

# Airmux-200

Broadband Wireless Multiplexer (Ver. 1.9.3)



Carrier-class radio system  
for Ethernet and TDM  
traffic delivery over  
license-free frequencies

- Carrier-class cost-effective broadband wireless multiplexer with Layer-2 VLAN capabilities
- Net throughput of up to 18 Mbps full duplex
- Transmission range of up to 50 miles (80 km)
- 2.4, 4.9, 5.3, 5.4 and 5.8 GHz transmission bands
- High reliability and availability based on robust air interface protocol



Airmux-200 is a carrier-class, cost-effective multiple point-to-point broadband wireless transmission device. It combines legacy TDM and Ethernet services for transmission over 2.4, 4.9, 5.3, 5.4 and 5.8 GHz bands, and is

suitable for deployment in FCC-regulated countries.



**data communications**

The Access Company

# Airmux-200

## Broadband Wireless Multiplexer

For the global markets of cellular backhaul, WiMAX and ISP backhaul, broadband access, large private and government networks, Airmux-200 offers high throughput, longer range and robustness at a competitive price.

The Airmux product line is part of RAD's Axxess+ portfolio for Multiservice Access Platform and First Mile solutions. The portfolio combines extensive support for legacy services with future-proof Ethernet capabilities to address the challenges faced by utilities, transportation networks, carriers, and mobile operators in migrating to next-generation networks and services with flexibility, efficiency and carrier-class reliability.

### MARKET SEGMENTS AND TYPICAL APPLICATIONS

Most common wireless applications are described below.

#### Service Providers and ISPs

Providing IP backhaul of 4G/broadband services in multiple point-to-point topologies, Airmux-200 offers broadband access for remote, rural and underserved communities:

- nLOS (no line of sight) in urban environment
- Long haul in rural setting (*Figure 2*).

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

#### Private Networks

Airmux-200 can be used in high-capacity interbranch connectivity applications for university campuses, health care organizations, government institutions, large enterprises and public establishments with high traffic requirements.

#### Mobile Carriers

In rural-to-urban cellular backhaul applications, Airmux-200 extends mobile reach to rural locations with carrier-grade, long-haul point-to-point T1/E1 and Ethernet services. It also can be used for backhaul of 3G traffic in urban environment with easy migration path from converged TDM/IP networks to all-IP networks.

#### Security and Surveillance

Aggregation and backhaul of traffic from multiple collocated megapixel video cameras, make Airmux-200 suitable for homeland security applications, municipal 'safe city' projects, border control installations.

#### AIRMUX-200VS

The **Airmux-200VS** model is suitable for video surveillance applications with asymmetric Ethernet throughput of 2/5 Mbps, at a distance of up to 12.5 miles (20 km).

#### ADDITIONAL AIRMUX PRODUCTS

**IDU-R (Redundancy)** – an IDU that provides T1/E1 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. IDU-R operates with all ODUs.

**ODU-HE (High End)** – an enhanced ODU that features Hub Site Synchronization (HSS), transmits higher power for some frequencies and operates with IDU and PoE devices. ODU-HE can be ordered as a combo device, supporting multiple frequencies and regulations within a certain band range.

**POE-8 (Power over Ethernet)** – 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)** – a hardened product for outdoor installation.

#### 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) operates with 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 include wide-range DC (-20 to -60 VDC) and AC (by AC converter) power supplies.

#### SITE SYNCHRONIZATION

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

**Note:** Like any other RF deployment, the wireless operation is highly dependent on factors such as available frequencies, the physical space between radios, other interfering radios, and whether Airmux 200 or Airmux-400 units are used.

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

For long distance coverage, the 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.

#### SECURITY

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

#### 1+1 TDM LINK REDUNDANCY

The Monitored Hot Standby (MHS) 1+1 TDM link redundancy protects the wireless transmission in case of equipment failure or air interface loss. TDM link switchover is performed in less than 50 msec.

## RESILIENT ETHERNET RING

Ethernet rings are used to protect data against link and node failures.

## 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.

## AIRLINK 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-, 10- AND 20-MHZ CHANNEL BANDWIDTH

Airmux-200 offers channel bandwidth at 5-, 10- and 20 MHz. The narrow channel bandwidth improves immunity to disturbances and enables deployment in high-interference environments, with enhanced channel allocation flexibility and improved sensitivity while the wide channel bandwidth allows transmission of high capacity services.

## 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

Information on links and management can be collected and analyzed in 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.

New software releases can be downloaded simultaneously to several locations without affecting the service. The software can be activated later, when service disruption can be best tolerated.

# Specifications

## RADIO

### Frequency Bands (GHz)

5.8 (5.740–5.835)  
5.4 (5.500–5.700)  
5.3 (5.260–5.330)  
4.9 (4.950–4.980)  
2.4 (2.412–2.462)

### Data Rate

Up to 18 Mbps, full duplex

### Channel Bandwidth

5, 10, 20 MHz (depending on a model)

### Duplex Technique

TDD

### Modulation

OFDM - BPSK, QPSK, 16 QAM, 64 QAM

### Transmit Power

See *Table 1*

### RF Dynamic Range

More than 50 dB

## Combo Model Frequencies

Default Band [GHz]	Supported Bands [GHz]
5.4 FCC	5.3 FCC, 5.3 universal HP, 5.4 FCC, 5.4 universal HP
5.4 IC	5.3 FCC, 5.4 IC, 5.3 universal HP, 5.4 universal HP
5.8 FCC	5.3 universal HP, 5.4 universal HP, 5.8 FCC, 5.8 WPC, 5.9 universal HP

## LAN INTERFACE

### Number of Ports

IDU: 1, 2

IDU-E: 3 (2 copper, 1 SFP)

### Type

10/100BaseT, autonegotiation

### Framing/Coding

IEEE 802.3u

### Bridging

Up to 2048 MAC addresses self-learning

### Maximum Frame Size

2047 bytes

### Traffic Handling

MAC layer bridging, self-learning

### Latency

3 msec (typical)

### Line Impedance

100Ω

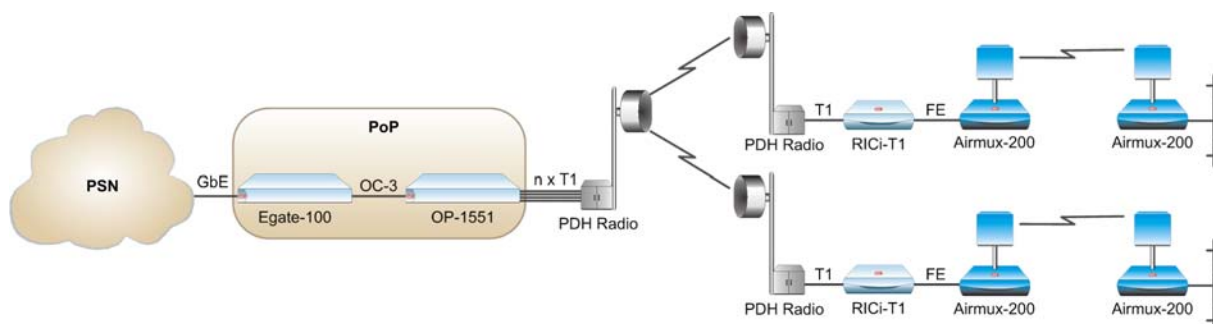


Figure 1. Extending the Reach of Ethernet-Based Services to Rural Locations over PDH Infrastructure  
Order from: Cutter Networks      Ph: 727-398-5252 / Fx: 727-397-9610      [www.bestdatasource.com](http://www.bestdatasource.com)

# Airmux-200

## Broadband Wireless Multiplexer

### VLAN Support

802.1p & Q

### Connector

RJ-45

### T1/E1 INTERFACE

#### Number of Ports

IDU: 2

IDU-E: 4

#### Framing

Unframed

#### Timing

Plesiochronous (independent  
Tx and Rx timing)

#### Line Code

T1: B8ZS, AMI

E1: HDB3

#### Latency

8 msec

#### Line Impedance

T1: 100Ω, balanced

E1: 120Ω, balanced

#### Jitter and Wander

As per G.823, G.824

### Connector

RJ-45

### MANAGEMENT

#### Network Management Protocols

SNMP-based, Telnet

#### Management Interface

10/100BaseT

#### Connector

RJ-45

### Upgrade Capabilities

Local and over-the-air software download

### INTEGRATED ANTENNA

#### Characteristics

See *Table 2*

### GENERAL

#### Diagnostics

Local and remote loopbacks

#### IDU-to-ODU Connection

Outdoor Cat.5e cable, 328 ft (100m) 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

### SFP PORT

#### Type

Fast Ethernet

For full details, see the *SFP Transceivers  
data sheet* at [www.radusa.com](http://www.radusa.com)

**Note:** It is strongly recommended to order this  
device with **original RAD SFPs installed**. This will  
ensure that prior to shipping, RAD has performed  
comprehensive functional quality tests on the  
entire assembled unit, including the SFP devices.  
RAD cannot guarantee full compliance to product  
specifications for units using non-RAD SFPs.

### Indicators

IDU (green/orange/red): IDU status

ODU (green/red): ODU status

AIR I/F (green/orange/red): Air link status

SVC (green/orange/red): TDM service status

HSS (green/orange/red): HSS status

STBY (green/orange/red): MHS status

LINK (yellow): Ethernet link status

ACT (green): Ethernet activity status

### Environment

Outdoor unit and external antenna:

Enclosure: IP67 all-weather case

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

Indoor units:

Temperature: 32° to 122°F (0° to 50°C)

Humidity: Up to 90%, non-condensing

### Physical

ODU (with integrated antenna):

Height: 12.0 in (305 mm)

Width: 12.0 in (305 mm)

Depth: 2.3 in (58 mm)

Weight 3.3 lb (1.5 kg)

IDU:

Height: 1.7 in (44 mm)

Width: 9.3 in (237 mm)

Depth: 6.5 in (165 mm)

Weight 1.1 lb (0.5 kg)

IDU-E:

Height: 1.7 in (44 mm)

Width: 17.0 in (430 mm)

Depth: 11.4 in (290 mm)

Weight: 3.3 lb (1.5 kg)

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 V1.4.1	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	25 (FCC)	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

## Ordering

### OUTDOOR UNIT

#### Airmux-200/ODU/#/!

Outdoor unit with integrated or external antenna. The unit can be ordered with IDU or IDU-E devices.

# Frequency band and regulation:

<b>F24HP</b>	2.4 GHz, high power
<b>F24F</b>	2.4 GHz, FCC
<b>F54IC</b>	5.4 GHz, Canada
<b>F54HP</b>	5.4 GHz, high-power
<b>F58F</b>	5.8 GHz, FCC

**Note:** F24HP is available with external antenna only.

#### Airmux-200/ODU-HE/\$/@/!

High-end outdoor unit with integrated or external antenna. The unit can be ordered with IDU, IDU-E or PoE devices.

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

\$ Frequency band and regulation:

<b>F24F</b>	2.4 GHz, FCC
<b>F24HP</b>	2.4 GHz, high power
<b>F49F</b>	4.9 GHz, FCC
<b>F54F</b>	5.4 GHz, FCC
<b>F54HP</b>	5.4 GHz, high power
<b>F54IC</b>	5.4 GHz, Canada
<b>F58F</b>	5.8 GHz, FCC

**Notes:**

- F54IC is available with external antenna only.
- F54HP is available with integrated antenna only.

@ Special model with multiple frequency support (Default=regular high-end ODU):

#### CMB

**Notes:**

- F54HP, F54IC, F58F are available with regular ODU-HE and combo tool.
- F54F is available with combo tool only.

#### Airmux-200VS/</!

Outdoor unit for video surveillance applications

< Frequency band and regulation:

<b>F24F</b>	2.4 GHz FCC (default), 2.4 GHz universal
<b>F58F</b>	5.8 GHz FCC (default), 4.9 GHz universal, 5.3 GHz universal, 5.4 GHz universal, 5.9 GHz universal

! Antenna:

<b>INT</b>	Integrated
<b>EXT</b>	External

### INDOOR UNIT FOR TDM AND ETHERNET SERVICES

#### Airmux-IDU/%

DC-powered indoor unit

% IDU interface:

<b>2TDM</b>	2 TDM (T1/E1) interfaces, 2 ETH interfaces, alarm port
<b>2ETH</b>	2 ETH interfaces

**Notes:**

- VLANs and resilient ring topology are supported by both IDU/2TDM and IDU/2ETH models.
- For AC power feeding, order external power adapter (Airmux-PS-E-AC/a). See Optional Accessories below.

#### Airmux-200/IDU-R/~/\*

Indoor unit with TDM bypass

**Legend**

~ AC power adapter assembly with matching AC plug:

<b>ACUS</b>	US
<b>ACOC</b>	Open-ended connector

**Note:** Airmux-PS-AC adapter can be ordered separately. See Optional Accessories.

\* IDU interface:

<b>T1</b>	T1 interface
<b>E1</b>	E1 interface

**Note:** IDU-R model supports single E1 or T1 interface only.

Antenna Type	Frequency	Gain	Beam	Dimensions		Weight		Connector
	[GHz]			[ft]	[mm]	[lb]	[kg]	
Flat panel	2.3–2.7	17.5	20	1.0×1.0×2.2	304×304×58	5.5	2.5	N-type
Flat panel	2.4–2.7	16	25	1.0×1.0×2.2	304×304×58	5.5	2.5	N-type
Flat panel	4.94–6.0	18.5, 22	10	1.0×1.0×2.2	304×304×58	5.5	2.5	N-type

# Airmux-200

## Broadband Wireless Multiplexer

Table 3. Supported Channel Bandwidths

Device	Frequency [GHz]	Antenna	Channel Bandwidth [MHz]
Airmux-200/ODU	2.4, high power	External	5, 10, 20
	2.4, FCC	External, integrated	5, 10, 20
	5.4, Canada	External, integrated	20
	5.4, high power	External, integrated	5, 10, 20
	5.8, FCC	External, integrated	5, 10, 20
Airmux-200/ODU-HE	2.4, FCC	External, integrated	5, 10, 20
	2.4, high power	External, integrated	5, 10, 20
	2.5, FCC (BRS)	External, integrated	5, 10, 20
	4.9, FCC	External, integrated	10, 20
	5.4, FCC	External, integrated (with combo model only)	5, 10, 20
	5.4, high power	External, integrated	5, 10, 20
	5.4, Canada	External, integrated (with combo model)	5, 10, 20
		External, integrated (without combo model)	20
	5.8, FCC	External, integrated (with combo model)	5, 10, 20
	5.8, WPC India	External, integrated (with combo model)	5, 10, 20
Airmux-200VS	2.4, FCC	External, integrated	5, 10, 20
	5.8, FCC	External, integrated	5, 10, 20



**Airmux-400/IDUE/4TDM**

Extended indoor unit with redundant wide range DC power supply (-20 to -60 VDC), 4 TDM ports, 2 FE ports, multiple clocks

**Note:** For AC power connection, order PS-E-AC adapter. See Optional Accessories.

**PoE UNIT FOR ETHERNET SERVICES****Airmux-POE/a**

Power over Ethernet (PoE) device

**Airmux-200/POE-DC/ >**

Power over Ethernet (PoE) device with DC plug

**Airmux-200/POE-8/a**

Indoor device with AC and DC power supply feeding 8 ODUs via PoE ports

**Airmux-200/OPOE**

Outdoor PoE device with AC power supply

- a** Power cable with matching plug:
  - ACUS** US
  - ACOC** Open-ended connector
  - DC** -20 to -60 VDC
- >** Power supply:
  - 48** -48 VDC power supply
  - 24** 24 VDC power supply

**Airmux-OPOE/DC**

Outdoor PoE device with wide-range DC power supply (-20 to -60 VDC)

**Note:** All PoE devices must be used with ODU-HE only.

**OPTIONAL ACCESSORIES****Airmux-ANT/\$**

External antenna supplied with 1m (3.3 ft) cable

**Legend**

- \$** External antenna, where **grid** is a grid antenna, **fp** is a flat panel antenna, and **dish** is a dish antenna:
  - F27-17/fp** 17dBi, 2.7-2.9 GHz, 2.7 GHz band
  - F2X-24/grid** 24 dBi, 2.3-2.9 GHz, 2.3, 2.4, 2.5, 2.7 GHz bands
  - F5X-18/fp** 18 dBi, 5.15-5.875 GHz, 5.3, 5.4, 5.8 GHz bands
  - F4.9-21/fp** 21 dBi, 4.90-5.35GHz, 4.9 GHz band
  - F5.X-22/fp** 22 dBi, 5.15-6.02GHz, 5.3, 5.4, 5.8, 5.9, 6.0 GHz bands
  - F2.4-24/grid** 24 dBi, 2.3-2.5 GHz, 2.3, 2.4 GHz bands
  - F2.5-24/grid** 24 dBi, 2.5-2.7 GHz, 2.5 GHz band
  - F4.9-27/dish** 27 dBi, 4.9-5.1 GHz, 4.9 GHz band
  - F5.X-28/fp** 28 dBi, 5.15-6.02 GHz, 5.3, 5.4, 5.8, 5.9, 6.0 GHz bands
  - F5.8-29/dish** 29 dBi, 5.72-5.85 GHz, 5.8 GHz band
  - F5.3-32/dish** 32 dBi, 5.25-5.35 GHz, 5.3 GHz band
  - F5.4-32/dish** 32dBi, 5.470-5.725 GHz, 5.4 GHz band
  - F5.8-32/dish** 32.5 dBi, 5.725-5.850 GHz, 5.8 GHz band

**Note:** For detailed description of external antennas, see Airmux-200 External Antennas data sheet at [www.radusa.com](http://www.radusa.com).

**Airmux-GSU/a**

Outdoor GPS-based synchronization kit (GSU, GPS antenna, 4.9 ft (1.5m) RF cable, CBL-Airmux-HSS/5 cable, PoE unit, and mounting kits for GSU and GPS antenna)

- a** Power cable with matching plug:
  - ACUS** US
  - ACOC** Open-ended connector
  - DC** -20 to -60 VDC

**Airmux-HSSU**

Hub site sync unit to connect 8 collocated outdoor units and 2 additional HSSUs

**CBL-Airmux-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

**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

**Airmux-PS-AC/a**

Power adapter for IDU, 90-240 VAC to 48 VDC

**Airmux-PS-E-AC/a**

Power adapter for IDU-E, 90-240 VAC to 48 VDC

**Legend**

- a** AC plug:
  - ACUS** US
  - ACOC** Open-ended connector

**Airmux-MHS-kit**

Cable and patch panel assembly (8 × RJ-45 Y-connections) for Monitored Hot Standby configuration

**Airmux-Lighting-Protection**

External lightning and surge protection kit, including outdoor lighting protection unit and 6.5 ft (2m) IDU-ODU cable

**RM-33**

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



## Airmux-200

## Broadband Wireless Multiplexer

Table 4. ODU/IDU Interoperability

		Airmux-200/ODU	Airmux-200/ODU-HE	Airmux-200VS
IDU	IDU/2TDM	✓	✓	X
	IDU/2ETH	✓	✓	✓
IDU-E		✓	✓	X
PoE		X	✓	✓

Table 5. Airmux Family Product Comparison

Features	 <b>Airmux-200 (Ver. 1.9.3)</b>		 <b>Airmux-400 (Ver. 2.6)</b>	
	Airmux-200	Airmux-200VS	Airmux-400/50	Airmux-400/100
Bandwidth (Mbps)	18	5/2	50 total (Ethernet + TDM)	100 total (Ethernet + TDM)
Services	2 Ethernet + 1, 2, 4 T1/E1	1 Ethernet	Up to 3 Ethernet + up to 16 T1/E1	Up to 3 Ethernet + up to 16 T1/E1
HSS	✓	✓	✓	✓
Maximum range (mi/km)	50/80	12.5/20	75/120	75/120

**International Headquarters**  
 24 Raoul Wallenberg Street  
 Tel Aviv 69719, Israel  
 Tel. 972-3-6458181  
 Fax 972-3-6498250, 6474436  
 E-mail market@rad.com

**North America Headquarters**  
 900 Corporate Drive  
 Mahwah, NJ 07430, USA  
 Tel. 201-5291100  
 Toll free 1-800-4447234  
 Fax 201-5295777  
 E-mail market@rad.com

**www.radusa.com** Order this publication by Catalog No. 803722  
 Order from: Cutter Networks Ph: 727-398-5252 / Fx: 727-397-9610



**data communications**

The Access Company  
 www.bestdatasource.com