



Canopy[®] System

5.7 GHz Connectorized AP

Product Note

5700APC-PN-en

Issue 1

April 2007

MOTO*Wi*⁴



Notices

See important regulatory and legal notices in Section 3.1.1 on page 12.

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<http://www.motorola.com/canopy>

Table of Contents

| | | |
|----------|--|-----------|
| 1 | Introduction | 5 |
| 1.1 | Abbreviations | 5 |
| 1.2 | Document Change History | 5 |
| 1.3 | Feedback on Documentation | 5 |
| 1.4 | Technical Support..... | 6 |
| 2 | Product Description | 7 |
| 2.1 | Specifications | 7 |
| 2.1.1 | <i>5.7 GHz AP modules with connectorized antennas</i> | <i>7</i> |
| 2.2 | Version information | 7 |
| 2.3 | Software Features | 7 |
| 3 | Installation | 9 |
| 3.1.1 | <i>5.7 GHz AP modules with connectorized antennas</i> | <i>9</i> |
| 4 | RF Planning | 11 |
| 4.1 | Planning with Connectorized 5.7 GHz AP | 11 |
| | Regulatory and Legal Notices | 12 |
| 4.2 | Important Note on Modifications | 12 |
| 4.3 | National and Regional Regulatory Notices..... | 12 |
| 4.3.1 | <i>US Federal Communication Commission (FCC) and Industry Canada (IC) Notification</i> | <i>12</i> |
| 4.3.2 | <i>European Union Notification.....</i> | <i>13</i> |
| 4.3.3 | <i>Equipment Disposal</i> | <i>13</i> |
| 4.3.4 | <i>UK Notification.....</i> | <i>13</i> |
| 4.3.5 | <i>Norway Notification</i> | <i>13</i> |
| 4.3.6 | <i>Brazil Notification</i> | <i>14</i> |
| 4.4 | Exposure Separation Distance..... | 14 |
| 4.4.1 | <i>Details of Exposure Separation Distances Calculations and Power Compliance Margins</i> 14 | |
| 4.5 | Legal Notices | 15 |
| 4.5.1 | <i>Software License Terms and Conditions.....</i> | <i>15</i> |
| 4.5.2 | <i>Hardware Warranty in US.....</i> | <i>18</i> |
| 4.6 | Limit of Liability | 18 |

List of Tables

| | |
|--|----|
| Table 1: US FCC IDs and Industry Canada Certification Numbers..... | 12 |
| Table 2: Exposure Separation Distances | 14 |
| Table 3: Calculated Exposure Distances and Power Compliance Margins..... | 15 |

1 Introduction

This product note covers the connectorized Canopy 5.7 GHz AP, including use under US FCC regulations. Using a connectorized AP allows for a higher EIRP which often will translate into a higher range for the sector, or a greater percentage of the SMs in the sector able to run at 2X.

See Section 2 for a complete list of available modules.

All modules are hardware series P10 running a minimum software release of Release 8.1.

Not all products are available in all regions or in all markets. If you have questions about availability, please check with your Canopy distributor or reseller.

1.1 ABBREVIATIONS

The following abbreviations may be used in these notes:

| | |
|--------------|---|
| BH | Backhaul Module, either timing master or timing slave |
| BHM | Backhaul Module – timing master |
| BHS | Backhaul Module – timing slave |
| AP | Access Point Module |
| SM | Subscriber Module |
| CNUT | Canopy Network Updater Tool |
| CMM | Cluster Management Module |
| DFS | Dynamic Frequency Selection for radar avoidance |
| MIB | Management Information Base |
| P7/P8/P9/P10 | Shorthand for hardware series levels |
| ETSI | European Telecommunications Standards Institute |
| EIRP | Equivalent Isotropically Radiated Power |

1.2 DOCUMENT CHANGE HISTORY

| | |
|---------|-------------|
| Issue 1 | First Issue |
|---------|-------------|

1.3 FEEDBACK ON DOCUMENTATION

We welcome your feedback on Canopy documentation. Comments on structure, content, accuracy, completeness, or any other area are appreciated. Please send your feedback to technical-documentation@canopywireless.com.

1.4 TECHNICAL SUPPORT

Tip! Don't clear the Event Log after you encounter issues – it may be useful to Technical Support if you need to escalate the issue.

If problems arise during the operation of a Canopy system, the Canopy support team is here to help. Here is the escalation path for resolution of a problem:

1. Check this document, especially the Troubleshooting section.
2. Escalate the problem to your Canopy supplier.
3. Escalate the problem to Canopy Technical Support or other designated Tier 3 technical support:

Canopy Technical Support

email: technical-support@canopywireless.com

1-888-605-2552

or

+1 217 824 9742

When you send e-mail or call, please include the following information:

- Information on your network configuration, especially IP addresses and MAC addresses, and features enabled, like NAT, VLAN, high priority channel, or CIR.
- Version numbers of the software on the modules with problems.

2 Product Description

Products covered by this note include the following model numbers:

| | |
|---------|---|
| 5700APC | 5.7 GHz Connectorized Access Point |
| 5701APC | 5.7 GHz Connectorized Access Point with AES |
| 5750APC | 5.7 GHz Connectorized Advantage Access Point |
| 5751APC | 5.7 GHz Connectorized Advantage Access Point with AES |

Not all products are available in all regions or in all markets. If you have questions about availability, please check with your Canopy distributor or reseller.

2.1 SPECIFICATIONS

2.1.1 5.7 GHz AP modules with connectorized antennas

5.7 GHz APs with connectorized antennas consist of a standard Canopy unit (without internal patch antenna) with a coax cable with an N-type connector.

These modules have been certified to FCC requirements with the following vertically-polarized antenna:

- Mars Model # MA-WC50-5X antenna (<http://www.mars-antennas.com/>):
 - 5° elevation by 60° azimuth 3 dB beam pattern
 - 17 dBi gain
 - Adjustable transmitter output power may be set to a **maximum** of 19 dBm to remain within 36 dBm EIRP limit for 5.7 GHz ISM band in the US (19 dBm transmit power + 17 dBi antenna gain – 0.5 coax cable loss = ~36 dBm EIRP).

The transmitter output power is adjustable in 1 dBm increments.

2.2 VERSION INFORMATION

All modules are P10 series hardware. P10 series hardware requires a minimum software release of Release 8.1.5.

2.3 SOFTWARE FEATURES

APs with connectorized antennas have the same software features as their integrated antenna counterparts.

P10 series modules running a minimum release of Release 8.1.5 display a new “Antenna Polarization” field on the Home => General Status page. Parameter values include

- Horizontal
- Vertical
- Connectorized

This parameter is also available from the MIB using SNMP.

P9 and previous series hardware does not have this “Antenna Polarization” field, regardless of software Release, but “Vertical” can be assumed since only vertically polarized integrated antennas were manufactured.

3 Installation

3.1.1 5.7 GHz AP modules with connectorized antennas

For connectorized units, installation requires attention to both the Canopy AP and the approved antenna.

The connectorized AP itself has the same form factor and installs the same as previous modules.

To install the connectorized flat panel antenna to a mast or structure, follow instructions that the manufacturer provides. Install the antenna safely and securely, consistent with industry practices.

The Universal Mounting Bracket available from Motorola (Part Number SMMB-1 and consisting of a mounting bracket and L-shaped aluminum tube) holds one Canopy module, but cannot hold both the module and a connectorized antenna. The SMMB-2 is a heavy duty bracket that can hold both a connectorized 5.7 GHz AP and its connectorized antenna.

Be aware that the elevation (top to bottom) of the antenna pattern of the approved antenna is only 5° instead of the 60° of the integrated antenna. Depending on location of SMs and terrain, downtilt of the antenna may be needed to ensure best coverage.

The professional installer is responsible for

- selection of an antenna that the regulatory agency has approved
- setting of the gain consistent with regulatory limitations and antenna specifications.
- ensuring that the polarity—horizontal or vertical—is identical on both ends of the link. (This may be less obvious where an integrated antenna is used on one end and a connectorized on the other.)
- use of moisture sealing tape or wrap to provide long-term integrity for the connection.



IMPORTANT!

The professional installer is responsible for ensuring modules as installed meet regulatory requirements. In the US, this means the professional installer must ensure the transmitter output power of a connectorized 5.7 GHz AP with the approved antenna is set to **no more than 19 dBm**.

On a module with an external antenna, use accepted industry practices to wrap the connector to prevent water ingress. Although the male and female N-type connectors form a gas-tight seal with each other, the point where the cable enters each connector can allow water ingress and eventual corrosion. Wrapping and sealing is critical to long-term reliability of the connection.

Possible sources of material to seal that point include

- the antenna manufacturer (material may have been provided in the package with the antenna).
- Universal Electronics (whose web site is <http://www.coaxseal.com>), who markets a weather-tight wrap named Coax-Seal.

Perform the following steps to wrap the cable.

Procedure 1: Wrapping the cable

1. Position the connector. Best results are often obtained by positioning the connector vertically rather than horizontally.
2. Start the wrap on the cable 0.5 to 2 inches (about 1.5 to 5 cm) below the connection, wrapping from the bottom up. Wrapping up rather than down allows the turns of the wrap to provide a shingling effect to help keep moisture out of the connection.
3. Wrap the cable to a point 0.5 to 2 inches (about 1.5 to 5 cm) above the connection.
4. Squeeze the wrap to compress and remove any trapped air.
5. Wrap premium vinyl electrical tape over the first wrap where desired for abrasion resistance or appearance, again wrapping from the bottom up.
6. Tie the cable securely to avoid sway from wind.

===== end of procedure =====

4 RF Planning

4.1 PLANNING WITH CONNECTORIZED 5.7 GHZ AP

With the connectorized antenna, an AP can develop the full 5.7 GHz FCC-allowed 36 dBm EIRP. This compares to 30 dBm EIRP for a 5.7 GHz AP with integrated antenna. Other things being equal, the additional 6 dB of link budget will support a link of twice the distance as before. Alternatively, the additional 6 dB may mean a greater percentage of the SMSs in the sector are able to run at 2X, which can boost both the through put available to a subscriber and the capacity of the sector.

The AP antenna pattern has a narrower elevation (top to bottom) - 5° vs 60°. This may cause the following:

- improved interference management, depending on site characteristics
- down tilt needed when mounting the AP
- more care needed in placement of SMSs.

The fact that the AP connectorized antenna has a greater gain than the integrated antenna – 17 dBi vs 7 dBi – may also be a factor in RF planning and especially manual transmit power control of close-in SMSs.

Regulatory and Legal Notices

4.2 IMPORTANT NOTE ON MODIFICATIONS

Intentional or unintentional changes or modifications to the equipment must not be made unless under the express consent of the party responsible for compliance. Any such modifications could void the user's authority to operate the equipment and will void the manufacturer's warranty.

4.3 NATIONAL AND REGIONAL REGULATORY NOTICES

4.3.1 US Federal Communication Commission (FCC) and Industry Canada (IC) Notification

This device complies with part 15 of the US FCC Rules and Regulations and with RSS-210 of Industry Canada as indicated in Table 1. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) This device must accept any interference received, including interference that may cause undesired operation. In Canada, users should be cautioned to take note that high power radars are allocated as primary users (meaning they have priority) of 5250 – 5350 MHz and 5650 – 5850 MHz and these radars could cause interference and/or damage to license-exempt local area networks (LELAN).

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the US FCC Rules and with RSS-210 of Industry Canada. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio-frequency energy and, if not installed and used in accordance with these instructions, may cause harmful interference to radio communications. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment on and off, the user is encouraged to correct the interference by one or more of the following measures:

- Increase the separation between the affected equipment and the unit;
- Connect the affected equipment to a power outlet on a different circuit from that which the receiver is connected to;
- Consult the dealer and/or experienced radio/TV technician for help.

FCC IDs and Industry Canada Certification Numbers are listed in Table 1:

Table 1: US FCC IDs and Industry Canada Certification Numbers

| Module Types | Operating Frequency Range | Max Transmitter Output Power | Reflector or Connectorized Antenna | FCC ID | Industry Canada Certification Number |
|--------------|---------------------------|------------------------------|---|-------------|--------------------------------------|
| AP | ISM 5725-5850 MHZ | 19 dBm (80 mW) | Mars Model # MA-WC50-5X vertically polarized antenna with 17 dBi gain | ABZ89FT7622 | none |

4.3.2 European Union Notification

The 5.7 GHz connectorized product is a two-way radio transceiver suitable for use in Broadband Wireless Access System (WAS), Radio Local Area Network (RLAN), or Fixed Wireless Access (FWA) systems. It is a Class 2 device and uses operating frequencies that are not harmonized throughout the EU member states. The operator is responsible for obtaining any national licenses required to operate this product and these must be obtained before using the product in any particular country.

This equipment is marked **CE 0977** to show compliance with the European R&TTE directive 1999/5/EC.

The relevant Declaration of Conformity can be found at <http://www.canopywireless.com/doc.php>.

4.3.3 Equipment Disposal



**Waste (Disposal)
of Electronic
and Electric
Equipment**

Please do not dispose of Electronic and Electric Equipment or Electronic and Electric Accessories with your household waste. In some countries or regions, collection systems have been set up to handle waste of electrical and electronic equipment. In European Union countries, please contact your local equipment supplier representative or service center for information about the waste collection system in your country.

4.3.4 UK Notification

The 5.7 GHz connectorized product has been notified for operation in the UK, and when operated in accordance with instructions for use it is compliant with UK Interface Requirement IR2007. For UK use, installations must conform to the requirements of IR2007 in terms of EIRP spectral density against elevation profile above the local horizon in order to protect Fixed Satellite Services. The frequency range 5795-5815 MHz is assigned to Road Transport & Traffic Telematics (RTTT) in the U.K. and shall not be used by FWA systems in order to protect RTTT devices. UK Interface Requirement IR2007 specifies that radiolocation services shall be protected by a Dynamic Frequency Selection (DFS) mechanism to prevent co-channel operation in the presence of radar signals.

4.3.5 Norway Notification

Use of the frequency bands 5725-5795 / 5815-5850 MHz are authorized with maximum radiated power of 4 W EIRP and maximum spectral power density of 200 mW/MHz. The radio equipment shall implement Dynamic Frequency Selection (DFS) as defined in Annex 1 of ITU-R Recommendation M.1652 / EN 301 893. Directional antennae with a gain up to 23 dBi may be used for fixed point-to-point links. The power flux density at the border between Norway and neighbouring states shall not exceed - 122.5 dBW/m² measured with a reference bandwidth of 1 MHz.

Canopy 5.7 GHz connectorized products have been notified for use in Norway and are compliant when configured to meet the above National requirements. Users shall ensure that DFS functionality is enabled, maximum EIRP respected for a 20 MHz channel, and that channel spacings comply with the allocated frequency band to protect Road Transport and Traffic

Telematics services (for example, 5735, 5755, 5775 or 5835 MHz are suitable carrier frequencies). Note that for directional fixed links, TPC is not required, conducted transmit power shall not exceed 30 dBm, and antenna gain is restricted to 23 dBi (maximum of 40W from the Canopy 5.7 GHz connectorized products).

4.3.6 Brazil Notification

Local regulations do not allow the use of passive reflectors on 5.7 GHz Canopy Access Points.

Important Note: This equipment operates as a secondary application, so it has no rights against harmful interference, even if generated by similar equipment, and cannot cause harmful interference on systems operating as primary applications.

4.4 EXPOSURE SEPARATION DISTANCE

The following table shows separation distances that support applicable exposure limits:

Table 2: Exposure Separation Distances

| Module Type | Separation Distance from all Persons |
|-------------------------------------|---------------------------------------|
| Canopy Module | At least 20 cm (approx 8 in) |
| Canopy Module with Reflector Dish | At least 1.5 m (approx 60 in or 5 ft) |
| Antenna of connectorized 5.7 GHz AP | At least 30 cm (approx 12 in) |

4.4.1 Details of Exposure Separation Distances Calculations and Power Compliance Margins

Limits and guidelines for RF exposure come from:

- US FCC limits for the general population. See the FCC web site at <http://www.fcc.gov>, and the policies, guidelines, and requirements in Part 1 of Title 47 of the Code of Federal Regulations, as well as the guidelines and suggestions for evaluating compliance in FCC OET Bulletin 65.
- Health Canada limits for the general population. See the Health Canada web site at <http://www.hc-sc.gc.ca/rpb> and Safety Code 6.
- ICNIRP (International Commission on Non-Ionizing Radiation Protection) guidelines for the general public. See the ICNIRP web site at <http://www.icnirp.de/> and Guidelines for Limiting Exposure to Time-Varying Electric, Magnetic, and Electromagnetic Fields.

The applicable power density exposure limits from the documents referenced above are

- 6 W/m² for RF energy in the 900-MHz frequency band in the US and Canada.
- 10 W/m² for RF energy in the 2.4-, 5.2-, 5.4-, and 5.7-GHz frequency bands.

Peak power density in the far field of a radio frequency point source is calculated as follows:

$$S = \frac{P \cdot G}{4 \pi d^2}$$

where

S = power density in W/m^2

P = RMS transmit power capability of the radio, in W

G = total Tx gain as a factor, converted from dB

d = distance from point source, in m

Rearranging terms to solve for distance yields

$$d = \sqrt{\frac{P \cdot G}{4 \pi S}}$$

Table 3 shows calculated minimum separation distances d , recommended distances and resulting power compliance margins for each frequency band and antenna combination.

Table 3: Calculated Exposure Distances and Power Compliance Margins

| Frequency Band | Antenna | Variable | | | d (calculated) | Recommended Distance | Power Compliance Margin |
|----------------|----------------------|---------------------|----------------|------------|---------------------|----------------------|-------------------------|
| | | P | G | S | | | |
| 5.2 GHz | internal | 0.2 W (23 dBm) | 5.0 (7 dB) | 10 W/m^2 | 0.09 m | 20 cm (8 in) | 5 |
| | internal + reflector | 0.0032 W (5 dBm) | 316 (25 dB) | 10 W/m^2 | 0.09 m | 1.5 m (5 ft) | 280 |
| 5.7 GHz | internal | 0.2 W (23 dBm) | 5.0 (7 dB) | 10 W/m^2 | 0.09 m | 20 cm (8 in) | 5 |
| | internal + reflector | 0.2 W (23 dBm) | 316 (25 dB) | 10 W/m^2 | 0.71 m | 1.5 m (5 ft) | 4.5 |
| | external | 0.080 W (19 dBm) | 50 (17 dB) | 10 W/m^2 | 0.28 m | 30 cm (12 in) | 1.13 |

The compliance distance is greatly overestimated in the reflector cases because the far-field equation neglects the physical dimension of the reflector, which is modeled as a point-source.

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4.5.1 Software License Terms and Conditions

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4.5.2 Hardware Warranty in US

Motorola US offers a warranty covering a period of 1 year from the date of purchase by the customer. If a product is found defective during the warranty period, Motorola will repair or replace the product with the same or a similar model, which may be a reconditioned unit, without charge for parts or labor.

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