

# SynAmps Wireless 4.5

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Wireless Amplifiers



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## 1      SynAmps Wireless

# ***SynAmps Wireless***

### ***User Guide***



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## 1.1 Contact Information

### For Technical Support...

If you have any questions or problems, please contact Technical Support through any of the following routes.

If you live outside the USA or Canada, and purchased your system through one of our international distributors, please contact the **distributor** first, especially if your system is under warranty. In all other cases, please use **techsup@neuroscan.com**, or see the other Support options on our web site (<http://www.neuroscan.com>). Or, if you live in the USA or Canada, please call **1-877-717-3975**. International callers should use **1-704-749-3200**.

For Sales related questions, please contact your local distributor, or contact us at **sales@neuroscan.com**.

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## 1.2 Introduction

The **SynAmps Wireless Amplifier** unit is a multi-functional, ambulatory recording device. It enables recording, monitoring, storage and transfer of up to 32 physiological data inputs, such as EEG, heart and muscle activity, and eye movement.

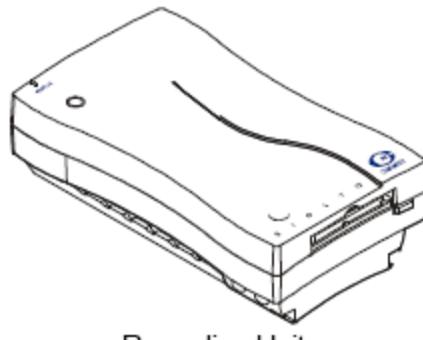
The amplifiers have a wireless network connection to the host computer. Data may be transferred across the network to the host computer, or may be stored on a flash card in the amplifier for later access, or both.

The purpose of this document is to provide instructions for the installation of the *SynAmps Wireless* amplifiers for use with the *Scan* software. *SynAmps Wireless* was originally developed for use with Compumedics' clinical sleep software programs. At various places in the software (or hardware), you may see either *SynAmps Wireless*, *Siesta*, or *Safiro*. Assume that these all refer to the *SynAmps Wireless*. *Siesta* is a similar wireless amplifier for ambulatory sleep recordings, and *Safiro* is another sleep product from Compumedics. Both use some of the same software and, for the current purposes, there are no distinctions made among them. Complete details for the *SynAmps Wireless* amplifier are found in this document, with additional information in the *Scan Tutorials* help file.

### 1.2.1 System Components

The **SynAmps Wireless System** is made up of several components.

#### Recording Unit



Recording Unit

- 32 user-definable channel configuration allows flexible physiological monitoring. This allows the recorder to be used to record a variety of signals.
- Built in Compact Flash Card interface for storage and convenient transfer to review workstations. There is no proprietary hardware required to transfer the study data.
- Built in Radio LAN transceiver capabilities allow remote monitoring and configuration of the study parameters as well as remote data collection. In addition the subject is completely ambulatory.
- Physically small unit provides for maximum subject comfort during data acquisition.
- Flexible power. Battery power can be used to power the unit in excess of 24 hours of continuous operation, depending upon use of Radio LAN and configuration of study. The unit supports both rechargeable and non rechargeable batteries as well as an external main powered combination power supply and battery charger.

#### Turn the Recording Unit On

Press the Power Button and hold until LED comes on (solid for a few seconds, then flashing).



### Turn the Recording Unit Off

Press and hold the Power button for five seconds. If AC power is attached, the LED will show a steady green light indicating that the battery is charging. Otherwise, the LED will go out.

### Recording Unit Status Indicator

- **Off (with charger in)** - unit turned off, battery fully charged.
- **Off** - off.

Unit status is reflected using the indicator color:

- **Solid Green** - *SynAmps Wireless* turned off and charging.
- **Solid Red** - Unrecoverable Error. It is necessary to remove all power from the unit.

Power status is reflected using indicator flashing:

- **Flashing Orange** - *SynAmps Wireless* turned on and idle (solid orange will begin flashing after a few seconds)
- **Flashing Green** - *SynAmps Wireless* turned on and capturing data
- **Flashing Red** - Error with Compact Flash Card. It is necessary to remove the card and perform operation again

### Battery Power

The battery, when fully-charged, is capable of powering the unit for a minimum of 24 hours (depending upon use of Radio LAN) when saving data to the Compact Flash Card. The Recording Unit supports either Nickel Metal Hydride or AA Alkaline non-rechargeable batteries.

The Recording Unit is able to determine automatically if the installed batteries are rechargeable or not.



Battery Pack

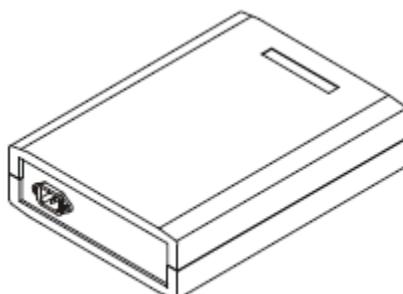
The power supply / battery charger is used to power the unit as an alternative to battery operation, and to charge an internal rechargeable battery.

### Charging

The charger automatically commences charging whenever external power is detected (solid green light on LED). The maximum time taken to charge the battery is 2.5 hours.

### Powered Operation

The power supply takes precedence over the internal batteries for powering the Recording Unit when both are connected.



Power Supply / Battery Charger

#### Host PC

The Host PC is a computer or laptop fitted with a Radio LAN device that is configured to communicate with specific *SynAmps Wireless* recording units. The computer is installed with **Scan 4.5** software, which allows the user to view and/or record studies, and **NetBeacon** software, which allows other computers to access the *SynAmps Wireless* unit via network connection.

### 1.2.2 Communication Modes

The **SynAmps Wireless System** can communicate with a computer in two modes:

#### Radio LAN (Access Point or Ad Hoc)

This mode is used by the *SynAmps Wireless* Recording Unit to carry data when recording studies onto the hard drive of a computer running the **Scan** software (either the Host PC or a computer networked to it).

**NetBeacon** software is used to connect to the *SynAmps Wireless* Recording Unit. The **Scan ACQUIRE** software is used to monitor and record the study. **NetBeacon** must be running on the Host PC, and also on any networked PC's that are used either to record the study or view it as it is being recorded on another PC. NetBeacon is installed to the Start Menu, and will be started whenever the computer is booted (it may be started manually from **Start → All Programs → Neuroscan → Scan4.5 → Netbeacon** ).

#### External IR Port

This is referred to as IrDA mode, and is for reconfiguring the *SynAmps Wireless* internal Radio LAN transceiver properties (*SynAmps Wireless* Recording Unit IP Address, Host PC IP Address, Radio Domain).

The IR Port must be within one meter of the *SynAmps Wireless* Recording Unit's IR Port, and must be within line of sight.

Refer to [Installing SynAmps Wireless](#) for further information.

### 1.2.3 Software

The terms *SynAmps Wireless*, *Siesta*, *Safiro*, and *ProFusion* may appear in various places in the software. These are all amplifiers made by Compumedics, and they share some aspects of the software. Consider them interchangeable for the current purposes.

The Scan 4.5 installation contains several programs that will be installed automatically on your computer and accessed by Desktop icons. These include the following:



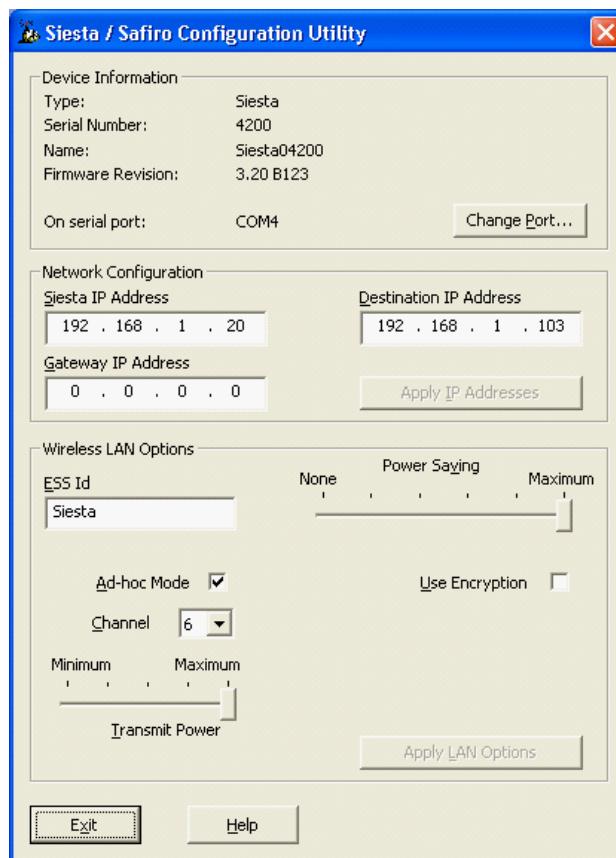
### Scan 4.5 Software

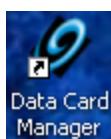
Used for acquiring and analyzing the data. Clicking the icon displays the Program Launcher, which has buttons for Acquire (acquisition), Edit (analysis), and 3D Space (used to digitize electrode positions and head shape).



### SynAmps Wireless (or Siesta 802) Config Tool

The *SynAmps Wireless* Configuration Utility (or Siesta) is used with the infra-red device to make initial configuration changes on the amplifiers, as needed.

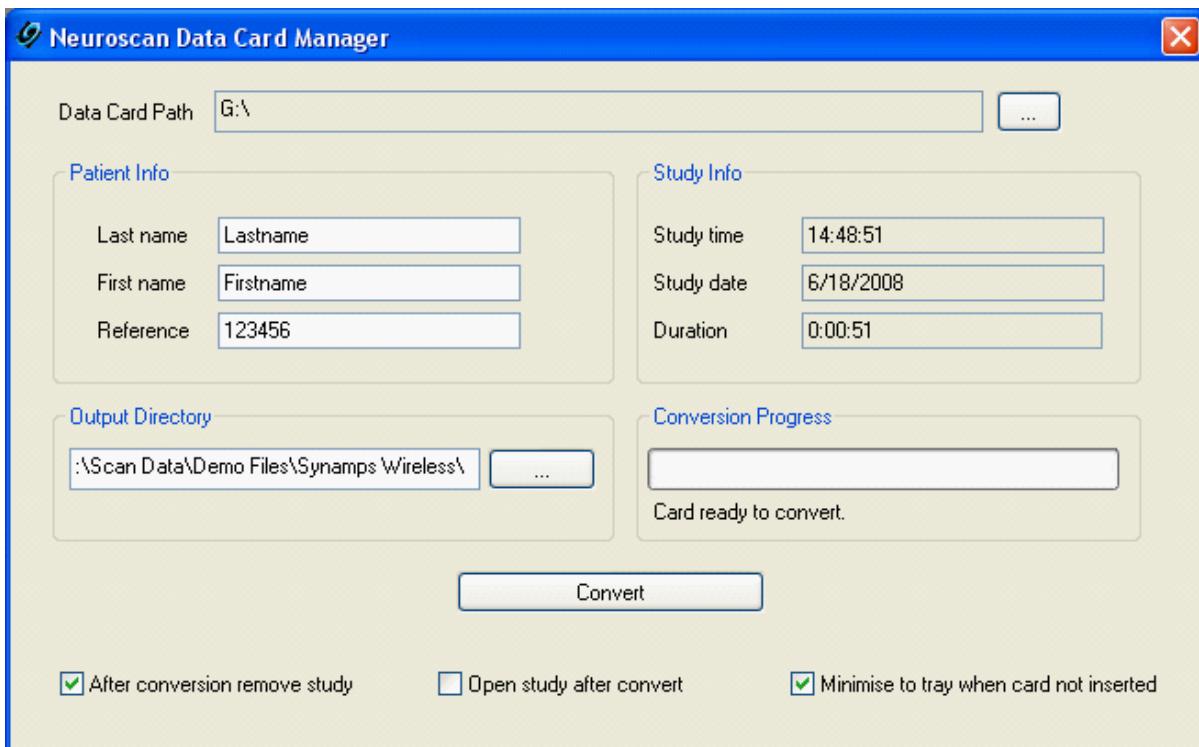




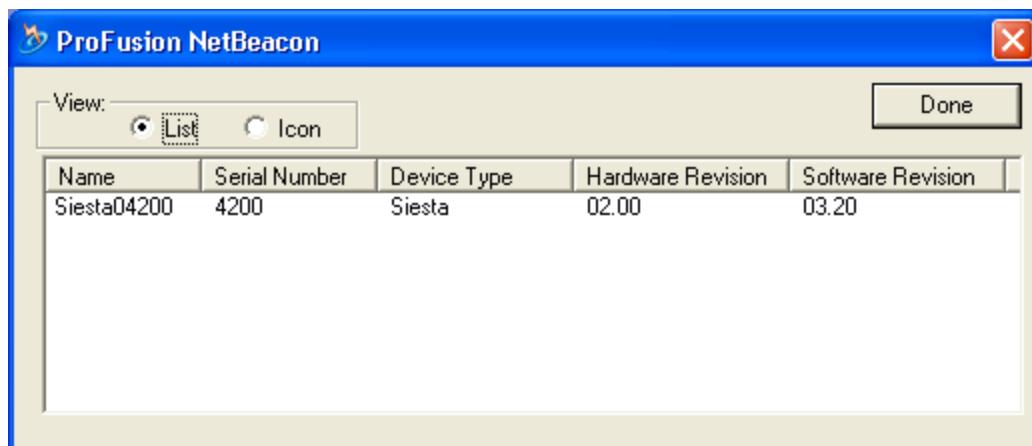
Data Card Manager

**Neuroscan Data Card Manager**

The **Neuroscan Data Card Manager** program is used to convert and transfer study files from the Flash Drive to the computer's hard drive.

**NetBeacon**

**NetBeacon** presents the user with a list of all *SynAmps Wireless* devices in the vicinity. This uses the wireless LAN to locate and present information about the units to the user. A log file of the activity of NetBeacon is created automatically, called *NetBeaconUI.log*, and stored in the default data storage folders for XP and Vista.



## 2 Before You Begin

### User Guide

The *SynAmps Wireless User Guide* contains procedures and information for you to work with the Compumedics/Neuroscan *SynAmps Wireless* Amplifiers. It is a member of a set of several user guides designed to enhance your knowledge of the Compumedics/Neuroscan *SynAmps Wireless* Amplifiers.

### Hardware

The Compumedics/Neuroscan *SynAmps Wireless* Amplifiers are intended for use by researchers in research facilities.

Subjects can be monitored in their own homes, in the research laboratory, or elsewhere. The data are stored either on a Compact Flash Memory Card, or directly onto a personal computer via wireless radio network connection.

The data are stored in a format that allows interrogation by existing Windows-based Compumedics Telemed Monitoring Systems.

### Limited Warranty - Hardware

Compumedics Telemed Pty Ltd warrants each new device to be free from defects in workmanship and materials under normal use and service for a period of twelve (12) months from the date of shipment. Compumedics' sole obligation under this warranty will be to repair or replace, at its option, products that prove to be defective during the warranty period. The foregoing shall be the sole warranty remedy. Except as set forth herein, seller makes no warranties, either expressed or implied, including the implied warranties of merchantability and fitness for a particular purpose. This warranty is not assignable.

### Limited Warranty - Electrodes, Sensors and Leads

Compumedics warrants each of the Products as free from material defect for a period of three (3) months from the date of delivery to the Distributor. During such period of three (3) months as aforesaid, Compumedics will replace without charge any component found to be materially defective and shall be responsible for all labor or other charges involved in repairing the Product(s) provided that Compumedics shall not be liable to replace components which are defective due to accident or misuse.

### Safety and Effectiveness Considerations

The operator must be thoroughly familiar with the information contained in this User Guide before using the equipment.

Do not use in conditions where vibrational stresses are excessive.

Do not use in excessively nonhygenic locations.

Do not operate the equipment at ambient temperatures above +40°C or below +10°C (+104°F, +50°F respectively).

Do not use in conditions where device may be exposed to liquids.

### Transport and Storage Conditions

-20°C (4°F) to +50°C (122°F), 30-95% RH non-condensing conditions.

### Indications For Use

The *SynAmps Wireless* System is intended for use in the recording, displaying, monitoring, printing and storage of human EEG, heart, muscle activity, eye movement, and various psychophysiological measures.

The *SynAmps Wireless* System is designed for stationary, ambulatory and mobile operation and can be used in or away from the laboratory environment, thus enabling subjects to be investigated under as realistic conditions as possible.

The *SynAmps Wireless* System unit is not intended for use as life support equipment such as vital signs monitoring in intensive care units.

The *SynAmps Wireless* System will not prevent or restore the interruption or loss of any physiological system.

### Contraindications

Discontinue use if subject displays distress, discomfort or adverse reaction to electrode and/or sensor attachment.

Discontinue use if subject perspires excessively. This may cause signal distortion.

### Labeling Definitions

Where the following symbols appear on equipment, according to IEC60601-1 they have the following definitions:



Where you see this symbol on any device label, it means "Attention, consult ACCOMPANYING DOCUMENTS"



Where you see this symbol on any device label, it means "Type CF Equipment"



Where you see this symbol on any device label, it means "Class II Equipment"

### Warnings and Cautions

- A **warning** indicates a potentially harmful situation.
- A **caution** indicates a condition which may lead to equipment damage, malfunction, or inaccurate operation.



### WARNINGS

- This device should not be used in the presence of flammable liquids or gases. This may present an explosion hazard.
- ELECTRICAL SHOCK HAZARD when covers are removed. Do not use device when covers are removed.

- For subject safety, do not operate the *SynAmps Wireless* System during electrical storms, if it is being operated with the Mains Power Supply, or if it is connected to any other mains operated equipment. In addition, information could be lost or equipment could be damaged. Damaged items manufactured by Compumedics must be returned to a Compumedics Authorized Repair Center.
- Use only the sensors and electrodes supplied with, or specifically intended for use with, this equipment. Failure to do so may result in invalid study data.
- Ensure the equipment's AC voltage rating is correct for the AC voltage at your installation site before using the equipment. The equipment AC voltage rating is shown on the ID Plate on the back of the Mains Power Supply. Failure to do so may damage the Mains Power Supply should it be connected incorrectly. Damaged items manufactured by Compumedics must be returned to a Compumedics Authorized Repair Center.
- Pacemaker Patients - Heart rate meters may continue to count the pacemaker rate during occurrences of cardiac arrest or some arrhythmias. Do not rely entirely upon heart rate meters. Keep pacemaker patients under close supervision.
- Equipment is not serviceable by the User's service personnel.
- Remove any non-rechargeable batteries from the Recording Unit if the equipment is not likely to be used for some time.
- This product contains batteries which must be disposed of properly. Local, state, or national laws may prohibit disposal of batteries in ordinary trash. Consult your local waste authority for information regarding available recycling and/or disposal options.
- To preserve natural resources, please recycle or dispose of expired batteries properly.



### CAUTIONS

- Operation may be affected in the presence of strong electromagnetic sources, such as electrosurgery equipment.
- Operation may be affected in the presence of computed tomograph (CT) equipment.

### Placement of Equipment

Do not operate the *SynAmps Wireless* system near flammable or explosive gases or materials.

### Interference

The *SynAmps Wireless* system records physiological electrical signals that can be influenced by external electrical interference. Filtering techniques can be used to minimize the influence of external sources of interference. However, by being alert to signal interference, the potential effects of interference can be minimized.

Keep the *SynAmps Wireless* system at least one meter away from all electrical appliances. Examples of these include TV sets, electric blankets, air conditioners, microwave ovens, cordless and cellular telephones, and walkie talkies.

Interference to physiological signals could be caused by strong transmitter signals such as TV, radio, airport, police, fire and ambulance stations. If recording will occur within about one mile of one or more of these sources, then ask Compumedics Product Support to help you to determine if your system will operate properly.

Synthetic fabric from draperies or carpets can cause interference due to static

electricity. Touching an electrically conductive and grounded object before handling the subject or the *SynAmps Wireless* system can prevent the build-up of static charges.

### **Manufacturer's Recommendations**

For all third party equipment used with the *SynAmps Wireless* system, follow all of the manufacturer's recommendations and instructions. Be sure to read, understand and follow the instructions in this User Guide and others that come with the system and its components.

### **Cleaning**

Always disconnect the components from all electrical power sources when cleaning the *SynAmps Wireless* system or any of its accessories.

Unless specified within these instructions, follow the manufacturer's recommendations and instructions for reusing, cleaning, disinfecting, or sterilizing sensors, sensor cables, and monitoring equipment used with the *SynAmps Wireless* system.

Do not autoclave, gas, or pressure sterilize any of the *SynAmps Wireless* components.

If any liquid is spilled on *SynAmps Wireless* system component, discontinue using it until it is determined that the component can be safely operated. Contact Compumedics Product Support or your authorized representative for assistance.

### **Wiring**

Do not connect sensor lead wires into electrical outlets. Lead wire contact with electrical outlets presents a serious shock hazard.

Keep children and pets away from the *SynAmps Wireless* system. Children or pets could accidentally disconnect the equipment or cause other incidents.

Do not allow the sensor wires or connecting cables to become tangled, coiled, or crossed, or wrapped around the patient's neck, arms or legs. This condition may cause strangulation.

Handle sensor wires carefully to prevent them breaking inside the insulation. Always grasp and pull the wires at the strain relief area to remove them from the Recorder Unit.

### **Care**

Do not drop the components of the *SynAmps Wireless* system. If a component is dropped, discontinue using it until it is determined that the component can be safely operated. Contact Compumedics Product Support or your authorized representative for assistance.

### **Product Support**

If you have a question regarding the correct use of the *SynAmps Wireless* System and/or any of its components, first refer to the relevant sections in this User Guide for the solution.

If you are unable to find the answer in this User Guide, contact Compumedics Product Support at:

**International** 1-877-717-3975  
**USA** 1-800 474-7875

or your authorized representative.

If you call, you should be close to the product so that questions by trained Compumedics/Neuroscan technicians can be answered efficiently. You should also have this manual at hand. When you call, please provide the following information:

- A description of what happened and what you were doing when the problem occurred.
- A description of any attempts made to fix the problem.

Repairs of Compumedics Pty Ltd's equipment under warranty or service contract must be made at authorized repair centers. If the equipment needs repair, contact Compumedics Pty Ltd's service department to request an RSO Number. When calling, have the device's model and serial number ready.



**Note:** Service items received without an RSO number may be returned to sender or remain unrepaired until such time as a number is raised.

### 3 Installing SynAmps Wireless

*SynAmps Wireless* was originally developed for use with Compumedics' clinical sleep software programs. At various places in the software (or hardware), you may see either *SynAmps Wireless*, *Siesta*, or *Safiro*. Assume that these all refer to the *SynAmps Wireless*. *Siesta* is a similar wireless amplifier for ambulatory sleep recordings, and *Safiro* is another sleep product from Compumedics. Both use some of the same software and, for the current purposes, there are no distinctions made among them.

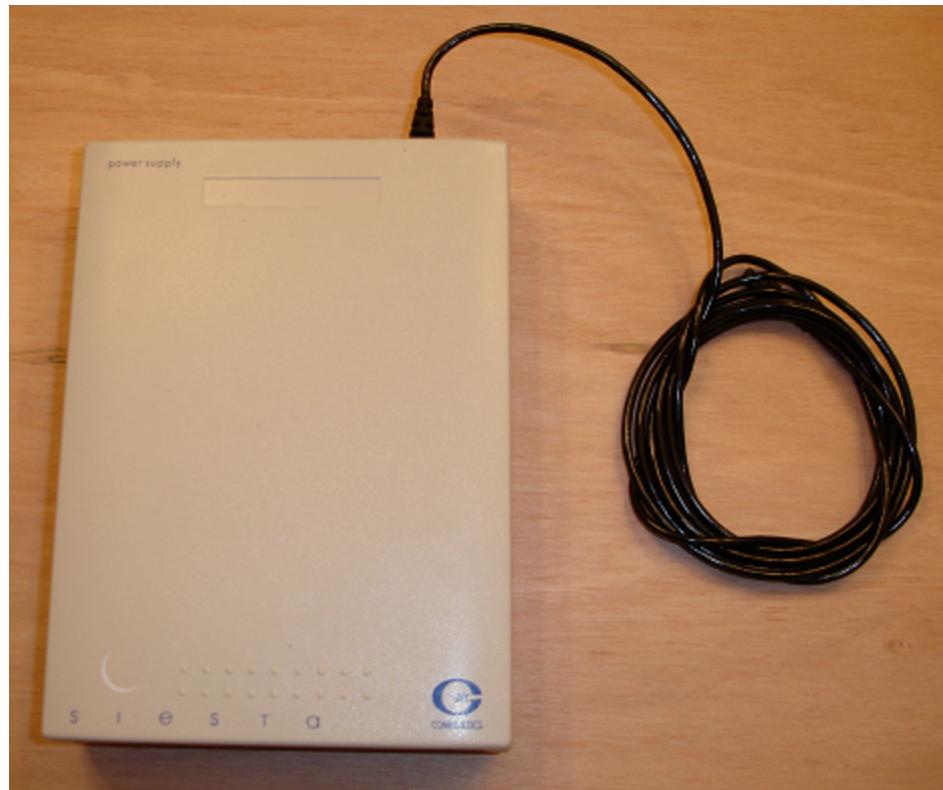
Because the *SynAmps Wireless* amplifiers communicate via a wireless network connection, the initial installation is somewhat more complex than with the other Neuroscan amplifiers. However, we will generally set up the system as much as possible, in advance.

First, please verify that you have the following components:

The *SynAmps Wireless amplifiers*.



The **Power Supply/Charger** and **Power Cable**.



**Extension cable** for the *SynAmps Wireless* power connector. If *SynAmps Wireless* is used in the pouch and you want to put the unit On and Off power, it is easier to use the extension cable and have the larger end accessible outside the pouch. Otherwise to connect the power you would need to unzip the pouch to connect the cable.



An **IR** (infrared) device. The attachable piece is used to hold the receiver and amps in place when communicating (set the amps on the extension).



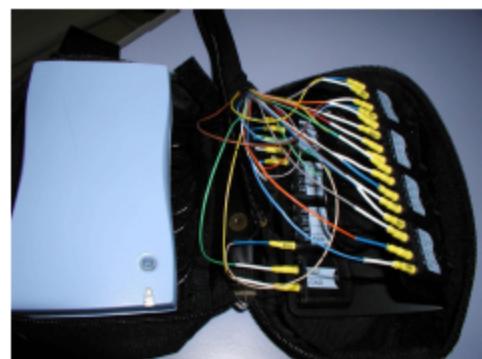
A **Compact Flash Disk**.



The **Wireless Access Point** (with its software and ethernet cable; models may vary).

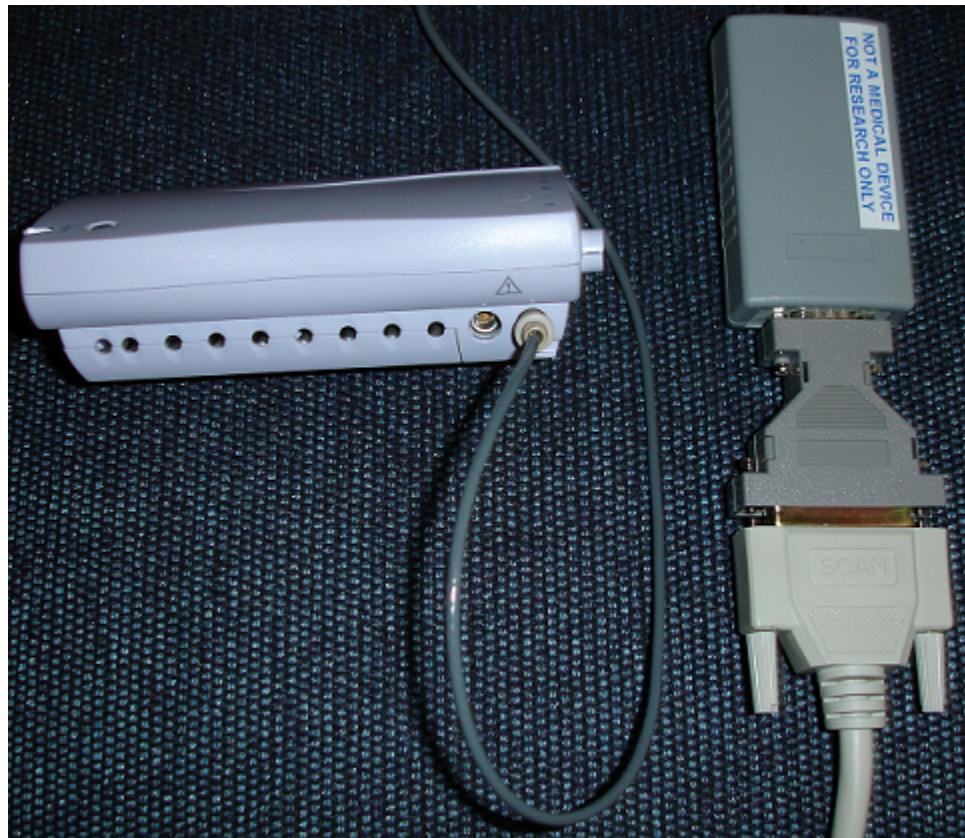


An optional carry pouch is available for the **SynAmps Wireless System** that can be used to hold the unit for longer (several hours or greater) ambulatory studies. Once a study has been started, the pouch can be zipped closed thus protecting the device from accidental damage. A locking loop is provided that allows the zip to be secured closed if desired, using a standard cable tie, to prevent patient tampering.



**Triggering Unit** and cable. If you are using the Stim2 system to present audio/video stimuli to subjects, you will receive a "stim-to-scan" cable. This has a D25 connector on both ends (resembling a parallel port connector). The Stim end connects either to the Stim Audio System Unit (complete Stim2 system), or to the computer's parallel port (software only version of Stim2). On the Scan end, there

is a D25 to D9 adapter to the Triggering Unit. The cable from the Triggering Unit connects to either of the two larger inputs on the side of the amplifier unit. See the [Triggers and Events](#) section below for more details.



### Caution

*Do not connect or disconnect the trigger cable to the amplifier unit when the amplifier unit is on. Damage to the unit or corruption of data may result.*

**Trigger Button.** A trigger button is supplied as another means for inserting stimulus events into the continuous data file. The Trigger Out connector connects to the Triggering Unit shown above, in place of the parallel-to-serial adapter. The stim-to-scan cable connects to the Trigger Inputs connector. See the [Triggers and Events](#) section below for more information.



Additionally you should also have received one or more caps (depending on your order), as well as a USB-to-Serial adapter and a Data Card Reader . The adapter is needed in case your computer does not have a serial port (for use with the IR transmitter, described [below](#)<sup>[21]</sup>). Follow the directions to install the data card reader.

### 3.1 Install the Scan Software

If you have not already installed the Scan 4.5 software, please do so now (use must have Scan version 4.5 or newer in order to use *SynAmps Wireless*). You have also received a dongle - or software lock. This is a small device, resembling a USB thumb drive, which plugs into a USB connector on the computer. The Scan software will not function without the dongle. The dongle is your license, and to replace it has the same cost as the original license, so guard it carefully.

The installation of Scan 4.5 is described in the *Overview* help file. Scan 4.5 is a complete installation (you should uninstall your existing Scan version).

After the installation has been completed you will see several new icons on the desktop (these will be used in later steps):



The **AmpInstall** program is used to select the amplifiers that you wish to use. If you do not see a shortcut on the Desktop, you will find the *ampinst.exe* file in the ...\\Program Files\\Neuroscan\\Scan4.5 folder. Create a shortcut to the Desktop for ease in future use.

Run the AmpInstall (*ampinst.exe*) program. Select the **SynAmps Wireless** option, and click **OK**, then click **Finished** on the confirmation screen. (You only need to do this once). You will not see anything happen - it merely loads the selected drivers for the amplifier you are using.



After the software is installed, the next step is to set up the network configurations for communicating with *SynAmps Wireless*. In most cases, this will have been done before you receive the system.

#### **Updating the SynAmps Wireless firmware**

From time to time it may be necessary to update the firmware on the amplifier unit itself. The firmware file will be found either on the ftp site, or received as an e-mail attachment. It will be typically be named SIESTA.BIN. Should you see it named with a different extension, for example, SIESTA.129, you need to rename it to SIESTA.BIN after downloading. Copy this file to the flash card (using, for example, the Windows Explore program) and the data card reader. With the amplifiers off, insert the card into the amplifier unit. Turn the amplifiers on and the light will flash and change colors (red, green, orange repeatedly, and then solid orange followed by the normal flashing orange) to indicate that the firmware has been loaded. Verify the installation by looking in the Siesta 802 Config Tool (IR connection must be established), and looking at the Firmware Revision field.

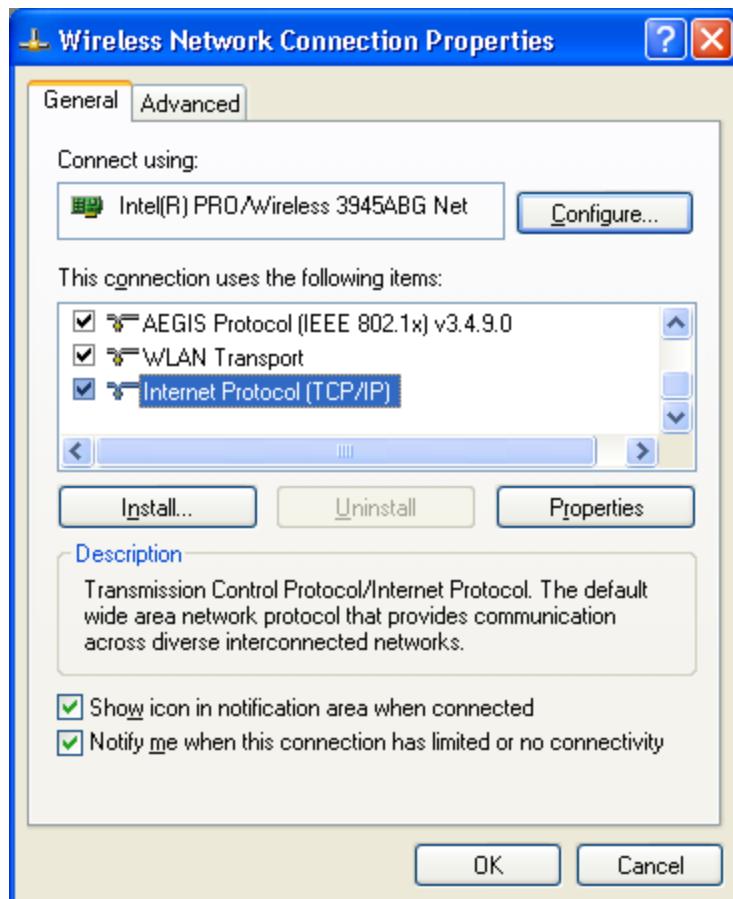
## 3.2 Changing Your IP Address

You will need to change the IP Address on your computer in order to communicate with *SynAmps Wireless*. (Whenever possible, the network connections will be set up before you receive your system, and it will not be necessary to complete these steps). See the note at the bottom of this section if you need to revert to a different network connection.

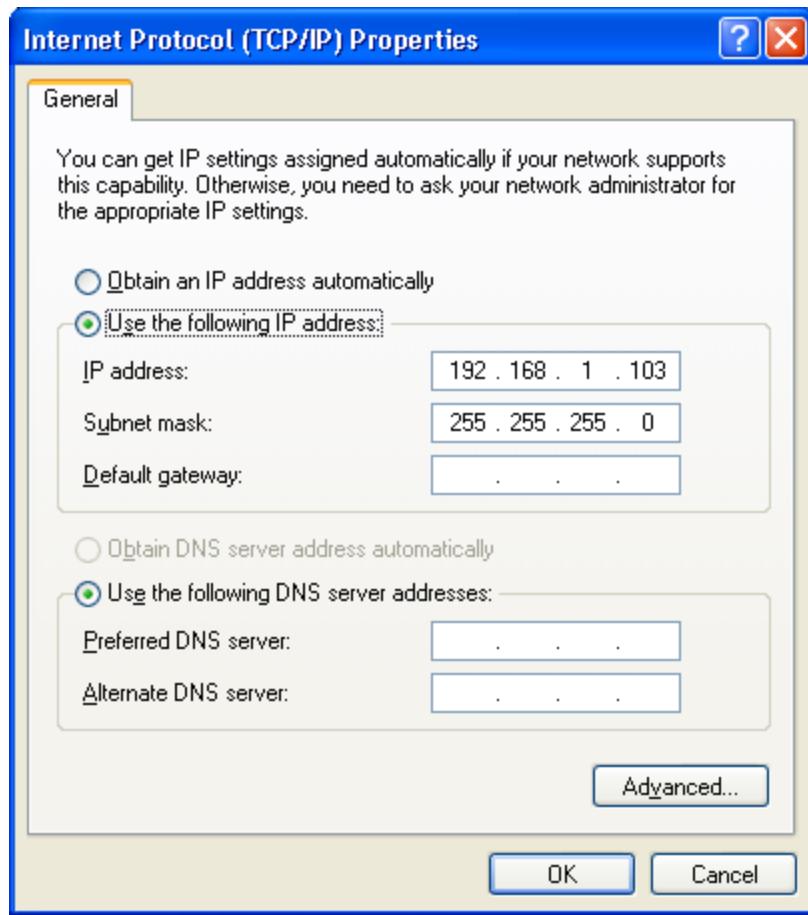
1. Go to **Start** → **Control Panel** and select **Network Connections**.
2. *Right click* on **Wireless Network Connection**, and select **Properties**.



3. Scroll down the list (if needed), and *double-click* on the **Internet Protocol (TCP/IP)** item.



4. You will then see the Properties window.



Select **Use the following IP address**.

Enter an **IP address**, such as **192.168.1.103**. This must be different from the IP Address of the *SynAmps Wireless* amplifiers and also different from the Access Point IP address. These will be set shortly.



**Note**

IF YOU ARE CONFIGURING YOUR OWN SYSTEM, OR CHANGING THE IP ADDRESS, SUBNET MASK, OR CHANNEL, BE SURE TO RECORD THE SETTINGS YOU ARE USING. IT MAY BE DIFFICULT FOR TECH SUPPORT TO HELP RESTORE YOUR SYSTEM IF THESE SETTINGS ARE NOT KNOWN.

Enter **255.255.255.0** for the **Subnet mask**.

Leave the **Default gateway** blank. Then click **OK** to exit the windows.



**Note**

If you wish to restore your network connection to its original state, or connect to your own LAN, wireless, or other network, return to the above display and select **Obtain an IP address automatically**, then click **OK**. You may then need to *right click* on the green network connection icon on the Taskbar, and select **Connect to**

**Profile.** Then select your own network profile.



### 3.3 USB-to-Serial Adapter

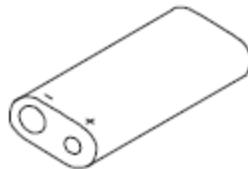
The IR (infrared) transmitter that comes with *SynAmps Wireless* is used for initial configuration of the amplifiers (and subsequent reconfiguration, if needed). It connects to the serial port on your computer. If your computer does not have a serial port, it is possible to use a USB-to-Serial adapter (supplied). Install it according to its directions. (This step will have been performed by Neuroscan in advance, whenever possible).

The IR device must use COM1-COM4. You will need to know which COM port is being used for the USB-to-Serial Adapter. To determine which COM port is being used, go to **Start** → **Control Panel**, and select **System**. Click the **Hardware** tab, and then the **Device Manager** button. Scroll down the list to see the **Ports (COM & LPT)** item, and expand it. You should then see which COM port is being used by the adapter.

Some computers have multiple USB ports, and, depending on the one you selected, you may see that COM5, COM6, etc. is being used. Connect the adapter to a different USB port until you see that COM1 to COM4 is used. The COM port will be needed in a later step, so note which one is being used. Exit the Device Manager and Control Panel.

### 3.4 Install the Ni-MH Battery Pack

If the Ni-MH Battery Pack has not been installed, please install it now. You will find a small screw driver that has been included with the shipment.



Turn the *SynAmps Wireless* amplifiers upside down and see the single screw near the middle of the bottom. Unscrew it until it stops unscrewing (it is not necessary to actually remove it). Then carefully push the tab in the front of the bottom plate to release the bottom cover.

Install the Battery Pack (noting the polarity on the Pack and the battery compartment notations), and replace the cover. Screw the screw back in.



When using standard AA alkaline batteries, it is recommended that fresh batteries be used for each study. This will ensure at least 24 hours recording time is possible when not using the wireless LAN.

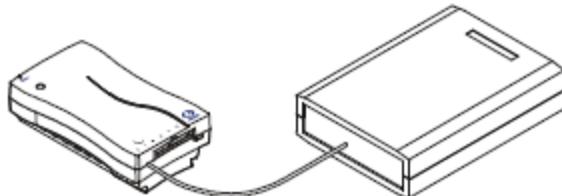
- The optional NiMH battery is good for up to 500 charge/discharge cycles. For maximum recording duration, it is recommended that the battery be replaced annually. Replace with the type specified in Appendix A.
- Where the NiMH battery pack is to be used, the battery should be fully charged within 24 hours prior to operation. To fully charge the battery, allow for a charging period of 2.5 hours.
- If power was removed or interrupted during recording due to flat batteries or disconnection of power, the study, up to the point of power failure, can still be transferred for data replay and analysis. The conversion software contained in **Data Card Manager** will automatically calculate the time that the study was closed.



**Note:** As the Battery power gets close to zero, you may experience intermittent loss of data transfer across the network (priority is given to flash card storage). If you experience data transfer difficulties, check the battery level before looking into other causes.

### 3.5 Connect the Amplifiers

Connect the Amplifiers to the Power Supply.



Find the long thin black cable with the small 3-pin connectors on each end. Connect one end to the power supply and the other to the amplifiers.

Do not force the connections. Note that the top side is flat. Line it up in the connector in the amplifier or power supply. When lined up properly the cable will plug in with minimal effort.

Connect the power cord from the back of the Power Supply to a grounded wall receptacle.

### 3.6 Connect the IR Transmitter

Connect the IR transmitter to the serial port on the computer. If your computer does not have a serial port, use a USB-to-Serial Adapter, [as described above](#)<sup>[21]</sup>. (If your system was preconfigured, you will not need to complete these steps). You will need to follow these steps if you are changing from Ad Hoc method to the Wireless Access Point.



You will need to know which COM port is being used. The IR device must use COM1-COM4. To determine which COM port is being used, go to **Start → Control Panel**, and select **System**. Click the **Hardware** tab, and then the **Device Manager** button. Scroll down the list to see the **Ports (COM & LPT)** item, and expand it. You should then see which COM port is being used by the IR transmitter. You need to know the COM port for the first step below.

This IR transmitter is used for initial configuration of the *SynAmps Wireless* amplifiers. It provides a direct way to communicate with the amplifiers that bypasses the network.

Note that the program does not verify what COM ports are available in your computer before displaying this window. It just allows you to select between COM1 and COM4.

Once the port is selected, however, it will attempt to open the port and use it for communication with the *SynAmps Wireless*. If the port does not exist or is not available (for example it is already in use by another application) an error will occur at this point and an error message will be displayed. If this happens close the error message window (by clicking its OK button) and either select the correct port or, if another program is using the port, shut down both the other program and the *SynAmps Wireless* Configuration Utility and then restart the *SynAmps Wireless* utility.

This error message may also be displayed as the *SynAmps Wireless* Configuration Utility starts up (before the main window opens). If this happens close the error message window (which will allow the *SynAmps Wireless* Configuration Utility main window to open) and then either select the correct port or shut down any other application using the port (in the second case you will also need to restart the *SynAmps Wireless* utility).

The *SynAmps Wireless* Configuration Utility will not be able to establish communication with the *SynAmps Wireless* device until the correct serial port is selected. Until that time all of the data in the "Device Information" section of the window will be shown as "Unknown" and all of the data entry windows will be blank and grayed out (that is, disabled). Once the correct port is selected, and communication is established, all of the windows will be updated with information read from the currently active device.

It is possible to discard any configuration changes that have been made, but not yet applied to the device, by simply pointing the infrared device away from the *SynAmps Wireless*. This will cause the communication link between the application and device to be "lost". After a few seconds the application will time out and remove information for the device, greying out all of the data entry windows. At this time re-align the device and the *SynAmps Wireless* infrared port. The communication link will be re-established and the original configuration information re-read from the device.

**Position the IR transmitter so that it is within about an inch of the back end of the amplifiers** (where the power cable attaches). That is where the IR receiver is inside the amps, and the transmitter and receiver should be placed in very close proximity. The plastic shelf attached to the IR device can be place under *SynAmps Wireless* to hold the two units in close proximity.

Turn the amps on by holding the button down on the top until the LED lights.

There are several colors that you will see:

Unit status is reflected using the indicator color:

- **Solid Green** - *SynAmps Wireless* turned off and charging.
- **Solid Red** - Unrecoverable Error. It is necessary to remove all power from the unit.

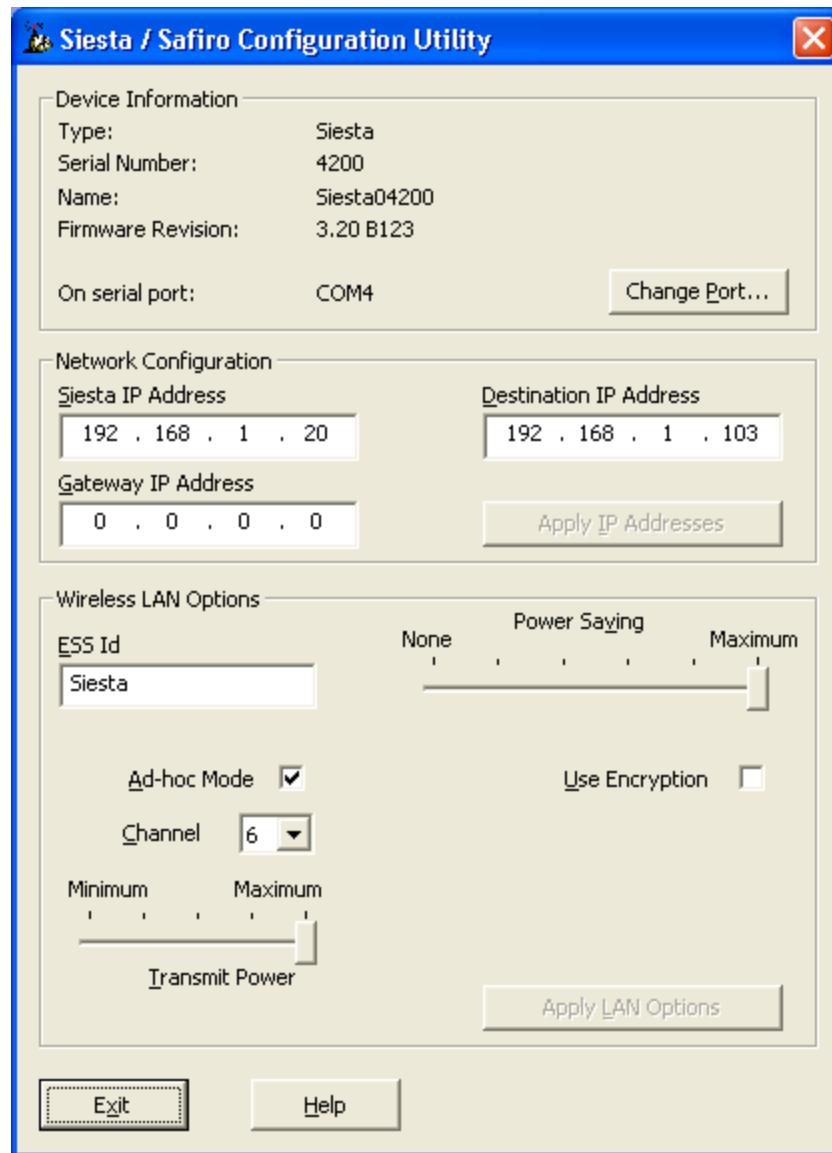
Power status is reflected using indicator flashing:

- **Flashing Orange** - *SynAmps Wireless* turned on and idle (it will be steady for a few seconds before it begins to flash).
- **Flashing Green** - *SynAmps Wireless* turned on and capturing data.
- **Flashing Red** - Error with Compact Flash Card. It is necessary to remove the card and perform operation again.

Click the ***Siesta 802 Config Tool*** icon that was created on your Desktop.

1. The Configuration Utility will open.

Click the **Change Port** button, and select the COM port for your IR device or [USB-to-Serial adapter](#)<sup>21</sup>. Again, you must use COM1, COM2, COM3, or COM4.



The *SynAmps Wireless* IP Address you will see is the default one set at the factory (different from that seen above). If you have multiple *SynAmps Wireless* units, you will need to give each one a unique IP address. If you have a single *SynAmps Wireless*, you may use the default IP address, or else enter a unique **IP Address**, such as **192.168.1.20**. Leave the Gateway IP Address empty (zeroes).

The **Destination IP Address** should be the same IP Address that you used for your computer, [as set above](#)<sup>19</sup>. Click the **Apply IP Changes** button to invoke the changes.

The **IP Address** window displays the current IP addresses for the *SynAmps Wireless*, the destination device and any gateway (or router) device. They can be modified by simply

typing new values into the desired window. The IP addresses are thirty-two bit quantities displayed in the conventional "dot notation" with four decimal numbers separated by full stops. Each number corresponds to eight bits of the IP address and therefore must be between 0 and 255 inclusive. The edit windows will not allow you to enter out of range values. If a number has three digits then the text entry will automatically advance to the next "field" of an IP address as the third digit is typed. To move to the next field when typing less than three digits you can either type a full stop character or click in the next field with the mouse.

Whenever a change is made in the IP address windows the "Apply" button (below the "Destination IP Address" window) is enabled. Clicking this button will write the change to the *SynAmps Wireless* device. While the writing is in progress, all of the data entry windows and apply buttons will be grayed out. Once the change has been written to the *SynAmps Wireless*, they will be re-enabled. It should be remembered that communication via the infrared interface is not one hundred percent reliable and, if necessary, the command should be retried until it is accepted by the *SynAmps Wireless*. This means that the length of time required to apply the change may vary slightly.

If you wish, it is possible to select the new IP addresses entirely from the keyboard (without using the mouse). Type ALT-s (type the "s" key while holding down the "ALT" key) to select the first field of the *SynAmps Wireless* IP address. You can then type the new value at the keyboard. As each field is completed the cursor will automatically move to the next field. Alternately you can use the left and right arrow keys to move between fields. To move to the Destination IP address either type ALT-d or use the TAB key from the *SynAmps Wireless* address edit window. Edit the destination IP address in the same fashion as the *SynAmps Wireless* address. To move to the Gateway IP address either type ALT-g or use the TAB key from the destination edit window. To apply the changes either type ALT-i or use the TAB key from the gateway address window to move to the "Apply" button and click it by pressing the space bar.

In most situations the *SynAmps Wireless* device and destination device will be on the same logical network and a gateway address will not be required. In this case the value for the gateway IP address should be entered as 0.0.0.0 which tells the *SynAmps Wireless* not to use a gateway. If it is desired to route *SynAmps Wireless* "traffic" between logical networks then it will be necessary to enter a gateway address. In this case the IP address used for the gateway should be the address of the router interface that is on the same logical network as the *SynAmps Wireless*. It is difficult to give definite instructions for determining whether the *SynAmps Wireless* traffic must be routed or not without a detailed discussion of IP addressing and routing. However this is generally determined by comparing the leading digits of the *SynAmps Wireless* and destination IP addresses. If they are the same then routing is not required, if they are different then routing may be required. The exact number of digits to compare varies based on the network configuration, but is often the first two or three data entry fields in the IP address windows.

Enter "Siesta" for the **ESS Id** (case sensitive). Set **Power Saving** to **Maximum**.

There are two ways to configure the connection to the amplifiers: using the **Ad-hoc Mode** or using the **Access Point** (AP), or infrastructure mode.

The Ad-hoc Mode uses the wireless connection on your computer to communicate with the amplifiers, and bypasses the AP altogether. It places a greater demand on the Battery Pack, and alternating among multiple

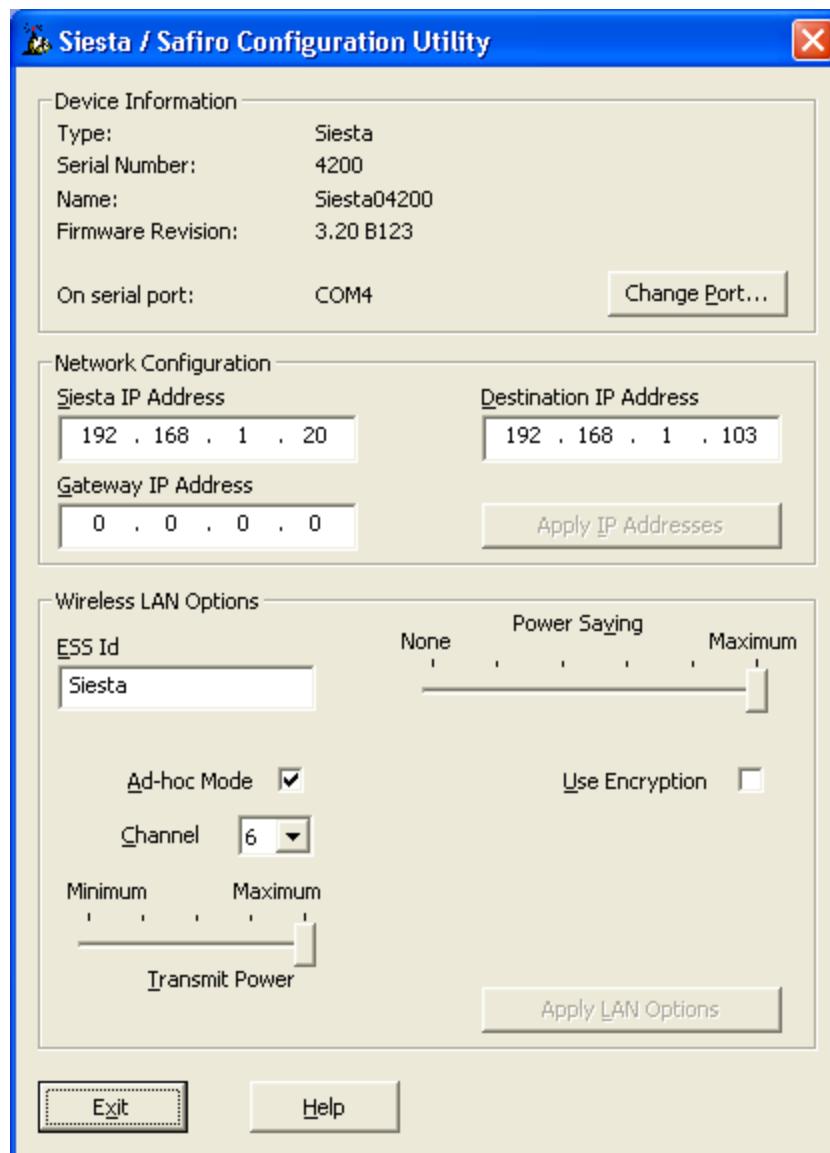
*SynAmps Wireless* units is more difficult.

The Access Point mode uses the Wireless Access Point to communicate with the *SynAmps Wireless* amplifiers. It is necessary if you are using more than one *SynAmps Wireless* and you wish to alternate easily among them.

The Ad-hoc Mode is described first, in the next section.

### 3.7 Configuring an Ad-hoc Network

The Ad-hoc Mode uses the wireless capability in your computer to communicate with the *SynAmps Wireless*, and bypasses the AP altogether.



Having entered the information in the previous step (you need to still have the infrared connection established), click **Ad-hoc Mode** (if needed). Don't worry about **Channel** for

now. Set **Transmit Power** to **Maximum**. (If using ad-hoc mode it may be necessary to select reduced (or no) power saving in order to achieve satisfactory network performance). Leave **Use Encryption** deselected. Then click the **Apply LAN Options** button.

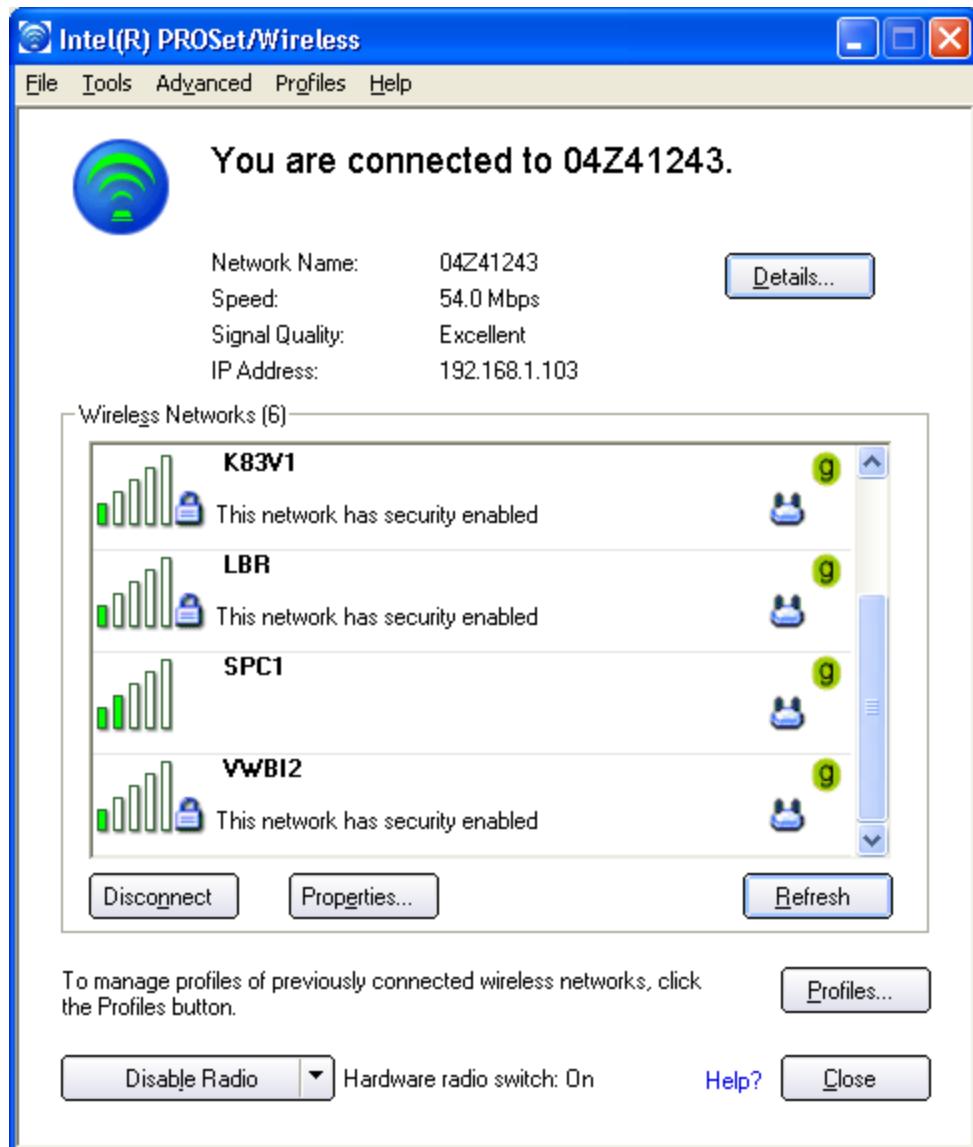
Leave the *SynAmps Wireless* Configuration Utility open.



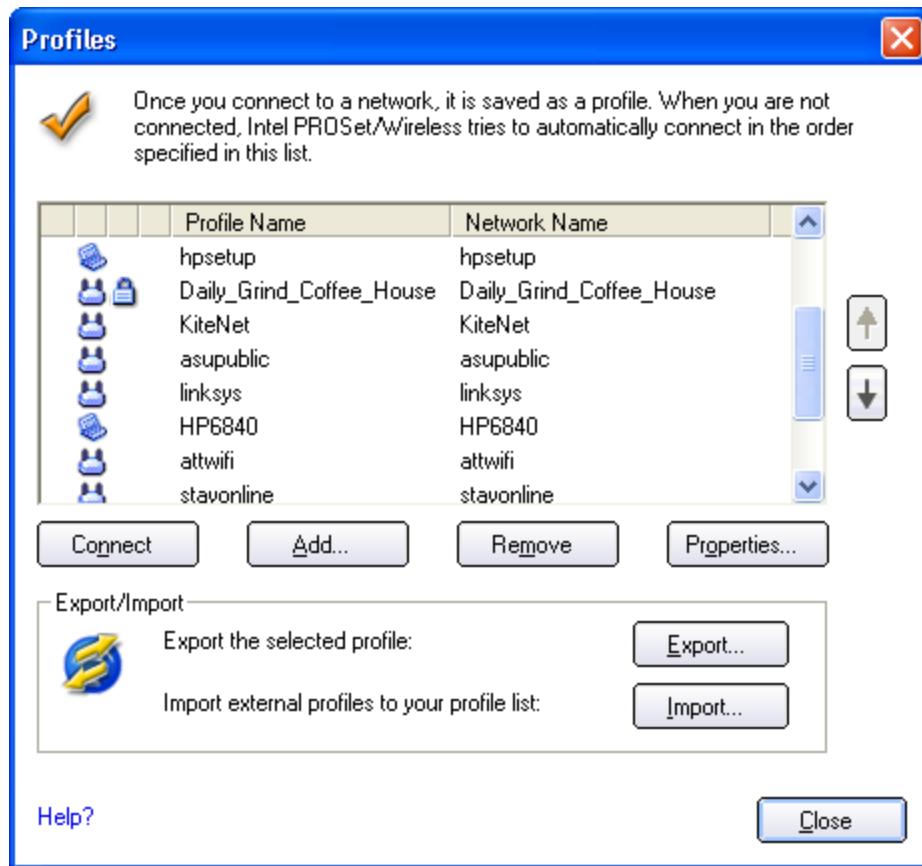
Find your wireless status icon on the Windows Taskbar, near the clock. *Right click* on it and select the **Open <brand>** option.



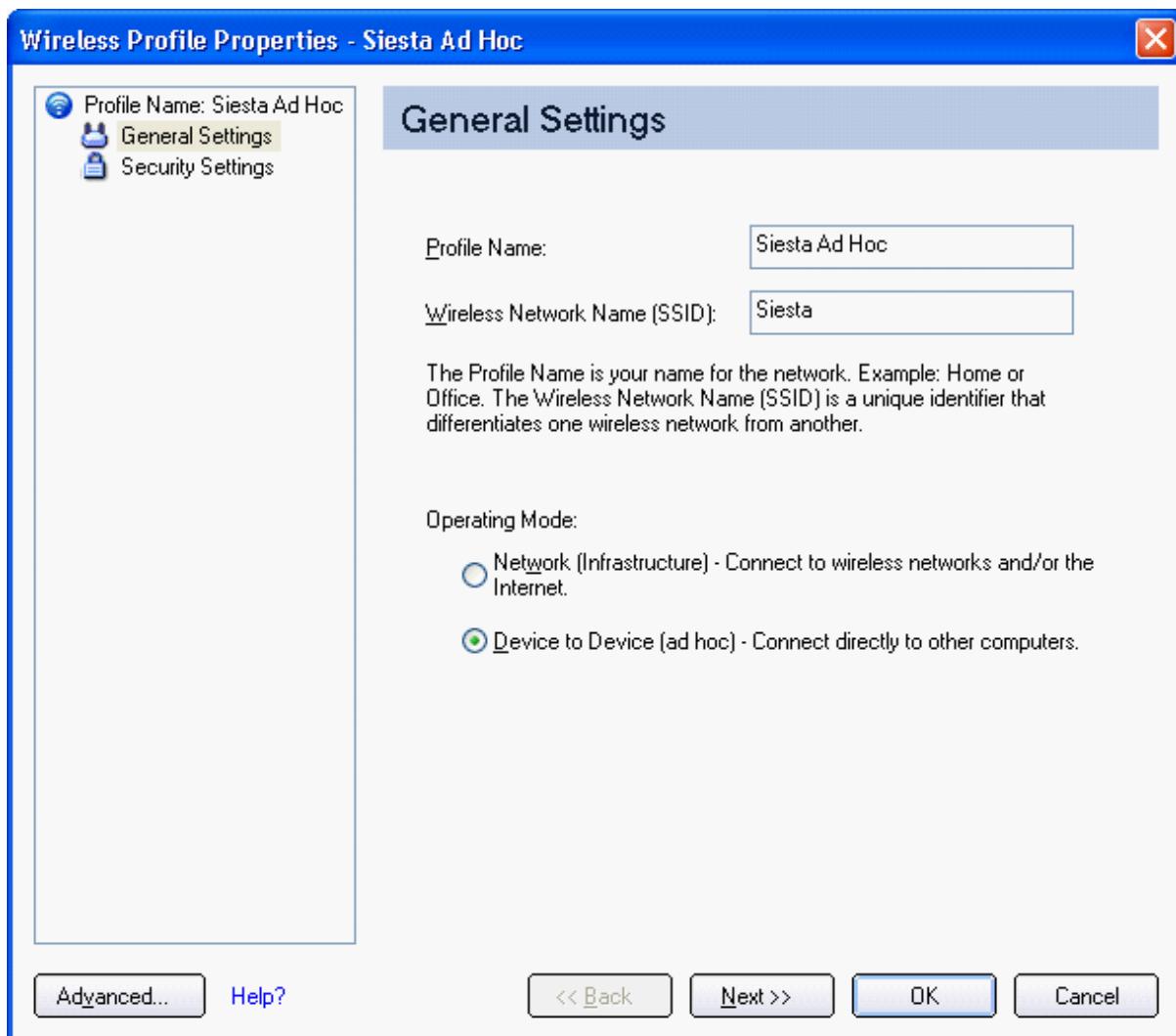
You will then see the all of the wireless networks in the vicinity, including whatever one you happen to be connected to.



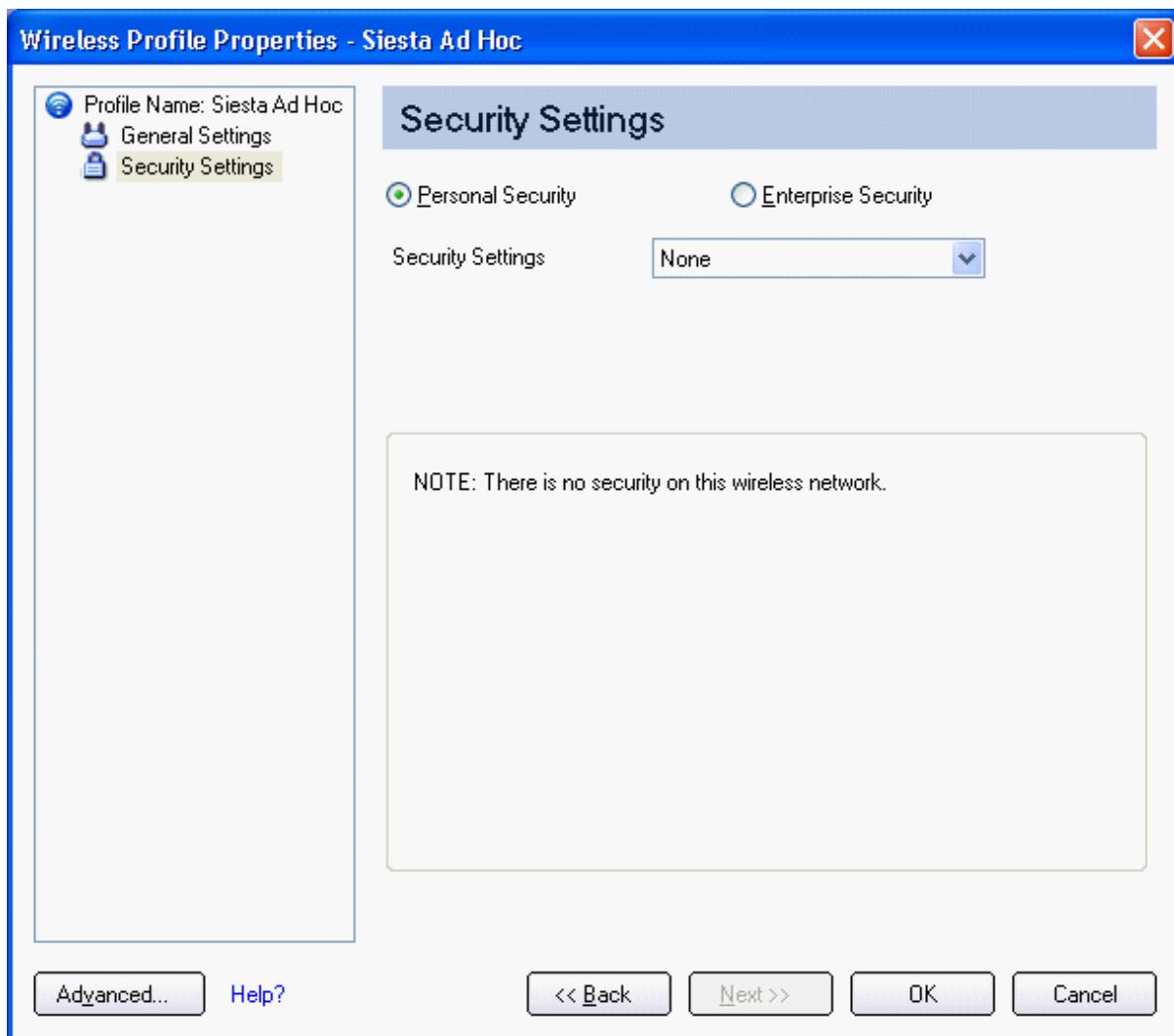
Click on the **Profiles** button, and you will see the networks you have been connected to in the past. Click the **Add** button.



The Wireless Profile Properties will appear. For **Profile Name** enter the name for the ad hoc connection, such as **Siesta Ad Hoc**. For the **SSID**, enter **Siesta** (case sensitive). Select **Device to Device (ad hoc)** for the **Operating Mode**. Then click **Next**.



For the Security Settings, select **Personal Security** and select **None** for the **Security Settings**. Click **OK**.



You will then see the **Profiles** window again. Highlight the profile you just created (SynAmps Ad Hoc), and click the **Connect** button.

Verify that *SynAmps Wireless* is turned on, and the LED is blinking orange.

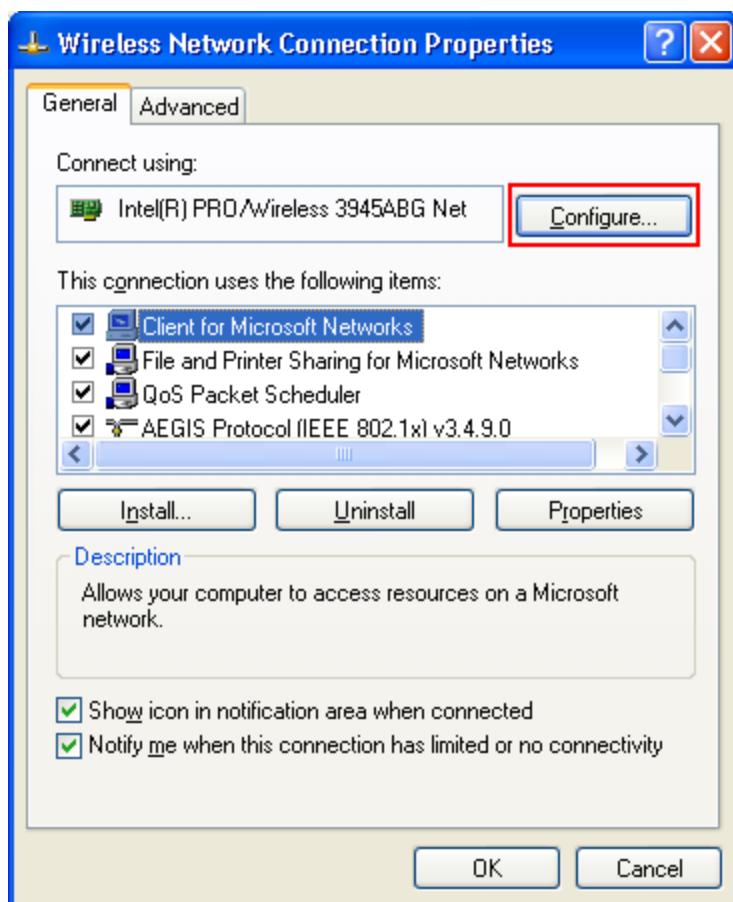
If you do not see the connection made to *SynAmps Wireless*, there is one more setting to check. Find the **Wireless Network Connection** icon on the Taskbar.



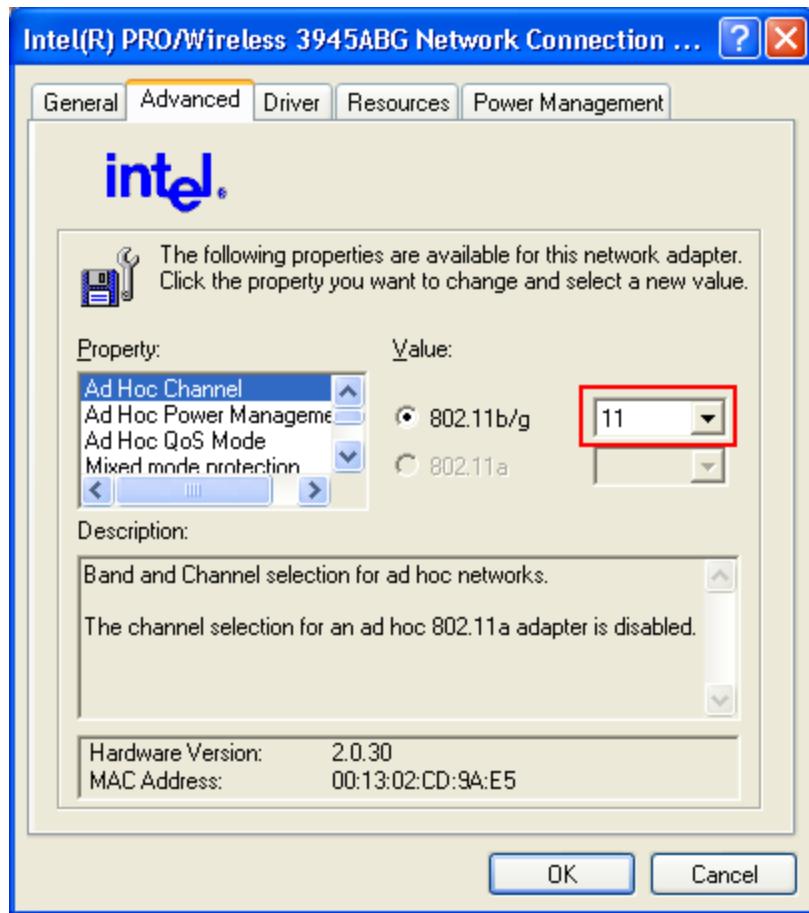
Right click on it and select **Open Network Connections**.

Name	Type
<b>LAN or High-Speed Internet</b>	
Wireless Network Connection	LAN or High-Speed Internet
Local Area Connection	LAN or High-Speed Internet

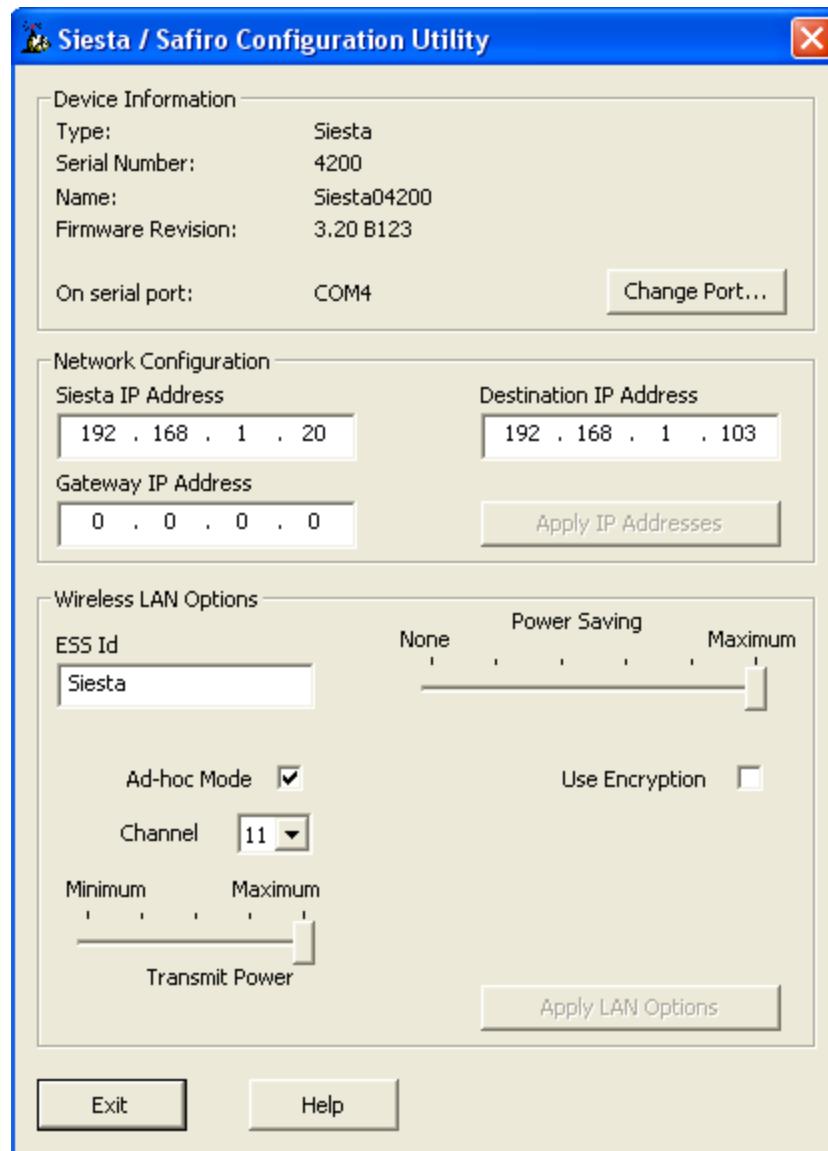
Right click on the **Wireless Network Connection** and select **Properties**. Click the **Configure** button for your network card.



Go to the **Advanced** tab and highlight **Ad Hoc Channel** (if needed). The number displayed on the right is the Channel number being used. Exit out of these displays. (If you encounter problems maintaining communication with the amplifier unit, try a different channel, such as 7).

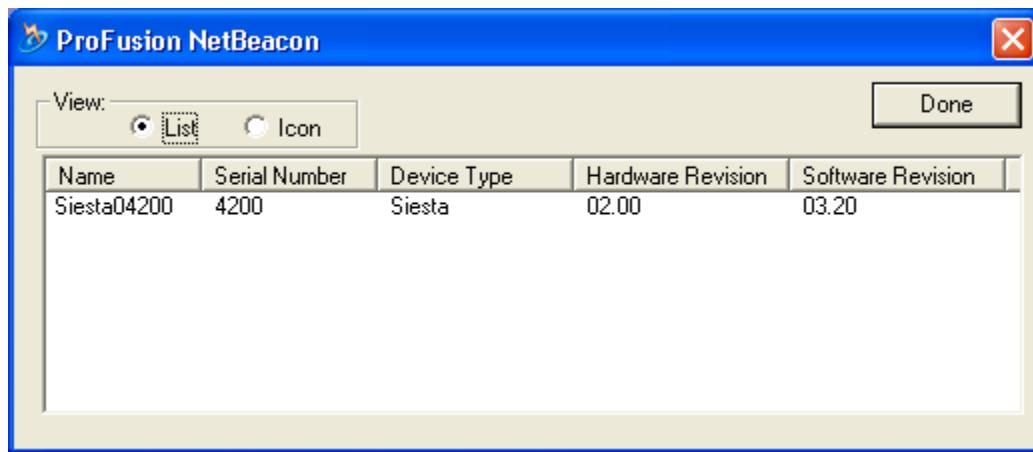


Back in the *SynAmps Wireless* Configuration Utility, enter the **Channel** number that is being used, and click the **Apply LAN Options** button.



You should now be connected to the *SynAmps Wireless* amplifiers.

Verify the connection by running the *NetBeacon* program. You should see the *SynAmps Wireless* (or *Siesta*) amps being found. If you have set up multiple *SynAmps Wireless* (or *Siesta*) units, you will see all of them (once they are configured).



Once you have made the connection to *SynAmps Wireless*, the next step is to format the Compact Flash card, described in a section [below](#)<sup>18</sup>.

#### **Special case in Ad Hoc mode and unattended Flash recordings**

If you are using the Ad Hoc mode, where you start a recording to the Flash card, then, for whatever reason, you turn off the Scan computer, you will need to take a couple of extra steps in order to re-establish connection to the amplifier unit in order to peek into the ongoing recording.

Make sure NetBeacon is running, and the recording unit is seen.

Once you have started the recording to the flash card, you need to manually disconnect the wireless link. Double-click on the green broadcast icon on the Taskbar, and click the Disconnect button. Click Yes to the message that appears.

Exit NetBeacon, and click Yes to stop any active studies.

After restarting the computer, you will need to reconnect to the Ad Hoc link manually. Display the list of networks, select the Ad Hoc network, and click the Connect button. Look in NetBeacon to verify that the amplifier has been found. Then start Scan.

## **3.8 Configuring the Wireless Access Point**

If you are not using the Ad Hoc Mode to communicate with *SynAmps Wireless*, you will need to use the Wireless Access Point (AP), or infrastructure method. (Whenever possible, your system will be preconfigured so that you may use either method to transfer data, without having to complete the following steps).

You should first Change the IP Address for your computer, [as described above](#)<sup>19</sup>.



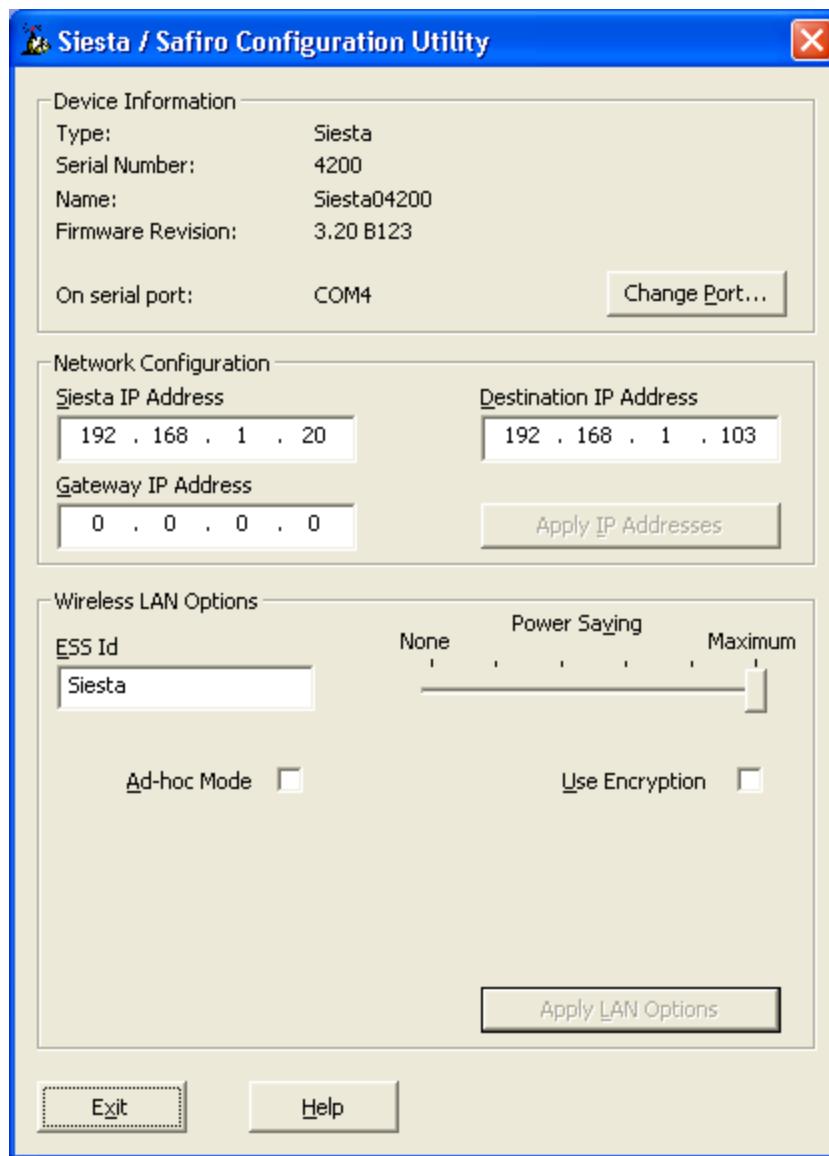
#### **Note**

IF YOU ARE CONFIGURING YOUR OWN SYSTEM, OR CHANGING THE IP ADDRESS, SUBNET MASK, OR CHANNEL, BE SURE TO RECORD THE SETTINGS YOU ARE USING. IT MAY BE

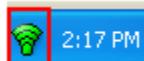
DIFFICULT FOR TECH SUPPORT TO HELP RESTORE YOUR SYSTEM IF THESE SETTINGS ARE NOT KNOWN.

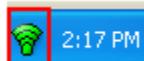
You should also have made the IR connection with the *SynAmps Wireless*, [as described above](#)<sup>[23]</sup>.

To set up the Access Point, you must first deselect **Ad-hoc Mode**. Click the **Apply LAN options** button.



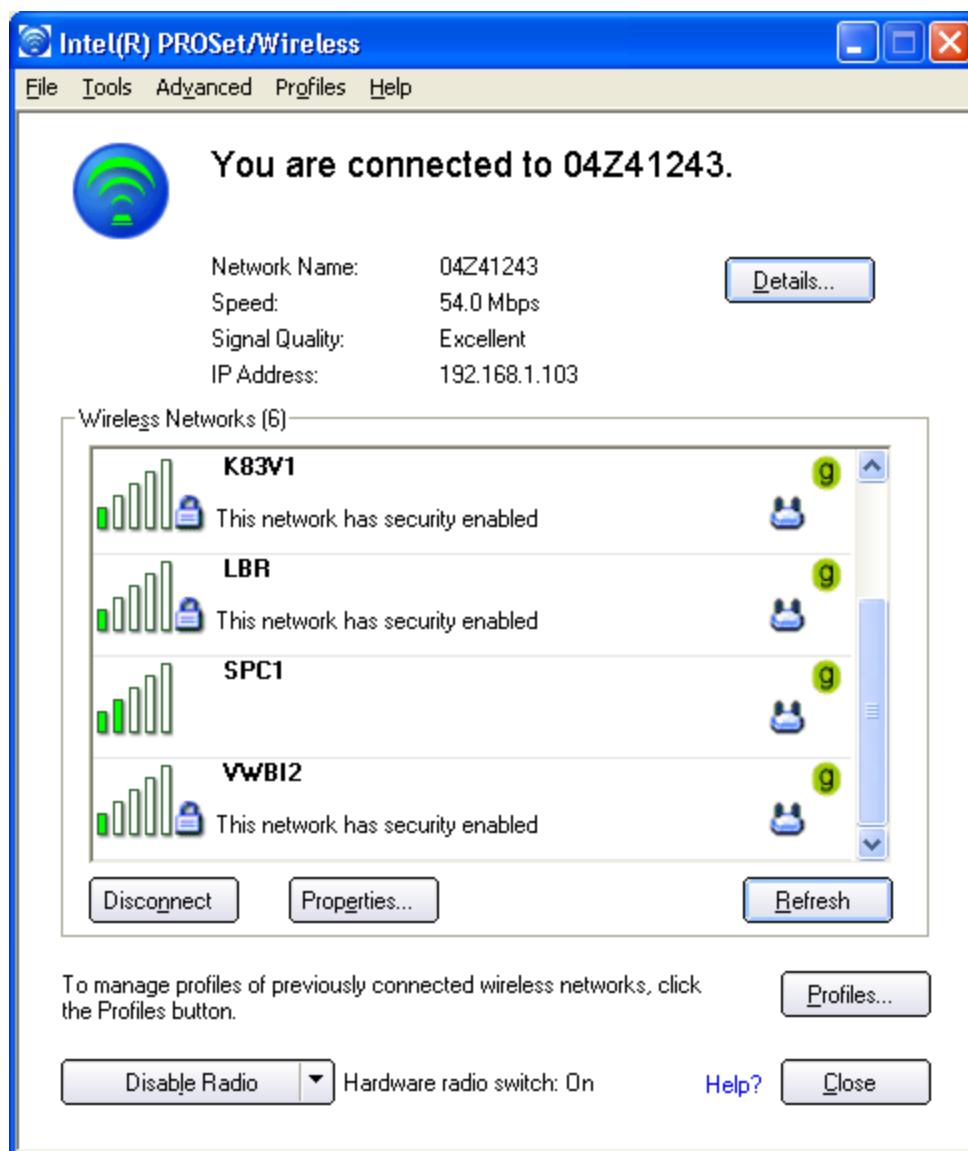
Leave the *SynAmps Wireless* Configuration Utility open.



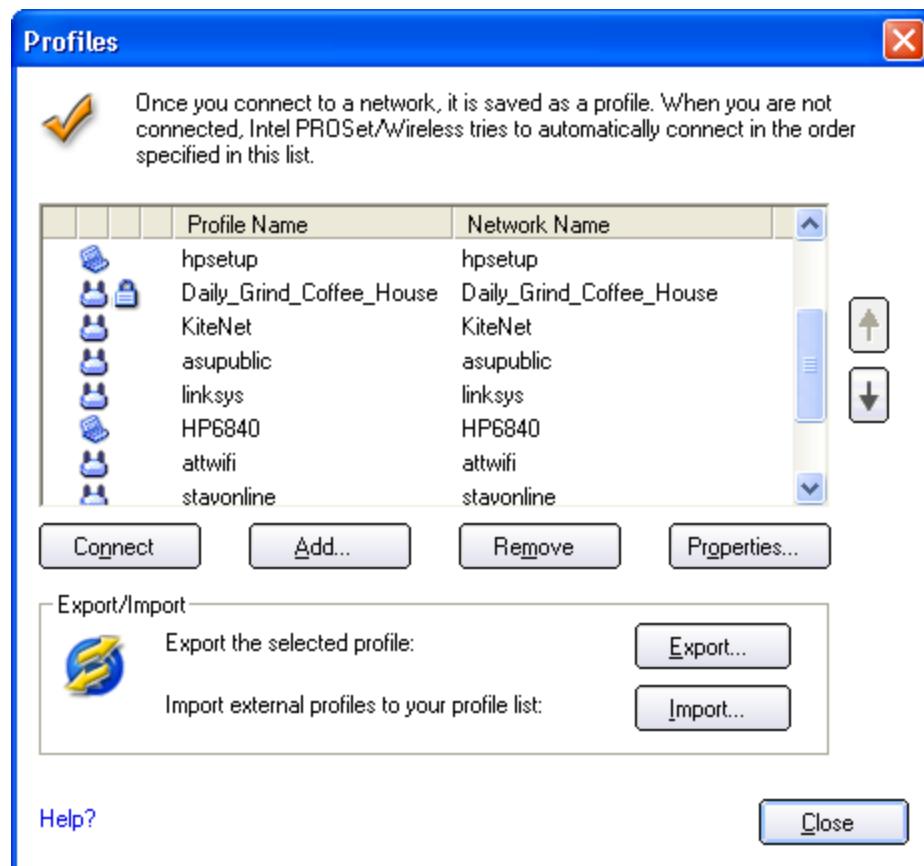
Find your wireless status icon  on the Windows Taskbar, near the clock. Right click on it and select the **Open <brand>** option.



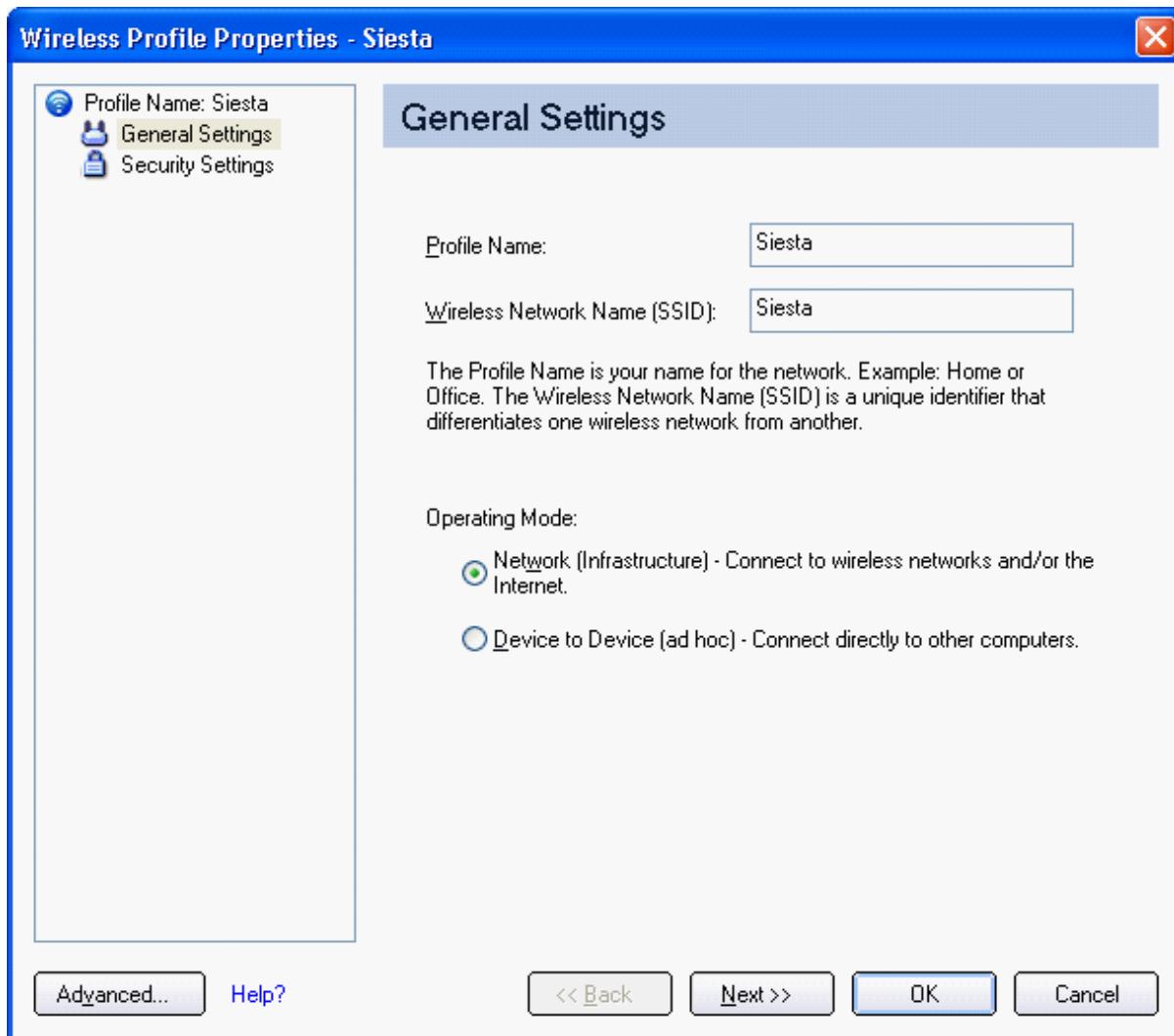
You will then see the all of the wireless networks in the vicinity, including whatever one you happen to be connected to.



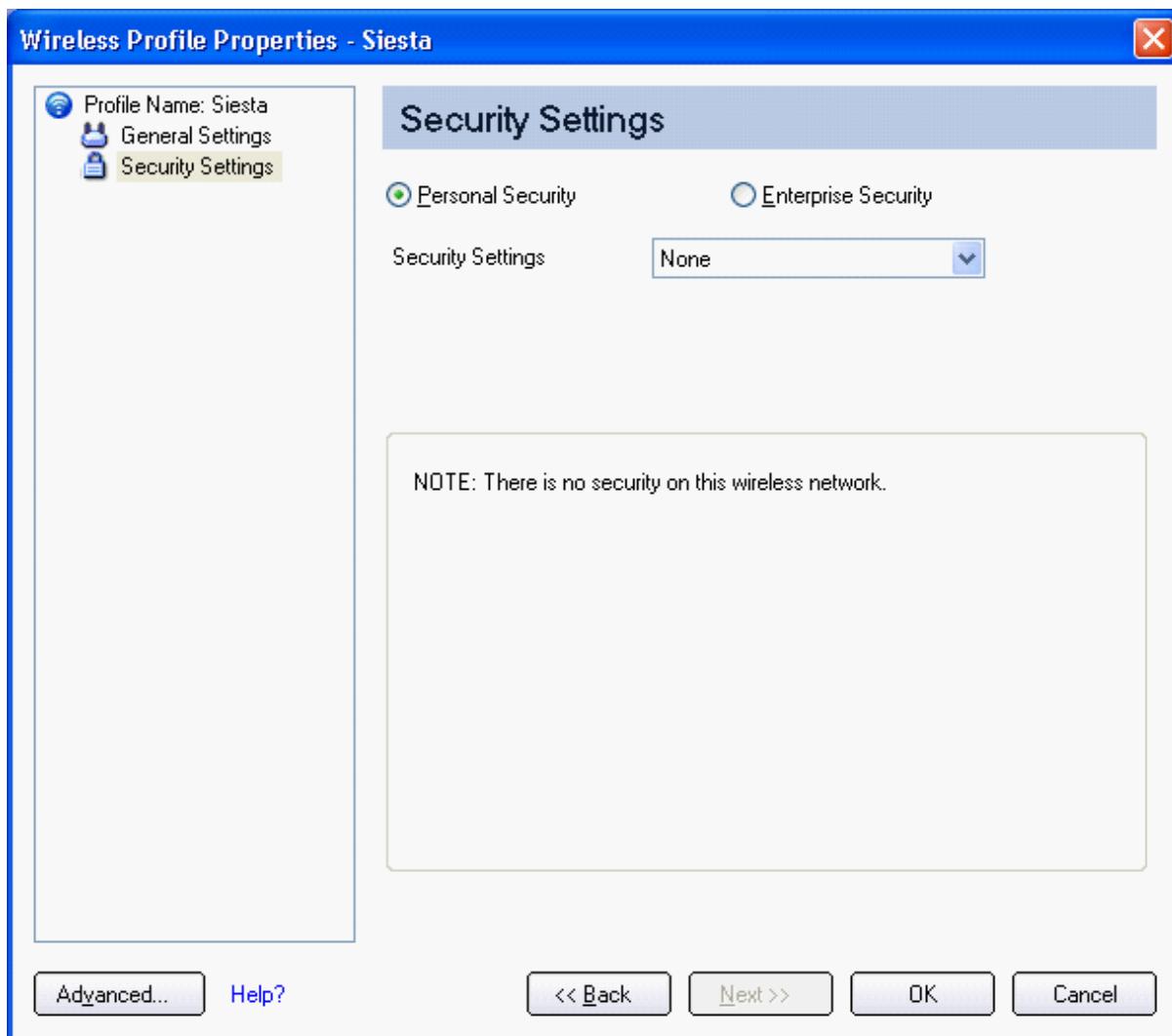
Click on the **Profiles** button, and you will see the networks you have been connected to in the past. Click the **Add** button.



The Wireless Profile Properties will appear. For **Profile Name** enter the name for the ad hoc connection, such as **Siesta**. For the **SSID**, enter **Siesta** (case sensitive). Select **Network (Infrastructure)** for the **Operating Mode**. Then click **Next**.



For the Security Settings, select **Personal Security** and select **None** for the **Security Settings**. Click **OK**.



You will then see the **Profiles** window again. Highlight the profile you just created (SynAmps), and click the **Connect** button.

Verify that *SynAmps Wireless* is turned on, and the LED is blinking orange.

Find the **Wireless Network Connection** icon on the Taskbar. You should see the "SynAmps" connection (Siesta below).



The next step is to configure the Access Point itself. Insert the CD and connect the hardware as directed from the CD.

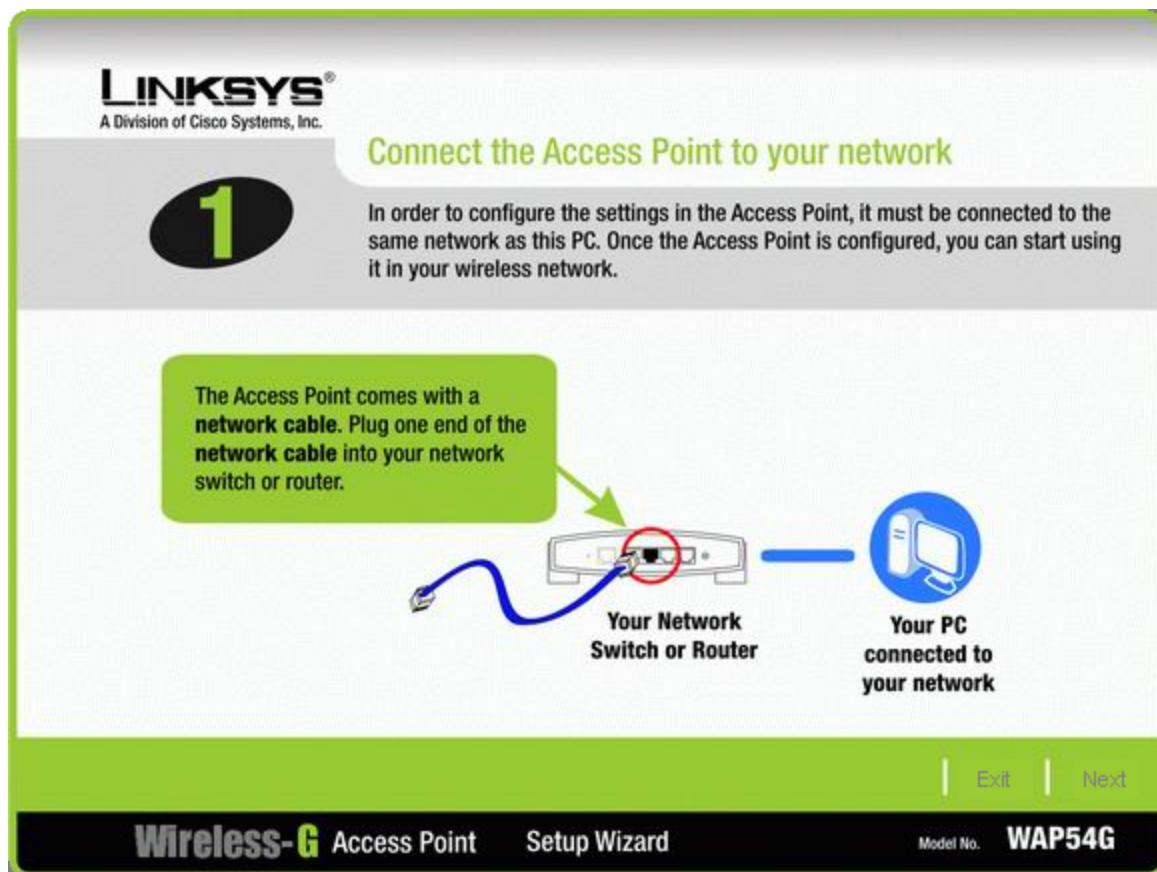


1. The welcome screen will appear. If it does not start automatically, run *setup.exe* from the CD drive.

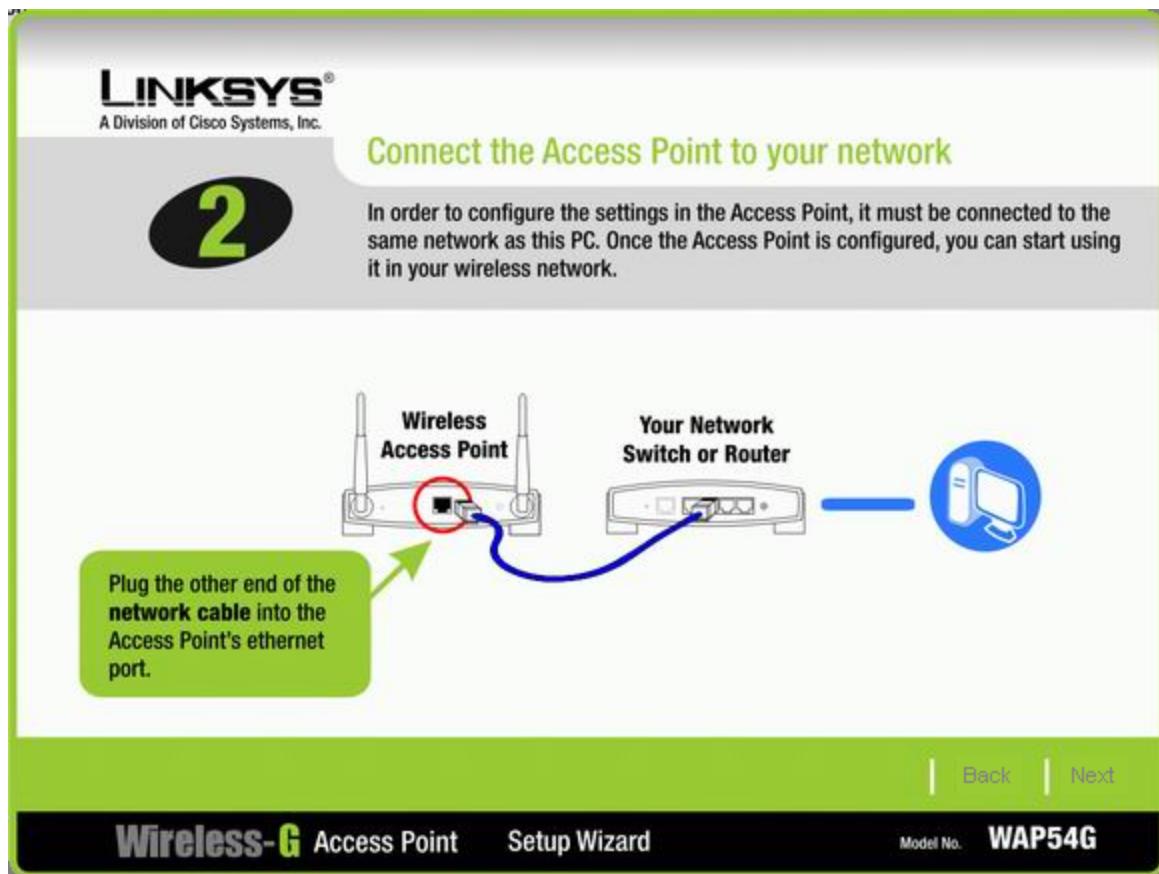


Click the "Click Here to Start" button.

2. Connect the supplied cable to your Network Switch or Router. If you do not have either, connect it to the ethernet connection on your computer, and click **Next**. The cable is used for the initial configuration. Once set up and communicating, you can disconnect it. However, if you are recording from 4 amplifier units, you may need to use the physical cable connection from the computer to the AP to preserve bandwidth.



3. Connect the other end of the cable to the AP connector, and click **Next**.



4. Connect the power cable to the AP. Click **Next**.

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### Power on the Access Point

**3**

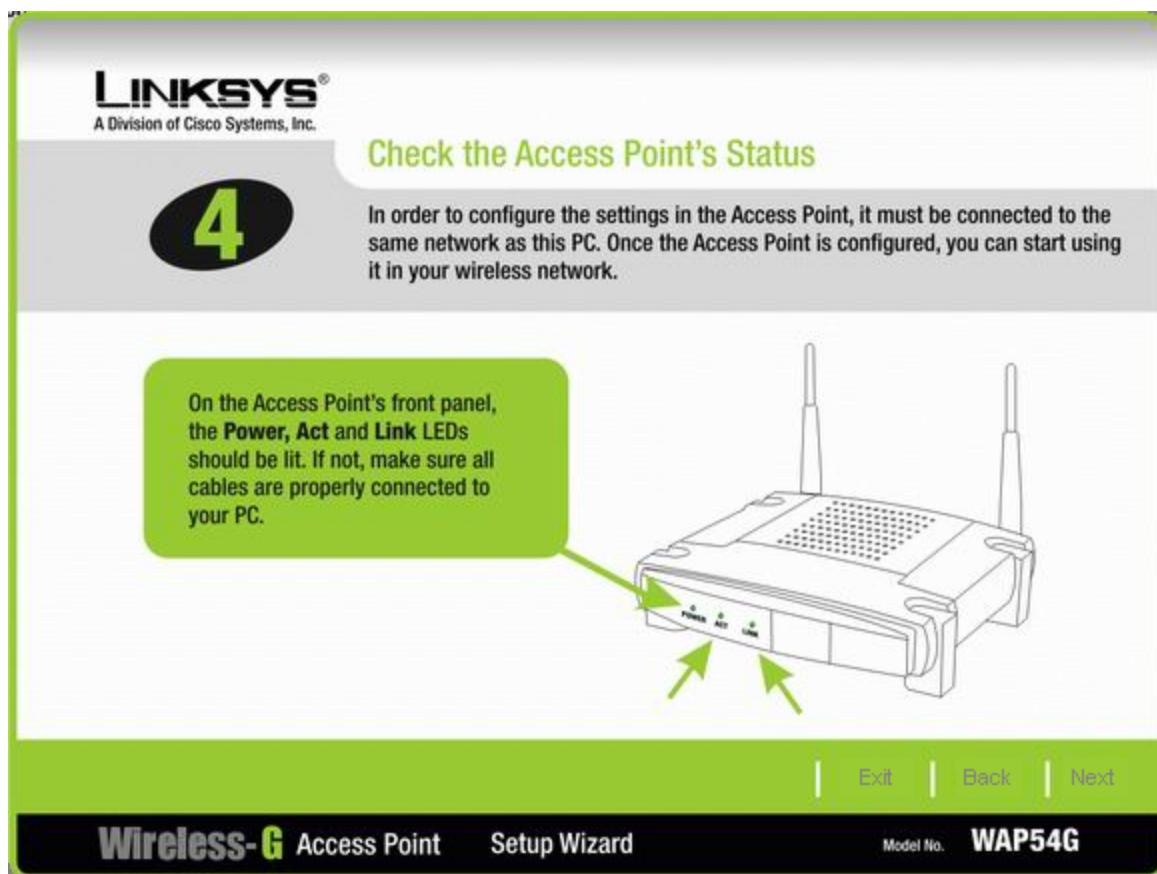
In order to configure the settings in the Access Point, it must be connected to the same network as this PC. Once the Access Point is configured, you can start using it in your wireless network.

Plug the power adapter into the Access Point's **Power** port. Plug the other end into an electrical outlet.

| Back | Next

Wireless-G Access Point    Setup Wizard    Model No. **WAP54G**

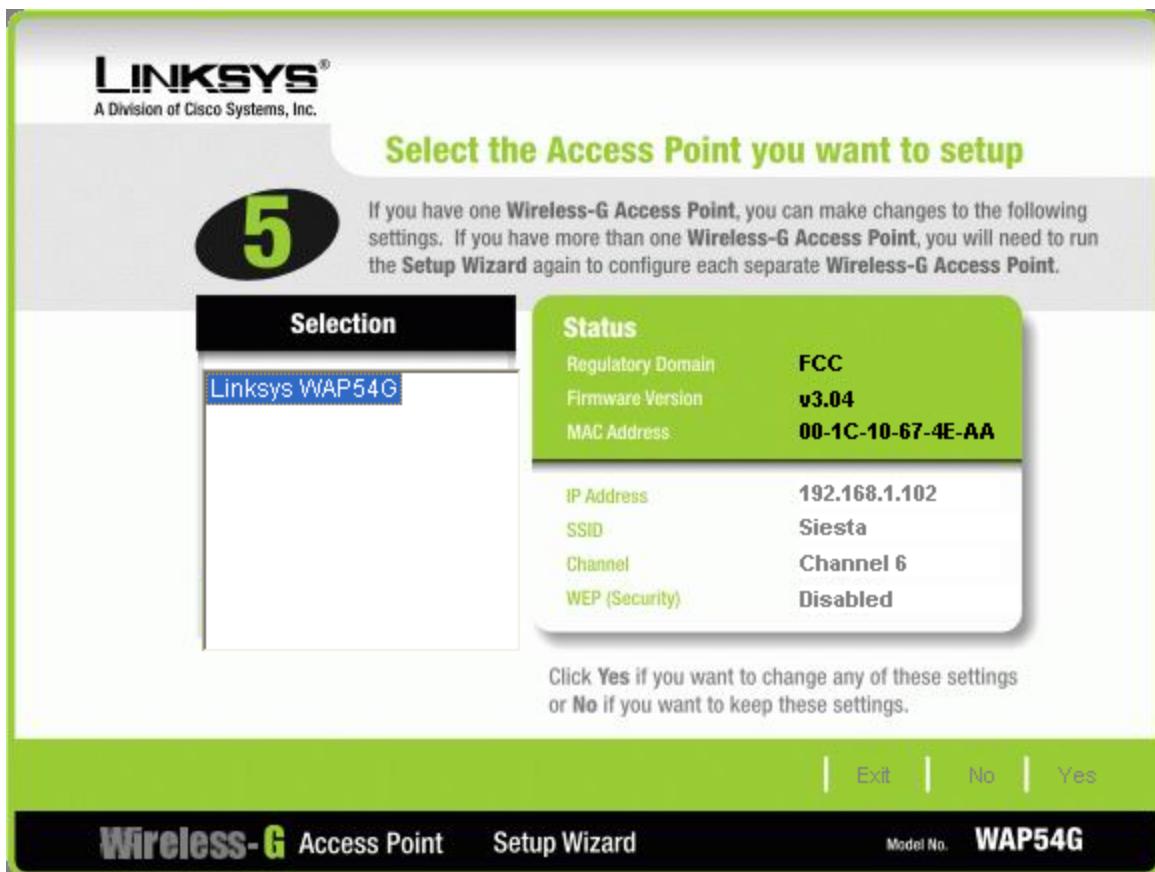
5. Make sure the lights in front are lit. Click **Next**.



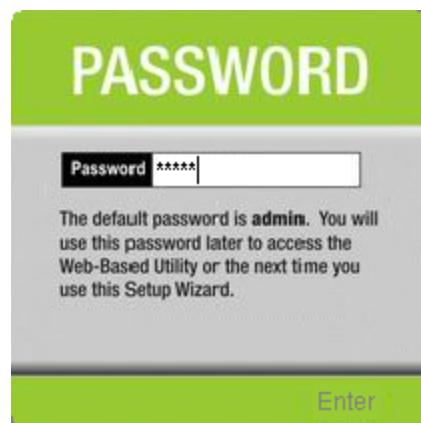
6. The software will then check the connection.



7. You then need to select the AP that you want to address. Most likely, you will only have the one. Click the **Yes** button to make changes.



8. You will be asked for a password: enter "admin" and click **Enter**.



9. You should then enter the basic settings. Leave **Device Name** as it appears. Enter a new **Password**, and note what it is in case you need it later. For **Network**, select **Static IP**.

The **IP Address** should be unique. (The default address is 192.168.1.245). Enter, for example, 192.168.1.102. For the **Subnet Mask**, use 255.255.255.0. The **Default Gateway** generally does not matter - leave the default as is.

**Note**

IF YOU ARE CONFIGURING YOUR OWN SYSTEM, OR CHANGING THE IP ADDRESS, SUBNET MASK, OR CHANNEL, BE SURE TO RECORD THE SETTINGS YOU ARE USING. IT MAY BE DIFFICULT FOR TECH SUPPORT TO HELP RESTORE YOUR SYSTEM IF THESE SETTINGS ARE NOT KNOWN.

Then click **Next**.

**LINKSYS®**

**Basic Settings**

**6**

These are basic settings for the Access Point. Please enter a new password to help secure your Access Point when accessing the Setup Wizard or Web-based utility.

**Device Name** Linksys WAP54G

**Password** \*\*\*\*\*

**Network** Static IP

**IP Address** 192.168.1.102

**Subnet Mask** 255.255.255.0

**Default Gateway** 192.168.1.1

The **Device Name** is a unique name given to the Access Point to prevent confusion when using multiple Access Points.

Please enter a new **password** for the Access Point. You will need this **password** to access the Web-based utility or Setup Wizard.

Select **Automatic-DHCP** if your network has a router (or DHCP server). Select **Static IP** if your network requires a static IP address for the Access Point.

Enter the **IP Address**, **Subnet Mask**, and **Default Gateway** if you know your network's settings, otherwise leave the default settings. An IP address must be specified in order to manage the Access Point from the network.

| Back | Next |

Wireless-G Access Point      Setup Wizard      Model No. **WAP54G**

10. Follow the directions if you have additional devices on the network; otherwise, click **Next**.

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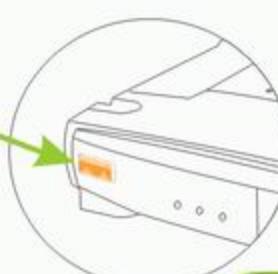
## Configure Wireless Settings

**1**

If you have other **SecureEasySetup** devices on your network, simply push the button to add the device to the network. If you do not have a **SecureEasySetup** capable device, click **Enter Wireless Settings Manually**.

Press the lighted Cisco logo for one second and release. Wait for the logo to turn white and start blinking. Locate the button on your other **SecureEasySetup** devices and press it to add it to your network. The Cisco logo should turn white and stop blinking once the device is added. To add more devices, repeat the process for each device.

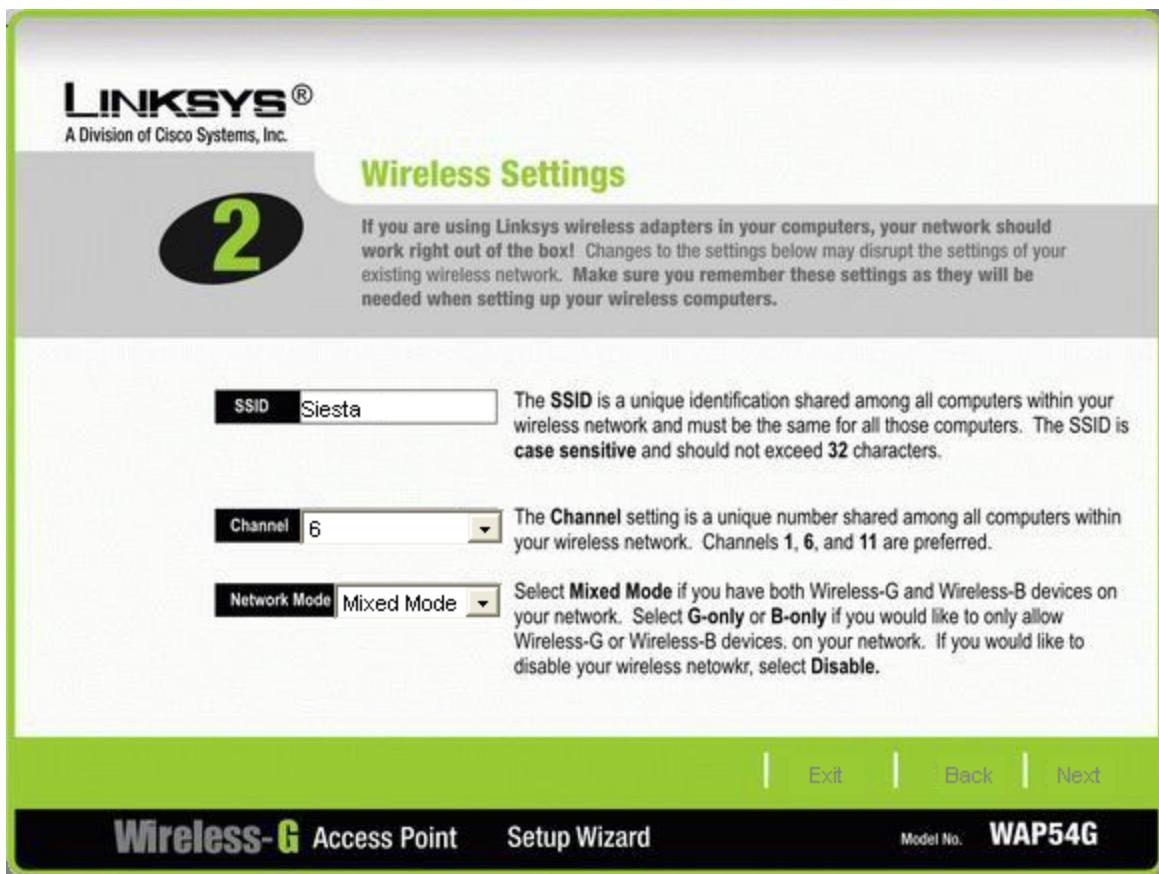
[Where is my SecureEasySetup button?](#)



**Enter Wireless Setting Manually**

Exit | Back | Next

11. Here you need to enter an **SSID**. Enter "Siesta" (case sensitive). For **Channel**, select **6**. If you use a different channel, remember the channel you selected. Select **Mixed Mode** for the **Network Mode**. Click **Next**.



12. For **Security Settings**, select **Disabled**. Click **Next**.

The screenshot shows the 'Security Settings' page of the Linksys WAP54G Access Point Setup Wizard. At the top, the Linksys logo and 'A Division of Cisco Systems, Inc.' are displayed. A large green number '3' is prominently shown with the word 'Security' below it. The title 'Security Settings' is in green at the top right. Below the title, a message reads: 'At this point, you have the opportunity to enable wireless security, which prevents unauthorized access to your wireless network. For your own security, please read and choose from the following options.' A horizontal scale bar at the bottom indicates security levels from 'weak' (red) to 'strong' (blue). The scale is divided into three main categories: 'Home' (WEP, WPA/WPA2 Personal), 'Business' (WPA-Enterprise, Linksys Wireless Guard), and 'Links' (disabled). Each category has a brief description and a link to 'Learn more'. Navigation buttons 'Back' and 'Next' are at the bottom.

Home	Business
<b>WEP</b>	<b>WPA-Enterprise</b>
Wired Equivalent Privacy (WEP) is a security system that encrypts the data sent over the wireless network so that only users that know the encryption key can access the network.	The RADIUS mode of Wi-Fi Protected Access (WPA-RADIUS) secures corporate wireless networks by authorizing each device against a master list held in a special authentication server.
<b>WPA/WPA2 Personal</b>	<b>Linksys Wireless Guard</b>
The Pre-Shared Key mode of Wi-Fi Protected Access (WPA/WPA2 Personal) is similar to WEP but stronger, with longer and constantly changing encryption keys.	Linksys Wireless Guard is a subscription service that gives small businesses the industrial-strength security of WPA-RADIUS, without the hassle of building your own RADIUS server. <a href="#">Learn more</a>

**Links**

**Disabled**

If you are setting up a publicly available network, you can leave wireless security disabled.

**Weak**      **Strong**

**Home**

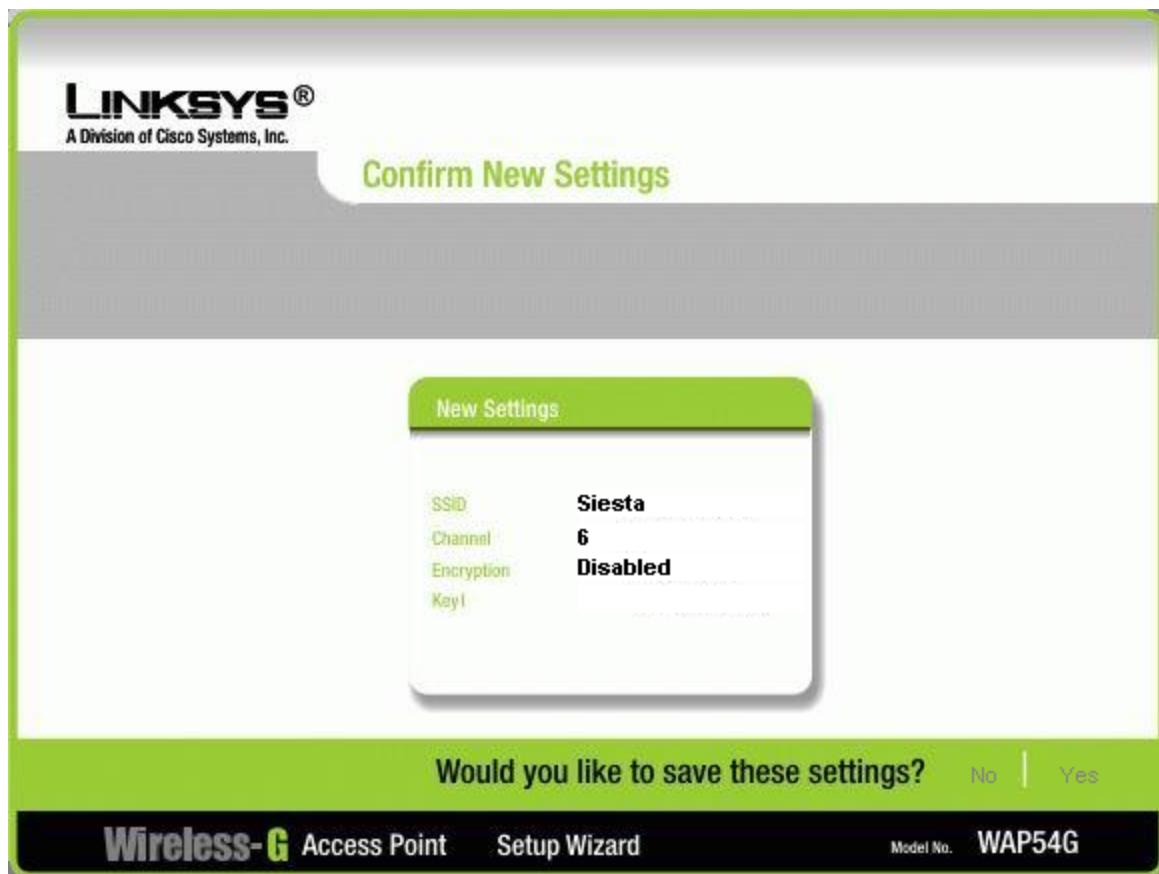
**Business**

**Links**

**Back** | **Next**

**Wireless-G Access Point**    **Setup Wizard**    Model No. **WAP54G**

13. Then you have the option to confirm the settings you have made. Click **Yes**.



14. You will see a progress bar showing the reconfiguration of the AP.

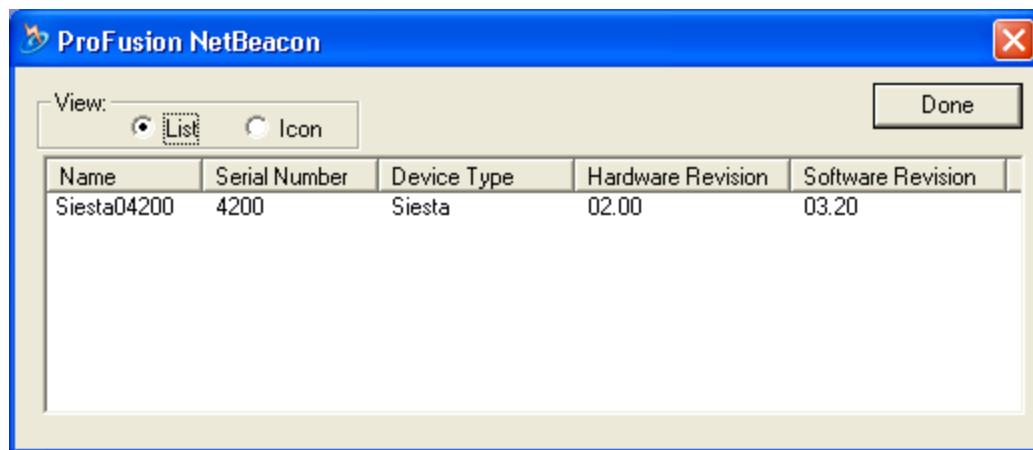


15. Lastly, click **Exit** to leave the program.



You should now be connected to the *SynAmps Wireless* amplifiers.

Verify the connection by running the **NetBeacon** program. You should see the *SynAmps Wireless* amps being found. If you have set up multiple *SynAmps Wireless* units, you will see all of them (once they are all configured).



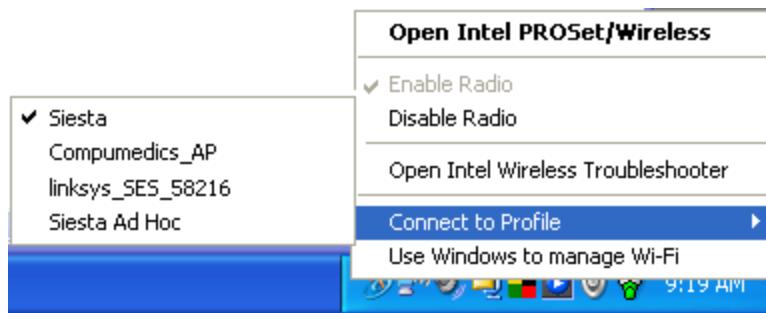
Name	Serial Number	Device Type	Hardware Revision	Software Revision
Siesta04200	4200	Siesta	02.00	03.20

Once you have made the connection to *SynAmps Wireless*, the next step is to format the Compact Flash card, described in a section below.

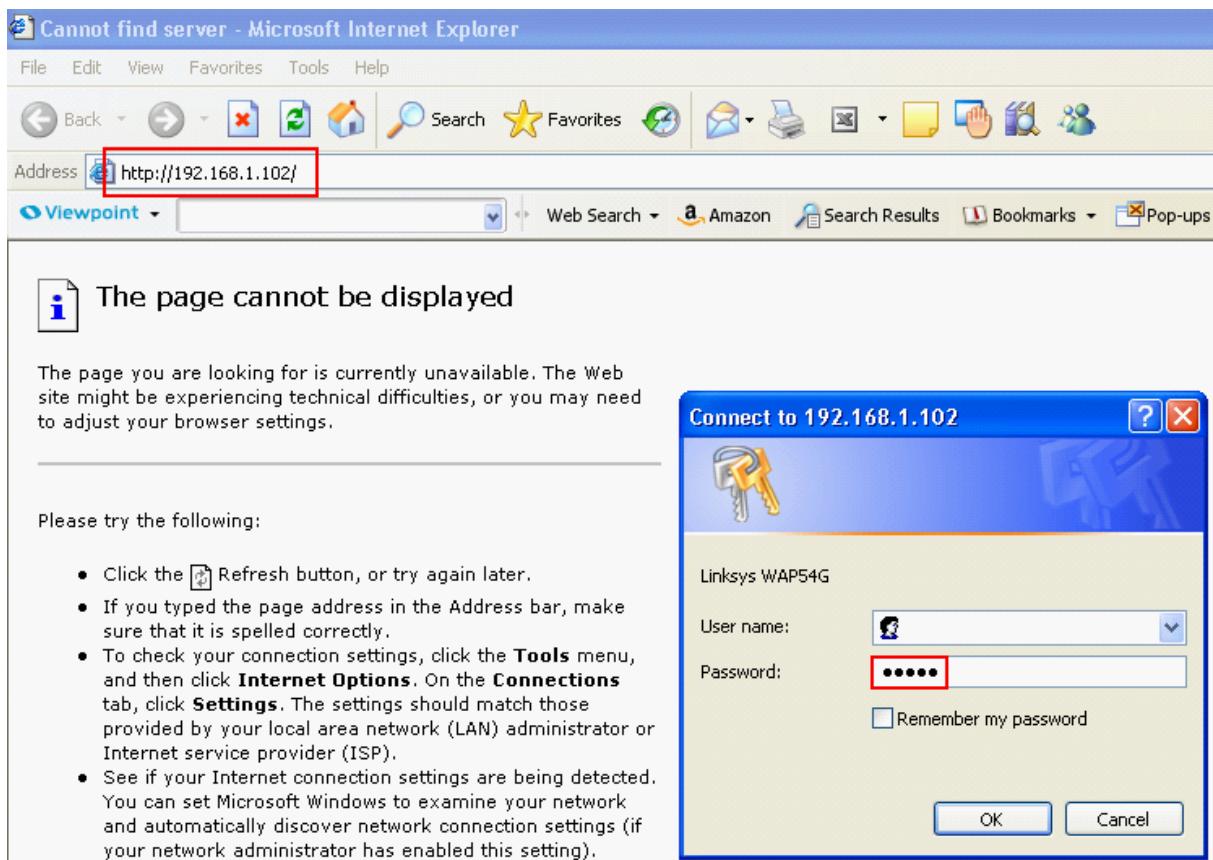
## Troubleshooting

While the configuration should be straightforward, things sometimes go amiss. There are some tools that can be useful in determining the problem and solving it.

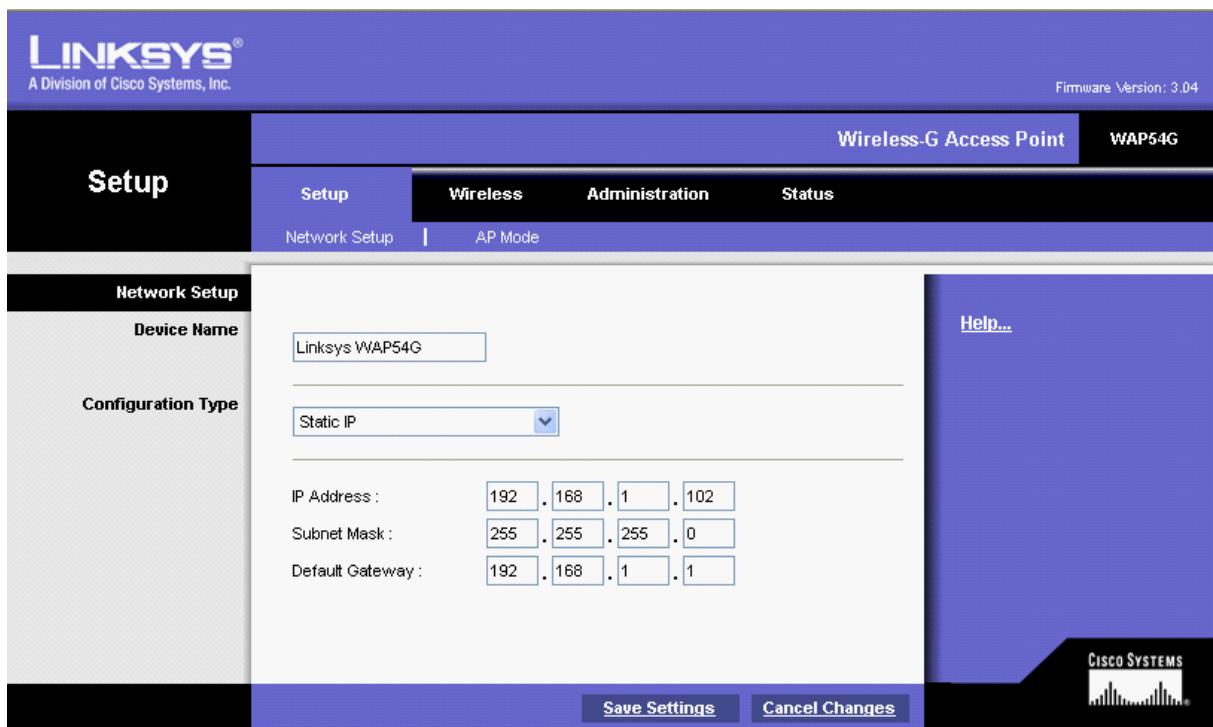
1. If you have difficulty making connection with the AP, or if you have to reestablish a connection to it to modify settings, you may see a message just after Step 6 above saying that there is a problem making the connection. If you cannot get past that, one option is to return the AP to its original default configuration. There is a small hole in the back side of the AP. Use a paper clip or pen point to push the button inside the hole to restore the default settings to the AP.
2. Sometimes you may need to use the **Connect to Profile** option. *Right click* on the network status icon on the Taskbar, and select **Connect to Profile**. You will see the list of profiles you have created, including the *SynAmps* one. Selecting that will sometimes force the connection to the right network.



3. Another way to access the AP is via the internet (you do not need an live internet connection for this). Type in the IP on the **Address** line. Use "admin" for the **Password** and no **User name**.

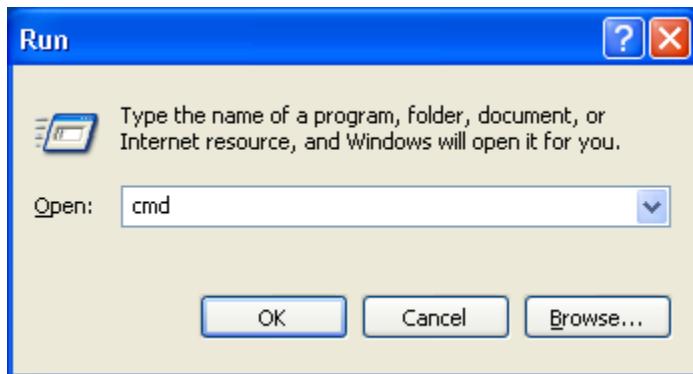


Go to the **Wireless** option, and from there you can enter/modify the **IP Address** and **Subnet Mask** (ignore the Default Gateway). Click Save Settings to make the changes.



If you find that communication at higher AD Rates (1024) via the AP becomes unstable, try changing the Channel. Click on the **Wireless** tab above and then select a different channel (try 7), then **Save** the **Settings**.

4. Another way to test the connections is to "ping" the IP addresses. Go to **Start** → **Run** and type "cmd" in the Open line.



You will then see the DOS prompt. Type in "ping xxx.xxx.x.xxx" where the x's are the IP address for the AP, *SynAmps Wireless*, or your computer. If connected properly, you should get replies from the device.

```
C:\WINDOWS\system32\cmd.exe
Microsoft Windows XP [Version 5.1.2600]
(C) Copyright 1985-2001 Microsoft Corp.

C:\Documents and Settings>ping 192.168.1.102

Pinging 192.168.1.102 with 32 bytes of data:
Reply from 192.168.1.102: bytes=32 time=9ms TTL=64
Reply from 192.168.1.102: bytes=32 time=7ms TTL=64
Reply from 192.168.1.102: bytes=32 time=7ms TTL=64
Reply from 192.168.1.102: bytes=32 time=13ms TTL=64

Ping statistics for 192.168.1.102:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss)
    Approximate round trip times in milli-seconds:
        Minimum = 7ms, Maximum = 13ms, Average = 9ms

C:\Documents and Settings>
```

A screenshot of a Windows Command Prompt window titled 'C:\WINDOWS\system32\cmd.exe'. It shows the copyright information for Microsoft Windows XP. The user types 'ping 192.168.1.102' and receives four replies from the target IP address. The window then displays ping statistics: 4 packets sent, 4 received, 0 lost (0% loss), with approximate round trip times ranging from 7ms to 13ms and an average of 9ms. The window has a standard Windows XP interface with a blue title bar and a scroll bar on the right.

Once you have made the connection to *SynAmps Wireless*, the next step is to format the Compact Flash card, described in a [section below](#).

### 3.9 Notes on Configuring the Wireless LAN

The Wireless LAN options section of the window allows all of the parameters related to the operation of the 802.11b wireless interface to be configured. The data to be entered and information displayed depends on how the wireless network is to be configured, that is whether it is used in infra-structure or ad-hoc mode and whether or not encryption is to be used.

#### **ESS ID**

In all cases (whether using infra-structure or ad-hoc mode) it is necessary to configure the ESS ID or network name. This name is used to refer to the logical network formed by the wireless LAN devices. It consists of between one and thirty-two alphanumeric characters (case is significant) and must be the same in the *SynAmps Wireless* device and any Access Point or wireless LAN card with which the *SynAmps Wireless* will communicate. To enter the name simply click in the text entry window (immediately below the text ESS Id) and type in the desired value. The edit window will not allow the entry of more than thirty-two characters. When shipped from the factory the default ESS ID is "Siesta" (without the enclosing quotes).

#### **Power Saving**

As with the ESS ID it is always necessary to choose the "Power Saving" level. To do this simply click in the slider to move the indicator to the left or right. Power saving works by putting the wireless LAN interface into a low current "sleep mode" whenever there is no data to transmit. There is a total of six power saving levels in all varying from no power saving (never enter "sleep mode") when the slider is all the way to the left to maximum power saving (enter "sleep mode" for a long time interval) when the slider is all the way to the right. Generally speaking the power saving will work best (lowest average current and minimal impact on network performance) when the wireless LAN is operating in infra-structure mode. If using ad-hoc mode it may be necessary to select reduced (or no) power saving in order to achieve satisfactory network performance.

#### **Power Saving Level**

In order to achieve the maximum battery life from the *SynAmps Wireless* device it is important to configure the power saving to the maximum level consistent with satisfactory network performance. In the case of infra-structure mode this will generally always be maximum power saving (resulting in the longest possible battery life). In the case of ad-hoc mode operation, however, it may be necessary to reduce the power saving level, possibly down to none, to achieve satisfactory performance. Also, for a given power saving level, the battery life will usually always be longer in infra-structure mode rather than ad-hoc mode. Since power saving is achieved by putting the radio module into low power "sleep mode" whenever there is no data to send the actual battery life will be determined both by the selected power saving level and the amount of data to be sent (that is the montage selected). Fewer channels or reduced samples per second will result in longer battery life for a given power saving level. Finally, remember that if using ad-hoc mode it is necessary to ensure that power saving in the PC wireless LAN card is completely disabled, this is because the PC will be unable to receive any data from the *SynAmps Wireless* while its wireless LAN card is in sleep mode. Access Points are usually always mains powered (via a plug pack or power adapter) and do not use power saving or sleep mode internally.

#### **Connection Modes**

An 802.11b wireless network operates in one of two possible modes. These are infra-structure mode or ad-hoc mode. In infra-structure mode 802.11b mobile devices

(such as the *SynAmps Wireless*) communicate with a wired LAN network via one or more "Access Point" devices. In this mode all communication, even between two "mobile devices", is via the access points and wired LAN. By using multiple access points it is possible to extend the range of mobile devices over any desired area. In ad-hoc mode one or mobile devices are able to communicate with each other if they are within radio range, a wired network is not required. The network coverage area is limited to the radio range of a single 802.11b device and the visible devices will change as they go in and out of radio range.

Compumedics recommends use of infra-structure mode for the *SynAmps Wireless* wireless network. This will generally provide the lowest power consumption and best network performance. This is the default configuration for *SynAmps Wireless* when shipped from the factory. If, however, it is desired to use ad-hoc mode this can be selected by clicking in the "Ad-hoc Mode" check box. When this box is checked additional configuration options, for channel and transmit power, become available. In infra-structure mode these are automatically set by the access point the *SynAmps Wireless* is communicating with and are not configured by the user. To select the channel use the drop down arrow beside the channel number to open a list of available channels and select the desired one from the list. If necessary use the scroll bar to move up and down in the list. For correct operation the selected channel must be the same as used in the PC based 802.11b card that the *SynAmps Wireless* will communicate with. To adjust the transmit power click on the slider to move it to the left or right. There are five transmit power levels in all varying from minimum, when the slider is all the way to the left, to maximum when the slider is all the way to the right. Using maximum transmit power will provide the largest distance between the *SynAmps Wireless* device and the receiving PC and should generally be selected. In those situations where it is necessary to have multiple independent networks within a small area selecting lower transmit power levels will reduce interference between the networks.

### **Notes on Wireless LAN Options**

Generally speaking the wireless LAN options configured for the *SynAmps Wireless* device must match the options selected for the Access Point or PC cards with which the *SynAmps Wireless* will communicate (for example all devices in the wireless network must use the same ESS ID). If this is not the case then the *SynAmps Wireless* will either be unable to "connect to" the destination device or will be unable to transfer data to the destination device. The method of configuring either Access Point devices or PC wireless LAN cards is beyond the scope of this document. For further information please refer to the documentation supplied with your Access Point or PC card.

While the *SynAmps Wireless* can be used in any valid 802.11b operating mode certain configuration options will provide either better network performance or lower operating power for the *SynAmps Wireless*.

### **Infra-Structure or Ad-Hoc Mode?**

The 802.11b standard provides two operating modes. These are infra-structure mode or ad-hoc mode.

In infra-structure mode a number of mobile 802.11b devices communicate with each other and wired LAN devices using one or more "Access Points" to connect between the wireless network and the wired network. The "Access Points" control the configuration of the mobile devices and coordinate all wireless communication whether it is from a mobile device to the wired network or between two mobile devices. By

connecting multiple access points to the wired network the coverage area for mobile devices can be increased to what ever size is required. As the mobile devices move around within the coverage area they automatically connect to (and transfer all data through) which ever access point is closest or provides the best signal. This is known as "roaming" and is controlled by the access points with little or no over-head to the mobile devices.

In ad-hoc mode one or more mobile devices communicate directly with each other without the need for any controlling access point. In this mode a wired network is not required (in fact the mobile devices cannot directly access any wired network resources). The advantage of ad-hoc mode is that it is more flexible in that networks will automatically "form" or "dissolve" as mobile devices move in range or out of range of each other. It has the disadvantage of not allowing easy access to wired network resources. Also the coverage area is limited to the coverage area provided by a single 802.11b device. Finally in ad-hoc mode there is no single "controlling device" (as with the access points in infra-structure mode) with coordination of network activity moving between the various mobile devices as they move about. As a result the network performance will usually be lower than can be achieved with infra-structure mode.

While the *SynAmps Wireless* is able to operate in either ad-hoc or infra-structure mode Compumedics recommends that *SynAmps Wireless* devices always be used in infra-structure mode, that is with one or more access point devices. This will provide the most reliable network connection and lowest operating power in the *SynAmps Wireless*. This is because the access point is able to optimize the power saving operation of the *SynAmps Wireless*, for example by buffering any data destined for a *SynAmps Wireless* while it is in low power "sleep" mode. Initially configuring a system with infra-structure mode also provides for greater flexibility moving forward as additional access points can easily be added if it is required to increase the coverage area. If it is necessary to use ad-mode, then ensure that any receiving PC card has power saving disabled. Like *SynAmps Wireless* the PC card will reduce power consumption by "going to sleep". While in this mode it is not possible to receive packets from the *SynAmps Wireless*. Since there is no access point to buffer this data it will simply be lost resulting in lost data from the *SynAmps Wireless*. This is especially important for PCMCIA cards in laptop where they may be pre-configured to automatically enter power saving mode whenever the laptop is operating off batteries. Also, if using ad-hoc mode, it may be necessary to reduce the power saving level in the *SynAmps Wireless* to achieve satisfactory wireless LAN performance. Turning power saving off completely will significantly reduce battery life in the *SynAmps Wireless*.

### **Channel Numbers**

It is only necessary to enter channel numbers into the *SynAmps Wireless* configuration utility if configuring the *SynAmps Wireless* for the ad-hoc mode of network operation. When using infra-structure mode channel numbers are configured in the access points which then configure the remote devices (that is the *SynAmps Wireless* devices). Unless otherwise noted the following discussion of channel numbers is applicable to either the ad-hoc mode or infra-structure mode of network operation.

The 802.11b standard provides for a total of 14 channels numbered from 1 through to 14. The actual channels available for use in any given country, however, are determined by the radio spectrum regulatory authorities for that country. Therefore, for example, in the US only channels 1 through to 11 are available, in Australia and

much of Europe channels 1 through to 13 are available while in Japan all 14 channels are available. If configuring multiple devices to be on the same ad-hoc mode network then all of the devices must be on the same channel. If configuring multiple ad-hoc networks then all networks within radio range of each other must be on non-overlapping channels. If configuring access points (whether on the same or independent networks) then all access point devices within radio range of each other must be on non-overlapping channels. For two devices to be on the same ad-hoc mode network then it is necessary for both the ESS ID and channel number of the devices to be the same. For multiple devices to be on the same infra-structure mode network then it is only necessary for all devices to have the same ESS ID and all access points to be physically connected to the same wired LAN.

For 802.11b the definition of non-overlapping channels is some what complicated. Adjacent channels are only 5 M Hz apart but each channel has a bandwidth of approximately 30 M Hz. This means that channels must be 5 or 6 channel numbers apart before they are non-overlapping (for example channels 1 and 6 do not overlap, or channel 3 and 8 do not overlap). Although many combinations of non-overlapping channels are possible for simplicity it is easiest to consider the only non-overlapping channels to be 1, 6 and 11 for the US or 1, 7 and 13 for Australia and most of Europe. In other regions the number of non-overlapping channels may be different. Usually most PC device drivers will require the country of operation to be selected and will then only allow channel numbers valid for that country to be used. This means it will usually be easier to first configure the PC card driver or access point and then configure the *SynAmps Wireless* to match (although the channel is only selected in the *SynAmps Wireless* for ad-hoc mode). In many cases access points will offer the choice of automatic channel configuration which means the choice of what constitutes non-overlapping channels can be left entirely to the devices.

### **Transmit Power**

It is only necessary to configure transmit power when configuring ad-hoc mode operation and, even then, in most cases it can be set to maximum. This will give the most reliable network performance and provide the greatest range between the *SynAmps Wireless* and receiving PC. The only time it would be necessary to reduce transmit power is if configuring multiple independent networks (for example multiple *SynAmps Wireless* devices, each sending data to a different PC) within a small geographic area. In this case reducing transmit power will reduce the range for each network allowing a larger number of networks to operate within a given area.

### **Encryption**

The *SynAmps Wireless* supports WEP encryption with either a 40 bit or 128 bit key. Enabling encryption will help prevent any unauthorized access to or interception of data on the wireless LAN network. By default the *SynAmps Wireless* has encryption disabled when it is shipped from the factory. To enable encryption simply click the "Use Encryption" check box to turn it on or off. When turned on an additional check box (to select 128 bit or 40 bit encryption) and a data entry window (to enter the key) become available. If the "Use 128 bit key" box is checked then the *SynAmps Wireless* is configured for a 128 bit WEP key, if it is not checked then it is configured for a 40 bit WEP key. The encryption key should be entered into the "Key" edit window. It should consist of only "HEX digits", that is the numbers "0" to "9" and the characters "A" to "F". Each hex digit sets 4 bits of the key, so for 40 bit encryption it must be 10 characters long and for 128 bit encryption it must be 26 characters long (in this case the last 24 bits are fixed by the 802.11b standard and do not need to be entered). The data entry window will only allow valid characters to be typed and will prevent more than the correct number of characters from

being entered. If you attempt to save the settings with an encryption key containing too few characters an error message will be displayed and the settings are not saved. For correct operation the key entered into the *SynAmps Wireless* and any Access Point or PC 802.11b cards which the *SynAmps Wireless* will communicate with must be the same.

### **Configuring Encryption**

The *SynAmps Wireless* device supports WEP encryption with a single key of either 40 or 128 bits; it does not support any variant of WPA encryption. For correct operation the encryption setting (on or off, 40 or 128 bit) and key used in the *SynAmps Wireless* must be the same as set in any access point devices or PC wireless LAN card. If using more than one access point then each one must be configured with the same WEP settings and key. One point to keep in mind is the difference in key entry between the *SynAmps Wireless* configuration utility and most access point or PC wireless LAN card drivers. In *SynAmps Wireless* the key must be entered as one 10 or 26 character string of hex digits. The "pass phase" key entry method available in most access points or PC card drivers is currently not supported by the *SynAmps Wireless* configuration utility. Also, if using direct key entry, access points and PC card drivers will usually allow you to enter four keys and select which one is currently in use, although it is usually only required that a single key be entered. For operation with the *SynAmps Wireless* it does not matter which of the four keys is used, it is only important that the active (selected) key match the key entered in the *SynAmps Wireless* configuration utility.

### **Applying Changes**

Whenever a change is made to any of the wireless LAN configuration data the "Apply LAN Options" button (in the lower right of the wireless LAN options area) is enabled. Clicking this button will write the changes to the *SynAmps Wireless* device. While the write to the *SynAmps Wireless* is in progress all of the data entry windows and apply buttons will be grayed out. Once the change has been written to the *SynAmps Wireless* they will be re-enabled. It should be remembered that communication via the infrared interface is not one hundred percent reliable and, if necessary, the command will be retried until it is accepted by the *SynAmps Wireless*. This means that the length of time required to apply the change may vary slightly.

If all of the edit windows are grayed out and blank (not showing any value) and the serial number in the Device Information section of the window is shown as "Unknown" then the program has lost (or never established) communication with the *SynAmps Wireless*. Ensure that the *SynAmps Wireless* is turned on and the infra red window is correctly aligned with the infra red dongle. Once communication with the *SynAmps Wireless* is re-established all of the displayed information will be automatically updated.



#### **Note**

IF YOU ARE CONFIGURING YOUR OWN SYSTEM, OR CHANGING THE IP ADDRESS, SUBNET MASK, OR CHANNEL, BE SURE TO RECORD THE SETTINGS YOU ARE USING. IT MAY BE DIFFICULT FOR TECH SUPPORT TO HELP RESTORE YOUR SYSTEM IF THESE SETTINGS ARE NOT KNOWN.

### 3.10 Formating the Compact Flash Disk

The Compact Flash Card is the medium on which study data are recorded instead of (or in addition to) recording to the computer's hard drive.

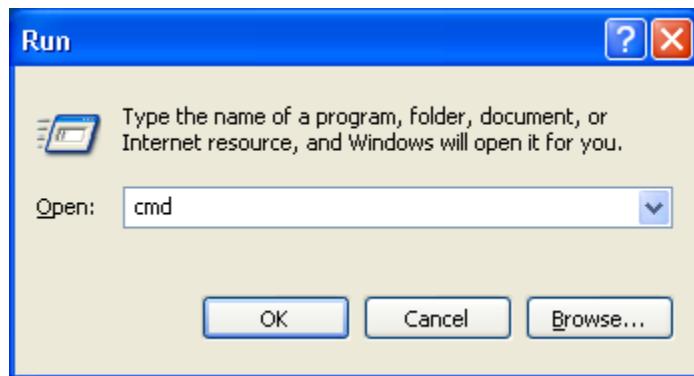


#### Compact Flash Card Care and Handling

- Do not bend or flex the Compact Flash Card.
- Do not expose the Compact Flash Card to dirt, moisture, water or fluids of any kind.
- Always carry the Compact Flash Card in the accompanying jewel case when not inserted in your computer slot or *SynAmps Wireless* Recording Unit.
- Never write to the Compact Flash Card when the computer/laptop battery is low.
- Never eject the Compact Flash Card while the *SynAmps Wireless* Recording Unit, Computer or Laptop is writing to it.
- Do not force Compact Flash Card into slot if resistance is encountered. This will damage the slot and/or Compact Flash Card.
- Observe correct orientation when inserting Compact Flash Card into the Recording Unit, Computer or Laptop.

Before saving the data to the flash drive for the first time, it must first be formatted. (This will also remove any information that is stored on the drive).

1. Use the Data Card Reader to format the flash drive. Some computers will have a suitable reader already installed. If yours does not have one, use the one that was supplied.
2. Install the device according to its instructions.
3. Insert the disk into the reader. You should see it appear as a Removable Disk in the Windows Explore program, or by going to **Start** → **My Computer**. It can be treated as any other external drive. Note which drive letter has been assigned to it.
4. To format the disk (FAT 16, which must be done in DOS), go to **Start** → **Run** and enter and type "cmd" in the Open line.



From the command prompt, type in "format X:/FS:FAT", where X is the drive letter, and press Enter. Follow the directions. Enter a Volume label if desired, when prompted. Then close the DOS window.

5. Remove the flash disk and insert it carefully into the back of the *SynAmps Wireless*. Make sure you insert it with the correct side up. There is a little lip on the back edge of one side of the drive. The lip should be up when inserting it into the amps, so that it can be removed more easily. It is possible to insert the drive upside down if you force it, and doing can damage the card and/or the unit. Be sure you are inserting it right side up. Insert it all the way, until the disk is nearly flush with the back of the amps.



#### NOTE

Only one study may be recorded on a Flash Card at a time. If you try to write a second study to the same card, it will overwrite the first one. To do multiple studies, you will need to use multiple flash cards or else to transfer the data between studies. Be sure that you are not recording data to the flash card when you remove it.

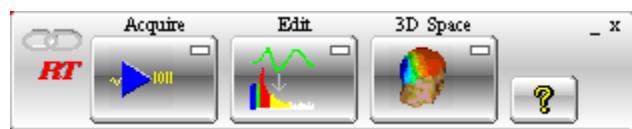
### 3.11 Making a Test Recording

Once you have established a network connection with *SynAmps Wireless* (either via the Ad-Hoc or AP Mode), and have formatted and inserted the flash drive (if you plan on using it), you are ready to do a test recording. The test recording can be just "noise", that is, the low voltage signals that are seen with no inputs to the amplifiers.

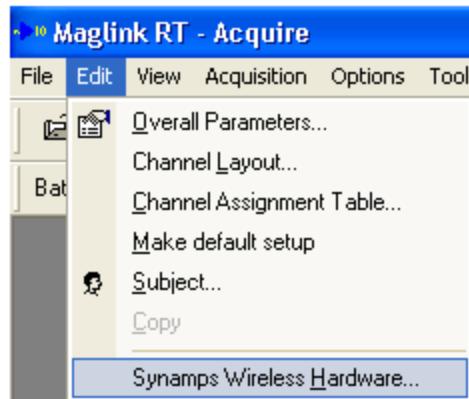
If you have not already installed the *SynAmps Wireless* amplifiers, do so now, [as described above](#)<sup>[17]</sup>.



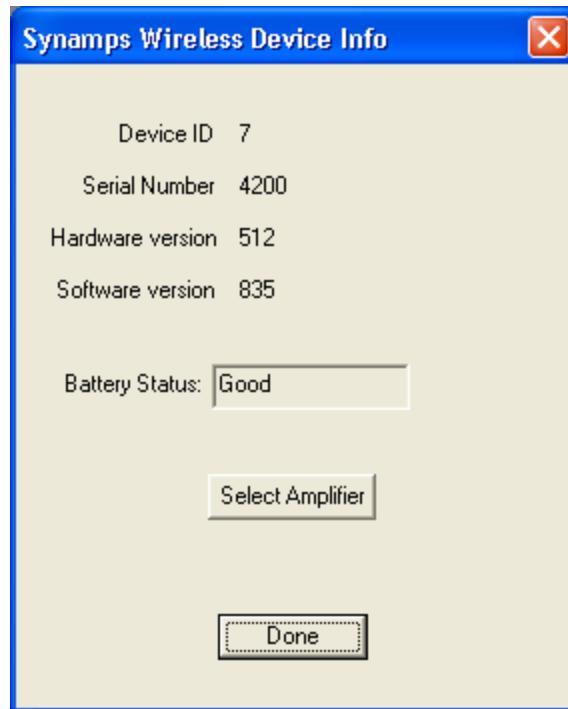
1. Start Scan 4.5 from the icon on the Desktop  . The program launcher will appear. Click the Acquire button.



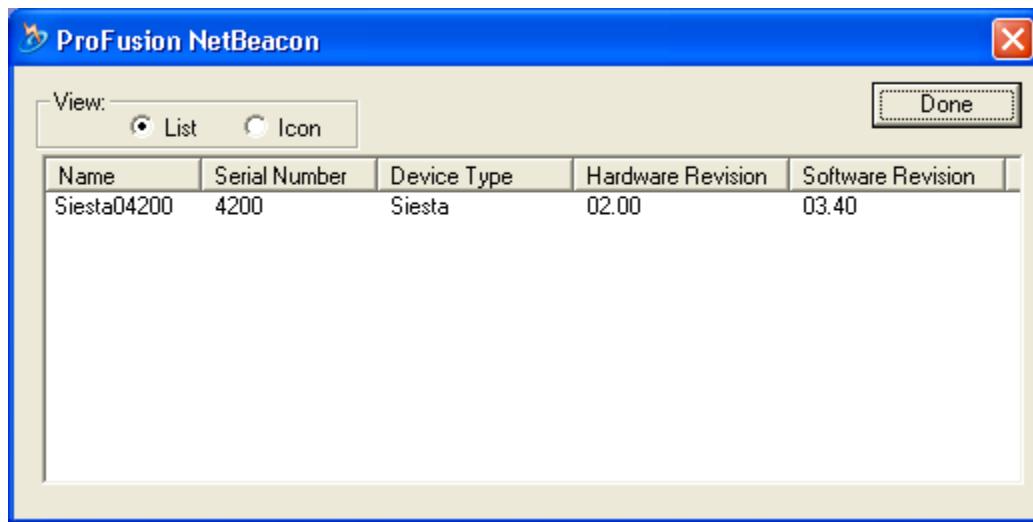
2. Make sure the *SynAmps Wireless* amplifiers are on and flashing orange. Verify that the *SynAmps Wireless* has been found by going to **Edit → SynAmps Wireless Hardware**.



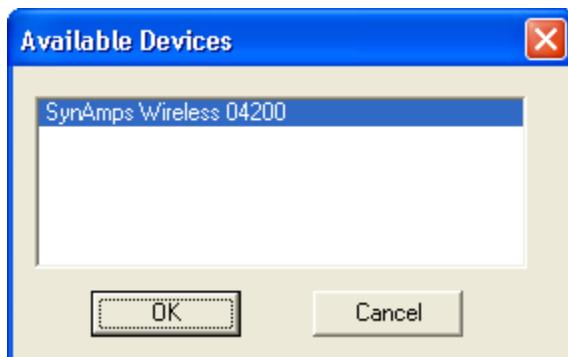
3. Clicking it displays the *SynAmps Wireless* Device Info display. The information fields should be filled. The power level of the battery is seen in the **Battery Status** field, as well as on the Status Bar below the data display.



You can also verify that you have communication with the amplifiers by running the NetBeacon program. You should see the amplifier(s) listed in the display. If you do not see the amplifier listed, there is a communication problem. Make sure the amplifiers are blinking orange and that the Access Point is on. Try turning the amplifiers off and on again. If the problem remains, there may be network issues that need to be resolved.



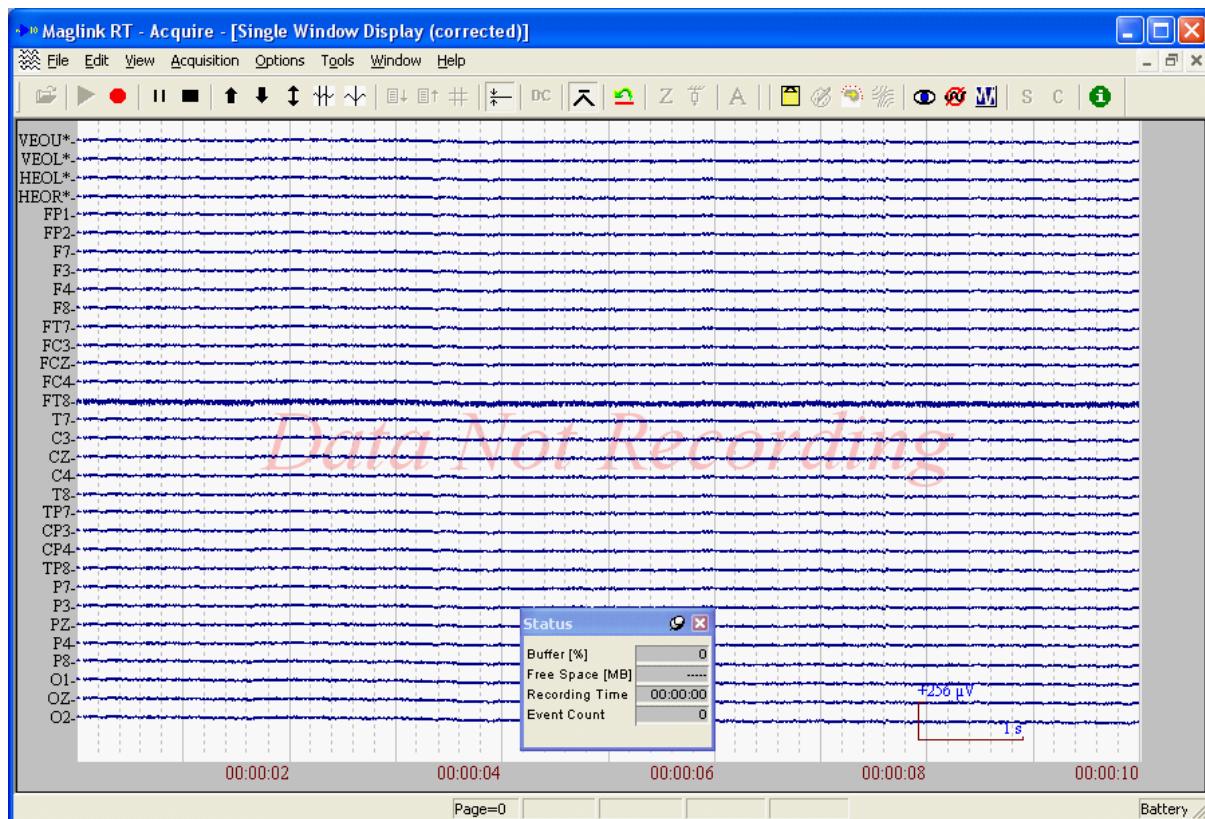
4. Click the Select Amplifier button. You should see the amplifiers that have been detected (one or more *SynAmps Wireless* units). Select one and click **OK** and then **Done**.



5. There are many parameters that may be set to govern acquisition, as described [below](#). For now, we will use one of the supplied setup files. Click open file icon and go to the *C:\Documents and Settings\All users\Application Data\Neuroscan\Scan4.5\Setup files\SynAmps Wireless* folder (for Vista, go to *C:\ProgramData\Neuroscan\Scan4.5\Setup Files\Synamps Wireless*) and select the *Syn Wireless 32 mono - CPZ Ref with VEOG.ast* file. This setup file records all 4 eye artifact channels and omits the mastoids and FZ. CPZ is the Reference. When using CPZ as the Reference, users generally compute the common average reference offline (see the GFP/Reference transform). The AD Rate is 512 Hz, and the acquisition filters are set from .15Hz to Nyquist.

6. Click the green arrow to start acquisition (which will be just noise).

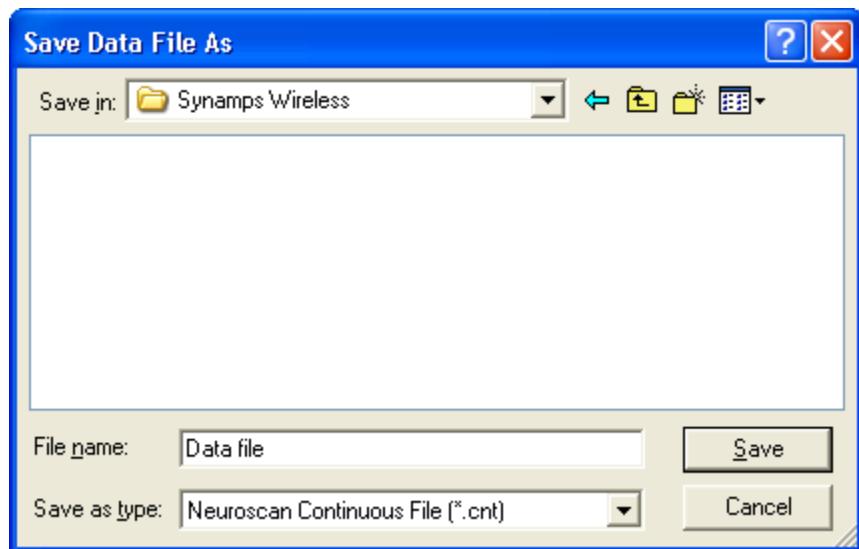
You should then see the "data" scrolling (after an initial ringing transition of the High Pass Filter). Adjust the display scale as needed.



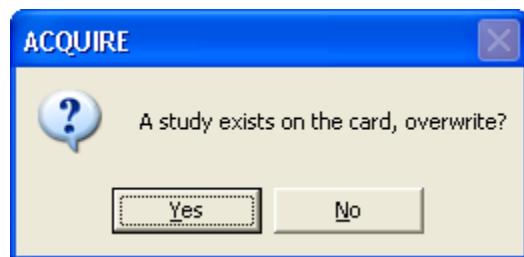
7. To save the data, click the red Record button . You will be asked if you want to record to the Hard Disk, the Flash Card, or Both. Complete details are provided in the [Acquiring Data](#) section below, but for now, select Record to Both. This will initiate a recording to both the flash card and to the computer's hard drive.



The Save Data File As window will appear. Select a folder, enter a file name, and click Save. This is for the data that will be written to the hard drive.



If a study already exists on the flash card, you will see a message asking if you want to overwrite it. You can only save *one study at a time* to the flash card. You must either overwrite the file, or else transfer the existing study to the computer (click No, discontinue the recording when prompted, turn off the amps, and remove the card). Click Yes in this example (unless you want to save what is on the flash card).



The data will be saved to both the flash card and the hard drive. A red notification, **Saving----**, will be seen on the Status Bar below the data display.

You will see the green light flashing on the *SynAmps Wireless* amplifiers as data are being transferred.

Click the black rectangle to stop the recording. You will be asked if you want to disable the amplifier's radio.



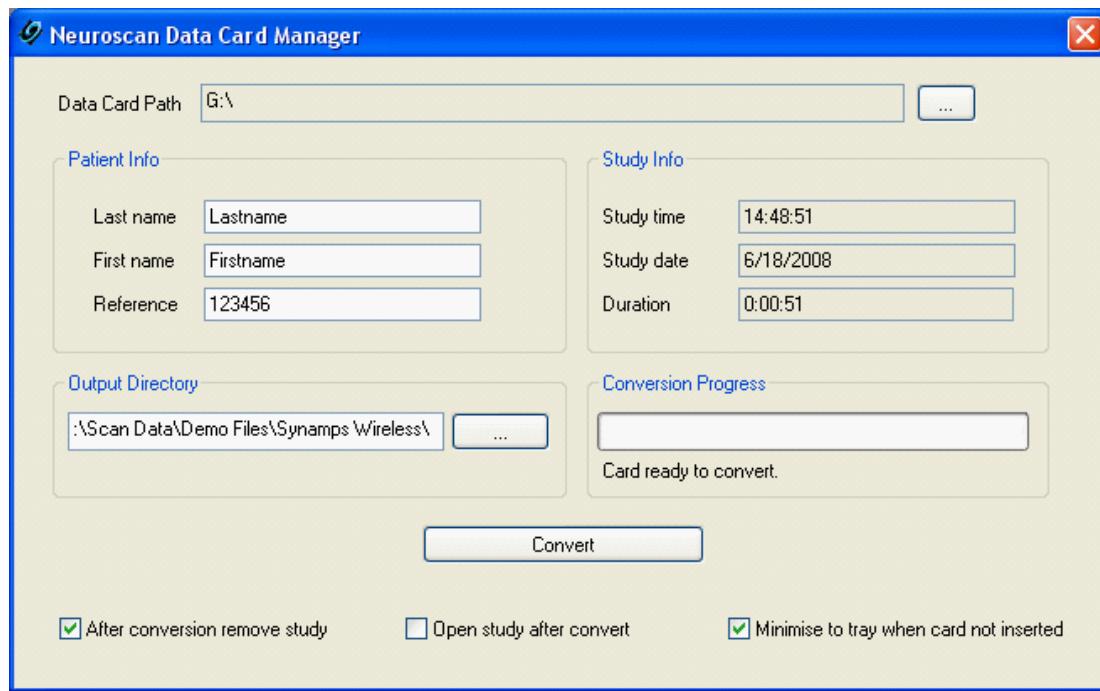
For now, click No (details described in the [Acquiring Data](#) section below).

### **Retrieving and Converting data from the Flash Card**

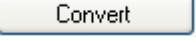
1. To retrieve the data from the flash card, make sure that data are not being transferred (flashing green LED). Frequently, this will mean turning the amplifiers off by holding the button down until the green flashing light goes off. Remove the card and insert it into the Data Card Reader. The Reader will appear in the Windows Explore program as an external drive, such as, *CompactFlash (G:)*. Looking at the contents of the drive, you will see that several files have been created on the flash drive. The STUDY.DAT file is the one containing the data.

Name	Size	Type	Date Modified
EVENTS.DAT	0 KB	DAT File	1/4/2008 2:05 PM
STUDY.DAT	2,884 KB	DAT File	1/4/2008 2:05 PM
STUDYCFG	6 KB	File	1/4/2008 2:05 PM

2. Run the **Neuroscan Data Card Manager** program (from the Desktop icon). You will see the following display.



Use the **Browse** button  at the top right to select the **Drive** assigned to the Data Card Reader ([g] in this case). In the **Output Directory** line, use the **Browse** button to select the folder where you want the converted data to be transferred, and enter a file

name. The remaining options are described [below](#). Then click the  button. The data will be converted and transferred to the folder you selected. If you enabled the **Open study after convert** option, the data file will be opened automatically in EDIT. If not enabled, open the data file as usual in EDIT ( see *Scan Tutorials* or the *EDIT manual*).

In EDIT, you may open the hard drive recording, the flash card recording, or both.

## 4 Setting Up SynAmps Wireless

The *SynAmps Wireless* System contains considerable flexibility in how it may be used.

You may use more than one *SynAmps Wireless* at a time.

You may record the data to the computer's hard drive, and monitor the data as they are recorded; or, you may set the *SynAmps Wireless* to record the data to its flash drive and let it record on its own.

You may set the *SynAmps Wireless* to record data, stop monitoring/recording to the hard drive, and then again monitor sections of the recording to the flash drive without interrupting the recording. This is known as "peeking" into the flash card recording, and is described in more detail [below](#).

You may record a variety of types of activity: EEG, EKG, EMG, etc., depending on the recording accessories you purchased with the system and where you place the electrodes.

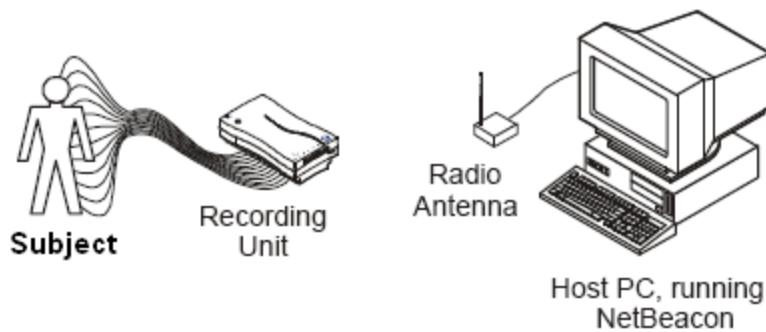
The next sections provide more details for setting up the *SynAmps Wireless* amplifiers.

### 4.1 Configuration Examples

It is possible to record from one or more *SynAmps Wireless* units.

#### **Single *SynAmps Wireless***

A single *SynAmps Wireless* System can be connected to a single PC, which must be installed with NetBeacon and ACQUIRE to be able to record the study.



#### **Points to Consider**

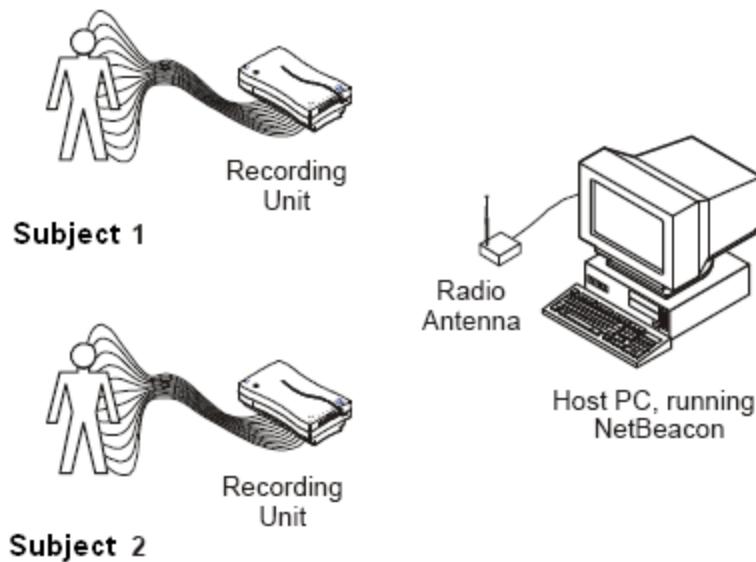
- The *SynAmps Wireless* Recording Unit, Radio LAN device and Host PC must have unique IP Addresses.
- The Radio Domain Number can be set to the default setting (0), however it must match the setting in the Radio LAN device configuration if that has been altered.
- A second PC can be networked to the Host PC to either record or view the study

as it is being recorded.

- This PC must also have a unique IP Address.
- Both PC's must be running **NetBeacon** software.
- Only one of these PC's can record the study and reconfigure any of the *SynAmps Wireless* Recording Unit settings at the one time. The other PC or PC's will only be able to view traces.

### **Two SynAmps Wireless Units**

Two *SynAmps Wireless* Systems can be connected to a single PC, which must be installed with NetBeacon and ACQUIRE to be able to record the studies.



When using 2 or more *SynAmps Wireless* units, you must use the Access Point, rather than Ad Hoc mode. Using the **Synamps Wireless Config Tool**, enter a unique Siesta IP Address. The Destination IP Address will be the same as on the other unit. The ESS ID should be the same as on the other unit (case sensitive). Apply the changes and exit the Config Tool.

Device Information

Type:	Siesta
Serial Number:	2701
Name:	Siesta02701
Firmware Revision:	3.43 B130

On serial port: COM4

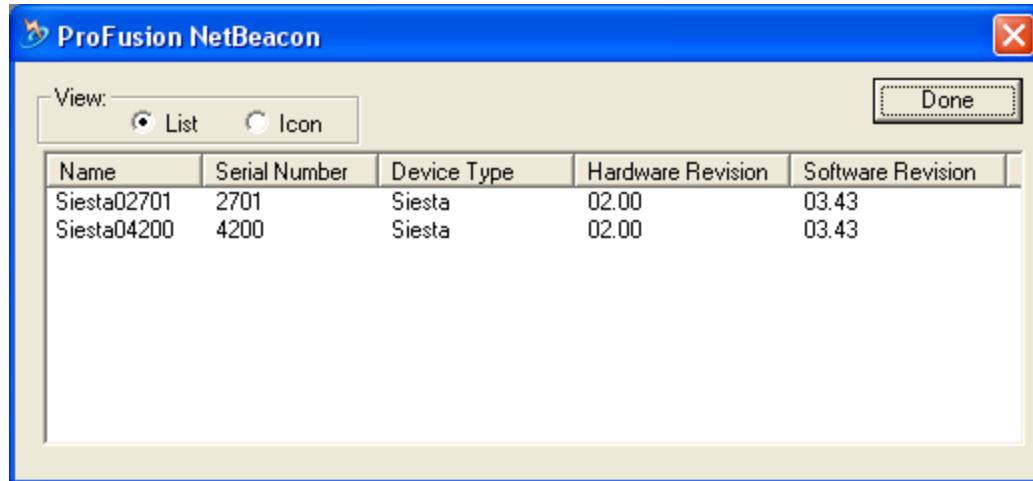
Network Configuration

Siesta IP Address	<input type="text" value="192 . 168 . 1 . 22"/>	Destination IP Address	<input type="text" value="192 . 168 . 1 . 103"/>
Gateway IP Address	<input type="text" value="0 . 0 . 0 . 0"/>	<input type="button" value="Apply IP Addresses"/>	

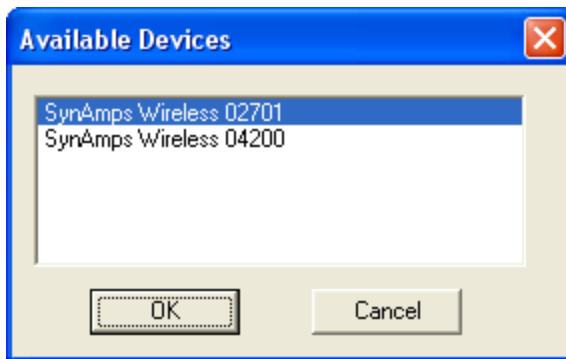
Wireless LAN Options

ESS Id	<input type="text" value="Siesta"/>	None	Power Saving	Maximum
<input type="checkbox"/> Ad-hoc Mode		<input type="checkbox"/> Use Encryption		

NetBeacon should see both units.

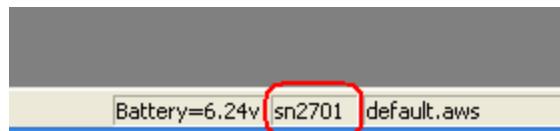


Enter ACQUIRE, and go to **Edit → Synamps Wireless Hardware**. Click the **Select Amplifier** button, and both units should be seen.



Select the one you wish to use first and click **OK**. Then start recording as usual. If you want to use the second unit, stop the acquisition display (if on), and go again to **Edit** → **Synamps Wireless Hardware**. Click the **Select Amplifier** button, and select the other unit. If one has an asterisk (\*) before it, that is the one currently being addressed.

Look at the serial number field in the Status Bar, below the data display, at any time to determine which amplifier unit you are communicating with.



### **Note**

You do not necessarily have to use the same setup file for each amplifier unit. You can use different setup files, with and without triggering, with different AD Rates, etc., with and without peeking, and so forth. Be sure to select the correct setup file when you communicate with different amplifier units.

#### **Points to Consider**

- Each *SynAmps Wireless* Recording Unit, Radio LAN device and Host PC must have unique IP Addresses.
- The Radio Domain Number can be set to the default setting (0), however it must match the setting in the Radio LAN device configuration if that has been altered.
- A second PC can be networked to the Host PC to either record or view the study as it is being recorded.
  - This PC must also have a unique IP Address.
  - Both PC's must be running **NetBeacon** software.
  - Only one of these PC's can record the study and reconfigure any of the *SynAmps Wireless* Recording Unit settings at the one time. The other PC or PC's will only be able to view traces.

#### **More than Two SynAmps Wireless Units**

It is recommended, due to bandwidth limitations, that a maximum of three *SynAmps Wireless* Recording Units share one Radio LAN device simultaneously. If transmission problems occur, use the cable connection between the AP and the Scan computer. If it is necessary to run more than three *SynAmps Wireless* Recording Units, two or more Host PC's and additional APs may be necessary.

**Points to Consider**

- Each *SynAmps Wireless* Recording Unit, Radio LAN device and Host PC must have unique IP Addresses.
- If the Host PC's are on the same network, the Radio Domain Number can be set to 1, however it must match the setting in the Radio LAN device configuration in the Host PC that is intended to act as the communication hub for that *SynAmps Wireless*, if that has been altered.
- A third PC can be networked to the Host PC's to either record or view the study as it is being recorded.
  - This PC must also have a unique IP Address.
  - All PC's must be running **NetBeacon** software.
  - Only one of these PC's can record the study and reconfigure any of the *SynAmps Wireless* Recording Unit settings at the one time. The other PC or PC's will only be able to view/record traces.

## 4.2 SynAmps Wireless Recording Methods

*SynAmps Wireless* has two methods of recording a study.

- unattended in the subject's home or elsewhere; or
- attended in a laboratory environment.

**Unattended Studies**

Unattended studies involve setting up the Subject and then leaving him/her unattended for a period or the night while the study data are being acquired. Study data are recorded onto the Compact Flash Card, and upon completion of the study the data are transferred from the card to a computer for later review and analysis. A Host PC is not used during recording of the study, thus increasing the battery life of the *SynAmps Wireless* Recording Unit as the Radio LAN transceiver is not being used.

**Attended Studies**

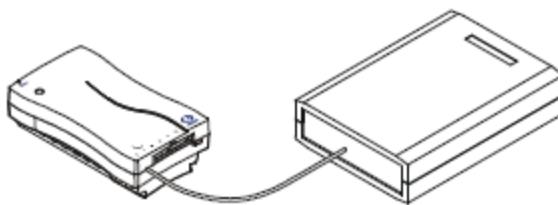
For attended studies, the *SynAmps Wireless* Recording Unit is connected via Radio LAN to a Host PC, and the study is recorded to that PC's hard drive (or a PC networked to it). This allows flexibility in determining the physical location of the monitoring computer in relation to *SynAmps Wireless* Recording Unit. The study can be recorded to a Compact Flash Card for backup purposes. The Battery Charger/Power Supply is used to power the unit.

## 4.3 Preparing the Recording Unit

**Charge the Batteries (unattended studies)**

The *SynAmps Wireless* will not power up if the Battery is below the required power-on voltage level.

The NiMH batteries are recharged using the *SynAmps Wireless* Battery Charger / Power Supply Unit.



### Battery Status Indication – *SynAmps Wireless Recording Unit*

The status of the charging process can be identified from the LED on the *SynAmps Wireless Recording Unit*:

- Solid Green: *SynAmps Wireless* is turned off and the battery is charging.
- Orange flashing: *SynAmps Wireless* is turned on and idle.



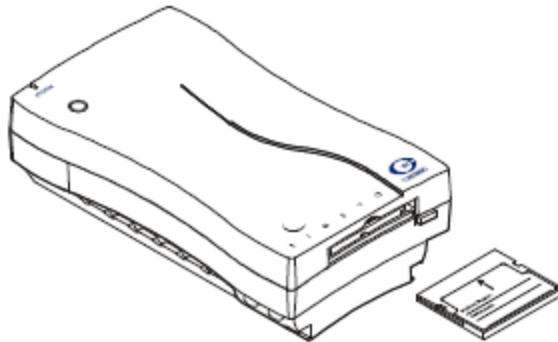
#### NOTES:

- The battery is good for up to 500 charge/discharge cycles. For maximum recording duration, it is recommended that the battery be replaced annually.
- Where battery power is to be used, the battery should be fully charged within 24 hours prior to operation. To fully charge the battery, allow for a charging period of 2.5 hours.
- If power was removed or interrupted during recording due to flat batteries or disconnection of power, the study, up to the point of power failure, can still be transferred for data replay and analysis. The conversion software contained in **Data Card Manager** will automatically calculate the time that the study was terminated.

### Insert Compact Flash Card

The Compact Flash Card should be inserted carefully and only with correct orientation.

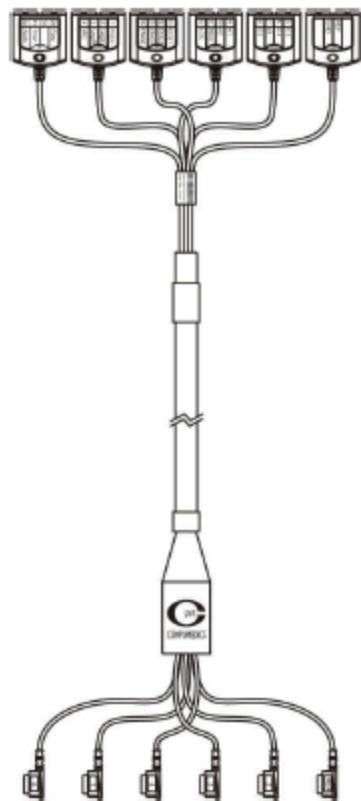
Attempting to insert Compact Flash Card by force can cause damage by bending or breaking pins or moulding within the *SynAmps Wireless Recording Unit*. The Compact Flash Card should slide into the slot easily.



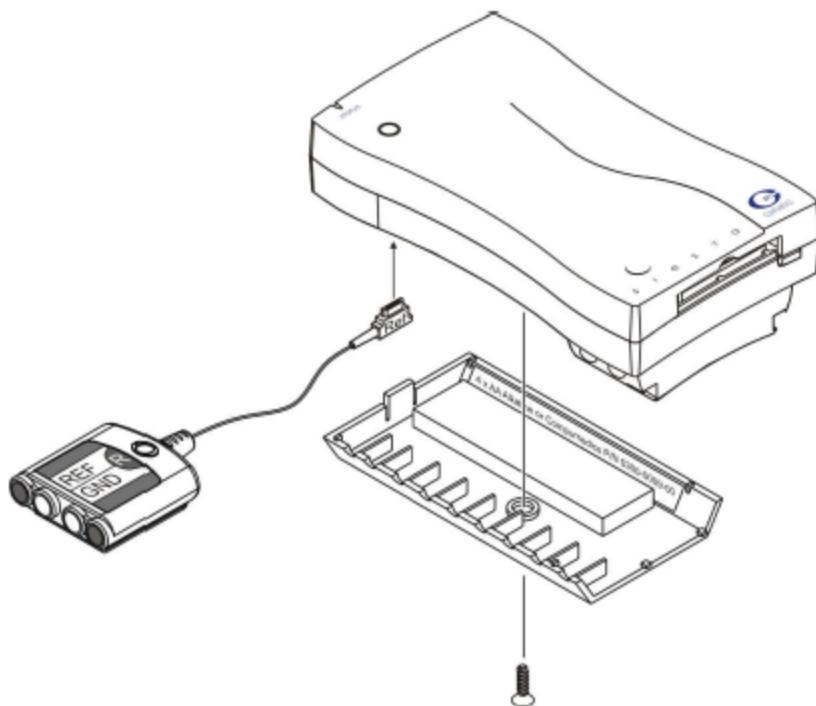
## 4.4 Connect Accessories

When configured for EEG recordings with Scan, the *SynAmps Wireless System* will have the capability to record 32 monopolar channels, plus Reference and Ground.

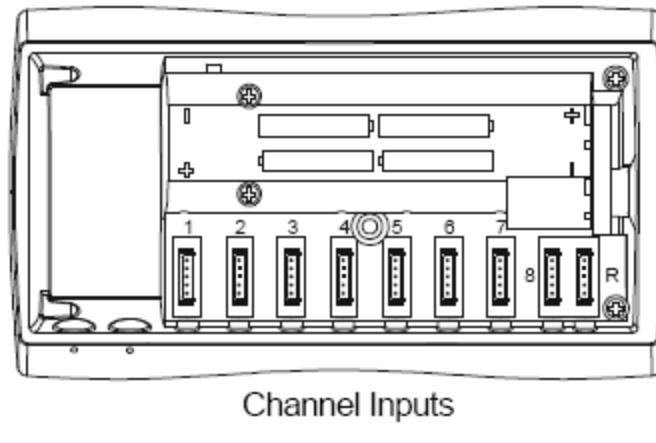
The system is configured such that there are 4 touchproof inputs per connector. A drawing with 6 connectors is shown below (24 channels).



Each set of 4 ends in a Harwin connector. The Harwin connectors are connected to the *SynAmps Wireless* by first removing the screw on the bottom of the unit, then the bottom cover, and then inserting the connectors according to their numbers. The Reference and Ground connector has only the two inputs.



The Reference and Ground is labeled "R". The others connectors are labeled 1 through 8.



Replace the bottom cover and screw.



#### **WARNING**

Ensure that the Adaptor Cover is re-attached and the screw tightened prior to using the *SynAmps Wireless* Recording Unit to record a study.

#### **Attaching the Electrodes or Electrode Cap**

Connect the Reference and Ground electrodes first. They allow input signals to be correctly referenced before attempting to view the traces. If you are using an electrode cap, it will connect to an adapter that has individual connectors, labeled appropriately.

**NOTE:**

The *SynAmps Wireless* system uses a driven subject ground to reduce common mode voltages. This is based on two electrodes: REF, the sensing electrode, and Ground, the driven electrode.

**NOTES:**

- Use low-allergenic tapes and gels to apply electrodes and sensors to the subject's skin.
- Test gels and tapes on a small section of skin prior to full application to ensure no adverse reaction from the subject.
- Do not apply any sensor or electrode to broken skin.
- All caps, straps, sensors and leads should be cleaned and disinfected as appropriate before use.

**Referential Inputs**

Referential inputs use the REF electrode as the reference potential. If referential inputs are used, then both REF and GND electrodes must also be connected to the subject.

## 5 Creating a Setup File in ACQUIRE

The *Scan Tutorials* and *ACQUIRE* manual contain all of the details for creating setup files. Setup files contain all of the parameter settings for doing a recording. Once you have the setup file created, you can save it and retrieve it later as needed. You may have multiple setup files.

Some example setup files may be found in the *C:\Documents and Settings\All users\Application Data\Neuroscan\Scan4.5\Setup Files* folders (if you have Vista, go to *C:\ProgramData\Neuroscan\Scan4.5\Setup files\SynAmps Wireless* folder:

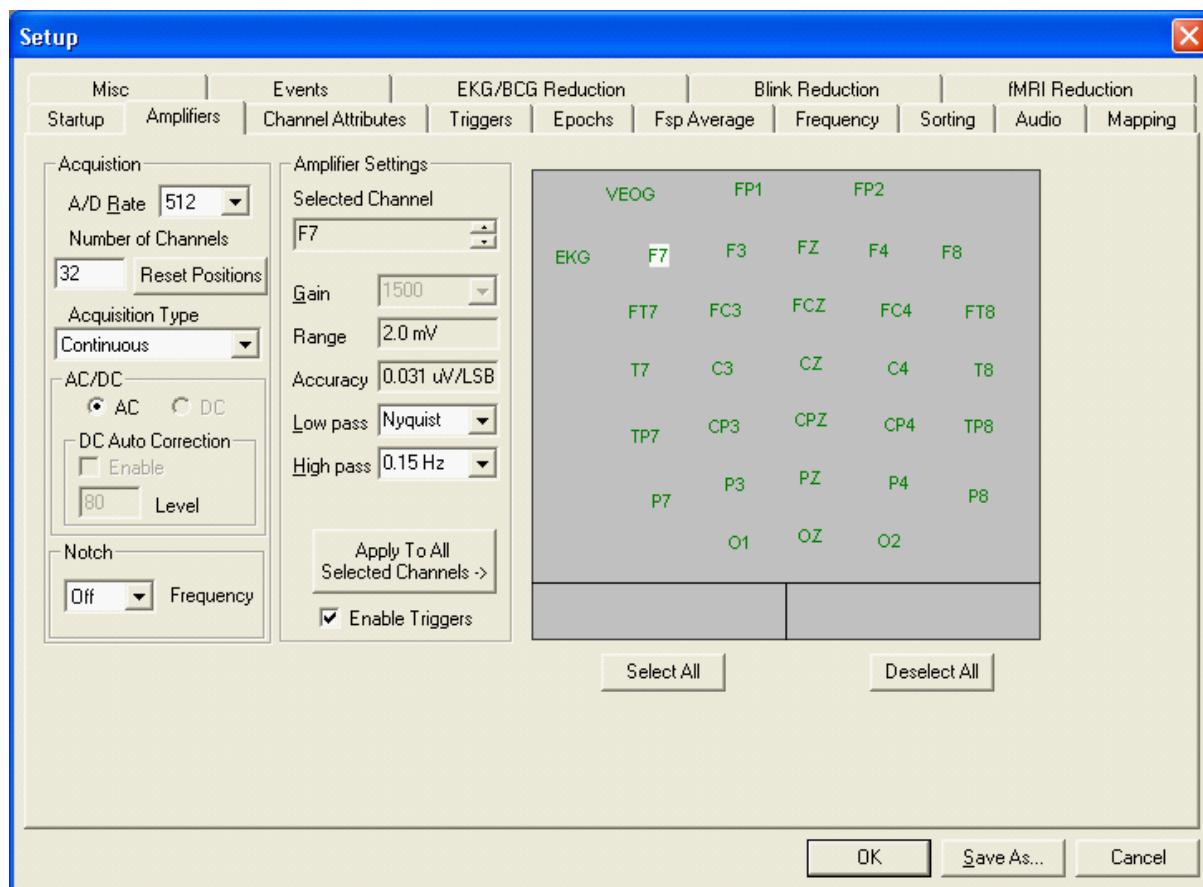
1. *Syn Wireless 32 mono - Linked.ast*. The setup file records from all 30 EEG channels, plus the VEOU and HEOL eye channels. The linked mastoid (or earlobe) reference is obtained by connecting the M1 and M2 connectors into the Y adapter, and then connecting that to the Reference input to the amplifiers. The AD Rate is 512 Hz, and the acquisition filters are set from .15Hz to Nyquist.
2. *Syn Wireless 32 mono - CPZ Ref with Mastoids.ast*. This setup file uses CPZ as the reference, and records 28 EEG channels, M1 and M2 (to give better resolution of inferior temporal areas), and VEOU and HEOL. VEOL, HEOR and FZ are not recorded. When using CPZ as the Reference, users generally compute the common average reference offline (see the GFP/Reference transform). The AD Rate is 512 Hz, and the acquisition filters are set from .15Hz to Nyquist.
3. *Syn Wireless 32 mono - CPZ Ref with VEOG.ast*. This setup file records all 4 eye artifact channels and omits the mastoids and FZ. CPZ is the Reference. When using CPZ as the Reference, users generally compute the common average reference offline (see the GFP/Reference transform). The AD Rate is 512 Hz, and

the acquisition filters are set from .15Hz to Nyquist.

You can, of course, modify the setup files to fit your needs. Often it is easier to modify an existing setup than to create one from scratch. It is recommended that you make a copy of the original setup files and make your changes to the copy, leaving the original intact. Be sure to make the corresponding changes in the Channel Assignment Table so that the labels and physical channels agree with the EBAs you will be using, and modify the Channel Layout as needed to obtain the correct positions in the Multiple Window Display.

There are some differences in the configuration of the *SynAmps Wireless* amplifiers that do not apply to any of the other amplifiers. These are described next; the remainder of the descriptions for the acquisition parameters is found in the sources mentioned above.

In ACQUIRE, go to **Edit → Overall Amplifiers**, and click on the Amplifiers tab.



In the **A/D Rate** field, there are three possible AD Rates: 256, 512, and 1024. The rate you select will depend on the temporal resolution you need. As a general rule-of-thumb, determine the fastest frequency of interest (including EMG), multiply that by 5, and take the next highest AD Rate. For example, if you are interested in 40Hz activity, where EMG contamination is an issue, and EMG can exceed 70Hz, you might conclude that 100Hz is the fastest frequency of interest. Multiple by 100 by 5 to get 500Hz. The next higher rate would then be 512Hz. Realize also that doubling the AD Rate will also double the file size. If you are making extended recordings to the Flash Drive, you may want to keep the AD

Rate as low as you can.

Another consideration when selecting the AD Rate is the distance between the Access Point and the amplifier unit. If that distance is relatively great, or if there are several walls or other obstructions in between, then, as a general rule, the faster AD Rates will be affected more than the slower ones. This only applies when you are viewing/recording data within Acquire, not if you send the subject away while recording only to the flash card. As the distance increases between the amplifier unit and the AP, you may begin to see a breakup of the data stream in Acquire. In that case, lowering the AD Rate may improve the transmission, up to a point. You may need to have more than one AP if the distance is very great. (Try also using the physical connection between the scan computer and the AP).

Currently, the **Acquisition Type** is **Continuous Mode** only. This will store the complete data stream for all channels, and maintain maximum flexibility when performing the offline analyses.

The *SynAmps Wireless* amplifiers are **AC** coupled. The minimum High Pass Filter that will be applied is 0.15Hz.

*SynAmps Wireless* amplifiers have a single **Gain** of 1500, which gives a Dynamic Range of 2mV and an Accuracy of 0.031 $\mu$ V. That is, signals exceeding +/-1mV will saturate the amplifier and be clipped (and likely ring the filter). Voltage is measured in increments of 0.031 $\mu$ V.

The **Low Pass** and **High Pass** filter settings are those that define the filters applied at the time of the recording (these are independent from the display filters). The *SynAmps Wireless* is set to record from 0.15Hz to just below the Nyquist value (half of the AD Rate). The pull-down menus for **Low pass** and **High pass** will display the options. If you select 0.15 for the HP and Nyquist for the LP, these are the filters inherent in the amplifiers. Note that the actual value for Nyquist will depend on your AD Rate. These settings will result in the broadest band width for the recording. If you select any other option, the filter will be additive, that is, a secondary filter applied to the data already filtered at 0.15Hz to Nyquist.

We recommend that you record with the filters as wide open as possible. You can always refilter the data offline. If you restrict the band width as the data are recorded, there is no way to retrieve data that have been filtered out.



**NOTE:**

The filter settings (other than 0.15Hz and Nyquist) are applied *only* to the data files that are recorded to the hard drive. If you are recording to the flash drive, these settings have no effect. Flash drive recordings are always 0.15Hz to just below the Nyquist value.

**Apply To All  
Selected Channels ->**

When you have selected the parameters you want to use, click the **Apply To All Selected Channels ->** button to apply the parameters to all of the selected channels (those in Green). The AD Rate cannot be changed across channels, but the Filter settings can be set to channels independently. Again, Filtering can be performed offline as well, so we generally recommend using a wide open band pass for all channels.

The **Enable Triggers** options should be selected if you are sending trigger events from Stim2 (or other similar stimulus presentation software). See the [Triggers and Events](#) section below.

Use the  button at the bottom of the display at any time to save/resave a setup file.

The remaining options for acquisition are described in the *ACQUIRE* manual. Most can be used with *SynAmps Wireless*, with the exception of Fsp averaging (not possible with Continuous Mode acquisition).

## 6 Acquiring Data

### Calibration

The *SynAmps Wireless* amplifiers are factory calibrated and there is no need for local corrections. Any amplifier malfunction will require a return to Compumedics for repair. If you want to verify that the amplifiers are functioning normally, you can input a known signal to all channels. This provides visual confirmation that the amplifiers are functioning - there is no correction across amplifiers (solid state amplifiers either function correctly or they do not).

### Impedance Testing

Impedances should be tested prior to acquiring the data. Click the  button on the Main Menu Bar. Each channel will be seen in a color corresponding to the kOhm levels as seen in the legend. (Refer to the *ACQUIRE* manual for details). Impedance is tested in sequential blocks of 8 channels. You will see the impedances being updated as these blocks are cycled. (If you are performing a quick impedance check, be sure to let the routine cycle through all sets of channels at least once; otherwise 0's will be written to the log file and the data file).

When you exit the impedance routine, you will be asked if you want to save the values to the log file. The log file is a text file that contains an accumulating list of impedance tests, with the date, time, subject name, ID number, and amplifier serial number. By default, that file is called *impedances.log*. The default path will vary depending on whether you have XP or Vista. The default path for XP is *C:\Documents and Settings\All Users\Application Data\Neuroscan\Scan4.5*. If you have Vista, the default path will be *C:\ProgramData\Neuroscan\Scan4.5*. The impedances are also saved with the data files, and may be viewed in Edit by right clicking on the data file and selecting **View Impedance Values**. If you have not performed an impedance test, all values will be 0's. If you do an impedance test prior to a peek recording, the most recent impedance values will be saved with the data file and to the log file. If you do not do an impedance test prior to a peek recording, then you will see the values of the most recent impedance test unless Acquire has been closed and reopened in the meantime. If you exit and re-enter Acquire and then do a peek recording without an impedance test, the impedances will all be 0's.

Similarly, if you perform an impedance check and save the EEG, then switch setup files without performing a new impedance test, the impedances saved with the new data file will be 0's. If you change setup files and want valid impedances, it is necessary to

perform a new impedance check prior to recording with the new setup file.

You can change the path and name for the .log file if you wish. Run **regedit** from the **Start → Run** line, and go to

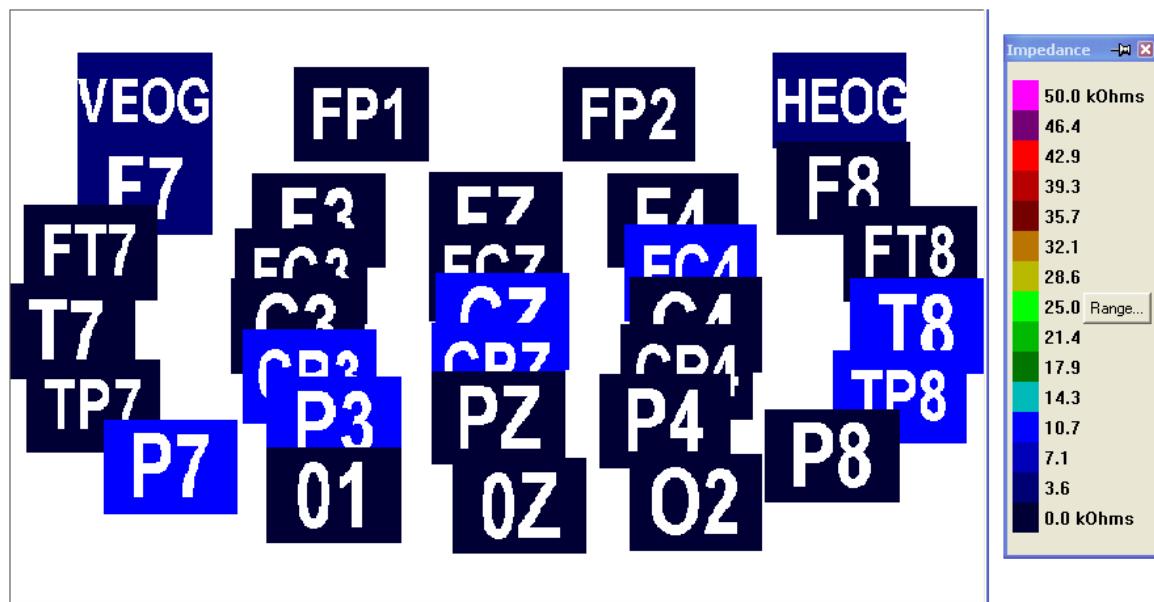
*HKEY\_LOCAL\_MACHINE\Software\Neuroscan\Acquire\Setup*. If the ImpedanceLogFile line is there, then the indicated path will be used to store the log file. Modify the path using **New → String Value**.

**ImpedanceLogFile**    REG\_SZ    C:\Program Files\Neuroscan\Scan4.5

If that entry is not there, the log file will be stored in the *HKEY\_LOCAL\_MACHINE\Software\Neuroscan\Acquire\State* folder, using the **DataDirectory**    REG\_SZ entry.

When you enter Acquire again, the new path and file name will be used. You can clear the contents of the .log file simply by opening it, deleting the contents, and resaving it.

The impedance procedure uses fixed gain and filter settings for optimum results; these are independent from user entered values.



### Note

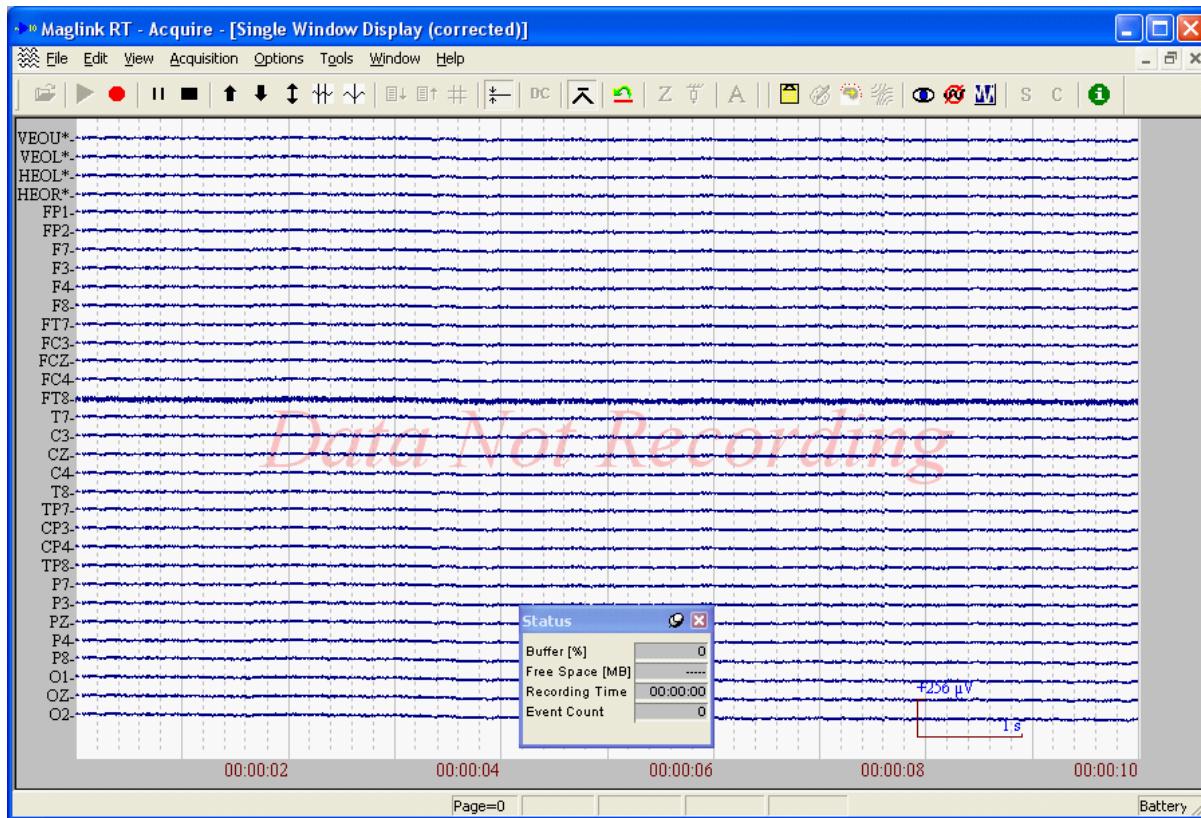
If you perform an impedance test while a recording to the flash card is in progress, the flash recording will capture the square wave impedance signals in place of the EEG data (i.e., the EEG data will not be recorded during the impedance check).

### Data Acquisition

Data acquisition is controlled by the icons on the Main Menu Bar .

Click the green arrow to start acquisition.

You should then see the data scrolling (after an initial ringing of the High Pass Filter).

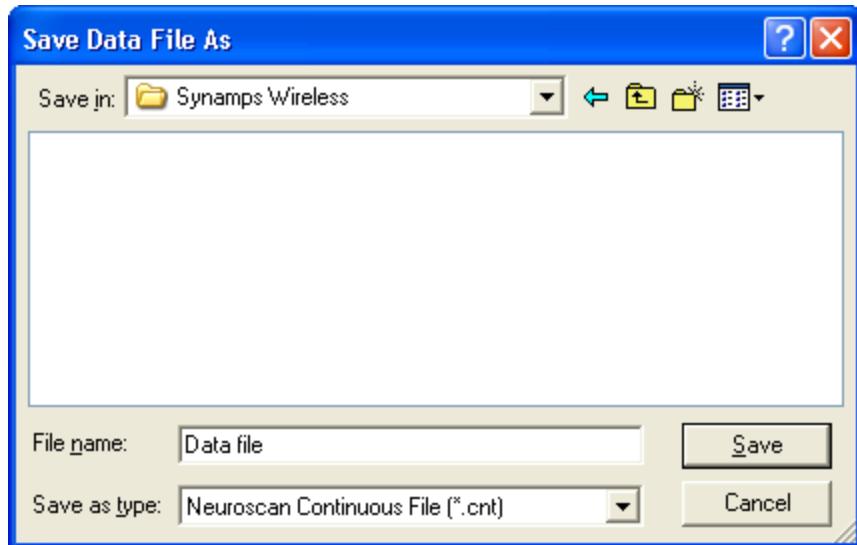


To save the data, click the red button . You will be asked if you want to record to the Hard Disk, the Flash Card, or Both.



#### Record to Hard Drive

Click the first option to record the data to the computer hard drive only. The Save Data File As window will appear. Select a folder and enter a file name. Click Save, and the data will be written to the hard drive. A red notification, **----Saving----**, will be seen on the Status Bar below the data display.

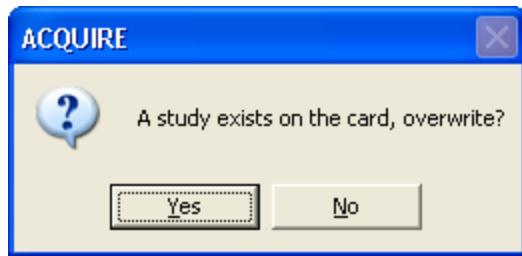


You will see the green light flashing on the *SynAmps Wireless* amplifiers as data are being transferred. Click the black rectangle  to stop the recording.

The LED on the amps will return to Standby (flashing orange). Open the data file in EDIT as usual (see the *Scan Tutorials* or the *EDIT* manual).

#### Record to Flash Disk

Click the second option to record to the flash card only. If a study already exists on the flash card, you will see a message asking if you want to overwrite it. *You can only save one study at a time to the flash card.* You must either overwrite the file, or else transfer the existing study to the computer.



If you select No, the data display will continue. If you say Yes, the existing study will be overwritten.

You will see the green light flashing on the *SynAmps Wireless* amps as data are being transferred. You will also see the notification on the Status Bar saying: **----FLASH----**.

If you click the black rectangle to stop the data display, you will be asked if you want to disable the amplifier's radio.



If you say Yes, the radio in the amplifier will be turned off (this will take a little while). The data will continue to be recorded to the flash card (the amplifier unit will flash green). You must turn the amplifier off and on to enable the radio again. The advantage of turning the radio off is that it preserves the battery for longer recordings (and frees bandwidth if you have multiple amplifier units). The disadvantage is that, since the radio is off, you cannot "peek" into the data file being recorded to the flash drive (see "peeking" below).

If you say No, the data display will stop, but the recording to the flash card will continue (the amplifier unit will continue to flash green). You can then "peek" into the file being recorded to the flash drive (see "peeking" below).

Click Cancel to return to the acquisition display.

### **Record to Both**

You also have the option to record to both the hard drive and the flash disk. After clicking OK, you will see the Save As window (as above) to select a folder and file name for the hard drive file. (Naming of the flash card data file happens when you convert the data file using the Data Card Manager, described below). The program will then check to see if there is a file already on the flash card (and give the message above). If you say Yes, the study will be overwritten. If you say No, you will see the following message.



If you say Yes, the recording to the hard drive will continue. If you say No, the data display will continue with no data being saved. When you click the black rectangle , the display or recording to the hard drive will stop, but the recording to the flash card will continue.

### **Unattended recordings**

In some instances you will want to start the recording to the flash drive, and then exit the ACQUIRE program completely. For example, you might want to send the subject home or elsewhere. The recording to the flash card will continue as long as the unit is blinking green. If you selected No to the Disable Siesta Radio message, you will be able to re-establish communication with the amplifiers. This is known as "peeking".

### **"Peeking" into the Flash recording**

It is possible to "peek" into the data being recorded to the flash card 1) after you have

closed the data display, yet the Acquire program has remained open, 2) after you have closed the data display and exited Acquire completely, or 3) after you have exited Acquire and turned off the Access Point (or the subject has gone out of range). Subsequent communication will be established as long as you have not disabled the radio.

To peek into the flash card recording, just click the green arrow  , as usual. You will see a message saying:



After clicking OK, you will see the current data stream. Click the red Record button  to record the peeked data to the Hard Drive. When you stop the display or the recording (by clicking the black rectangle ), you will be asked if you want to Disable the Siesta Radio. Say No to be able to continue to peek into the flash card data.

You can peek into the flash card data file, and make multiple recordings of the peeked files to the hard drive, as many times as you like.

#### Events in the flash card file

When you peek into the ongoing flash card recording, events are inserted into the continuous data recording. The events are seen as red response events of 10, 11, and 12 . A Type 10 event indicated the point at which you started acquisition of the peeking. A Type 11 event indicates the point at which you started saving the peeked data to the hard drive. A Type 12 event indicates the point at which you stopped the display/ recording of the peeked data. Events are placed to the nearest second in the flash card file, and are therefore close approximations of the precise times of the operations.

Do not remove the flash drive while data are being recorded to it. The recording will continue until there is no more room on the flash disk, the batteries run down, or you turn the recording unit off.

## 7 Triggers and Events

There are several ways in which events are used with the *SynAmps Wireless*. These include stimulus trigger events from Stim2, keyboard events and annotations, button events, and events to indicate the start of acquisition, recording, and the end of recording.

#### Stimulus Trigger Events

Stim2 is programmed to send TTL pulses to the SynAmps Wireless amplifiers that are seen in Acquire as blue stimulus events. Valid events are between 1 and 255 (unless you are using the Button to insert events - see **Button Events** below). These are seen at the bottom of the data display, and are saved with continuous data files recorded to either or both the hard drive and flash card data files.



When using the Trigger box to transfer the TTL pulses from Stim2 to Scan, you must select the **Enable Trigger** option (**Edit** → **Overall Parameters** → **Amplifiers** tab). Otherwise, you will see flat lines in the recording. Similarly, if you do not have the Trigger box connected, do not select **Enable Triggers**, or else you will see flat lines. If you plan, for example, to start a recording to the flash drive, and then at a later time peek into the recording to obtain evoked responses using triggers from Stim2, you should connect the trigger box first and select **Enable Triggers**. Once the flash recording has started, you cannot change the status of **Enable Triggers**.



### Caution

*Do not connect or disconnect the trigger cable to the amplifier unit when the amplifier unit is on. Damage to the unit or corruption of data may result. If you are using multiple amplifier units and Stim2, each unit should have its own trigger box. You can safely disconnect the Stim-to-Scan cable from one trigger unit and connect it to another.*

In Edit, you may create epochs around these events, sorting them as desired, and then create averages of the evoked responses (see the *Scan Tutorials* and the *Edit* manual for details).



### Note

If you see that some triggers are being missed, or if you see spurious triggers, try increasing the Pulse Width (found in Stim2 under **Options** → **Program Settings**). With slower AD Rates, you will need a longer pulse width. 10-15ms is usually sufficient for all AD Rates.



### Note

The SynAmps Wireless is currently not configured to recognize subject Response events from the 4-button response pad, the mouse, or the keyboard, as described in the Stim2 manual.

### Keyboard Events and Annotations

The Acquire manual describes how to use Keyboard Events (function keys or other keys) and Annotations. These are configured in the **Events** tab, in Acquire, by going to **Edit** → **Overall Parameters**.

Keyboard Events will insert events in the continuous data file, and these are saved to either the hard drive, flash card, or both. In the hard drive data files, the events will be placed at the precise moment when you click the function key (or other keyboard key you have selected). In the files recorded to the flash card, the keyboard events will be placed to the nearest second. While it is possible to create epochs around the keyboard events in Edit, and then averages of the epochs, there will be slight differences in the final averaged files recorded to the hard drive versus the flash card, due to the variations in the keyboard events placements (which may vary up to about 2 seconds). Keyboard events, especially in the flash card recordings, are intended to

be informational, providing descriptions of things that are occurring during the recordings.

Annotations have a slightly different function. They are placed by clicking the **A** icon on the Toolbar in Acquire (see the *Acquire* manual for details). You must be saving the data for the icon to be active. When you click the icon, you may either select a previously created text string, or you may enter a new one "on the fly". The text will be placed in the continuous file at the point you clicked the icon. *Annotations are saved with the files recorded to the hard drive only; they are not seen in files recorded to the flash drive.* Hold the mouse over the **A** in the file in Edit to see the text of the annotation.



### **Button Events**

It is possible to place a single stimulus event into the continuous data stream via the hand held button. This is an alternate way to mark points in the file (Keyboard Events may be used instead). When pressed, a stimulus type code of 128 is placed in the .cnt file. *Using this button sacrifices one of the 8 bits (the 128 bit) used for stimulus events.* This means that you can only use type codes from 1-127 in Stim<sup>2</sup>. If you use larger type codes, they will be seen in Acquire with 128 subtracted from them (e.g., a type code of 200 will be seen as 72 in Acquire).

Button events differ from Keyboard Events in that they 1) are seen as regular stimulus events, and 2) in flash card recordings, they are placed at the precise moment the button is pressed; whereas, Keyboard Events are placed to the nearest second (flash card recordings only).

The button events are inserted in continuous data files recorded to both the flash card and the hard drive. They may be treated as any other stimulus events. Note that if you, for example, epoch genuine stimulus events in the type code range of 100-150, the button press events will be included in the epoch creation (which you may not wish to do).

### **Synchronizing Events**

Events are automatically created in the data file recorded to the flash drive when you perform certain operations related to acquisition. The events are seen as red response events in the converted flash card files, with values of **10**, **11** and **12**. These are useful in "peeked" recordings, where you wish to see where the peeking occurred in the flash recording.

Type **10** events - indicate the point at which you click the Start Acquisition icon



Type **11** events - indicate the point at which you click the Start Recording icon



Type **12** events - indicate the point at which you click the Stop Recording icon



The placement of these events will be to the nearest second in the *flash card* file only.



## 8 Terminating Acquisition and Transferring Data

### Unattended Study (write to Flash drive)

The Study will terminate when either the Compact Flash Card is full, the batteries run out of power, or the amplifiers are turned off.

### Attended Study (write to Hard Drive)

Terminate the Study from within the ACQUIRE software by clicking the black rectangle ■ (refer to the ACQUIRE Help file for further information).

### Transfer Study

If a study is recorded to the Compact Flash Card, it must be converted back to the hard drive of the computer with the Compact Flash Card interface, using the **Neuroscan Data Card Manager** software.

Remove the flash drive and insert it into the **Data Card Reader**. (Do not remove the flash card when data are being written to it, i.e., with the amplifier unit is flashing green - turn the amplifier unit off first).

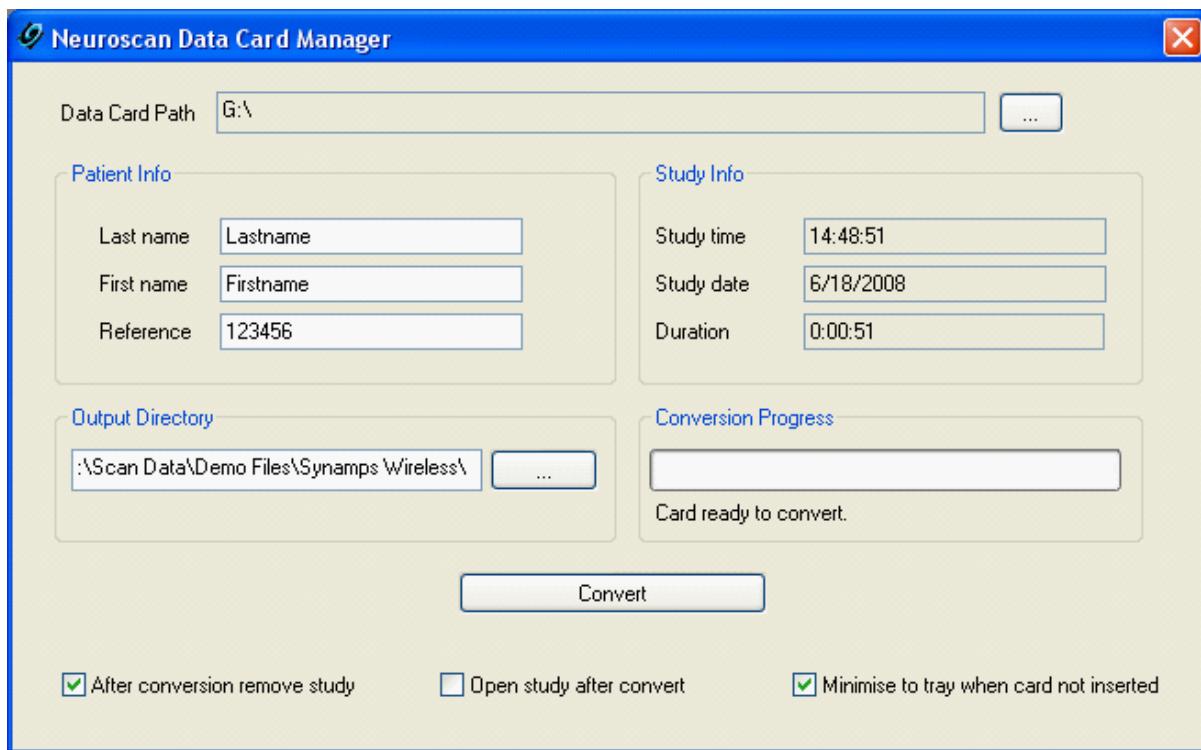
Running the **Neuroscan Data Card Manager** program opens the following display.

**Data Card Path.** The Compact Flash Card Drive must be selected to enable **Data Card Manager** to transfer a completed study from the Compact Flash Card Drive to the computer.

The **Patient Info** fields display the **Last name** and **First name** that you entered in Acquire, in the Subject window (**Edit → Subject**). The Reference field displays the Subject ID that you entered in Acquire, in the Subject window.

The **Study Info** fields display the time, date, and duration of the recording.

Use the **Browse** button in the **Output Directory** field to enter a file name and select the folder in which the converted data file will be placed.



Click the **Convert** button to convert the data file and transfer it to the computer, the Progress bar will display the progress of the data transfer.

#### Auto conversion options

**After conversion remove study.** When this is selected, the Compact Flash Card is cleared of all study data immediately after the study transfer process is complete.

**Open study after convert.** If enabled, the converted CNT file will be opened automatically in EDIT. If you have a version of EDIT already open, a second version will open with the new converted file.

**Minimize to tray when card not inserted.** Select this option to automatically minimize the **Data Card Manager** to the System Tray when it is not in use, with

the icon appearing as shown . It will be activated when you insert a flash card into the flash card reader.

## 9 Cleaning SynAmps Wireless

### Contamination with AIDS, Viral Hepatitis or CJD

If a sensor (or cap) is used on a patient suspected of having AIDS or being infected with Viral Hepatitis or Creutzfeldt-Jakob disease, it is recommended that the sensor not be reused until it has been cleaned and/or sterilized according to the protocols of

your facility.

**Damage or Deterioration**

Sensors and electrodes manufactured by Compumedics are designed in most cases to be reused. If damage, deterioration or loss of performance is observed, it is recommended that the sensor be replaced, or returned to Compumedics or your authorized representative for repair evaluation.

**Recording Unit**

Disconnect all power before cleaning.  
Clean the surfaces with a damp cloth.  
Do not immerse in liquids.  
Do not sterilize.  
Do not disinfect.

**EEG Electrodes (caps)****Cleaning:**

Follow the instructions in the electrode cap manual.

**Disinfecting:**

Follow the instructions in the electrode cap manual, and your facility's protocol.

## 10 Appendix A - Technical Description

### **System Environmental Requirements**

#### **Transport and Storage Conditions:**

-20°C (4°F) to +50°C (122°F),  
30-95% RH non-condensing conditions

#### **Operating Temperature**

Ambient operating temperature range: 0°C - 45°C (32°F - 113°F)

#### **Altitude**

Less than 50,000 feet

### **Recording Unit**

Part Number: 8007-0001-01

Classification: Type CF, IEC 60601-1

Power Input: External Power Supply / Battery Charger (refer C.3); or  
Ni-MH Battery Pack (P/N 0300-0009-00) or

4 x AA Alkaline

Fuses: There are no user-replaceable fuses.

Service: There are no user-serviceable parts inside the *SynAmps Wireless* Recording Unit. Repairs to any component of the *SynAmps Wireless* System must be made at a Compumedics authorized repair center.

If you require a replacement or additional NiMH battery, contact Compumedics or your authorized representative. The internal battery charger function will only charge the NiMH Battery Pack (P/N 0300-0009-00).

The NiMH Battery Pack can be replaced with alkaline AA batteries if desired. The *SynAmps Wireless* will not attempt to charge alkaline batteries.

### **Features**

A stable, low noise, high gain, high input impedance, software programmable amplifier/data acquisition system, providing state of the art in amplification and digitization of physiological signals from electrodes, sensors and transducers. Features 32 isolated high-frequency channels.

### **Patient Safety Standards**

- Complies with IEC601-1 specifications for medical electrical equipment
- Complies with IEC601-1-2 specifications for electromagnetic compatibility

### **Inputs**

32 user defined, AC, fully isolated, referential

### **Input Impedance**

10 MΩ

**Input Current**

Typically 10nA, 100nA max

**Input Noise**

Typically 2 $\mu$ Vp-p

**Input Range**

2mVp-p

**CMRR**

> 100dB

**Frequency Response**

- 0.15 to Nyquist for all channels

**High Pass Filter**

- Standard 0.15 Hz
- Channels 29-32 have extended HP filter of 0.046Hz for support of respiratory sourced signals (currently not available for Scan).

**Low Pass Filter**

- Four pole anti-aliasing low-pass filter, -3dB of 210Hz.

**Notch Filter**

Software based display filtering of 50Hz, 60Hz, or off.

**Sampling Rate**

The signals for each of the units is sampled and stored with AD Rates of 256, 512Hz, or 1024Hz, with true 16-bit digital resolution.

**Data Storage**

The *SynAmps Wireless* provides built-in storage using an industry standard removable Compact Flash card. The current maximum size available is 2GB or larger (larger than 2GB must have a partition table, same as hard disc drives, with the first partition on the card set to 2GB or less, made active and formatted FAT16).

**Isolation**

*SynAmps Wireless* has no inherent patient isolation as it operates from batteries. When operating from an external supply, the supply has 1500Vrms isolation from ground and 4000Vrms isolation from mains.

**Dimensions**

5.5in x 3inx 1.5in  
139.7mm x 76.2mm x 38.1mm

**Weight**

9.6 ounces  
300 grams

**Power Supply / Battery Charger**

Part Number: 8007-0006-01  
Classification: Class I, Type CF, IEC 60601-1  
Mains Supply: 100-240V~ 50/60Hz

Power Input: 55VA

Output: 10V 1.0A

Fuses: There are no user-replaceable fuses. The Recording Unit contains self-resettable fuses.

Service: There are no user-serviceable parts inside the *SynAmps Wireless* Power Supply / Battery Charger. Repairs to any component of the *SynAmps Wireless* System must be made at a Compumedics authorized repair center.



### **WARNINGS**

Only connect the *SynAmps Wireless* Power Supply / Battery Charger to the *SynAmps Wireless* Recording Unit. Other third party power supplies **MUST NOT** be used.

The Battery Charger/Power Supply will only charge the NiMH Battery Pack (P/N 0300-0009-00).

### **Battery Charge Time**

2.5 hours

Where battery power is to be used, the battery should be fully charged within 24 hours prior to operation. To fully charge the battery, allow for a charging period of 2.5 hours. The battery is good for up to 500 charge/discharge cycles. Replace with P/N 0300-0009-00.

### **Radio LAN Communication**

The *SynAmps Wireless* was designed to operate in a TCP/IP wireless and wired network environment using a commercial Spread Spectrum Radio network device. The circuitry and antenna are inside the case. The unit is fully IP compliant with a routable IP address. The wireless nature of the connection allows for subject mobility and roaming within the range of the host computer. Use of bridge devices can extend the range of subject mobility to areas in excess of 1000 feet from the host computer. Nominal transmission distance between the *SynAmps Wireless* unit and a host PC with a 6-8dB gain antenna is 30 to 50 meters, though RF transmission is affected by environmental and architectural factors.

### **Ira Port**

The Ira standard infrared serial port built into the *SynAmps Wireless* Recording Unit provides a communication link with a computer equipped with an external Ira port attached to a serial port. The port is used primarily for changing control settings in the *SynAmps Wireless*, for troubleshooting and for short-term data transmission. As is the case with most Ira devices, the port operates in line-of sight, with a range of about 1 to 1.5 meters.

## **11 Appendix B - Electrode Cap Layout**

The standard *SynAmps Wireless* cap uses the following electrode placements. (Cap designs sometimes change over time, and this layout may not agree exactly with the cap you have. Refer to the documentation that came with the cap for the latest information).

If you look at the figure below, you will see there are 30 EEG electrodes, M1 and M2, 4

EOG electrodes (VEOU, VEOL, HEOL and HEOR), and Ground. There is no dedicated Reference. Looking at the actual amplifier inputs, REF and GND have their own inputs. Use the GND electrode for ground, and then you may use any other electrode for the REF (you must use one of the channels for the Reference). Typically, CPZ or linked mastoids (earlobes) is used for the Reference.

Note that there are 32 EEG inputs into the SynAmps Wireless amplifiers, plus additional inputs for Ground and Reference. There are 35 electrodes in the cap (plus Ground and Reference). You must, therefore, decide which 3 electrodes you do not wish to use.

Some example montages are supplied in the setup files in the C:\ProgramData\Neuroscan\Scan4.5\Setup files\SynAmps Wireless folder:

1. *Syn Wireless 32 mono - Linked.ast*. The setup file records from all 30 EEG channels, plus the VEOU and HEOL eye channels. The linked mastoid (or earlobe) reference is obtained by connecting the M1 and M2 connectors into the Y adapter, and then connecting that to the Reference input to the amplifiers. The AD Rate is 512 Hz, and the acquisition filters are set from .15Hz to Nyquist.
2. *Syn Wireless 32 mono - CPZ Ref with Mastoids.ast*. This setup file uses CPZ as the reference, and records 28 EEG channels, M1 and M2 (to give better resolution of inferior temporal areas), and VEOU and HEOL. VEOL, HEOR and FZ are not recorded. When using CPZ as the Reference, users generally compute the common average reference offline (see the GFP/Reference transform). The AD Rate is 512 Hz, and the acquisition filters are set from .15Hz to Nyquist.
3. *Syn Wireless 32 mono - CPZ Ref with VEOG.ast*. This setup file records all 4 eye artifact channels and omits the mastoids and FZ. CPZ is the Reference. When using CPZ as the Reference, users generally compute the common average reference offline (see the GFP/Reference transform). The AD Rate is 512 Hz, and the acquisition filters are set from .15Hz to Nyquist.

You can, of course, modify the setup files to fit your needs. Often it is easier to modify an existing setup than to create one from scratch. It is recommended that you make a copy of the original setup files and make your changes to the copy, leaving the original intact. Be sure to make the corresponding changes in the Channel Assignment Table so that the labels and physical channels agree with the EBAs you will be using, and modify the Channel Layout as needed to obtain the correct positions in the Multiple Window Display.



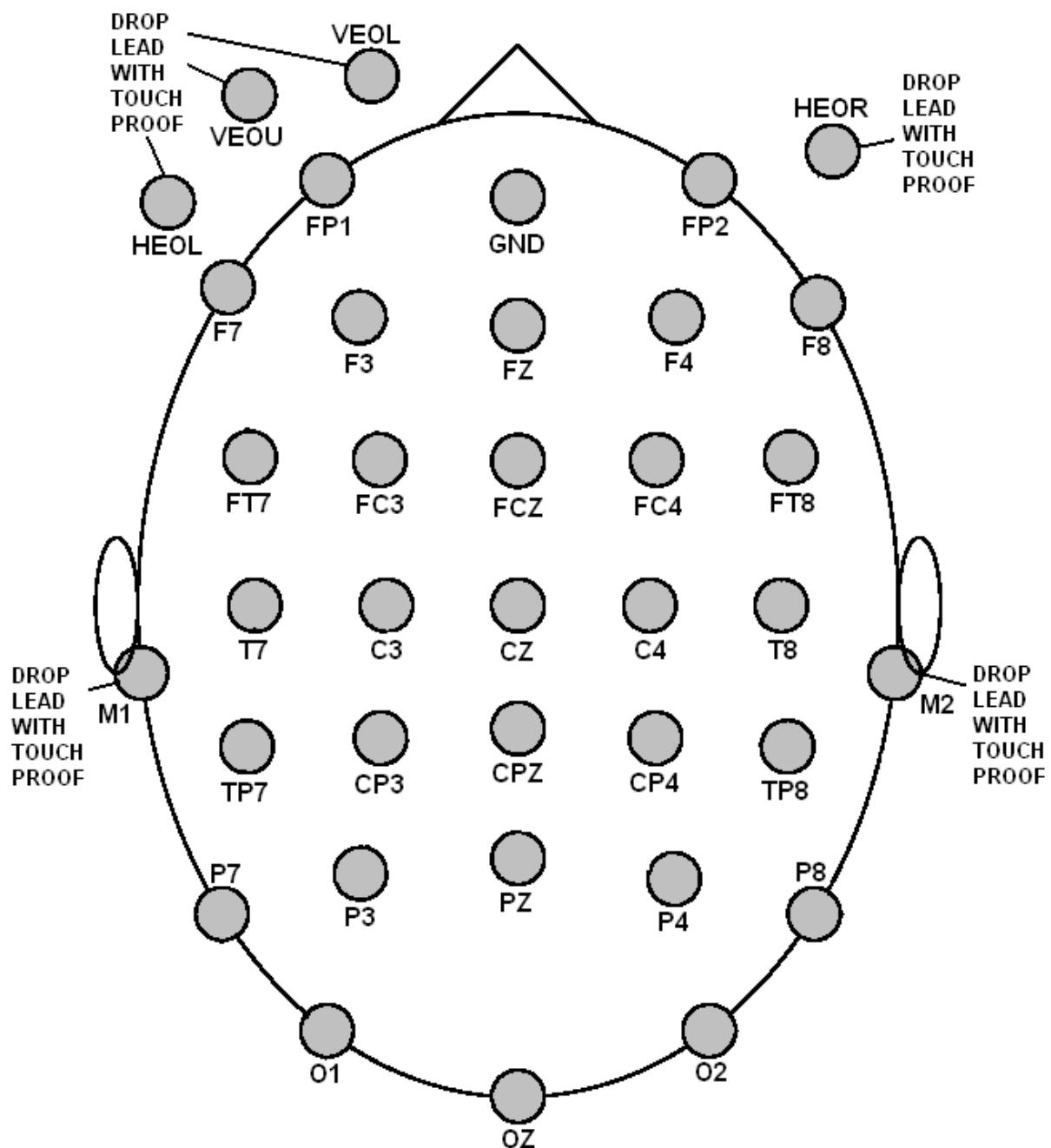
#### Note

Once you decide which 3 electrodes you are not using, **do not put the Quik-Cells or any gel in the electrodes you are not using**. If connected to the scalp, they will act like antennae and may introduce noise into the recordings.

The reason that there are more electrodes than amplifiers is that future development of the SynAmps Wireless amplifiers will include true bipolar channels, where VEOU and VEOL will go into a single bipolar channel, and HEOL and HEOR will go into another bipolar channel. Then there will be only one electrode that is unused - you decide which one that is.

In the meantime, it will be necessary to decide which 32 electrodes you wish to use, and to connect them accordingly using the EBA connectors (and make the corresponding

changes to the channel labels in the setup file).



The pinout for the IDE 40 pin connector is as shown (also subject to revision - refer to the documentation that came with your cap for the most current information).

VEOL (Bipolar -)	1	2	VEOU (Bipolar +)
HEOL (Bipolar -)	3	4	HEOR (Bipolar +)
N/C	5	6	FP1
N/C	7	8	F7
N/C	9	10	GND
M1	11	12	CPZ
FP2	13	14	F3
FC3	15	16	FT7
T7	17	18	F8
F4	19	20	FZ
FCZ	21	22	C3
TP7	23	24	FT8
FC4	25	26	CZ
M2	27	28	CP3
P3	29	30	P7
T8	31	32	TP8
C4	33	34	P8
CP4	35	36	P4
PZ	37	38	OZ
O1	39	40	O2
IDE 40 Pin Connector			