



***MOUNTING SOLUTIONS FOR
WIRELESS DEPLOYMENT***



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Welcome to Oberon

Oberon designs, produces, and sells products to improve wireless Local Area Network (LAN) infrastructure design. Our enclosure and antenna products simplify installation and maintenance, preserve plenum space integrity, and enhance physical security, RF coverage, and aesthetics. Our network intrusion detection systems, RF, Ethernet, and AC power management and monitoring products improve wireless network security and performance, and reduce installation costs.

Our experienced technical staff provides RF site survey services using specialized software, to verify RF coverage. This guarantees network integrity, and commonly achieves significant cost savings by optimally placing wireless access points.

As a product and service vendor, we provide outstanding support to our market channel partners -- the distributors, network designers, installers, and integrators responsible for enterprise wireless LAN installation.

Our combination of patent pending, innovative products, and industry experienced staff will provide the wireless infrastructure designer exceptional cost, performance, security, aesthetic, and installation value.



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Compatibility Table

OBERON WIRELESS LAN ACCESS POINT ENCLOSURE - COMPATABILITY TABLE

Manufacturer/Model #	Indoor Models											Outdoor Models					Connector Type			
	Wall				Ceiling															
	Mount				Mount															
	1023-00	1027-00	1062-00	1036-00	1038-00	1042-00	1050-00	1052-00	1055-00	1058-00	1059-00	1060-00	1061-00	1025-00	1035-00	1080-00	1080-01	1081-00	1081-01	
3Com AP2750	•	•	•	•			♦				♦		•	•	•	+	+	+	+	3
Air Magnet Sensor									+											1
Aruba	•	•	•	♦			♦			♦	♦		•	•	•	+	+	+	+	2
Blue Socket Sensor 1500											♦									2
Blue Socket Sensor 1540				•			•													2
Chantry Networks BeaconPoint BP200	•	•	•	•			•						•	•	•	+	+	+	+	2
Cisco 350	•	•	•	•			•						•	•	•	+	+	+	+	1
Cisco 1010									♦											1
Cisco 1020 & 1030/Airspace		•	•	•			♦		♦				•	•						0,1
Cisco 1100									+											1
Cisco 1130AG												♦								0
Cisco 1232	•	♦	•	•			♦	♦	+				♦	•	•	+	+	+	+	1
Cisco 1242	•	•	•	♦	♦	♦	♦	♦		♦	♦		•	•	•	+	+	+	+	1
Colubris		•	•	•			•				•		•							2
Meru AP150 & AP200	•	•	•	♦			♦			♦	♦		•	•	•	+	+	+	+	2
Netgear WG302		•	•	•			•						•	•						2
Newbury LP-351	•	•	•	•			•				♦		•	•	•	+	+	+	+	1
Orinoco AP-600													♦	♦	•	•	•	•		5
Orinoco AP-700	•	•	•	•			•			♦	♦		•	♦	♦	+	+	+	+	5
Orinoco AP-2000		♦	•	•			♦						•	•						4
Orinoco AP-4000		♦	•	•			♦						•	•						4
Tsunami MP-11/MP-11A													♦	♦	•	•	•	•		5
Secnet 11	•	•	•	•			•						•	•	•	+	+	+	+	3
Siemens AP2610 & AP2620	•	•	•	•			♦				♦		•	•	•	+	+	+	+	0,1
Sony SNC-RZ30N Net Cam									♦						♦	♦	♦	♦	♦	1

Note: The above list is comprised of access points that have been tested for compatibility with Oberon™ enclosures. If your application requires an access point that is not listed, contact your Oberon representative to determine compatibility.

- ♦ Recommended Enclosure
- Compatible
- + Requires Optional Mounting Plate

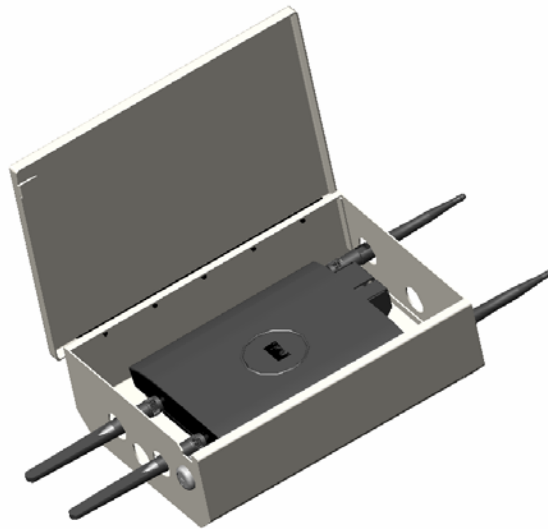
Antenna Connector Type:

- 0 = Integrated Antenna, No Connectors
- 1 = RP-1TNC
- 2 = RP-SMA Male Connectors
- 3 = SMA Male
- 4 = Alprox Connector
- 5 = N Male

“Secure Mounting Solutions”

Model 1023-00

The model 1023-00 Wireless LAN Access Point Enclosure permits the AP to be secured in an aesthetic, locking, wall mounted steel box. Antenna ports provide a convenient way to provide effective RF coverage with many manufacturers' APs. The Model 1023-02, with integrated diversity antennas, improves in-room coverage, and reduces emissions outside of the room



Specifications:

- Designed for surface mounting on indoor hard walls, where secure mounting is required
- Beveled corners permit easy installation in the corner of the room
- Construction: 18 gauge steel
- Size: 7 ¾" x 11" x 3 ½", 3" useful depth with universal mounting plate in place
- Weight: < 6lbs

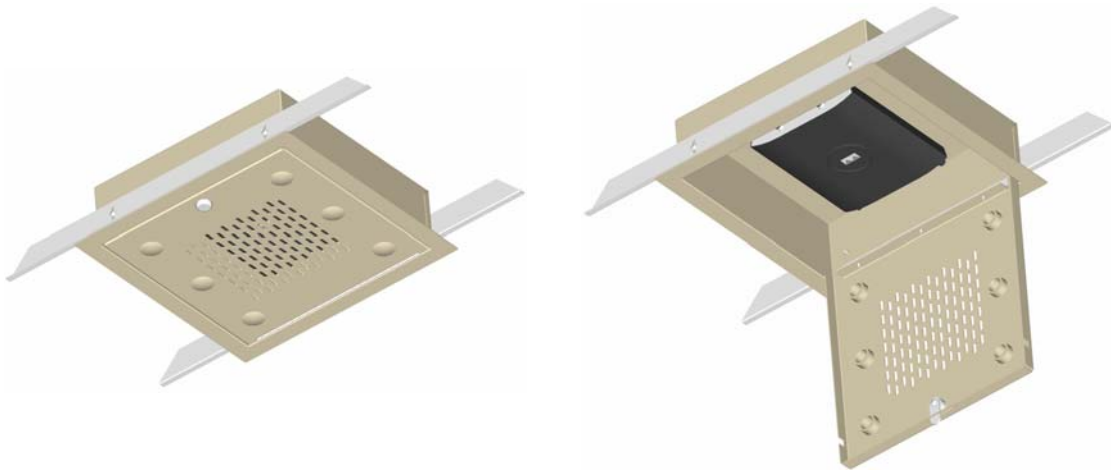
Model 1023-00 Includes:

- Mounting Plate for many manufacturers access points, Mounting Screws & Hardware
- Mounting Instructions
- (2) Knockouts on top permit mounting of 2 external 2.4GHz antennas
- Knockout for ¾" diameter cable clamp connector (included)

“Aesthetic Economical Solutions”

Model 1036-00

The model 1036-00 Wireless LAN Access Point Enclosure permits Access Points to be secured aesthetically above the ceiling tile within an enclosure. An opening is cut into the tile and the enclosure is placed within the tile and is supported by two tile bridges with the door protruding, thus, making the enclosure look as if it is a part of the ceiling tile system.



Specifications:

- UL Listed - File#E249360
- Designed to meet NEC300-22 and 300-23 for plenum installations, where secure mounting is required
- Construction: Steel
- Accommodates: 1 Access Point from most manufacturers (reference Compatibility Table)
- Accommodates up to four external antennas, or permits standard dipoles to protrude through door
- Size: Flange 14” x 14” square, Enclosure is 12” x 12” x 3.75, Weight: 7lbs

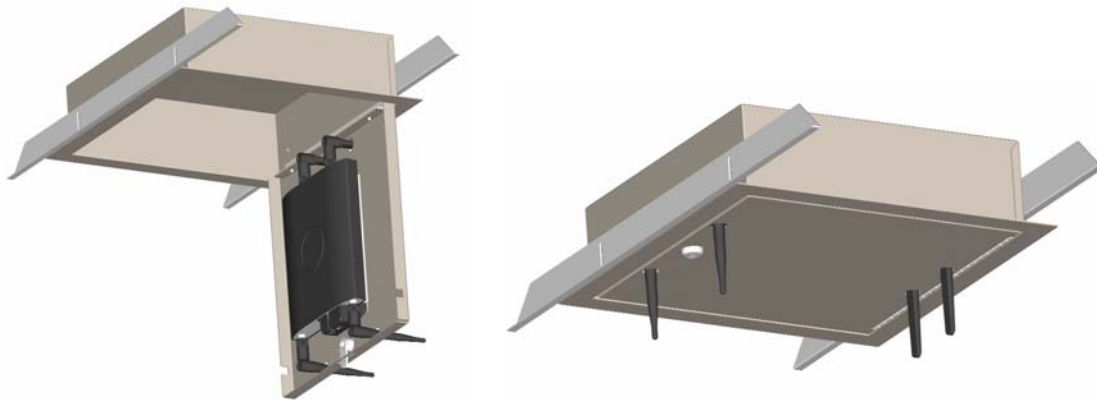
Model 1036-00 Includes:

- (2) Removable hole covers for $\frac{3}{4}$ " (trade) clamp connector in the enclosure
- Clamp connectors
- Mounting Plate, Mounting Screws & Hardware
- Eyelets for suspension using support wires (wire not included)
- Mounting Instructions

“Aesthetic Economical Solutions”

Model 1038-00

The model 1038-00 Wireless LAN Access Point Enclosure permits Access Points to be secured aesthetically above the ceiling tile within an enclosure. An opening is cut into the tile and the enclosure is placed within the tile and is supported by two tile bridges with the door protruding, thus, making the enclosure look as if it is a part of the ceiling tile system.



Specifications:

- UL Listed - File#E249360
- Designed to meet NEC300-22 and 300-23 for plenum installations, where secure mounting is required
- Construction: Steel
- Designed specifically for the Cisco 1242 access point.
- Accommodates up to four external antennas, or permits standard dipoles to protrude through door
- Size: Flange 14" x 14" square, Enclosure is 12" x 12" x 3.75, Weight: 7lbs

Model 1038-00 Includes:

- (2) Removable hole covers for ½" and 1" (trade) conduit fittings in the enclosure
- ½" Conduit nipple
- Mounting Screws & Hardware
- Eyelets for suspension using support wires (wire not included)
- Mounting Instructions

“Versatile Secure Mounting Solutions”

Model 1050-00

All model 1050 series enclosures are UL Listed. The model 1050 series Wireless Access Point Enclosures permit the AP to be secured in an aesthetic plenum rated ceiling tile replacement. Optional antennas kits are mounted on the door for effective RF coverage.



Specifications:

- UL Listed - File#E249360
- Allows 802.11b-g-a migration
- Designed to meet NEC300-22 and 300-23 for plenum installations, where secure mounting is required
- Construction: Aluminum & Steel
- Accommodates: 1 Access Point from most manufacturers (reference Compatibility Table)
- Accommodates: up to four 2.4/5.2GHz external antennas
- Hinged locking door is standard
- Size: 24"x24", AP Enclosure is 12"x12"x3.75", Weight: 13lbs

Model 1050-00 Includes:

- (2) Removable hole covers for $\frac{3}{4}$ " (trade) clamp connector in the enclosure
- Clamp connectors
- Mounting Plate, Mounting Screws & Hardware
- Eyelets for suspension using support wires (wire not included)
- Mounting Instructions

“Aesthetic Secure Mounting Solutions”

Model 1059-00

The model 1059 Wireless Access Point Enclosure permits the AP to be secured in an aesthetic ceiling tile replacement. The low profile dome protrudes only 4" below the ceiling surface and allows use in areas where overhead space is at a premium.



Specifications:

- Allows 802.11b-a-g migration
- Designed for Cisco 1242, Airmagnet Sensor, Blue Socket AP as well as any AP or Sensor with an overall height of $< 5\frac{3}{4}$ "
- Designed to meet NEC300-22 and 300-23 for plenum installations, where secure mounting is required.
- Construction: Aluminum and steel enclosure, UL-94HB listed - impact resistant ABS dome
- Hinged locking door w/white color Dome
- Size: 24" x 24" x $6\frac{3}{4}$ ", AP Enclosure is 18" x 18" x 2.6", Dome-14" Sq. x 4" High
- Weight: 17.5lbs (not including access point)

Model 1059-00 Includes:

- (2) Removable hole covers for $\frac{3}{4}$ " (trade) clamp connector in the enclosure
- Clamp connectors
- Mounting Plate, Mounting Screws & Hardware
- Eyelets for suspension using support wires (wire not included)
- Mounting Instructions

“Secure Mounting Solutions”

The model 1060 Wireless Access Point Ceiling Mount is specifically designed to simplify staging and mounting the Cisco 1130 Access Point. The model 1060 Wireless Access Point Enclosure permits the AP to be secured in an aesthetic plenum rated ceiling tile replacement with a simple turn of a key. Access Point maintenance can be performed without removing the AP or enclosure from the ceiling



Specifications:

- Designed specifically for aesthetic, secure mounting for the Cisco 1130AG Access Point
- Designed to meet NEC300-22 and 300-23 for plenum installations, where secure mounting is required.
- Construction: All Aluminum
- Integral key lock, common core
- Size: 24" x 24" x 2¼"
- Weight: 6lbs (not including access point)

Model 1060-00 Includes:

- Clamp connector
- Eyelets for suspension using support wires
- Mounting Instructions
- Security hasp

Additional Oberon Access Point Enclosures

Plenum Rated Ceiling Enclosures

Model 1055-00



Netcam Enclosure

Specifications:

- Allows 802.11b-g-a migration
- Designed to meet NEC300-22 and 300-23 for plenum installations, where secure mounting is required
- Construction: Aluminum & Steel
- Reversible mounting plate to accommodate camera or access point
- Accommodates: 1 Access Point from most manufacturers
- Hinged locking door w/Smoked Color Dome
- Size: 24"x24"x4½", Enclosure- 12"x12"x3¾", Dome- 9" Diameter x 5½" High
- Weight: 13lbs

Model 1058-00



Economical Enclosure for Cisco 1242

Specifications:

- UL Listed - File#E249360
- Allows 802.11b-a-g migration
- Designed exclusively for Cisco 1242 access point
- Designed to meet NEC300-22 and 300-23 for plenum installations, where secure mounting is required.
- Construction: Aluminum and steel enclosure
- Screw on cover
- Size: 24" x 24" x 2.2", AP Enclosure is 14" x 14" x 2.2"
- Weight: 16.5lbs (not including access point)

Model 1061-00



Two Access Point Enclosure

Specifications:

- Designed to meet NEC300-22 and 300-23 for plenum installations, where secure mounting is required
- Construction: Steel and Aluminum
- Accommodates 2 Access Points from most manufacturers
- Accommodates up to four external 2.4/5.2GHz antennas
- Hinged locking door
- Size: 12" x 24", AP Enclosure is 11" x 23" x 3¾"
- Weight: 13lbs (not including access point or antenna)

Model 1027-00



Wall/Hard-Lid Ceiling Enclosure

Specifications:

- Designed to meet NEC300-22 and 300-23 for plenum installations, where secure mounting is required
- Construction: Steel and Aluminum
- Accommodates 1 Access Point from most manufacturers
- Accommodates up to four external 2.4GHz antennas
- Hinged locking door
- Mounting holes located 16" on center
- Size: 17½" x 17½", AP Enclosure is 12" x 12" x 3¾"
- Weight: 11lbs (not including access point or antenna)

Outdoor NEMA Enclosures

Model 1025-00

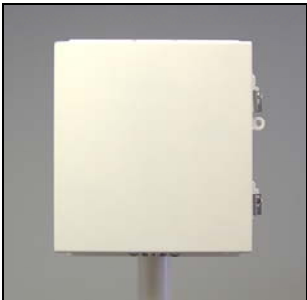


Compact NEMA 3R Enclosure

Specifications:

- Designed for surface mounting on indoor or outdoor walls or masts, where weather protection is required
- Construction: 16 gauge steel, NEMA 4 type construction
- Locking door
- 1 hole for $\frac{3}{4}$ " (trade) cable clamp, and 2 holes for $\frac{1}{2}$ " (trade) cable clamps, which are included
- Size: 8" x 12" x 3.5" deep
- Weight: 9 lbs

Model 1035-00



NEMA 3R Enclosure

Specifications:

- Designed for surface mounting on indoor/outdoor walls or mast mount, where secure, weather proof installation is required
- Construction: 16 gauge steel, NEMA 4 type construction
- Ring set for hasp of pad lock (not included)
- Size: 12" x 12" x 3.5" deep, 3", useful depth with mounting plate in place
- Weight: 12lbs

Model 1035-00



Net-Cam Enclosure With Heater and Cooling Fan

Specifications:

- Specifically designed to be used with Sony SNC-RZ30N Wireless Net Cam. The exclusive rack mounting system can be modified to fit most access points.
- Model 1081-00 only includes heater, cooling fan, and dual range thermostat.
- Construction: 16 gauge steel, NEMA 3R type construction
- Accommodates one (1) access point or radio bridge and one (1) wireless net camera
- Hinged locking door is standard
- Color: ANSI 61 gray
- Size: 12 $\frac{1}{4}$ " x 10 $\frac{3}{4}$ " x 10 $\frac{3}{4}$ "
- Weight: 15lbs (not including access point or antenna)

For additional information on these and other Oberon products, visit our website at www.oberonwireless.com.

Custom Wireless LAN Access Point Enclosures

Oberon offers one of the industries broadest ranges of wireless access point enclosures to meet your wireless deployment needs. This means that you will probably find what you need in this catalog, however, if you find an application where you need a customized solution, Oberon can design enclosures and system components for practically any network connection requirement. Using our existing design database, Oberon can quickly and economically design electronic equipment enclosures, which accommodate most manufacturers' products. Contact your Oberon representative for details.

- Aesthetically pleasing, locking, plenum rated ceiling enclosures
- Vandal, tamper, and theft resistant indoor enclosures
- Architecturally benign or discrete electronics enclosures
- Indoor/outdoor NEMA 4/ 3R enclosures

Applications:

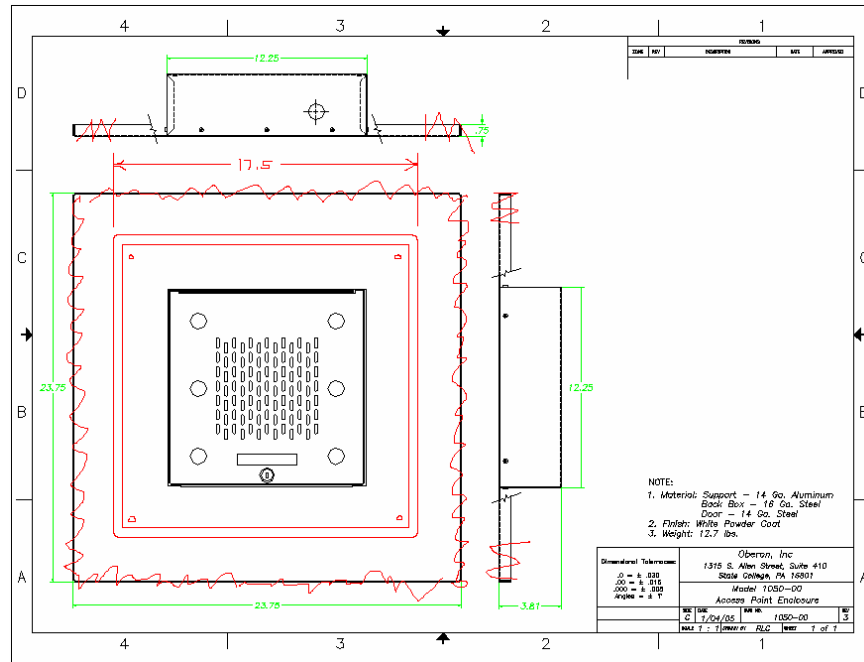
- Wireless LAN access points and radio bridges
- Network Cameras
- Indoor and outdoor cellular repeaters and converters
- Wireless asset tracking and RFID
- Security sensors
- PICs and PLCs
- Embedded processors
- Other sensors

These additional features add value to, and simplify, your installation:

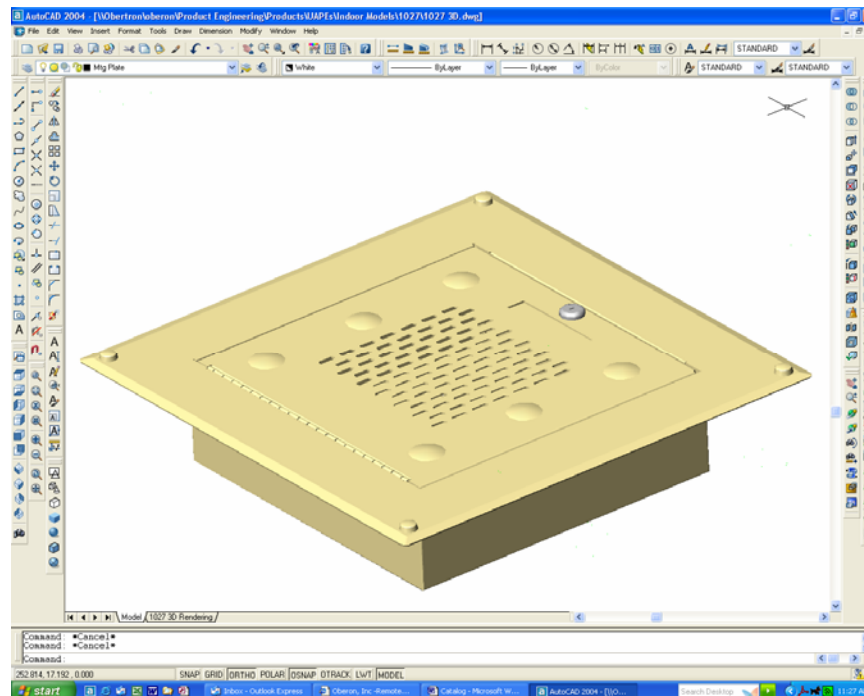
- Integrated single, diversity, directional, or omni-directional antennas
- Antenna swivel mounts
- Integrated RF connectors and RF jumper cables
- Weather proof and tamper resistant locks
- Heaters and blowers for outdoor installations
- Cord grips for field termination of data cables
- Weather proof Ethernet connectors
- Clear acrylic domes and doors
- Integrated AC power receptacles, conduit clamps, and grounding features
- Lightning arrestors and surge suppressors
- POE splitters
- Serial to Ethernet adaptors
- PICs
- Embedded controllers
- Cellular Modems
- UL Listing
- OSHPD Compliant

Product Modification – From Concept to Production

Step 1: Make changes to an existing drawing, create a sketch, or send us an actual product sample for which you would like to have an enclosure designed.



Step 2: Using our 3D CAD software, we can create prints and 3D models of your custom design for you to approve prior to actual production.



With a minimum order, Oberson can customize any existing enclosure or create a new enclosure to your specifications.

This antenna provides superior pattern coverage for indoor applications operating in 2400-2500 MHz, as well as 4900 to 5825 MHz. This economical model provides industry leading wideband performance and omni-directional gain. It features an attractive, compact package that is ideal for indoor applications where aesthetics are important.

General Specifications:

Dual band Low Profile Antenna

Radome Material:
UL 94-V0 PC/ABS

Polarization:
Vertical, Linear

Nominal Impedance:
50 Ohms

Cable:
16" Plenum rated RG-58/U PL

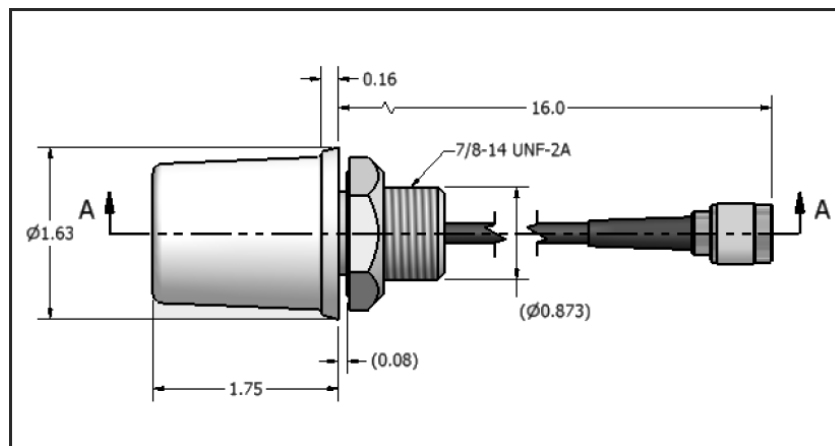
Connector Options:
Reverse Polarity TNC
Reverse Polarity SMA

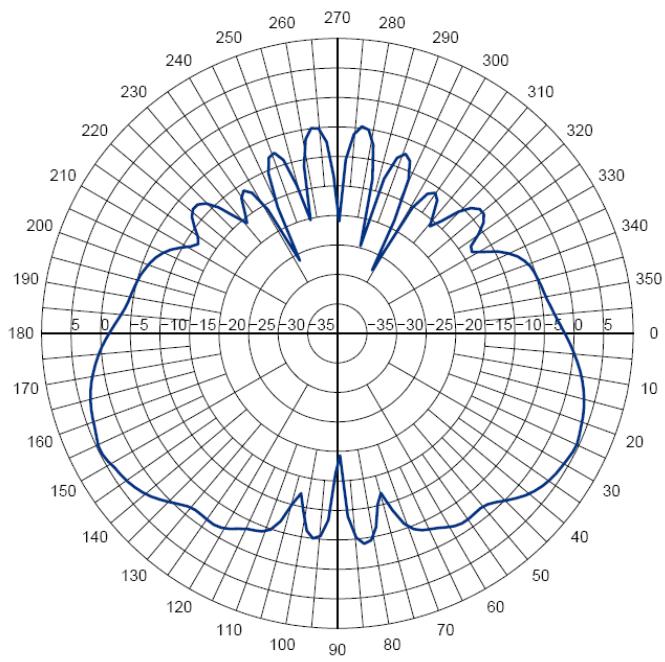
Mounting Method:
Through hole 15/16 dia (0.94)
7/8-14 UNF plastic Hex-Nut



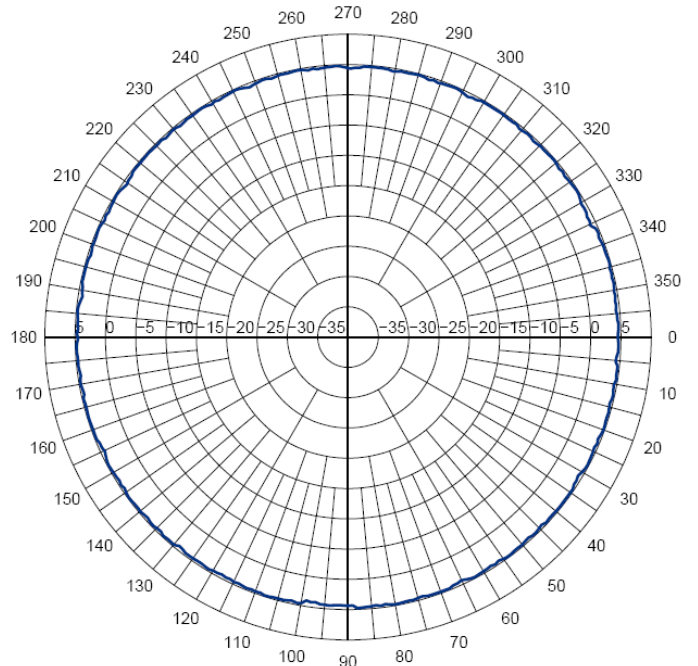
Electrical Specifications

Frequency Range	Nominal Gain	H-Plane Beamwidth	E-Plane Beamwidth	VSWR	Maximum Input Power
2400-2500 MHz	4 dBi	Omni-directional	35° Nominal	< 2.0:1	10 Watts
4900-5825 MHz	4 dBi	Omni-directional	20° Nominal	< 2.0:1	10 Watts

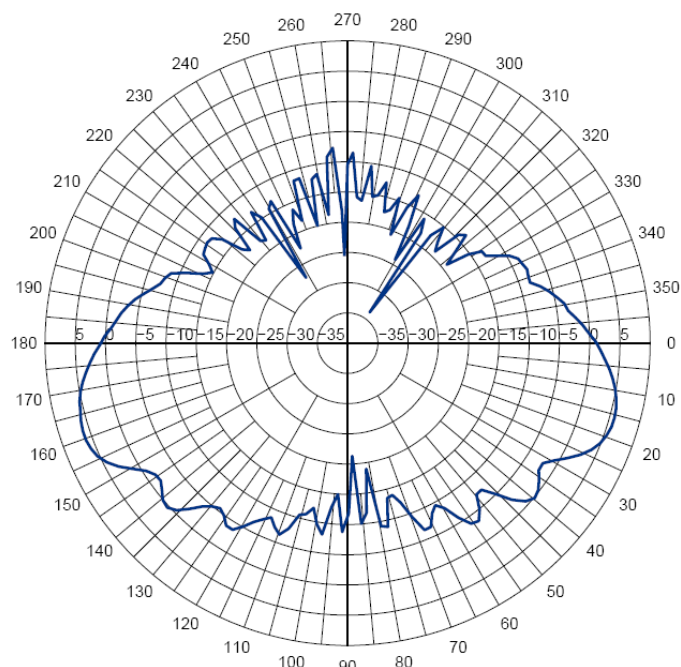




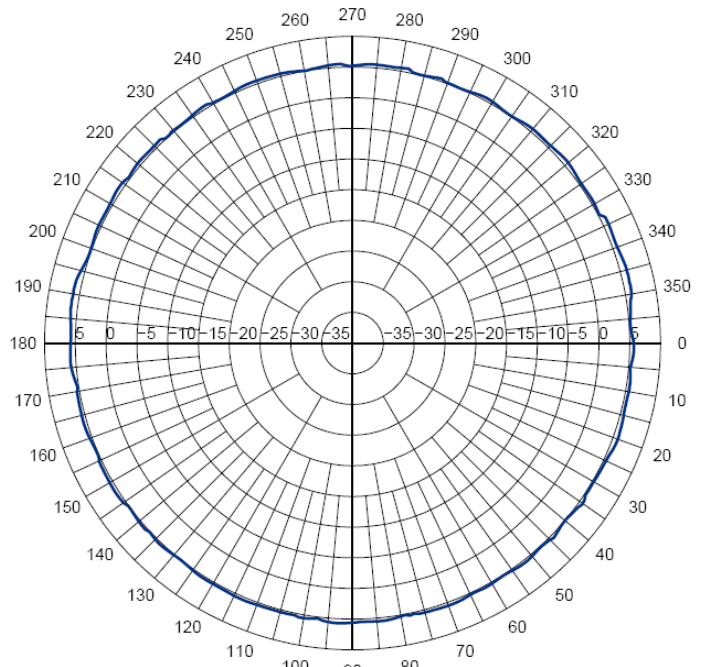
Elevation Cut at 2.4 GHz



Azimuth Cut at 2.4 GHz



Elevation Cut at 4.9-5.9 GHz



Azimuth Cut at 4.9-5.9 GHz

Additional Oberon Antennas

34-DMDUAL-KIT



Aesthetic, Dual Band Wi-Fi Antenna

Specifications:

<u>CONNECTOR</u>	<u>FREQ RANGE</u>	<u>GAIN</u> Without ground plane	<u>GAIN</u> With ground plane	<u>VSWR</u>
RPTNC	2400-2485 MHz	2.5 dBi	5 dBi	2:1
	5150-5830 MHz	2.5 dBi	5 dBi	2:1

34-LPANT-KIT



Indoor/Outdoor Low Profile Antenna

Specifications:

<u>CONNECTOR</u>	<u>FREQ RANGE</u>	<u>GAIN</u> Without ground plane	<u>GAIN</u> With ground plane	<u>VSWR</u>
N, Female	1700-2500 MHz	2.5 dBi	5 dBi	<1.5:1

34-PLANAR



Very Low Profile, Omni-directional Gain

Specifications:

<u>CONNECTOR</u>	<u>FREQ RANGE</u>	<u>GAIN</u> Without ground plane	<u>GAIN</u> With ground plane	<u>VSWR</u>
RPTNC	2300-2500 MHz	3.5 dBi	5 dBi	<1.35:1

34-BMANT24-KIT



Indoor/Outdoor Antenna

Specifications:

<u>CONNECTOR</u>	<u>FREQ RANGE</u>	<u>GAIN</u> Without ground plane	<u>GAIN</u> With ground plane	<u>VSWR</u>
RPTNC	750-2700 MHz	2.5 dBi	5 dBi	2:1

Securing Your Wireless LAN Electronically and Physically



Reprinted from: *Cabling Installation & Maintenance* May, 2005
Author: Scott Thompson

Site surveys, correct use of built-in capabilities, are crucial to safe information transport.

Wireless local area networks (WLANs) are providing in-office flexibility and convenience for roaming laptops, voice phones, or other portable devices. These characteristics, combined with standardization and aggressive cost reduction, foretell a future enterprise environment wherein the WLAN could prevail as the dominant client connection medium.

Commonly, the WLAN is installed as an overlay to the wired LAN. So, for network designers and installers, a new business opportunity is created: to provide the structured wiring to the WLAN access points (APs) the data-communications equipment that interfaces with the wireless client adapter in the roaming device to the wired network via radio waves.

As popular as WLAN equipment has become, however, it has limitations. Concerns for network security-both the electronic information and the physical components-have become well publicized, and perhaps well founded.

The prevailing, standards-based WLAN products presumably are compliant with the Institute of Electrical and Electronics Engineers (IEEE; www.ieee.org) 802.11b, 802.11a, or 802.11g standards. The standard defines how the radios in the AP and wireless client device will communicate with each other. The standard also describes the basic communication protocol that permits devices to share the common medium-the airwaves-similar to the manner in which the IEEE 802.3 Ethernet standard describes how devices can share a twisted-pair wire.



With a universal access point enclosure such as this one manufactured by Oberon, the access point can be locked and secured and still maintain aesthetic appeal, serviceability, and ease of installation.

The label "Wi-Fi compliant" on a product indicates that the product has been subjected to 802.11b, 802.11a, and 802.11g interoperability tests. Any Wi-Fi compliant client device should be interoperable with any other Wi-Fi labeled AP or client device.

Given that the network is no longer constrained to hosts connected by data wires, and that usable radio signal strengths can be measured a kilometer away from the AP or wireless client adapter, how can the wireless network provide reliable coverage where coverage is required, and minimize emissions outside of the coverage area?

Two kinds of security

The first requirement is for *electronic security*. The standards define, and compliant equipment supports, methods to authenticate client adapters and to encrypt the data payload to provide access and information security. Authentication is the process of verifying that the client attempting to engage the network is authorized to do so. Effective encryption will prevent an eavesdropper from using the transmitted information.

The second requirement is to provide *physical security* of the WLAN components, which involves mounting the APs in such a way that they cannot be stolen, moved, vandalized, blocked, or damaged. It also involves considering coverage areas, and minimizing coverage outside of the area intended for coverage. For example, maybe you would like your coverage to include the building interior, but perhaps not the parking lot, adjacent buildings, or public hallways. Such coverage specificity requires a radio-frequency (RF) facilities analysis, structured AP placement and wiring, and antenna-pattern selection.

Pay now, or much more later

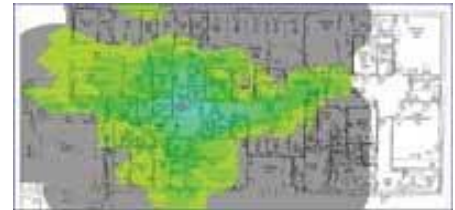
Electronic security is a matter of degrees, and the highest network security generally comes at the highest *initial* cost. Remember, however, an inadequate security solution could be very costly in terms of network downtime or inadequately protected enterprise communications and information. A number of electronic-security solutions are available for WLANs, but they may not all be interoperable. Different organizations will have different requirements for electronic security, so it's

worth spending the time to understand the target organization's requirements and capabilities. A comprehensive review of security solutions is beyond the scope of this article, but some of the important definitions are provided here.

The IEEE 802.1x standard describes wireline authentication, authorization, accounting, and encryption with a Layer 2 extension for WLANs, enabling a security level on par with most wired networks. 802.1x describes the following:

- The *Extensible Authentication Protocol* (EAP) provides authentication between the client and the authentication server. Several EAP types are available, including EAP-Cisco, EAP-TLS (EAP Transport Layer Security), EAP-TTLS (EAP Tunneled Transport Layer Security), and PEAP (Protected EAP); these let an enterprise choose the authentication type that best suits its needs.
- *Encryption* is at the link layer between the WLAN client and the AP. The current encryption mechanisms available are Wired Equivalency Privacy (WEP) and WEP plus TKIP (Temporary Key Integrity Protocol), Wi-Fi Protected Access (WPA), and Advanced Encryption Standard (AES). The emerging IEEE 802.11i standard for encryption prescribes AES.
- *Authorization* is controlled by the virtual LAN (VLAN) membership in combination with the access controls applied at the access router terminating the VLAN.
- *RADIUS* (Remote Authentication Dial In User Service) provides the accounting, via communication between a RADIUS server and the APs.

In addition to understanding these authentication and encryption issues, it is recommended that wireless LANs be a separate LAN segment from the wired network. It may also be appropriate to engage a wireless intrusion-detection system (WIDS), which generally comprises WIDS sensors distributed throughout the facility, and an IDS server or appliance. The IDS server or appliance aggregates detected radio packets and is able to report unauthorized APs, unauthorized wireless clients, malicious behavior, and malfunctions in APs or clients. Users should review their network security policies and periodically audit their facilities for rogue wireless networks or intrusion attempts. Network managers can program WIDS to enforce these policies. Finally, the APs' transmit power should be adjusted to provide RF coverage only where desired, and minimize RF outside the zone of intended coverage.



An RF site survey, or facilities analysis, is required to establish correct location and number of APs. This figure shows the RF signal coverage from one AP on a floor of a building. The AP is mounted in an enclosure in the plenum space but the antenna is below the drop ceiling. If the antenna were above the drop ceiling, the coverage could be quite different.

Physical security

In addition to electronic security, network designers, installers, and users should incorporate physical security for APs. The AP locations will be based on the results of an RF site survey or facilities analysis. This site survey is essential for providing effective RF coverage when more than one room is involved, and generally is much more cost-effective than guessing AP quantity and location.

Because the APs are required to provide RF coverage, they inherently cannot be locked into a telecom facility. The APs, however, by their nature require exposure to provide RF coverage, and must be protected from theft, accidental moves, vandalism, damage, or blockage. These requirements often are at odds with each other, so network managers must provide physical security for APs in-situ.

For the sake of convenience, the AP is sometimes placed above the drop ceiling in the plenum space. This approach, however, is less than ideal. The drop ceiling may introduce 2 to 3 decibels (dB) of attenuation between the AP and the area intended to be covered, which results in a 30% reduction in coverage range and a 50% reduction in coverage area. Therefore, the AP can be placed in the plenum space only if the RF site survey was performed with the AP in the plenum space. Significantly more APs may be required within the facility to provide desired coverage if the APs are mounted above the drop ceiling, versus below the drop ceiling.

If installed in the plenum space, the AP must be plenum-rated and must be installed per the *National Electrical Code* specifications for plenum-space installations. Additionally, maintaining the AP may be more difficult within the plenum space, and even locating the AP may be a problem.

Ideally, the AP should be mounted in an AP enclosure that can be locked and that facilitates antenna connection. External antennas can be connected to the AP via short coaxial jumper cables, integrated directly with the enclosure, or protruding through the enclosure from the AP. In any case, the antennas should emulate the antennas used in the RF site survey.

Enclosures deter theft, vandalism, and accidental moves, and they are less likely to be accidentally blocked than a standalone AP. Integrated antennas prevent tampering and theft. The enclosures also support moves, adds, and changes (MACs). As AP standards or requirements change, the AP can be swapped out of the enclosure, or additional APs can be added, leaving the data wiring and line wiring in place.

Generally, due to attenuation concerns, it is good to avoid radiating through plastic or fiberglass enclosures. Also, plastic or fiberglass enclosures may not be acceptable in plenum spaces.

Antenna selection

Using the correct antenna can optimize RF coverage, which means not only providing RF signals to the wireless client device, but also minimizing interference between APs, maximizing data throughput, and minimizing the number of APs used. Most AP manufacturers provide products with detachable antennas to meet a variety of WLAN design needs. For wall-mounted APs, it's wise to choose a directional panel antenna that radiates into the room. For APs mounted near the center of a room, choose an omni-directional antenna.

In years past, a WLAN designer was constrained to use the AP manufacturer's antenna-and for 802.11a WLANs, which operate in the 5-GHz band, only APs with non-detachable antennas could be used. In July 2004, however, the Federal Communications Commission (FCC) changed some of its rules regarding the use of external antennas with APs, giving WLAN installers more flexibility in network design for RF coverage. According to FCC rule change CFR 47, Section 15.204, paragraph (c)(4), you can use any antenna that is of similar type to the antenna provided by the manufacturer, with equivalent or lower directional gain. Also, 5-GHz 802.11a APs with detachable antennas are now permitted, thereby providing you with greater flexibility when using external antennas in 802.11a-compliant networks.

Checklist for now and the future

In summary:

- When using WLAN equipment, engage the standards-based authentication and encryption available with Wi-Fi compliant client adapters and APs.
- Remember that the equipment may be shipped with authentication and encryption disabled.
- Review security policies and isolate the WLAN from the wired network.
- APs are critical to WLAN performance, so it is necessary to physically secure them to avoid network downtime and loss of capital equipment.
- Understand the RF site survey and install the APs so they provide optimum RF coverage while mitigating mutual interference.
- Use an antenna that is suitable for the area to be covered, and perform an RF site survey with the same type of antenna.

Wireless LAN standards are evolving, so anticipate upgrades, either through firmware or hardware, in the near future. Structure your WLAN design for future performance enhancements and MACs.

SCOTT D. THOMPSON is director of engineering for Oberon (www.oberonwireless.com).

Appendix A – Warranty

Terms and Conditions

Sale of Equipment -Seller agrees to sell the equipment specified on any quotation, sales order, invoice, or packing slip to Buyer upon the terms and conditions stated below.

Shipment- Unless special arrangements are made, ownership of the goods and risk of damage/loss passes to Buyer when the freight carrier picks them up from Seller, and Buyer is responsible for filing any freight claims for damage or loss. If an item is received with freight damage, it is very important for the Buyer to note "Damaged Freight" on the carrier's bill before signing it.

Freight and Other Charges -Freight charges are prepaid by Seller and added to Buyer's invoice plus a service/handling charge. Sales tax will be charged as required by law.

Credit and Payment Terms -Standard credit terms are Net 30. Oberon accepts company checks, certified checks, Visa or Mastercard. Payments on past due invoices will be subject to a "Late Charge" in the amount of 1½% per month.

Returns and Exchanges – 10% Re-Stocking Fee. Special order, custom configured, modified, or cut to length products are not returnable. After 90 days, no returns or exchanges will be accepted. Under no circumstances will the seller be liable for any incidental, consequential, special or exemplary damages.

Limited Warranty

Equipment manufactured by Seller -Seller warrants to Buyer that the equipment will be free of defects in materials and workmanship for a period of one (1) year from the date of shipment. This warranty shall not apply to any equipment, which is misused, or for any damage to the equipment resulting from improper installation or operation, vandalism, acts of God, or any other cause beyond reasonable control of the seller. This warranty shall be void if the equipment has been altered, tampered with, or repaired by a party other than the Seller or its authorized representative. In the event of equipment failure within the warranty period, Seller will repair or replace the defective equipment, at its option, provided that Buyer notifies Seller and obtains a RMA number prior to returning the equipment to Seller. Defective equipment must be returned, shipping prepaid, to the Seller's specified address. The warranty on repaired or replaced equipment will be the balance of the original Equipment Warranty. This Warranty Is In Lieu Of All Other Warranties, Express or Implied, Including, Without Limitation, Statutory Warranties or Warranty of Merchantability or Fitness for a Particular Purpose. Seller's sole liability and buyer's sole remedy hereunder will be repair or replacement of the Equipment as provided in this agreement.

Other Equipment -Seller will pass through to Buyer all original Manufacturers' Warranties that may apply to the equipment. Seller may, at its option, process warranty requests by the Buyer to the Original Manufacturer, or refer the Buyer to the Original Manufacturer. Seller is not responsible for any warranty-related issues.

Applications- By placing an order with Oberon, Buyer agrees to these terms and conditions regarding this order and any subsequent orders, and no modifications or other terms are binding on Buyer without prior written approval. Pennsylvania Law Applies.