Zebra Enterprise Solutions

WhereLAN III

LOS-5000

User's Guide

Typographical Conventions

Warnings call attention to a procedure or practice that could result in personal injury if not correctly performed. Do not proceed until you fully understand and meet the required conditions.

Cautions call attention to an operation procedure or practice that could damage the product, or degrade performance if not correctly performed. Do not proceed until understanding and meeting these required conditions.

Note

Notes provide information that can be helpful in understanding the operation of the product.

Document Revision History

Revision	Description of Changes	Date	Approved
A	Initial Release	10/20/10	GLC

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1 DOCUMENT OVERVIEW

This document describes the basic configuration and recommendations on physical installation of the Location Sensor product. The site design and placement is detailed in the Location Sensor Placement Guide D0406 and WhereLAN III Installation Guide D1677.

2 PRODUCT DESCRIPTION AND FEATURES

The WHERELAN III is the next generation of WhereLAN product that receives the signals transmitted by WhereTags (ISO 24730-2), which are attached to the tracked assets. The WHERELAN III has improved performance and uses less power than the previous, WhereLAN Location Sensor. The received tag blinks are decoded, time stamped, and routed to a PC or ZLA (Zebra Location Appliance) for additional processing. The locate algorithm running on the PC or ZLA calculates the tag position based on the time stamps of multiple Location Sensors, and reports that position to the database where it is displayed by Resource Manager.

There are three base WhereLAN III configurations:

- LOS-5000-00AA(Wired Ethernet, POE 802.3af compliant)

- LOS-5000-00AB (with 802.11b/g Wireless LAN Client, POE 802.3af Compliant)

- LOS-5000-01AA (no embedded transmissions, Wired Ethernet, POE 802.3AF Compliant)

Both the LOS-5000-00AA and LOS-5000-00AB configurations also include a low power an embedded transmitter, which complies with the ISO 24730-2

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standard, is used to distribute configuration data, health, and timing signals to other Location Sensor units.

The embedded transmitter uses channels, both left and right, for transmit and receive, which is not compatible with the legacy LOS/LAP 4000 series WhereLAN products. However by default the WHERELAN III will be shipped in G2 emulation mode, and in site launch with system builder the user will be able to select full WHERELAN III mode to take advantage enhanced features, if not being used to replace WhereLAN infrastructure. *Note: The LOS-5000-01AA has this embedded transmitter function disabled.*

3   PRODUCT SPECIFICATIONS

3.1   Mechanical

Size:	10.3 x 1.7 x 12.0	in (HxDxW)
	261 x 43 x 305	mm
Weight:	7.0	Lbs
	3.2	Kg

3.2   Electrical

Voltage:	36 to 57	Vdc
	48V nominal	

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Current:	.350 (max)	Amps
Power Dis.:	13.0 (max)	Watts

Power: Can be powered by a Zebra approved, Limited AC to DC Power Supply or Power Over Ethernet (POE). *See Accessories List*

3.3 Environmental

Operating Temp.[1]:	-40 to +60	°C
Storage Temperature:	-40 to +70	
Ingress Protection:	54	IP
	TBD	NEMA
Humidity	0 to 100 %	Non-condensing

[1] See power supply limits

3.4 External Connections

Antenna (2):	MCX (Jack)
DC Power:	2.5 ID/ 5.5 OD mm (Jack)
Opt. WiFi Antenna:	SMB (Jack)
Ethernet:	RJ45 (Jack) 10/100 and 802.3af POE
Timing (3):	RJH (4 wire telephone handset, Jack)

The Location Sensor utilizes standard 10/100 802.3 Ethernet connectivity via cat 5 cables. The WhereLAN III must be wired to a nearby hub, which is in turn connected to the network containing the database CPU. The maximum

Ethernet cable run is 328 ft (100 m). If additional distance is required, hubs, repeaters, and fiber (with 10baseT converters) can be used to extend the distance. Refer to IEEE guidelines for Ethernet cabling. It is also compliant with 802.3af POE standard.

4   ACCESSORIES

The accessories indicated below are required to complete the installation of the Location Sensor. Ordering information is supplied where applicable.

Note: Not all accessories are globally available. Check with local sales representative regarding availability.

Accessories	Model Number
• All Weather Omni Antenna[1] (standard)	AK-210-10
• Office Omni Antenna[1] (indoor only)	AK-110-10
• DC power cable extender, 50 ft, Plenum Rated **(Indoor Only)**	PX-010-00
• DC power cable extender, 50ft., Outdoor Rated.	PX-050-00

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- Power Over Ethernet injector   TBD

- Power Supply   PS-040-00

- Power Supply (Extended Temp)   TBD

- Pole Mount Kit: TBD

5   CONFIGURATION & CONTROL

5.1   Location Sensor Self Boot

Upon power up, the Location Sensor executes a self boot process.   The boot process takes between 45 to 60 seconds. If a fault occurs during the boot process, the unit may reset and restart the boot process. During that process, the four LEDs blink in a sequence to indicate the current stage of the power up boot process. Once the boot process is complete, the LEDs revert to their standard functions indicating power/health, tag status, Ethernet, and WLAN**.**

5.2   Location Sensor Interface

After the Location Sensor has completed its boot process, it is possible to communicate with the unit via the following methods.

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Note

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Do not attempt to communicate with the Location Sensor until it has completed the first stage of the boot process (i.e., left LED is solid). Doing so will stop the boot process. The unit must be reset to clear this condition.

These units are configured using:

- Telnet/SSH via Ethernet (preferred)
- iSensor (Sensor Analyzer)
- WhereWand
- Hyperterminal (or any terminal emulation software) via serial port

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Telnet/SSH is the preferred method of communicating with the Location Sensor, once installed. Use the HyperTerminal is for initial set-up before being installed on a network for setting static Ip addresses, if DHCP is not used.

Telnet via Ethernet

Communication Parameters:

- 10/100 Mb/s

- Cat 5 cable/ RJ-45 plug To connect via telnet, open a DOS command prompt window and type telnet <IP address>,where the IP address is iSensor (Sensor Analyzer)

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Hyperterminal via Serial Port

Communication Parameters:

- Null-modem cable, 9-pin female to 9-pin female

- 19200 baud

- 8 data bits, 1 stop bit, no parity, no hardware flow control

Hyperterminal is used in only two instances. The first is for initial configuration in which the Location Sensor has been configured for DHCP but there is no DHCP server available. The second instance is if a fault occurs during the first stage of the boot process, or if visibility to the boot process is needed for debugging installation problems.

5.3 Location Sensor MAC/ IP Address Configuration

Location Sensors communicate over an Ethernet interface using TCP/IP. For the LOS-5000-00AB, both the Location Sensor and the embedded Client Card must be independently configured with their own unique IP addresses. The IP address of each LS must be recorded and entered into the ZES site file, which contains the configuration information for each LS, including its location, and MAC address.

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Failure to configure the Location Sensor prior to operation may result in an inoperative unit.

Each Location Sensor is shipped with a label set containing one label (Figure 1) with the bar coded MAC address of the Location Sensor and Wifi Client

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and three labels with the last six characters of the Location Sensor's MAC address in large type. Ensure that the label is correct by matching the MAC address(es) on the loose label set with the MAC address(es) listed on the back of the Location Sensor. Place the loose bar code label in the site design document where indicated, and place one or more of the large type, six character labels on the exterior of the Location Sensor in positions that are visible after installation.

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Note   **The MAC address label must be clearly marked on the exterior of the**
_____   **Location Sensor housing in a position visible after installation.**
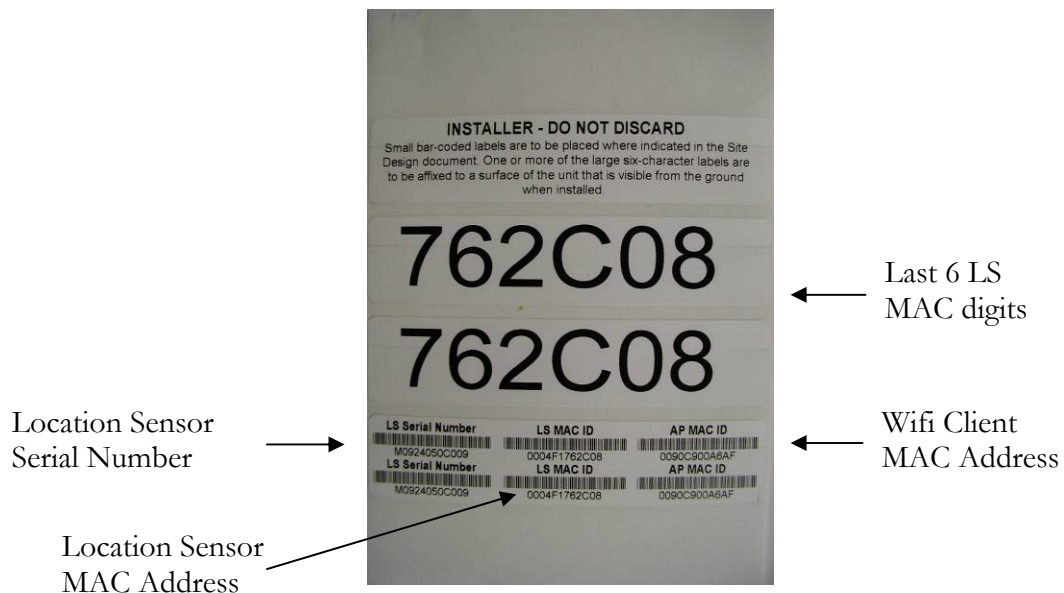

Figure 1   Example of LOS-5000-00AB Label

Like other network equipment, the Location Sensor IP address(es) must be set to a predetermined address. While there is no restriction to the IP address, it

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must match the address in the Site file for that particular Location Sensor.

The IP address(es) can be static assigned, or dynamically assigned via DHCP.

If assigned through DHCP, the DHCP server must contain the MAC address

and corresponding IP address for each of the Location Sensors (and WLAN

Client).

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For networks utilizing DHCP, the MAC addresses of the Location Sensor and Wifi Client (LOS-5000-00AB only) must be entered in the DHCP server.

To configure the IP address of the Location Sensor:
*Note the following configuration examples are done thru HyperTerminal.*

- Connect to the Location Sensor using Telnet (preferred), or HyperTerminal.

- Select 1 and confirm the unique MAC address for the Location Sensor.

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- Select 1 for setting Boot Method, Flash for internal image or Network for image.

- Select 2 for wired LAN Port IP setting or 3 WLAN client IP/DHCP setting.
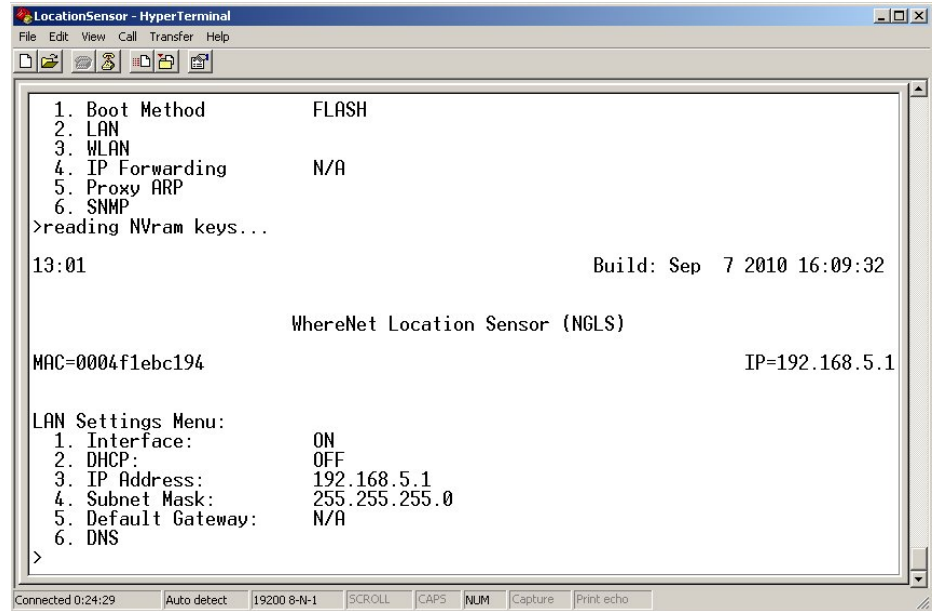
- Save the configuration changes by using ESC key entering the password "ff2".

- Note Changes take effect on unit reboot/reset.

- Confirm communication to the Location Sensor by "pinging" the device from a DOS prompt.

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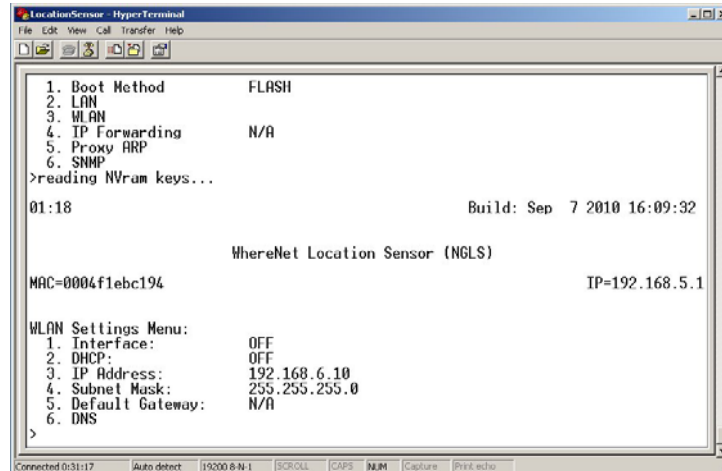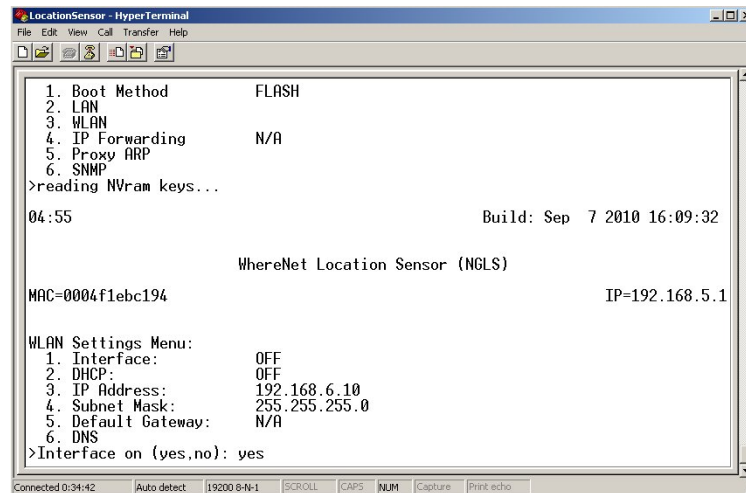## 5.4   WLAN Client Configuration (LOS-5000-00AB only)

The WLAN embedded in the Location Sensor must be configured with the proper IP address and Interface must be ON.

- Under Ethernet Menu select 3 WLAN

- Set 1. Interface to ON, then IP/DHCP settings.

- Save the configuration changes by using ESC key entering the password "ff2".

- Note Changes take effect on unit reboot/reset.

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6 MOUNTING OVERVIEW

The site design specifies the location of the Location Sensor(s) to provide optimum system performance. It is critical that the Location Sensor is mounted in a position which provides good RF visibility to the tracked assets. Thus the Location Sensor must be mounted exactly in the position specified in the site design document.

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Failure to mount the Location Sensor in the exact position specified in the site design will result in erroneous or non-locates of the tracked assets.

The Location Sensor can be hung using nut pocket on top for attachment to accept a 3/8 in (10 mm) threaded rod and jam nut, useful when using a beam clamp type of hanger. A pole mount hardware kit is available separately, ZES Part Number **RM-TBB Mounting Bracket, Pole Mount**.

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For safety it is strongly recommend that a Safety Lanyard be employed with either mounting method.

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6.1   3/8ths Threaded Rod

The Location Sensor can be hung via a 3/8 inch (10 mm) threaded rod per the following instructions. The required supports, threaded rod, nuts, etc., are not included.

- Cut the threaded rod to the desired length and install it directly above the desired Location Sensor position.

- Thread one nut up 2 in (50 mm) from the bottom of the threaded rod, with Lock Washer and Washer.

- Place the second nut onto threaded rod, flush with the end of the threaded rod and install the Location Sensor.

- Tighten the upper nut down on top of the Location Sensor housing.
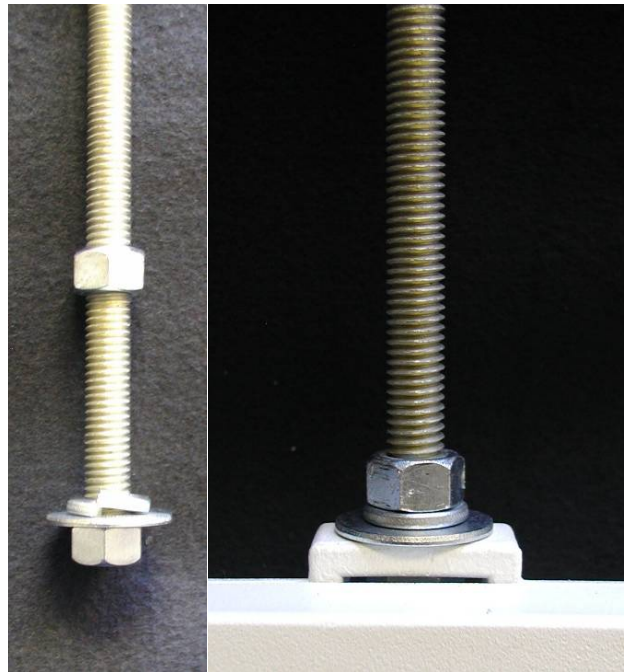
Figure 2 Threaded-Rod

Figure 3 Safety Lanyard 2

For Location Sensor installation using the Threaded Rod Mounting, it must also be secured to the building infrastructure with a safety cable through the Wall Mount/Pole Mount bracket key holes.

6.2   Pole Mount

The required pole mount kit, catalog number RM-410-00, must be ordered separately. The Location Sensor can be mounted to a pole per the instructions included with the pole mount kit.

Figure 4 Pole Mount

Note: For Location Sensor installation using the Pole Mount Bracket, it must also be secured to the Pole structure with a safety cable through the 3/8" Rod Mounting hole as indicated in the figure above.

7   ANTENNAS

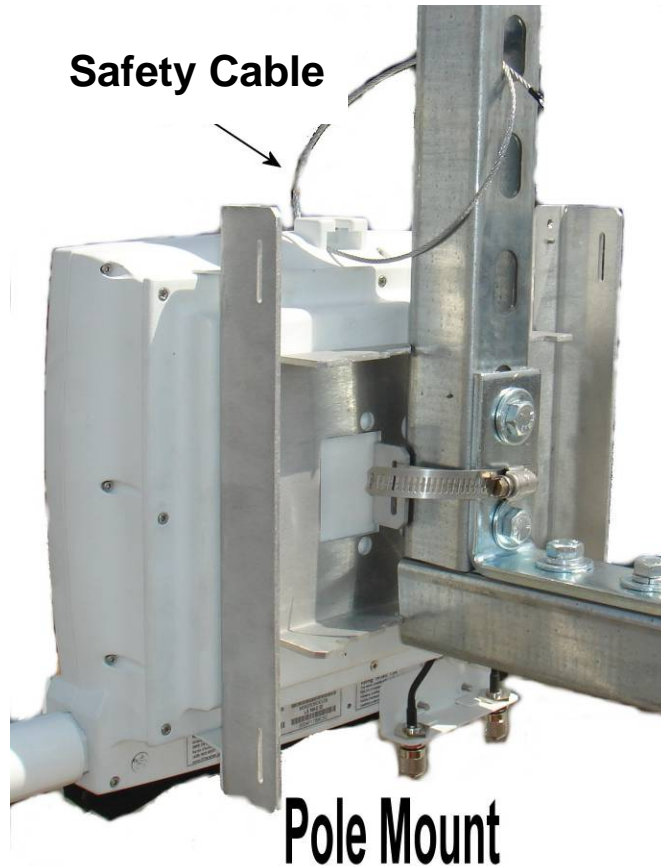Two different antennas are available for the Location Sensor. The standard antenna is the All Weather Omni AK-210-10, which can be bolted directly to the Location Sensor housing. The Office Omni AK-110-10 is available for indoor only installations where appearance critical. See WhereLAN Placement Guide D0406 and WhereLAN III Instillers Guide D1677, for more details on Antenna and Placement

7.1   Vertical Diversity Mounting

For outdoor installation requiring the maximum location accuracy and consistency, the use of vertical diversity for antenna placement should be implemented. Installations such as Yard Sites and Marine Terminal Sites will require that vertical diversity be installed. ZES offers three different vertical diversity cable kits for installation. For all installation it is recommended that the Right antenna be higher than the Left Antenna. Consult instruction sheet included in each kit and WhereLAN III Installation Guide D1677 for further installation information.

1) Antenna Extension Cable Kit, **CBL-010-10**, which is a 5ft cable kit is typically used for Yard Sites.
2) Antenna Extension Cable Kit, **CBL-015-10** a 15ft. standard cable kit is used for Marine Terminals.
3) Cable Kit **CBL-015-11**, Low Loss Antenna Extension, Location Sensor, 15ft may be used for Marine Terminals.

NOTE: All of these Extension Cable Kits will introduce signal loss, and reduced range for Wireless LAN coverage. CBL-015-11 has a lower loss cable that will help to reduce the effects of signal and coverage loss, however still reduces Wireless LAN coverage.

7.2   Power, AC

The customer must provide 100-240 Vac power 50/60 Hz to the specified Location Sensor position. The Location Sensor units require DC 36-57V, 350mA for operation. The power supply used must be ZES approved. The recommended power supply, which is shipped with the Location Sensor, has a 6 ft (2 m) AC cable and a 6 ft (2 m) dc cable. The electrician should verify that the AC power is available within 6 ft (2 m) of the position of the Location Sensor. This allows a 6 ft (2 m) "service loop" margin if the Location Sensor position must be readjusted after the AC power is installed.

The Location Sensor must always be used with the specified power supply available from ZES. The use of a different power supply could result in equipment damage and/or electric shock or fire hazard.

Two optional 50 ft (15 m) dc power extension cables are available for installations in which it is not desirable to rout the AC power within 6 ft (2 m) of the Location Sensor. One is for indoor use only and is Plenum Rated, **ZES Part Number PX-010-00**. The other is an outdoor rated (UV stable), **ZES Part Number PX-050-00**.   Consult your ZES Account Manager for recommended wire size if additional lengths are required for a particular installation.

Power Supplies have a limited safe operating temperature rating, please check with ZES account representative concerning limitations or availability of extend temperature range power supply, such as PS-TDB-00. In outdoor installations the power supply must be installed within a suitable waterproof housing per applicable building codes. The use of a non qualified housing could result in equipment damage and/or electric shock or fire hazard.

8   CABLING

Figure 5 below shows the connections which must be made to the Location Sensor in normal operation. The connector types and recommended cable types are detailed in Section 3.
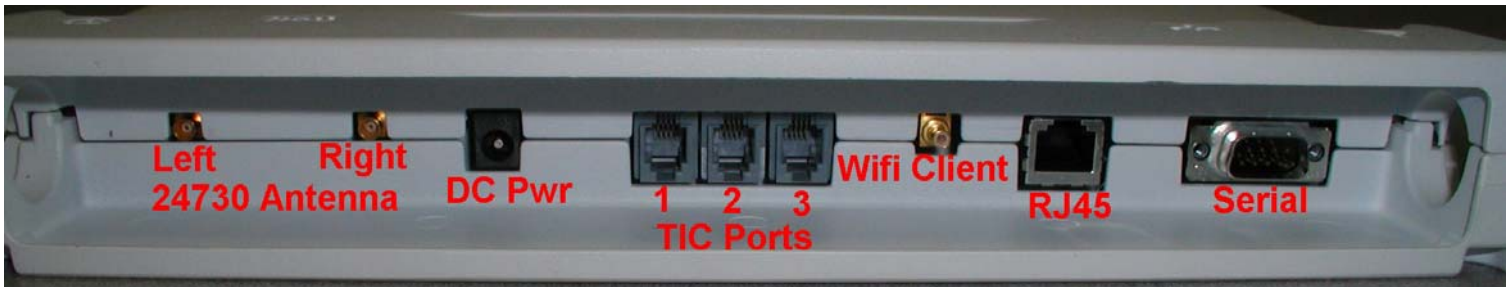
Figure 5   Location Sensor connections

Note: *For all Outdoor installations, use ZES part GS-888-00 grease in* **ALL Connecter Jacks.** *Fill each of the following connections, with grease, these include the Left and Right antenna, Timing connections, Wifi Client, Ethernet, Serial interface, and Power connection.* This *is to help weather proof the connections from water and corrosion. Routing the cables through the Rubber Grommet, supplied with unit, is also necessary for Outdoor installations.*

8.1   Timing Cable Interconnection Guidelines

For some applications the Location Sensor requires a timing cable to be connected to other nearby Location Sensor units. The site design document, provided by the site designer, will specify which Location Sensors will be connected together. Each of the three timing ports on the Location Sensor is an identical bi-directional link. The cable and connector types are specified in section 4 above.

The following rules must be applied when connecting timing cables between the Location Sensors:

- Do not connect the timing cable from one Location Sensor back to the same Location Sensor.
- Do not connect two timing cables between the same two Location Sensors.
- The maximum timing cable length is 1000 feet (305 m).

Note

Do not exceed the maximum timing cabling length of 1000 ft (305 m).

Install the Location Sensor timing cables from one unit to the next, as specified in the site design document, using the specified 2 pair or 4 pair* cable and RJ22 (telephone handset 4c4p) connectors. (* see 8.2.1)

Note

Incorrect routing of the timing cables between the Location Sensors may result in decreased location accuracy.

8.2 Timing Cable Pinout

This Cat5 two pair cable should be constructed with straight through wiring, with pin 1 on one end routed to pin 1 on the other end. For the 2 pair CAT5 cable, the following pin out must be used (Figure 612). See WhereLAN III Installation Guide D1677 for full install details, and use of CAT-5 for Timing Cables.

Pair 1: orange/white wire is pin 1; orange wire is pin 2

Pair 2: white/blue wire is pin 3; blue wire is pin 4

RJ22

To pin 1 white/orange
To Pin 2 orange
To pin 3 white/blue
To pin 4 blue

2 Pair Cat5

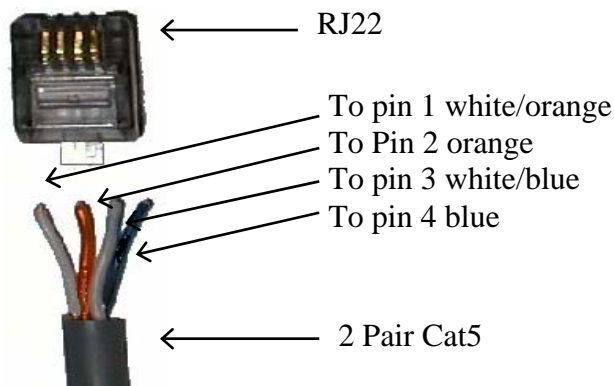Figure 6   Timing cable wiring pin out

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Note

For a reliable system operation, the <u>jacket</u> of the timing cable must be securely crimped inside the RJ-22 (4p4c) connector. It is recommended 2 pair cable be utilized to ensure a proper crimp. If a 2 pair cable is not available Standard eight conductor Cat 5 cable may be used, but the steps in Installation Guide D1677 must be followed.

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8.3 Location Sensor Operational Verification

Prior to optimizing locate performance, the operation of the Location Sensor must be verified. The checklist below specifies the verification of the configuration and basic operation.
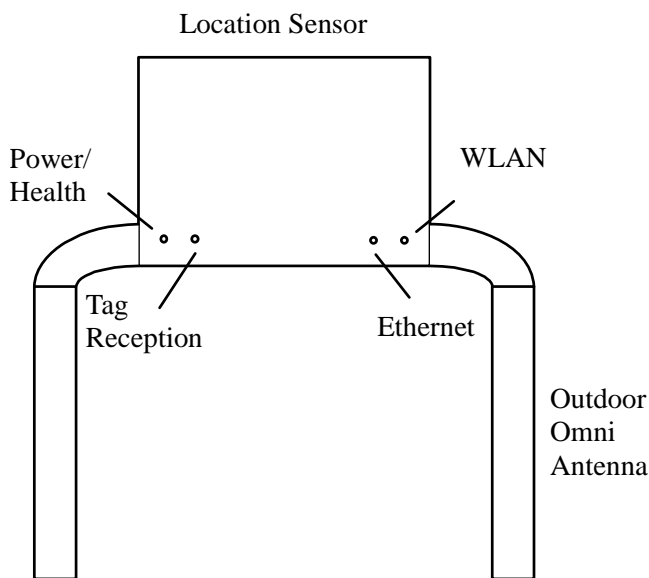
Figure 7   Location Sensor LED indicators

❑ Verify that each Location Sensor is operational by verifying that the left Power/ Health LED is illuminated solid red.

❑ For wired 802.3 Location Sensors, verify that the Ethernet LED is solid red when connected and blinking red when activity is present.

❑ Verify that the RX detects LED is blinking red indicating reception of tag blinks.

❑ For wireless 802.11b Location Sensors, verify that the WLAN activity LED is blinking red during power up state and solid red otherwise.

❑ Confirm that the site Location Sensor channel assignment is correct by running "display locate" from the LP Manager tool with a tag placed directly under each LS. Verify that the nearest Location Sensor, as indicated by a "0" in the display locate report, is that Location Sensor nearest the tag.

❑ Verify that detects are received on the channel by using either LP Manager Detect History, or WTLPHealth LS detects when a tag is placed at a distance from each Location Antenna equivalent to the maximum required range from that Location Antenna. Typical tag to Location Antenna range is 1000 ft (305 m) (Unobstructed/ outdoor), 350 ft (107 m) Minimally Obstructed (indoor office/ light commercial), 250 feet (76 m) Significantly Obstructed (heavy industrial).

Section Signoff

Initial	Date	Comments/ Exceptions

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9   REGULATORY INFORMATION

FCC & IC Requirements

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 Class A devices, pursuant to Part 15 of the FCC Rules.

This ISM device complies with Canadian ICES-001.
Cet appareil ISM est conforme à la norme NMB-001 du Canada.

9.1   RF Notice

Any changes or modifications to ZES Corp. equipment not expressly approved by ZES could void the user's authority to operate the equipment. *(Note: Regulator licenses are filed under WhereNet, a ZES Corp. Technology division.)*

FCC Radiation Exposure Statement

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator and your body. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

9.2   EU Compliance Information (LOS-5000-00AA & LOS-5000-00AB)

Approved for use in the following countries.

AT	BE	BG	CY	CZ	DK	EE
FI	FR	DE	GR	HU	IE	IT

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LV	LT	LU	MT	NL	PL	PT
RO	SK	SI	ES	SE	GB	
IS	LI	NO	CH		TR	

Note: -Use is restricted for countries that are grayed out.   See below for

limitations.

	Important Notice: This RF device is intended for indoor and outdoor use in all EU and EFTA with the following limitations. France: Outdoor use limited to 10 mW e.i.r.p. within the band 2454-2483.5 MHz Italy: For private use, a general authorization is required if WAS/RLAN's are used outside own premises. For public use, a general authorization is required. Luxembourg: General authorization required for network and service supply. Norway: Wideband Data Transmission systems 2400.0-2483.5 MHz does not apply for the geographical area within a radius of 20 km from the centre of Ny-Ålesund
C E 0681 ①	

APPENDIX A: **LOS-5000** EFFECTIVE PROJECTED AREA (EPA)

LS-LAP Housing
- Housing Size (Inches): 12.5 Wide 10.7 High 2.5 Deep (LOS)
- Housing Size (Inches): 12.5 Wide 10.7 High 4.0 Deep (LAP)
- Housing Size with 1/2" Radial Ice (Inches): 13.0 Wide 11.2 High 2.9 Deep (LOS)
- Housing Size with 1/2" Radial Ice (Inches): 13.0 Wide 11.2 High 4.5 Deep (LAP)
- Maximum Projected Area with Ice (Square Inches): 145.6
- Shape Factor (C$_D$ per EIA-222-F) 1.4
- **Effective Projected Area with Ice (Square Inches) 203.8**

Omni Antenna (One Antenna)
- Antenna Size (Inches): 1.3 Diameter 19.0 Long
- Antenna Size with 1/2" Radial Ice (Inches): 2.3 Diameter 20.0 Long
- Maximum Projected Area with Ice (Square Inches): 46.6
- Shape Factor (C$_D$ per EIA-222-F) 0.8
- Effective Projected Area with Ice (Square Inches) 37.3

LOS-5000 Effective Projected Area (EPA)
- LS-LAP Housing with Ice (Inches): 203.8
- Omni Antenna #1 with Ice (Inches): 37.3
- Omni Antenna #2 with Ice (Inches): 37.3
- Total Effective Projected Area with 1/2" Radial Ice

Effective Projected Area, Total (Square Inches): 278.4

Note: The above does not include conduit/cabling for Omni Antenna polarization diversity and LOS-5000 power

APPENDIX B: LOS-5000 WEIGHT

LOS-5000 Housing with AP
- Housing Weight (Pounds): 8.8 (LOS)
- Housing Weight (Pounds): 13.2 (LAP)
- Ice Volume at 1/2" Radial Thickness (Cubic Inches): 94.7
- Density of Ice (Pounds per Cubic Foot): 56.0
- Ice Weight (Pounds): 3.1
- **Housing and Ice Weight (Pounds): 11.9 (LOS)**
- **Housing and Ice Weight (Pounds): 16.3 (LAP)**

Omni Antenna (One Antenna)
- Antenna Weight (Pounds): 0.8
- Ice Volume at 1/2" Radial Thickness (Cubic Inches): 58.9
- Density of Ice (Pounds per Cubic Foot): 56.0
- Ice Weight (Pounds): 1.9
- **Antenna and Ice Weight (Pounds): 2.7**

Total Weight with 1/2" Radial Ice
- LOS Housing Ice (Pounds): 11.9
- LOS Housing Ice (Pounds): 16.3
- Omni Antenna #1 with Ice (Pounds): 2.7
- Omni Antenna #2 with Ice (Pounds): 2.7

Weight, Total (Pounds): 17.3 (LOS)

Note: The above does not include conduit/cabling for Omni Antenna polarization diversity and LOS-5000 power