Data Sheet

Airmux-200

Wireless Broadband Multiplexer

Point-to-point and multi point-to-point radio solution for combined TDM and Ethernet traffic over license-free frequencies

- Cost effective multi point-to-point encrypted wireless broadband multiplexer
- Transmission range of up to 80 km (50 miles)
- 2.3 to 2.7 GHz and 4.9 to 5.9 GHz transmission bands
- Air data rate of up to 48 Mbps
- High reliability and availability based on robust air interface protocol

Airmux-200 is a carrier-class, 48-Mbps capacity, cost effective multi point-to-point broadband wireless transmission system. It combines legacy TDM and Ethernet services for transmission over 2.3 to 2.7 GHz and 4.9 to 5.9 GHz bands, and is suitable for deployment in FCC-regulated countries.

Airmux-200 provides high performance and reliability. The interface ensures low BER, as well as low latency, and full compliance with E1/T1 interface jitter and wander requirements.

Transmission range of up to 80 km (50 miles) is available with an external antenna.

RAD
data communications
The Access Company

In addition to Airmux-200, the following models are also available:

Airmux-200L is a low-price POE link for Ethernet services only that enables improved position versus low-end competitors. The supported frequencies are 2.4 FCC, 2.4 High Power, and 5.8 FCC. Throughput is limited to 2 MBps full-duplex with a maximum range of 20 km (12 miles).

Airmux-200LC is an Airmux-200L with hardware-ready collocation capabilities. It enables Airmux-200L collocations at a central site using burst synchronization pulses to reduce mutual interference.

PHYSICAL CONFIGURATIONS

Airmux multiplexers consist of an outdoor unit (ODU) and an indoor unit (IDU or IDU-E).

The outdoor unit is suitable for mast or wall installation. Mounting brackets are supplied with the unit.

ODU-HE (high-end) supports synchronized, collocated units and supplies a higher output power of up to 23 dBm.

Two AC power supply options are available for IDU-E: a single fixed power supply or two modular power supplies. All IDU products support wide-range DC (-20 to -60 VDC) and AC (by AC converter) power supplies.

ADDITIONAL AIRMUX PRODUCTS

IDU-R is a new IDU that provides E1/T1 backup for a leased line to maintain continuous operation of the link. Upon failure of the primary connection, IDU-R switches automatically to the backup link. The air interface can be defined as the primary or backup link (see *Figure 3*). IDU-R operates with all ODUs.

ODU-HE (High End) is an enhanced ODU that supports Hub Site Synchronization (HSS), transmits higher power for some frequencies and operates with IDU and POE devices.

POE-8 (Power over Ethernet) is an indoor unit that feeds up to eight ODUs from a single unit, instead of using eight separate POE devices. POE-8 uses AC as well as DC (-20 to -60 VDC) power.

OPoE (Outdoor Power over Ethernet) is a hardened product for outdoor installation.

HUB SITE SYNCHRONIZATION

Hub Site Synchronization (HSS) ensures simultaneous (multi point-to-point deployment) data transmission for all collocated radios by eliminating the interference that normally occurs when different ODUs transmit and receive from the same site (see *Figure 2*).

HSS, which supports up to 16 collocated units, enables a complex radio environment of mixed services (TDM or ETH) and channel bandwidth frequencies (5, 10, or 20 MHz).

The collocation feature requires ordering the HSS unit as well as its synchronization cables.

ODU-High End (ODU-HE), All Indoor (AIND) and Airmux-200L products support HSS.

SECURITY

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

Table 1. Radio Regulatory Compliance and Maximum Transmit Power

Frequency [GHz]	USA and Canada		Europe (ETSI)	
	Regulation	Max. Tx Power [dBm]	Regulation	Max. Tx Power [dBm]
5.740 – 5.940	47CFR Part 15 Subpart C, RSS-210	16/23	N/A	N/A
5.500 – 5.700	N/A	N/A	EN 300 216 V1.2.1, EN 301 893 V1.2.3	8 EIRP ≤ 30
5.260 – 5.330	47CFR Part 15 Subpart E , RSS-210	8	N/A	N/A
4.950 – 4.980	47CFR Part 15 Subpart B	15	N/A	N/A
2.500 – 2.690	47CFR Part 15 Subpart B	22	EN 300 386 V1.3.2 EN 301 489-4 V1.3.1 EN 301 489-1 V1.4.1	23
2.412 – 2.462	47CFR Part 15 Subpart C , RSS-210	27 (for FCC)	N/A	N/A
2.412 – 2.472	N/A	N/A	EN 300 328	-4 EIRP ≤ 20

ADAPTIVE MODULATION

Airmux-200 adaptively changes the modulation according to air conditions, targeting maximum rate while maintaining link stability. The rate drops temporarily after encountering interference, then automatically returns to the highest possible rate.

QUALITY OF SERVICE

When the link quality is out of limits, Airmux-200 automatically searches for a clear channel within a pre-selected list of frequencies.

5 MHZ AND 10 MHZ CHANNEL BANDWIDTH

Airmux-200 offers additional channel bandwidth options to the 20 MHz channel bandwidth already supported. Narrow channel bandwidth improves immunity to disturbances and enables deployment in high-interference environments, with enhanced channel allocation flexibility and improved sensitivity.

INCREASED FRAME SIZE

Airmux-200 supports larger frames (1536 bytes for IDU, 1800 bytes for POE) to improve Ethernet traffic efficiency and reduce the overall overhead.

SHORT TIME-TO-SERVICE

Because Airmux-200 operates in license-exempt frequencies, it can be deployed in record time, eliminating the costs and delays involved in leasing lines or trenching fiber.

MANAGEMENT

Factory settings can be restored at any time for each ODU.

Information on links and management can be collected and analyzed via a single action.

VLAN management allows the separation of user traffic from NMS traffic. The user decides if such a separation is required. Both the headquarters and remote sites are configured with VLAN management.

External events trigger alarms via the dry-contact alarm inputs.

APPLICATIONS

Cellular Backhauling
Airmux-200 connects between cellular base stations and controllers. This solution meets the requirements of cellular backhauling applications by providing four E1/T1 interfaces and Ethernet traffic for maintenance and control.

Hot-Spot Backhauling
Airmux-200 provides a robust alternative to the last mile connection between the WLAN access point and the data network, compared with the often used expensive E1/T1 leased lines.

Broadband Access
Airmux-200 provides broadband Ethernet and leased line services, to Small and Medium Enterprises (SME).

Wireless ISP Backhaul
Wireless Internet Service Providers (WISP) backhaul their Point of Presence (POP) traffic to the network operation center. With Airmux-200, WISPs achieve higher capacity, and can offer bundled connectivity, with a range of up to 80 km (50 miles).

Remote Site Connectivity
Airmux-200 is also offered to enterprises with multiple sites that require a transparent connection of LAN and PBX systems across their various campuses.

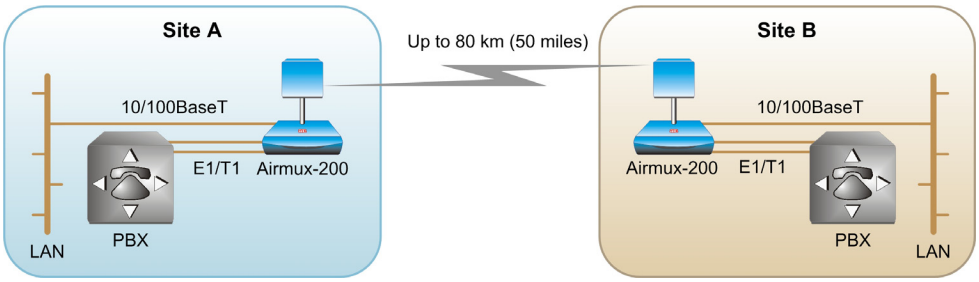

Figure 1. Airmux-200 in a Point-to Point Application

Specifications

RADIO

Frequency Bands
5.9 GHz (5.740–5.940 GHz)
5.8 GHz (5.740–5.835 GHz)
5.4 GHz (5.500–5.700 GHz)
5.3 GHz (5.260–5.330 GHz)
4.9 GHz (4.950–4.980 GHz)
2.4 GHz (2.412–2.462 GHz)
2.3 GHz (2.312–2.387 GHz)

Data Rate
Up to 48 Mbps, user-configurable

Channel Bandwidth
20 MHz

Duplex Technique
TDD

Modulation
OFDM - BPSK, QPSK,
16 QAM, 64 QAM

Transmit Power
See *Table 1*

RF Dynamic Range
More than 50 dB

LAN INTERFACE

Number of Ports
IDU: 1
IDU-E: 2

Type
10/100BaseT, autonegotiation

Framing/Coding
IEEE 802.3u

Bridging
Up to 2048 MAC addresses self-learning

Traffic Handling
MAC layer bridging, self-learning

Latency
3 msec (typical)

Line Impedance
100Ω

VLAN Support
Transparent

Connector
RJ-45

E1/T1 INTERFACE

Number of Ports
IDU: 1 or 2
IDU-E: 4

Framing
Unframed

Timing
Plesiochronous (independent Tx and Rx timing)

Line Code
E1: HDB3
T1: B8ZS, AMI

Latency
8 msec

Line Impedance
E1: 120Ω, balanced
T1: 100Ω, balanced

Connector
RJ-45

Jitter and Wander
As per G.823, G.824

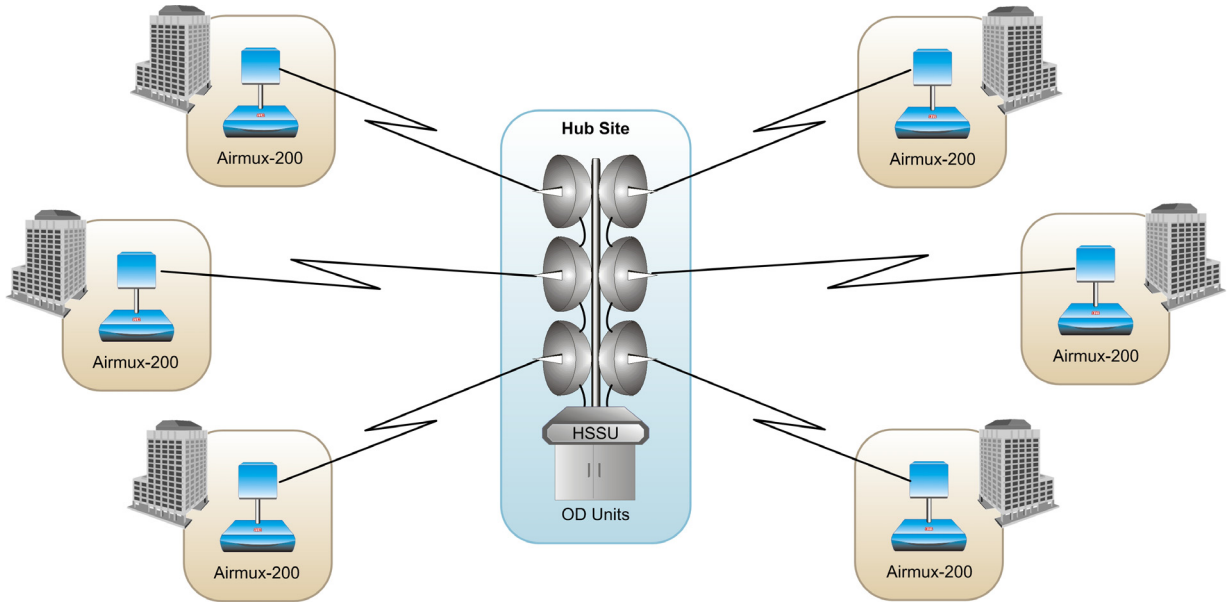

Figure 2. Airmux-200 Central Site Collocation (Multi Point-to-Point)

MANAGEMENT

Network Management and Protocol
SNMPc-based
VLAN management enabled

Management Interface
10/100BaseT

Connector
RJ-45

Upgrade Capabilities
Local and over-the-air software download

ANTENNA

Characteristics
See *Table 2*

GENERAL

Diagnostics
Local and remote loopbacks

IDU-to-ODU Connection
Outdoor Cat.5e cable,
100m (328 ft) max. length

Grounding and Lightning Protection
Individual grounding for each IDU/ODU
Internal arrestors for lightning protection
Internal ESD protection circuits over power/telecom lines

Power
DC: -48, 24 VDC
AC: 100–240 VAC

Power Consumption
ODU with IDU: 10W max
ODU with IDU-E: 14W max

Indicators
PWR (green) – Power status
IDU (green) – IDU status
ODU (green/red) – ODU-to-IDU link status
AIR I/F (green/red) – Air Interface status
SERVICE (green/red) – E1/T1 signal status

Environment
Outdoor unit and external antenna:
Enclosure: IP67 all-weather case
Temperature: -35° to 60°C (-31° to 140°F)
Indoor units:
Temperature: 0° to 50°C (32° to 122°F)
Humidity: Up to 90%, non-condensing

Physical
ODU (with integrated antenna):

Height: 305 mm (12.0 in)
Width: 305 mm (12.0 in)
Depth: 58 mm (2.3 in)
Weight 1.5 kg (3.3 lb)

IDU:

Height: 44 mm (1.7 in)
Width: 237 mm (9.3 in)
Depth: 165 mm (6.5 in)
Weight 0.5 kg (1.1 lb)

IDU-E:

Height: 44 mm (1.7 in)
Width: 430 mm (17.0 in)
Depth: 290 mm (11.4 in)
Weight: 1.5 kg (3.3 lb)

Table 2. Airmux-200 Antenna Options

Frequency [GHz]	Antenna Type		Gain [dBi]	Typical Range [km]	[mi]	Beam [degrees]	Dimensions [mm]	[in]	Weight [kg]	[lb]	Connector
5.9, 5.8, 5.4, 5.3	Integrated	Flat panel	22	40	25	9.0	305×305×58	12×12×2.3	0.5	1.1	NR
	External	Flat panel	28	80	50	4.5	600×600×51	23.6×23.6×2	5.0	11.0	N-type
5.8	External	Dish	32.5	80	50	4.5	Diam. 900	Diam. 35.4	10	22	N-type
4.9	External	Flat panel	21	24	15	9.0	305×305×58	12×12×2.3	0.5	1.1	N-type
	External	Dish	27	80	50	5	Diam. 600	Diam. 23.6	5.0	11.0	N-type
2.3, 2.4	Integrated	Flat panel	17	40	25	20	305×305×58	12×12×2.3	0.5	1.1	NR
	External	Grid	24	80	50	7.5	600×997×380	23.5×39.2×15	2.0	4.4	N-type

***Note**: The range of the system depends on the system configuration. For further information, please contact the RAD distributor nearest you or one of RAD's offices worldwide.*

Ordering

INDOOR UNIT

Airmux-200/IDU/~/UTP/*
Indoor unit

Airmux-200/IDUE/~/~/2UTP/*
Extended indoor unit with optional redundant power supply

Airmux-200/IDU-R/&/a
Indoor unit with TDM bypass

OUTDOOR UNIT

Airmux-200/ODU/#/^
Outdoor unit

Airmux-200/ODU-HE/!
Outdoor unit, high-end

Airmux-200/ODU-HE/!!/EXT
Outdoor unit, high-end, for external antenna connection

Note 1: *A multi point-to-point application supports multiple collocated radio links at a central site. This site is based on high-end ODUs (ODU-HE) and on synchronization hub(s) (HSSU). When running a multi point-to-point site, the customer must order the appropriate ODU-HEs, HSSUs, and cables.*

Note 2: *ODU do not interoperate with standalone POE devices. For POE configurations, a specific ODU is required.*

POWER OVER ETHERNET

Airmux-200/=/~/POE
Outdoor unit with POE device with integrated antenna

Airmux-200/+/~/EXT/POE
Outdoor unit with POE device for external antenna

Airmux-200/POE-8/a
Indoor device feeding 8 ODUs via PoE ports with AC and DC.

Airmux-200/POE-AC/a
POE device with AC plug

Airmux-200/OPOE
Outdoor POE device with AC

COLLOCATION HUBS

Airmux-200/HSSU
Hub site sync unit to connect 8 collocated outdoor units and 2 additional HSSUs

AIRMUX-200L/LC

Airmux-200L/?/%/EXT/a
Low Ethernet traffic, outdoor unit, and POE

Airmux-200L/?/%/INT/a
Low Ethernet traffic, outdoor unit, POE, and integrated antenna

Note*: Available with F58F only.*

Airmux-200LC/?/%/EXT/a
Collocated, Low Ethernet traffic, outdoor unit and POE

Airmux-200LC/?/%/INT/a
Collocated, Low Ethernet traffic, outdoor unit, POE, and integrated antenna

Note*: Available with F58F only.*

Note*: All Airmux-200 products support the narrow channel bandwidth, in addition to 20 MHz, except for the following that support 20 MHz only:*

- *ODU with the frequencies 4.9F, 5.3E, 5.3F, 5.4E, 5.4E-HG, 5.4E-LG, 5.4IC, 5.8UK*
- *POE with frequencies 4.9FP, 5.3E, 5.4E, 5.4E-HG, 5.4E-LG*

Airmux-200L and Airmux-200LC support 5 MHz channel bandwidth only.

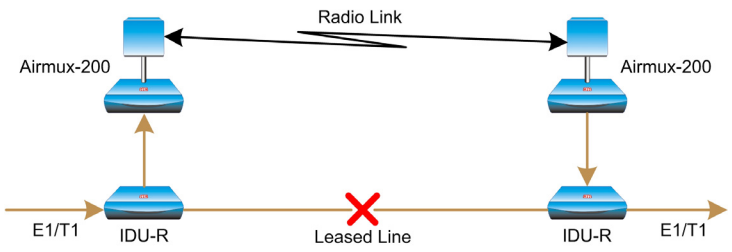

Figure 3. Automatic Radio Link Backup

Legend

~ Power supply type:

- **115** 115 VAC power supply
- **230** 230 VAC power supply
- **ACOC** AC open-ended

IDU-E only:

- **48** -48 VDC power supply
- **24** 24 VDC power supply

Note: *The Airmux-200 IDU-E can be ordered with AC redundant power supplies only. DC redundant power supplies are not available.*
The power supply of the single power supply option is not removable.
For IDU, the default power supply is –20 TO -60 VDC. AC power in the IDU is supplied by an AC/DC adapter.

a AC Plug type:

- **ACEU** European
- **ACUS** US
- **ACUK** UK
- **ACOC** Open-ended

? Net Ethernet throughput:

- **2** 2 Mbps

= Frequency band and regulation:

- **F24F** 2.412–2.462 GHz, FCC
- **F24HP** high-power F24
- **F54E** 5.500–5.700 GHz, ETSI
- **F54HP** high-power F54
- **F58F** 5.740–5.835 GHz FCC

+ Frequency band and regulation:

- **F24E-LG** 2.412–2.472 GHz, ETSI, low-gain
- **F24F** 2.412–2.462 GHz, FCC
- **F24HP** high-power F24
- **F49FP** 4.950–4.980 GHz, FCC
- **F53E** 5.180–5.320 GHz, ETSI
- **F53HP** high-power F53
- **F54E-HG** high-gain F54E
- **F54E-LG** low-gain F54E
- **F54HP** high-power F54
- **F58F** 5.740–5.835 GHz, FCC

Frequency band and regulation:

- **F23HP** 2.312–2.387 GHz, high power
- **F24E** 2.412–2.472 GHz, ETSI
- **F24HP** high-power F24
- **F24E-LG** low-gain F24E
- **F24F** 2.412–2.462 GHz, FCC
- **F49F** 4.950–4.980 GHz, FCC
- **F53E** 5.180–5.320 GHz, ETSI
- **F53HP** high-power F53
- **F54E** 5.500–5.700 GHz, ETSI
- **F54E-HG** high-gain F54E
- **F54E-LG** low-gain F54E
- **F54IC** F54 Canada
- **F54HP** high-power F54
- **F58F** 5.740–5.835 GHz, FCC

Note*: F23HP, F24HP, F24E, F24E-LG, F53E, F49F, F54E-LG and F54E-HG are available with external antenna only.*

% Frequency band and regulation:

- **F24F** 2.412–2.462 GHz, FCC
- **F24HP** 2.4 GHz high-power
- **F58F** 5.740–5.835 GHz FCC

! Frequency band and regulation:

- **F24F** 2.412–2.462 GHz, FCC
- **F25BRS** 2.500–2.690 GHz BRS FCC
- **F54E** 5.500–5.700 GHz, ETSI
- **F54HP** high-power F54
- **F58F** 5.740–5.835 GHz FCC

!! Frequency band and regulation:

- **F24F** 2.412–2.462 GHz, FCC
- **F25BRS** 2.500–2.690 GHz BRS FCC
- **F49F** 4.950–4.980 GHz, FCC
- **F49HP** high-power F49
- **F54E-LG** low-gain F54E
- **F54IC** 5.500–5.700 GHz, Canada
- **F54HP** high-power F54
- **F58F** 5.740–5.835 GHz FCC
- **F58UK** 5.740–5.835 GHz, UK

***** Interface type IDU:

- **E1** E1 interface
- **T1** T1 interface
- **2E1** 2 x E1 interfaces
- **2T1** 2 x T1 interfaces
- **ETH** Ethernet interface only

Interface type IDU-E:

- **4E1** 4 x E1 interfaces
- **4T1** 4 x T1 interfaces

^ **EXT** for outdoor unit with dedicated connector for external antenna connection

Note: *If EXT is not specified, Airmux-200/ODU is supplied with an integrated antenna.*

& Interface type:

- **E1** E1 interface
- **T1** T1 interface

Airmux-200

Wireless Broadband Multiplexer

OPTIONAL ACCESSORIES

Airmux-ANT/$
External antenna supplied with 1m (3.3 ft) cable

Legend

$ External antenna type, where **grid** is a grid antenna, **fp** is a flat panel antenna, and **dish** is a dish antenna:

18/F5X/db/fp	18 dBi, 5.x GHz
21/4.9/db/fp	21 dBi, 4.9 GHz
22/5.3/db/fp	22 dBi, 5.3 GHz
22/5.4/db/fp	22 dBi, 5.4 GHz
22/5.8/db/fp	22 dBi, 5.8 GHz
24/2.4/db/grid	24 dBi, 2.4 GHz
24/2.5/db/grid	24 dBi, 2.5 GHz
27/4.9/db/dish	27 dBi, 4.9 GHz
28/5.3/db/fp	28 dBi, 5.3 GHz
28/5.4/db/fp	28 dBi, 5.4 GHz
28/5.8/db/fp	28 dBi, 5.8 GHz
29/5.8/db/dish	29 dBi, 5.8 GHz
32/5.3/db/dish	32.5 dBi, 5.3 GHz
32/5.4/db/dish	32.5 dBi, 5.4 GHz
32/5.8/db/dish	32.5 dBi, 5.8 GHz

CBL-Airmux-UTP/@
Assembled cable for permanent connection between indoor and outdoor units

Legend

@ Cable length:

25	25m (82 ft) cable
50	50m (164 ft) cable
75	75m (246 ft) cable
100	100m (328 ft) cable

CBL-HSS/@@
Assembled cable for permanent connection to HSS

Legend

@@ Cable length:

5	5m (16.4 ft) cable
15	15m (49.2 ft) cable
50	50m (164 ft) cable
100	100m (328 ft) cable

RM-33
Hardware kit for mounting one IDU in a 19-inch rack

PS-AC/a
Power adaptor for IDU, 90–240 VAC, 48 VDC (spare unit)

PS-E-AC/a
Power adaptor for IDU-E, 90–240 VAC, 48 VDC (spare unit)

Legend

a AC Plug type:

ACEU	European
ACUS	US
ACUK	UK
ACOC	Open-ended

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