

# Airmux-5000

High Capacity Point-to-Multipoint Wireless System



Carrier-class broadband  
point-to-multipoint  
radio solution for  
Ethernet traffic

- Up to 200Mbps aggregate throughput with guaranteed SLA per Subscriber Unit
- Suitable for wide variety of applications such as Fixed, Nomadic and Mobility topologies
- Long range of up to 40 km/25 miles between Base Station and Subscriber Unit
- Multiband operation over 2.5 GHz, 3.3 to 3.8 GHz and 4.8 to 6 GHz frequencies
- Excellent operation in nLOS and NLOS environments
- Robust and reliable in tough conditions and extreme temperatures

Airmux-5000 is a carrier-class, cost-effective point-to-multipoint broadband wireless system.

It includes High Capacity Base Stations (BS) and High Capacity Subscriber Units (SU) for **Fixed** and **Nomadic** applications. In these applications a Subscriber Unit can be set at fixed location or move about between Base stations and get service while in stationary position.

Airmux-5000 portfolio also offers High Capacity Base Stations (BS-MOB) and High Capacity Subscriber Units (SU-MOB) for **Mobility** applications. In this application a Subscriber Unit can be set on moving vehicles and get continuous broadband service while in motion.

Airmux-5000 supports transmission over an extensive range of frequency bands: 2.5, 3.3 to 3.8 GHz and 4.8 to 6 GHz.

**AIRMUX**  
**ACCESS+**

**RAD**

data communications

The Access Company

# Airmux-5000

## High Capacity Point-to-Multipoint Wireless System

The system is suitable for deployment in FCC, IC and ETSI-regulated countries.

Ensuring the highest spectrum efficiency available in the market, Airmux-5000 delivers greater throughput over smaller channel bandwidth.

High spectrum efficiency results in additional network revenue reduced spectrum license fees and increased flexibility in frequency planning.

Airmux-5000 is the ideal wireless system for business access users demanding high capacity throughput and Ethernet SLA assurance.

The Airmux product line is part of RAD's Access+ portfolio for Multiservice Access Platform and First Mile solutions. The portfolio supports Ethernet over wireless links, to address the challenges faced by utilities, transportation networks, carriers, and mobile operators, in migrating to next-generation networks and services.

### MARKET SEGMENTS AND APPLICATIONS

The most common wireless applications are described below.

#### Service Providers and ISPs

Providing IP backhaul of 4G/broadband services in point-to-multipoint topologies, Airmux-5000 offers broadband access for remote, rural and underserved communities:

- nLOS (near line of sight) in urban environment
- Long haul in rural setting.

#### Corporate Clients

Large corporate clients can build their networks with Airmux-5000 to eliminate the recurring fee of incumbent leased line services, while maintaining a secured dedicated capacity per site.

#### Mobile Networks

Airmux-5000 can be used in Public and Private Organizations requiring broadband connectivity for vehicles in motion.

The Mobility solution offers powerful, easy to deploy Base Stations that guarantee high capacity connectivity to mobile units mounted on vehicles, trains and vessels.

#### Security and Surveillance

Aggregation and backhaul of traffic from multiple collocated megapixel video cameras make Airmux-5000 suitable for homeland security applications, municipal 'safe city' projects, and border control installations.

*Figure 1* illustrates a typical wireless access network for ISPs.

Table 1. Airmux Family Comparison Table

Feature	Airmux-400	Airmux-400L	Airmux-400LC/25	Airmux-400LC/10	Airmux-5000
Topology	Point-to-point	Point-to-point	Point-to-point	Point-to-point	Point-to-multipoint, up to 32 remote SUs
Aggregate Bandwidth, Mbps	200	50	25	10	200
Services	16 TDM Ethernet	8 TDM Ethernet	4 TDM Ethernet	Ethernet	Ethernet
Application	Fixed	Fixed	Fixed	Fixed	Fixed Nomadic Mobility

**PHYSICAL CONFIGURATIONS**

Airmux-5000 multiplexer includes a mast- or wall-mountable High-Capacity Base Station (HBS), operating at multiple frequencies, and PoE devices. Each HBS supports up to 32 remote High-Capacity Subscriber Units (HSUs) with aggregated throughput of 5, 10, 20 or 50 Mbps (depending on SU type).

**SUPERIOR SPECTRAL EFFICIENCY**

Built on advanced MIMO and OFDM technologies, the Airmux-5000 system provides a high-capacity link at channel bandwidth of 5, 10, 20 or 40 MHz. This guarantees a robust air interface able to withstand strong RF interference and harsh ambient conditions.

**MULTIBAND RADIO**

All Airmux-5000 radios support multiband operation over various frequencies: same hardware can be used at different bands.

**SECURITY**

Data transmitted over the air interface is encrypted using Advanced Encryption System (AES) with a 128-bit encryption key.

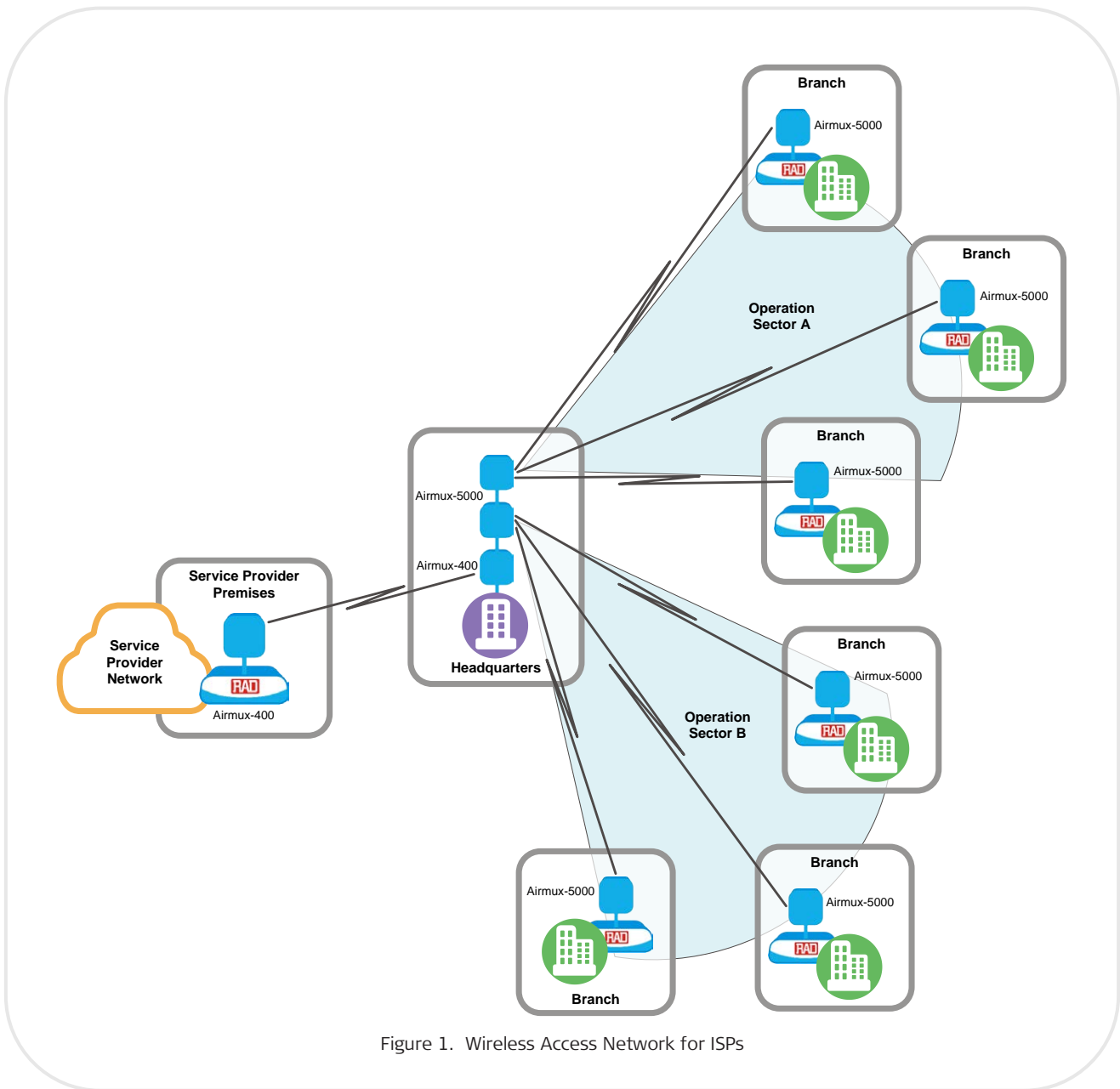


Figure 1. Wireless Access Network for ISPs

# Airmux-5000

## High Capacity Point-to-Multipoint Wireless System

### AIR LINK QUALITY OF SERVICE

When the link quality is low, the Airmux-5000 Base Station automatically searches for a clear channel within a pre-selected list of frequencies.

### SHORT TIME-TO-SERVICE

Since Airmux-5000 operates at license-exempt frequencies, it can be deployed in record time, eliminating the costs and delays involved in leasing lines or trenching fiber.

### NOMADIC SUPPORT

Airmux-5000 nomadic solution delivers high capacity service to Nomadic users.

Subscriber Units can now move from one Base Station to another and get services once resuming stationary position without any need for device reconfiguration.

Nomadic support allows customers to use existing Airmux-5000 install base for new application such as perimeter security in airports and factories or broadcasting services from remote vehicles.

Both fixed and nomadic users are supported from a common Base Station.

### MOBILITY SUPPORT

Airmux-5000 Mobility solution delivers high capacity of up to 100 Mbps at speeds of up to 200 Km/h for video and Internet connectivity.

Train operators can now provide real-time video surveillance and Internet access to passengers on board.

Military organizations can remotely control unmanned patrol vehicles and get high quality video streams from moving vehicles.

Industries can use this technology for remote control of heavy machinery such as cranes in docks, Trucks and drills in mining plants or for communication between ships and oil rigs.

Table 2. Supported Bands, Frequency Ranges and Regulations

Band (GHz)	Regulation	Occupied Frequency Range (GHz)	Supported Channel Bandwidth [MHz]	Compliance
2.5	FCC BRS(*)	2.495-2.690	5, 10, 20	FCC 47CFR, Part 27, Subpart M (BRS/EBS)
3.5	ETSI(+)	3.4105-3.7025	5, 10, 20	ETSI EN 302 326-2
	IC	3.475-3.650	5, 10, 20	IC RSS-192
	Universal	3.300-3.800	5, 10, 20	N/A
3.6	FCC/IC	3.650-3.675	5, 10, 20	FCC Part 90, Subpart Z and IC RSS-197 (Restricted)
4.9	FCC/IC	4.940-4.990	5, 10, 20	FCC 47CFR, Part 90, Subpart Y and IC RSS-111
	Universal	4.890-5.010	5, 10, 20, 40	N/A
5.0	Universal	4.990-5.160	5, 10, 20, 40	N/A
5.3	ETSI	5.150-5.350	5, 10	ETSI EN 301 893
	FCC/IC	5.260-5.340	5, 10, 20, 40	FCC 47CFR, Part 15, Subpart E and IC RSS-210
	Universal	5.140-5.345	5, 10, 20, 40	N/A
5.4	ETSI	5.475-5.720	10, 20, 40	ETSI EN 301 893
	FCC	5.480-5.590	5, 10, 20, 40	FCC 47CFR, Part 15, Subpart E
		5.660-5.715		
	IC	5.480-5.590 5.660-5.715	5, 10, 20, 40	IC RSS-210
Universal	5.465-5.730	5, 10, 20, 40	N/A	
5.8	ETSI	5.725-5.875	10, 20	ETSI EN 302 502
	FCC/IC	5.725-5.850	5, 10, 20, 40	FCC 47CFR, Part 15, Subpart C and IC RSS-210
	MII China	5.730-5.845	5, 10, 20, 40	MII China
	WPC India	5.825-5.875	5, 10, 20, 40	GSR-38
5.9	Universal	5.730-5.960	5, 10, 20, 40	N/A
6.0	Universal	5.690-6.060	5, 10, 20, 40	N/A

## SITE SYNCHRONIZATION

Hub Site Synchronization (HSS) enables collocating multiple radios by reducing the interference that normally occurs when several radios transmit and receive in close proximity to one another. HSS provides a complex radio environment of mixed services and channel bandwidth frequencies. The collocation feature requires ordering the HSS unit, as well as its synchronization cables.

**Note:** Like any other RF deployment, wireless operation is highly dependent on factors such as available frequencies, the physical space between radios, or other interfering radios.

HSS does not eliminate the need for careful RF planning to ensure the design will work as required.

For long distance coverage, synchronization can be obtained using a GPS Synchronization Unit (GSU). The GSU reduces the interference between the collocated radios, by providing a GPS signal simultaneously to ODUs at all locations.

## DIVERSITY

Airmux-5000 uses dual bipolar antennas to transmit the same data through both radio links. This ensures data transmission integrity under harsh conditions.

## MANAGEMENT

A single SNMP-based network management application (Airmux Manager) is used to control the Airmux-5000 system.

RADview-EMS, RAD's SNMP-based management software provides access to the Airmux Manager via its topology map.

Airmux-5000 Web Interface (WI) enables to carry out the basic sector management functions using a Web browser.

The Airmux Manager Spectrum View utility is an RF survey tool enabling link installation prior to full link service activation. It provides comprehensive and clear spectral measurement information for easier installations.

## Specifications

### RADIO

#### Net Aggregate Capacity

HBS: 100 Mbps (20 MHz),  
200 Mbps (40 MHz)

HSU: 5, 10, 20, 50 Mbps

**Note:** For a full list of supported bands and frequency ranges see Table 2.

#### Subscriber Units Supported

Up to 32

#### Range

Up to 40 km (25 miles)

#### Channel Bandwidth

5, 10, 20, 40 MHz

#### Duplex Technique

TDD

#### Modulation

2x2 MIMO-OFDM

#### Error Correction

FEC, k = 1/2, 2/3, 3/4, 5/6

#### Encryption

AES 128

#### Max Tx Power

25 dBm

## ETHERNET USER INTERFACE

### Type

HBS: 10/100/1000BaseT (via indoor PoE device)

HSU: 10/100BaseT

### Framing/Coding

IEEE 802.3u

### Bridging

Up to 4000 MAC addresses self-learning

### Latency

4 to 10 msec (typical under full sector load)

### Line Impedance

100Ω

### QoS

4-queue traffic prioritization

### VLAN Support

IEEE 802.1p & q, QinQ, layer-2 VPN

## MANAGEMENT

### Protocol

SNMP, Telnet

### Interface

10/100/1000BaseT

### Connector

RJ-45

### Upgrade Capabilities

Local and over-the-air software download

## GENERAL

### Power

PoE device with AC power feeding:  
100-240 VAC

PoE device with DC power feeding: 48 VDC

### Power Consumption

HBS: 20W max

HSU: 25W max

### PoE Cable

Outdoor Cat.5e cable

Max. length: 100m (328 ft) for 100BaseT,  
75m (246 ft) for 1000BaseT

### Grounding and Lightning Protection

Individual grounding for each HBS and HSU

### Environment

Enclosure: IP67 all-weather case

Temperature: -35° to 60°C (-31° to 140°F)

Humidity: 100%, condensing

### Physical

HBS/HSU (with external/embedded small form-factor antenna):

Height: 270 mm (10.6 in)

Width: 195 mm (7.6 in)

Depth: 80 mm (3.1 in)

Weight 1.8 kg (3.6 lb)

HSU (with integrated antenna):

Height: 371 mm (14.6 in)

Width: 371 mm (14.6 in)

Depth: 110 mm (4.3 in)

Weight 3.5 kg (7 lb)

# Airmux-5000

## High Capacity Point-to-Multipoint Wireless System

### Ordering

#### FIXED AND NOMADIC SERIES STANDARD CONFIGURATIONS

Airmux-5000/BS/F58F/200M/EXT  
 Airmux-5000/BS/F54E/200M/EXT  
 Airmux-5000/BS/F54U/200M/EXT  
 Airmux-5000/BS/F3XF/100M/EXT  
 Airmux-5000/BS/F25F/100M/EXT  
 Airmux-5000/BS/F58F/50M/EXT  
 Airmux-5000/BS/F54E/50M/EXT  
 Airmux-5000/SU/F58F/50M/EXT  
 Airmux-5000/SU/F54E/50M/EXT  
 Airmux-5000/SU/F58F/20M/INT  
 Airmux-5000/SU/F58F/20M/EMB  
 Airmux-5000/SU/F54E/20M/INT  
 Airmux-5000/SU/F3XF/20M/INT  
 Airmux-5000/SU/F25F/20M/INT

#### MOBILITY SERIES STANDARD CONFIGURATIONS

Airmux-5000/BS/F58F/MOB/EXT  
 Airmux-5000/BS/F54U/MOB/EXT  
 Airmux-5000/SU/F58F/MOB/EXT  
 Airmux-5000/SU/F54U/MOB/EXT

#### LEGEND

##### Frequency Band and Regulation

F58F 5.x GHz, FCC/IC  
 F54E 5.x GHz, ETSI  
 F54U 5.x GHz, universal  
 F3XE 3. x GHz, ETSI  
 F3XF 3. x GHz, FCC/IC  
 F25F 2.5 GHz, FCC/IC

##### Aggregate Throughput

5M 5 Mbps  
 10M 10 Mbps  
 20M 20 Mbps  
 50M 50 Mbps  
 100M 100 Mbps  
 200M 200 Mbps

##### Antenna

EMB Embedded integrated antenna, connectorized for external antenna  
 INT Integrated antenna  
 EXT Connectorized for external antenna

#### FIXED AND NOMADIC CONFIGURATIONS

Airmux-5000/BS/\*

Airmux-5000/SU/+

Complete \* from Table 3 or + from Table 4 for selected band and rate.

Table 3. Fixed and Nomadic Base Station Configurations

Band	Rate [Mbps]		
	200	100	50
F58F	F58F/200M/EXT	NA	F58F/50M/EXT
			F58F/50M/INT
F54E	F54E/200M/EXT	NA	F54E/50M/EXT
			F54E/50M/INT
F54U	F54U/200M/EXT	NA	F54U/50M/EXT
			F54U/50M/INT
F3XE	NA	F3XE/100M/EXT	NA
F3XF	NA	F3XF/100M/EXT	NA
F25F	NA	F25F/100M/EXT	NA

Table 4. Fixed and Nomadic Subscriber Unit Configurations

Band	Rate [Mbps]			
	50	20	10	5
F58F	F58F/50M/INT	F58F/20M/EMB	F58F/10M/EMB	F58F/5M/INT
	F58F/50M/EXT	F58F/20M/INT	NA	F58F/5M/EXT
F54E	F54E/50M/INT	F54E/20M/EMB	F54E/10M/EMB	NA
	F54E/50M/EXT	F54E/20M/INT	NA	NA
F54U	F54U/50M/INT	F54U/20M/INT	F54U/10M/EMB	F54U/5M/INT
				F54U/5M/EXT
F3XE	NA	F3XE/20M/INT	F3XE/10M/INT	NA
		F3XE/20M/EXT	F3XE/10M/EXT	
F3XF	NA	F3XF/20M/INT	F3XF/10M/INT	NA
		F3XF/20M/EXT	F3XF/10M/EXT	
F25F	NA	F25F/20M/INT	NA	NA
		F25F/20M/EXT		

## OPTIONAL ACCESSORIES

## Fixed and Nomadic BS External Antennas

## Airmux-5000/BS-ANT/\$

## Legend

\$ External antenna:

<b>14/4959/FP</b>	14 dBi, 4.90–5.950 GHz bands, 90°
<b>15/4959/FP</b>	15 dBi, 4.90–5.950 GHz bands, 60°
<b>12/5358/FP</b>	12dBi, 5.150-5.875 GHz bands, 120°
<b>14/3338/FP</b>	14dBi, 3.3-3.8 GHz bands, 90°
<b>14/2327/FP</b>	14dBi, 2.3-2.7 GHz bands, 60°

## Fixed and Nomadic SU External Antennas

## Airmux-400-ANT/\$

## Legend

\$ External antenna:

<b>23/4958/FP</b>	23 dBi, 4.90–5.80 GHz, 4.9, 5.3, 5.4 GHz bands
<b>32/4958/DISH</b>	23 dBi, 4.90–5.80 GHz, 4.9, 5.3, 5.4 GHz bands
<b>28/5260/DISH</b>	28 dBi, 4.90–6.06 GHz, 5.3, 5.4, 5.8, 5.9, 6.0 GHz bands
<b>21/3338/FP</b>	21dBi, 3.30-3.80 GHz bands
<b>19/2327/FP</b>	19dBi, 2.30-2.70 GHz bands

**Note:** *FP* stands for a flat panel antenna, and *DISH* for a dish antenna.

## Mobility BS External Antennas

## Airmux-5000/BS-ANT/15/4959/M/FP

Single polarization, sector antenna, 120 degrees, 15 dBi gain, 4.9-6.1 GHz

## Airmux-5000/BS-ANT/12/5358/M/FP

Single polarization, flat panel antenna, 18 degrees, 18 dBi gain, 5.15-5.875 GHz

## Mobility SU External Antennas

## Airmux-5000/SU-ANT/10/4958/M/FP

Omni-directional antenna, 10 dBi gain, 4.9-5.875 GHz

## Airmux-5000/SU-ANT/12/4959/M/FP

Vehicular omni-directional antenna, 12 dBi gain, 4.9-5.9 GHz

# Airmux-5000

## High Capacity Point-to-Multipoint Wireless System

### Power-over-Ethernet (PoE) Devices

BS and SU devices receive power and Ethernet traffic via PoE units

#### Airmux-PoE/GbE/DC

DC-PoE device with 100BaseT/GbE interface for BS with 48 VDC power feeding

#### Airmux-PoE/GbE/a

PoE device with 100BaseT/GbE interface and AC power feeding

#### Airmux-PoE/RUG/2060DC

Ruggedized DC-PoE for Airmux-5000 Mobile units with 20 to 60 VDC power feeding.

#### Airmux-PoE/RUG/1030DC

Ruggedized DC-PoE for Airmux-5000 Mobile units with 10 to 30 VDC power feeding.

#### Airmux-PS-E-AC/a

AC power adapter for 90-240 VAC to 48 VDC

#### Legend

**a** Power cable with matching plug:

<b>ACEU</b>	Europe
<b>ACUS</b>	US
<b>ACUK</b>	UK
<b>ACIDA</b>	India
<b>ACAU</b>	Australia/China
<b>ACOC</b>	Open-ended connector
<b>ACAG</b>	Argentina
<b>ACSA</b>	South Africa

#### CBL-Airmux-UTP/@

Assembled cable for connection between IDU and ODU

#### Legend

<b>@</b> Cable length:	
<b>25</b>	25m (82 ft)
<b>50</b>	50m (164 ft)
<b>75</b>	75m (246 ft)
<b>100</b>	100m (328 ft)

#### CBL-Airmux-HSS/@@

Assembled cable for HSS connection

#### Legend

<b>@@</b> Cable length:	
<b>5</b>	5m (16.4 ft)
<b>15</b>	15m (49.2 ft)
<b>50</b>	50m (164 ft)
<b>100</b>	100m (328 ft)

#### Airmux-Planner

Radio network planning tool

#### Airmux-Lightning-Protection

Outdoor lightning protection device to minimize the risk of damage due to lightning strikes

#### Airmux-Lightning-Protection-Kit

Set of 10 Airmux-Lightning-Protection units

#### Airmux-FE-Repeater

Ethernet repeater to extend the PoE-to-ODU cable beyond the 100m limit (but not more than 200m)

#### Airmux-HSSU

Hub site synchronization unit to support the collocation of more than two outdoor units at a central site

#### Airmux-GSU/a

Outdoor GPS-based synchronization kit to handle inter-site interferences under large-scale deployment scenarios

#### Airmux-IDUH/2ETH

Ethernet traffic aggregation device for up to six HBSSs (or other RAD ODU products)

#### Airmux-PS-H-AC/a

AC power adapter for Airmux-IDUH/2ETH

#### Airmux-RMK-LC-SPARE

Spare mounting kit for 5M radios (see *Table 4*, Column 5)

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