AT-WL2411 Wireless Accessories Guide

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Introduction

The purpose of this document is to provide Allied Telesyn customers with a tool which will enable them to better understand how the various Allied Telesyn antennas, cable assemblies, and accessories blend together.

Regulatory Concerns

Note: The information below will help you to understand some of the regulatory issues surrounding the use of antenna, antenna circuits, and radios. However, it is critical to remember that all antennas must be approved and certified before they can be used with radio (RF) equipment purchased from Allied Telesyn.

FCC

FCC requirements limit the total output power of a wireless LAN system operating in the 900 MHz and 2.4 GHz frequency ranges to 4 Watts. This limit is expressed in EIRP, which stand for "Effective Isotropically Radiated Power." This is the total power created by the transmitter and gain generated by the antenna, minus any loss due to cabling and connections. Given this 4W (4000 mW) maximum, the EIRP must not exceed 36dBi.

ETSI

ETSI requirements limit the total output power of a 2.4 GHz wireless LAN system to 0.1 Watt (100 mW). Given this 100 mW maximum, the EIRP must not exceed 20dBm. 900 MHz systems are not allowed and UHF system maximum EIRPs vary from country to country. Most European countries such as France and Italy operate under a lower power directive, which limits them to a maximum output limit of 10 mW.

Non-ETSI & Non-FCC Countries

Electromagnetic-transmission regulations are mandated by each country's own governing body. Many countries follow the directives issued by ETSI or the FCC but others create their own regulations.

Before adding radios or antennas to a RF system, please consult an Allied Telesyn Systems Engineer.

Basic Antenna Concepts

Antennas and Power

Antennas do not increase nor decrease the power applied to them. They can only transmit or receive the amount of power that is applied to them. It is possible to have some power loss before or after the signal leaves the antenna. An example of this is "line loss: which is a decrease in power due to imperfect connections and imperfect conductivity to cabling materials. It is, however, possible to increase the power output in a certain direction. But the total power emitted will always be the same as the amount applied to the antenna minus the amount lost due to line loss, ohmic loss, reflection loss etc…

dBi – (decibels relative to an isotropic {spherical} radiation pattern)

An isotropic antenna is a theoretical antenna that radiates in the shape of a perfect sphere.

dBm – (decibels relative to one milliwatt)

dBm is a commonly used unit of measurement in the RF industry that expresses radio frequency power relative to a 1 mW point of reference.

dBd – (decibels relative to a ½ wave dipole antenna)

dBd is gain with respect to a ½ wave dipole antenna. Some commercial antenna companies use dBd to rate their antennas.

EIRP – (Effective isotropically radiated power)

The mathematical product of (1) the power supplied to the antenna and (2) its gain.

Gain

Gain is given in dB (decibels). If an "I" is added as in 3dBi, this rating is relative to an "isotropic" antenna. An isotropic antenna is a theoretical antenna that radiates in the shape of a perfect sphere. If a "d" is added as in 3dBd, this rating is relative to a "dipole" antenna. A dipole antenna with a rating of 2.14dB is equivalent to a 0dBd antenna.

Line-of-sight

This refers to the fact that some electromagnetic wave frequencies require a clear line of sight between transmitter and receiver. This is largely because higher frequency electromagnetic waves, such as those in the 2.4 GHz range, do not bend around or penetrate objects as well as some lower frequency signals.

Multipath, Reflection, or Physical Interference

Because of the electromagnetic properties of waves used to transmit data, large metal objects in the immediate transmission path of the antenna will likely cause distortion of the signal and should therefore be avoided.

Omni-directional

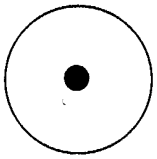
An omni-directional antenna radiates evenly horizontally around the antenna in a plane parallel to the earth. These antennas do not always radiate evenly vertically around the antenna in a plane perpendicular to the earth. By giving up vertical coverage, above and or below the antenna and refocusing that signal around the antenna, it is possible to achieve gain with an omni-directional antenna.

Omni-gain

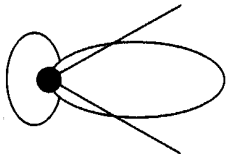
Wavelength and operating frequency determine the size of the antenna. By using a longer antenna, you do not achieve greater overall coverage, but you can achieve greater distance in a focused direction. For example, omni-directional antennas with gain achieve some measure of gain in the horizontal plane.

Radiation Patterns of Various Antennas

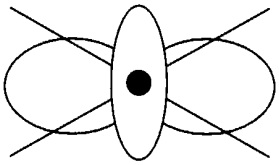
Omnidirectional:
Circular pattern in open spaces
Range is slightly effected by antenna gain but the radiation pattern will remain relatively circular.



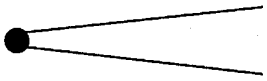
Flat Panel:
Modest directional coverage with a slight backlobe
The main lobe of the radiation pattern can be from almost circular to fairly oblong in shape. Good for slightly directional coverage such as down corridors or away from walls.



Dual Flat Panel:
Bi-directional coverage
Good for transmission down two opposing directions of a corridor.



Directional YAGI (High Gain):
Highly focussed signal.
Good for wireless bridging or very specialized coverage.
Not available for _ watt (500 mW), 2.4 GHz uses.



There must always be a tradeoff between gain and coverage area. As can be seen in the radiation patterns presented, the higher the gain (directional distance) as with the Yagi antenna, the narrower the coverage. And conversely, the lower the gain, the more universal the coverage about the antenna's axis.

Antenna patterns are 3 dimensional. The radiation patterns (above) are views of the azimuth plain, which is a top down view.

Antenna Installation/Preparation Guidelines

The AT-WL2411 Access Point features antenna diversity, which means that two antennas can be attached to a single radio. The antenna ports on the radio card are marked | and ||. Port | is the send/receive port; port || is the receive-only port. (Note that the antenna diversity system uses only one antenna at a time.) Allied Telesyn recommends that you use two antennas for optimal performance of your AT-WL2411 Access Point. If you attach only one antenna to the AT-WL2411 Access Point, you must attach it to Port |.

If you are using two antennas for one AT-WL2411 Access Point, placement of the antennas is critical because each antenna has a particular function. Antennas placed too close together may cause interference with each other. Antennas placed too far apart may not be able to establish two-way communications with other radios. To achieve optimum placement for the two antennas, you must place the transmit/receive antenna so that it is within range of all the radios that the receive-only radio can hear.

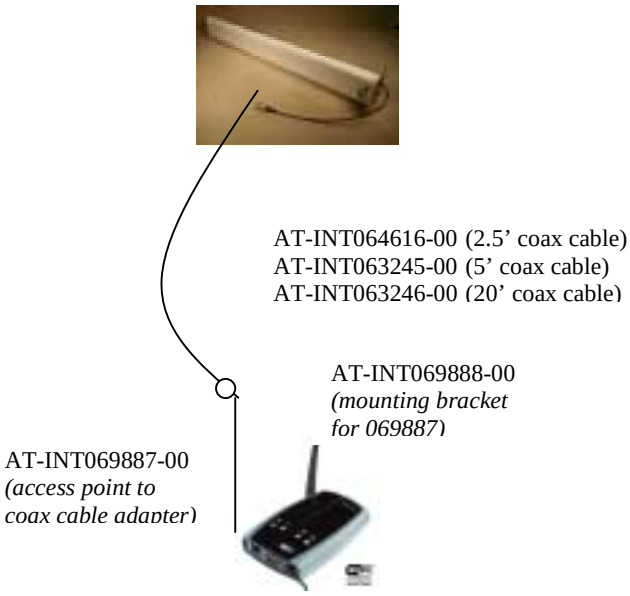
Note these important points about antenna placement for an AT-WL2411 Access Point:

- Use external antennas to achieve the recommended antenna separation for placement of either omni or directional antennas.
- Position directional antennas so they point in the same direction.
- Follow the recommended antenna separation precisely when using the closest distances. Movement of as little as 3.05 centimeters (1.2 inches) may strongly affect performance.
- Position the antennas so that both antennas are within range of the radios they need to communicate with.
- Do not position the two antennas around a corner or so that a wall is between them.

The recommended antenna separation is listed in the following table. You should choose the greatest distance possible within the constraints of your environment.

Location	**Recommended Antenna Separation**
Highly reflective warehouse environment	0.33 m (13 in) or 0.64 m (25 in)
Moderate reflective warehouse environment	0.64 m (25 in), 1.22 m (4 ft), or 1.83 m (6 ft)
Open/Office environment	1.22 m (4 ft) to 3.05 m (10 ft)

Configuration Examples (final version will have additional):



Cable Assy, N Plug / N Plug

AT-INT064616-00 – 30 Inch – cable loss .2 dB
AT-INT063245-00 – 60 Inch – cable loss .3 dB
AT-INT063246-00 – 20 Feet – cable loss 1.3 dB
AT-INT071179-00 – 30 Feet – cable loss 1.3 dB

Connect to cable assy ATI-INT069887-00 (page __) and to Antennas ATI-INT065349-00, ATI-INT063365-00.

30”, 60”, & 20’ Cable Assemblies are constructed with LMR-400 cable.
30’ Cable Assembly is constructed with LMR-600 cable.

LMR-400 cable is .40 diameter (inch)
1.0 (cm)

LMR600 cable is .60 diameter (inch)
1.5 (cm)

ATI-INT069887-00

Cable Assy, Radiall, Splice N

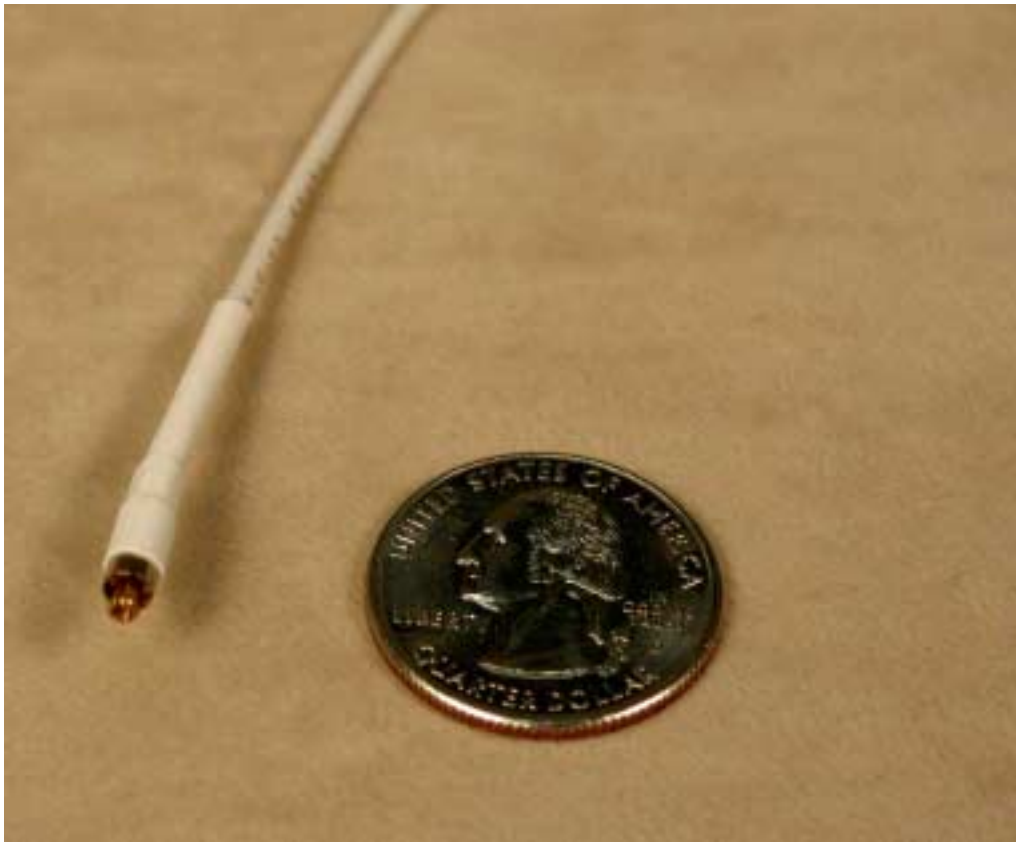
Used to connect AT-WL2411
with Radiall (Lucent) connector to Allied Telesyn N Plug
Cable Assys, AT-INT064616-00, AT-INT063245-00,
AT-INT063246-00, and AT-INT071179-00.

AT-INT070403-00

Cable Assy, Radiall, N Plug

Used to connect AT-WL2411 with Radiall (Lucent) connector directly to Allied Telesyn N Receptacle connector on AT-INT063360-00, AT-INT063365-00, AT-INT067262-00, AT-INT067263-00, AT-INT071121-00, and AT-INT071122-00.

N Receptacle Connector used on the following Antennas: 063363, 063365, 067261, 067262, 067263, 071121, and 071122. Antennas 063366 and 065349 use the same style of N Receptacle but the connector is attached directly to the antenna.



Radiall (Lucent) Connector on Antenna AT-INT070141-00

AT-INT069888-00

Kit, Bracket, Mounting, Antenna

Used to mount Cable Assy AT-INT069887-00 to wall.

Mounting screws provided.

AT-INT069893-00

Kit, Power Supply Holder, 5V
Used to mount AT-WL2411 Power Supply to wall.

Mounting screws provided.

AT-INT061868

Lightning Suppressor

Use between Cable Assys, 064616, 063245, 063246, or 071179.

Replacement/spare lightning capsules are available. Order part # AT-INT586610-00.

AT-INT063363-00

Antenna, 2.4 GHz, Omni

FCC
ETSI

Size: 1.0 diameter x 11.5 inches
2.5 x 29.2 cm

Hardware for mast installation provided.

	Approx. Beam Width	
Gain	**Azimuth Plane**	**Elevation/Vertical Plane**
5 dBi	**360 degrees**	**30 degrees**

AT-INT063365-00

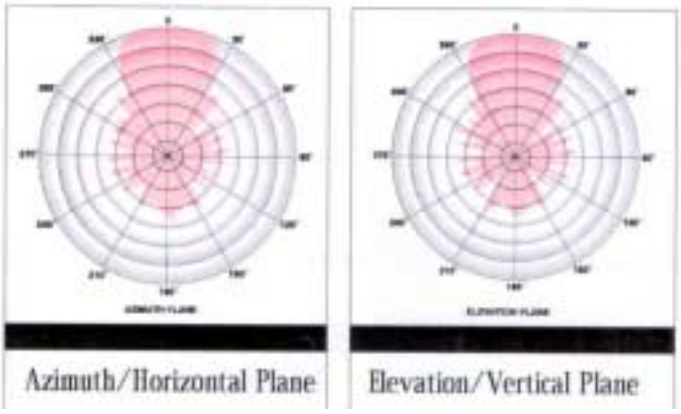
Antenna, 2.4 GHz, 15dBi, Yagi

FCC

Size: 26.0 x 4.0 x 1.0 inch
66.0 x 10.2 x 2.5 cm

Hardware for mast installation provided.

Gain	Approx. Beam Width Azimuth Plane	Elevation/Vertical Plane
15 dBi	**34 degrees**	**30 degrees**



AT-INT063366-00

Antenna, 2.4 GHz, Flat Panel

FCC

Size: 9.5 x 9.5 x 2.0 inch
24.1 x 24.1 x 5.1 cm

Hardware for mast installation provided.

	Approx. Beam Width	
Gain	**Azimuth Plane**	**Elevation/Vertical Plane**
14 dBi	**30 degrees**	**30 degrees**

AT-INT065349-00

Antenna, 2.4 GHz, 9dBi, Omni

FCC
ETSI

Size: 1.7 diameter x 22.0 inches
4.3 x 55.9 cm

Hardware for mast installation provided (on pole).

	Approx. Beam Width	
Gain	**Azimuth Plane**	**Elevation/Vertical Plane**
9 dBi	**360 degrees**	**14 degrees**

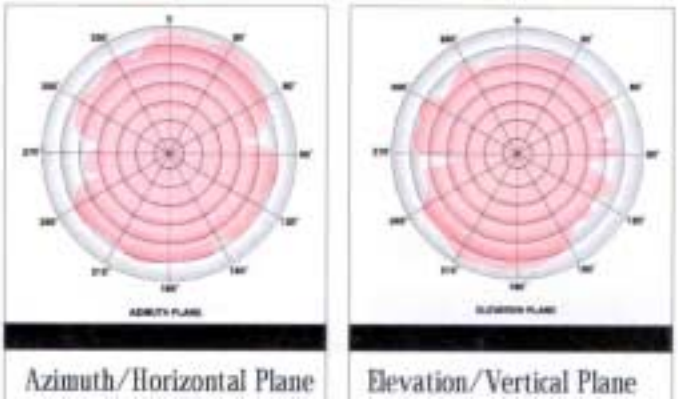
AT-INT067262-00

Antenna, 2.4 GHz, 5dBi, Dual Flat Panel

FCC

Size: 2.7 x 2.5 x .8 inches
6.9 x 6.4 x 2.0 cm

Gain	Approx. Beam Width Azimuth Plane	Elevation/Vertical Plane
5 dBi	**60 degrees**	**30 degrees**



AT-INT067263-00

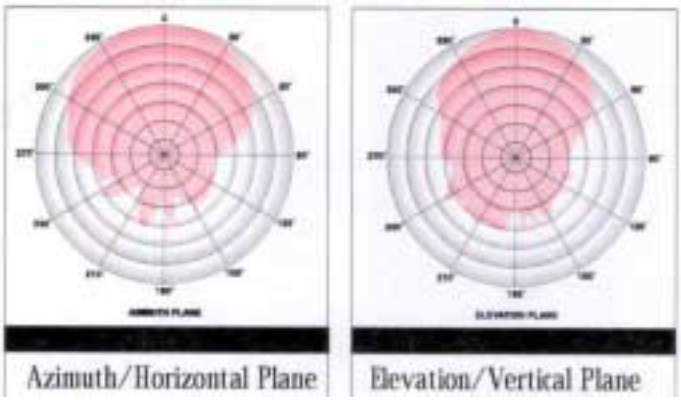
Antenna, 2.4 GHz, 9dBi, Flat Panel

FCC

Size: 5.0 x 5.0 x .75 inches
12.7 x 12.7 x 1.9 cm

Provided with Velcro patches, plastic drywall anchors, self threading screws and Tilt Pan bracket. ***Tilt Pan bracket shown on next page.***

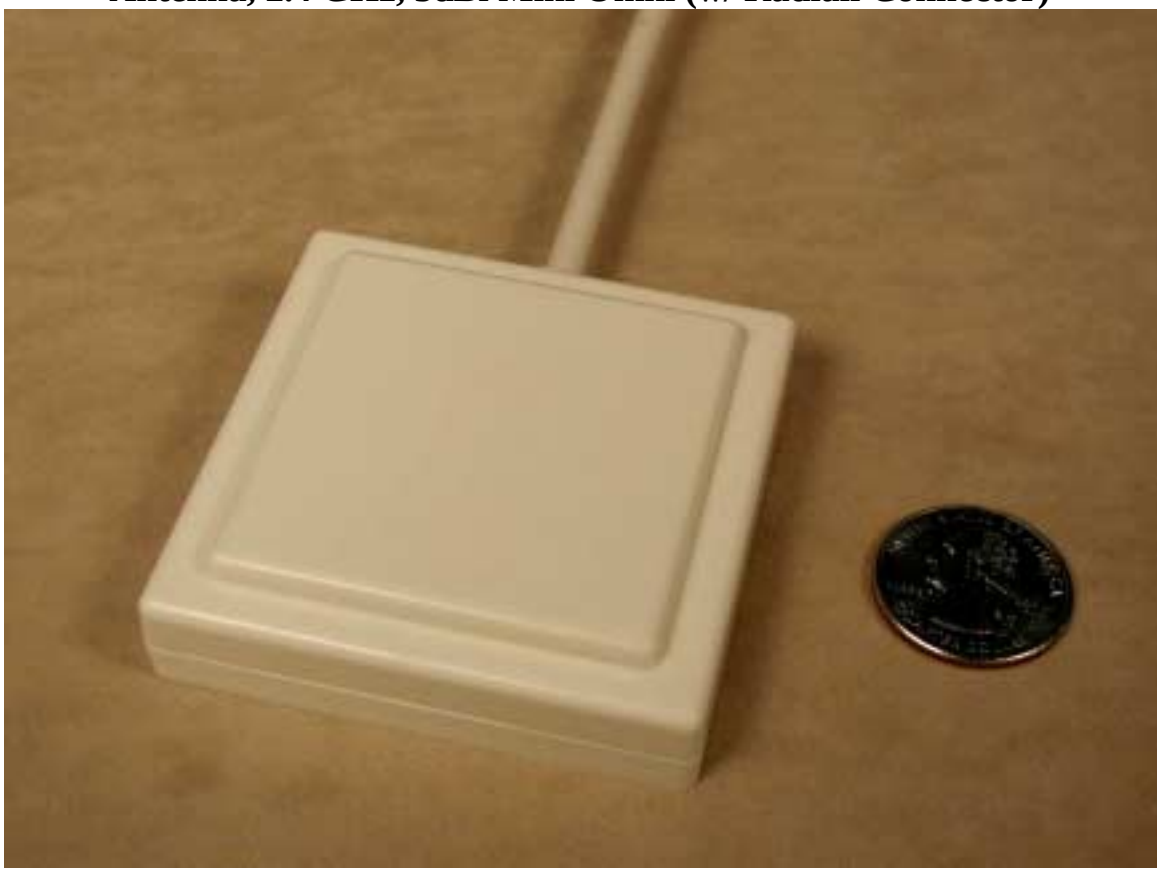
Gain	Approx. Beam Width Azimuth Plane	Elevation/Vertical Plane
9 dBi	60 degrees	60 degrees



Rear View of AT-INT067263-00 shown with Tilt Pan Mount

AT-INT070141-00

Antenna, 2.4 GHz, 3dBi Mini Omni (w/ Radiall Connector)

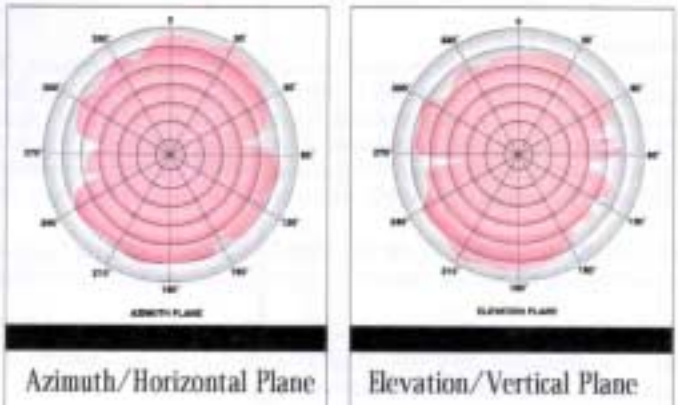


FCC **Size: 2.0 x 2.5 x 1.0 inches**

ETSI **5.1 x 6.4 x 2.5 cm**

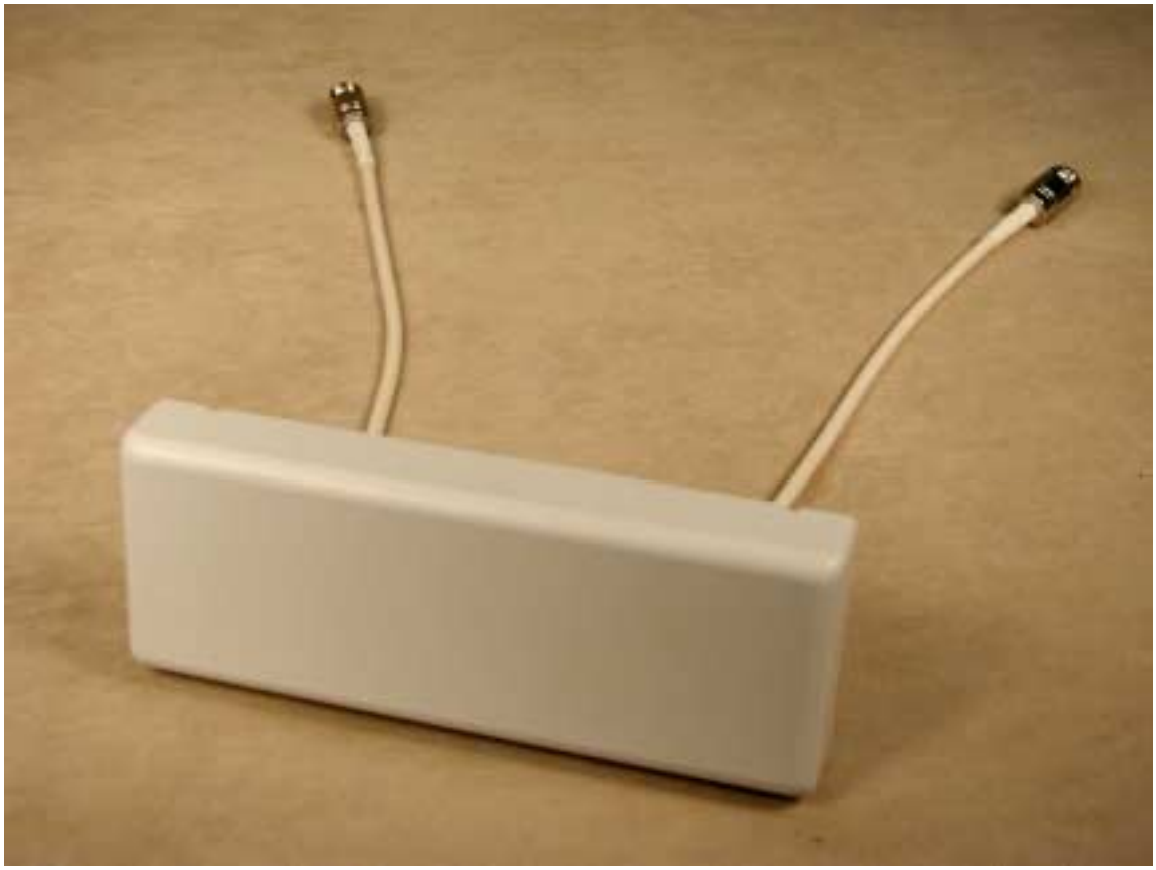
Hardware for drop-ceiling installation is provided. This antenna connects directly to the AT-WL2411, and includes a Radiall connector.

Gain	Approx. Beam Width Azimuth Plane	Elevation/Vertical Plane
3 dBi	360 degrees	180 degrees



AT-INT071121-00

Antenna, 2.4 GHz, Diversity, 3dBi



FCC

Size: 2.7 x 7.2 x 1.0 inches
6.9 x 18.3 x 2.5 cm

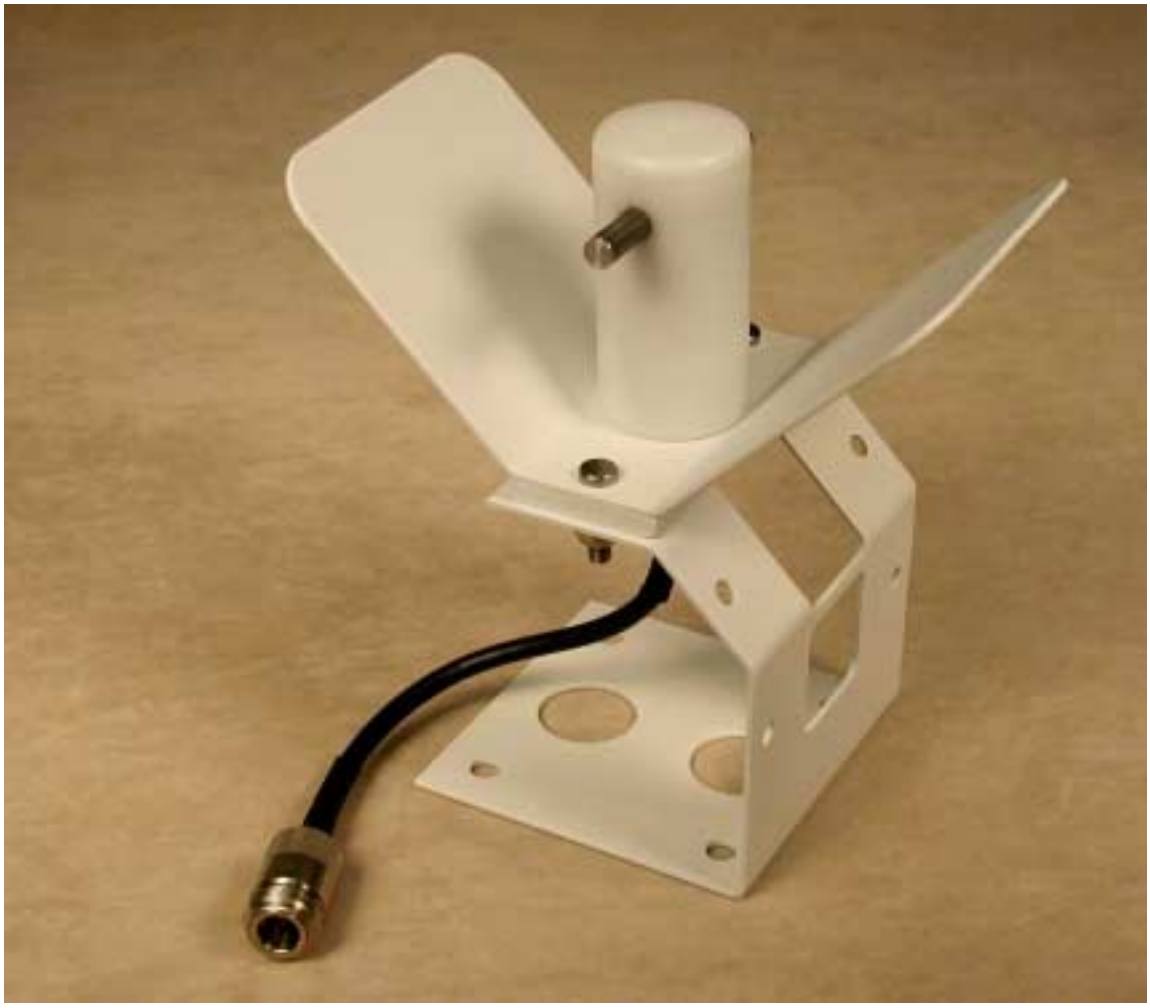
Provided with integral clip for drop-ceiling installation.

Gain

3 dBi

AT-INT071122-00

Antenna, 2.4 GHz, Corner Reflect



FCC

Size: 6.0 x 5.5 x 3.0 inches
15.2 x 14.0 x 7.6 cm

Hardware for mast installation provided.

	Approx. Beam Width	
Gain	**Azimuth Plane**	**Elevation/Vertical Plane**
9 dBi	**65 degrees**	**75 degrees**

AT-INT071489-00

Diversity Antenna, 2.4 GHz with Radiall (Lucent) connector

FCC
ETSI

Size: 4.8 x 4.2 x 1.4 inch
12.2 x 10.7 x 3.6 cm

Mounts to ceiling, wall, or desk.
Hardware for drop-ceiling installation provided.

	Approx. Beam Width	
Gain	**Azimuth Plane**	**Elevation/Vertical Plane**
0 dBi	**360 degrees**	**50 degrees**

AT-INT071620-00

1-port Power over Ethernet Bridge

AT-INT071578-00

6-port Power over Ethernet Bridge

AT-INT071579-00

12-port Power over Ethernet Bridge

Allied Telesyn's MobileLAN Power is a plug and play LAN hardware product set that delivers electrical power to the access points on a wireless LAN over existing Ethernet cables, without work-arounds or compromise. It is a cost-saver not only for the warehouse or factory sharing data from terminals, but also for the office LAN supporting laptop users as they roam through the enterprise. The 1-, 6-, and 12-port Power over Ethernet Bridge works with Allied Telesyn's AT-WL2411.

BENEFITS

CUTS INSTALLATION COSTS

Running AC power to access points can represent over half the cost of installing a wireless LAN. MobileLAN power lowers WLAN installation costs significantly by eliminating the expense of installing separate power cables. This is especially valuable when access points need to be mounted in hard-to-reach places. It also saves on the cost of local AC adapters.

EASES NETWORK MANAGEMENT

MobileLAN power makes network management easy to monitor because all port interfaces and LED displays are on the front panel. In conjunction with a centralized UPS it delivers clean, reliable, uninterrupted power to access points and other devices. It's an intelligent network device which can be managed and configured remotely, and which allows remote power cycling of access points.

PROTECTS THE EXISTING INVESTMENT

Because it works in tandem with an existing Ethernet or Fast Ethernet switch, and connects using standard Category 5 cabling, MobileLAN power preserves the existing LAN or Ethernet cable infrastructure. Over the same lines that deliver power, an interrogation detects power-enabled devices and supplies them with inline power immediately, but automatically protects non-power-enabled devices from receiving power for which they are not equipped. Future investments are also provided for. MobileLAN power is fully SNMP supportable and supports 10/100 networks. Multiple power bridges can be added to the wiring cabinet to support more access points as requirements evolve.

HOW MOBILELAN POWER WORKS

Allied Telesyn's MobileLAN power system consists of an Ethernet switch, a power bridge (or a power-enabled Ethernet switch) that serves as the power source, and a number of power-enabled data terminals. MobileLAN power bridges are available in 1-, 6-, and 12-port models.

The system is connected in a star topology where each load has a dedicated connection to the centralized power bridge. If a powered device is incompatible with the power bridge, an external splitter is installed.

The power bridge is connected in series to an Ethernet switch/hub (cascaded) where the power bridge's inputs are connected to the switch outputs, and the power bridge outputs are connected to the patch panel. Power is carried over the spare twisted pairs (pins 7 & 8) and (pins 4 & 5) in an ordinary Category 5 cable using RJ-45 connectors and assuring negligible degradation of data communication.

6-Port Bridge Physical Characteristics

Physical Specifications
Dimensions: Height: 44mm x Width: 241mm (1/2 x 19.0in.) x Depth 400mm
Weight: 2.5 Kg

Environmental Specifications
Operating Temperature: 0 to 40 °C
Operating Humidity: 10 to 90% (no condensation allowed)
Storage Temperature: -20 to 70 °C
Storage Humidity: 10 to 90% (no condensation allowed)

Electrical Specifications
Input Voltage: 90 to 264 VAC (47-63 Hz)
Input Current at 110 VAC: 1.5 Amperes
Total Power Consumption, Continuous,
24 ports at full load: 150 Watts
Output Power, per Port: 16 Watts
Nominal Output Voltage, per Port: 48 VDC (±4V)

Ethernet Interface
Input (Data): 6 Ports; Ethernet 10/100 Mbps: RJ 45 female socket
Output (Data & Power): 6 Ports; Ethernet 10/100 Mbps, and 48 VDC: RJ 45 female socket, with DC voltage on wire pairs 7/8 and 4/5

Serial Port Interface
DB9 Serial Data Monitor port

12-Port Bridge Physical Characteristics

Physical Specifications
Dimensions: Height: 76mm (3.0 in.) x Width: 483mm (19.0 in.) x Depth 300mm (12.0 in.)
Weight: 4.8 Kg

Environmental Specifications
Operating Temperature: 0 to 40 °C
Operating Humidity: 10 to 90% (no condensation allowed)
Storage Temperature: -20 to 70 °C
Storage Humidity: 10 to 90% (no condensation allowed)

Electrical Specifications
Input Voltage: 90 to 264 VAC (47-63 Hz)
Input Current at 110 VAC: 3 Amperes
Total Power Consumption, Continuous,
24 ports at full load: 300 Watts
Output Power, per Port: 9 Watts
Nominal Output Voltage, per Port: 48 VDC (±4V)

Ethernet Interface
Input (Data): 12 Ports; Ethernet 10/100 Mbs: RJ 45 female socket
Output (Data & Power): 12 Ports;
Ethernet 10/100 Mbs, and 48 VDC: RJ 45 female socket, with DC voltage on wire pairs 7/8 and 4/5

Serial Port Interface
DB9 Serial Data Monitor port