WhereNet

Location Sensor

(including Locating Access Point)

Installation Guide

PRELIMINARY

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
PA6	Preliminary	1/20/02	

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1   DOCUMENT OVERVIEW

This document describes the physical installation and basic configuration of the Location Sensor product. The site design is detailed in the D0406 Location Sensor Placement Guide.

2   PRODUCT DESCRIPTION AND FEATURES

The Location Sensor receives the signals transmitted by the WhereTags, which are attached to the tracked assets. The decoded tag information is time stamped and routed to a PC for additional processing. The locate algorithm running on the PC 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 two separate Location Sensor models:

- LOS-4100 (802.3 Wired Ethernet)

- LAP-4200 (with 802.11b Wireless LAN Access Point, also known as a Locating Access Point)

The difference between the two models is that the LAP-4200 contains an Access Point, while the LOS-4100 does not. These units are identical in appearance; the

only way to distinguish them is by the model number on the housing. Note that both units have a wired Ethernet port; the LAP-4200 has a can function as either a client bridge or an access point.

Both units also include a low power transmitter which is used to distribute configuration data, and timing signals to other Location Sensor units. This transmitter has the same transmitter characteristics as a tag.

Features include:

- Outdoor weatherproof housing

- Wireless data transport capability

- Wireless Timing capability

There are three separate antenna options for the Location Sensor. In addition, there is an optional high gain Wireless LAN Access Point directional antenna for installations in which the standard antennas do not proved the range required to communicate with the base access point. The available antennas are listed in section 4 below.

3   PRODUCT SPECIFICATIONS

3.1   Mechanical

Size:	10.3 x 3.2 x 12.0	in (HxDxW)
	261 x 80 x 305	mm
Weight:	8.0	Lbs
	3.6	kg

3.2   Electrical

Voltage:	18 to 36	Vdc
	36 nominal	
Current:	1.5 (max)	Amps
Pwr Diss:	25 (max)	Watts
AC Power[1]	100- 240	Vac

[1] With recommended power supply

3.3   Environmental

Operating Temperature:	-30 to +50	ºC
Storage Temperature:	-40 to +70	
Ingress Protection:	65	IP

![WhereNet logo]

3.4   External Connections

Antenna:	MCX (female)
DC Power:	2.5 ID/ 5.5 OD mm (female)
Opt. Access Point Antenna:	RP-TNC (male)
Ethernet	RJ45 (female)
Timing	RJH (4 wire telephone handset, female)

4   PARTS AND TOOLS

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

Part	**Model Number**
• All Weather Omni Antenna[1] (standard)	AK-210 (Figure 1)
• Office Omni Antenna[1] (indoor only)	AK-110 (Figure 2)
• Flat PanelAntenna[1] (directional indoor/ outdoor)	AK-120 (Figure 3)
• High Gain WLAN Antenna (optional)	TBD (Figure 4)
• Power Supply	PS-021 (Figure 5)
• Outdoor Power Supply enclosure (outdoor use only)	(Figure 6)

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Part	Model Number
• Pole Mount Kit	RM-410-00
• Wall Mount Bracket (to provide 12 inch (305 mm) spacing from metal wall w/ AK-210 antenna	RM-250-00
• Cat 5 network cable;	Belden: 1583A 006U1000 riser , 1585A 877U1000 Plenum, or equiv.
	1624R Non-plenum, shielded; 1624P Plenum, shielded.
• Connector	AMP 5-569278-X with load bar, or AllenTel AT8X8RCSC-24
• Timing cable (2 twisted pairs);	Belden: 1588R-006U1000 riser, 1590A-8771000 plenum
• Connector	Allen Tel AT4X4SC-2224
• Network hub/ router/ switch	N/A

[1] Choose 1 of the three antenna options

Recommended cable/connector/tool supplier Graybar (800) 766-7101

Figure 1   All weather omni antenna

Figure 2   Indoor office omni antenna

Figure 3   Flat panel directional antenna

Figure 4   Optional high gain antenna

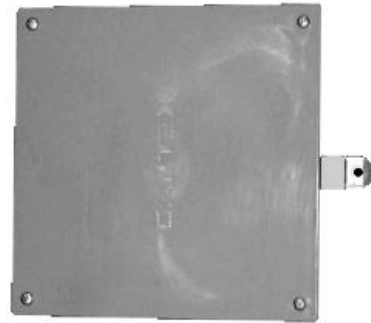**Location Sensor Installation Guide**   D0405 rev PA6

Figure 5   Power supply

Figure 6   Outdoor P.S. housing

Tools

• Computer to configure Location Sensor, including	
• Crossover Cat 5 (Ethernet) cable	Available locally
• Null Modem serial cable (optional)	Digi-Key: AE1034-ND DB9 M/F, or AE1033-ND F/F
• RJ Connector tool for RJ45 and RJH	Figure 7
• Fluke 620 LAN CableMeter	Figure 8
• Miscellaneous hand tools	Available locally

Figure 7   RJ cable tool   Figure 8   Fluke LAN CableMeter

5   CONFIGURATION

The Location Sensor (Location Access Point) must be configured prior to
operation. Configuration includes:

- Setting the Location Sensor configuration, including the IP address

- Setting the embedded Access Point configuration (LAP-4200 only),
  including the Service Set Identifier (ESS ID), and IP address.

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

Both of these units are configured using:

- LPManager software via Ethernet (preferred),

- Telnet via Ethernet, or

- Hyperterminal (or any terminal emulation software) via serial port

For the LAP-4200, both the Location Sensor and the embedded Access Point must be independently configured. That is, both units must have their IP addresses correctly specified. The communication connection can be switched between the Location Sensor and the Access Point by typing ctrl-w.

5.1   Location Sensor Configuration

Location Sensors communicate over an Ethernet interface using TCP/IP. Each Location sensor must be configured with a unique IP address. The IP address of each LS must be recoded and entered into the WhereNet site file, which contains the configuration information for each LS, including its location.

Each Location Sensor is shipped with a label set containing one label (Figure 9) with the bar coded MAC address of the Location Sensor (and of the Access Point if so equipped) 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.
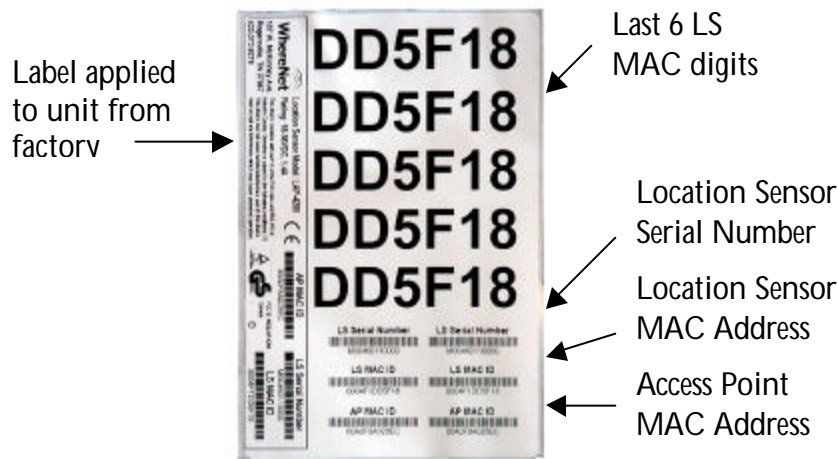

Figure 9   LAP-4200 Label

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 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 though DHCP, the DHCP server must contain the MAC address and corresponding IP address for each of the Location Sensors (and Access Points).

The Location Sensors can be configured using either an automatic process or a manual process:

Automatic Configuration

TBD

Manual Configuration

- Connect to the Location Sensor using LP Manager, Telnet or Hyperterminal.

- Confirm the unique MAC address for the Location Sensor.

- Select Set IP Address from the menu and set the IP address.

- Access the Access Point configuration by typing ctrl-w.

- Follow the menu prompts and set the IP address.

- Confirm communication to the Location Sensor by "pinging" the device(s) using LP Manager.

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

6 ASSEMBLY INSTRUCTIONS

The Outdoor Omni antenna must be mounted to the Location Sensor housing; the Indoor Office Omni antenna and the Flat Panel Directional antennas are mounted separately to the appropriate wall or ceiling. Follow the specific instructions included with the antennas.

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The left and right antenna must be correctly oriented per the site design. Inadvertently reversing the left and right antenna will result in a two foot location error.

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7 FCC INFORMATION

This equipment complies with Part 15 of the FCC Rules.

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Note

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

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This equipment complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

1. This device may not cause harmful interference.

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 (and commercial) installation.

This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the manufacturer's instruction manual, may cause interference with 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, you are 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 the 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/ television technician for assistance.

To comply with FCC RF exposure requirements, no one may remain within 20 cm of the antenna.

8 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.

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.

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The Location Sensor can be mounted to a wall using the integral keyhole mounting slots. An attachment hole is also provided to accept a 3/8 in (10 mm) threaded rod. A pole mount hardware kit is available separately.

8.1   Wall Mount

The Location Sensor may be mounted directly against a non-metallic wall using the standard AK-210 All Weather Omni-directional antennas. For a metallic wall, Location Sensor must be mounted 12 inches (305 mm) away from the wall for the antennas to operate properly. Alternately, the AK-120 Flat Panel antennas may utilized as they may be mounted directly to a metallic wall.

The Location Sensor can be mounted to a wall using the four key hole mounting slots per the following instructions:

- Determine the preferred screw/ anchor type (not supplied) for the particular wall material. The Location Sensor requires a #6 or 3.5 mm mounting screw.

- Mark and drill holes in the wall to match the keyholes on the Location Sensor (Figure 10).

- Mount the Location Sensor and securely tighten the screws.

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7.88 in
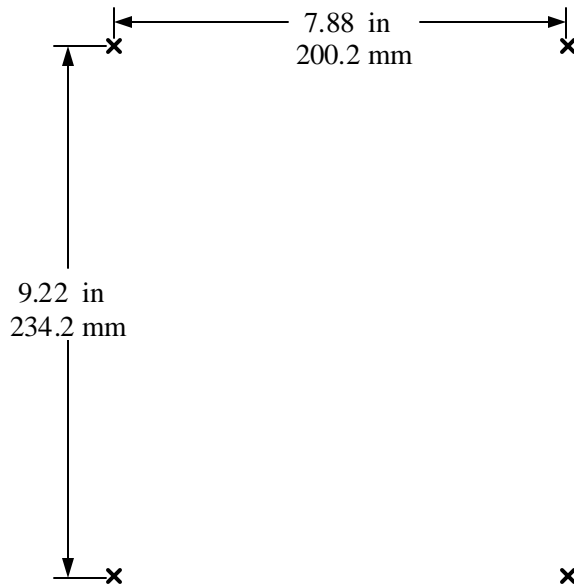200.2 mm

9.22 in
234.2 mm

Figure 10   Wall mounting hole dimensions

If the Location Sensor is in a position in which it could be ripped off the wall by industrial equipment, it should be secured to the building infrastructure with a safety cable through the 3/8 inch (10 mm) hole in the housing.

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8.2   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 inches (50 mm) from the bottom of the threaded rod.

- Place the Location Sensor onto the threaded rod and install the second nut.

- Tighten the upper nut down on top of the Location Sensor housing.

8.3   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 following instructions:

TBD

9   CABLING

Figure 11 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 4 above.
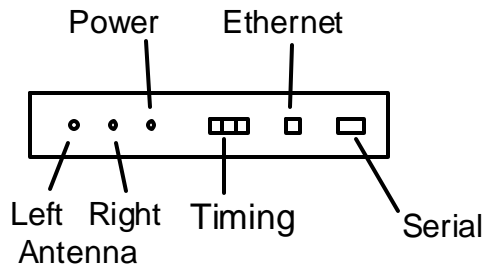
Figure 11   Location Sensor connections

9.1   Power

The customer must provide 120 Vac power to the specified Location Sensor position. The Location Sensor utilizes an external power supply to convert 120 Vac to the required +18 to 36 Vdc. The recommended power supply has a 6 foot (2 m) AC cable and a 6 foot (2 m) dc cable. The electrician should verify that the AC power is available within 3 feet (1 m) of the position of the Location Sensor.

This allows a 9 foot (3 m) "service loop" margin if the Location Sensor position must be readjusted after the AC power is installed.

For outdoor installations the power supply must be installed within a suitable waterproof housing. Follow local and national building codes.

9.2   Timing

For most indoor and some outdoor applications the Location Sensor requires at least one timing cable to be connected to other nearby Location Sensor units. The site design document 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.

For a reliable system operation, the <u>jacket</u> of the timing cable must be securely crimped inside the RJH connector. Standard eight conductor cat 5 cable is too large for crimping in the 4 wire connector; the recommended 4 wire cable must be utilized to ensure a proper crimp.

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 (310 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 Cat 3 cable and RJH (telephone handset) connectors.

_____

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

_____

9.3   Ethernet

The Location Sensor utilizes standard 10/100 802.3 Ethernet connectivity via cat 5 cables. The Location Sensor 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 feet (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.

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⚠   **Do not exceed the maximum Ethernet cabling length of 328 ft (100 m).**

9.4   Access Point Antenna Cabling (Optional)

In many installations, the Access Point antenna must have omni directional RF coverage to support communication from nearby 802.11 wireless terminals. Thus, in the standard configuration the Access Point shares the same antennas as the Location Sensor.

However, in some installations the distance between the Location Sensor and the receiving Access Point is beyond the maximum **TBD** range supported by the omni directional antennas. In that case the optional high gain antenna must be utilized to permit the embedded Access Point to communicate with the receiving Access Point. The high gain Access Point antenna will increase the communication range to approximately 2000 feet (620 m) (US Only), at a bit rate of 1 MB/s, when used in conjunction with a receiving omni directional antenna. The range in Europe will be less due to regulatory output power restrictions.

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The use of the optional high gain Access Point antenna will reduce the wireless LAN coverage range for hand held terminals in areas of the site to the side of and behind the high gain antenna due to the directivity of the antenna.

To install the optional high gain Access Point antenna follow the following instructions:

TBD

10   LOCATION SENSOR INSTALLATION CHECKLIST

10.1 Location Sensor Installation Verification

The installation of **each** Location Sensor must be verified by the Account Manager to ensure that it was correctly installed at the location specified in the Site Design document. The Account Manager should also record the MAC and IP addresses of each Location Sensor. After verifying these items the Account Manager should initial and date the table at the end of this section.

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- ❑ Location Sensor mounted within +/-1 foot (0.3 m) of position specified in Site Design document. After measuring the installed position, documenting it on the following form, and comparing it to the position specified in the Site Design document, the Account Manager should place an "X" in the installed position accepted/rejected line for each Location Sensor on site.

- ❑ MAC and IP addresses recorded in document below. One or more MAC label(s) placed on the Location Sensor in a position visible from ground.

- ❑ Location Sensor mounted properly with cylindrical antennas pointing down a minimum of 12" (0.3 m) from metal walls.

- ❑ Ethernet, power, timing (if required), and antennas cables properly connected.

LS Site Design ID Number	Reference point desc. (e.g., column E12)	Distance and bearing from reference point in X direction	Distance and bearing from reference point in Y direction	Height above floor level Z/ Direction LEDs are facing
1.	MAC address:		IP address:	
Specified in Site Design				
Actual installed				

LS Site Design ID Number	Reference point desc. (e.g., column E12)	Distance and bearing from reference point in X direction	Distance and bearing from reference point in Y direction	Height above floor level Z/ Direction LEDs are facing
	ˍ Accept ˍ Reject installed position specified above			
2.	MAC address:		IP address:	
Specified in Site Design				
Actual installed				
	ˍ Accept ˍ Reject installed position specified above			
3.	MAC address:		IP address:	
Specified in Site Design				
Actual installed				
	ˍ Accept ˍ Reject installed position specified above			
4.	MAC address:		IP address:	
Specified in Site Design				
Actual installed				
	ˍ Accept ˍ Reject installed position specified above			
5.	MAC address:		IP address:	
Specified in Site Design				
Actual installed				

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LS Site Design ID Number	Reference point desc. (e.g., column E12)	Distance and bearing from reference point in X direction	Distance and bearing from reference point in Y direction	Height above floor level Z/ Direction LEDs are facing
	_ Accept _ Reject installed position specified above			
6.	MAC address:		IP address:	
Specified in Site Design				
Actual installed				
	_ Accept _ Reject installed position specified above			
7.	MAC address:		IP address:	
Specified in Site Design				
Actual installed				
	_ Accept _ Reject installed position specified above			
8.	MAC address:		IP address:	
Specified in Site Design				
Actual installed				
	_ Accept _ Reject installed position specified above			
9.	MAC address:		IP address:	
Specified in Site Design				
Actual installed				

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LS Site Design ID Number	Reference point desc. (e.g., column E12)	Distance and bearing from reference point in X direction	Distance and bearing from reference point in Y direction	Height above floor level Z/ Direction LEDs are facing
	__ Accept __ Reject installed position specified above			
10.	MAC address:		IP address:	
Specified in Site Design				
Actual installed				
	__ Accept __ Reject installed position specified above			
11.	MAC address:		IP address:	
Specified in Site Design				
Actual installed				
	__ Accept __ Reject installed position specified above			
12.	MAC address:		IP address:	
Specified in Site Design				
Actual installed				
	__ Accept __ Reject installed position specified above			
13.	MAC address:		IP address:	
Specified in Site Design				
Actual installed				

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LS Site Design ID Number	Reference point desc. (e.g., column E12)	Distance and bearing from reference point in X direction	Distance and bearing from reference point in Y direction	Height above floor level Z/ Direction LEDs are facing
	＿ Accept ＿ Reject installed position specified above			
14.	MAC address:		IP address:	
Specified in Site Design				
Actual installed				
	＿ Accept ＿ Reject installed position specified above			

Section Signoff

Initial	Date	Comments/ Exceptions

10.2 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.

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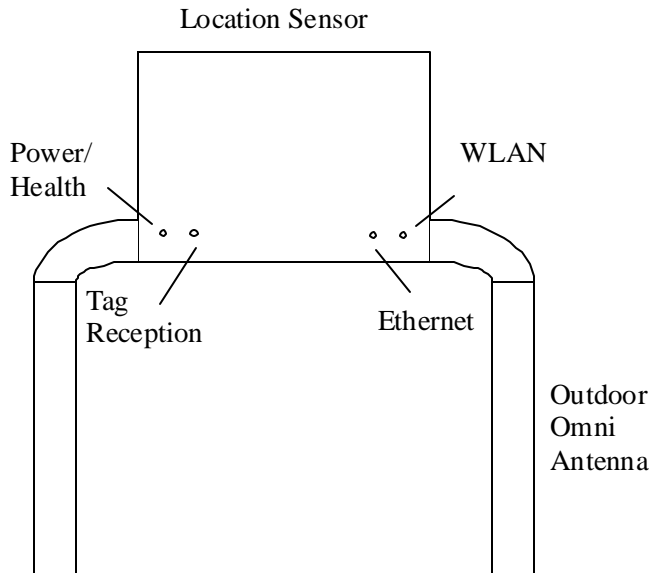
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Figure 12   Location Sensor LED indicatorsLED indicators

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

- ❑   For wired 802.3 Location Sensors, verify that the Ethernet LED is blinking
    green.

- ❑   Verify that the RX detects LED is blinking green.

- ❑   For wireless 802.11b Location Sensors, verify that the WLAN activity
    LED is blinking green.

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- ❑ Confirm that the site LS 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 LS, as indicated by a "0" in the display locate report, is that LS nearest the tag.

- ❑ Verify that detects are received on the channel by using either LP Manager Detect History, or WT LPHealth APC detects when a tag is placed at a distance from each LA equivalent to the maximum required range from that LA. Typical tag to LA 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