

**AIRWAY™**

**11 Mbps Network  
User Guide**

**PRELIMINARY**

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AirWay™ TransPort User Guide  
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# Introduction

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## *About This Manual*

This User Guide provides detail information on installing, using, and maintaining your AirWay 11 Mbps (Megabits per second) Network. It contains the following sections:

- Getting Started - an introduction to the AirWay 11 Mbps Network system, requirements for using the system, and suggestions for choosing a location.
- Installing TransPort - how to connect the TransPort unit.
- Adding computers to the Network - a description of adding computers to your wireless network including installing cards and the software
- Monitoring the Network - how to interpret the TransPort troubleshooting signals
- Managing Your Computers - how to monitor the communication link, view your network setting, and configure the network.
- “Managing TransPort” - how to manage the settings for TransPort and the AirWay 11 Mbps Network
- Attaching TransPort to the Controller - how to attach TransPort to the 900 MHz Controller
- Troubleshooting - resolutions to typical network problems
- Frequently Asked Questions - answers to often asked questions about the network system
- Glossary - definitions of technical terms used in this guide
- Appendix - with Regulatory Statements and wall-mounting procedures

## ***Getting Help***

If you need help installing or using your AirWay system, you can refer to the following resources:

- The Troubleshooting section in this manual
- Toll-free Telephone Support; call 1-888-WHY-WIRE (949-9473)
- Internet Support at <http://www.AirWaySystem.com>

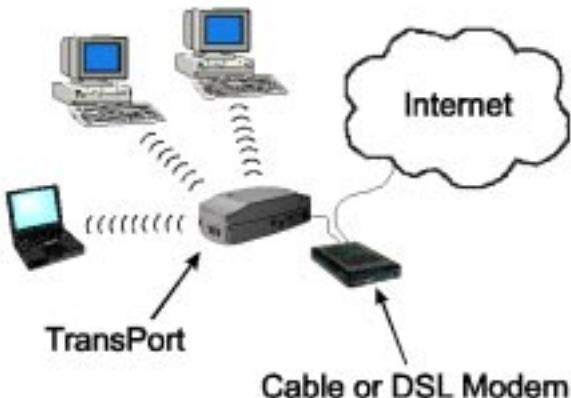
# Getting Started

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## *About the 11 Mbps Airway Network*

The AirWay 11 Mbps Network is a wireless networking product that allows you to:

- Build a fast, flexible, secure Wireless Local Area Network (WLAN) in your home or small business.
- Connect WLAN clients to a high-speed Internet connection or an existing high-speed wired (Ethernet-based) LAN.
- Easily add new computers to the network or move existing computers around without the trouble and expense of running new cables between the computers and a network hub.



## ***Overview of the Wireless Network***

The AirWay 11 Mbps Network enables you to connect to a broadband Internet connection (DSL or cable) and to transmit data wirelessly at high speed (11 megabits per second.) Many of you are familiar with a wired LAN (Local Area Network) that is in many offices. In that environment, a network server is connected by wires to computers called *clients*<sup>1</sup>; this is *client/server* architecture. The server manages the data that is transmitted over the network. This setup allows computers to share data between computers and other connected devices, such as printers. AWLAN is like a LAN except that it uses radio signals instead of wires.

### ***Internet Gateway***

In the AirWay 11 Mbps Network, TransPort acts as the Gateway between the Internet and the wireless network. Instead of a *server*, it acts as an *access point* or base station, which transmits data by radio signals between the networks. In this way, a computer is connected to both networks, wired and wireless.

TransPort can be configured either as a *gateway* so that the wired network, the Internet, connection can be made directly to the personal computers. The Internet connection is shared among the computers on the WLAN. As a gateway, TransPort acts as a firewall and a network address translator (NAT). It hides your internal *IP addresses* on your WLAN from the external network. When you elect not to share the Internet and use TransPort as a bridge, then the Internet connection is not filtered nor are IP addresses distributed to the WLAN computers.

### ***Ad Hoc Network***

You can also configure the network to operate in an *ad hoc* mode. This type of network operates from one device to another without TransPort. This setup could be useful in a meeting or outside the office where you want to make use of the wireless communication between computers.

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1. All italicized words in this section are defined in the “Glossary” on page 51.

## ***Roaming***

You also have the ability to *roam*, which means you can take your computer with a network card from one TransPort area to another area. You must use the same Service Set Identifier (SSID) and the same encryption method and code for all the units in the network. If you remove your computer from one network and go to another without the same SSID, then you have to reset the identifier so that the client can communicate with the access point.

# ***Before You Begin***

## ***Requirements***

Each computer in your AirWay 11 Mbps Network must have the following:

- Microsoft Windows 95/98, NT4, or 2000
- A CD-ROM drive
- An external DSL (Digital Subscriber Line) or cable modem, or other high speed modem with a 10BaseT line
- An Internet browser: Microsoft Internet Explorer or Netscape Navigator, version 4.0 or later

If a desktop computer is used, you also need an open slot for the PCI card, or if a laptop computer is used, you need one that supports a 3.3 VDC network card (not a 5.0 VDC).

## ***Checking Parts***

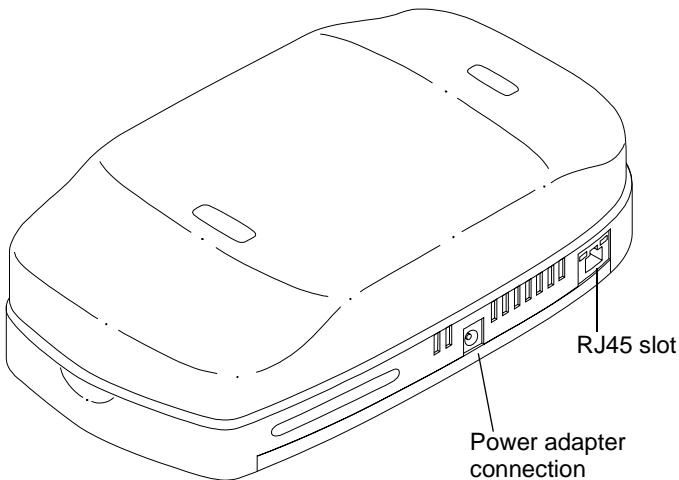
Your AirWay 11 Mbps Network package contains the following items:

- AirWay TransPort (1)
- Power Supply Adapter (1)
- 9' Ethernet RJ-45 Cable (1)
- Sheet of self-adhesive protective feet for TransPort
- Printed User Documentation

If any parts are missing or broken, contact your equipment supplier.

## ***Learning about Your TransPort***

Refer to the following illustration to become familiar with your TransPort.



## ***Choosing a Location***

Remember the following points when deciding where to place TransPort.

- Do not install TransPort in the following locations:
  - Attics, garages, or other temperature-extreme locations
  - On top of or immediately adjacent to a TV, VCR, stereo system, or computer, or beside a window facing a street with heavy traffic.
  - Near radiators or microwave ovens, or in direct sunlight.
  - Where it might be subject to water splash, dust, or mechanical vibration.
- On a metal surface or near metal obstructions TransPort must be located within 6 feet of an electrical outlet that is not controlled by a wall switch. If connecting to a wired Ethernet LAN, you must also place TransPort within 9 feet of a Ethernet jack.

- In general, all computers in your WLAN must be within 100 - 300 feet of TransPort. Although radio waves pass quite readily through most walls as well as glass, they will not pass through metal. If your walls or floors contain metal, or there are metal structures between TransPort and network computers, you will notice degraded service.
- Per FCC guidelines on radio frequency radiation exposure, this product should not be installed within 20 cm (7.8 inches) of the user or other nearby individuals.
- Place TransPort where you can easily see the light indicators on the side of the unit so that you can monitor the transmission.

## ***Safety Instructions***

When using your telephone equipment, basic safety precautions should always be followed to reduce the risk of fire, electric shock, and injury.

1. Read and understand all instructions.
2. Follow all warnings and instructions marked on the product.
3. Do not use this product near water or when you are wet (for example, near a bath tub, kitchen sink, laundry tub, wash bowl, wet basement, or swimming pool). Unplug this product from the wall outlet before cleaning. Do not use liquid cleaners or aerosol cleaners. Use a damp cloth for cleaning. Do not plug the product back in until it is thoroughly dry.
4. This product should be operated only from the type of power source indicated on the marking label. If you are not sure of the type of power that is supplied to your location, consult your dealer or local power company.
5. Do not overload the wall outlets or extension cords because this can result in the risk of fire or electric shock.
6. Do not allow anything to rest on the power cord. Do not locate this product where the cord will be abused by people walking on it.

7. This product must not be installed in an attic, garage or other temperature-extreme environment.
8. To reduce the risk of electric shock, do not disassemble the equipment. Opening or removing covers may expose you to dangerous voltages or other risks. Incorrect reassembly could cause electric shock. If service or repair work is required, take the unit to a qualified technician.
9. Unplug this product from the wall outlet and refer servicing to qualified service personnel under the following conditions:
  - The power cord is damaged or frayed.
  - Liquid has been spilled into the product.
  - The product has been exposed to rain or water.
  - The product has been dropped or the enclosure has been damaged.
  - The product exhibits a distinct change in performance.
  - The product does not operate normally by following the operating instructions.

### ***Use with medical devices***

This device operates in the frequency range of 2.4 GHz and has a power output level that ranges from 0.001 to 0.10 watts. Before installing and using the device in a location where personal medical devices such as pacemakers, etc., are in use, consult the manufacturer of the medical device to determine if it is adequately shielded from external RF (radio frequency) energy in the indicated range. Do not use this unit in health-care facilities when regulations posted in the area so indicate. Hospitals or health-care facilities may be using equipment that could be sensitive to external RF (radio frequency) energy.

### ***Preventing static electricity damage***

The components inside your system are extremely sensitive to static electricity, also known as electrostatic discharge (ESD). Static electricity can cause irreparable damage to your system. You can help prevent such damage by taking the following precautions:

- Avoid touching circuit board for electronic components.

- Avoid placing static-causing surfaces such as plastic and Styro-foam near your unit.
- Avoid sliding the unit across any surface.

# Installing TransPort

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## *Setting up Your Network*

Setting up the AirWay 11 Mbps Network consists of installing the TransPort unit and then configuring the software for the computers and TransPort. The procedure for the initial setup includes the following steps:

1. Connect TransPort to the modem with the supplied cable and to the power source.
2. Install a AirWay network card into the first client computer. (This card is sold separately from TransPort.)
3. Install the software for the first client computer and configure the settings for TransPort.
4. Install cards and the software for the remaining clients computers of the WLAN.

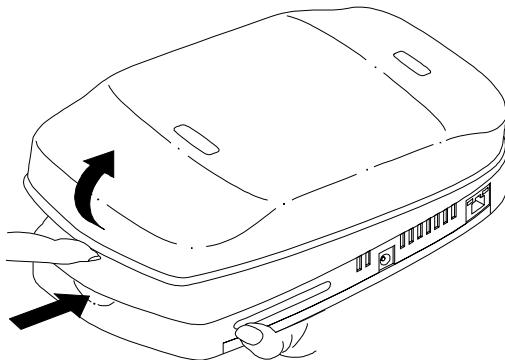
This chapter and the next, “Adding Computers to the Network” on page 13, describe this process.

## *Connecting TransPort*

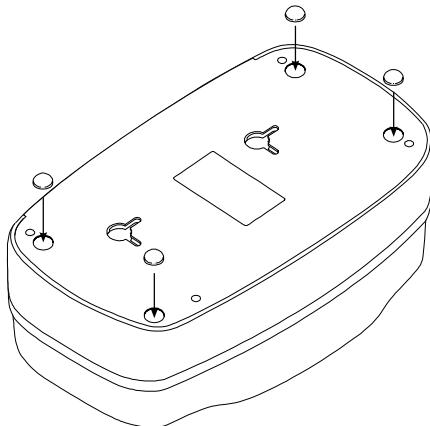
**1** Record the TransPort serial number. You will need this information during the software installation process, for configuration purposes, and for support calls.

The serial number is located both on the label beneath the cover and on the bottom of the unit. Refer to the accompanying illustrations for information on removing the cover and

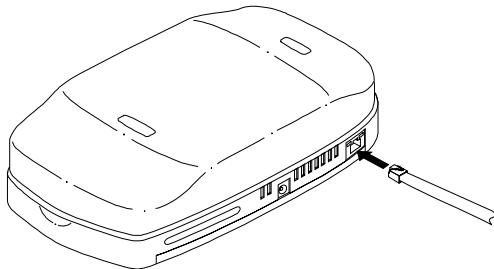
locating the serial number. Be sure to replace the cover after recording the serial number.



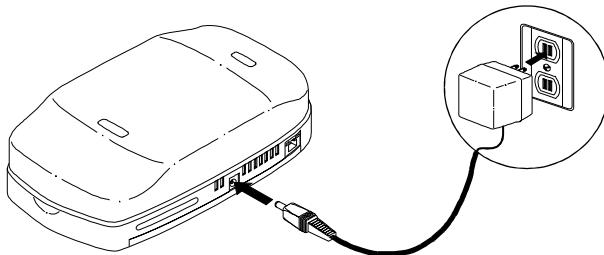
**2** Affix the included self-adhesive protective feet to the underside of the TransPort module.



**3** Connect the provided Ethernet cable to your external DSL (Digital Subscriber Line) or cable modem and plug it into the Transport RJ45 connector.



**4** Connect the power adapter to the TransPort module and plug the adapter into a standard 120V electrical outlet.



**5** Make sure that the yellow and green lights are on. If the lights are not on, see “Troubleshooting” on page 46 to resolve the problem.

Having connected your TransPort unit, you can now build your wireless network by installing cards and software for each computer of your network.

# Adding Computers to the Network

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After you have connected TransPort, you can add computers to your wireless AirWay 11 Mbps Network. To add a computer, you must complete the following steps:

1. Install network card (PCI or PCMCIA)
2. Install 802.11b Adapter driver and software
3. Set up the Internet Gateway for the first computer you add to the network. You do not need to do this step for subsequent computers you add.

 **Note:**

You may be asked for your Windows CD-ROM during software installation. To prevent software conflicts, be sure to use the same version of Windows that is currently installed on your computer.

## *Installing Network Cards*

### *Desktop Computer*

Use the following procedure to install a PCI (Peripheral Component Interconnect) card in a desktop computer.

- 1 Turn off and unplug your desktop computer.
- 2 Remove the computer case, then remove the slot cover from an empty expansion slot.
- 3 Insert the AirWay PCI card into the expansion slot, making sure that it is fully seated in the slot. Secure the card in place using the screw removed in the previous step.

- 4** Replace the computer case.
- 5** Connect the AirWay external antenna to the PCI card.
- 6** Plug in the computer and turn it on.
- 7** Install the AirWay 11 Mbps Network drivers and software.

## ***Laptop Computer***

Use the following procedure to install a network (PCMCIA) card in a laptop computer.

- 1** Turn off your laptop computer.

 **Note:**

You must have computer that supports a 3.3 VDC (Volts Direct Current) card. The AirWay PCMCIA card uses 3.3 VDC. Some older computers do not support this voltage; they support only 5.0 VDC. If your computer does not support 3.3 VDC, you will not be able to seat the cord in the PCMCIA card socket.

- 2** Insert the AirWay network card into the card slot of the laptop.
- 3** Turn on the laptop.

# ***Installing the Network Card and TransPort Software***

After you have installed the network card into your computer, Windows will detect the new card and the Add New Hardware Wizard appears. The Wizard walks you through the process of finding and installing a driver for the 802.11 adapter.

## **Note:**

This procedure describes installation with the AirWay network card and CD-ROM. To set up your client computers using non-AirWay 802.11 adapters, see “*Installation with Non-Airway Network Adapters*” on page 19.

Before you install your network software, you must have your Internet service provider supply you with information about your Internet connection. You need to know the type of Internet Gateway you have. You have three options: PPPoE (Point-to-Point Protocol over Ethernet), DHCP (Dynamic Host Configuration Protocol), and setting the IP address yourself. For a complete description of these options, see the Internet Gateway information on page 17.

- 1** On the Add New Hardware Wizard window, click *Next* twice.
- 2** Insert the AirWay CD-ROM into your CD-ROM drive.

## **Note:**

Make sure that the CD-ROM drive option is selected. If not, click the box to select it.

- 3** Click *Next* twice. Windows copies the files needed for the adapter. Wait until the Finish button appears on the Wizard window.
- 4** Click *Finish*.
- 5** When the System Settings Change window appears, click *Yes* to restart your computer. Once your computer restarts, you will set up the adapter.

## **Adapter Setup**

- 1** When the Welcome window appears, click **Next**. The PC-AP Software License Agreement appears.
- 2** Read the Agreement and click **Yes** to accept the conditions and to continue installation.
- 3** Enter the last eight digits of your TransPort serial number. This is your SSID (Service Set Identifier).

 **Note:**

In order to communicate with each other, all computers on the network and TransPort must have the same SSID.

- 4** Click **Next**.
- 5** In the Choose Destination Location window, click **Next** to accept the default location for the adapter configuration files.

 **Note:**

If you want to install the software in another folder, click **Browse** and select a new folder location. Then click **Next** on the Choose Destination Location window to install the software.

After the files have been copied, the Setup Complete window appears. Before you click **Finish** to restart your computer, make sure that your TransPort has been connected and that your computer is within range of it. Your computer has to verify its link to TransPort.

- 6** Click **Finish** to restart your computer again.

Your computer will restart and then automatically launch your default Web browser. Next, you will configure your Internet Gateway on TransPort using the Network Management Console.

## ***Configuring Your Internet Gateway on TransPort***

When your computer is on again, your default browser will automatically display the AirWay 11 Mbps Network Status page.

The Network Status page indicates whether you need to configure your TransPort. You must configure the Internet Gateway when you install software on the first computer of your network. You do not need to do this when you install software on subsequent computers.

Usually, you do not need to change any other settings for the AirWay 11 Mbps Network. The settings are automatically done for you. You can, however, change settings for your network by logging in as an administrator and using the Network Management Console. For further information about making changes, see “Managing TransPort” on page 32.

**1** On the Internet Gateway page, click the check box, ***Use your AirWay TransPort to share an Internet connection.***

- If checked, TransPort is used as an Internet gateway that protects the WLAN data and distributes IP addresses to computers on the network.
- If not checked, TransPort directly links the computers on the WLAN. In this mode TransPort does not act as a Gateway to the wired network and does not distribute IP addresses.

**2** If you are sharing your Internet connection, then select the correct option for the Gateway and enter your service provider information into the correct boxes. The table below describes each of your options.

Option	Description
PPPoE	Point-to-Point Protocol over Ethernet; a format for transmitting data over an Ethernet line. This format requires a login and password.
DHCP	Dynamic Host Configuration Protocol; a method for assigning IP addresses dynamically, which means that every time you connect to the network the IP address can change.
Manual	This option allows you to enter the configuration settings

**3** Click one of the Configure options. If your Internet connection is DHCP (Dynamic Host Configuration Protocol), you do not need to enter any further information. Go to step 5.

**4** If you click the option for PPPoE Server or for Configure Manually, type the information into the text boxes.

- For the PPPoE (Point-to-Point Protocol over Ethernet) server, type your ISP (Internet Service Provider) user name and your password in the ISP Password and Confirm ISP Password boxes.
- For the Configure Manually option, you must type numbers into all the text boxes that apply to your Internet connection. The Internet settings (addresses) are
  - IP Address - Internet Protocol address, which is the number of a computer or device on the Internet
  - Subnet Mask - a filter that determines the sub-network that an IP address belongs to
  - Default Gateway - the entry point of the network
  - Primary and Secondary DNS - Domain Name System, which translates domain names (such as [www.AirWaySystem.com](http://www.AirWaySystem.com)) into IP addresses

**5** Click *Submit Changes*.

TransPort is restarted, so you will lose connection to your network. Shortly, the connection is re-established and the Network Status page is displayed. It confirms the settings that you have made.

Repeat the installation of software for each of the computers on your AirWay 11 Mbps Network. Remember that for the additional computers of the network you do not need to configure the Internet Gateway. At the end of installation, the Network Status page is displayed confirming that the settings are correct and that the network is operational.

# ***Installation with Non-Airway Network Adapters***

You can use other, non-AirWay 802.11-standard adapters or network cards for the AirWay 11 Mbps Network. However, because other cards do not have the AirWay CD-ROM installation, you cannot use the AirWay installation procedures.

Instead, use the adapter's installation utility to enter the following default settings for the AirWay 11 Mbps Network:

<b>SSID</b>	The last eight numbers of your TransPort serial number
<b>Ethernet Conversion</b>	RFC1042
<b>Encryption (WEP)</b>	Disabled
<b>Network Mode</b>	Infrastructure, in order to link to TransPort ( <i>Ad Hoc</i> if you are linking to other computers only)

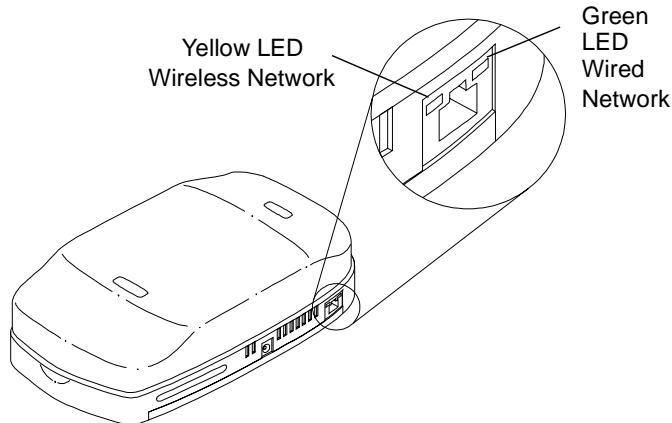
To set your Internet Gateway, you must log on to the Network Management Console on TransPort:

- 1** Open your Internet browser.
- 2** Type the IP address for the Console in the address box of the browser: **http://192.168.0.1**.
- 3** Follow the instructions given for “Configuring Your Internet Gateway on TransPort” on page 17.

# Monitoring Your Network Connection

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After you have setup your network, you can quickly monitor the status of your AirWay 11 Mbps Network connection by looking at the light (actually LEDs, light-emitting diodes) indicators Lon TransPort. These lights are located on the side of the unit where the Ethernet connector is. See the illustration below.



The green light indicates the state of the data being transferred of the Internet or wired LAN. The yellow light indicates the status of wireless network transmission.

The table below describes the statuses indicated by the LEDs.

<b>Light</b>	<b>Status</b>	<b>Indication</b>
Green	Off	No power
	Slow Flashing (one flash per second)	Problem; see the “Troubleshooting” on page 46.
	Fast flashing (five flashes per second)	Data is being transferred on the wired 802.3 port
	On (not flashing)	The wired network is functioning, but no data is being transferred.
Yellow	Off	No Power
	Slow Flashing	Problem; see the “Troubleshooting” on page 46.
	Fast Flashing	Data is being transferred on the wireless port
	On (not flashing)	The wireless network is functioning, but no data is being transferred

# Managing Your Computers

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You can perform system administration and configuration of client computers by using the Station Configuration Utility. There are two types of system administration modes: **Standard** and **Advanced**.

## Standard Mode

- Allows you to view the version and dates of your AirWay 11 Mbps Network software driver, configuration utility, and NIC firmware.
- Allows you to view current link info.

To access Standard Mode, click the TransPort icon in your system tray.

## Advanced Mode

Advanced Mode allows you not only to view the same information as you can in Standard Mode, but also to manage

- The configuration of the connection to the network
- The encryption (security) codes for your network.

To access Advanced Mode, hold down the Control (Ctrl) key and click the TransPort icon in your system tray.

## **Standard Mode**

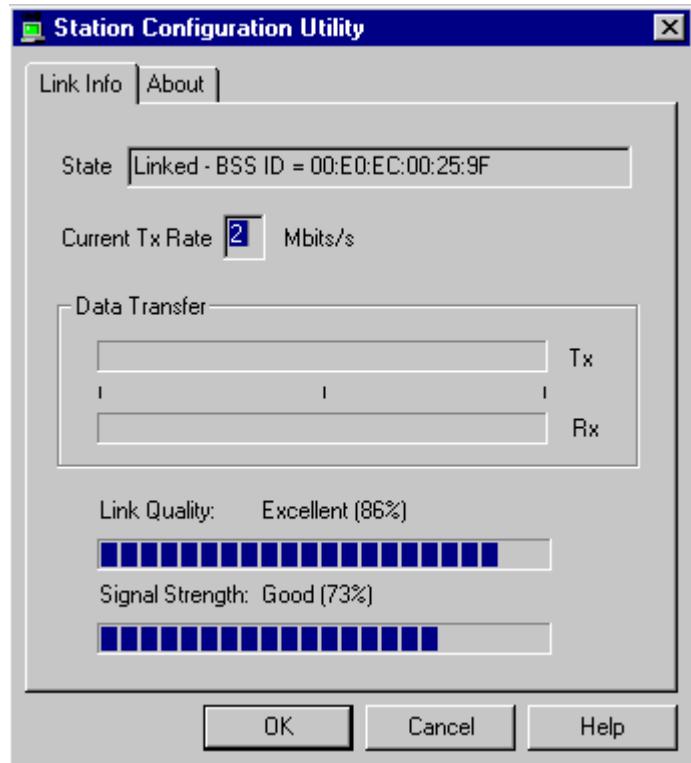
To access Standard Mode of the Configuration Utility, click the TransPort icon in your system tray. (See below.) In Standard Mode, you can view the status of the network and component versions. You cannot change the network configuration in this mode.



TransPort icon

## ***Viewing Link Information***

The Link Info pane of the Station Configuration Utility displays information about the status of the link between TransPort and the computer. An example is shown below.



The Link Information is described below.

### **State**

Displays the current state of the connection between the computer and TransPort.

- The state is *linked* when the computer is connected to the network. Also displayed is the SSID (Service Set Identification) number of the TransPort. (This is the Media Access Controller (MAC) number and may be needed for cable installation.)
- The state is *not linked* when the computer is not connected to TransPort. To establish a link, see “Troubleshooting” on page 46.

### **Current Tx Rate (Mbps)**

Displays the rate that data is being transmitted in megabits per second (Mbps)

### **Data Transfer**

Indicates the rate that data is being transferred (Tx) and received (Rx).

### **Link Quality**

Indicates the quality of the link between the computer and TransPort. The range of qualities are Not Connected, Poor, Fair, Good, Excellent. If the link is Not Connected, see Troubleshooting.

### **Signal Strength**

Displays the strength of the signal received from TransPort

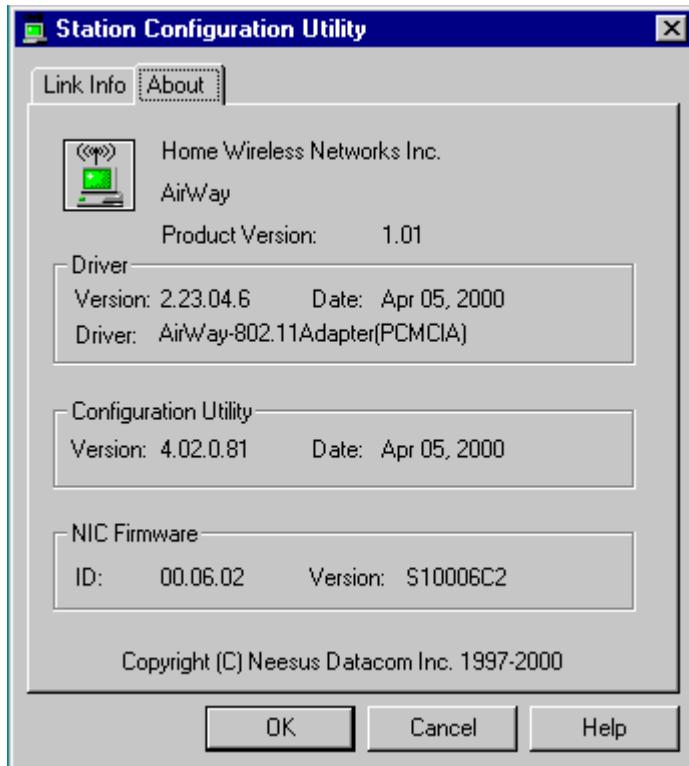
### **Current Channel**

This setting appears in Advanced Mode only. It displays the number of the infrastructure channel used for the TransPort link

## ***Viewing Network Information***

The information about the versions and dates of your AirWay 11 Mbps Network software driver, configuration utility, and NIC firmware are displayed on the Station Configuration Utility window.

Click the **About** tab to view the version information. An example is shown below.



The table below describes the components making up your TransPort communication link:

Component	Description
Product Version	The current version of the software
Driver	The software that enables the communication between the computer and TransPort
Configuration Utility	The program used to configure the link for your computer
NIC Firmware	The network interface card (NIC) software that enables the link to TransPort

## ***Advanced Mode***

The Advanced Mode of the Configuration Utility enables you to change the default settings of your computer's link to TransPort. You should not attempt to change these settings unless you are thoroughly knowledgeable of this type of configuration. Read the instructions carefully before changing these parameters.

To access Advanced Mode, hold down the Control (Ctrl) key and click on the TransPort icon in your system tray. In the Advance mode you can not only view link and version information as you can in Standard Mode, you can also change the configuration and set security codes for your Transport network. The following sections describe the Advanced Mode features that allow you to adjust your network settings:

- “[Changing Your Configuration](#)” on page 27
- “[Setting Encryption Keys for Computers](#)” on page 30

### ***Viewing Link and Version Information***

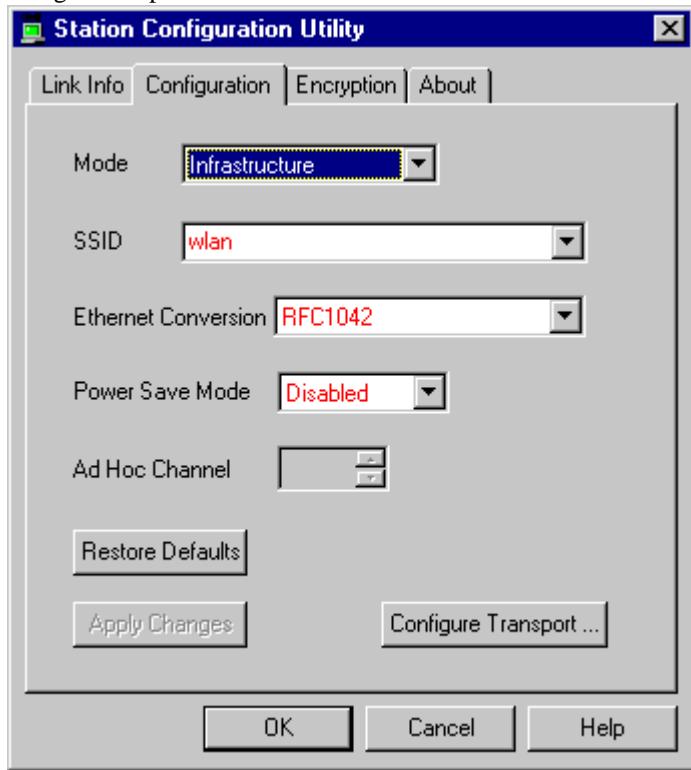
The Link Info pane of the Configuration Utility displays information about the status of the link between TransPort and the computer. Click the ***Link Info*** tab to view information about your communication connection.

In the Advanced mode, the Link information is the same as in the Standard mode. The only addition to this pane is the Current Channel, which displays the number of the channel used for the link. See the Link Info table on page 23 for a description of the information on Link Info.

Like the link information, the version information is same in both Standard and Advance modes. Click the ***About*** tab to view this information. See the About table on page 25 for a description of this pane.

## Changing Your Configuration

In Advanced mode, you can change the configuration of your network. Click the configuration tab to access the options. A configuration pane is shown below.



Use the following procedure to change your settings.

- 1 Click the **Configuration** tab of the Station Configuration Utility window.
- 2 Change the settings. Look at the following section for descriptions of the configuration options.
- 3 Click **Apply Changes**.

## **Configuration Options**

The configuration options are described below.

### **Mode**

Two modes are available in Transport:

- Infrastructure - All communication is done through TransPort to other computers, not from one computer to other as in the *Ad Hoc* mode.
- *Ad hoc* - This mode is peer-to-peer or totally wireless; client computers are not connected to a wired LAN. All communication is from computer to computer.

### **SSID**

The Service Set Identifier is the last eight numbers of your TransPort serial number. All components of the network must use the same SSID. Make sure that your TransPort has the SSID setting. For more information, see “View Configuration” on page 35, or “Changing the TransPort Radio Settings” on page 39.

### **Ethernet conversion**

This field sets the conversion method used to transmit old-style (DIX) Ethernet frames over the 802.11 wireless link. You should use the default setting. Remember that all client computers on the network must have the same setting.

If you want to connect to another network, you can change this setting to match the network’s setting.

The three types of Ethernet conversion are:

- Encapsulated - This setting takes the entire Ethernet frame and puts it into a 802.11 frame. (A frame contains the destination address in addition to the data.) It is used for compatibility with some older 802.11 implementations and normally should not be used.
- 802.1h - This setting converts DIX (Digital Intel Xerox) Ethernet frames to 802.11 frames with a “tunneled” (or redirected) 802.2 SNAP (Subnetwork Access Protocol) header. On reception, all “tunneled” frames are converted to DIX frames. (The DIX Ethernet is a precursor of the IEEE 802.3 Ethernet.)

- RFC1042 - This setting converts DIX Ethernet frames to 802.11 frames with a normal 802.2 SNAP header. On reception, all SNAP header frames are converted to DIX frames. All others are converted to 802.3 Ethernet frames.

## Power Saving Mode

When this mode is enabled, it reduces the average power consumption of the radio by periodically turning off the power. In this enabled mode, TransPort sends data only when the computer specially signals for it.

## Ad Hoc Channel

The radio channel that is used when in the *ad hoc* (peer-to-peer) mode. All computers in the network must use the same value. In *ad hoc* mode computers are not connected to the wired network.

### Note

This channel is for *ad hoc* networks only. If you have set up your network in an infrastructure mode, where computers are linked to TransPort, then use the Network Management Console to change this radio channel. For the procedure, see “Changing the TransPort Radio Settings” on page 39.

## Restore Defaults

Clicking this button removes all changes and restores the settings to the original (default) values.

## Configure TransPort

Clicking this button opens your web browser to the TransPort Management Console, where you configure Transport.

### Note

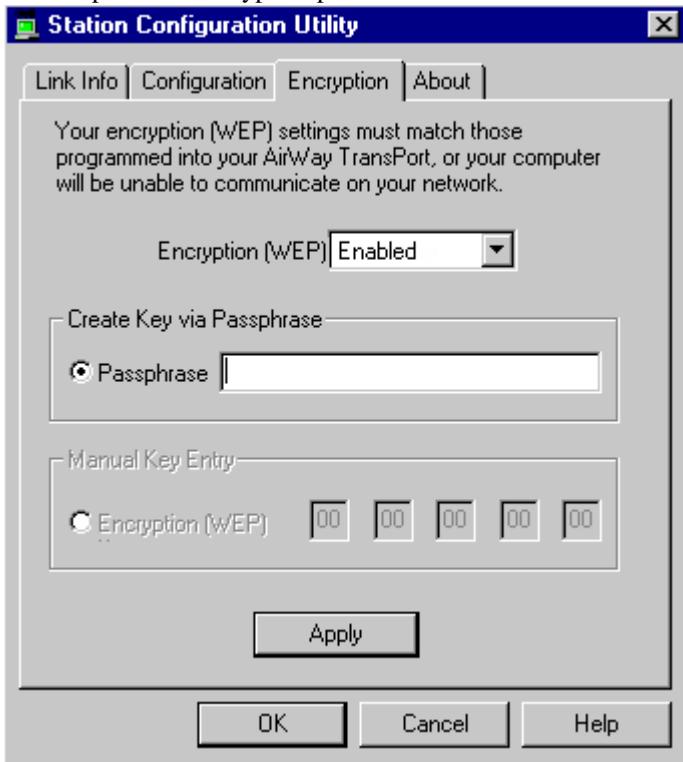
If you have changed the IP Address of TransPort, clicking this button will not open the Console browser page. The button is set to open the browser only with the original IP Address of <http://192.168.0.1>. To open Console, type your revised TransPort IP Address into your browser address box and click Enter.

## Setting Encryption Keys for Computers

To set the encryption key for your wireless network, you must first set the key on TransPort using the Network Management Console. For this procedure, see “Setting an Encryption Key on TransPort” on page 41. After you set up TransPort, return to this section for the procedure to set up your computers.

On the Encryption pane of the Station Configuration Utility, you can set an encryption or security code by entering a passphrase or a Wired Equivalent Privacy (WEP) code. Make sure that the same passphrase or WEP is used for all components on the network.

An example of an Encryption pane is shown below.



Use the following procedure to set your encryption for each client computer.

- 1 Click the **Encryption** tab of the Station Configuration Utility window.

- 2** From the Encryption (WEP) list, select **Enabled**.
- 3** Click one of the methods of entering an encryption key, passphrase or WEP key. Click either **Passphrase** or **Encryption (WEP)**.
- 4** Type your encryption key.
  - If you chose passphrase, type your password into the Passphrase box. The passphrase can be 21 characters long and any alphanumeric character. The system automatically converts your passphrase into an encryption key.
  - If you chose WEP, type the numbers into the WEP key boxes. The WEP must be two characters for each text box. The characters can be from *0* to *9* and from *a* to *f*

- 5** Click **Apply Changes**.

### *Turning Off Encryption*

To disable encryption:

- 1** Click the **Encryption** tab of the Station Configuration Utility window
- 2** From the Encryption (WEP) list, select **Disabled**.
- 3** Click **Apply Changes**.

If you want to enable encryption again, the key that you enabled originally will be saved. You can enable the key without having to retype a WEP key.

# Managing TransPort

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TransPort acts as your gateway to the Internet. You can manage how TransPort is configured through the Network Management Console. It allows you to administer your Internet connection and your own network's settings.

The only setting that you must configure is the Internet Gateway, which was originally done when you install the software. (See “Installing the Network Card and TransPort Software” on page 15.) The other Console options allow you, as the administrator, to configure your network that best suits your requirements.

From the Console you can:

- View the configuration of your AirWay 11 Mbps Network, page 35
- Change your Internet gateway settings (including sharing the wired connection to your LAN or the Internet), page 36
- Change your Admin PIN, page 38
- Change the radio settings, page 39
- Configure your Network IP addresses, page 40
- Encrypt your over-the-air transmissions, page 41
- Download software upgrades, page 42

The following sections describe these procedures.

# Opening the Console for TransPort

You can access TransPort's settings in one of two ways:

■ Open the Network Management Console from your browser:

1. Type the IP address of TransPort in the address box; the default address is <http://192.168.0.1>. The Network Status page is displayed.

 **Note:**

The original TransPort IP address is the one used here. If you change the IP address, use the new address to access TransPort.

2. Click **Login**. The Enter Network Password window appears.
3. If the user name is not already entered, type your user name. The default value is **admin**.
4. Type your password. The default value is **1234**.
5. Click **OK**. The Network Management Console is displayed.

■ Open the Station Configuration Utility:

1. Hold the Control button and click the TransPort icon in the system tray. The Utility opens in Advanced Mode.
2. On the Station Configuration Utility, click the **Configuration** tab.
3. Click **Configure TransPort**. The Network Status page is displayed.

 **Note:**

If you have changed the IP Address of TransPort, clicking this button will not open the Console browser page. The button is set to open the browser only with the original IP Address of <http://192.168.0.1>. To open Console, type your revised TransPort IP Address into your browser address box and click Enter.

4. Click **Login**. The Enter Network Password window appears.
5. If the user name is not already entered, type your user name. The default value is **admin**.
6. Type your password. The default value is **1234**.
7. Click **OK**. The Network Management Console is displayed.

# ***View Configuration***

The View Configuration option on the Network Management Console displays a page with all of the configuration information of the Internet Gateway and the Airway 11 Mbps Network.

To view this page, click ***View Configuration*** on the Network Management Console. This page provides the following information:

<b>Setting</b>	<b>Description</b>
TransPort Serial number	The identification number of TransPort stamped on the labels of the unit
Ethernet MAC Address	The Media Access Control address is a hardware address that uniquely identifies each node (a processing location such as a computer) of a network
Internet Gateway	<ul style="list-style-type: none"><li>• This setting indicates whether the Internet connection is being shared (enabled) by the computers on the network.</li><li>• If sharing is enabled, the page shows the network information. The configuration options are PPPoE, DHCP, or manual. See the “Configuration Table” on page 37 for a description of these options.</li><li>• If the network is configured manually, the IP addresses are given. For an explanation of the addresses, see “Manual Configuration Table” on page 37.</li></ul>
TransPort Radio Settings	The radio channel and the SSID that TransPort is using
Network IP Addresses	The private address of TransPort; see the “IP Address Table” on page 40 for a description.
Encryption (WEP) status	Indicates whether encryption is enabled. Encryption is done by a Wired Equivalency Protocol (WEP) key.

# ***Changing Your Internet Gateway Settings***

The Internet Gateway option allows you to share the Internet connection from your wired network through TransPort and to set up the parameters.

TransPort can be used as an Internet gateway with a firewall protecting the WLAN and distributing IP addresses to computers on the network. It can also be used as a bridge where the outside network is directly linked to the computers on the WLAN. The “bridge” configuration is used only for special requirements.

In your installation of the AirWay 11 Mbps Network software, you set up the Internet Gateway. You will probably need to contact your Internet Service Provider to provide the information needed for this set up. You need to know the type of Internet Gateway you have. You have three options: Point-to-Point Protocol over Ethernet (PPPoE), Dynamic Host Configuration Protocol (DHCP), and setting the IP address yourself. For a complete description of these options, see the page 37.

Complete these steps to configure your TransPort Internet Gateway.

- 1** Open the Network Management Console. For instructions on opening the Console, see page 33.
- 2** Click ***Internet Gateway***.
- 3** Select the option for sharing the Internet connection:
  - If checked, TransPort is used as an Internet gateway that protects the WLAN data and distributes IP addresses to computers on the network.
  - If not checked, TransPort directly links the computers on the WLAN. In this mode TransPort does not act as a Gateway to the wired network and does not distribute IP addresses. Go to step 5.
- 4** If you are sharing your Internet connection, then select the correct option for the Gateway and enter your service provider

information into the correct boxes. The table below describes each of your options.

### ***Configuration Table***

Option	Description
PPPoE	Point-to-Point Protocol over Ethernet; a format for transmitting data over an Ethernet line. This format requires a login and password.
DHCP	Dynamic Host Configuration Protocol; a method for assigning IP addresses dynamically, which means that every time you connect to the network the IP address can change.
Manual	This option allows you to enter the configuration settings

**5** Click one of the Configure options. If your Internet connection is DHCP (Dynamic Host Configuration Protocol), you do not need to enter any further information. Go to step 7.

**6** If you click the option for PPPoE Server or for Configure Manually, type the information into the text boxes.

- For the PPPoE (Point-to-Point Protocol over Ethernet) server, type your ISP (Internet Service Provider) user name and your password in the ISP Password and Confirm ISP Password boxes.
- For Configure Manually, you must type numbers into all the text boxes that apply to your Internet connection. The table describes the Internet settings (addresses):

### ***Manual Configuration Table***

IP Address	Internet Protocol address, which is the number of a computer or device on the Internet
Subnet Mask	A filter that determines the sub-network that an IP address belongs to
Default Gateway	The entry point of the network
Primary and Secondary DNS	Domain Name System, which translates domain names (like www.cnn.com) into IP addresses

- 7** Click **Submit Changes**. The Network Management Console is displayed with the Internet Gateway option checked to show a change has been made.
- 8** When you have completed all of your network changes, click **Apply Changes** on the Console page. A change is not actually made until you click this button.

The Configuration Complete page appears. You can review the network configuration to ensure that the changes are correct.
- 9** Click **Finish** to restart TransPort.

The Network Status page is displayed and shows that TransPort is resetting.

## ***Changing Your Admin PIN***

The Admin PIN (Administrator's Personal Identification Number) is your number for logging on to the Console. The default number is 1234, but you can change it by completing the following steps:

- 1** Open the Network Management Console. For instructions on opening the Console, see page 33.
- 2** On the Console, click **Admin PIN**.
- 3** Type a 4-digit number into both text boxes, **Change Admin PIN** and **Confirm PIN**.
- 4** Click **Submit**. The Network Management Console is displayed with the Admin PIN option checked to show a change has been made.
- 5** When you have completed all of your network changes, click **Apply Changes** on the Console page.

The Configuration Complete page appears. You can review the network configuration to ensure that the changes are correct.

- 6** Click **Finish** to restart TransPort.

The Network Status page is displayed and shows that TransPort is resetting.

# Changing the TransPort Radio Settings

From this Console option you can change the radio channel for an Infrastructure network or change your SSID.

## Note

The radio channel setting is for an infrastructure network, where all computers are linked to the TransPort and the wired network. This is *not* the channel for an *ad hoc* (peer-to-peer) network, where computers are linked to each other and not to TransPort. To change an *ad hoc* channel, see “Changing Your Configuration” on page 27.

Even though the radio channel is set at the factory, you can manually set the channel for the best transmission if have some interference problems.

You might also need to change your SSID if you move a computer from a wireless connection with one TransPort to another TransPort. The SSID for the computer and TransPort must be the same.

To change either radio setting, complete the following steps.

- 1** Open the Network Management Console. For instructions on opening the Console, see page 33.
- 2** On the Console, click **TransPort Radio**.
- 3** Change the radio setting:
  - If you are changing the channel number, select it from the Channel list.
  - If you are changing the SSID, type your SSID (Service Set Identifier) in the SSID box. The SSID is comprised of the last eight numbers of your TransPort serial number.
- 4** Click **Submit**. The Network Management Console is displayed with the Radio Settings option checked to show a change has been made.
- 5** When you have completed all of your network changes, click **Apply Changes** on the Console page.

The Configuration Complete page appears. You can review the network configuration to ensure that the changes are correct.

**6** Click **Finish** to restart TransPort.

The Network Status page is displayed and shows that TransPort is resetting.

## **Configuring Your Network IP Addresses**

The option for Network IP Addresses allows you to change TransPort’s IP Address and to set the Subnet Mask for your network.

**1** Open the Network Management Console. For instructions on opening the Console, see page 33.

**2** Click **Network IP Addresses**.

**3** Complete the settings for the Network IP Addresses. The setting are described in the following table:

*IP Address Table*

<b>Setting</b>	<b>Description</b>
TransPort IP Address	TransPort’s Internet Protocol address, which is the number of a computer or device on the Internet
Subnet mask	A 32-bit number that determines how an IP address is split into network and host portions

**4** Click **Submit**. The Network Management Console is displayed with the Network IP Addresses option checked to show a change has been made.

**5** When you have completed all of your network changes, click **Apply Changes** on the Console page.

The Configuration Complete page appears. You can review the network configuration to ensure that the changes are correct.

**6** Click **Finish** to restart TransPort.

The Network Status page is displayed and shows that TransPort is resetting.

## ***Setting an Encryption Key on TransPort***

In order to secure your wireless transmission beyond the SSID, you can encrypt the data transmission on your wireless network. Setting the encryption key is a two-step process:

1. Set the key on Transport using the Network Management Console. The procedure is described below.
2. Set the key for each computer in your network using the Station Configuration Utility. See “Setting Encryption Keys for Computers” on page 30, for a description of setting up your computers.

The Network Management Console gives you two methods for enabling encryption of data. You can use a passphrase that is automatically translated into a Wireless Encryption Protocol (WEP) key, or you can enter the WEP key manually.

- 1 Open the Network Management Console. For instructions on opening the Console, see page 33.
- 2 Click ***Encryption (WEP)***. The Encryption (WEP) page appears.
- 3 Click one of the Enable options. You can enter a passphrase or manually enter a WEP key.
  - 4 Depending on your Enable selection, type a passphrase or a WEP key.
    - The Passphrase can be 21 characters long and use any character.
    - The WEP must be two characters for each text box. The characters must be from *0* to *9* and from *a* to *f*.
- 5 Click ***Submit***. The Network Management Console is displayed with a check mark beside Encryption (WEP) to indicate a change.

**6** When you have completed all of your network changes, click **Apply Changes** on the Console page.

The Configuration Complete page appears. You can review the network configuration to ensure that the changes are correct.

**7** Click **Finish** to restart TransPort.

The Network Status page is displayed and shows that TransPort is resetting.

Now you must complete the second step of the Encryption setup process, which is setting the encryption key for each client computer. See “Setting Encryption Keys for Computers” on page 30 for a description of setting up your computers.

## ***Downloading a Software Upgrade***

- 1** Open the Network Management Console. For instructions on opening the Console, see page 33.
- 2** Click **Software Download**.
- 3** In the Authorization Code box, type your eight-digit Authorization code.
- 4** Click **Start** to begin the download.
- 5** When the download is complete, click **Restart Transport**.

# Attaching TransPort to the Controller

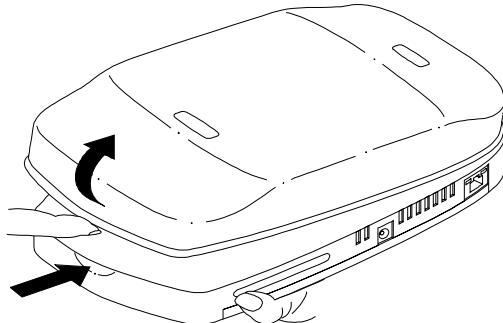
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If you have the AirWay Controller, the Transport can be attached to it in order to save space.

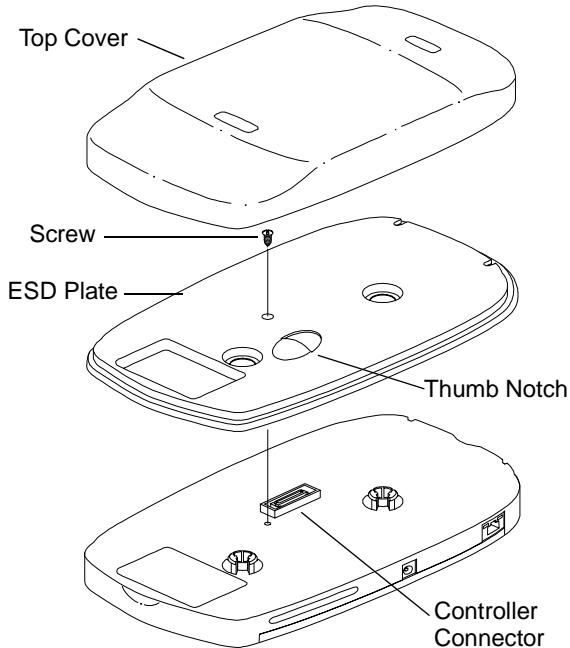
Even though the two units can be attached, the wireless networks that they control remain separate. Thus, the computers linked to the AirWay 11 Mbps network (through TransPort) can exchange data with each other, but they cannot exchange data with computers that are connected to the 900 MHz data jacks. In order to connect computers now using data jacks to the wireless TransPort network, you must add AirWay network cards to them (PCI cards for desktops, PCMCIA cards for laptops.)

To attach TransPort to the Controller, complete the following steps:

- 1 Remove the top cover of TransPort.

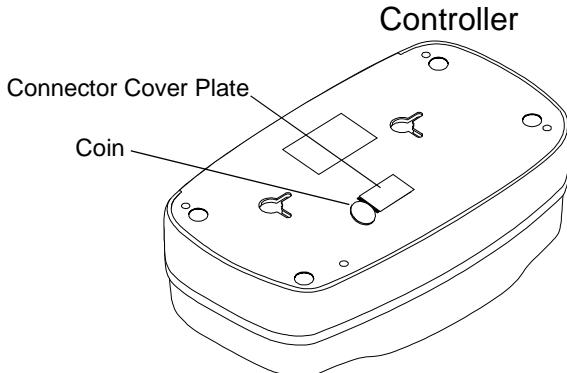


**2** Unscrew the TransPort ESD (Electrostatic Discharge) plate.

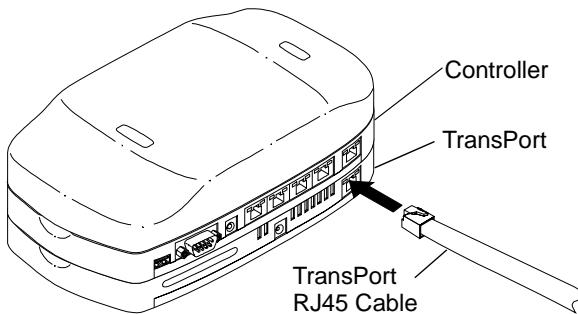


**3** Insert your thumb into the thumb notch and pull the lid to remove it from the TransPort body.

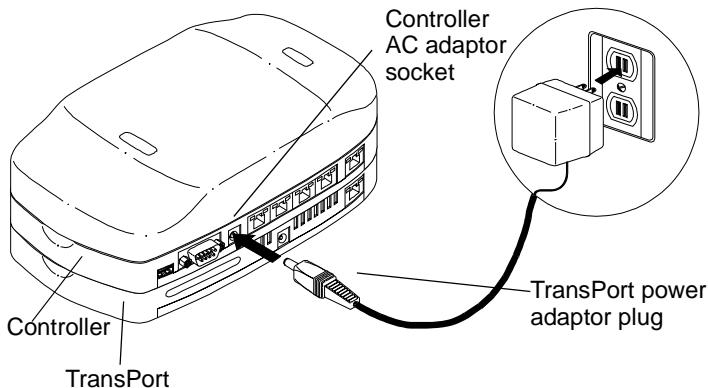
**4** Using a coin, remove the connector cover plate from the bottom of the Controller.



- 5** Attach the top of TransPort to the bottom of the Controller. Make sure the connector is snapped meshed together and that the units are flush.
- 6** Connect the provided Ethernet cable to your external DSL (Digital Subscriber Line) or cable modem and plug it into the Transport RJ45 connector.



- 7** Connect the TransPort power adapter to the Controller (not into TransPort).



**Caution:**

**This is very important: Do not use the Controller power adapter. Use the TransPort adapter only.**

# Troubleshooting

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## *Link questions*

### **My computer is not linked to TransPort.**

Many things could cause this problem. Check the following:

- Is your network card fully slotted and working?
- Is TransPort connected and is the computer within radio range?
- Does the SSID for the computer match the SSID of the TransPort? Check the Station Configuration Utility (“Viewing Link Information” on page 23) and the Network Management Console (“Opening the Console for TransPort” on page 33) for this information.
- Is your encryption method the same for the computer and TransPort? Check the Station Configuration Utility and the Network Management Console for this information. Encryption must be the same for both units, either disabled or enabled, and if enabled, have the same WEP.

### **When I connect my cable to the TransPort unit, the yellow light is not on.**

Make sure that you have the proper cable and that your modem is on.

## *Installation*

### **My browser did not launch when I ran the installation program.**

Your computer must communicate with TransPort in order to launch the browser page (and to complete your setup). Therefore, you must have TransPort plugged in and be within radio range of it. Once you have done this, open the Station Configuration Utility (by holding down the Ctrl key and clicking the TransPort icon in the system tray), click the Configuration tab, and then click the TransPort button.

## *Interpreting Network Status Lights*

### **My indicator light is flashing slowly.**

A problem is indicated when you have one or both lights flashing slowly. The type of problem is designated by the number of times a light flashes in a period of seven seconds. In each seven-second period, there is a two-second period where no light flashes. The table below describes the problems that are indicated for each light flashing sequence:

Network Problem States		
Number of Light Flashes in 7 seconds period	Problem Description	Action
Green	Yellow	
0	1	
0	2	
0	3	
1	0	
2	0	
3	0	

### **I typed in the IP address for TransPort, but the Network Management Console does not open.**

Make sure that you are using the correct IP address. The default IP address is <http://192.168.0.1>. If you have changed the IP address, you must use the new address.

If you use a proxy server to connect to the Internet, you must enable your browser to bypass the proxy server for a local address (TransPort's IP address). In Internet Explorer, click Internet Options in the Tools menu. Click the Connection tab and then the LAN Setting button. Click the box for Bypass proxy server for local addresses. Click OK twice.

In Netscape, click Preferences in the Edit menu. In Categories, click Proxies under the Advanced option. Click Manual proxy configuration and then click View. Type in the Exceptions box, ---, click OK.



# Frequently Asked Questions

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## *About TransPort*

### **What is the frequency range used by the AirWay 11 Mbps Network?**

The AirWay 11 Mbps Network system operates in the 2.4 GHz frequency range.

### **What is the maximum range of the AirWay 11 Mbps Network?**

It has a maximum range of 1500 feet and typically from 150 to 300 feet indoors.

### **How many computers can the TransPort unit support?**

You can connect up to 63 computers to a single TransPort on the AirWay 11 Mbps Network. However, the quality of the data transmission with this many computers would not be as good as with fewer computers. Your individual circumstances and quality standards should determine the number of computers you have on your WLAN.

### **Can I use more than one TransPort to extend my network?**

Yes; however, in order for all computers on the network to communicate with one another, you must configure the computers and TransPorts with the same SSID (and encryption method if used).

## *About Network Cards*

### **Do I have to use an AirWay network card?**

It is recommended that you use only AirWay cards. However, any network card that meets the IEEE 802.11 standard could be used. Unless you buy an AirWay network card, you do not

have the CD-ROM, which includes the installation and setup software and the Station Configuration Utility.

If you want to connect your computers to another network, then the configuration of the network must be changed.

### ***About the Wireless Network***

#### **Are my transmissions secure?**

First, only computers with your SSID can communicate on the AirWay 11 Mbps Network, so no one without the SSID can enter or extract data from your network. Second, you can encrypt all data transmissions by using WEP, as explained in “Setting Encryption Keys for Computers” on page 30.

#### **Can I connect to other wireless networks?**

You can connect to other wireless networks only if you configure your network to communicate with another network. See “Changing Your Configuration” on page 27.

#### **Can a microwave oven affect my AirWay 11 Mbps Network?**

You should be able to maintain data transmission and to browse on the Internet. Some degradation of the transmission is expected while the microwave oven is on, but it should not terminate your connection.

#### **How do I connect directly to my wired network?**

Turn off the shared connection on TransPort. Open the Network Management Console, click Internet Gateway, and deselect the shared connection check box. For more information, see “Changing Your Internet Gateway Settings” on page 36.

# Glossary

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This glossary describes many of the technical terms used in this guide and that are relevant to understanding network management.

<b>10Base-T</b>	A type of Ethernet. <i>10</i> stands for signaling speed of 10MHz; <i>Base</i> means Baseband; <i>T</i> is for a twisted pair cable. A baseband transmission carries only one signal, or channel, at a time; unlike broadband, which can carry more than one signal simultaneously.
<b>802.11b</b>	The IEEE (Institute of Electrical and Electronic Engineers) specification for 11 Megabit per second wireless local area networking
<b>Access point</b>	An access point or base station acts as a hub for a wireless network and as a connection to a wired network. TransPort is the access point for the AirWay 11 Mbps Network.
<b>Ad hoc network</b>	This is a wireless network configuration where devices communicate with one another but not with an access point device, such as TransPort, that is connected to a wired network. It's also called a peer-to-peer network.
<b>Client</b>	A client is the requesting program or user in a client/server relationship. In the AirWay 11 Mbps Network, the clients are computers that are requesting data from TransPort.
<b>DHCP</b>	Dynamic Host Configuration Protocol is a protocol for assigning dynamic IP addresses to devices on a network. With dynamic addressing, a device can have a different IP address every time it connects to the network, instead of having one static address.
<b>DSL</b>	Digital Subscriber Line provides a faster Internet connection than dial-up provides even though it operates over existing copper telephone lines

<b>Gateway</b>	A gateway is a network point that acts as an entrance to another network; TransPort acts a gateway for the AirWay 11 Mbps Network.
<b>Infrastructure network</b>	This is a client/server network as defined by the IEEE's 802.11b specification; the opposite is an <i>ad hoc</i> network. In a infrastructure network, network devices communicate with an access point, which connects the WLAN to a wired network.
<b>IP address</b>	Internet Protocol address is the 32-bit number that identifies each computer or device on the Internet; an example is 12.23.34.45.
<b>LED</b>	Light-emitting diode
<b>MAC Address</b>	Media Access Control address is a hardware address that uniquely identifies each node (a processing location such as a computer) of a network
<b>Mbps</b>	Megabits per second or one million bits per second; this represents the speed that data can be transmitted. A <i>bit</i> is a binary digit, the smallest unit of information on a machine; it has a value of 1 or 0.
<b>NIC Firmware</b>	Network Interface Card; the card (NIC) and software that enables the link from a computer to TransPort
<b>PassPhrase</b>	A term used for encryption in the AirWay 11 Mbps Network; it is automatically changed into a WEP key.
<b>PCI</b>	Peripheral Component Interconnection
<b>PCMCIA</b>	Personal Computer Memory Card International Association sets the standards for cards for memory and input/output, such as modems and network cards.
<b>PPPoE</b>	Point-to-Point Protocol over Ethernet uses the Internet protocol (an agreed-upon format for transmitting data) over an Ethernet line (coaxial or twisted pair) rather than a serial line.

<b>Router</b>	A device or software that determines where to forward data (information packets) from one network to another
<b>Server</b>	In the client/server environment, a server is a program that awaits and fulfills requests from client programs; in the AirWay 11 Mbps NetWork, TransPort acts as a network server or access point.
<b>SSID</b>	Service Set Identifier is the IEEE 802.11 network identification; in the AirWay 11 Mbps Network, the SSID is comprised of the last eight numbers of your TransPort serial number
<b>WEP</b>	Wired Equivalency Protocol is a IEEE 802.11 standard for a shared encryption key used by the access point and its wireless clients.
<b>WLAN</b>	A Wireless Local Area Network is a computer network connected by radio waves to share files within a relatively small area.

# Appendix

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## *Specifications*

### *TransPort*

Size	8.5" x 4.75" x 2.25"
Weight	14.7 oz.
Channels	14
Ambient Temperature range	32° - 104° Fahrenheit
Humidity range	10 - 90% (non-condensing)
Power Source	7.5 VDC 2.0 Amp power adapter
Frequency range	2.4 - 2.483 Ghz
Effective range	maximum 1500 feet; indoor 150-300 feet
Maximum number of computers linked to one TransPort	63

## *Regulatory Statements*

### *United States*

#### **Interference information**

Some telephone equipment generates, uses, and can radiate radio frequency energy, and if not installed and used properly, may cause interference to radio or TV reception.

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 to 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.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

1. This device may not cause harmful interference.
2. This device must accept any interference received, including interference that may cause undesired operation.

 **Note:**

Privacy of communications may not be ensured when using this phone.

### **Radio Frequency Emissions**

Per FCC guidelines on radio frequency radiation exposure, this product should not be installed within 20 cm (7.8 inches) of the user or other nearby individuals.

## **Interference Information**

To prevent radio interference to the licensed service, this device is intended to be operated indoors and away from windows to provide maximum shielding. Equipment (or its transmit antenna) that is installed outdoors is subject licensing.

Operation is subject to the following two conditions:

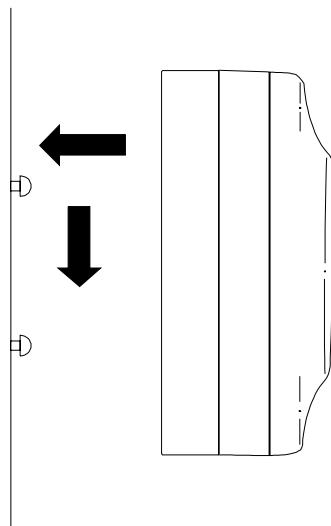
1. This device may not cause interference
2. This device must accept any interference, including interference that may cause undesired operation of the device.

# ***Wall Mounting Instructions***

## ***Mounting the TransPort on the wall***

Use the template on page 58 to help position the TransPort on the wall.

1. Locate a wall stud in the area where you want to mount TransPort.
2. Hold the template against the wall with the crossmarks centered on the stud and mark through the center of each crossmark with a pencil or other sharp-pointed object.
3. Insert the mounting screws through the wall board and into the stud at the marked locations. Leave enough of the screw protruding to hold the TransPort.
4. Position the TransPort against the wall so the mounting screws align with the holes on the underside of the TransPort base.
5. Slide the TransPort down until it seats firmly on the mounting screws.



### ***TransPort Wall-Mounting Template***

Use this template when mounting the TransPort on the wall.

To mark the positions of the mounting screws, hold the template against the wall with the crossmarks on a wall stud. Push a pencil or pen point through the center of each crossmark to mark the wall.

