Breeze ACCESS Subscriber Unit

SU-A-D/DV - 2.4-110/220 Series

SU-O-D/DV - 2.4-110/220 Series

Installation Manual

Revision B.1

August, 1999

Cat. No. 213059

Trade Names

BreezeACCESS, BreezeNET, BreezeLINK, BreezeVIEW and WIX are trade names of BreezeCOM Ltd. Other brand and product names are registered trademarks or trademarks of their respective companies.

Statement of Conditions

The information contained in this manual is subject to change without notice. BreezeCOM shall not be liable for errors contained herein or for incidental or consequential damages in connection with the furnishing, performance, or use of this manual or equipment supplied with it.

Warranty

In the following warranty text, "the Company" shall mean:

- BreezeCOM Inc., for products located in the USA.
- BreezeCOM Ltd., for products located outside the USA.

This Breeze ACCESS product is warranted against defects in material and workmanship for a period of one year from date of purchase. During this warranty period the Company will, at its option, either repair or replace products that prove to be defective.

For warranty service or repair, the product must be returned to a service facility designated by the Company. Authorization to return products must be obtained prior to shipment. The buyer shall pay all shipping charges to the Company and the Company shall pay shipping charges to return the product to the buyer within the USA.

The Company warrants that the firmware designed by it for use with the unit will execute its programming instructions when properly installed on the unit. The Company does not warrant that the operation of the unit or firmware will be uninterrupted or error-free.

Limitation of Warranty

The foregoing warranty shall not apply to defects resulting from improper or inadequate maintenance by the buyer, buyer supplied interfacing, unauthorized modification or misuse, operation outside of the environmental specifications for the product, or improper site preparation or maintenance. No other warranty is expressed or implied. The Company specifically disclaims any implied merchantable and fitness warranties for any particular purpose.

Information to User

Any changes or modifications of equipment not expressly approved by the manufacturer could void the user's authority to operate the equipment.

Safety Considerations

For the following safety considerations, "Instrument" means the Breeze-Access Subscriber Unit components and its cables.

Caution

To avoid shock, do not perform any servicing unless you are qualified to do so.

Grounding

Before connecting the instrument to the power line, verify that a suitable power cord is being used (the protective earth terminal of this instrument must be connected to the protective conductor of the power cord). The mains plug shall only be inserted in a socket outlet provided with a protective earth contact. If an extension cord (power cable) is used make sure it has a protective conductor (grounding).

Line Voltage

Before connecting this instrument to the power line, make sure that the voltage of the power source matches the requirements of the instrument:

- 207-253 VAC for SU-A/O 2.4-220
- 100-120 VAC for SU-A/O 2.4-110

Radio

The instrument transmits radio energy during normal operation. To avoid possible harmful exposure to this energy, do not stand or work for extended periods of time in front of its antenna. The long-term characteristics or the possible physiological effects of Radio Frequency Electromagnetic fields have not been yet fully investigated.

Antenna Installation and Grounding

Be sure that the Outdoor unit, the antenna and the supporting structure are properly installed to eliminate any physical hazard to either people or property. Verify that the antenna mast is grounded so as to provide protection against voltage surges and static charges. Make sure that the installation of the antenna and cable is performed in accordance with all relevant national and local building and safety codes.

FCC Notice

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. 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 the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

-Reorient or relocate the receiving antenna.

-Increase the separation between the equipment and receiver.

-Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

-Consult the dealer or an experienced radio/TV technician for help.

Changes or modifications to this equipment not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

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1. System Description

The BreezeACCESS IP Broadband Wireless Local Loop (WLL) system is a high-performance wireless access system. It allows ISPs and service providers to offer their subscribers high-speed wireless IP connectivity services. BreezACCESS employs wireless packet data switching technology, significantly more appropriate for IP-based services than older switching technology, and supports Voice over IP (VoIP) based on the H.323 protocol.

The BreezeACCESS 2.4 line of products use Frequency Hopping Spread Spectrum radios and operate in the 2.4 GHz ISM band allowing for license-free installation in most countries.

The difference between the SU-A-D/DV series and the SU-O-D/DV series is in the structure of the Outdoor unit: the Outdoor unit of the SU-A-D/DV line of products includes an integrated antenna, while the Outdoor unit of the SU-O-D/DV line of products does not include an antenna.

The Indoor units of both the SU-A-D/DV and the SU-O-D/DV series provide interfaces to user's equipment. In addition, the Indoor unit provides 48 VDC to the Outdoor unit.

The SU-A-D/DV and the SU-O-D/DV lines of products, through the Ethernet port, provide all the functionality required to connect workstation computers and other Ethernet equipment at the subscriber premises to the network. SU-A-DV and SU-O-DV lines of products provide the same data functionality, plus a telephone interfaces supporting regular telephones.

The SU-A/O-D/DV-2.4 110 lines of products operate with main voltage of 110 VAC, while the SU-A/O-D/DV-2.4 220 lines of products operate with main voltage of 220 VAC.

The **SU-A/O-D 2.4-110/220 series** includes the following products:

- SU-A/O-1D-2.4-110/220: supports a single Ethernet workstation/PC
- SU-A/O-8D-2.4-110/220: supports up to 8 Ethernet workstations/PCs
- SU-A/O-BD-2.4-110/220: supports a LAN (a bridge functionality)

The **SU-A/O-DV 2.4-110/220 series** includes the following product:

- SU-A/O-1D1V-2.4-110/220: supports a single Ethernet workstation and a regular telephone interface

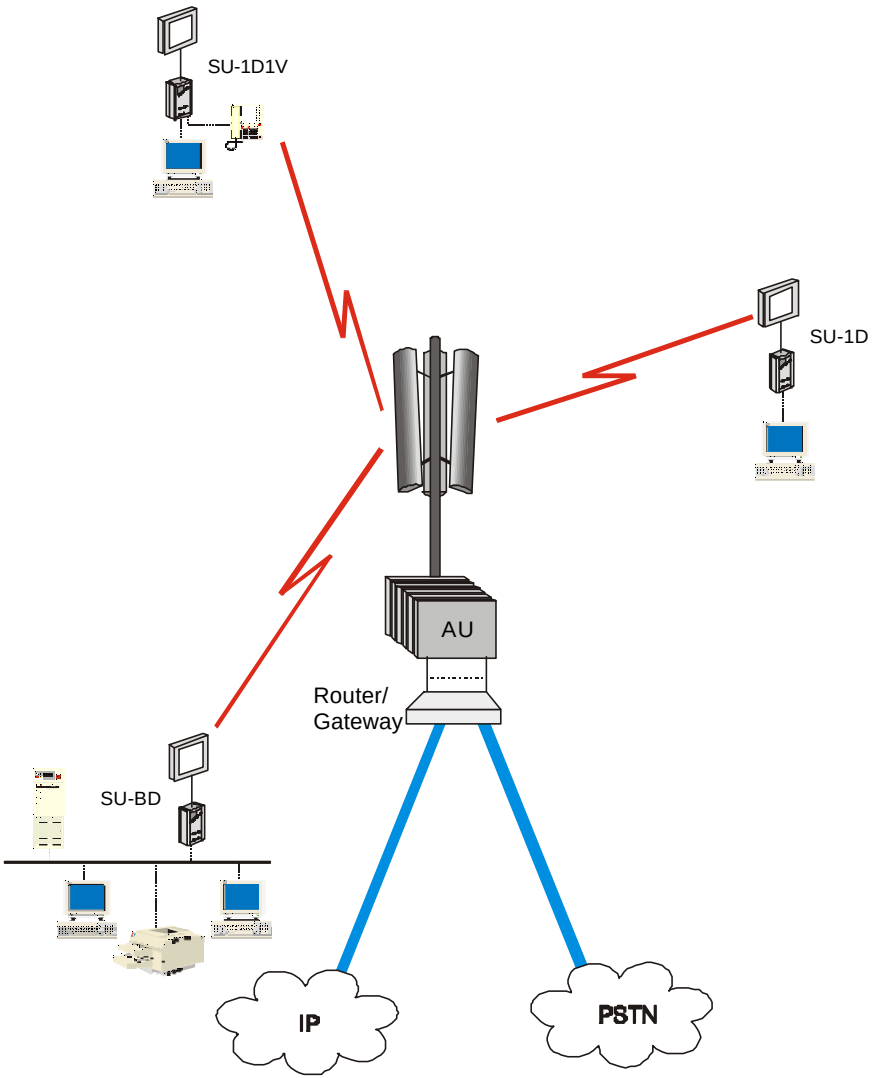

Figure 1. System Diagram

2. Packing List

- Indoor unit
- Outdoor unit (includes integrated antenna on SU-A models)
- 110/220 VAC Power Cord (open ended)
- Sun-guard (installed on the rear side of the Outdoor unit)
- Telephone cable (for the SU-A/O DV series only)

2.1 Other Optional Items Available from BreezeCOM

- Technician cable
- U-bolts size A kit for pole mounting (up to 2" pole)
- U-bolts size B kit for pole mounting (up to 3" pole)
- Wall mounting kit
- Sun-guard (optional for front side, SU-O only)
- Baseband cable (available in different lengths)
- A set of connectors for the Baseband cable (when not using the cables available from BreezeCOM. Refer to Appendix A for instructions on how to build the cable.)

2.2 Other Required Items

In addition to the items supplied by BreezeCOM, the following items must be available for the installation.

- Antenna for SU-O series line of products; refer to the Specifications on page 24 for information regarding the radio unit
- An RF cable connecting the antenna to the Outdoor unit (SU-O series only)
- Power mains cable termination plug per country of installation
- U-bolts or metal bands for pole mounting (if not using the optional U-bolts kit available from BreezeCOM)
- Ground cables with an appropriate terminal
- Ethernet cable (straight)

3. Installation Guidelines

This manual covers basic installation procedures. All the parameters not mentioned here can be configured remotely from the Access unit (refer to the Administration Manual for further information).

Follow the instructions in the appropriate column according to the products that you have purchased.

SU-O Series	SU-A Series
• Select an appropriate location for the Outdoor unit and the antenna (not supplied by BreezeCOM). The antenna should be mounted on a pole and should be installed where a direct line of sight with the Access Unit/Base Station antenna can be established. The antenna should be directed towards the Access Unit/Base Station and placed where it shall be convenient to align it to optimally aim towards the Access Unit/Base Station. • The Outdoor unit can be pole- or wall-mounted. Its location should be selected to allow easy access to the unit for installation and testing. The antenna and Outdoor unit should be installed near each other. • The Outdoor unit is designed for operation under outdoors environmental conditions. However, it is recommended to try to install it in a place where its exposure to direct sunlight will be minimal. • The unit is designed to withstand rain and humidity. However, it is not designed to	• Select an appropriate location for the Outdoor unit. The Outdoor unit should be mounted on a pole and should be installed where a direct line of sight with the Access Unit/Base Station antenna can be established. The front side of the unit should be directed towards the Access Unit/Base Station and placed where it shall be convenient to align it to optimally aim towards the Access Unit/Base Station. • The Outdoor unit can be pole- or wall-mounted. Its location should be selected to allow easy access to the unit for installation and testing. • The Outdoor unit is designed for operation under outdoors environmental conditions. However, it is recommended to try to install it in a place where its exposure to direct sunlight will be minimal.

SU-O Series	SU-A Series
withstand immersion in water and it should not be installed in a place where large quantities of water can accumulate. • The maximum length of the Baseband cable, between the Indoor and the Outdoor unit, should not exceed 30 meters. • Select an appropriate location for the Indoor unit. The Indoor unit should be installed in a place that is as close as possible to the exit point of the cable connecting it to the Outdoor unit. The selection of location of the Indoor unit should also take into account the need to connect it to a power outlet and to the user's PC (or LAN).	• The unit is designed to withstand rain and humidity. However, it is not designed to withstand immersion in water and it should not be installed in a place where large quantities of water can accumulate. • The maximum length of the Baseband cable, between the Indoor and the Outdoor unit, should not exceed 30 meters. • Select an appropriate location for the Indoor unit. The Indoor unit should be installed in a place that is as close as possible to the exit point of the cable connecting it to the Outdoor unit. The selection of location of the Indoor unit should also take into account the need to connect it to a power outlet and to the user's PC (or LAN).

Note: *The SU-O Outdoor unit comes with a sun-guard mounted on its rear side. This accessory can be removed by unscrewing the attaching screws, and can be installed on the front side if necessary. A second, optional sun-guard can be ordered for assembly on the front cover. The second sun-guard is recommended for installations where both the front and the back of the Outdoor unit may be exposed to direct sunlight. Contact your BreezeCOM representative for a parts catalog with the accessories that you can order.*

3.1 Installation Overview

Note: *It is highly recommended to complete configuration of the system parameters in a lab prior to the installation. Refer to page 17 for instructions on these settings.*

The typical installation scheme is depicted in Figure 2. The installation process should follow these general steps:

1. Mount the Outdoor unit. If you are installing an SU-O series, mount an external antenna (not supplied by BreezeCOM). Connect the Outdoor unit to the antenna (SU-O series only). Connect the Baseband and ground cables to the Outdoor unit.

2. Mount the Indoor unit. Connect the Baseband cable (from the Outdoor unit). Connect the Indoor unit to the AC mains via the power cable.

3. Verify optimal antenna positioning.

4. Verify connectivity to the Base Station.

5. Connect the Indoor unit Ethernet connector to the user's network/PC using an Ethernet Cable (a straight cable for connecting SU-A/O 1D or SU-A/O 1D1V to a PC, or for connecting SU-A/O BD or SU-A/O 8D to a hub).

6. Connect the telephone cord to the voice port and the POTS (DV products).

7. Connect an ASCII terminal to the MON port of the Outdoor unit(s) via the technician cable and configure basic system parameters.

Note: *The Indoor unit should be connected to the power source only after the Outdoor unit have been connected to it.*

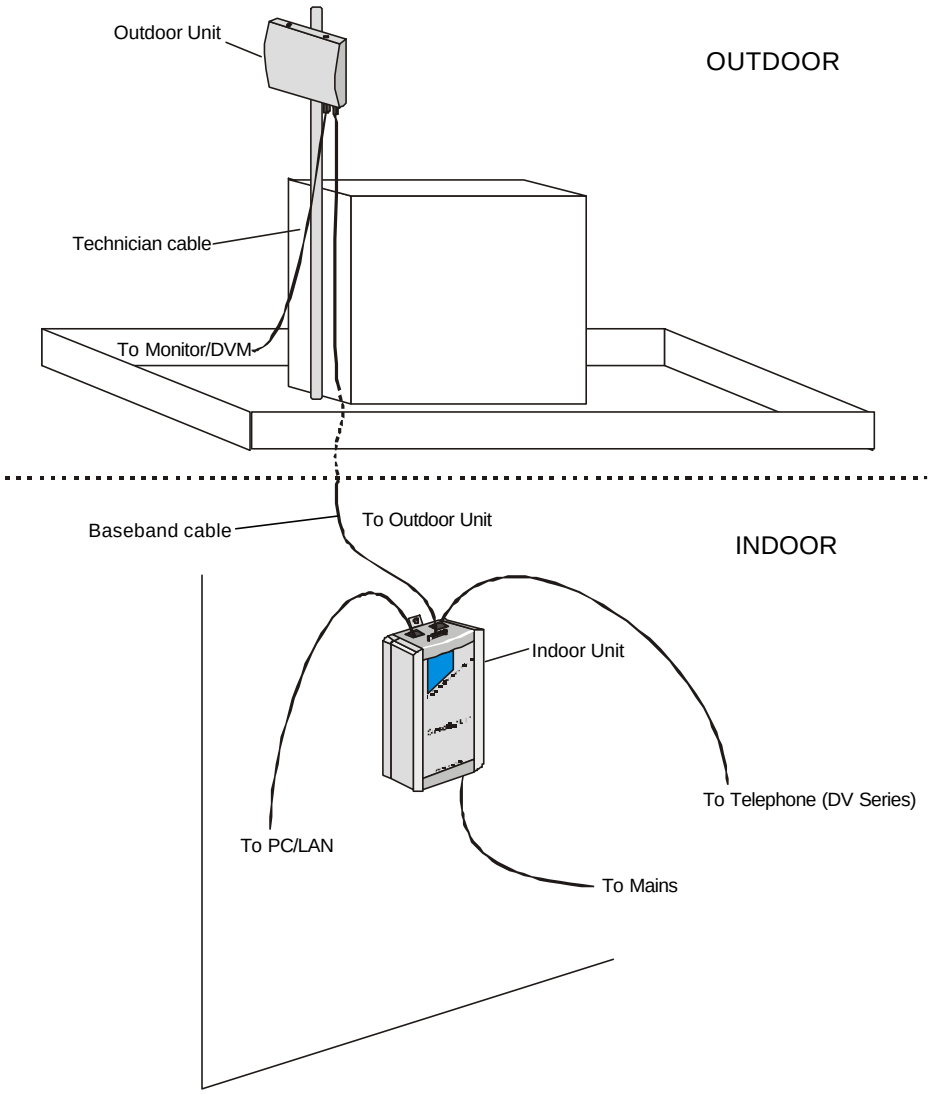

Figure 2. General Installation Scheme - SU-A Pole Mounting

4. Installing the Outdoor Unit - SU-O Series

Note: *When mounting the Outdoor unit, be sure to mount it with the Antenna connectors facing upwards.*

The Outdoor unit can be mounted in either of the following configurations:

- Pole mounted
- Wall mounted

4.1 Pole Mounting

Choose a location where the unit's exposure to direct sunlight is minimal. Avoid placing it in locations where water might accumulate. If necessary, install the sun-guard plates on the panels where exposure to sunlight is expected.

The installation holes on the rear side of the Outdoor unit (see Figure 3) can be used to pole mount the unit using one of the following options:

- U-bolt - size A (inside installation holes, up to 2" pole)
- U-bolt - size B (outside installation holes, up to 3" pole)
- Metal bands

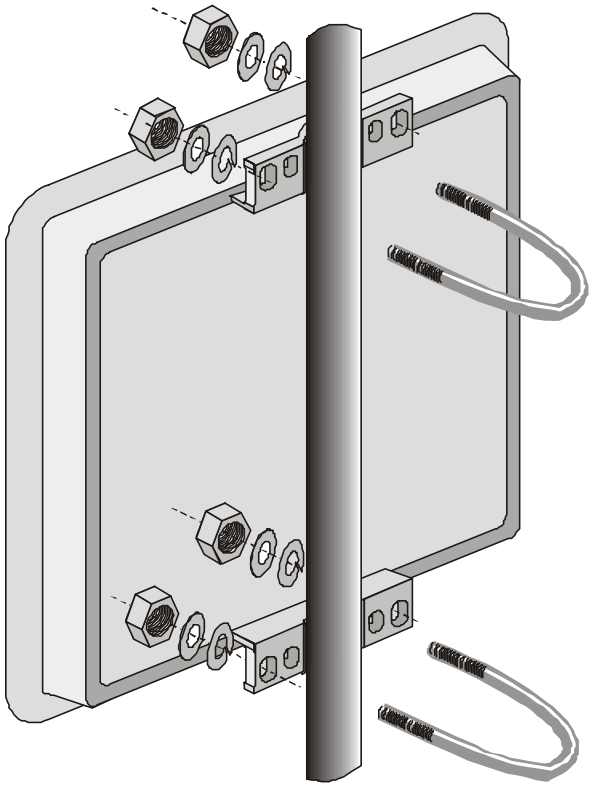

Figure 3. Pole Mounting Installation

4.2 Wall Mounting the Outdoor Unit

See the instructions included with the wall mounting kit.

4.3 Mounting the Antenna

Secure brackets to the antenna using screws, lock washers and nuts as appropriate. Mount the antenna on a pole and secure it using metal bands or U-bolts. Do not tighten the metal bands or U-bolts, in order to enable rotation of the antenna over the horizontal plane. The front of the antenna should be directed towards the Base Station/Access Unit. Use Vertical Polarization.

5. Installing the Outdoor Unit - SU-A Series

Note: *All SU-A Outdoor units are supplied with a sun-guard assembled on the rear panel of the unit.*

The SU-A Outdoor unit should be installed on a pole to allow optimal alignment. Use the installation holes (see Figure 3) to pole mount the unit using one of the following options:

- U-bolt - size A (inside installation holes, up to 2" pole)
- U-bolt - size B (outside installation holes, up to 3" pole)
- Metal bands

5.1 Connecting the Baseband, Antenna (SU-O) and Ground Cables

The Baseband and Ground cable connectors are located on the bottom panel of the Outdoor unit, shown in Figure 4. The Antenna connector is located on the top panel of the SU-O series Outdoor unit, shown in Figure 5.

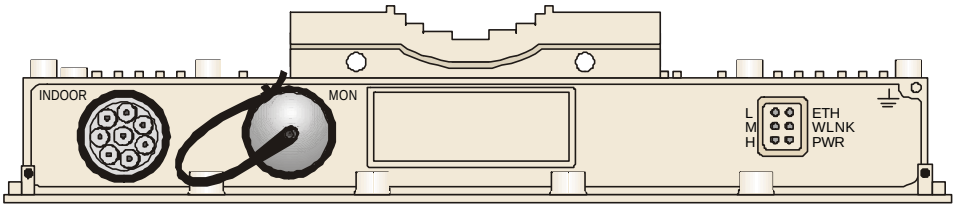

Figure 4. Outdoor Unit Bottom Connection Panel

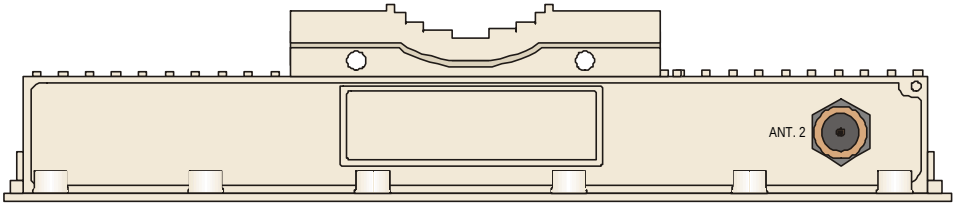

Figure 5. Outdoor Unit (SU-O) Top Connection Panel

1. If you are installing an SU-O series, connect the antenna cable between the Outdoor unit and the antenna.

2. Connect one end of the ground cable to the Outdoor unit bottom panel and connect the other end to a good ground connection.

3. Connect the Indoor unit to Outdoor unit Baseband cable, supplied with the access unit, to the appropriate connector. Appendix A provides instructions on how to prepare this cable.

6. Installing the Indoor Unit

1. Remove the wall mounting bracket clipped to the rear of the Indoor unit and mount the Indoor unit on a wall as shown in Figure 6.

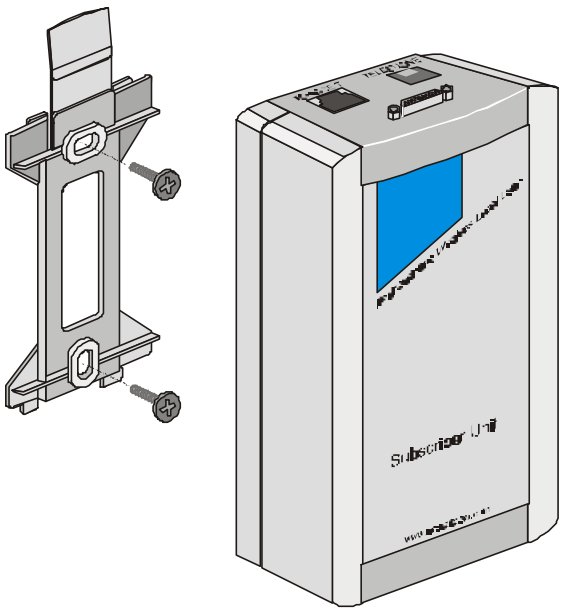

Figure 6. Wall Mounting the Indoor Unit

2. According to specific conditions, route the Outdoor unit to Indoor unit Baseband cable into the house/office so that it shall conveniently reach the Indoor unit in such a way as to ensure minimal interference, leaving some

spare. Connect the Baseband cable to the Radio connector, located on the front panel of the Indoor unit shown in Figure 8.

3. Connect the power cord to the unit's port connector, located on the rear panel shown in Figure 7. Connect the other end of the power cord to the AC mains.

Note: *Prepare the other end of the power cord with a power plug appropriate to the country in which the unit is being installed. The color codes of the cable are:*

brown	*phase ~*
blue	*neutral 0*
yellow/green	*grounding* ⏚

The factory set voltage of the Indoor unit is marked appropriately on the rear panel of the unit.

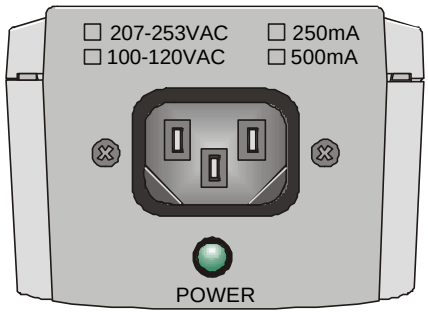

Figure 7. Indoor Unit Rear Panel

4. Verify that the LED, located on the rear panel, is ON indicating that the 48 VDC is not shorted.

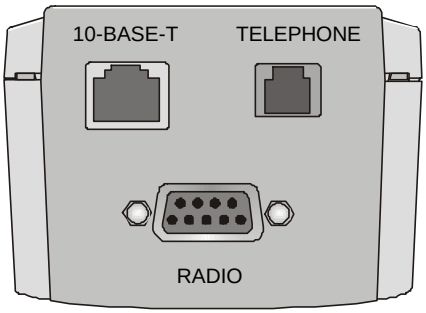

Figure 8. Indoor Unit Front Panel

Note: *Only units with the DV option have the Telephone port.*

5. Connect a PC (SU-A/O 1D or SU-A/O 1D1V) or a hub (SU-A/O 8D or SU-A/O BD) to the 10-Base T connector, located on the front panel of the Indoor unit. The cable connection should be straight.

6. Use the telephone cord to connect the Telephone port to the user's telephone (units with DV option only).

Note: *The length of each of the cables connected to the user's equipment, together with the length of the Baseband cable, should not exceed 100 meters.*

7. Aligning the Antenna

Note: *Antenna alignment is possible only after the Access unit you wish to associate with operates.*

To align the antenna, you can either use a DVM or view the Received Signal Strength Indication (RSSI) on the Monitor.

7.1 Aligning the Antenna Using a DVM

1. Connect the technician cable to the Monitor port on the bottom panel of the Outdoor unit.
2. Connect a DVM (Digital Voltmeter) to the two wires in the technician cable.
3. Move the antenna left and/or right until you reach the point of maximum RSSI reading. RSSI readout range is 1.50 to 3.30 volts (the higher the better). Make sure that all the time, the front of the antenna faces the general direction of the Base Station so as not to use the back lobe rather than the front lobe of the antenna for tuning.
4. For proper operation the RSSI reading should be at least 2 volts. If maximal reading is lower try to improve it through placing the antenna higher or in a different location.

Note: *The DVM reading might be inaccurate due to possible reception of energy from other devices transmitting energy in the 2.4GHz ISM band. When in doubt, verify performance using the Print-Per-Hop Statistics that is based on measurement of the desired signal only.*

7.2 Aligning the Antenna Using the Site Survey Menu

1. To use the *Site Survey* menu configure the *ESSID* parameter (refer to Section 8.4).
2. Connect the terminal to the Outdoor unit using the technician cable.
3. From the main menu type 3 to access the *Site Survey* menu. Type 3 to access the *Print Per-Hop Statistics* selection screen. Type 1 to display RSSI readouts per frequency. In order to update the screen press **Enter** twice.

```
Site Survey
===========
1 - Traffic Statistics
2 - Wireless Management Statistics
3 - Print Per-Hop Statistics
4 - TCP/IP Statistics
5 - VLAN Statistics
6 - Memory Usage Statistics
7 - Average RSSI Continues Display (SU only !)
8 - MAC Address database
9 - Voice Statistics
A - Call Management Statistics
```

Figure 9. Site Survey Menu

4. Move the antennas until the maximum received signal strength is attained. As you align the antennas, you will see that the RSSI (received signal strength indicator) continually increases until it reaches a certain level after which the RSSI begins to decrease. This is the maximum attainable RSSI level indicating optimum receive antenna alignment.
5. For proper operation the RSSI reading should be at least 75 units. When maximal reading is lower try to improve it through placing the antenna higher or in a different location.
6. Tighten the U-bolts (or metal band) over the antenna to secure it to the pole.

8. Configuring System Parameters

After completing the installation process for both the Outdoor and Indoor units, as described in the preceding sections of this manual, proceed with alignment of the antenna and configuration of the basic system parameters.

For this configuration process, you will need to connect an ASCII terminal with terminal emulation software (e.g., Procomm or Windows 95 HyperTerminal) to the MON port of the Outdoor unit(s) via the supplied technician cable.

8.1 Setup for PC Terminal Emulation Program

Use the following setup for the ASCII terminal connection:

Baud rate	9600
Data bits	8
Stop bits	1
Parity	None
Flow Control	None
Connector	Available Com Port

Note: *Optionally, the product can be configured using Telnet over the Ethernet port, after setting IP address. For further information refer to the Administration Manual.*

8.2 Parameters

The following system parameters must be configured for each specific installation:

- IP Address
- Subnet Mask
- Default Gateway Address
- ESS ID
- Max. Data Rate

At the end of the configuration process access rights setting should be changed to "Installer". It is recommended to configure system parameters at the laboratory prior to the actual installation.

Note: *You should select Reset Unit in the Station Control Sub-menu for the changes to take effect.*

8.3 IP, Subnet Mask and Default Gateway Address Configuration

1. After connecting the ASCII terminal to the Outdoor unit, press **Enter** to access the BreezeACCESS Monitor main screen.

```
BreezeACCESS (SU-A/O)
Official Release Version - 1.3.5
Release Date:  Wed Apr 28 16:23:57 1999
BreezeACCESS Monitor
====================
1 - System Configuration
2 - Advanced Settings
3 - Site Survey
4 - Access Control
BreezeACCESS >>>
```

Figure 10. Breeze Access Monitor Main Menu

2. Type 1 to access the *System Configuration* sub-menu.

```
System Configuration
====================
1 - Station Status
2 - TCP\IP and SNMP Parameters
3 - Wireless LAN Parameters
4 - Bridging
5 - Station Control
BreezeACCESS >>>
```

Figure 11. System Configuration Menu

3. Type 2 to access the *TCP/IP and SNMP Parameters* sub-menu.

```
IP and SNMP Parameters
======================
1 - IP Address
2 - Subnet Mask
3 - Default Gateway
    Address
4 - SNMP Traps
5 - TCP Parameters
S - Display Current Values
```

Figure 12. IP and SNMP Parameters

4. Type 1 to access the *IP Address* selection screen. Type in the required IP Address determined by the system manager. Press **Enter** to return to the *IP and SNMP Parameters* menu.

5. Type 2 to access the *Subnet Mask* selection screen. Type in the required Subnet mask.

6. Press **Enter** to return to *IP and SNMP Parameters* menu.

7. Type 3 to access the *Default Gateway Address* selection screen. Type in the required gateway address. Press **Enter** to return to *IP and SNMP Parameters* menu.

8.4 ESSID Configuration

1. Press **Esc** to return to the *System Configuration* menu.

2. Type 3 to access the *Wireless LAN Parameters* menu.

```
Wireless LAN Parameters
=======================
1 - Hopping Sequence (Shift) (AU only)
2 - Hopping Sequence Offset
3 - Hopping Sequence Set
4 - ESS ID
5 - Max. Data Rate
6 - Transmit Diversity
7 - Mobility
8 - Load Sharing
9 - Long Range
A - Prioritized Channels
B - MIR And CIR Parameters
S - Display Current Values
BreezeACCESS >>>
```

Figure 13. Wireless LAN Parameters Menu

3. Type 4 to access the *ESS ID* selection screen.

4. Type in the required ESS ID.

8.5 Max. Data Rate Configuration

1. Press any key to return to the *Wireless LAN Parameters* menu.

2. Type **5** to access the *Max. Data Rate* selection screen.

   a) Select 3 (3Mbps) if the RSSI reading, when using the *Site Survey* menu, is higher than 2.5 Volts (93 units).

   b) Select 2 (2Mbps) if the RSSI reading, when using the *Site Survey* menu, is between 2.2 Volts and 2.5 Volts (83 to 93 units).

c) Select 1 (1Mbps) if the RSSI reading, when using the *Site Survey* menu, is lower than 2.2 Volts (83 units).

8.6 Change Access Rights and Reset Unit

1. After properly configuring all system parameters, the access right should be changed to USER to prevent users from unauthorized tampering with system parameters. Press **Esc** three times to return to the main menu. Type 4 to access the *Access Control* menu. Type 1 to access the *Change Access Rights* menu. Type 0 to select Installer access rights allowing users only reading the configured parameters.

2. Press **Esc** twice to return to main menu. Type 1 to access the *System Configuration* menu. Type in 5 to access the *Station Control* sub-menu. Type 1 to access the *Reset Unit* sub-menu. Type in 1 to reset the unit so that new configuration settings are applied.

Note: *Should you make any mistake during configuration, or should you encounter any problem associated with system configuration parameters, you may configure the unit back to the factory defaults.*

Select 2 in the Station Control menu to access the Set Factory Defaults menu and than Type in 1 to load the default values. Select 1 in the station control menu to access the Reset Unit, then type 1 so that the unit will be reset in order for the factory defaults to take effect.

8.7 Voice Port Setup

Note: *This setting only applies to DV series units that have a telephone interface.*

The specific configuration sequence varies according to the equipment (gateway and gatekeeper) that is used by the Service Provider. For further information on the Voice Port setup refer to the Telephony Application Manual.

9. Initial Operation

After completing the installation as described above, the system starts operation. To verify correct operation, view the LED panel located on the bottom panel of the Outdoor unit, as shown in Figure 14.

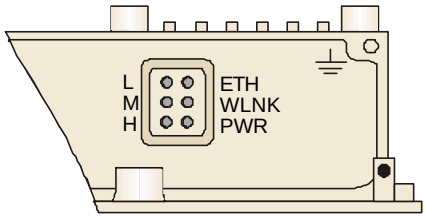

Figure 14. Outdoor Unit LEDs

The following table lists the various LED states.

Name	Description	Functionality	
PWR	Power supply	On – After successful power up Off – Power off	
WLNK	Synchronization	Off – No Synchronization On – Synchronization with Access unit	
ETH	Ethernet activity	Blinking – Reception of data from Ethernet LAN Off – No reception of data from Ethernet LAN	
QLT	Quality of received RF signal	L ○ M ○ H ○	very low quality reception or not synchronized with Access Point less than -81 dBm
		L ● M ○ H ○	low quality reception (usually enabling 1Mbps traffic) from -81 to -77 dBm
		L ● M ● H ○	medium quality reception (usually enabling 2 Mbps traffic) from -77 to -65 dBm
		L ● M ● H ●	high quality reception (usually enabling 3 Mbps traffic) greater than -65 dBm

10. Specifications

Radio

Frequency	2.4 GHz ISM Band	
Operation and Standards	FHSS, ETSI, ETS 300 328; FCC Part 15	
Operation mode	Time Division Duplex	
Output Power (SU-O)	USA (FCC): 17 dBm, Europe (ETSI): 0dBm	
Antenna Gain (SU-A)	16dBi	
Transmitted Power (SU-A)	FCC: 33dBm EIRP ETSI: 20dBm EIRP, max.	
Sensitivity (dBm, BER $1E10^{-6}$)	1Mbps 2Mbps 3Mbps	-81 -75 -67
Data Rate	3Mbps max	
Modulation	Multilevel GFSK: 2 (@ 1Mbps), 4 (@ 2Mbps) or 8 (@ 3Mbps) FSK	

Management

CIR	Committed Information rate; Symmetrical/Asymmetrical CIR support
MIR	Maximum Information Rate (burst rate) limitations
Class of Service	CIR/MIR by customer; Prioritize transport by customer
System Management	SNMP agent, Telnet
Security	Authentication based on RC-4
Software	Upgradeable (download)

Voice Communication (DV series only)

Protocol	H.323 Voice over IP compliant
Compression	G.723 6.3 Kbps compression, G.729 8Kbps compression, G.711 64Kbps transparent
Echo Cancellation	G.165

Interfaces

	Outdoor Unit	**Indoor Unit**
RF	N Type, male (SU-O)	
Ethernet		10Base-T (RJ-45)
Telephone (DV products)		RJ-11 (POTS)
Monitor	Mini Sealed connector, 5 pin, female	
Power		AC power oulet
Outdoor to Indoor unit	Mini Sealed connector, 8 pin, male	9-pin D-type, female

Indicators

Outdoor Unit	**Indoor Unit**
Power, Ethernet, Sync, quality	Power

Electrical

Outdoor Unit	**Indoor Unit**
48 VDC from Indoor Unit	110/220 VAC

Mechanical

Outdoor Unit	**Indoor Unit**
31cm x 31cm x 4.7cm (SU-O) 31cm x 31cm x 9.6cm (SU-A)	15.4cm x 8.4cm x 5.6cm

Environmental

	Outdoor Unit	**Indoor Unit**
Operating Temperature	-40^0C to 50^0C	0^0C to 40^0C
Operating Humidity	Weather protected	5%-95% non condensing

Appendix A. Preparing the Indoor Unit to Outdoor Unit Baseband Cable

To assist in assembling the Indoor-Unit-to-Outdoor Unit Baseboard cable, use the following tools.

1. For Bulgin Mini Sealed connector:

   - Bulgin Contact Insertion Tool (P/N SA3150)
   - Bulgin Crimping Tool (SA 2800)

   For further information, refer to Bulgin's Internet site at www.bulgin.co.uk.

2. For D-Type 9-pin connector:

   - Amphenol hand crimp tool 17 D 440 SP
   - Amphenol contact insertion and removal tool 17 D 438 SP

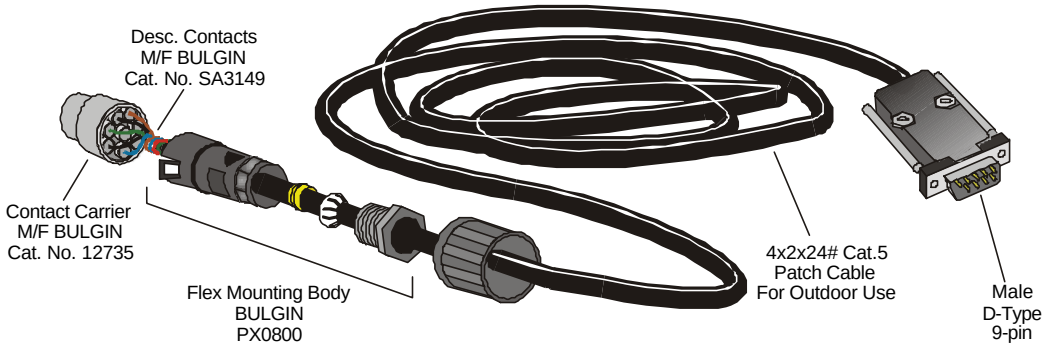

Figure 15. Assembling the Indoor-Unit-to-Outdoor Unit Baseband Cable

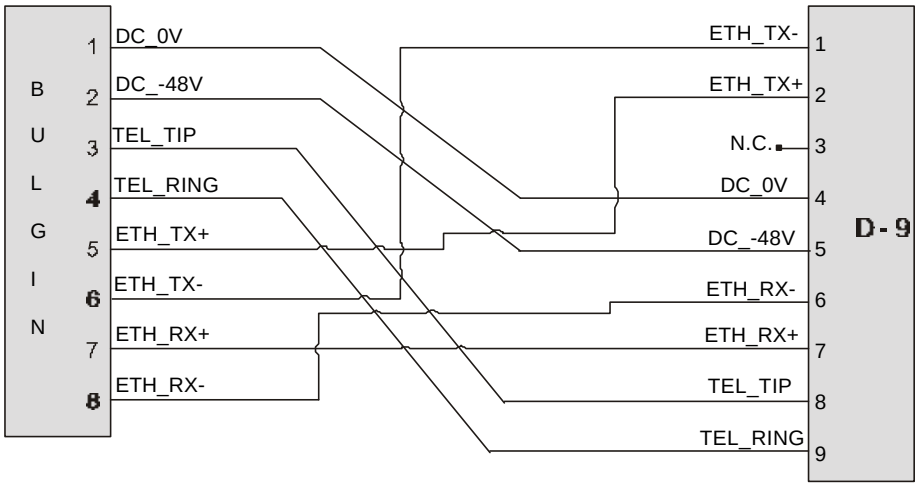

Figure 16. Bulgin to 9-Pin D-Type Pin Assignments

Table 1. Bulgin to 9-Pin D-Type Pin Assignments

D-9	BULGIN	Description
1	6	ETH_TX-
2	5	ETH_TX+
3		N.C.
4	1	DC_0V
5	2	DC_-48V
6	8	ETH_RX-
7	7	ETH_RX+
8	3	TEL_TIP
9	4	TEL_RING