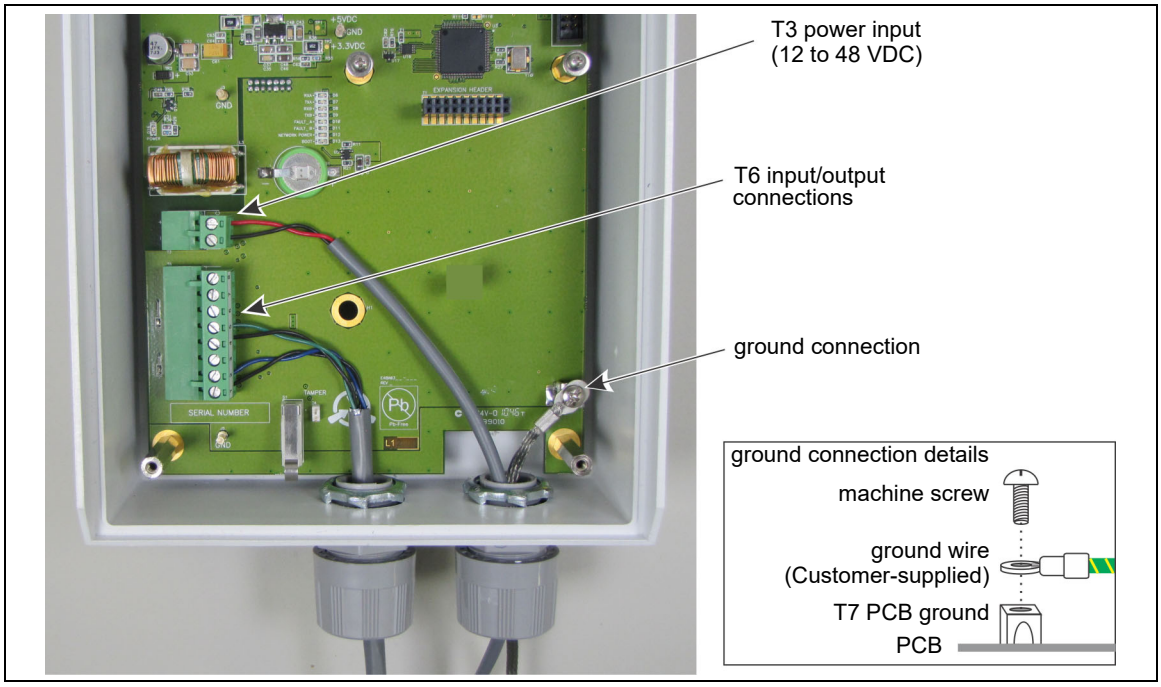


Figure 18 Relay output, power input and ground connection wiring (Rx & Tx)

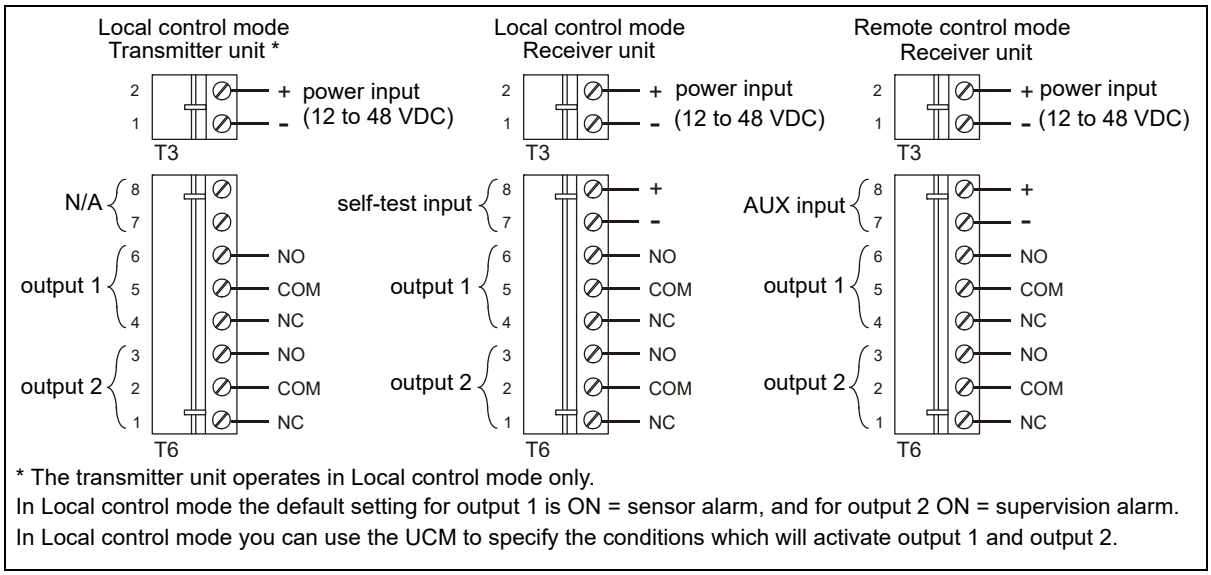


Figure 19 Transmitter/receiver wiring connections

T3 - power input

The UltraWave 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 19 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 6 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 19 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 (receiver unit)

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 UltraWave unit includes two 22 mm (0.875 in.) cable ports and two compression glands. Pull the cables through the compression glands, into the enclosure and through the locking nut. Then install the compression glands in the cable ports. After making the wiring connections, 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 18).

Enclosure tamper switch

Each UltraWave 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 UltraWave unit's installation location.
2. Connect the ground wire to the ground lug on the transmitter/receiver PCB (see Figure 18).

Power supply connection

WARNING!	DO NOT bring AC mains power into the UltraWave 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 power source.

- To power the system from a central source, run the power distribution cable around the perimeter and tap off to each UltraWave unit.
- At each UltraWave 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 18).

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 UltraWave 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 18).

Power over Ethernet

For power over Ethernet, a class 3 PoE switch is required. In this configuration, minimum Category 5 cable is also required and the maximum distance between the UltraWave transmitter/receiver and the PoE switch is 100 m (328 ft.). Each unit receiving PoE requires an earth ground connection. To use PoE, connect the PoE switch to the Ethernet port on the NIC (T1) and then connect the NIC's power output (T2) to the power input on the transmitter/receiver unit (T3).

CAUTION	The PoE NIC is intended to supply power only to the transmitter/receiver on which it is mounted. It is not recommended to use the PoE NIC to power an auxiliary device.

Silver Network alarm data communications

Note	A network interface card must be installed on the UltraWave 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 26).
8. Reconnect the power and replace the enclosure cover.

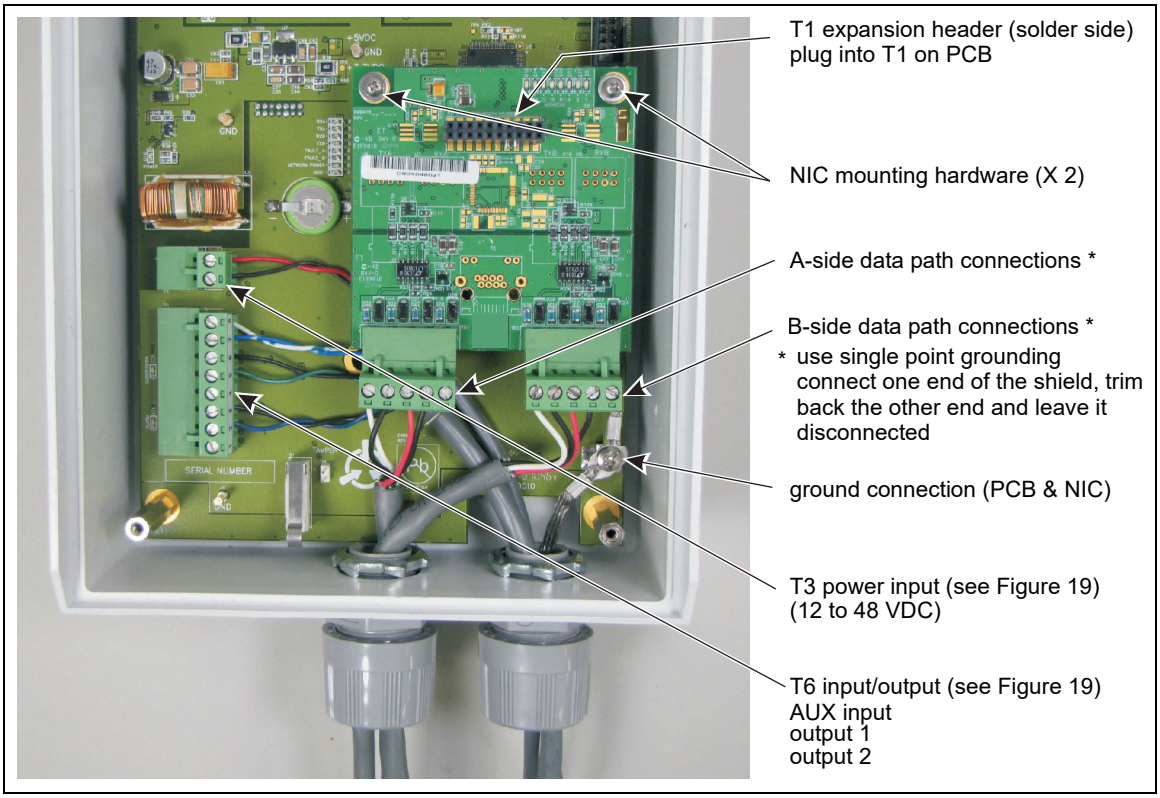


Figure 20 Receiver unit Silver Network wiring connections

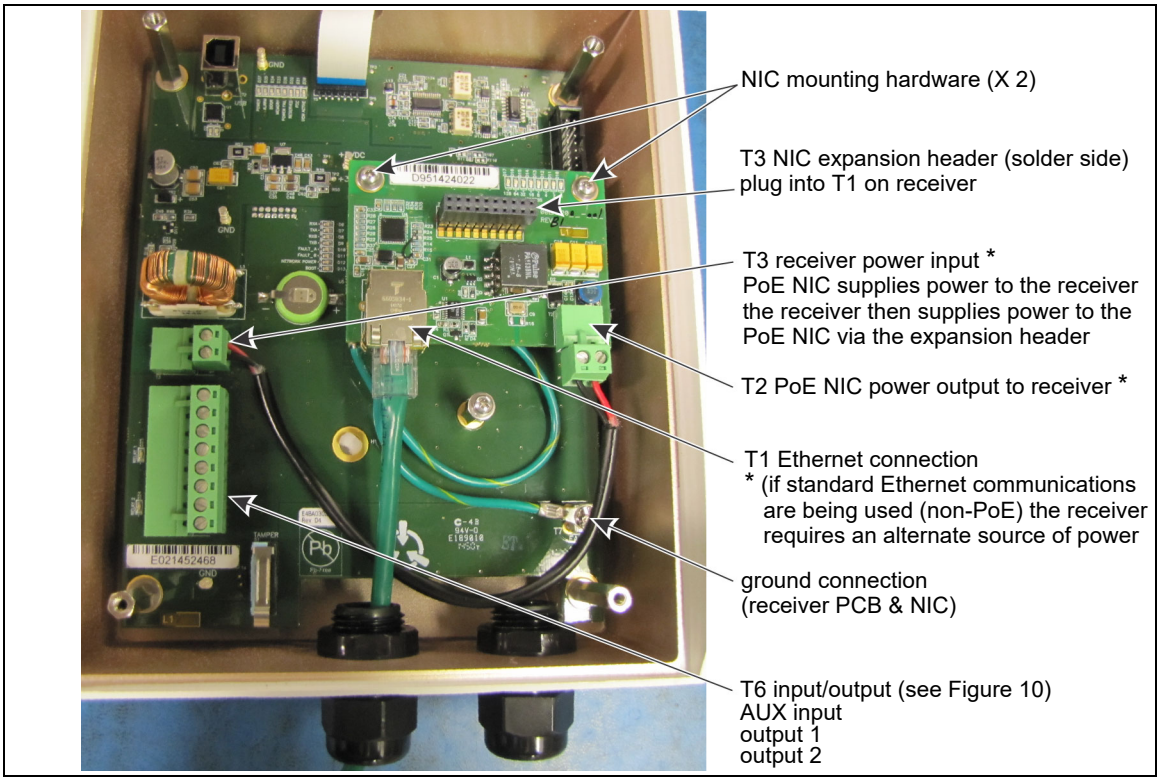


Figure 21 Receiver unit PoE NIC Silver Network connections

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 using the Silver Loop configuration. Figure 22 shows the network connections and data flow directions for the EIA-422 and fiber optic communication options. Figure 26: illustrates an Ethernet based Silver Network using the Star configuration:

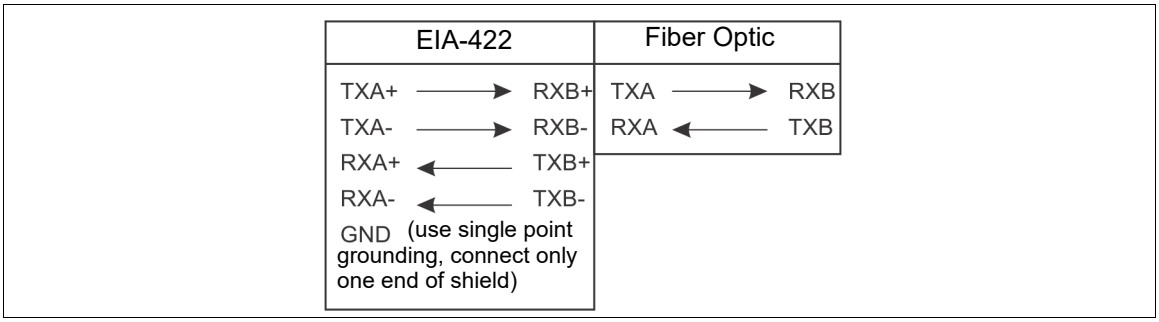


Figure 22 Silver Network connections

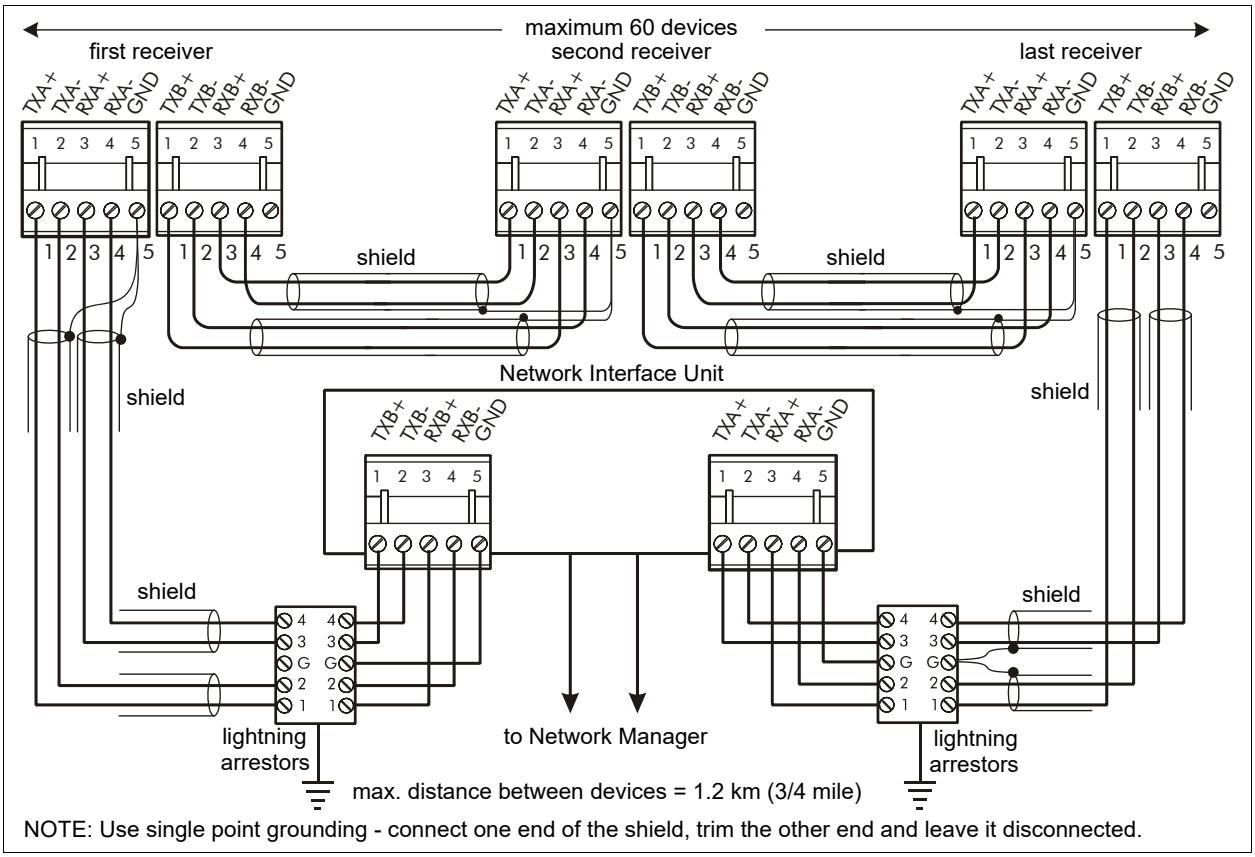


Figure 23 Silver Network EIA-422 wiring diagram

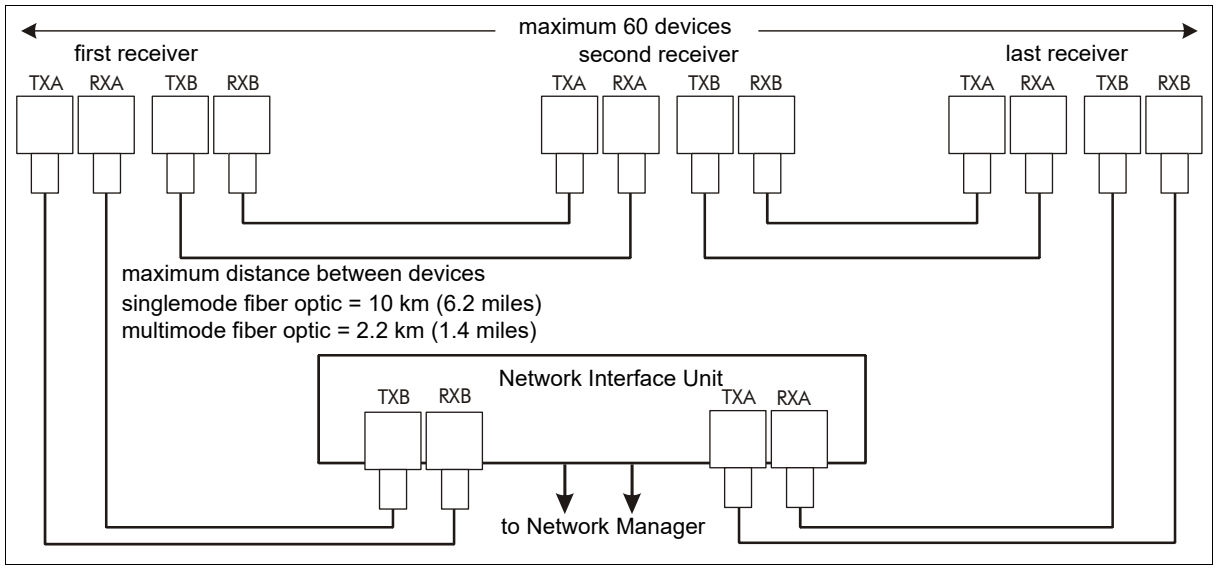


Figure 24 Silver Network fiber optic wiring diagram

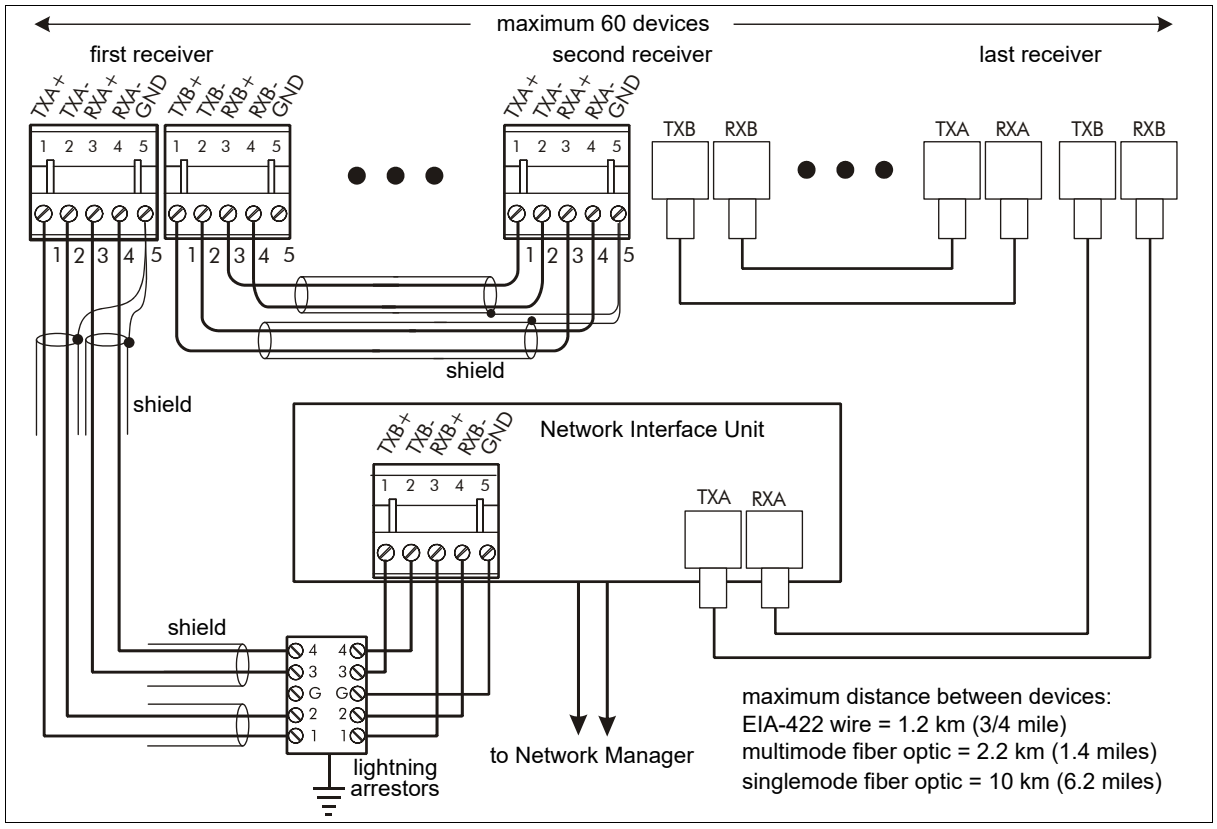


Figure 25 Silver Network mixed media wiring diagram

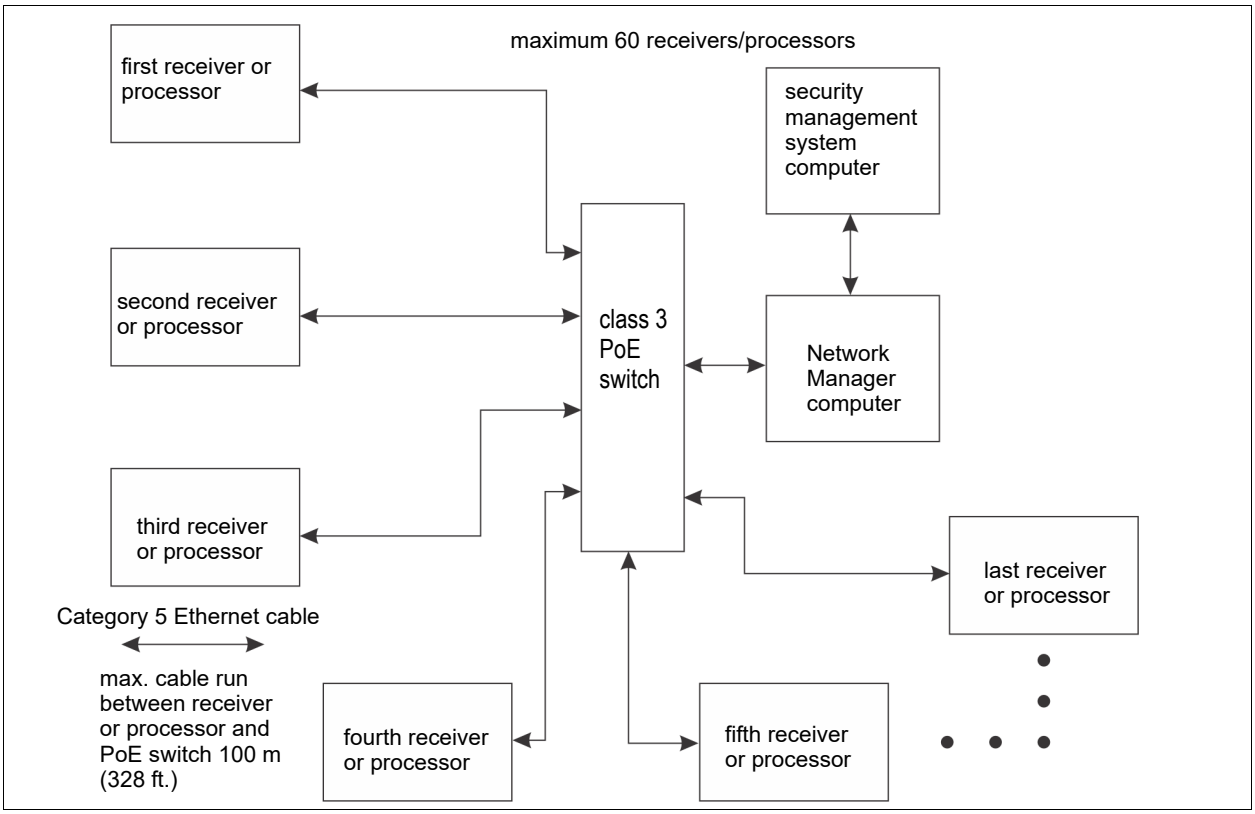


Figure 26: Silver Network Ethernet wiring diagram

Stacking UltraWave units

To increase the height of the microwave field, it is possible to stack two, or three, UltraWave 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 UltraWave 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 27 illustrates the wiring connections for a double stacked UltraWave configuration. Figure 3 illustrates a triple stack UltraWave system.

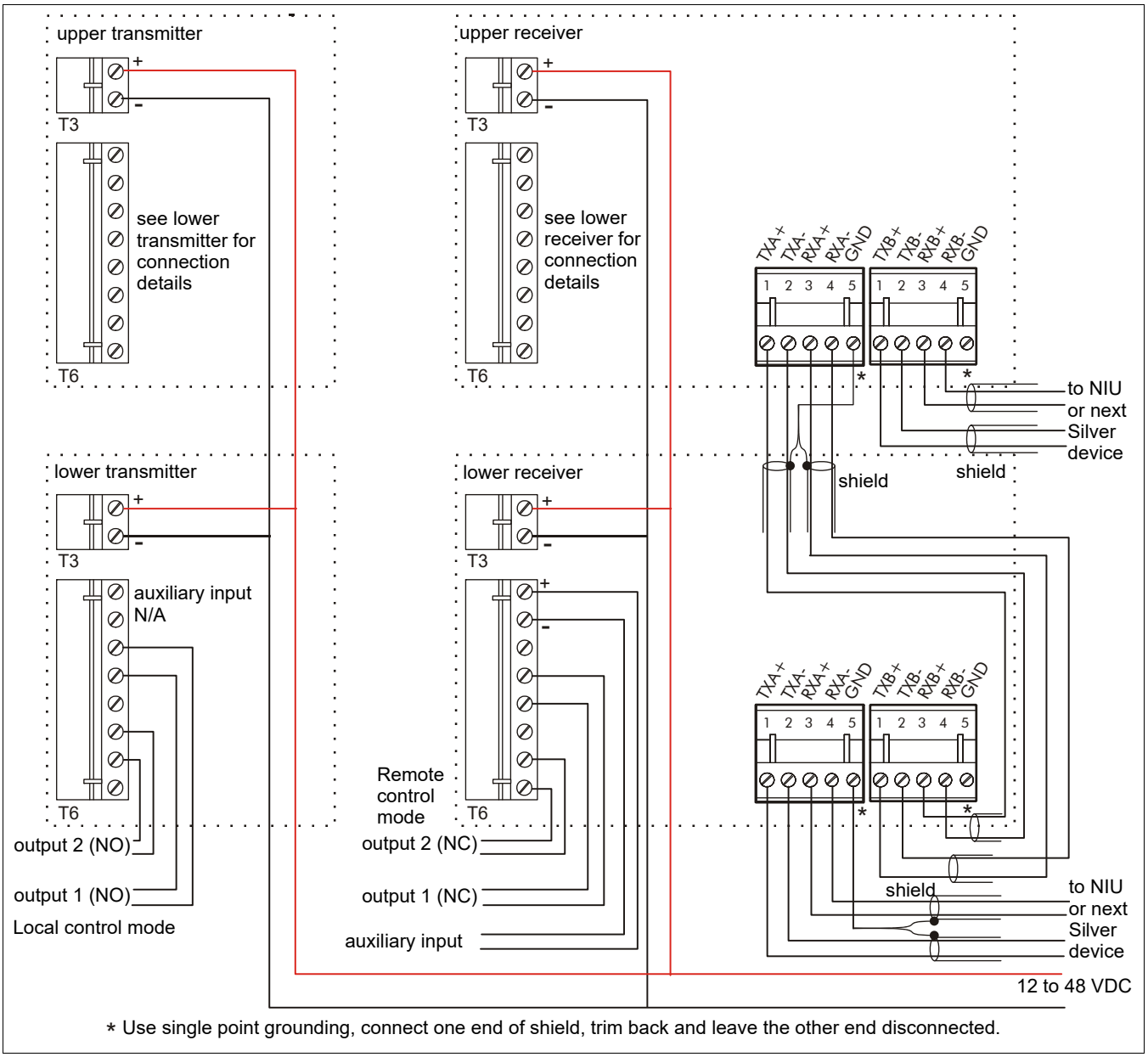


Figure 27 Double stack UltraWave wiring diagram

3 Setup and calibration

Setup

Note	UltraWave setup and calibration should be performed by a qualified technician.

UltraWave 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 UltraWave unit via USB. Network based UltraWave receivers can also connect remotely via the Silver Network Manager.

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

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

The UltraWave 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 UltraWave 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 UltraWave 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 UltraWave receiver will auto-calibrate to provide the best possible received signal strength (see Receiver calibration on page 38).

Connect the UCM and specify the Locale

1. Remove the lower cover from the UltraWave 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.

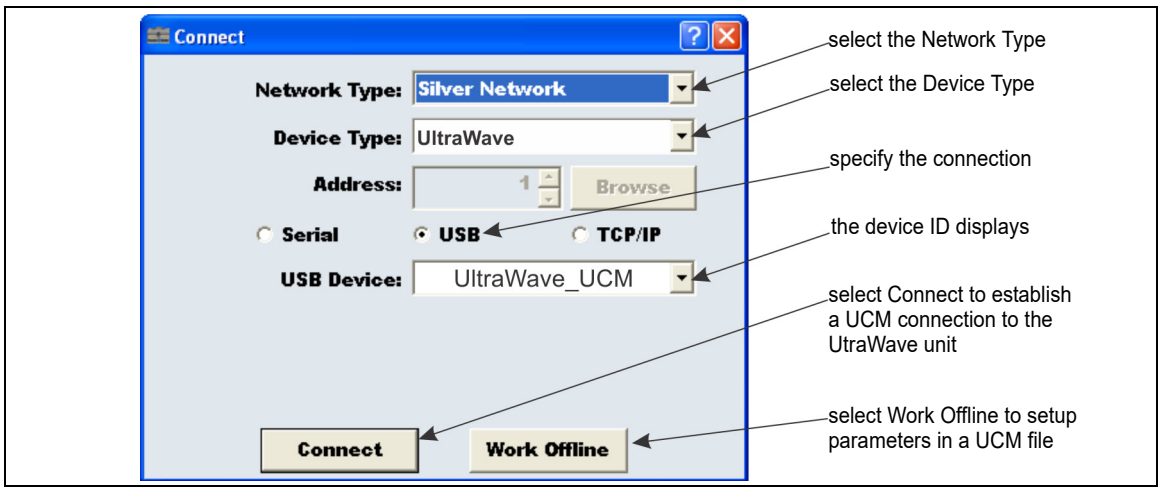


Figure 28 Connecting the UCM

Note It is also possible to connect the UCM to the UltraWave receiver remotely through the Silver Network Manager (see Figure 29).

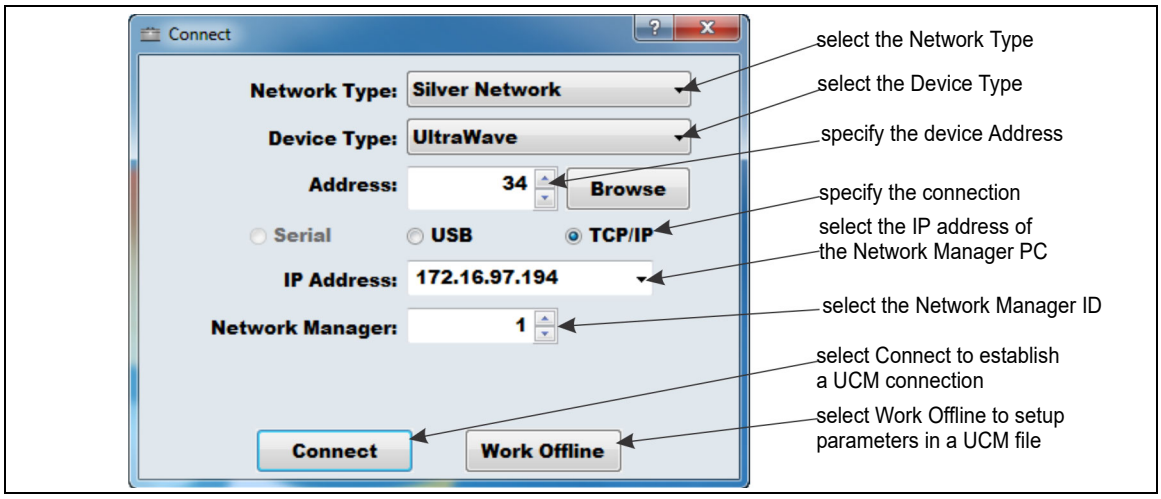


Figure 29 Connecting the UCM

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 UltraWave will not operate until both the transmitter and receiver have the Locale specified.

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

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

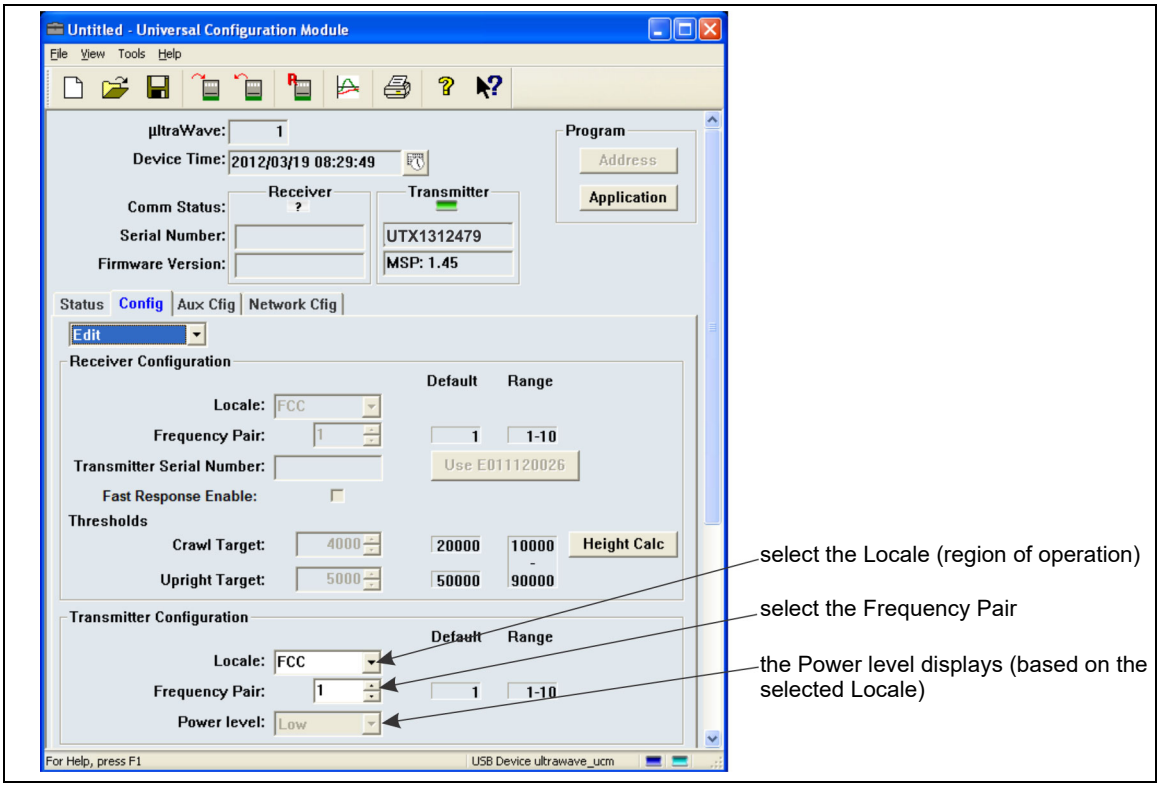


Figure 30 UCM Config tab (transmitter unit)

2. If required, use the arrows to specify the Locale for this UltraWave sensor (transmitter and receiver).

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

3. In the Frequency Pair field, use the arrows to specify the Frequency Pair that will be used for this UltraWave sensor (transmitter and receiver).
4. Save and download the configuration changes to the transmitter 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.

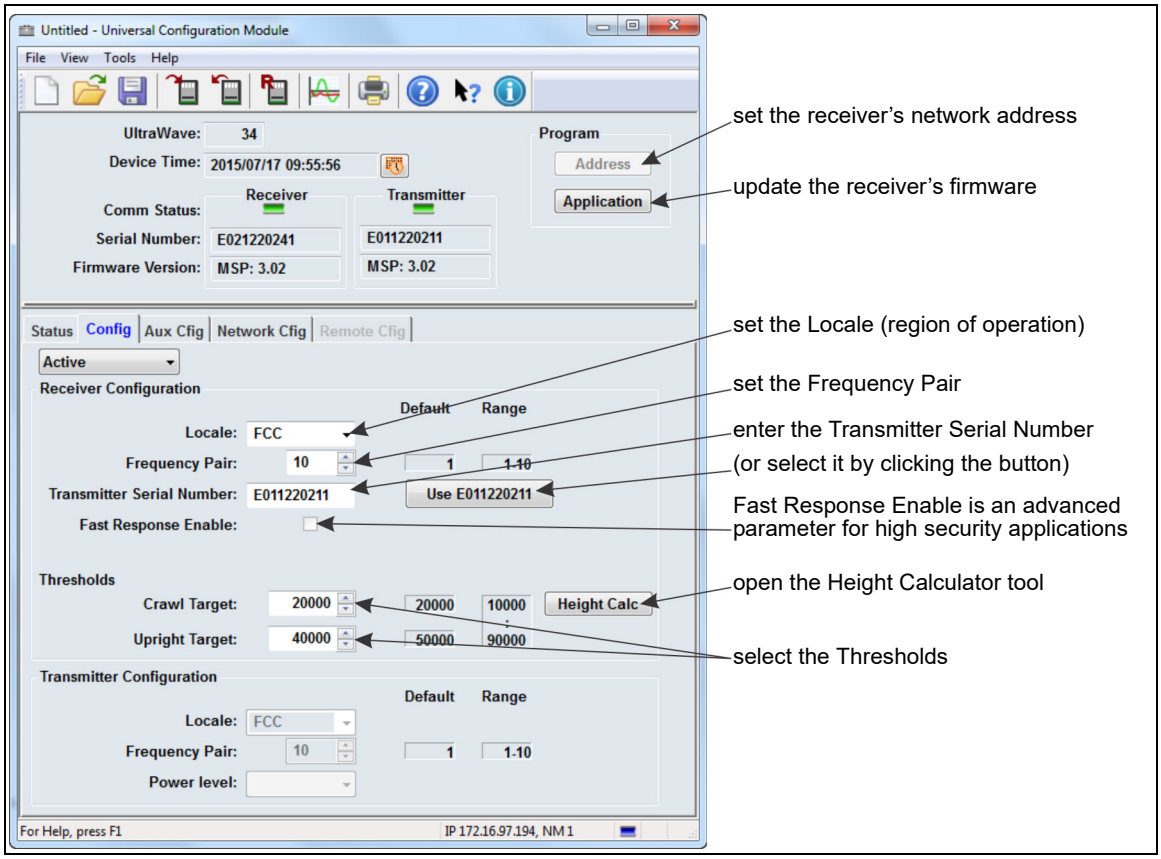


Figure 31 UCM Config tab (receiver unit)

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.)

Note	Fast Response Enable is a parameter that is used to bypass the sensor's advanced signal processing algorithms. When Fast Response is enabled, UltraWave functions like a classic analog microwave sensor. An alarm is triggered when the microwave signal exceeds the Threshold setting. The Fast Response channel provides early alarm notification, but can also cause an increase in the sensor's nuisance alarm rate (NAR). Fast Response is intended for use in high-security applications that include a sterile zone. However, Fast Response should NOT be used in Sally Port areas.

5. If desired, select the Fast Response Enable checkbox to increase the speed at which the Ultrawave sensor reports a microwave alarm.

6. 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 raise an alarm Threshold to decrease the sensitivity to the specified type of intrusion, or you 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.

7. 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 UltraWave 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 UltraWave 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 Loop, Silver Star, 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).
   For the Silver Star you specify the IP Address, the Subnet Mask and the Gateway IP Address (if required).
3. Save and download the configuration changes to the processor.

Specify the Auxiliary I/O control mode

Specify the control mode for the UltraWave 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 UltraWave 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 6 includes the selectable Remote Control input wiring configurations, and Table 7 includes the selectable supervision resistor values.

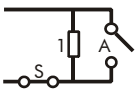
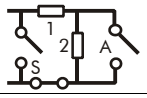
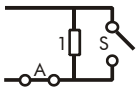
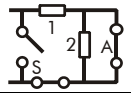
Input option	UCM selection	Alarm relay	Supervision relay	R1	R2
unsupervised		NO	---	---	---
single resistor supervision		NO	NC	5.1 k	---
dual resistor supervision		NO	NO/NC	4.3 k	820
unsupervised		NC	---	---	---
single resistor supervision		NC	NO	5.1 k	---
dual resistor supervision		NC	NO/NC	5.1 k	820

Table 6 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 7 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 UltraWave 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 UltraWave 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 UltraWave 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.

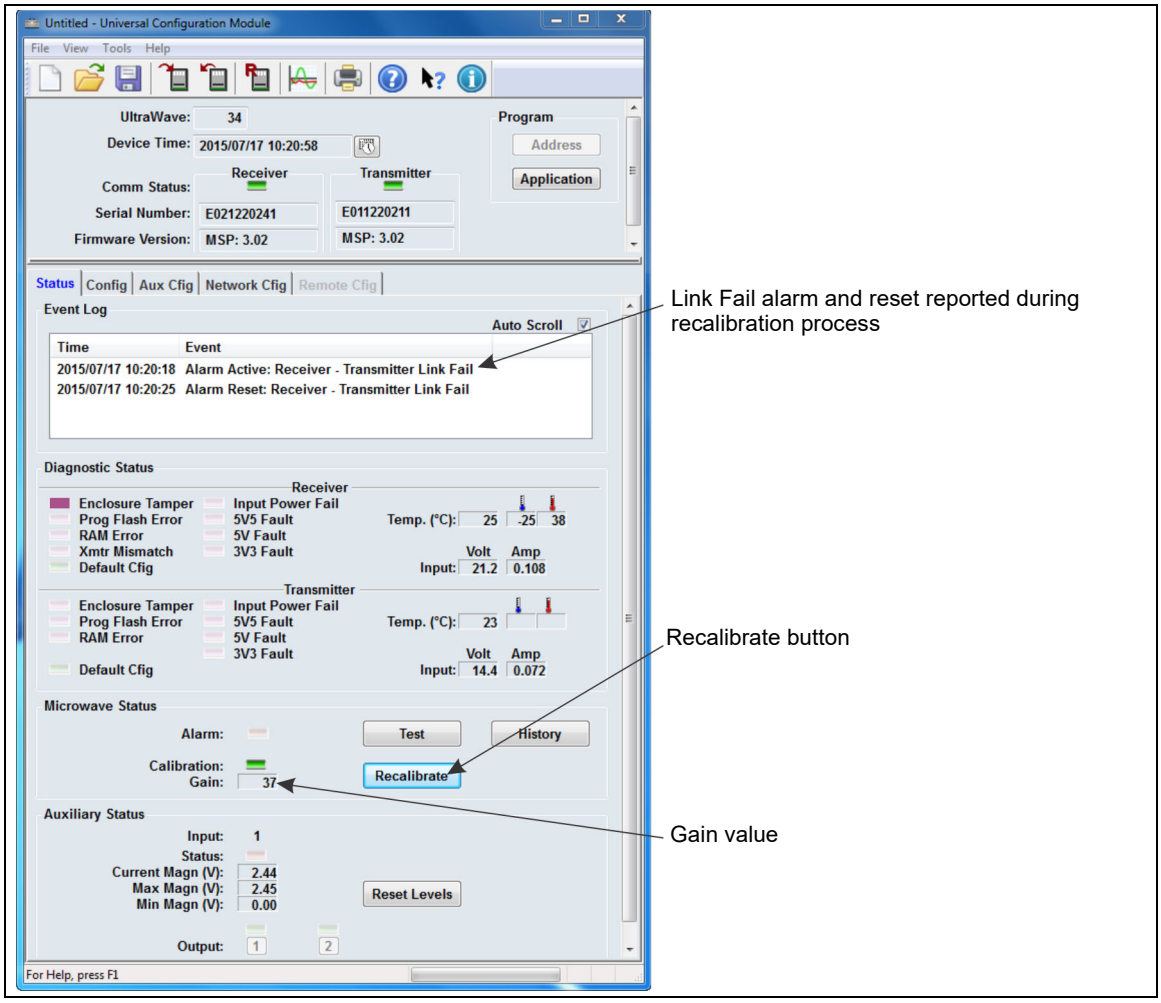


Figure 32 UCM Status tab

Optimizing the alignment

Typically, the initial alignment of the UltraWave 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.

Note	See Verifying the UltraWave alignment on page 43 for information about using the unit's received signal strength indicator LEDs.

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 UltraWave sensor. The type of tests recommended to verify the proper operation of the UltraWave system depends on the type of installation, and your site specific security requirements (see Site design on page 5). 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 8 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 33 is a flow chart of UltraWave calibration testing.

1. Start the UCM and establish a connection to the UltraWave 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.

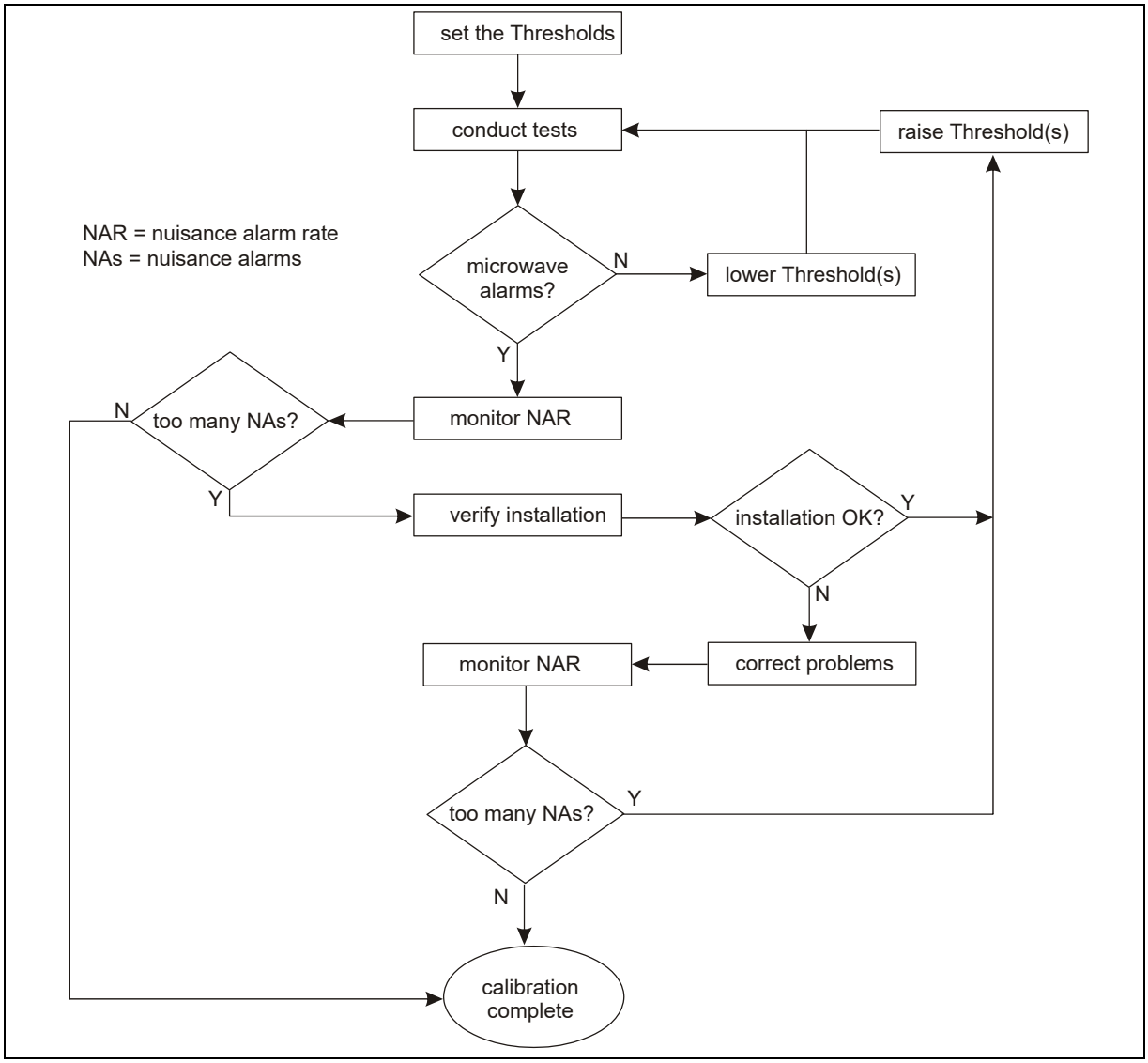


Figure 33 UltraWave verification test flow chart

4 Maintenance

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

UltraWave 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).

UltraWave 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.

UltraWave testing

The amount and type of testing depend 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 39).

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

For UltraWave 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 UltraWave 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 UltraWave 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 UltraWave units.

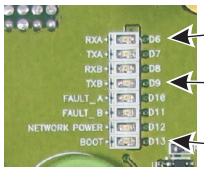
Correcting nuisance alarm problems

If an UltraWave 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 UltraWave alignment

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



D6 - maximum received signal strength (operational range D9 to D6)

D9 - minimum operational signal strength

D13 - minimum received signal strength

Figure 34 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.)
	Mounting post size (OD)	• 4.8 to 11.4 cm (1 7/8 to 4 1/2 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	• 13º (horizontal) • 13º (vertical)
	Operating temperature	• -40º to +66ºC (-40º to +150º 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

b Parts list

Component	Part Number	Description
UltraWave microwave sensor system		
UltraWave sensor system	E4FG0101	UltraWave transmitter and receiver pair with two mounting kits and four cable glands
UltraWave transmitter unit		
transmitter unit	E4EM0101	replacement transmitter unit with mounting kit and two cable glands
UltraWave receiver unit		
receiver unit	E4EM0201	replacement receiver unit with mounting kit and two cable glands
UltraWave 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)
UltraLink	00FG0220	UltraLink 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

Component	Part Number	Description
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
Network Interface Card (Power over Ethernet)	00BA2200	PoE network interface card for Ethernet communications and power (Silver Star configuration)
UltraWave documentation		
documentation CD	E4DA0120	UltraWave product documentation CD

c NM Mode

The UltraLink I/O processor can be configured to operate in Network Manager Mode (NM Mode). In NM Mode, the UltraLink I/O processor functions as the Network Manager, providing alarm outputs for a connected network of up to eight Silver devices. In NM Mode, the Silver devices do not require a connection to a PC running Silver Network Manager software. The supported Silver devices include UltraWave, FlexZone, FlexPS, OmniTrax, XField and XField LT. Sensor alarms and supervision conditions are assigned to UltraLink I/O outputs (relay or open collector). When an alarm occurs on a connected sensor, the corresponding UltraLink I/O output is activated. If Multiple alarm conditions are assigned to a single UltraLink I/O output, the conditions are OR'd. A maximum of four output expansion modules can be used in NM Mode enabling up to 136 distinct output points.

Note	NM Mode supports only the Silver Loop configuration. The Silver Star configuration (PoE NIC) cannot be used with NM Mode.

Use NM Mode to setup a network of up to eight Silver Network based sensors that will report alarm, supervision and diagnostic conditions via UltraLink I/O outputs. The 4 onboard relays on each sensor are also available for use in NM Mode. UltraLink I/O inputs are not used in NM Mode. Figure 35: illustrates an UltraLink I/O system operating in NM Mode with eight connected sensors and a temporary connection to a Silver Network Manager to enable remote maintenance access.

Note	The UltraLink I/O output point assignments for each node are made at the sensor level through a direct UCM (USB) connection to the sensor (or via a temporary remote connection to the Silver Network Manager). Each sensor allows the user to specify the alarm, supervision and diagnostic fault conditions, and the UltraLink I/O outputs they activate. The Aux Control for each sensor must be set to Remote control mode.

Note	The UltraLink processor's Silver Network address is not used in NM Mode, and does not count against the NM Mode address limit of 8 nodes. By convention, set the UltraLink I/O processor's Silver Network address to 9.

Note	The output activation buttons located below the outputs on the UCM status screen do not function in NM Mode.

Note	Each sensor connected to the UltraLink I/O system (operating in NM Mode) requires a Network Interface card with the exception of a connected block of FlexZone processors. For a connected block of FlexZone sensors, one FlexZone requires an NIC to connect to the UltraLink I/O processor and the other FlexZone processors can communicate over the sensor cables.

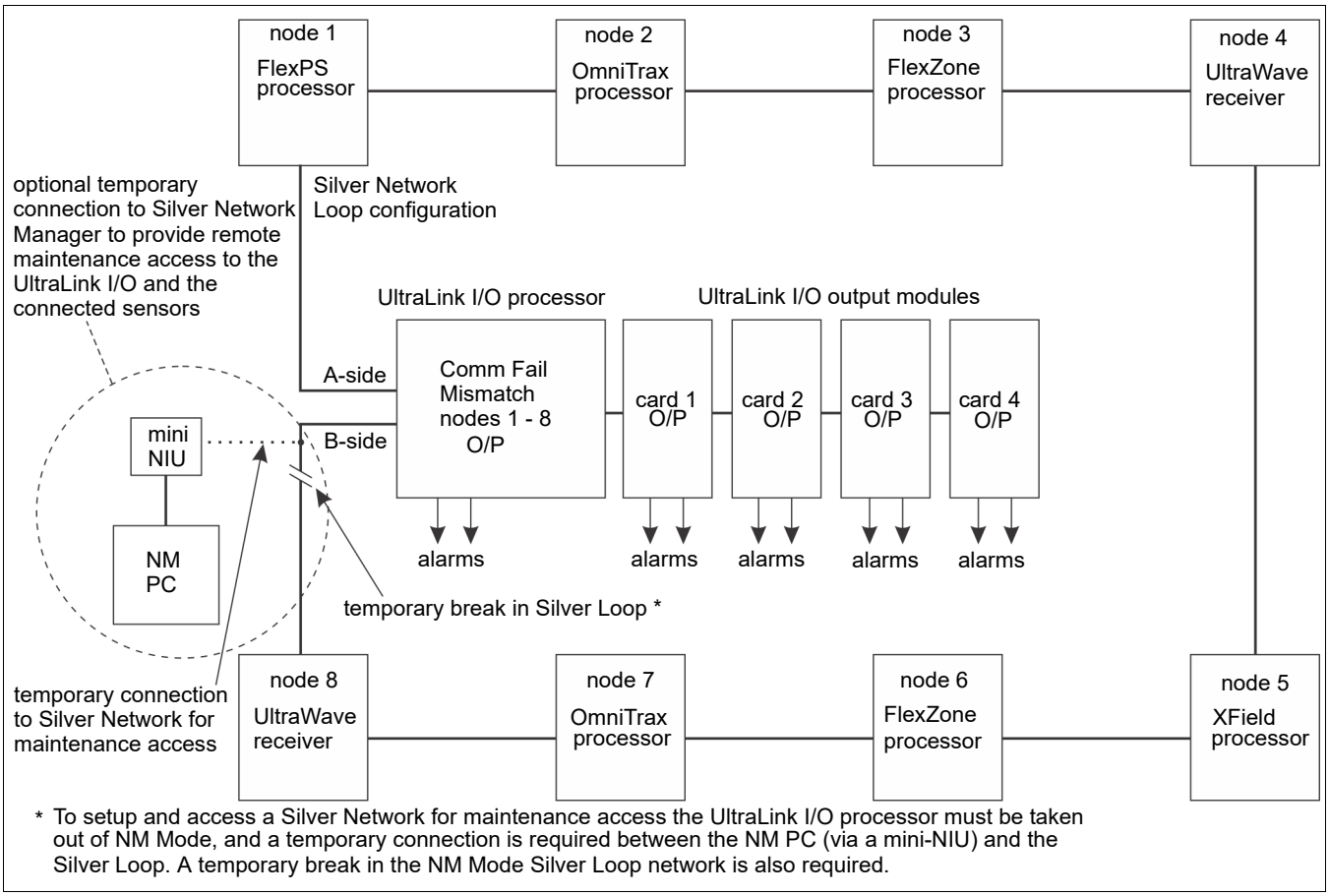


Figure 35: NM Mode block diagram

UCM configuration

To use UltraLink modular I/O system outputs to report UltraWave alarm and supervision conditions establish a UCM connection to the UltraWave receiver.

Note	Refer to the UltraLink Modular I/O system instruction sheet and the UCM help file for additional details on NM Mode operation.

Select the Remote Cfig tab and specify the outputs that will activate to annunciate the required alarm and supervision conditions (see Figure 35:).

Note	Output assignments for Comm Fail and device mismatch for each connected device are made via a UCM connection to the UltraLink processor (see 00DA1003-002).

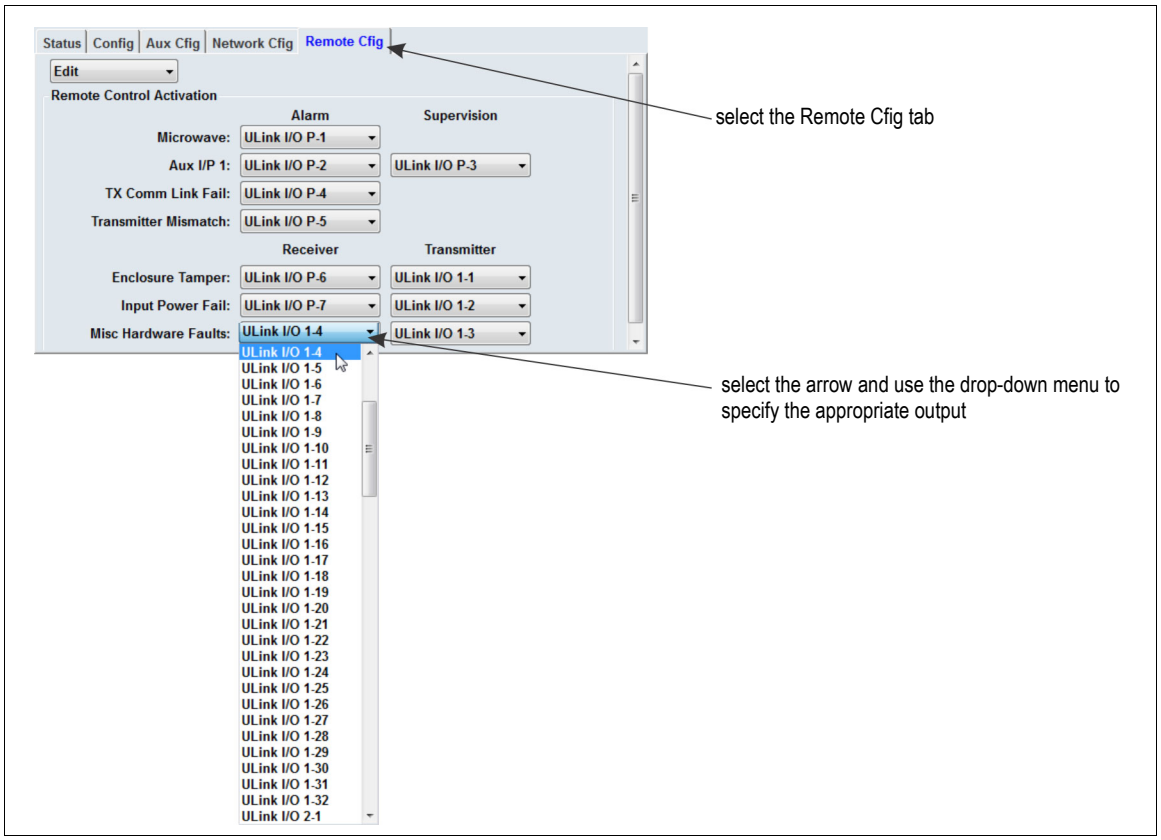


Figure 36: Setting up the Remote Configuration outputs