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WhereLAN III User's Guide

**WhereLAN III**  
**LOS-5000**  
**User's Guide**

**DRAFT**

## 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.

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Note

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



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## Document Revision History

Revision	Description of Changes	Date	Approved
A	Initial Release	10/20/10	GLC
B	Per ECO C02532	05/09/11	GLC
C	Addition of Secure Shell, Wi-Fi configuration, Network Auto-configuration (DHCP), and general errata.	8/28/11	SR
D	Per ECO C02834	04/04/12	GC
E	Per ECO C02879	05/21/12	GC



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## 1 DOCUMENT OVERVIEW

This document describes the basic configuration and recommendations on physical installation of the WhereLAN III product, which is part of the Location Sensor product line. The site design and placement is detailed in the Location Sensor Placement Guide D0406 and WhereLAN III Instruction Sheet (26913), provide with each unit.

## 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), and provides data to the Location Algorithm processor. The received tag blinks are decoded, time stamped, and routed to a Windows Server or ZLA (Zebra Location Appliance) for additional processing. The locate algorithm running on the Windows Server 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.

The WhereLAN III Location Sensor supports the same Real Time Locating System (RTLS) functions as the previous sensor, known as the WhereLAN Location Sensor (LOS). WhereLAN III is fully backwards compatible and may be used, as outlined herein, as a drop-in replacement for any existing LOS. However, the WhereLAN III incorporates modern and patent-pending techniques that result in superior accuracy performance over the current LOS product. In addition, WhereLAN III supports a number of other value-added features, as follows:

**Time Synchronization:** Like the LOS, WhereLAN III supports wireless and wired time synchronization. However, the product can operate in two distinct time synchronization modes, known as "Legacy" and "Time Synch II". As shipped, the product defaults to Legacy time synchronization. In Legacy mode, WhereLAN III is drop-in compatible with LOS and is backwards compatible with VSS release 3.8. The Legacy Time service relies on various user-defined entities, such as Line-of-Sight lists and Timing Islands. Time Synch II no longer exposes these entities to the end user. A site must run either the Legacy Time service or the Time Synch II service, but not both. In Time Synch II mode, WhereLAN III furnishes additional data required by a new Time Synchronization Process, scheduled for release in Q4 2012, which runs on the Windows Server or ZLA. The Time Synch II service reduces site design complexity and post-install support. It accomplishes this by being "self-configuring" and "self-adjusting"; it hides its configuration details from





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the end user, automatically self configures and automatically adjusts to a wide range of Radio Frequency environmental changes. The new Time Synch II service is substantially different from and is not backwards compatible with the Legacy Time Synch service. In Legacy mode, the embedded wireless time beacons are transmitted over the right channel whereas both the left and right channels are used in Time Synch II mode. Time Synch II can operate in an all WhereLAN IIIs network, an all LOSs network, or a network with mixed WhereLAN IIIs and LOSs. However, in order for Time Synch II to work with LOSs, they must operate in “dual-posting” mode.

Wi-Fi: A variant of the LOS, known as a Locating Access Point (LAP), supports an integral 802.11 b/g/a Access Point. WhereLAN III does not support an integral Access Point. Instead, a variant of WhereLAN III supports establishing an 802.11 b/g Wi-Fi client side connection to any industry-standard Access Point. Unlike WhereLAN III, the LOS does not support establishing Wi-Fi client side connections.

Network Auto-Configuration (DHCP) and IPv6: The WhereLAN III, with the release of VSS 4.0.5.2 support both DHCP IP and IPv6 address assignment. However, the methods used by system software to establish connectivity with the sensors on start-up preclude the full use of (dynamic) DHCP IP addresses. This restriction is being eliminated, in the VSS 4.0.5.2 release, for WhereLAN III sensors by a new process, referred to as Network AutoConfig. This process conveys the IP address of the RTLS server to the WhereLAN IIIs as part of the standard DHCP IP address assignment message exchange. In turn, the WhereLAN IIIs “check-in” with the RTLS server by passing it the MAC address of their Ethernet port. The RTLS server uses the MAC address to “authenticate” the identity of the WhereLAN IIIs by checking for the MAC addresses to be present in the site configuration file.

IEEE 802.3af Power of Ethernet (PoE): WhereLAN III supports industry-standard PoE. This allows for easier installation as it removes the need to run DC power cabling to the unit. PoE may be supplied by any standards-compliant network switch. Alternatively, Zebra offers a single-line PoE injector.

Power Consumption: WhereLAN III consumes just 12 watts, a 31% and 57% reduction relative to the LOS and LAP, respectively.



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The WhereLAN III product line contains the following product skews:

LOS-5000-00AA: This is a “base” WhereLAN III unit, with an integral 802.3af compliant Ethernet interface, supporting wireless and wired timing options.

LOS-5000-00AB: This version adds 802.11 b/g Wi-Fi support, in client mode, to the base unit. This part number is approved for sale to U.S. Federal Government procurements.

LOS-5000-00CA: This is a “base” WhereLAN III unit approved for sale to U.S. Federal Government procurements.

LOS-5000-01AA: This is a “base” WhereLAN III unit incapable of transmitting a wireless time beacon and is approved for sale to U.S. Federal Government procurements.



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### 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	
Current:	.350 (max)	Amps
Power Dis.:	12.0 (max)	Watts
Power:	Can be powered by a Zebra approved, Limited AC to DC Power Supply or Power Over Ethernet (POE). <i>See Accessories List</i>	

#### 3.3 Environmental

Operating Temp. <sup>1</sup> :	-40 to +60	°C
Ingress Protection:	55	IP
Humidity	5 to 95%	Non-condensing

<sup>1</sup> See power supply limits



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### 3.4 External Connections

Antenna (2):	MCX (Jack)
DC Power:	2.5 ID/ 5.5 OD mm (Jack)
Opt. Wi-Fi Antenna:	SMB (Jack)
Ethernet:	RJ45 (Jack) 10/100 and 802.3af POE
Timing (3):	RJ-22 (4 wire telephone handset, Jack)

With the exception of the LOS-5000-00AB model (Wi-Fi backhaul), the WhereLAN III must be wired to a nearby 10/100BaseT Ethernet switch or hub. In addition, the network to which the switch or hub connects must allow full access to a number of standard communication protocols and port ranges (TCP/IP, UDP, ftp, etc). See the Zebra VSS Software Installation Guide for further detail on the interconnecting network requirements. 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. The LOS-5000-00AB must be configured to connect to an IEEE 802.11 b/g Wi-Fi network, as outlined in this document.



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## 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 listed or globally available. Check with local sales representative regarding availability.*

Accessories	Model Number
• All Weather Omni Antenna <sup>1</sup> (standard)	AK-210-10
• Office Omni Antenna <sup>1</sup> (indoor only)	AK-110-10
• DC power cable extender, 50 ft, Plenum Rated ( <b>Indoor Only</b> )	PX-010-00
• DC power cable extender, 50ft., Outdoor Rated.	PX-050-00
• Power Over Ethernet injector	EP-025-00
• Power Supply	PS-040-00 or PS-045-00
• Pole Mount Kit:	RM-510-00
• Wi-Fi Antenna Kit	CBK-020-00
• Wi-Fi Indoor Omni Antenna, 2.2dBi	AK-170-00
• Wi-Fi Outdoor Omni Antenna, 5.2dBi	AK-151-00
• Wi-Fi Outdoor Directional Antenna, 13.5dBi	AK-153-00

## 5 CONFIGURATION & CONTROL

### 5.1 WhereLAN III Self Boot

Upon power up, WhereLAN III 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. The LED Process is as follows after initial power is applied.

- 1 LED (Power): The Boot Loader is loading the Kernel.
- 4 LED's : The Kernel is initialized and is loading the applications, JFFS2 and CRAM File system
- 1 LED (Power): The Application is loading the FPGA's and DSP's
- 2 LED's (Power and Tag Reception): The unit is initializing the FPGA's and DSP's.
- 1 LED (Power): Unit is booted and ready for operations.

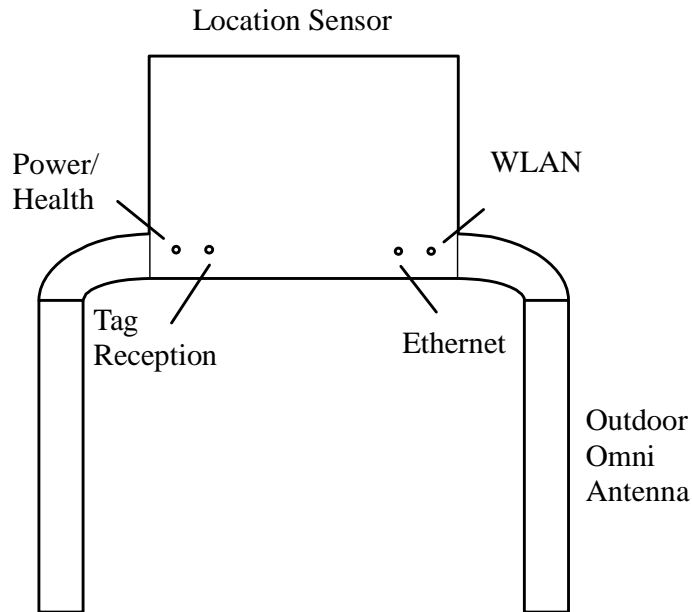
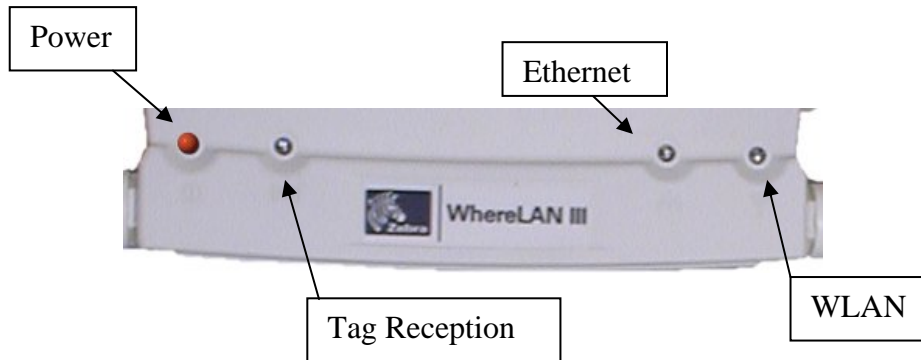


Figure 1 LOS-5000 LED's

### 5.1.1 LED Functions

Once the boot process is complete, the LEDs revert to their standard functions indicating power/health, tag status, Ethernet, and Wi-Fi.



- **Power/Health LED:** Indicates unit has power and general health of unit.
  - ***State 1 Steady ON:*** When the Power LED is steady on, the unit is healthy and sitedata has been received and is correct.
  - ***State 2 80% Duty Cycle:*** The Power LED is ON for close to 80% of the time and OFF for a brief period. This indicates either sitedata has not been received or that there is a problem with site data.
  - ***State 3 50% Duty Cycle:*** The Power LED blinks ON for 1 Second and OFF for 1 Second. This indicates a health check has failed and possible hardware problem. For example, the unit is either not blinking its embedded tag or is not receiving its embedded tag.
- **Tag Reception LED:** Blinks when WhereTag signals are received.
- **Ethernet LED:** Is on solid when has connection to an Ethernet network.
- **WLAN LED:** Is on solid when Wi-Fi connection is established.

**See Appendix F:** For Complete Boot Sequence details.



## 5.2 WhereLAN III Interface

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

Note

**Do not attempt to communicate with the WhereLAN III 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:

- SSH (Secure Shell 2) via Ethernet (preferred)
- WhereWand
- Hyperterminal (or any terminal emulation software) via serial port

Note

**SSH is the preferred method of communicating with the WhereLAN III. Use the HyperTerminal is for initial set-up before being installed on a network for setting static IP addresses, if DHCP is not used. In addition to SSH, WhereLAN III also supports Telnet, but this protocol is disabled by default. To use Telnet, you must first enable it via accessing the WhereLAN III configuration menu via SSH or a serial port connection. However, enabling Telnet is not recommended as it sends user name and passwords across the network in the clear.**

The Ethernet Communication Parameters are:

- 10/100 Mb/s
- CAT 5 cable/ RJ-45 plug





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### Hyperterminal via Serial Port

Communication Parameters:

- Null-modem cable, 9-pin female to 9-pin female
- 19200 baud, RS-232c
- 8 data bits, 1 stop bit, no parity, no hardware flow control

HyperTerminal may be used to configure the sensor before connecting it to a network with a DHCP server, or when a rare fault occurs during the first stage of the boot process, or if visibility to the boot process is needed for debugging installation problems.

#### 5.2.1 Establishing an SSH Connection

WhereLAN III supports Secure Shell (SSH), SSH2 being preferred over SSH1. Either the IP address or host name of the unit must be known in order to establish an SSH session.

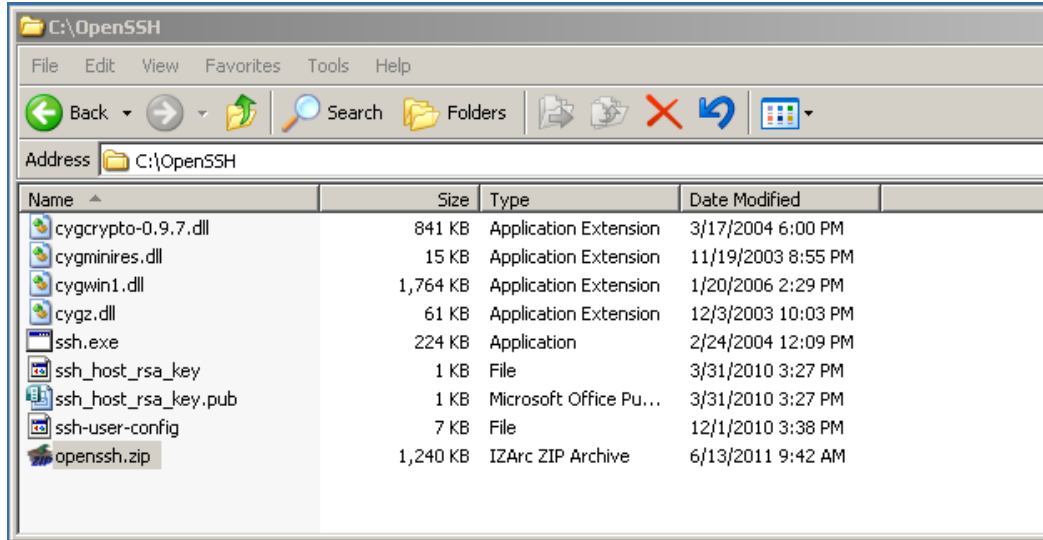
An SSH session may be established using a freely available application called OpenSSH (supplied by your Zebra Professional Services staff or visit <http://openssh.com> for further details, but requires the `ssh_zebra_rsa_key` available from Professional Services). Alternatively, other applications, such as PuTTY, may be used as well, but will require the conversion on the `ssh_zebra_rsa_key` into the appropriate format.

To establish the SSH session, you must use Zebra-supplied key, called “`ssh_host_rsa_key`” and the “blowfish” passphrase.

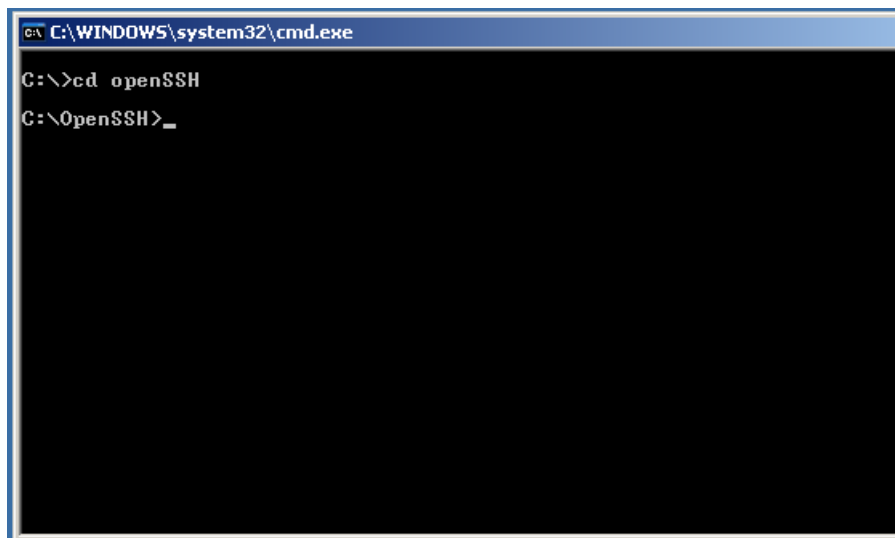
The following section shows how to use the OpenSSH application.

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The provided zip archive contains all you need to use OpenSSH. Unzip the file and put it anywhere on your harddrive.



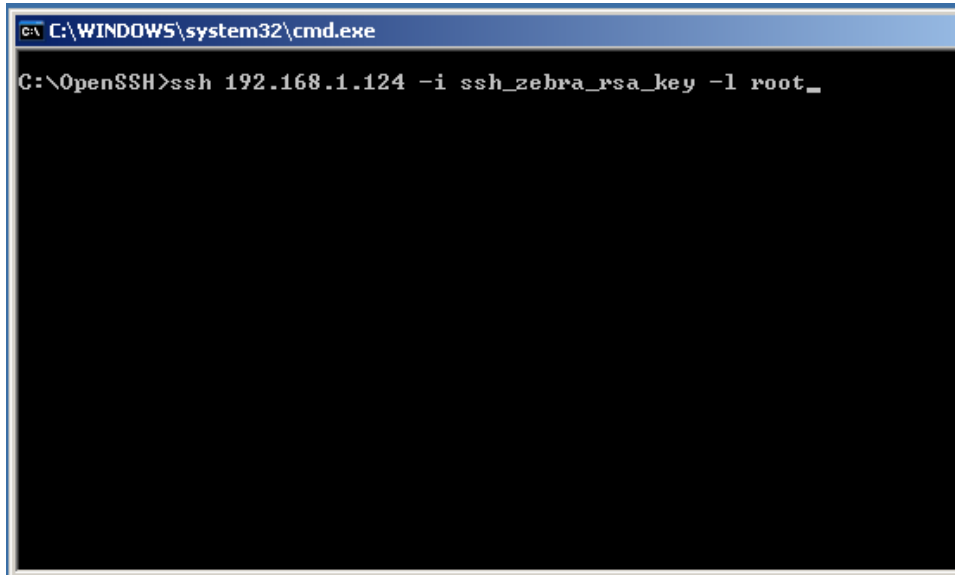
1. Launch a command prompt, and change directory to the folder where you placed the executable ssh.exe file, for example, "C:\OpenSSH".



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2. Enter the following command at the command prompt:

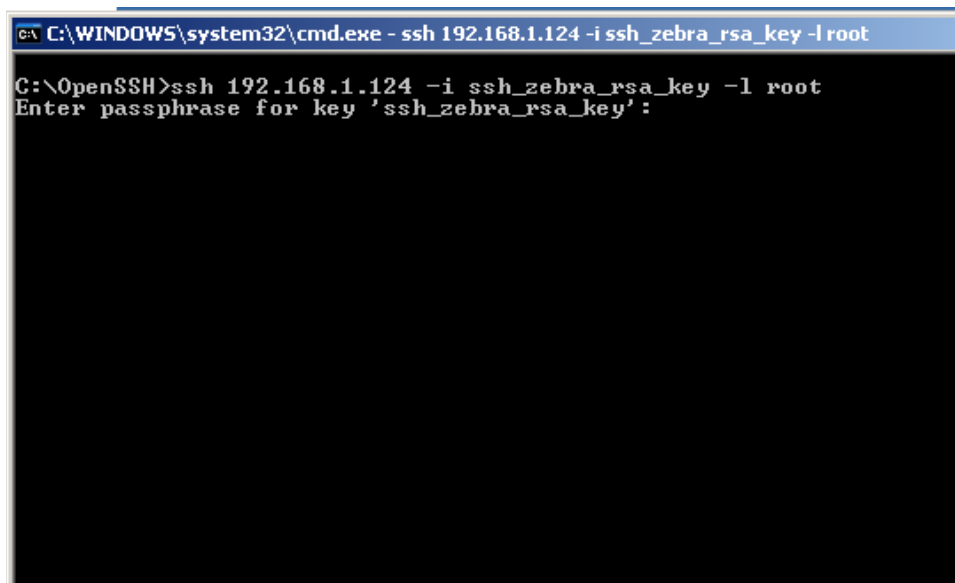
*'ssh <ip-address> -i ssh\_zebra\_rsa\_key -l root'*



```
C:\WINDOWS\system32\cmd.exe
C:\OpenSSH>ssh 192.168.1.124 -i ssh_zebra_rsa_key -l root_
```

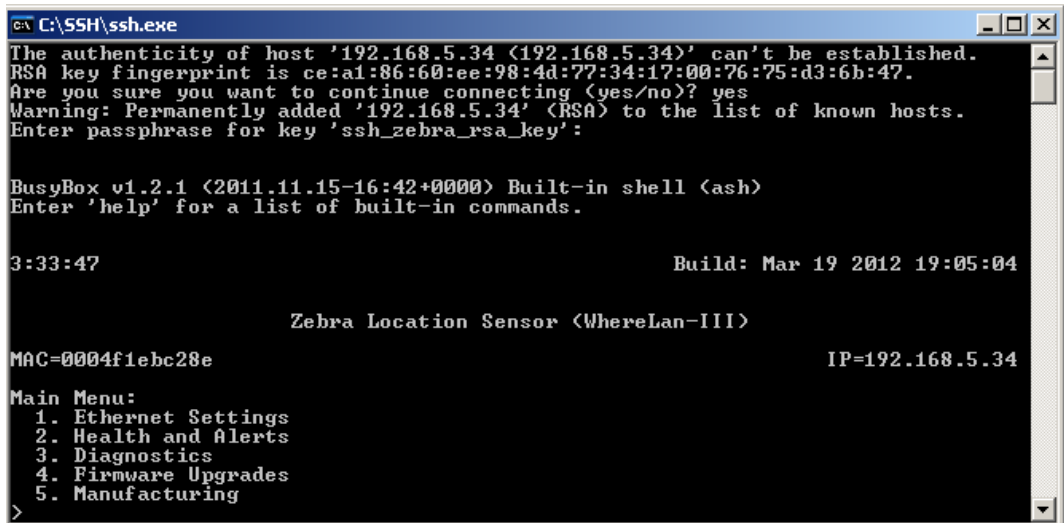
**Note:** The first time you do this from most computers you will be told “can’t establish....” And it will ask you “are you sure?”...enter ‘yes’

3. The application will prompt you for a passphrase, use: ‘blowfish’



```
C:\WINDOWS\system32\cmd.exe - ssh 192.168.1.124 -i ssh_zebra_rsa_key -l root
C:\OpenSSH>ssh 192.168.1.124 -i ssh_zebra_rsa_key -l root
Enter passphrase for key 'ssh_zebra_rsa_key':
```

4. WhereLAN III then presents secure access to its Configuration menu.



```
C:\SSH\ssh.exe
The authenticity of host '192.168.5.34 (192.168.5.34)' can't be established.
RSA key fingerprint is ce:a1:86:60:ee:98:4d:77:34:17:00:76:75:d3:6b:47.
Are you sure you want to continue connecting (yes/no)? yes
Warning: Permanently added '192.168.5.34' (RSA) to the list of known hosts.
Enter passphrase for key 'ssh_zebra_rsa_key':

BusyBox v1.2.1 (2011.11.15-16:42+0000) Built-in shell (ash)
Enter 'help' for a list of built-in commands.

3:33:47                                     Build: Mar 19 2012 19:05:04

                Zebra Location Sensor (WhereLan-III)

MAC=0004f1ebc28e                             IP=192.168.5.34

Main Menu:
 1. Ethernet Settings
 2. Health and Alerts
 3. Diagnostics
 4. Firmware Upgrades
 5. Manufacturing
>
```

## 5.2.2 Enabling Telnet

The WhereLAN-III comes shipped with Telnet Disabled as added network security. However for certain installation and/or customers Telnet may be Enabled via the Menu System.

The enabling of Telnet is done via the numbered menu system either through HyperTerminal or SHH, either will method will provide the same Menu structure. The following example is shown using a direct connection with a Null Modem Serial cable and HyperTerminal Session.

- From the Main Menu select the number that corresponds to 'Ethernet Settings'. The WhereLAN III application shows the following sub-menu:



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```
WLAN III - HyperTerminal
File Edit View Call Transfer Help
[Icons]
3. Health and Alerts
4. Diagnostics
5. Firmware Upgrades
6. Manufacturing
7. Modify Passwords
>reading NVram keys...
38:38                               Build: May 6 2011 13:06:42
                                   Zebra Location Sensor (WhereLan-III)
MAC=0004f1ec4b46                    IP=10.2.16.200
Ethernet Settings Menu:
1. Boot Method           FLASH
2. LAN
3. WLAN
4. IP Forwarding        N/A
5. Proxy ARP
6. SNMP
7. Telnet                OFF
>
```

- Next select the number that corresponds to 'Telnet' and respond with y to enable (or n to disable) Telnet.



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```
WLAN III - HyperTerminal
File Edit View Call Transfer Help
[Icons]
6. SNMP OFF
7. Telnet OFF
>
Start telnet on boot (yes,no)? y
39:31 Build: May 6 2011 13:06:42
Zebra Location Sensor (WhereLan-III)
MAC=0004f1ec4b46 IP=10.2.16.200
Ethernet Settings Menu:
1. Boot Method FLASH
2. LAN
3. WLAN
4. IP Forwarding N/A
5. Proxy ARP
6. SNMP ON
7. Telnet ON
** You have made changes. You will be able to save them upon ESC **
>_
Connected 11:12:16 ANSIV 19200 8-N-1 SCROLL CAPS NUM Capture Print echo
```

Press the ESC key and enter the “ff2” password when prompted. The unit will update NVRAM, save your changes, and ask if you wish to reset the unit. After reset, the unit will boot with Telnet support.

**Note Telnet User and Password are as follows.**

**User: root**

**Password: password**



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## 5.3 WhereLAN III MAC/ IP Address Configuration

WhereLAN IIIs connect to an IP network over an Ethernet or Wi-Fi interface using TCP/IP, UDP, and other standard network protocols. For the LOS-5000-00AB, both the Location Sensor and the embedded Client Card must be independently configured with its own unique IP addresses or for DHCP address assignment. The IP address of each LS must be recorded and entered into the site configuration file, which contains the configuration information for each LS, including its location, and MAC address. This is for versions of VSS prior to the 4.0.5.2 release.

### 5.3.1 Activating IPv6 Transport

The WhereLAN-III device, running appropriate firmware V5.0.1 or later, will automatically generate a link-local IPv6 address after booting up. However, in order to acquire a global IPv6 address, which is needed for IPv6 communication with the VSS server, there must be an IPv6 router on the network having the following configuration:

- Allow local IPv6 traffic with a global.
- IPv6 network prefix (such as, for example, 2001:470:87c4:1000::/64)
- Enable neighbor discovery/route advert. protocol

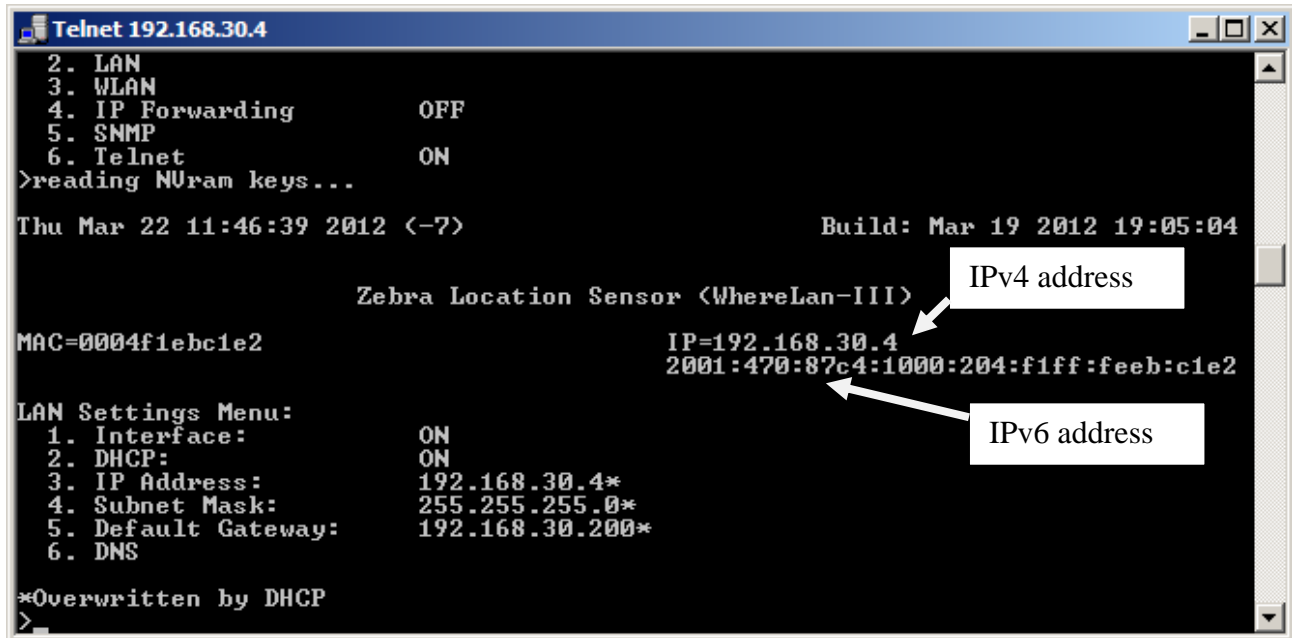
**NOTE:** The global IPv6 network prefix is a globally unique address and can be used inside or outside of internal networks. You need to apply for and obtain a global IPv6 network prefix for your network (for example, see [www.tunnelbroker.net](http://www.tunnelbroker.net)). This is a task typically performed by IT personnel responsible for the network.

If additionally you would like to assign a fixed IPv4 address to a WhereLAN-III, you can do so via the sensor menu, which can be accessed via Telnet (if enabled) or SSH client, or direct connect with serial cable.

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For example, if you Telnet to a sensor, you may see three IP addresses at the top right of the window, as shown in the screenshot below:

- An IPv4 address, if one has been configured using the 'Ethernet Settings' in the sensor menu (see screenshot).
- A global IPv6 address. This is the IPv6 address required for communication with the VSS server using IPv6 transport.
- A link-local IPv6 address, automatically generated at boot up time from the MAC address of the device



```
Telnet 192.168.30.4
2. LAN
3. WLAN
4. IP Forwarding      OFF
5. SNMP
6. Telnet              ON
>reading NURam keys...
Thu Mar 22 11:46:39 2012 (-7)                               Build: Mar 19 2012 19:05:04

Zebra Location Sensor <WhereLan-III>
MAC=0004f1ebc1e2
IP=192.168.30.4
2001:470:87c4:1000:204:f1ff:feeb:c1e2

LAN Settings Menu:
1. Interface:         ON
2. DHCP:              ON
3. IP Address:        192.168.30.4*
4. Subnet Mask:       255.255.255.0*
5. Default Gateway:   192.168.30.200*
6. DNS

*Overwritten by DHCP
>
```

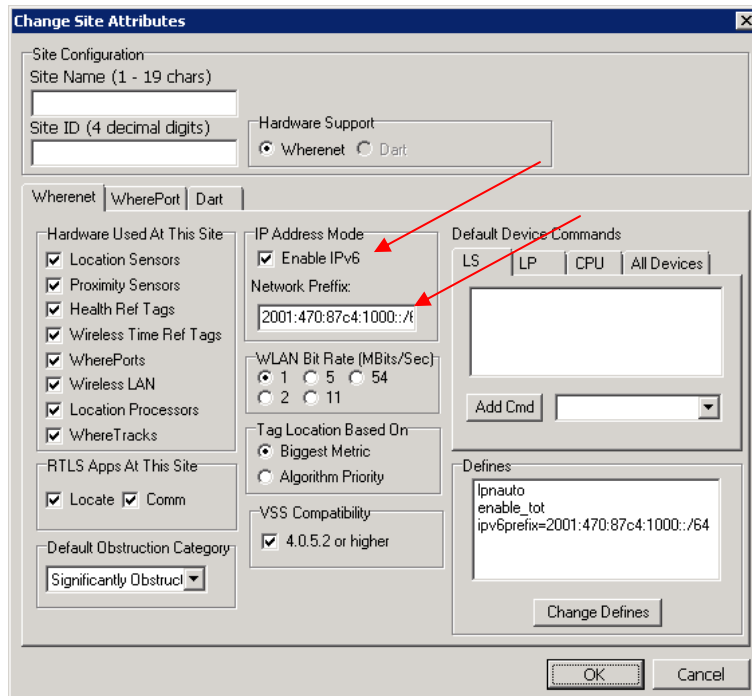
The screenshot shows a Telnet window with a black background and white text. At the top right, there are two white boxes with arrows pointing to the IP addresses: 'IPv4 address' pointing to '192.168.30.4' and 'IPv6 address' pointing to '2001:470:87c4:1000:204:f1ff:feeb:c1e2'. The text in the window includes menu options, status indicators, and system information.



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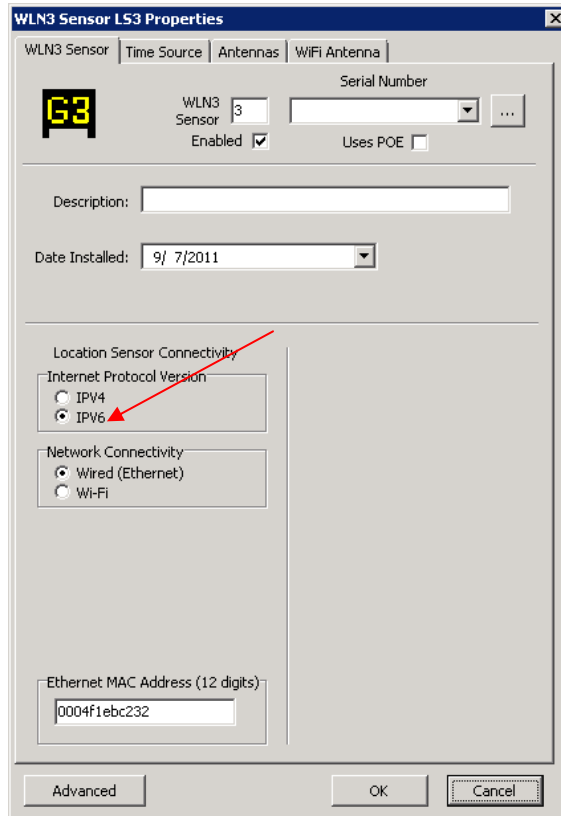
In order to have IPv6 network traffic (blinks, status information, etc.) between the WhereLAN-III devices and the VSS server, the following requirements must be fulfilled:

- The WhereLAN-III device must be able to acquire a global IPv6 address as described above.
- IPv6 must be enabled in the operating system (Windows) on the VSS server.
- The following steps must be followed in System Builder, which is the tool that generates the sitedata.dat configuration file parsed by the VSS services and the WhereLAN-III devices:
  - Activate IPv6 in the 'Change Site Attributes' dialog window and enter the global IPv6 network prefix that the IPv6 router on that network is using:



## WhereLAN III User's Guide

- Select IPv6 option in the Sensor Properties window:

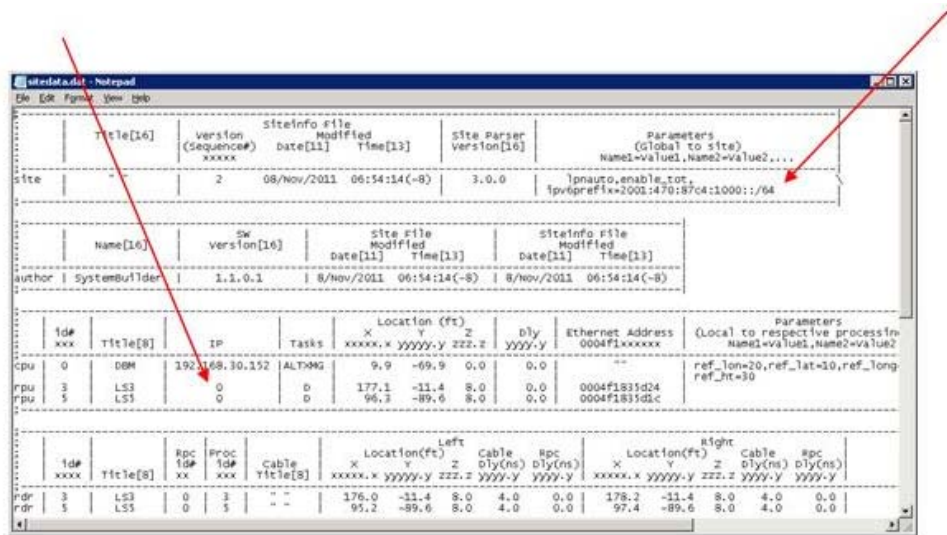


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The resulting sitedata.dat generated by System Builder will include the following:

- A site define `ipv6prefix` specifying the global IPv6 network prefix used by the IPv6 router on that network
- 0 (zero) IP address for all WhereLAN-III units that will communicate using IPv6

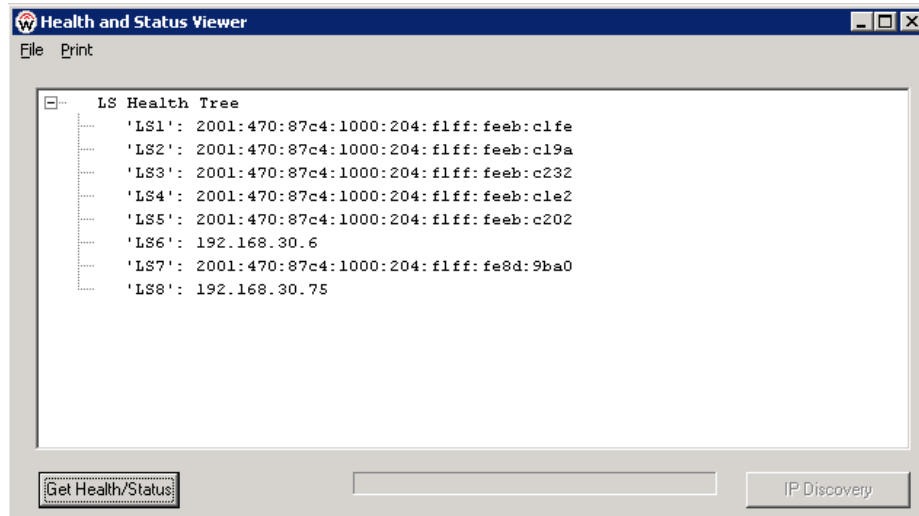
An example sitedata.dat is shown in the screenshot below:



NOTE: As usual, you need to restart the VSS services on the VSS server for changes in sitedata.dat to take effect. Some changes require rebooting the WhereLAN-III devices as well.

### 5.3.2 VSS Tool Support for IPv6

Once IPv6 transport between the VSS server and the WhereLAN-III devices has been activated as described above, you can use the VSS diagnostics and status tools as usual, but you will notice that the IPv6 address is used for devices configured with the IPv6 option in System builder, as shown in the Sensor Analyzer screenshot below:

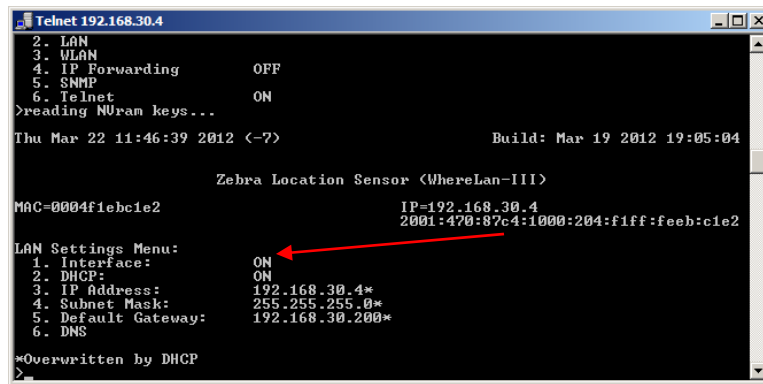


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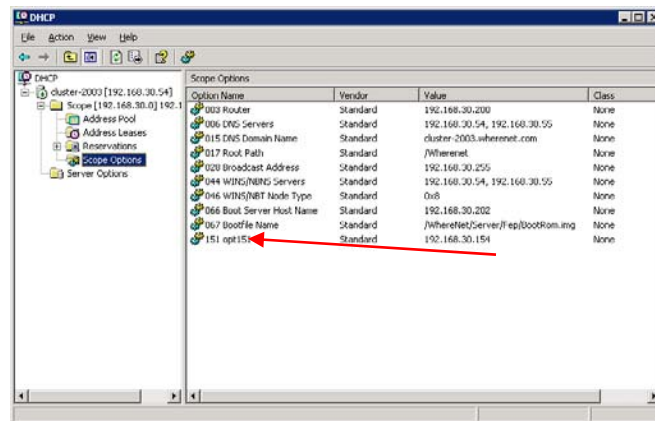
### 5.3.3 IPv4 DHCP Dynamic IP for WhreLAN-III Devices

It is possible to have a WhereLAN-III device automatically acquire an IPv4 address from a DHCP server. This IP assignment is dynamic and therefore the assigned IP may change the next time the device is rebooted. To enable the device to do so, the following steps are required:

- o The DHCP option in the sensor menu needs to be turned ON:

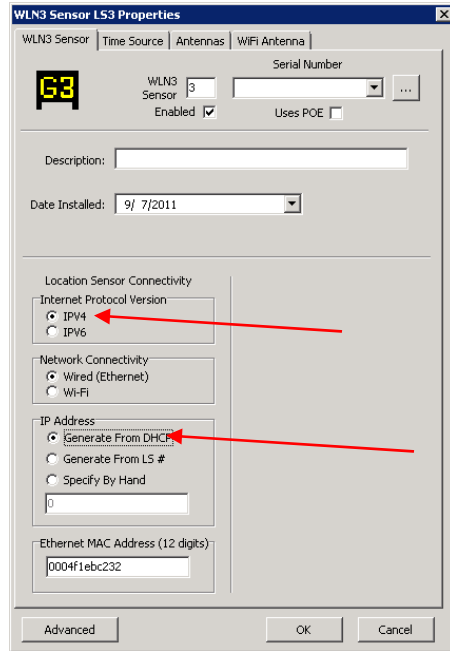


- o On the DHCP server, add scope option 151 (IP Address type) and point it to the IP address of the VSS server:

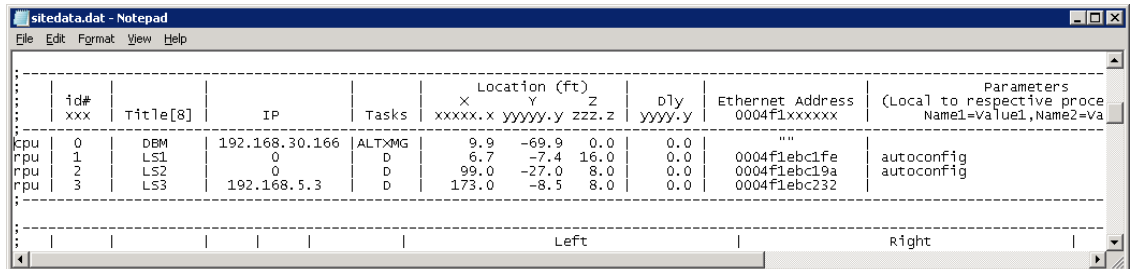


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- o In the Sensor Properties window in System Builder, select the IPv4 – DHCP option:

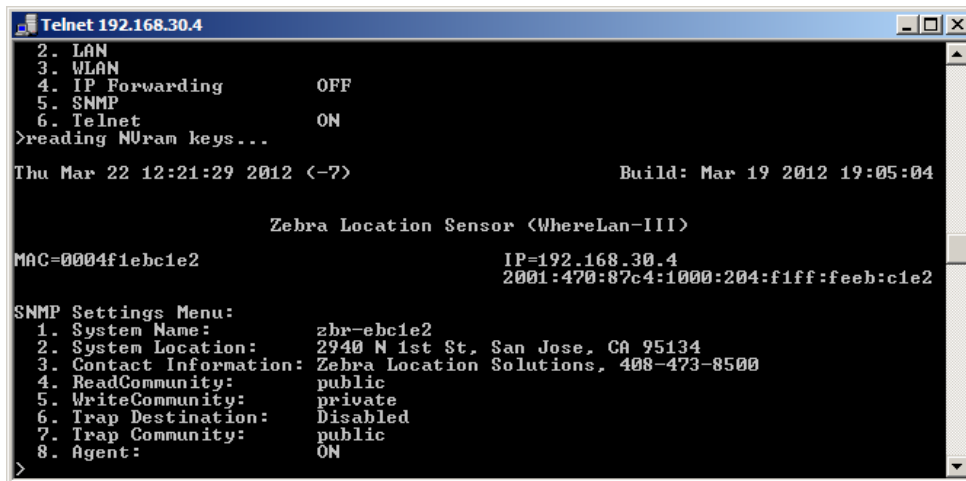


This will result in an entry for this sensor in sitedata.dat with a '0' IP address and the 'autoconfig' define, as shown in the example below:



### 5.3.4 SNMP and DNS Support in WHERELAN-III Devices

The WhereLAN-III firmware version 5.0.1 includes support for the SNMP and DNS network protocols. The 'Ethernet Settings' menu in the sensor menu includes menus to enable and configure these protocols, as shown in the screenshots below:



```
Telnet 192.168.30.4
2. LAN
3. WLAN
4. IP Forwarding      OFF
5. SNMP
6. Telnet             ON
>reading NVRam keys...
Thu Mar 22 12:21:29 2012 (-?)                Build: Mar 19 2012 19:05:04

                Zebra Location Sensor <WhereLan-III>
MAC=0004f1ebc1e2                IP=192.168.30.4
                                2001:470:87c4:1000:204:f1ff:feeb:c1e2

SNMP Settings Menu:
1. System Name:        zbr-ebc1e2
2. System Location:    2940 N 1st St, San Jose, CA 95134
3. Contact Information: Zebra Location Solutions, 408-473-8500
4. ReadCommunity:     public
5. WriteCommunity:    private
6. Trap Destination:  Disabled
7. Trap Community:    public
8. Agent:              ON
>
```



SEE MORE. DO MORE.

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### 5.3.5 WhereLAN-III MAC Legacy Compatibility

The WhereLAN-III MAC address is not directly compatible for replacing a WhereLAN-II at an existing site that is running a version of VSS prior to 4.0.5.2, and WhereWAND's that are running software that is from VSS prior to 4.0.5.2.

Location Sensors use 4 unique embedded tags id's, for Timing and Health. These 4 unique embedded tag Id's correspond to the Rf Transmit and TIC ports (1, 2, and 3). The upper 32 bits of these four tag-ID's MATCH bits 31 down to 2 of the unit's MAC address. For this reason MAC addresses of Location Sensor with, WhereLAN-II or WhereLAN-III, skip in a modulus of 4.

- For Example: In a WhereLAN-2 a MAC address might look like 0004F1AAA120, then the next MAC address of a WhereLAN-2, in sequence, would be 0004F1AAA124.
- So this means for a WhereLAN-2 that there MAC address will always end in either a 0, 4, 8, or C.
- For the above Example: Embedded tags for 0004F1AAA120:  
**Rf Port:** F1AAA120  
**Tic1:** F1AAA121  
**Tic2:** F1AAA122  
**Ttic3:**F1AAA123
- The WhereLAN-III MAC addresses now ends in either 2, 6, A, and E.





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WhereLAN-III MAC addresses now ends in either 2, 6, A, and E. This new MAC scheme allows more efficient use of the MAC space defined for this product and easy recognition by users and the system in identify a unit as a WhereLan-III or II by just looking at its MAC.

- However the embedded tags still follow the format of the WhereLAN-II, meaning they MATCH bits 31 down to 2 of the unit's MAC address in order of RF Tag thru wired time ports.
- Older versions of the WhereWand FW assume that the lower 32-bits MATCH between the MAC and the RF tag-ID. To fit WhereLan-III into the MAC space it is now that sensors MATCH bits 31 down to 2.
- The embedded tags not matching the MAC address is causing issues, because the WhereWAND uses the Rf embedded tag id to communicate with the Location sensor.

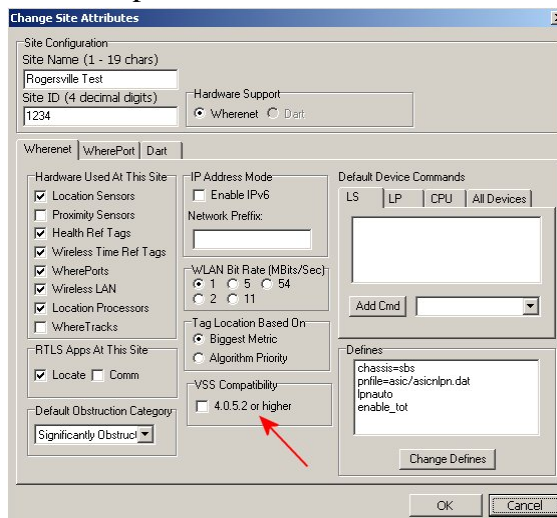
The differences described above cause three main issues with the WhereLAN-III MAC address and running an older version of VSS prior to VSS 4.0.5.2, cause.

1. The Blink Service auto-generates a list of expected/known system embedded tags based on the MAC address in SiteData. Entering the MAC as listed on the unit, a legacy BlinkService will not generate a proper list of embedded reference tags, and the Time Service will not receive the embedded tag blinks it needs from the WhereLAN-III.
2. iSensor validates the MAC addresses in sitedata.dat match the MAC of the Location sensors. With legacy iSensor, this causes red-lights on the health and status display.
3. The WhereWAND's download of the site configuration contain the MAC addresses of each Location Sensor. The WhereWAND must use the Rf embedded tag Id to communicate with the location sensor and legacy WhereWand FW calculates the tag-ID incorrectly, resulting in no-response from the specific sensor.

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There are three ways to fix these issues.

1. The best is to have the customer site upgrade to VSS 4.0.5.2 or later, which has the tools and system builder that take care of the issues directly.
2. The next best is to see if the customer will allow new tools to be loaded onto their system, if they require an approval time for full VSS. The tools will be the System Builder and iSensor from the VSS 4.0.5.2 release. This will work with legacy version of VSS.
  - a. With this the MAC of the WhereLAN-III can be entered accurately (as it is shown on the WHERELAN-III label) into system builder, in the Location Sensor, WLN3 of the tree view. Under the 'Site Attributes' tab, make sure the 4.0.5.2 VSS Compatibility box is unchecked for legacy VSS systems. This will save and publish the sitedata.dat in the correct form.





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- 3. Otherwise, In legacy VSS systems using legacy tools, the MAC address must be adjusted by subtracting 2 from the MAC address that is listed on the unit, see table below.

Actual WLAN III MAC	System Builder MAC Entry
00-04-f1-xx-xx-02	00-04-f1-xx-xx-00
00-04-f1-xx-xx-06	00-04-f1-xx-xx-04
00-04-f1-xx-xx-0A	00-04-f1-xx-xx-08
00-04-f1-xx-xx-0E	00-04-f1-xx-xx-0C

**NOTE: This table only applies to legacy VSS, version prior to VSS 4.0.5.2**

This will allow the WhereLAN-III's to function in the Blink Service and have the Time Service looking for the correct embedded tag Id's. However with legacy iSensor this will still display the unit as Red in Health and Status, for the MAC mismatch. To fix the health indicator, you can consider just replacing the iSensor executable with the one from VSS 4.0.5.2.

Note

**Failure to configure the WhereLAN III prior to operation may result in an inoperative unit. Ethernet connected units installed on an operational and reliable network with DHCP IP address assignment may be configured post installation. All Wi-Fi connected units must be configured with the appropriate Wi-Fi network parameters before installation.**

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Each WhereLAN III is shipped with a label set containing one label (Figure 2) with the bar coded MAC address of the unit and its Wi-Fi client (as applicable) 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 unit. 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.

**Note**

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



Figure 2 Example of LOS-5000-00AB Label

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While there is no restriction to the IP address, it must match the address in the Site file for that particular WhereLAN III. 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 Wi-Fi Client).

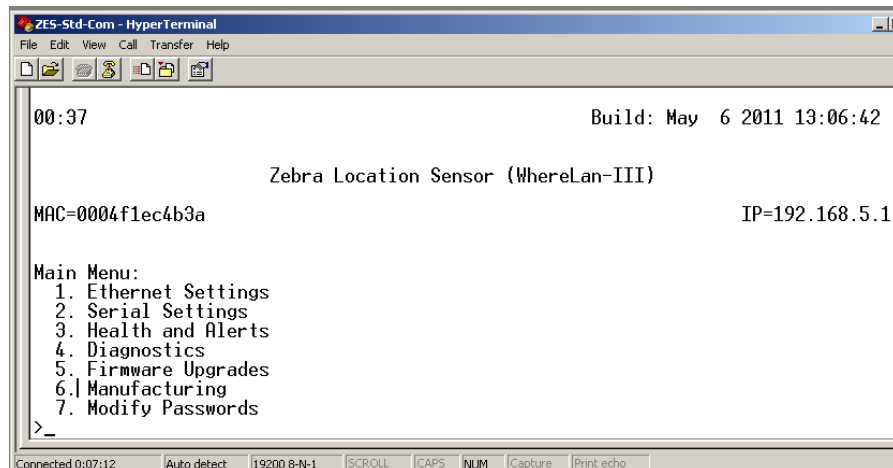
#### Note

**For networks utilizing DHCP, the IP address or host name of the site's RTLS server must be entered in the DHCP server. See the VSS User Guide for more details on Network Autoconfig.**

To configure the IP address of the Location Sensor:

*Note the following configuration examples are done thru HyperTerminal.*

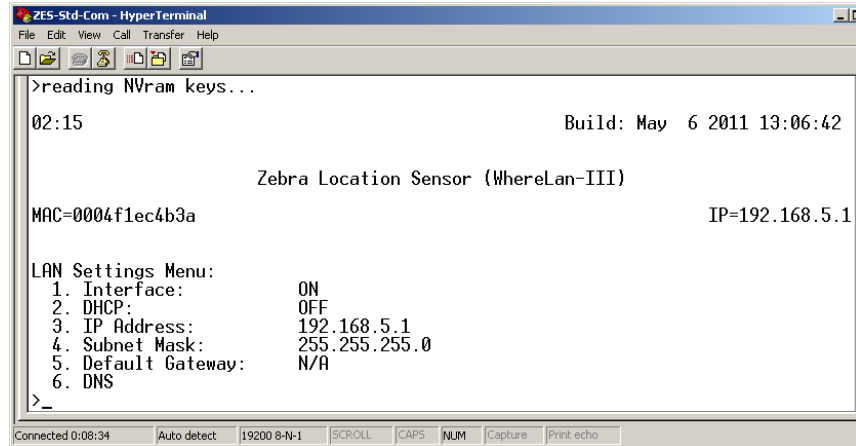
- Connect to the Location Sensor using SSH, or HyperTerminal.
- Select the number that corresponds to 'Ethernet Settings'1 and confirm the unique MAC address for the Location Sensor.



```
ZES-Std-Com - HyperTerminal
File Edit View Call Transfer Help
00:37 Build: May 6 2011 13:06:42
Zebra Location Sensor (WhereLan-III)
MAC=0004f1ec4b3a IP=192.168.5.1
Main Menu:
1. Ethernet Settings
2. Serial Settings
3. Health and Alerts
4. Diagnostics
5. Firmware Upgrades
6. Manufacturing
7. Modify Passwords
>
```

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- Select 1 for setting Boot Method, Flash for internal image or Network for image. (Flash is default and most commonly used).
- Select 2 for wired LAN Port IP setting or 3 WLAN client IP/DHCP setting.



```
>reading Nvram keys...
02:15                               Build: May 6 2011 13:06:42

                                Zebra Location Sensor (WhereLan-III)

MAC=0004f1ec4b3a                               IP=192.168.5.1

LAN Settings Menu:
1. Interface:           ON
2. DHCP:                OFF
3. IP Address:         192.168.5.1
4. Subnet Mask:       255.255.255.0
5. Default Gateway:   N/A
6. DNS

>
```

- 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.

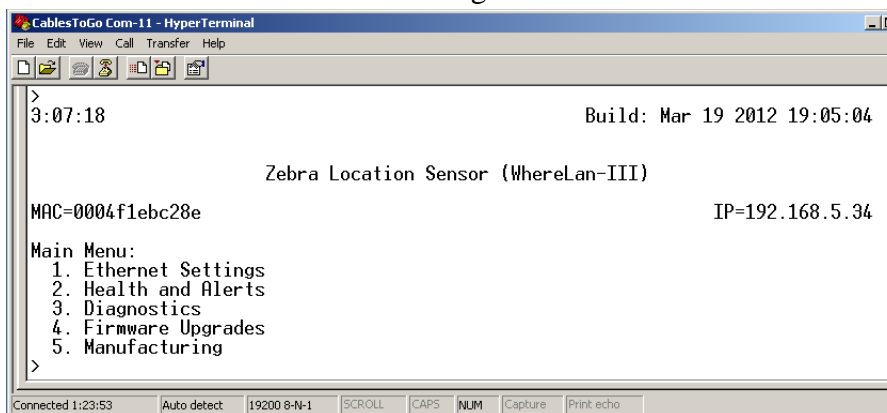
## WhereLAN III User's Guide

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

The Wi-Fi client card embedded in the WhereLAN III must be configured with the proper IP address or for DHCP set and the Interface must be ON. In addition, the Wi-Fi network parameters, such as the SSID, and authentication and encryption methods, must be configured in the wpa\_supplicant, ([See sections 5.4.2 Configuring the Wi-Fi Network Parameters and 5.4.3 WPA Supplicant Cautions](#))

From the Main Menu:

- Select Ethernet Settings.



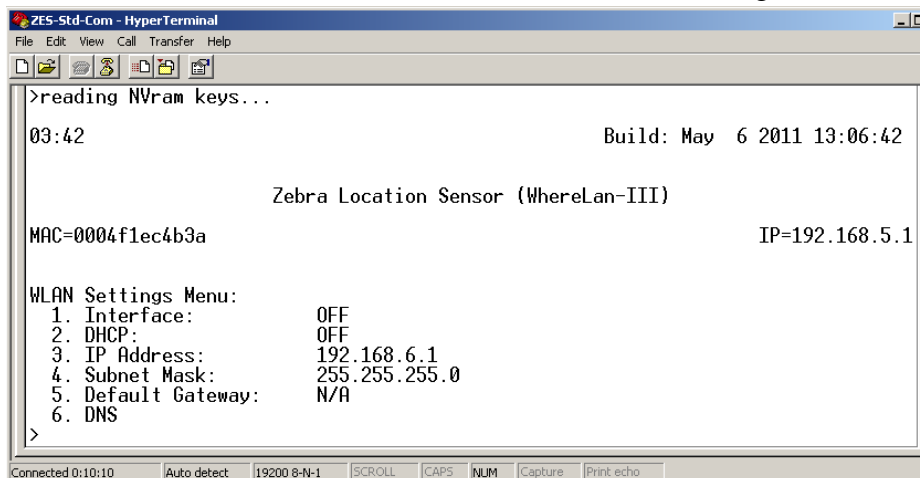
```
CablesToGo Com-11 - HyperTerminal
File Edit View Call Transfer Help
[Icons]
>
3:07:18                               Build: Mar 19 2012 19:05:04

                Zebra Location Sensor (WhereLan-III)

MAC=0004f1ebc28e                       IP=192.168.5.34

Main Menu:
1. Ethernet Settings
2. Health and Alerts
3. Diagnostics
4. Firmware Upgrades
5. Manufacturing
>
```

- Under Ethernet Menu select 3 WLAN.
- Set 1. Interface to ON, then IP/DHCP settings.



```
ZES-Std-Com - HyperTerminal
File Edit View Call Transfer Help
[Icons]
>reading NVram keys...
03:42                               Build: May 6 2011 13:06:42

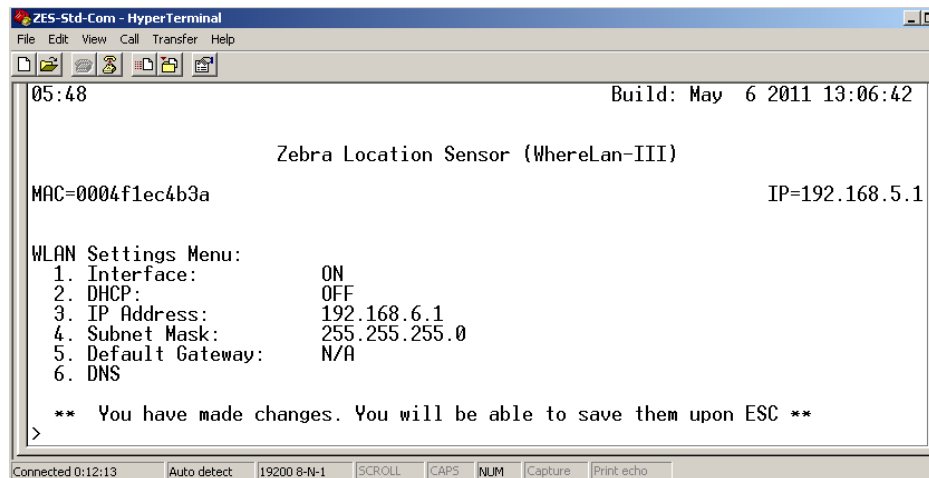
                Zebra Location Sensor (WhereLan-III)

MAC=0004f1ec4b3a                       IP=192.168.5.1

WLAN Settings Menu:
1. Interface:           OFF
2. DHCP:                OFF
3. IP Address:          192.168.6.1
4. Subnet Mask:         255.255.255.0
5. Default Gateway:     N/A
6. DNS
>
```

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- Save the configuration changes by using ESC key entering the password “ff2”.
- Select either ‘yes’ or ‘no’ at this point, depending on if further configuration needs to take place.. *(A reset/reboot will be required thought for all the changes to take effect.)*



```
05:48 Build: May 6 2011 13:06:42

Zebra Location Sensor (WhereLAN-III)

MAC=0004f1ec4b3a IP=192.168.5.1

WLAN Settings Menu:
1. Interface:      ON
2. DHCP:          OFF
3. IP Address:    192.168.6.1
4. Subnet Mask:   255.255.255.0
5. Default Gateway: N/A
6. DNS

** You have made changes. You will be able to save them upon ESC **
```

**Note:** Although the LOS-5000-00AB has two network interfaces (its Ethernet and Wi-Fi ports) in the vast majority of cases, only its Wi-Fi port is actually connected to an operational network. If enabled, the Ethernet port must be configured to be on a different subnet than the Wi-Fi port. In this case, it is recommended that a non-routable IP address be used such as 192.168.5.0/255.255.255.0, to enable local diagnostics via the Ethernet port.

#### 5.4.1 Setting Wi-Fi Antenna Type

The Wi-Fi antenna setting is available in firmware versions V5.0.2 or later (Build Date Apr 30 2012 or later). The antenna selection is set under 802.11Client Menu, which is reached from the Main Menu via the Diagnostics Menu. There are currently three antenna choices to select from, and these match the Wi-Fi antennas that are offered on the marketing price list. The selection is entered under the “Select Antenna” menu item.

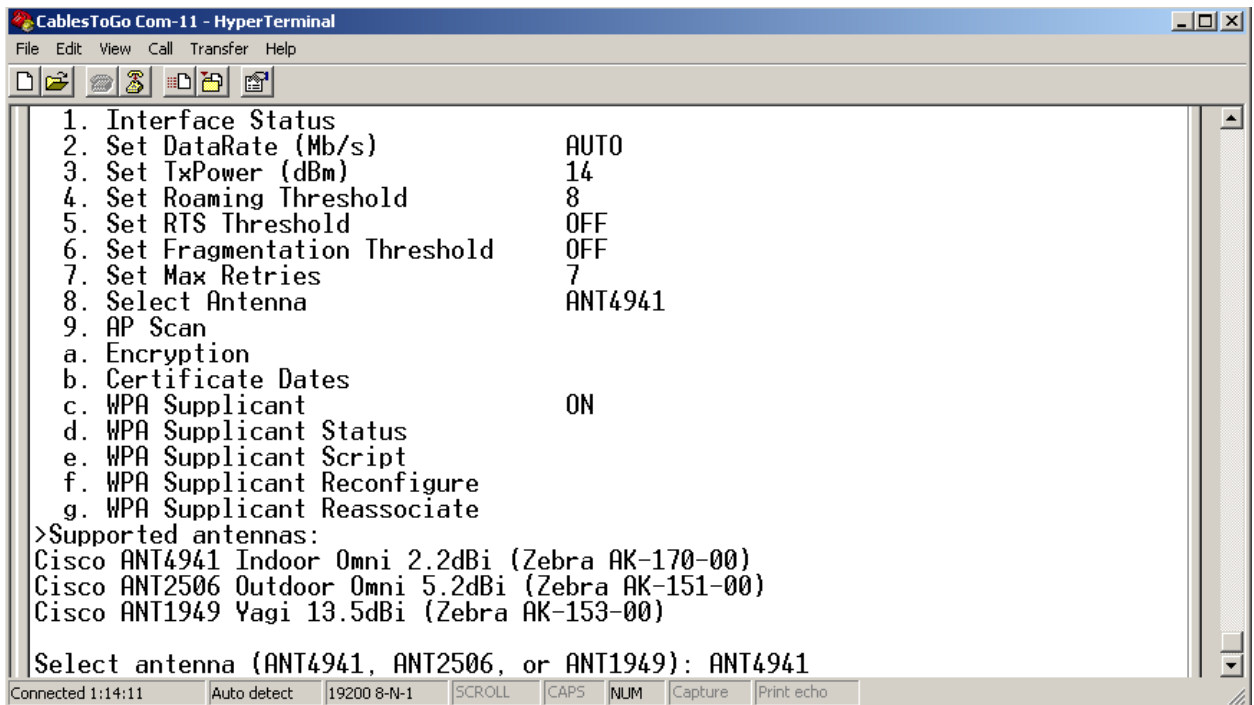
Antenna Options:

- AK-170-00 2.2dBi Dipole Antenna (Rubber Duck) , Selection **ANT4941**
- AK-151-00 5.2dBi Omni Antenna, Selection **ANT2506**



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From the *Main Menu*, select *Diagnostics*, and from the *Diagnostics Menu* select *802.11 Client*. Then, in the *802.11 Client Menu*, select the number that corresponds to “Select Antenna”, and enter the value that corresponds to the antenna that will be attached to the WhereLAN-III.



```
CablesToGo Com-11 - HyperTerminal
File Edit View Call Transfer Help
[Icons]
1. Interface Status
2. Set DataRate (Mb/s)          AUTO
3. Set TxPower (dBm)           14
4. Set Roaming Threshold       8
5. Set RTS Threshold           OFF
6. Set Fragmentation Threshold OFF
7. Set Max Retries             7
8. Select Antenna              ANT4941
9. AP Scan
a. Encryption
b. Certificate Dates
c. WPA Supplicant              ON
d. WPA Supplicant Status
e. WPA Supplicant Script
f. WPA Supplicant Reconfigure
g. WPA Supplicant Reassociate
>Supported antennas:
Cisco ANT4941 Indoor Omni 2.2dBi (Zebra AK-170-00)
Cisco ANT2506 Outdoor Omni 5.2dBi (Zebra AK-151-00)
Cisco ANT1949 Yagi 13.5dBi (Zebra AK-153-00)
Select antenna (ANT4941, ANT2506, or ANT1949): ANT4941
Connected 1:14:11  Auto detect  19200 8-N-1  SCROLL  CAPS  NUM  Capture  Print echo
```

Escape “ESC” to save selection, ‘ff2’ is the password. The unit will need to be rebooted for the setting to take effect.

### 5.4.2 Configuring the Wi-Fi Network Parameters

All the Wi-Fi network parameters are under the control of a file called `wpa_supplicant.conf`. In order to configure the WhereLAN III Wi-Fi client card to access your network, you must first edit or create this file to match your Wi-Fi network configuration and then upload the file onto the WhereLAN III unit. The `wpa_supplicant.conf` file must be created or edited with a Linux friendly text editor. Do not use Notepad or similar. A popular free Linux editor is called VIM and is found at <http://vim.sourceforge.net/>.

---

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The process will be illustrated assuming a sample Wi-Fi network with the following parameters.

- a. SSID = ZEBRA
- b. Security = WPA2, Pre-Shared Key (WPA2-PSK)
- c. WPA2 passphrase = ZebraPassphrase2011

To match these Wi-Fi parameters, the `wpa_supplicant.conf` file is very simple and is shown below:

```
# A simple script file for WPA2-PSK with AES CCMP mode.

# The following line should not be changed. Otherwise, Wi-Fi will not work.
ctrl_interface=/var/run/wpa_supplicant

# Let wpa_supplicant take care of scanning and AP selection
ap_scan=2

# Network Block
network={
    ssid="ZEBRA"
    proto=WPA2
    key_mgmt=WPA-PSK
    pairwise=CCMP
    group=CCMP
    psk="ZebraPassphrase2011"
}
```

Create your `wpa_supplicant.conf` file with your Linux-friendly editor and place a copy of it on the RTLS Server's `ftproot` directory. Placing the file in this directory facilitates the upload process.

Uploading the `wpa_supplicant.conf` file onto the WhereLAN III Unit.

#### 5.4.3 WPA\_Supplicant Cautions



SEE MORE. DO MORE.

---

### WhereLAN III User's Guide

**Important:** The wpa\_supplicant file, which controls security of the wireless client card, is currently over written when upgrading the firmware on a WhereLAN-III.

- Over writing the wpa\_supplicant file can lead to loss of network connection if the WhereLAN-III is wirelessly connected to the network.
- Once upgraded the wpa\_supplicant file will revert to its original configuration.
- Recovery WILL require direct connection to the unit.

**Solution:** The issue of over writing the wpa\_supplicant file can be avoided by editing the WhereLAN-III 'upgrade.txt' script file that is distributed with the WhereLAN-III firmware files. *The files will be located in a directory under the /inetpub/ftproot/server\G3v501.*

- The script file is the first to be read by the WhereLan-III and is subsequently used by the WhereLan-III to control which of the four firmware files (bootloader.bin, uImage, rootfileys, and JFFS2) are to be uploaded to the WhereLan-III during the upgrade process.
- The wpa\_supplicant.conf file is stored within the JFFS2 image. When JFFS2 is upgraded, the site specific wpa\_supplicant.conf file is replaced with the default found in the released JFFS2 image.
- Modifications to the upgrade.txt script file are supported to enable the WhereLan-III to temporarily save the site specfic wpa\_supplicant.conf file and restore it after the upgrade of JFFS2 completes.
- The necessary command line for saving and restoring the wpa\_supplicant.conf file is present in the upgrade.txt script, but is commented out and therefore causes no effect.
- Modifying the wpa\_supplicant.conf file can be done by removing the “#” (indicator for a comment line)from in front of the F1=”wpa\_supplicant/conf” line.
  - Note ‘#’ is the script’s language for indicating the line is a comment and contains no instructions. Removing the ‘#’ causes the script to execute the instruction on that line.
  - The upgrade.txt file must be edited with a Linux friendly text editor. Do not use Notepad or similar as it WILL corrupt the



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file. A popular free Linux editor is called VIM and is found at <http://vim.sourceforge.net/> .

Example excerpt from a default upgrade.txt script file:

```
#####
# List JFFS2 files and/or directories (F0-FN, N<10) to be restored
#####
#F0="wpa_supplicant.conf_reference"
#F1="wpa_supplicant.conf"
```

Modified example excerpt from a default upgrade.txt script file to cause the wpa\_supplicant.conf file to be save d and later restored:

```
#####
# List JFFS2 files and/or directories (F0-FN, N<10) to be restored
#####
#F0="wpa_supplicant.conf_reference"
F1="wpa_supplicant.conf"
```

NOTE the removed “#” (from the fourth line) in front of the F1 as shown above.

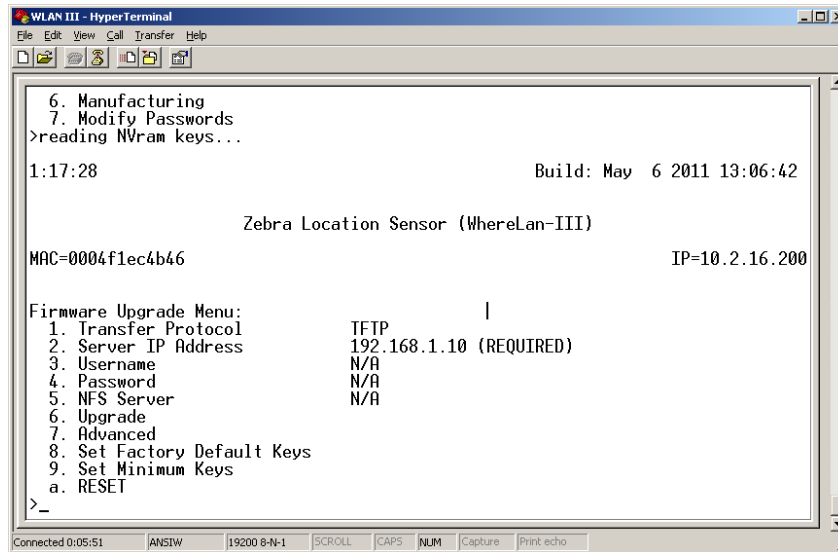
Engineering is in planning on how to deliver a standard set of firmware files and scripts that may default to automatic save/restore.

**5.5 WPA Supplicant Upload**

The following instructions will demonstrate on how to upload a wpa\_supplicant.conf file to the WhereLAN-III.

From the Main Menu, select the number that corresponds to ‘Firmware Upgrade’.

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```
WLAN III - HyperTerminal
File Edit View Call Transfer Help
[Icons]
6. Manufacturing
7. Modify Passwords
>reading NVRam keys...
1:17:28                               Build: May  6 2011 13:06:42
                                     Zebra Location Sensor (WhereLan-III)
MAC=0004f1ec4b46                       IP=10.2.16.200
Firmware Upgrade Menu:
1. Transfer Protocol                    TFTP
2. Server IP Address                    192.168.1.10 (REQUIRED)
3. Username                             N/A
4. Password                             N/A
5. NFS Server                           N/A
6. Upgrade
7. Advanced
8. Set Factory Default Keys
9. Set Minimum Keys
a. RESET
>_
Connected 0:05:51  ANSW  19200 8-N-1  SCROLL  CAPS  NUM  Capture  Print echo
```

Now Select the 'Transfer Protocol' (either TFTP *default*, FTP, or NFS) and set the 'Server IP Address' of the server where the files are locate. Ensure the tftp and/or ftp service is enabled on the computer that contains the wpa\_supplicant.conf file.

Now, select the item number that corresponds to 'Advanced', and enter the ff2 password. The WhereLAN II present the following menu.



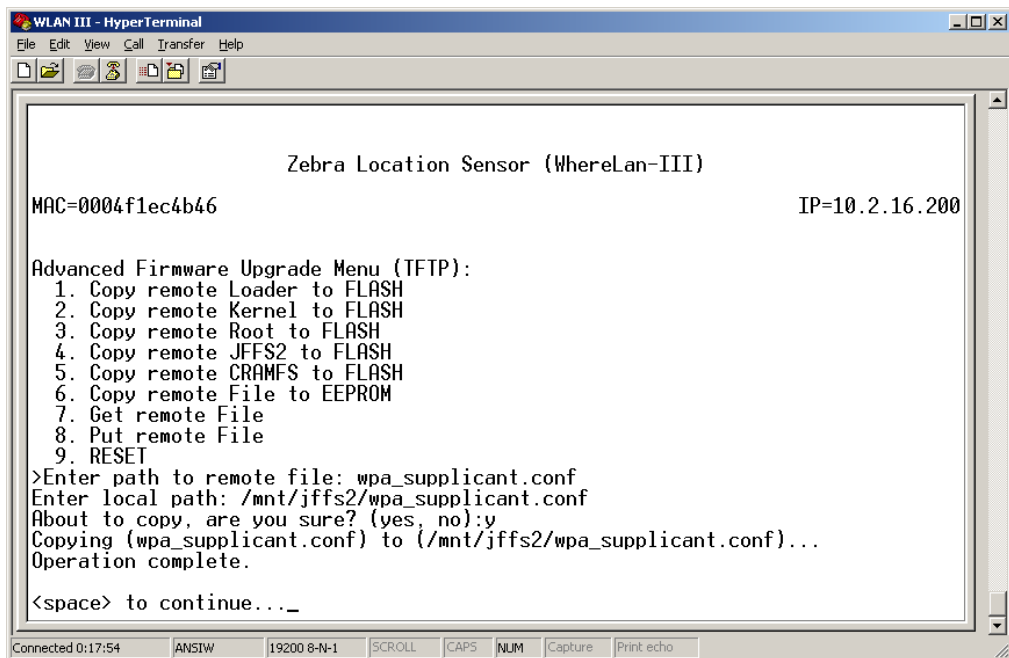
SEE MORE. DO MORE.

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```
WLAN III - HyperTerminal
File Edit View Call Transfer Help
[Icons]
8. Set Factory Default Keys
9. Set Minimum Keys
a. RESET
>For advanced firmware management, enter password :***
1:22:32                               Build: May 6 2011 13:06:42
                                     Zebra Location Sensor (WhereLan-III)
MAC=0004f1ec4b46                       IP=10.2.16.200
Advanced Firmware Upgrade Menu (TFTP) :
1. Copy remote Loader to FLASH
2. Copy remote Kernel to FLASH
3. Copy remote Root to FLASH
4. Copy remote JFFS2 to FLASH
5. Copy remote CRAMFS to FLASH
6. Copy remote File to EEPROM
7. Get remote File
8. Put remote File
9. RESET
>_
Connected 0:08:27  ANSIW  19200 8-N-1  SCROLL  CAPS  NUM  Capture  Print echo
```

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- Now, select 7, 'Get remote file'. The WhereLAN III asks for the path to the remote file. As you have placed the file in the server's root directly, simply enter 'wpa\_supplicant.conf'.
- Now, the WhereLAN III asks for a local path, i.e., where the file should be placed in the WhereLAN III itself. Enter '/mnt/jffs2/wpa\_supplicant.conf'. Be sure to enter the path and file names correctly, as an error here will prevent normal Wi-Fi operations. WhereLAN III asks you to confirm before the file is uploaded. Accept by entering y. When the operation completes, your screen should look like this.

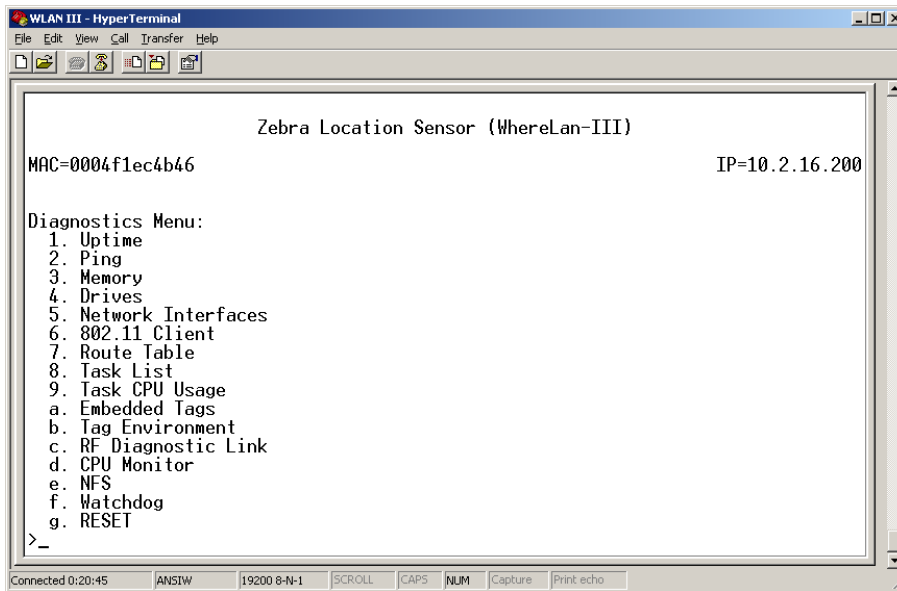


```
WLAN III - HyperTerminal
File Edit View Call Transfer Help
Zebra Location Sensor (WhereLan-III)
MAC=0004f1ec4b46 IP=10.2.16.200
Advanced Firmware Upgrade Menu (TFTP):
1. Copy remote Loader to FLASH
2. Copy remote Kernel to FLASH
3. Copy remote Root to FLASH
4. Copy remote JFFS2 to FLASH
5. Copy remote CRAMFS to FLASH
6. Copy remote File to EEPROM
7. Get remote File
8. Put remote File
9. RESET
>Enter path to remote file: wpa_supplicant.conf
Enter local path: /mnt/jffs2/wpa_supplicant.conf
About to copy, are you sure? (yes, no):y
Copying (wpa_supplicant.conf) to (/mnt/jffs2/wpa_supplicant.conf)...
Operation complete.
<space> to continue..._
Connected 0:17:54 ANSIW 19200 8-N-1 SCROLL CAPS NUM Capture Print echo
```

- Now, that the wpa\_supplicant.conf file has been uploaded, you must enable wpa\_supplicant processing on the WhereLAN III itself.

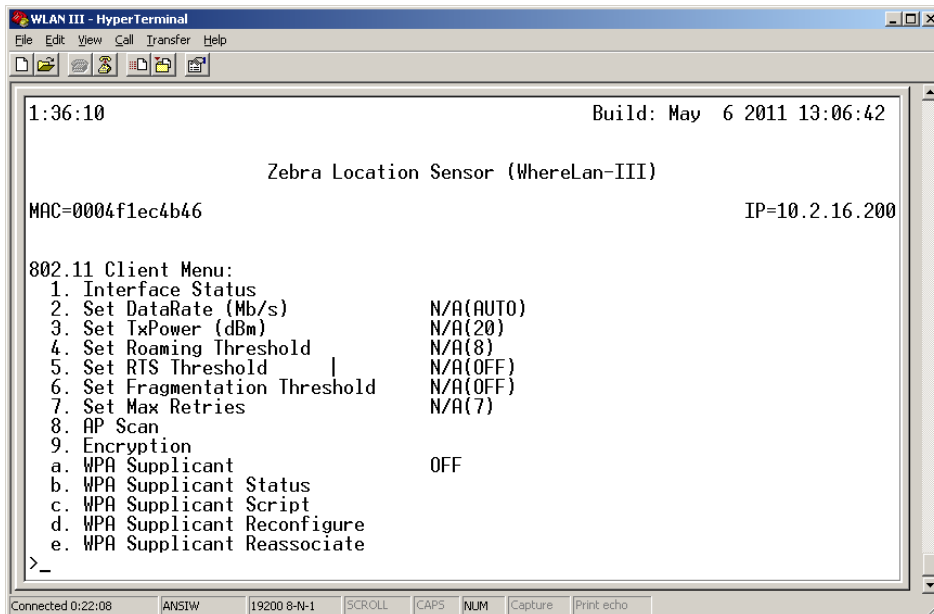
### WhereLAN III User's Guide

- From the Main Menu, select the number that corresponds to, 'Diagnostics'. This will display the Diagnostic menu as shown below.



```
WLAN III - HyperTerminal
File Edit View Call Transfer Help
Zebra Location Sensor (WhereLan-III)
MAC=0004f1ec4b46 IP=10.2.16.200
Diagnostics Menu:
1. Uptime
2. Ping
3. Memory
4. Drives
5. Network Interfaces
6. 802.11 Client
7. Route Table
8. Task List
9. Task CPU Usage
a. Embedded Tags
b. Tag Environment
c. RF Diagnostic Link
d. CPU Monitor
e. NFS
f. Watchdog
g. RESET
>_
Connected 0:20:45 ANSIW 19200 8-N-1 SCROLL CAPS NUM Capture Print echo
```

- Next select the number that corresponds to, '802.11 client'.



```
WLAN III - HyperTerminal
File Edit View Call Transfer Help
1:36:10 Build: May 6 2011 13:06:42
Zebra Location Sensor (WhereLan-III)
MAC=0004f1ec4b46 IP=10.2.16.200
802.11 Client Menu:
1. Interface Status
2. Set DataRate (Mb/s) N/A(AUTO)
3. Set TxPower (dBm) N/A(20)
4. Set Roaming Threshold N/A(8)
5. Set RTS Threshold N/A(OFF)
6. Set Fragmentation Threshold N/A(OFF)
7. Set Max Retries N/A(7)
8. AP Scan
9. Encryption
a. WPA Supplicant OFF
b. WPA Supplicant Status
c. WPA Supplicant Script
d. WPA Supplicant Reconfigure
e. WPA Supplicant Reassociate
>_
Connected 0:22:08 ANSIW 19200 8-N-1 SCROLL CAPS NUM Capture Print echo
```

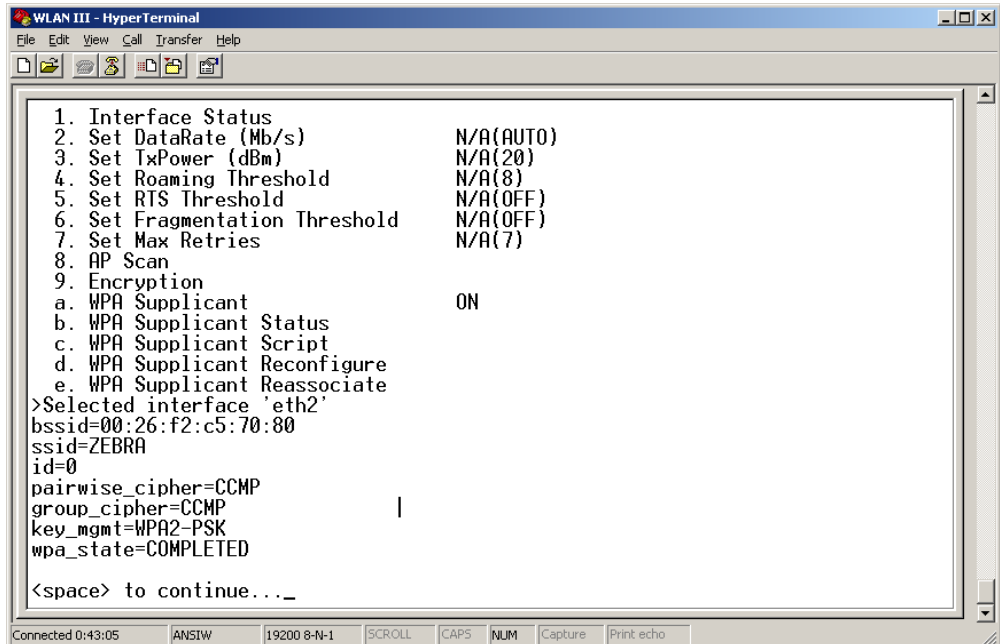


### WhereLAN III User's Guide

- And now, the item that corresponds to, 'WPA Supplicant', respond 'yes' to enable wpa\_supplicant operation.
- Press ESC to save changes, and enter the ff2 password, and space to continue.
- The unit must be reset in order for wpa\_supplicant processing to take effect.

Verify the unit's Wi-Fi network connection is operation.

- From the Main Menu select the number that corresponds 'Diagnostics'.
- In the Diagnostics Menu, select the number that corresponds to '802.11 Client'.
- In the 802.11 Client Menu, select the item that corresponds to 'WPA Supplicant Status' and WhereLAN III will display its Wi-Fi association status, as shown below.




```
WLAN III - HyperTerminal
File Edit View Call Transfer Help
1. Interface Status
2. Set DataRate (Mb/s) N/A(AUTO)
3. Set TxPower (dBm) N/A(20)
4. Set Roaming Threshold N/A(8)
5. Set RTS Threshold N/A(OFF)
6. Set Fragmentation Threshold N/A(OFF)
7. Set Max Retries N/A(7)
8. AP Scan
9. Encryption ON
  a. WPA Supplicant
  b. WPA Supplicant Status
  c. WPA Supplicant Script
  d. WPA Supplicant Reconfigure
  e. WPA Supplicant Reassociate
>Selected interface 'eth2'
bssid=00:26:f2:c5:70:80
ssid=ZEBRA
id=0
pairwise_cipher=CCMP
group_cipher=CCMP
key_mgmt=WPA2-PSK
wpa_state=COMPLETED
<space> to continue..._
Connected 0:43:05 ANSIW 19200 8-N-1 SCROLL CAPS NUM Capture Print echo
```

**Important: It is good practice to verify the operation of the Wi-Fi before having the unit installed.**

## 6 INSTALLATION AND MOUNTING

Read Installation and Instruction sheet included with the Location Sensor as well as all Safety and Installation Warnings/Cautions before installing. Follow the Site Design document for installed location.


### 6.1 Safety and Installation Warnings and Cautions


 **Warning - Warning - Electrical Shock:** A protective earthing conductor with green and yellow insulation, minimum of 18 AWG, shall be installed to the protective earthing terminal of the metal enclosure when I/O or power cables are routed outdoors. National electrical codes shall be followed to install facility protective earthing conductor to the protective earthing terminal.





Earth Ground Locations.  
Bolt Size 8mm. Max  
Length 25mm.

Figure 3 Safety and Warnings

 **Warning - Electrical Shock:** No operator serviceable parts inside. Refer servicing to qualified personnel. To prevent electrical shock, do not remove covers.

 **Caution -** The Location Sensor hardware must be installed by a qualified service technician

 **Caution -** Use of Zebra external power supply is limited to indoor use and a max 40° C environment. Only use Zebra approved power supplies.

 **Caution -** The Timing Sync cable use is limited to indoor only.

## 6.2 Mounting

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

The Location Sensor has two methods of mounting .The first 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. The second method of mounting is a pole mount hardware kit is available separately, ZES Part Number **RM-510-00 Mounting Bracket, Pole Mount**.

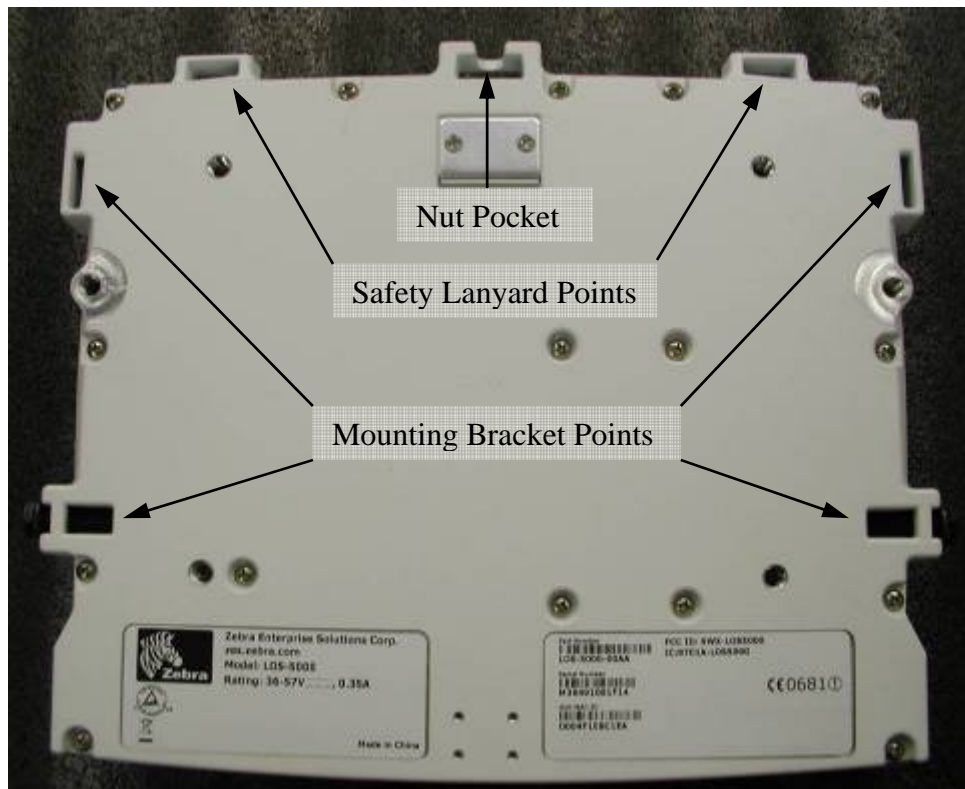


Figure 4 Mounting Points

### Note

**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.**



*For safety it is strongly recommend that a Safety Lanyard be employed with either mounting method. The Safety Lanyard points are large enough to accept a 3/16" loop style wire rope. Stainless Steel Rope is recommended.*



Figure 5 Safety Lanyard

### 6.3 3/8ths Threaded Rod

The Location Sensor can be hung via a 3/8 inch (10 mm) threaded rod per the following instructions. This type of mounting is intended for indoor installations only, if mounting outdoors use the Pole Mount Kit described in Sections 6.4. 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.

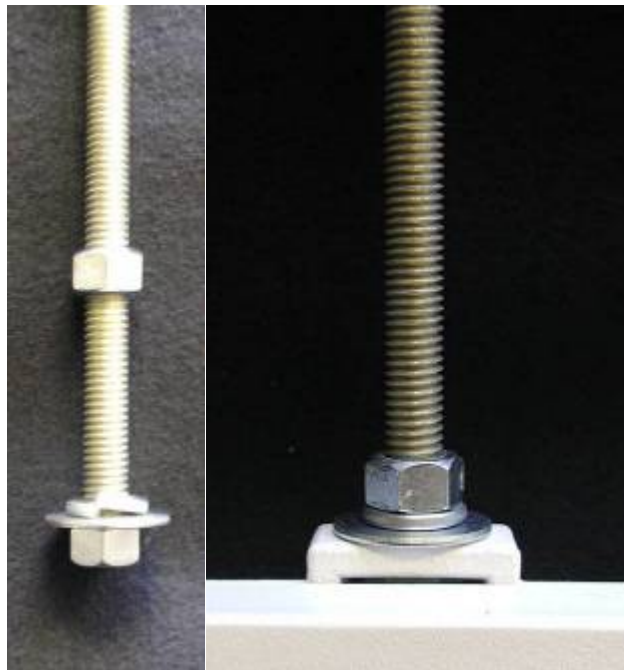


Figure 6 Threaded-Rod

### 6.3.1 Safety Lanyard with Threaded Rod

For Location Sensor installation using the Threaded Rod Mounting, it must also be secured to the building infrastructure with a safety lanyard through the one of the rectangular loops on top the casting. See below in Figure 7 Safety Lanyard.



Figure 7 Safety Lanyard

## 6.4 Pole Mount Kit

The pole mount kit, catalog number RM-510-00, must be ordered separately. The pole mount kit will allow the Location Sensor to be mounted to either a pole or 1-1/4" metal channel framing, per the instructions included with the pole mount kit.

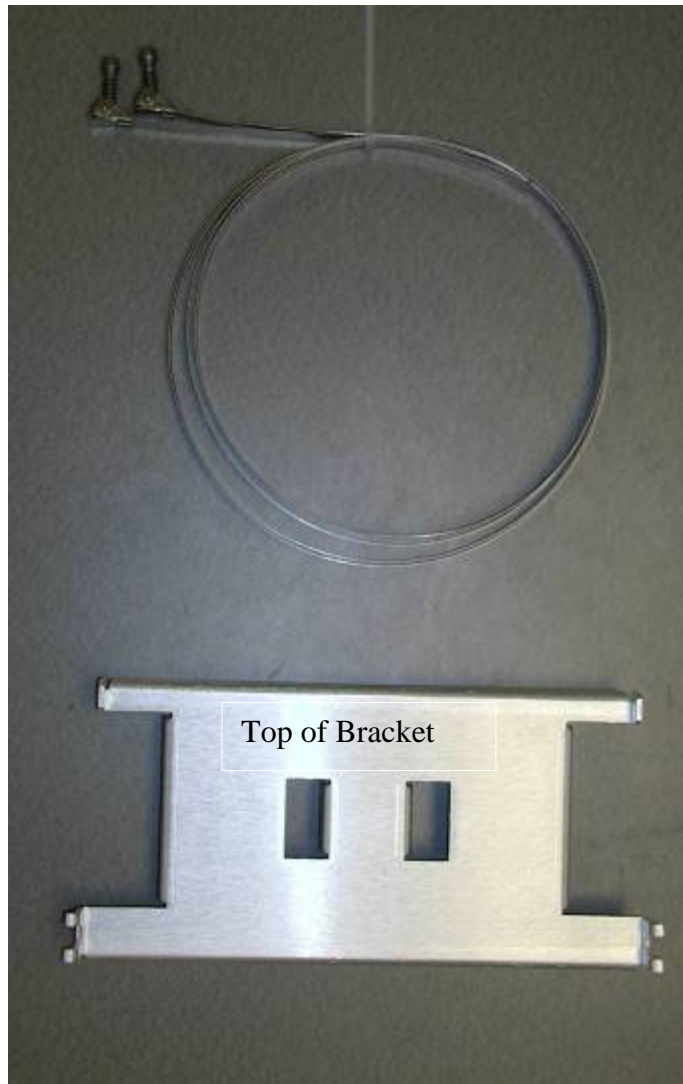


Figure 8 Pole Mount Kit

### 6.4.1 Pole Mount on Metal Frame

First mount bracket to metal frame in location, orientation and height specified in the site design, with support hooks up and retaining slots down, using supplied clamp.

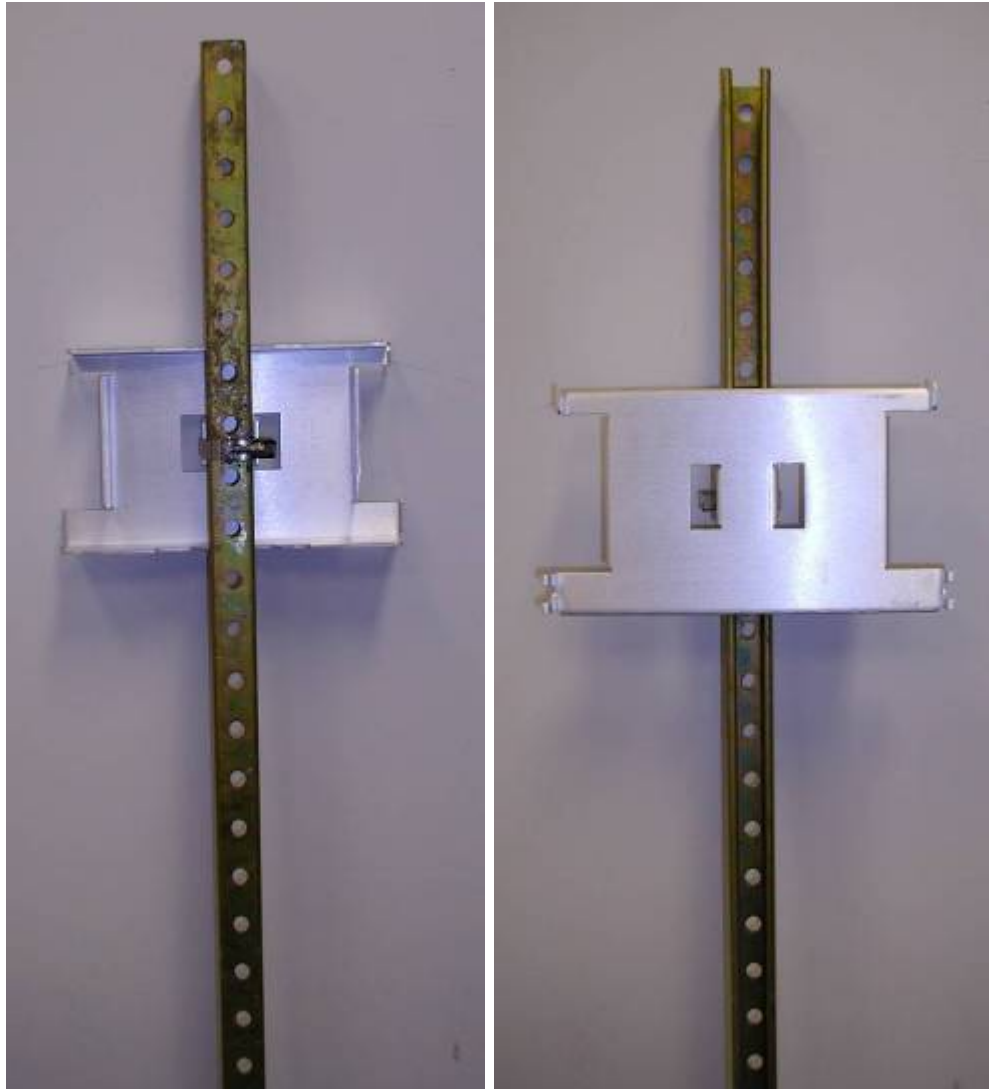


Figure 9 Bracket Mount



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Loosen the retaining bolts on each side of the Location Sensor, but do not remove them.



Figure 10 Retaining Bolts

---

### WhereLAN III User's Guide

Hang the Location Sensor on the bracket and tighten retaining bolts securely. Next install safety lanyard through one of the Location Sensor's lanyard points, and the other end of the lanyard to a point above the Location Sensor.



Figure 11 Location Sensor Mounted

### 6.4.2 Pole Mount on Pole

First mount bracket to Pole at height location, orientation and height specified in the site design, with support hooks up and retaining slots down, using supplied clamp.



Figure 12 Pole mount on Pole

Loosen the retaining bolts on each side of the Location Sensor, but do not remove them (See **Figure 10 Retaining Bolts**).

---

### WhereLAN III User's Guide

Hang the Location Sensor on the bracket and tighten retaining bolts securely. Next install safety lanyard through one of the Location Sensor's lanyard points, and the other end of the lanyard to a point above the Location Sensor.



Figure 13 Location Sensor on Pole

## 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. The choice of antenna will be specified in the site design.



Figure 15 All Weather Omni



Figure 14 Office Omni

### 7.1.1 All Weather Omni

As its name suggests, the All Weather Omni provides omni-directional coverage and is suitable for outdoor environments. It should be attached directly to the Location Sensor housing, and therefore requires no additional mounting. For this reason, it is the preferred antenna for the Location Sensor.

Because it is an omni-directional antenna, the coverage pattern of the All Weather Omni can be degraded if mounted too close to metallic structures. Therefore, the All Weather Omni must be mounted a minimum 12 inches (305 mm) from nearby metallic structures.

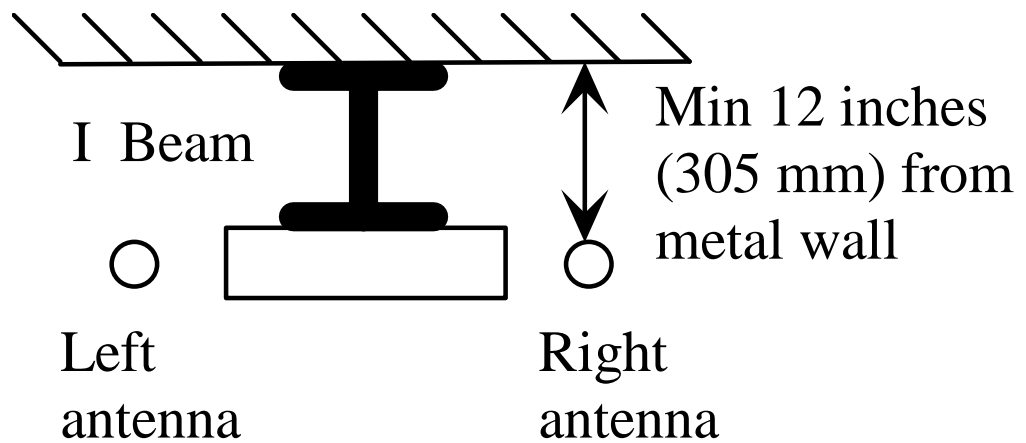


Figure 16 Minimum clearance to metallic structures



**The All Weather (and Indoor Office) Omni antennas must be mounted a minimum of 12 inches (305 mm) away from metal walls.**

### WhereLAN III User's Guide

For best diversity reception, the Location Sensor should be mounted in an orientation in which the antennas are at a diagonal (45 deg) orientation with respect to surrounding walls and aisles. The RM-250 Wall Mount Bracket can be utilized to provide the necessary clearance from nearby metallic surfaces.

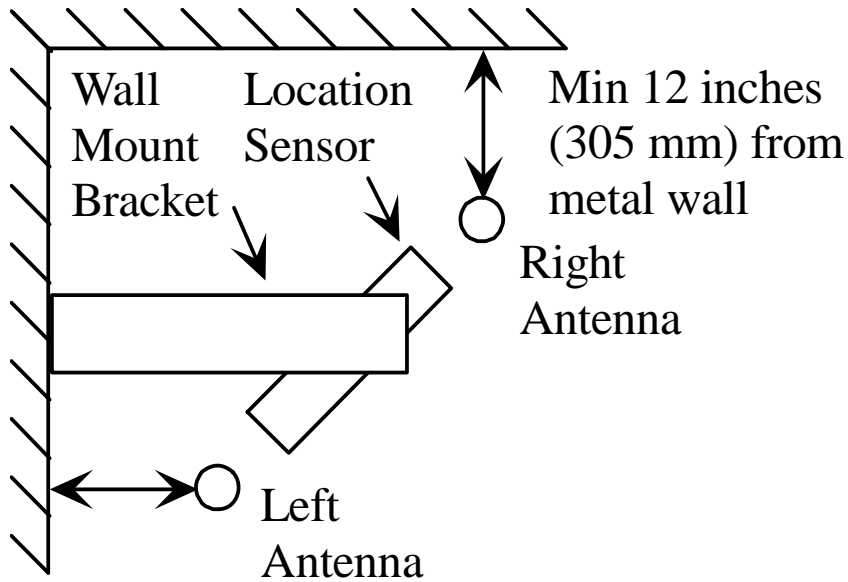


Figure 17 Corner mount industrial application

### 7.1.2 Indoor Omni

The indoor omni is designed to be mounted directly to the ceiling. It has a small profile designed to be unobtrusive in an office environment. Like the All Weather Omni antenna, it must be mounted a minimum of 12 inches from metal walls. There is no spacing requirement for drywall or other non-metallic walls. For best diversity reception, mount the antennas in a diagonal orientation 24 in (610 mm) from each other, in the center of the corridor (if applicable), as shown in Figure 18 below. Be certain to note which antenna is on the left, and which is on the right, and connect them to the appropriate ports on the Location Sensor during installation.

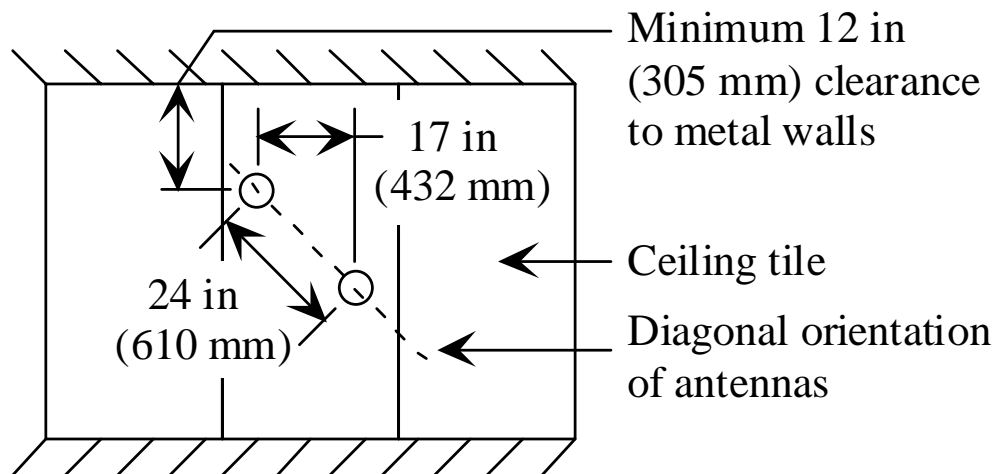


Figure 18 Office omnidirectional in corridor



## 7.2 Vertical Diversity Mounting

Outdoor installations requiring the maximum location accuracy and consistency should use vertical and horizontal diversity for antenna placement should be implemented. This applies to most Yard and Marine Terminal Sites. Zebra offers three different vertical diversity cable kits for installation. For all installations, 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.

The most critical item in placing and installing the Location Sensors is to ensure that the antennas are not blocked by nearby structures. Detailed instructions with several examples are provided in the Location Sensor Placement Guide D0406.

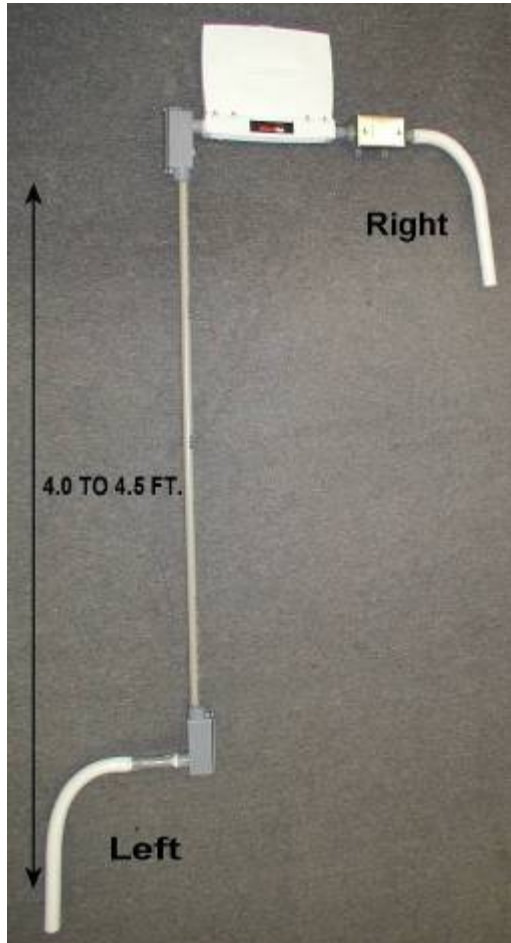
For accurate locate performance, the position of the left and right antennas must be individually specified in the site design. System Builder requires the center point and orientation of the antennas.



**The left and right antenna must be correctly oriented per the site design. Inadvertently reversing the left and right antennas results in a two foot location error in standard diversity configurations and greater error in vertical diversity configurations.**

### 7.2.1 Example Configuration Using CBL-010-10:

The following diagram is an example of how to achieve vertical diversity, using 3/4" PCV schedule 40 conduit and 3/4" PVC conduit fitting.



Carefully Coil excess cable for Right Channel.



Figure 19 Vertical Diversity 5ft,

\*Use Splicing tape and ZES GS-888-00 connect sealant, install weather tight cover. For Both Right and Left Antenna Connections.

### 7.2.2 Example Configuration Using CBL-015-10:

Below is a picture of a ZES Location Sensor installed on a 100' light pole. Note the Vertical Diversity ("VD") created by extended antennas above and below the Location Sensor. The installer will have to achieve at a minimum the vertical distance of 11' see below, the VD can be greater than 11'. This installation calls for 12' of diversity. The picture shows 3/4" electrical metallic tubing extending the "bullhorn" antennas (white).

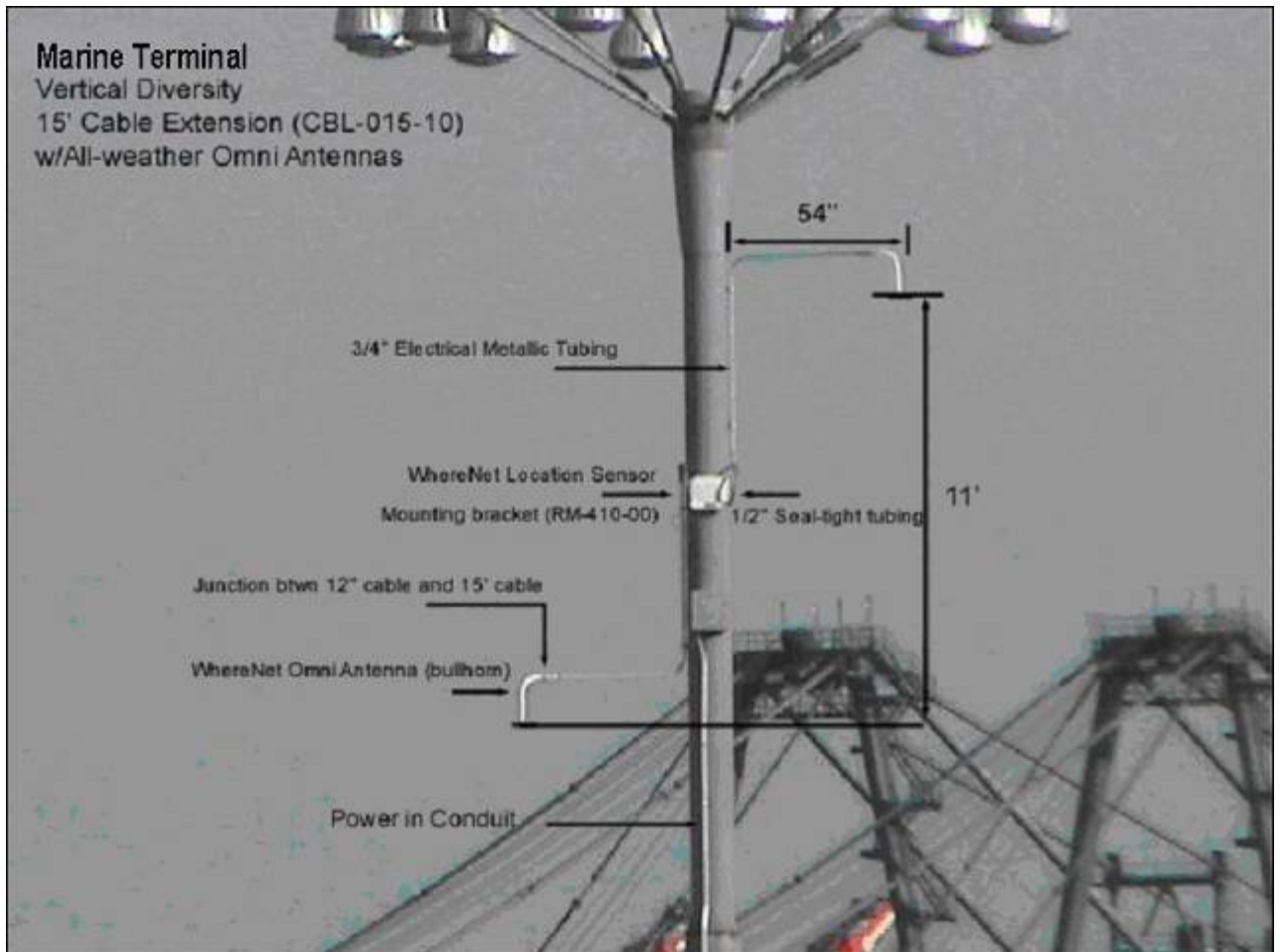


Figure 20 Vertical Diversity +11ft.

### 7.2.3 Vertical Diversity Connections

Make appropriate connection to the Location Sensor, as shown below.

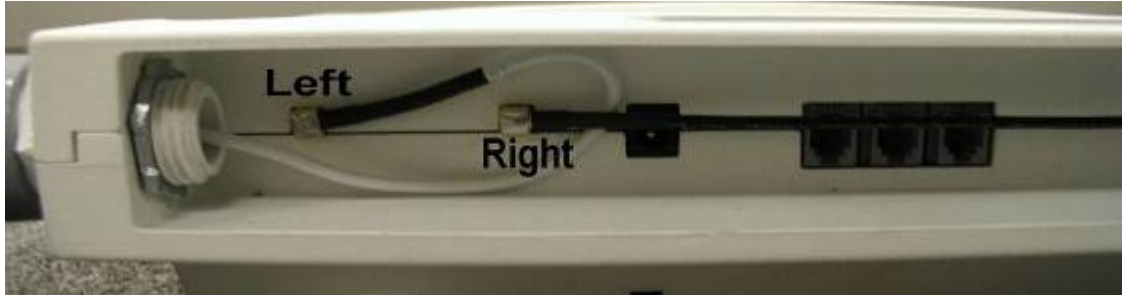


Figure 21 Vertical Diversity Connections

### 7.3 Wi-Fi 802.11 b/g Antennas

There are three antenna options for Wi-Fi network connectivity of the for the LOS-5000-01AB. In addition, the CBK-020-00 allows you to connect to the smb Wi-Fi port on the unit and must always be separately procured. See instruction sheet included with cable mounting bracket kit regarding installation. See Site Design for specifics of WLAN antenna choice and orientation.

- Wi-Fi Antenna Indoor 2.2dBi      AK-170-00
- Wi-Fi Antenna Outdoor Omni 5.2dBi      AK-151-00
- Wi-Fi Antenna Outdoor Directional 13.5dBi      AK-153-00

## 8 CABLING

The figure below, labels the appropriate 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 22 Location Sensor Connections

For all Outdoor installations:

- Use part GS-888-00 grease (supplied with unit) in **ALL Connector Jacks**. Fill each of the following connections, with Nyogel Weather Sealant, these include the Left and Right antenna, Timing connections, Wi-Fi Client, Ethernet, Serial interface, and Power connection. This is to help weather proof the connections from water and corrosion.
- Routing the cables through the Drip Plug, supplied with unit, plug cables into units and fully (carefully) fully install Drip Plug into connector well.

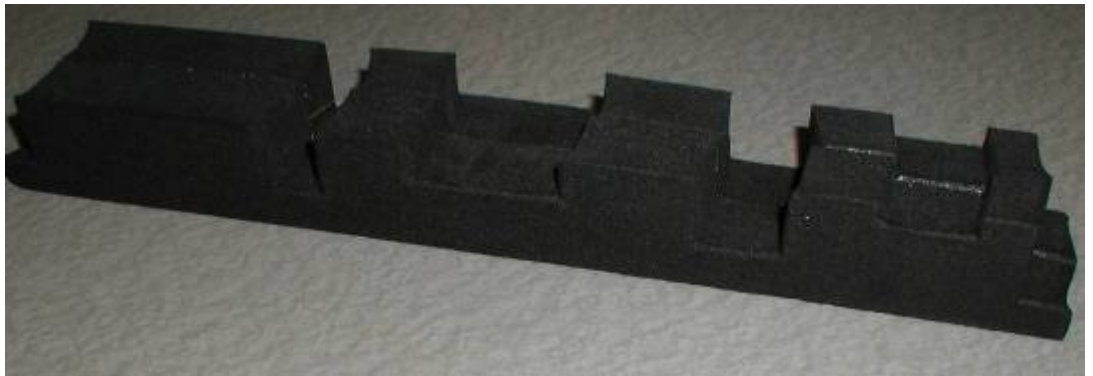


Figure 23 Drip Plug

## 8.1 Power, AC

The WhereLAN III location sensor can be powered via IEEE 802.3af POE or directly with a standalone DC power supply.

If the standalone DC power supply is option is used, the customer must provide 100-240 VAC 50/60 Hz power to the specified Location Sensor position. The Location Sensor units require DC 36-57V, 250mA for operation (12 Watts). The recommended power supply (PS-040-00), which must be purchased separately, has a 6 ft (2 m) AC cable and a 6 ft (2 m) dc cable. For longer cabling runs, the recommended power supply is the PS-045-00. The electrician should verify that the AC power is available within 2 m of the position of the power supply. The Location Sensor itself may be installed up to 20 m and 100 m from the PS-040-00 and PS-045-00 power supplies, respectively. . 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 WhereLAN III must always be used with the specified power supply. 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 WhereLAN III. 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 the account representative concerning limitations or availability of extend temperature range power supply, such as PS-040-00. 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.**

## 8.1 Ethernet

The WhereLAN III 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 ft (100 m). If additional distance is required, hubs, repeaters, and fiber (with 10/100BaseT converters) can be used to extend the distance. Refer to IEEE guidelines for Ethernet cabling.



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

## 8.2 Wi-Fi Antenna Kit

The LOS-5000-00AB WhereLAN-III with Wi-Fi has the option of adding on an antenna cable and mounting bracket kit CBK-020-00. This kit is intended to work with any of the three Wi-Fi antenna Accessories.

The kit consist of the mounting bracket, 4 screws, and the SMB to RP-TNC cable.

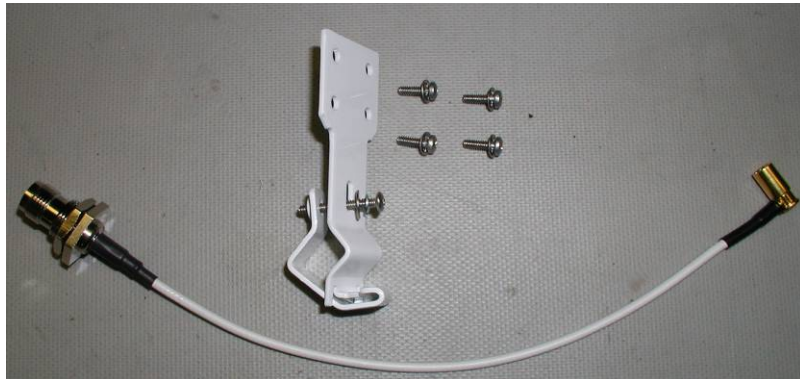


Figure 24 CBK-020-00

## 8.2.1 Wi-Fi Kit Installation

The following steps will outline the installation of the CBK-020-00 Wi-Fi Bracket and Cable Kit.

1. Run required cables through the Drip Plug, matching up the cutouts with the appropriate connector location.



Figure 25 Wi-Fi Cable 1



### WhereLAN III User's Guide

2. Next connect the cables to the WhereLAN-III, and install Drip Plug by carefully pressing Drip Plug into connector well without pinching the cables.



Figure 26 Wi-Fi Cables Drip Plug

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3. Now install the Wi-Fi cable bracket on the rear side of the unit, as shown below, using the supplied hardware. The hinged portion of the clamp should be facing the front of the unit. Recommended torque for mounting screws is 6 in-lbs (0.68Nm).



Figure 27 Wi-Fi Bracket

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4. Installing the Wi-Fi antenna.
  - a. Option 1 for the AK-170-00 2.2dBi Dipole Antenna (Rubber Duck Style). Slide the antenna, with the antenna straight, through the Wi-Fi bracket and tighten onto the RP-TNC connector. Recommend 12 to 15 in-lbs of torque (1.4 to 1.7 Nm).



Figure 28 2.2 dBi Dipole

Then slip the knurled part of the antenna connector back into the Wi-Fi Bracket clamp, and tighten the retaining screw to 2 in-lbs (0.23Nm). Then articulate the antenna downward.

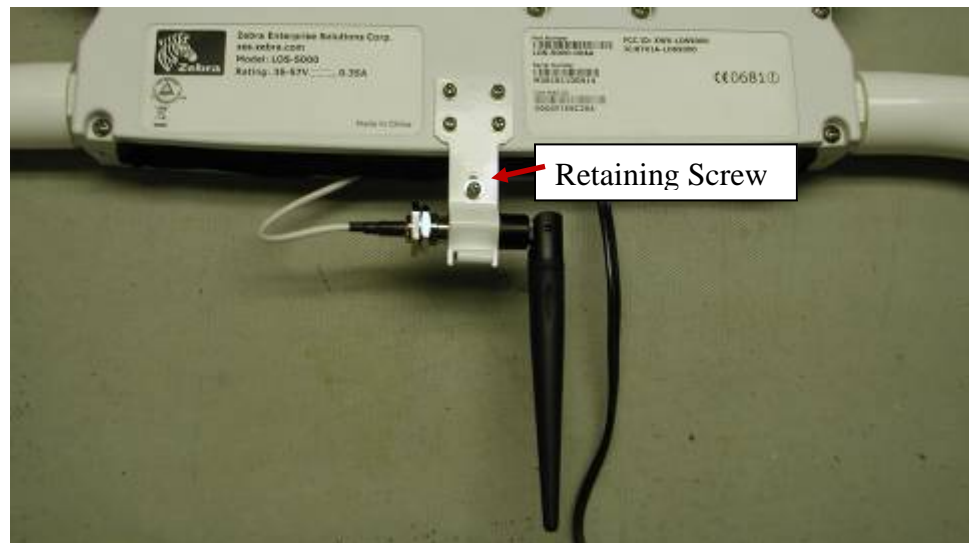


Figure 29 2.2 dBi Installed.

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- b. Option 2 is for either the AK-151-00 Cisco 5.2dBi Omni or the AK-153-00 Cisco 13.5 dBi Yagi antenna. These are both remotely mounted antenna. Slide the antenna connector through the Wi-Fi Bracket Clamp and tighten onto the RP-TNC connector. Recommend 12 to 15 in-lbs of torque (1.4 to 1.7 Nm).

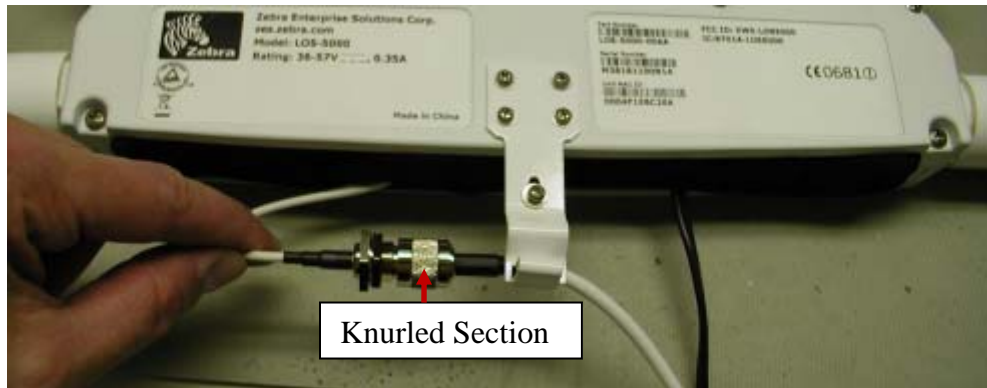


Figure 30 Wi-Fi Bracket Remote Antenna

Then slip the knurled part of the antenna connector back into the Wi-Fi Bracket clamp, and tighten the retaining screw to 2 in-lbs (0.23Nm). Mount the antenna according to the recommend instructions provided with the antenna and in the site design document.

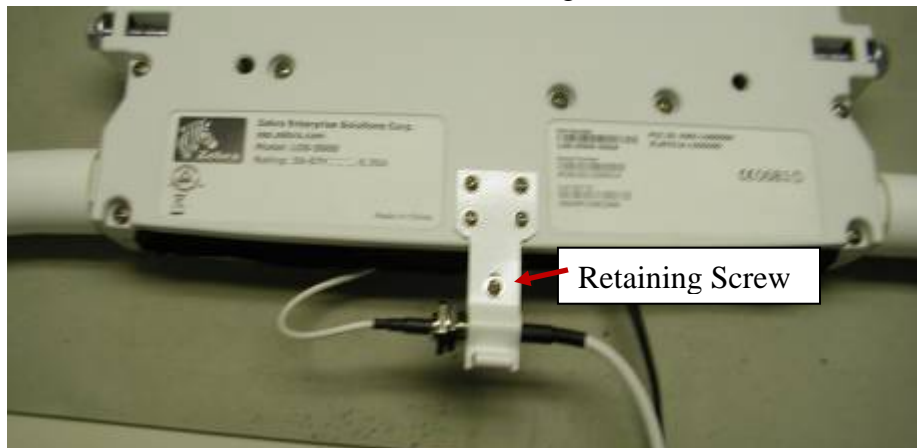


Figure 31 Remote Antenna Clamp

**Note: For all outdoor installations use the connector grease supplied with the unit for this connection.**



### 8.3 Timing Cable Interconnection Guidelines

In certain cases, the WhereLAN III may require a timing cable to be connected to other nearby WhereLAN III units. In general, the use such wired timing links should not be necessary with a good site design, but may be necessary in select cases. 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).**

---

---

**Note**

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

---

### 8.3.1 Timing Cable Pin-Out

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 3212). 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

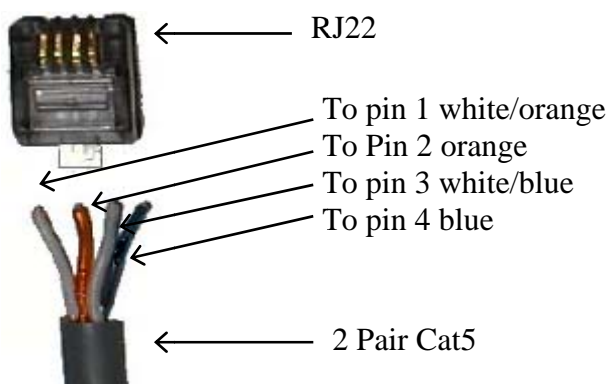


Figure 32 Timing cable wiring pin out

**Note**

For a reliable system operation, the jacket 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.

### 8.3.2 Cat-5 Four Pair Installation

Steps:

1. Trim out Jack back approximately ½ inch.



Figure 33 Timing Cable Trim

2. Pull Back Jack until at least 1-1/4 inches of wire is exposed, separate Blue/White and Orange/White pair from Green/White and Brown/White pair.

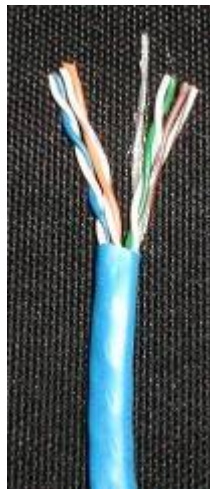


Figure 34 Timing Cable Jacket

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**WhereLAN III User's Guide**

- Trim the Green/White and Brown/White Pairs flush with outer jacket.



Figure 35 Timing Cable Trim

- Pull outer jacket back up leaving only ¼ inch of wire exposed. Separate wires as shown in **Figure 21** and trim wires evenly.



Figure 36 Timing Cable Pull Jacket



---

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5. Insert into RJ-22(4p4c) as shown and crimp with appropriate tool. Note outer cable jacket is captured by strain relief.



Figure 37 Timing Cable Crimp

### 8.3.3 Timing Cable Test Procedure

The timing cables must be properly wired in order for the timing signal to be transmitted from one Location Sensor to the other. It is recommended that this test be completed on each cable by the installer prior to operation. This test requires quantity 2 four pair to two pair connector adapters ZES p/n 21204, and a Fluke 620 CableMeter. Brief instructions are provided below; consult the Fluke CableMeter instruction manual for detailed instructions.

#### Setup

Connect adapter #1 between the Fluke 620 CableMeter and the near end of the cable to be tested. Connect the Fluke Cable ID unit and adapter #2 to the far end of the cable to be tested using a RJ-45 coupler.

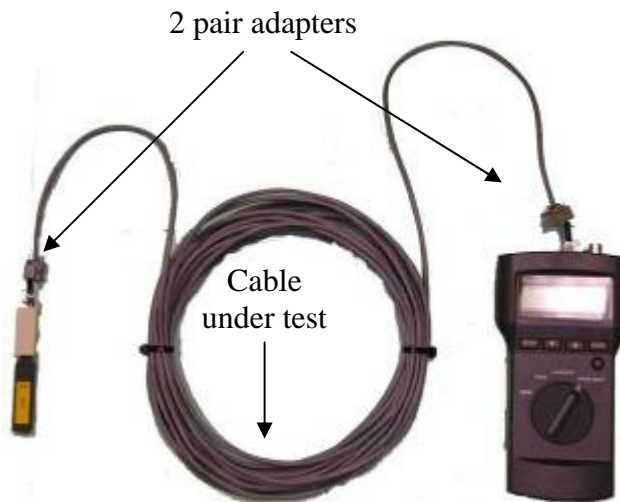


Figure 38 Test setup for CAT5 cable using Fluke 620

---

WhereLAN III User's Guide

**Procedure**

Use the SETUP to select cable type, wire standard, category and wire size on the Fluke CableMeter:

- Cable: UTR
- Wiring: 10BaseT 2PR
- Category: Cat5
- Wire Size: AWG24

Turn the Fluke CableMeter rotary switch to WIRE MAP. The correct readout when testing 2 pair cable is shown in Figure 39 below. If a different readout appears, the cable was not constructed properly and must be corrected.



Figure 39 Correct readout when testing 2 pair cable.

## 8.4 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.

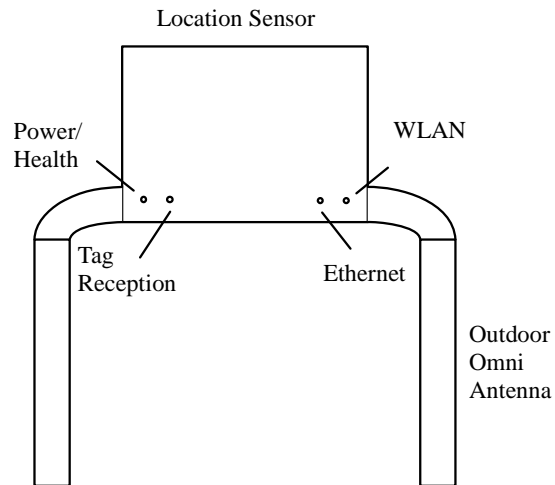


Figure 40 Location Sensor LED indicators

- ❑ 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 LOS-5000-00AB 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 Blink Console under the Blink Service Diag window, 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.



SEE MORE. DO MORE.

**WhereLAN III User’s Guide**

- Verify that detects are received by the Location Sensor using Blink Consoles 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

Note See Blink Console User’s Guide.



SEE MORE. DO MORE.

## REGULATORY INFORMATION

### FCC Regulatory Compliance Information

This device complies with FCC Part 15.247.

Operation is subject to the following two conditions:

- (1) This device may not cause harmful interference
- (2) This device must accept any interference which may cause undesired operation

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

#### RF Notice

Any changes or modifications to equipment not expressly approved by Zebra Technologies Corporation could void the user's authority to operate the equipment.

### 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.

### Industry Canada Compliance Statements

Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes :  
(1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.



SEE MORE. DO MORE.

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### WhereLAN III User's Guide

This Class A digital apparatus complies with Canadian ICES-003.

Cet appareil numérique de la classe A est conforme à la norme NMB-003 du Canada.

This device and its antenna(s) must not be co-located or operating in conjunction with any other antenna or transmitter.

Cet appareil et son antenne (s) ne doit pas être co-localisés ou fonctionnant en conjonction avec une autre antenne ou transmetteur.

This equipment should be installed and operated with a minimum distance of 20cm between the radiator and your body

Cet équipement doit être installé et utilisé à une distance minimale de 20cm entre le radiateur et votre corps.

It is the responsibility of the installer to ensure that when using the outdoor antenna kits, only those antennas certified with the product are used. The use of any antenna other than those certified with the product is expressly forbidden by FCC rules 47 CFR part 15.204 and IC RSS standards.

Il est de la responsabilité de l'installateur de s'assurer que lorsque vous utilisez les kits d'antennes extérieures, seules les antennes certifiées avec le produit sont utilisés. L'utilisation d'une antenne autre que ceux qui sont certifiées avec le produit est expressément interdite par la réglementation FCC partie 47 CFR 15.204 et IC normes RSS.



SEE MORE. DO MORE.

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WhereLAN III User's Guide

**EU & EFTA Compliance Information**

**Approved for use in the following countries.**

AT	BE	BG	CY	CZ	DK	EE
FI	FR	DE	GR	HU	IE	IT
LV	LT	LU	MT	NL	PL	PT
RO	SK	SI	ES	SE	GB	
IS	LI	NO	CH		TR	





SEE MORE. DO MORE.

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WhereLAN III User's Guide

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

### LOS Housing

- Housing Size (Inches) [cm]: 12.0" [30.4] Wide, 10.3" High [26.2], 1.7" [4.3] Deep
- Housing Size with 1/2" Radial Ice (Inches) [cm]: 12.5" [31.8] Wide, 10.8" High [27.4], 2.3" [5.8] Deep
- Maximum Projected Area with Ice (Square Inches): 135.0" [2212 cc]
- Shape Factor ( $C_D$  per EIA-222-F) 1.4
- **Effective Projected Area with Ice (Square Inches) 189 [3097cc]**

### Omni Antenna (One Antenna)

- Antenna Size (Inches) [cm]: 1.3 [3.3] Diameter 19.0 [302] Long
- Antenna Size with 1/2" Radial Ice (Inches): 2.3 [5.8] Diameter 20.0 [50.8] Long
- Maximum Projected Area with Ice (Square Inches): 46.6 [763cc]
- Shape Factor ( $C_D$  per EIA-222-F) 0.8
- Effective Projected Area with Ice (Square Inches) 37.3 [611cc]

### LOS-5000 Effective Projected Area (EPA)

- LOS Housing with Ice (Inches): 189 [3097cc]
- Omni Antenna #1 with Ice (Inches): 37.3 [611cc]
- Omni Antenna #2 with Ice (Inches): 37.3 [611cc]
- Total Effective Projected Area with 0.5 inch Radial Ice

**Effective Projected Area, Total (Square Inches): 263.6 [4319cc]**

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



SEE MORE. DO MORE.

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## APPENDIX B: LOS-5000 WEIGHT

### LOS-5000 Housing

- Housing Weight (Pounds): 7.0 [3.17.0Kg]
- Ice Volume at 0.5 inch [12.7mm] Radial Thickness: 94.7 Cubic Inches [1552cc]
- Assumed density of Ice: 0.032 pounds per cubic inch [0.90 g/cc]
- Mass of Ice: 3.0 pounds [1.4Kg]
- **Housing and Ice Mass: 10.0 pounds [4.53Kg]**

### Omni Antenna (One Antenna)

- Antenna Weight: 0.8 pounds [0.36Kg]
- Ice Volume at 0.5 inch [12.7mm] Radial Thickness: 58.9 Cubic inches [965 cc]
- Assumed density of Ice: 0.032 pounds per cubic inch [0.90 g/cc]
- Ice Weight: 1.9 pounds [.86Kg]
- **Antenna and Ice Weight: 2.7 pounds [1.22Kg]**

### Total Weight with 1/2" Radial Ice

- LOS Housing Ice: 10.0 pounds [4.53Kg]
- Omni Antenna #1 with Ice: 2.7 pounds [1.22Kg]
- Omni Antenna #1 with Ice: 2.7 pounds [1.22Kg]

**Weight, Total: 15.4 pounds [6.98Kg]**

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



SEE MORE. DO MORE.

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WhereLAN III User's Guide

## **APPENDIX C: WI-FI REGULATORY COMPLIANCE**

TBD



SEE MORE. DO MORE.

## Antenna options

This mini PCI card has been tested and found to be in compliance when used with the following 2.4 GHz antennas:

Cisco Aironet 5.2-dBi Dipole Omnidirectional Antenna (P/N AIR-ANT2506)

Cisco Aironet 2-dBi Dipole Omnidirectional Antenna (P/N AIR-ANT4941)

## APPENDIX D: FIRMWARE UPGRADE

The WhereLAN-III's firmware can be upgraded manually without the use of iSensor or similar tool set. The upgrade can take place through the Menu system on the WhereLAN-III, and a network connection supporting either FTP or TFTP must be present. The following examples are done using an SSH connection. However any of the way to get to the WhereLAN-III Menu system is valid. All the same generation location sensors on site must have same Firmware Build Date. *(All WhereLAN-III's must have same WhereLAN-III firmware and all WhereLAN-2's must have same WhereLAN-2 firmware).*

**Note the upgrade files must be placed in the ftp root directory on the server machine. (Files: initrd.boot, jffs2\_ls.img, u-boot.bin, uImage\_ls, and upgrade.txt)**

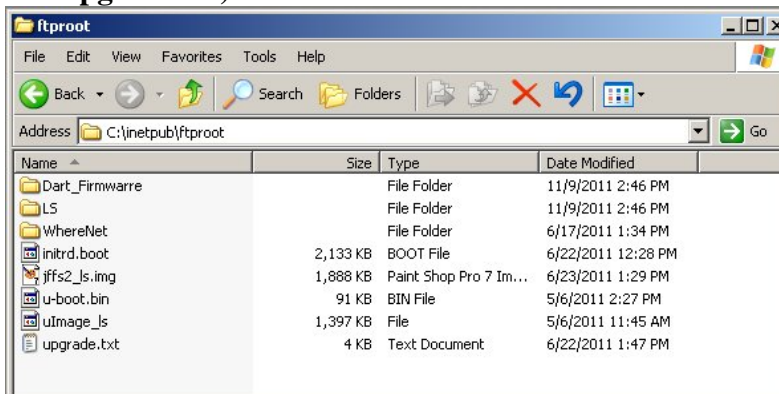
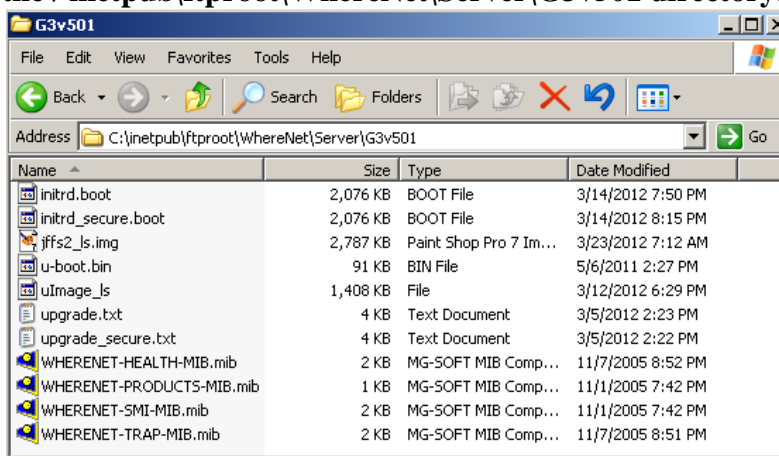


Figure 41 Ftproot Directory

**With the release of VSS 4.0.5.2, the firmware files for the WhereLAN-III will be included now as a standard part of VSS. The files will be under the / inetpub\ftproot\WhereNet\Server\G3v501 directory.**



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Figure 42 VSS Firmware 4.0.5.2 Directory

1. From the Main Menu select number that corresponds to 'Firmware Upgrade'.

```

C:\OpenSSH\ssh.exe
Enter passphrase for key 'ssh_zebra_rsa_key':
Last login: Thu Jan 1 00:02:02 1970 from 192.168.5.250

BusyBox v1.2.1 (2011.02.14-15:44+0000) Built-in shell (ash)
Enter 'help' for a list of built-in commands.

17:51                               Build: May 6 2011 13:06:42

                                Zebra Location Sensor <WhereLan-III>

MAC=0004f1ec4b3a                               IP=192.168.5.1

Main Menu:
1. Ethernet Settings
2. Serial Settings
3. Health and Alerts
4. Diagnostics
5. Firmware Upgrades
6. Manufacturing
7. Modify Passwords
>
  
```

2. Next select the file transfer method, 'Transfer Protocol' either TFTP or FTP. Then set IP address of the Server where the files are located 'Server IP Address'.

```

C:\OpenSSH\ssh.exe
5. Firmware Upgrades
6. Manufacturing
7. Modify Passwords
>reading NVRam keys...

19:33                               Build: May 6 2011 13:06:42

                                Zebra Location Sensor <WhereLan-III>

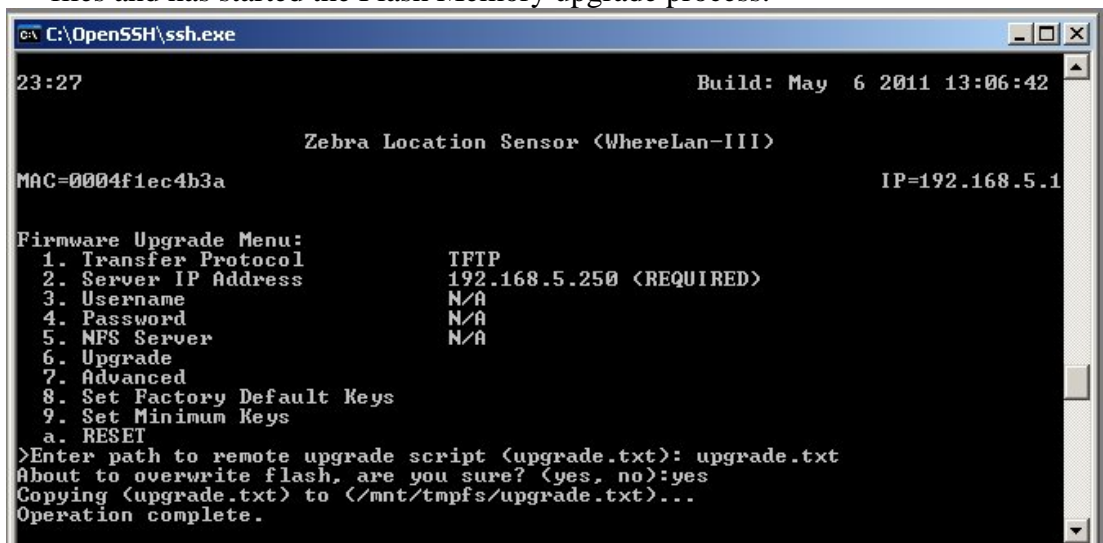
MAC=0004f1ec4b3a                               IP=192.168.5.1

Firmware Upgrade Menu:
1. Transfer Protocol           TFTP
2. Server IP Address          192.168.5.250 <REQUIRED>
3. Username                   N/A
4. Password                   N/A
5. NFS Server                 N/A
6. Upgrade
7. Advanced
8. Set Factory Default Keys
9. Set Minimum Keys
a. RESET
>
  
```

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- Now select the number that corresponds to 'Upgrade', and type 'upgrade.txt' at the prompt (enter/return) if files are located directly under the **ftproot** directory (See Reference 1 below). (OR) If the files located in the **inetpub/ftproot/WhereNet/Server/G3v501** directory (See Reference 2 below), then type "/whereNet/server/G3v501/upgrade.txt", note the direction of the slashes.

Then confirm to overwrite the flash, 'yes' (enter/return). The unit responds with Operation Complete confirming that it has downloaded the firmware files and has started the Flash Memory upgrade process.



```

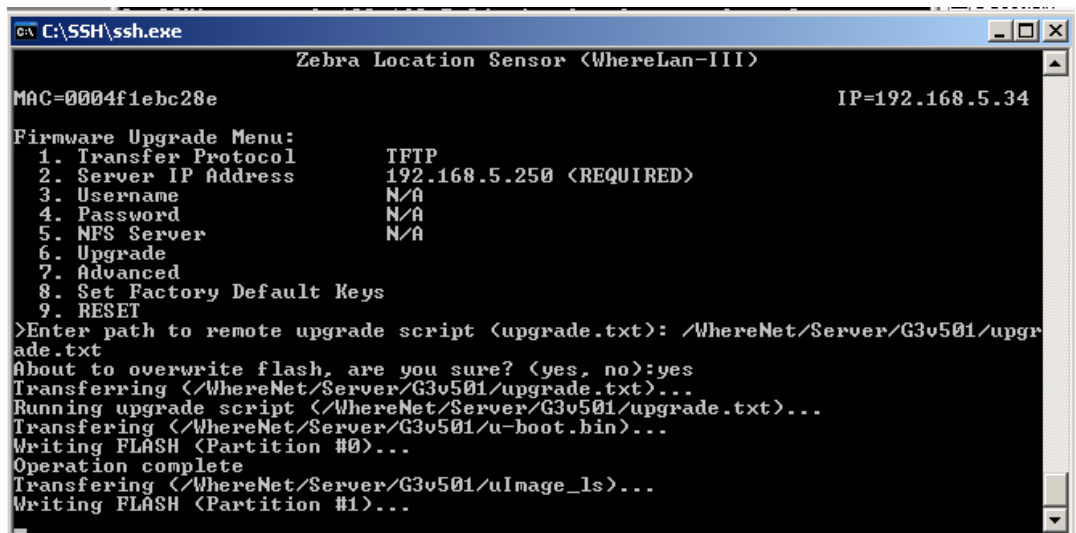
C:\OpenSSH\ssh.exe
23:27                               Build: May  6 2011 13:06:42

                Zebra Location Sensor (WhereLan-III)

MAC=0004f1ec4b3a                               IP=192.168.5.1

Firmware Upgrade Menu:
 1. Transfer Protocol           TFTP
 2. Server IP Address          192.168.5.250 (REQUIRED)
 3. Username                   N/A
 4. Password                   N/A
 5. NFS Server                 N/A
 6. Upgrade
 7. Advanced
 8. Set Factory Default Keys
 9. Set Minimum Keys
  a. RESET
>Enter path to remote upgrade script (upgrade.txt): upgrade.txt
About to overwrite flash, are you sure? (yes, no):yes
Copying (upgrade.txt) to /mnt/tmpfs/upgrade.txt)...
Operation complete.
  
```

Reference 1



```

C:\SSH\ssh.exe
                Zebra Location Sensor (WhereLan-III)

MAC=0004f1ebc28e                               IP=192.168.5.34

Firmware Upgrade Menu:
 1. Transfer Protocol           TFTP
 2. Server IP Address          192.168.5.250 (REQUIRED)
 3. Username                   N/A
 4. Password                   N/A
 5. NFS Server                 N/A
 6. Upgrade
 7. Advanced
 8. Set Factory Default Keys
 9. RESET
>Enter path to remote upgrade script (upgrade.txt): /WhereNet/Server/G3v501/upgr
ade.txt
About to overwrite flash, are you sure? (yes, no):yes
Transferring (/WhereNet/Server/G3v501/upgrade.txt)...
Running upgrade script (/WhereNet/Server/G3v501/upgrade.txt)...
Transferring (/WhereNet/Server/G3v501/u-boot.bin)...
Writing FLASH (Partition #0)...
Operation complete
Transferring (/WhereNet/Server/G3v501/uImage_ls)...
Writing FLASH (Partition #1)...
  
```

Reference 2

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The when the unit has completed the Flash Memory upgrade process, it will respond with “<space> to continue....”

```

C:\OpenSSH\ssh.exe
44:48                               Build: Jun 23 2011 13:24:24

                Zebra Location Sensor (WhereLan-III)

MAC=0004f1ec4b3a                      IP=192.168.5.1

Firmware Upgrade Menu:
 1. Transfer Protocol                TFTP
 2. Server IP Address                192.168.5.250 <REQUIRED>
 3. Username                          N/A
 4. Password                          N/A
 5. NFS Server                        N/A
 6. Upgrade
 7. Advanced
 8. Set Factory Default Keys
 9. RESET
>Enter path to remote upgrade script (upgrade.txt): upgrade.txt
About to overwrite flash, are you sure? (yes, no):yes
Copying (upgrade.txt) to (/mnt/tmpfs/upgrade.txt)...
Operation complete.
<space> to continue...
  
```

4. Last Reset the unit (Reset) and 'yes to confirm. Note on SSH or Telnet this will end the session and the unit takes 45 to 60 seconds to completely reboot.

```

C:\OpenSSH\ssh.exe
Operation complete.
<space> to continue...
26:42                               Build: May 6 2011 13:06:42

                Zebra Location Sensor (WhereLan-III)

MAC=0004f1ec4b3a                      IP=192.168.5.1

Firmware Upgrade Menu:
 1. Transfer Protocol                TFTP
 2. Server IP Address                192.168.5.250 <REQUIRED>
 3. Username                          N/A
 4. Password                          N/A
 5. NFS Server                        N/A
 6. Upgrade
 7. Advanced
 8. Set Factory Default Keys
 9. Set Minimum Keys
 a. RESET
>
Reset (yes,no)? yes
  
```





SEE MORE. DO MORE.

---

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SEE MORE. DO MORE.

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**APPENDIX E: HYPERTERMINAL BOOT SEQUENCE**

```
U-Boot 1.1.4 (May 6 2011 - 14:27:47) Micrel, WhereNet 1.2
DRAM: 32 MB
Flash: 8 MB
In: serial
Out: serial
Err: serial
Enter "CTRL-Z" to abort autoboot in 3 seconds
## Booting image at 02020000 ...
   Image Name: Linux-2.6.9-KS8695
   Image Type: ARM Linux Kernel Image (uncompressed)
   Data Size: 1441116 Bytes = 1.4 MB
   Load Address: 00008000
   Entry Point: 00008000
   Verifying Checksum ... OK

OK

## Loading Ramdisk Image at 021a0000 ...
   Image Name: Ram disk
   Image Type: ARM Linux RAMDisk Image (gzip compressed)
   Data Size: 2124742 Bytes = 2 MB
   Load Address: 00800000
   Entry Point: 00800000
   Verifying Checksum ... OK
Starting kernel ...
Uncompressing Linux..... done, booting the kernel.
Linux version 2.6.9-KS8695 (gcc version 3.4.5)
WhereNet Generation III
CPU: ARM922Tid(wb) [41029220] revision 0 (ARMv4T)
CPU: D VIVT write-back cache
CPU: I cache: 8192 bytes, associativity 64, 32 byte lines, 4 sets
CPU: D cache: 8192 bytes, associativity 64, 32 byte lines, 4 sets
Machine: Micrel Centaur
Memory policy: ECC disabled, Data cache writeback
Built 1 zonelists
Kernel command line: console=ttyAM0,19200
PID hash table entries: 256 (order: 8, 4096 bytes)
Console: colour dummy device 80x30
Dentry cache hash table entries: 8192 (order: 3, 32768 bytes)
Inode-cache hash table entries: 4096 (order: 2, 16384 bytes)
Memory: 32MB = 32MB total
Memory: 27488KB available (2205K code, 513K data, 68K init)
Mount-cache hash table entries: 512 (order: 0, 4096 bytes)
CPU: Testing write buffer coherency: ok
```



SEE MORE. DO MORE.

## WhereLAN III User's Guide

### 4 LED's : The Kernel is initialized and is loading the applications, JFFS2 and CRAM File system.

```
***** 4LED *****
checking if image is initramfs...it isn't (no cpio magic); looks like an initrd
Freeing initrd memory: 2074K
NET: Registered protocol family 16
PCI: bus0: Fast back to back transfers disabled
NetWinder Floating Point Emulator V0.97 (double precision)
JFFS2 version 2.2. (C) 2001-2003 Red Hat, Inc.
Initializing Cryptographic API
g3wdt version 1.0.0.0, 2007: margin 60 sec
RAMDISK driver initialized: 16 RAM disks of 5800K size 1024 blocksize
g3dev version 1.0.0.1, 2006
g3rtc version 1.0.0.1, 2011
i2c /dev entries driver
i2c_adapter i2c-0: found 2048 byte 24c16 I2C EEPROM (writable)
i2c_adapter i2c-0: found DS1780 CPU monitor
Serial: Micrel Centaur UART driver version: 2.6.1.0
ttyAM0 at MMIO 0x3ff0000 (irq = 8) is a KS8695
Serial: g3-8250/16x50 driver version: 1.00, IRQ sharing enabled
ttyS1 at MMIO 0x3200100 (irq = 5) is a 16550A
eth info: Micrel KS8695P Ethernet Network Driver, version 1.0.0.21, Copyright (c) 2002-2005 Micrel, Inc.
eth info: Icache mode = roundrobin
eth info: VA = 0xf03ff000, PA=0x03ff0000
eth info: VA = 0xf03ff000, PA=0x03ff0000
Using deadline io scheduler
physmap flash device: 800000 at 2000000
phys_mapped_flash: Found 2 x16 devices at 0x0 in 32-bit bank
  Amd/Fujitsu Extended Query Table at 0x0040
number of CFI chips: 1
cfi_cmdset_0002: Disabling erase-suspend-program due to code brokenness.
cmdlinepart partition parsing not available
RedBoot partition parsing not available
Using physmap partition definition
Creating 5 MTD partitions on "phys_mapped_flash":
0x00000000-0x00020000 : "bootloader"
0x00020000-0x001a0000 : "kernel"
0x001a0000-0x00400000 : "ramdisk"
0x00400000-0x007e0000 : "jffs2"
0x007e0000-0x00800000 : "cramfs"
NET: Registered protocol family 2
IP: routing cache hash table of 512 buckets, 4Kbytes
TCP: Hash tables configured (established 2048 bind 4096)
NET: Registered protocol family 1
```



SEE MORE. DO MORE.

---

### WhereLAN III User's Guide

## Continued 4 LED's : The Kernel is initialized and is loading the applications, JFFS2 and CRAM File system.

```
NET: Registered protocol family 10
IPv6 over IPv4 tunneling driver
NET: Registered protocol family 17
ath_rate_amrr: 0.1 (0.9.4)
ath_pci: 0.9.4.5 (0.9.4)
ath_pci: No devices found, driver not installed.
ath_hal: 0.9.18.0 (AR5210, AR5211, AR5212, RF5111, RF5112, RF2413, RF5413, REGOPS_FUNC)
wlan: 0.9.4wlan: mac acl policy registered
RAMDISK: Compressed image found at block 0
VFS: Mounted root (ext2 filesystem).
init started: BusyBox v1.2.1 (2011.11.15-16:42+0000) multi-call binary
Disabled Privacy Extensions on device c028dbf0(lo)
BusyBox v1.2.1 (2011.11.15-16:42+0000) Built-in shell (ash)
Enter 'help' for a list of built-in commands.
WhereLan-III: Mar 19 2012 19:05:04
embedded tag rx service
started rx diagnostic receive process started
```

### 1 LED (Power): The Application is loading the FPGA's and DSP's

```
Executing coldboot.wsf
Configuring FPGA...
Opening file...done
Checking file...(1243888) bytes
Config mode...done
Loading...done
```



SEE MORE. DO MORE.

---

## WhereLAN III User's Guide

### 2 LED's (Power and Tag Reception): The unit is initializing the FPGA's and DSP's.

```
Booting DSP's...
Opening file...done
Verifying AIS magic...done
Start-word synch...done
Ping opcode synch...done
Loading...done
Opening file...done
Verifying AIS magic...done
Start-word synch...done
Ping opcode synch...done
Loading...done
00004000: 00002000 --
00004000: 00002000 --
embedded transmit tag service started
MAC=0004f1ebc28e
creating tags:
  lpn=f1ebc28c path=0800
  lpn=f1ebc28d path=0100
  lpn=f1ebc28e path=0200
  lpn=f1ebc28f path=0400
Completed coldboot.wsf
```

### 1 LED (Power): Unit is booted and will display health of unit.

```
00:39                               Build: Mar 19 2012 19:05:04
                                Zebra Location Sensor (WhereLan-III)

MAC=0004f1ebc28e                    IP=192.168.5.34
Main Menu:
  1. Ethernet Settings
  2. Health and Alerts
  3. Diagnostics
  4. Firmware Upgrades
  5. Manufacturing
>
```