

Airmux-5000

High Capacity Point-to-Multipoint Wireless System



- Up to 250Mbps aggregate throughput with guaranteed SLA per Subscriber Unit
- 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 near line-of-site 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.

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

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 mobile network with high speed access for moving trains.

Figure 2 illustrates a typical wireless access network for ISPs.

ARCHITECTURE

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, 25 or 50 Mbps (depending on SU type).



data communications

The Access Company

Airmux-5000

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RADIO

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 (FIPS-197).

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.

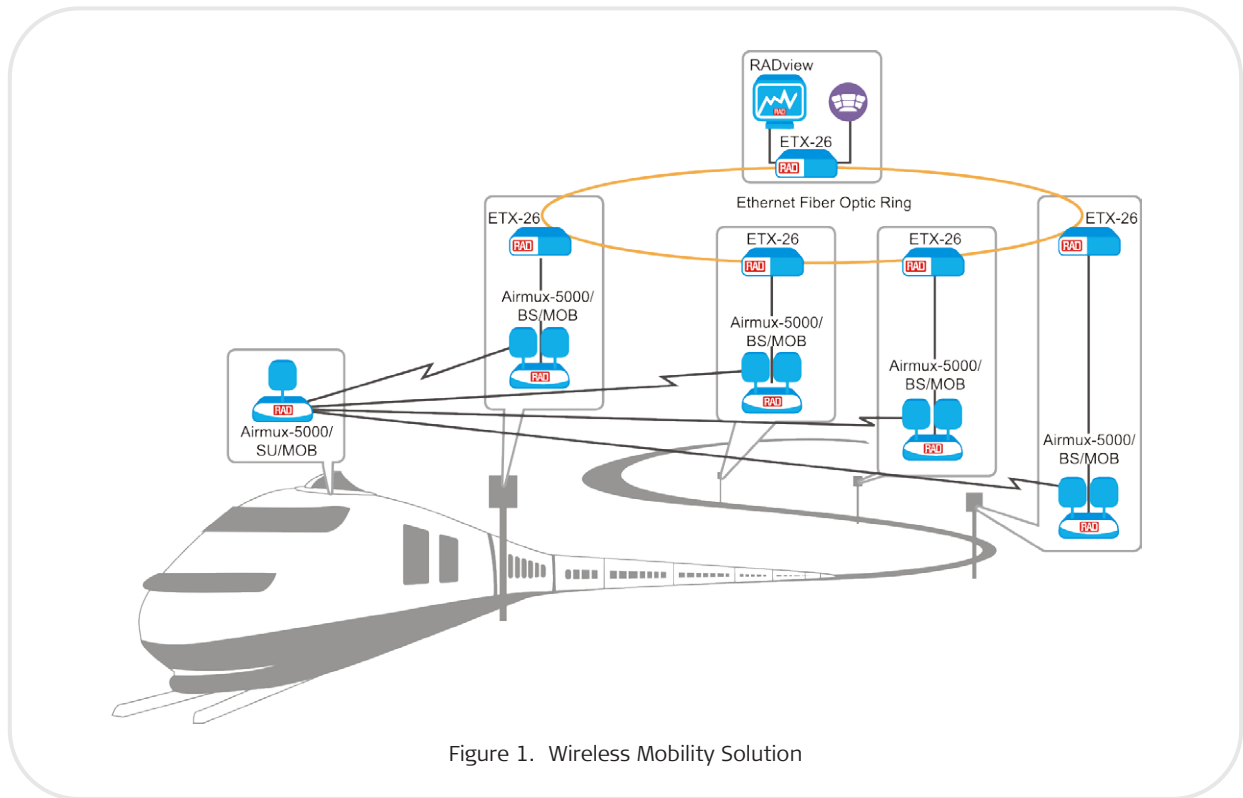


Figure 1. Wireless Mobility Solution

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 installed 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 SU speed 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 1. 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

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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 co-located radios, by providing a GPS signal simultaneously to ODU's at all locations.

RESILIENCY

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

MANAGEMENT AND SECURITY

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.

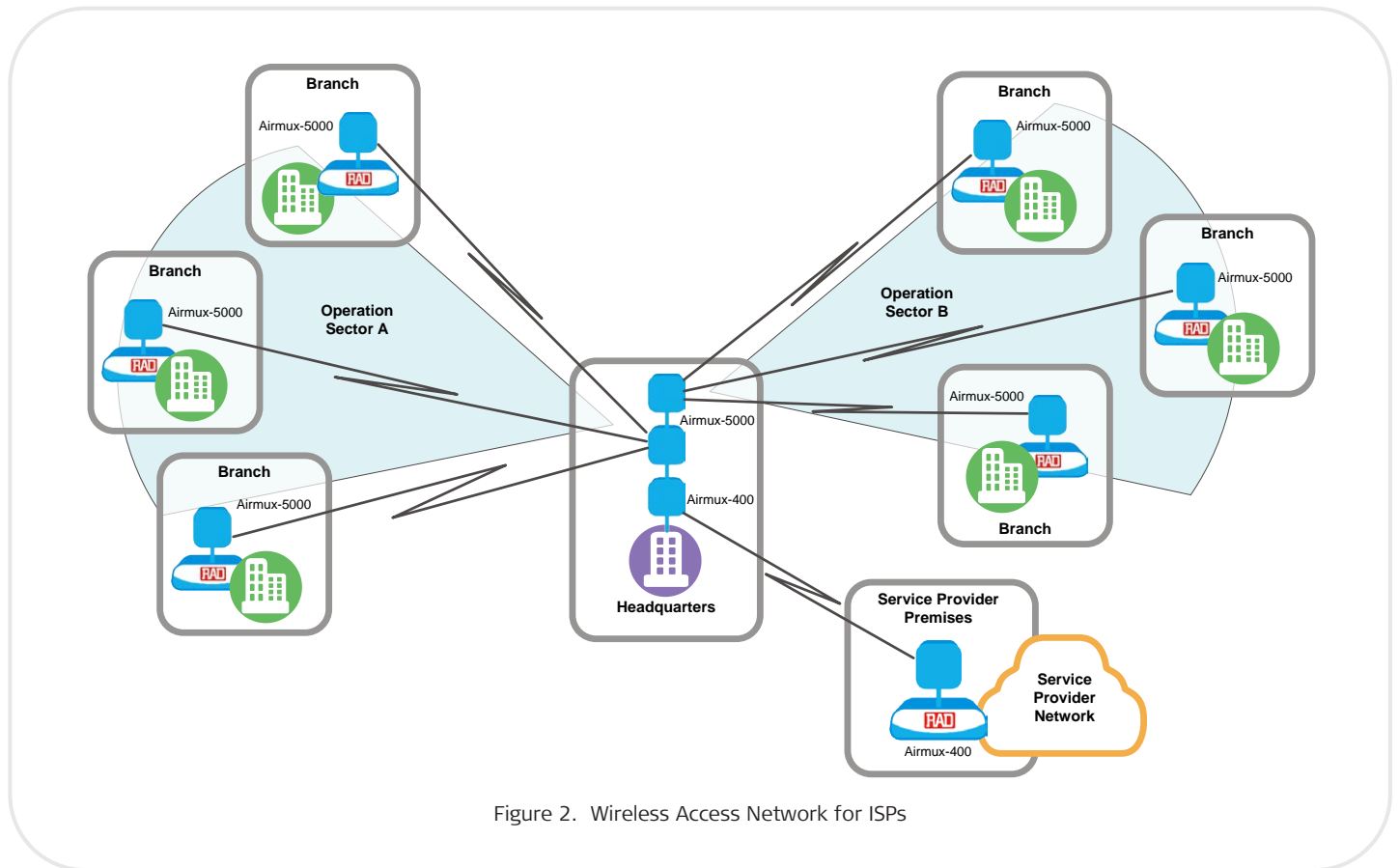


Figure 2. Wireless Access Network for ISPs

Specifications

RADIO

Net Aggregate Capacity

HBS: 114 Mbps (20 MHz),
250 Mbps (40 MHz)

HSU: 5, 10, 20, 25, 50 Mbps

Note: For a full list of supported bands and frequency ranges see Table 1 and 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

FIPS-197

Max Tx Power

25 dBm

PoE Cable

Outdoor Cat.5e cable

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

ETHERNET INTERFACES

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 AND SECURITY

Protocol

SNMP, Telnet

Interface

10/100/1000BaseT

Connector

RJ-45

Upgrade Capabilities

Local and over-the-air software download

RESILIENCY

Grounding and Lightning Protection

Individual grounding for each HBS and HSU

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

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)

Table 2. Japanese Regulations

Band [GHz]	Channel Bandwidth [MHz]	Frequency Allocation [MHz]	Regulation
4.9	10	4915, 4920, 4925, 4935, 4940, 4945	MIC Notification 88 Appendix 47, Article 2 Paragraph 1 Item 19-5 Base station
	20	4920, 4940, 4960, 4980	
	40	4930, 4970	
5.0	10	5040, 5045, 5055	
	20	5040, 5060, 5080	
5.6	20	5500, 5520, 5540, 5560, 5580, 5600, 5620, 5640, 5660, 5680, 5700	MIC Notification 88 Appendix 45, Article 2 Paragraph 1 Item 19-3-2 5.6 GHz Wide Band Low Power Data Communication System
	40	5510, 5550, 5590, 5630, 5670	

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Ordering

FIXED AND NOMADIC SERIES RECOMMENDED 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/F54E/20M/INT
Airmux-5000/SU/F3XF/20M/INT
Airmux-5000/SU/F25F/20M/INT

MOBILITY SERIES RECOMMENDED CONFIGURATIONS

Airmux-5000/BS/F58F/MOB/EXT
Airmux-5000/BS/F54U/MOB/EXT
Airmux-5000/BS/F50J/MOB/EXT
Airmux-5000/BS/F49J/MOB/EXT
Airmux-5000/SU/F58F/MOB/EXT
Airmux-5000/SU/F54U/MOB/EXT
Airmux-5000/SU/F50J/MOB/EXT
Airmux-5000/SU/F49J/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
F49J 4.9 GHz, Japan
F50J 5.0 GHz, Japan

Aggregate Throughput

5M 5 Mbps
10M 10 Mbps
20M 20 Mbps
25M 25 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 SPECIAL CONFIGURATIONS

Airmux-5000/BS/*

Airmux-5000/SU/+

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

ANTENNAS

Fixed and Nomadic BS External Antennas

Airmux-5000-BS-ANT/\$

Legend

\$ External antenna:

14/4959/FP 14 dBi, 4.90–5.950 GHz bands, 90°
15/4959/FP 15 dBi, 4.90–5.950 GHz bands, 60°
11/4959/FP 11 dBi, 4.900–5.950 GHz bands, 120°
12/5158/FP 12 dBi, 5.150–5.875 GHz bands, 120°
14/3338/FP 14 dBi, 3.3–3.8 GHz bands, 90°
14/2327/FP 14 dBi, 2.3–2.7 GHz bands, 60°
13/5764/FP 13 dBi, 5.700–6.400 GHz bands, 90°

Fixed and Nomadic SU External Antennas

Airmux-400-ANT/\$

Legend

\$ External antenna:

23/4960/FP 23 dBi, 4.90–6.06 GHz, 4.9, 5.3, 5.4 GHz bands
32/4958/DISH 23 dBi, 4.90–5.80 GHz, 4.9, 5.3, 5.4 GHz bands
28/4964/FP 28 dBi, 4.900–6.425 GHz bands
28/5260/DISH 28 dBi, 4.90–6.06 GHz, 5.3, 5.4, 5.8, 5.9, 6.0 GHz bands
21/3338/FP 21 dBi, 3.30–3.80 GHz bands
19/2327/FP 19 dBi, 2.30–2.70 GHz bands
22/4451/FP 22 dBi, 4.40–5.10 GHz bands
24/5764/FP 24 dBi, 5.700–6.425 GHz bands
25/3338/DISH 25 dBi, 3.30–3.80 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/18/5158/M/FP

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

Airmux-5000-BS-ANT/17/4958/M/FP

Single polarization, flat panel antenna, 60 degrees, 16.5 dBi gain, 4.9–5.875 GHz

Mobility SU External Antennas

Airmux-5000-SU-ANT/10/4958/M/OMNI

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

Airmux-5000-SU-ANT/12/4959/M/OMNI

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

Table 3. Fixed and Nomadic Base Station Configurations

Band	Rate [Mbps]			
	200	100	50	25
F58F	F58F/200M/EXT	NA	F58F/50M/EXT F58F/50M/INT	F58F/25M/EXT F58F/25M/INT
F54E	F54E/200M/EXT	NA	F54E/50M/EXT F54E/50M/INT	F54E/25M/EXT F54E/25M/INT
F54U	F54U/200M/EXT	NA	F54U/50M/EXT F54U/50M/INT	F54U/25M/EXT F54U/25M/INT
F50J	NA	F50J/100M/EXT	NA	NA
F49J	F49J/200M/EXT	NA	NA	NA
F3XE	NA	F3XE/100M/EXT	NA	NA
F3XF	NA	F3XF/100M/EXT	NA	NA
F25F	NA	F25F/100M/EXT	NA	NA

Table 4. Fixed and Nomadic Subscriber Unit Configurations

Band	Rate [Mbps]				
	50	25	20	10	5
F58F	F58F/50M/INT F58F/50M/EXT	F58F/25M/INT F58F/25M/EXT	F58F/20M/INT	F58F/10M/INT F58F/10M/EXT F58F/10M/EMB F58F/10M/POE/INT	F58F/5M/INT F58F/5M/EXT
F54E	F54E/50M/INT F54E/50M/EXT	F54E/25M/INT F54E/25M/EXT	F54E/20M/INT	F54E/10M/INT F54E/10M/EXT F54E/10M/EMB F54E/10M/POE/INT	F54E/5M/INT F54E/5M/EXT
F54U	F54U/50M/INT	F54U/25M/INT F54U/25M/EXT	F54U/20M/INT	F54U/10M/INT F54U/10M/EXT F54U/10M/EMB F54U/10M/POE/INT	F54U/5M/INT F54U/5M/EXT
F49J	F49J/50M/INT F49J/50M/EXT	NA	F49J/20M/INT F49J/20M/EXT	NA	NA
F50J	F50J/50M/INT F50J/50M/EXT	NA	F50J/20M/INT F50J/20M/EXT	NA	NA
F3XE	F3XE/50M/INT	NA	F3XE/20M/INT F3XE/20M/EXT	F3XE/10M/INT F3XE/10M/EXT	NA
F3XF	F3XF/50M/INT	NA	F3XF/20M/INT F3XF/20M/EXT	F3XF/10M/INT F3XF/10M/EXT	NA
F25F	NA	NA	F25F/20M/INT F25F/20M/EXT	NA	NA

Airmux-5000

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POWER-OVER-ETHERNET (POE) DEVICES

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

Airmux-POE/GBE/a

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

Airmux-POE/GBE/DC

PoE device with 100BaseT/GbE interface and +48 VDC power feeding

Airmux-POE/DC

DC-PoE device for Airmux-400 and Airmux-5000/SU with -20 to -60 VDC power feeding

Airmux-OPOE/DC

Outdoor DC-PoE device for all Airmux radios with -20 to -60 VDC 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

OPTIONAL ACCESSORIES

CBL-Airmux-UTP/@

Assembled cable for connection between IDU and ODU

Legend

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

CBL-Airmux-HSS/@@

Assembled cable for HSS connection

Legend

@@	Cable length:	
	5	5m (16.4 ft)
	15	15m (49.2 ft)
	50	50m (164 ft)
	100	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 co-location 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

Legend

a	Power cable with matching plug:	
	ACEU	Europe
	ACUS	US
	ACUK	UK
	ACAU	Australia/China
	ACOC	Open-ended connector
	ACAG	Argentina
	ACSA	South Africa

Airmux-RMK-LC-SPARE

Spare mounting kit for 5M, 10M, and 25M radios

Airmux-RF-Cable

Coax cable with two N-type connectors

Capacity/S0510/Airmux-5000/SU/5M-10M

License key for Airmux-5000 throughput upgrade from 5 to 10 Mbps

Capacity/S0525/Airmux-5000/SU/5M-25M

License key for Airmux-5000 throughput upgrade from 5 to 25 Mbps

Capacity/S1025/Airmux-5000/SU/10M-25M

License key for Airmux-5000 throughput upgrade from 10 to 25 Mbps

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