FLUKE networks™

OptiView™

Wireless Network Analyzer

Getting Started Guide

PN 3337363
September 2008

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PO Box 777

Everett, WA 98206-0777 U.S.A.

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Software Notice

Portions of the application are based on PeerSec Networks MatrixSSL(tm) (http://www.peersec.com).

Table of Contents

Title	Page
Before You Start	i
Federal Communication Commission Interference Statement	i
Contacting Fluke Networks Sales, Service, and Support Centers	4
OptiView Wireless Network Analyzer Support	4
OptiView Wireless Network Analyzer and Accessories	5
Installing the OptiView Wireless Network Analyzer Software	6
Using a USB CD drive, perform the following steps:	6
Using a USB Flash Drive, perform the following steps:	7
Installing the Wireless LAN Card	8
Using the OptiView Wireless Network Analyzer	10
Starting the OptiView Wireless Network Analyzer	10
Initial Setup	12
Troubleshooting Your Analyzer	13
Resetting and Powering the Analyzer Completely Off	13
Resetting the Analyzer	13
Forcing Power Off	13
Before Calling Technical Support	14
Do you suspect Windows has locked up?	14
Do you suspect the analyzer has locked up?	14
Does the analyzer power-up?	14
Does the Windows wireless setup not support your network's security settings?	14
Known Issues/Limitations	14
Using the Online Help System	15
WLAN Card Specifications	16

Introduction

OptiView™ Wireless Network Analyzer, hereafter referred to as the "analyzer", brings the ruggedness, portability, and ease-of-use of OptiView Network Analyzer to wireless LANs. Whether you are designing your first wireless LAN deployment, detecting rogue access points, verifying a recent installation, monitoring or troubleshooting wireless connectivity problems, the OptiView Wireless Network Analyzer gives you the vision you need to manage your wireless network.

Note

The OptiView Wireless Network Analyzer is equipped with a wireless network access card that supports 802.11a/b/g/n specifications.

Before You Start

Federal Communication Commission Interference Statement

The OptiView Wireless Network Analyzer complies with:

- FCC part 64, class B
- FCC part 15, class B

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

—Reorient or relocate the receiving antenna.

—Increase the separation between the equipment and receiver.

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

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

FCC Caution: To assure continued compliance, (example - use only shielded interface cables when connecting to computer or peripheral devices) any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.

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

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

For product available in the USA/Canada market, only channel 1~11 can be operated. Selection of other channels is not possible.

This device is going to be operated in 5.15~5.25GHz frequency range, it is restricted in indoor environment only.

This device supports FCC Part 15, subpart E dynamic frequency selection (DFS).

For the band 5150–5350 MHz this equipment must be used indoors only to reduce potential for harmful interference to co-channel mobile satellite systems.

Operation is subject to the following conditions:

- The maximum antenna gain permitted (for devices in the 5250-5350 MHz and 5470-5725 MHz bands) to comply with the e.i.r.p. limit.
- The maximum antenna gain permitted (for devices in the 5725-5825 MHz band) to comply with the e.i.r.p. limits specified for point-to-point and non point-to-point operation as appropriate, as stated in section A9.2(3).
- Users are cautioned that high power radars are allocated as primary users (meaning they have priority) of 5250-5350 MHz and 5650-5850

MHz and these radars may cause interference and/or damage to LE-LAN devices.

IMPORTANT NOTE:

Federal Communication Commission (FCC) Radiation Exposure Statement

This EUT is compliance with SAR for general population/uncontrolled exposure limits in ANSI/IEEE C95.1-1999 and had been tested in accordance with the measurement methods and procedures specified in OET Bulletin 65 Supplement C.

IMPORTANT NOTE:

Federal Communication Commission (FCC) Radiation Exposure Statement

This EUT is compliance with SAR for general population/uncontrolled exposure limits in ANSI/IEEE C95.1-1999 and had been tested in accordance with the measurement methods and procedures specified in OET Bulletin 65 Supplement C. This equipment should be installed and operated with minimum distance 1.5 cm between the radiator & your body.

This Class B digital apparatus complies with Canadian ICES-003.

Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Cet appareil numérique de la classe B conforme á la norme NMB-003 du Canada.

Operation is subject to the following two conditions: (1) this device may not cause interference and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

This device and its antenna(s) must not be co-located or operation in conjunction with any other antenna or transmitter.

To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (e.i.r.p) is not more than that permitted for successful communication.

The device could automatically discontinue transmission in case of absence of information to transmit, or operational failure. Note that this is not intended to prohibit transmission of control or signaling information or the use of repetitive codes where required by the technology.

The device for the band 5150-5250 MHz is only for indoor usage to reduce potential for harmful interference to co-channel mobile satellite systems.

The maximum antenna gain permitted (for devices in the bands 5250-5350 MHz and 5470-5725 MHz) to comply with the e.i.r.p. limit.

The maximum antenna gain permitted (for devices in the band 5725-5825 MHz) to comply with the e.i.r.p. limits specified for point-to-point and non point-to-point operation as appropriate, as stated in section A9.2(3).

High-power radars are allocated as primary users (meaning they have priority) of the bands 5250-5350 MHz and 5650-5850 MHz and these radars could cause interference and/or damage to LE-LAN devices.

IMPORTANT NOTE:

IC Radiation Exposure Statement:

This EUT is compliance with SAR for general population/uncontrolled exposure limits in IC RSS-102 and had been tested in accordance with the measurement methods and procedures specified in IEEE 1528. This equipment should be installed and operated with minimum distance 1.5cm between the radiator & your body.

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ΩWarnings

To avoid possible electric shock or personal injury, follow these guidelines:

- **Do not operate the product around explosive gas, vapor or dust.**
- **If this product is used in a manner not specified by the manufacturer, the protection provided by the product may be impaired.**

Contacting Fluke Networks Sales, Service, and Support Centers

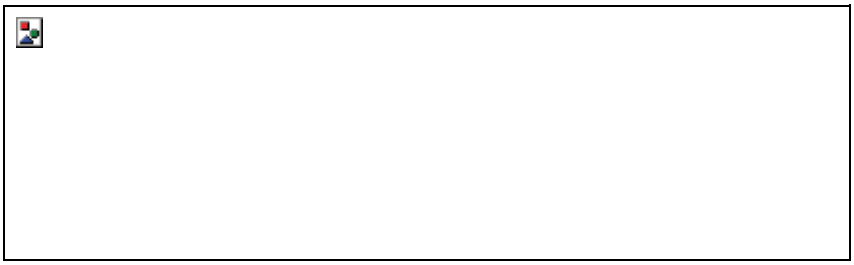
To order accessories or get the location of the nearest Fluke Networks distributor or service center, visit the Fluke Networks contact website at http://www.flukenetworks.com/fnet/en-us/contactUswww.flukenetworks.com/contact. Send email to support@flukenetworks.com. For operator assistance in the USA, call 1-800-28-FLUKE (1-800-283-5853).

OptiView Wireless Network Analyzer Support

As a registered user, you are entitled to entry level product support, including three free telephone support incidents during the first 60 days of ownership, access to entry level online Knowledge Base library of product operation and Software information, and Web-based trouble ticketing. We will also be sending you Fluke Networks company and product information updates.

Please take the time to register your analyzer. A registration card is supplied in the shipping box. You can also register by going to www.flukenetworks.com.

OptiView Wireless Network Analyzer and Accessories



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Item		Description
1	Wireless LAN Adapter	WLAN 802.11A/B/G/N Cardbus PC Cardwith antenna connection
2	CD-ROM	OptiView Wireless Network Analyzer CD-ROM. Contains installation software and documents.
3	OptiView Wireless Network Analyzer Getting Started Guide	Provides basic operating information, accessory part numbers, and specifications for the OptiView Wireless Network Analyzer.
4	Antenna	Triband flag directional antenna with Hirose connector.
	Registration Card	Fluke Networks can serve you best by registering online at www.flukenetworks.com. If you cannot register online, please fill out and return the supplied registration card.
	Warranty Card	Factory 1 year warranty.

Figure 1. The OptiView Wireless Network Analyzer and Supplied Accessories

Installing the OptiView Wireless Network Analyzer Software

If the OptiView Wireless Network Analyzer icon does not appear on your OptiView Series III Integrated Network Analyzer desktop, you will need to install the software. There are three steps involved in the installation:

- Move the self-extracting software file onto the analyzer's hard disk
- Install the software on the analyzer
- Install the Wireless LAN PCMCIA card

Note

The OptiView Wireless Network Analyzer software must be installed BEFORE installing the 802.11a/b/ga/b/g/n Wireless LAN Card.

Moving the Software to Your OptiView Integrated Network Analyzer

There are three methods for moving the software file:

Download the software file from the Fluke Networks Web Site directly to the analyzer

Copy the file from the OptiView Wireless Network Analyzer CD to your analyzer using an external USB CD-ROM drive

Copy the file from your OptiView Wireless Network Analyzer CD to your PC, and then transfer the file to the analyzer using one of the methods listed below:

Use a direct point-to-point connection

Transfer the software file to the analyzer using the analyzer's TFTP Server software

From the analyzer, use Microsoft Networking to map a drive on the PC, and copy the file to the analyzer (analyzer and PC must be in same subnet)

Once the software file is on your analyzer, you will need to install it as described in Installing the Software on the Analyzer.

Downloading the Software File from the Fluke Networks Web Site Directly to the OptiView Integrated Network Analyzer

If your OptiView Integrated Network Analyzer is connected to a network that has Internet access, perform this procedure:

Connect the analyzer to the network and correctly configure the IP configuration. Refer to the analyzer documentation for help if needed.

Start your web browser and go to the www.flukenetworks.com web site.

Select the Support and Downloads tab and follow the instructions to select and download the correct version of Wireless Network Analyzer software.

You are now ready to Install the Software on the Analyzer.

Copying the Software File from the OptiView Wireless Network Analyzer CD to the OptiView Integrated Network Analyzer using an external USB CD-ROM drive

Follow this procedure to move the file from a USB CD-ROM drive:

Connect the drive to the OptiView Integrated Network Analyzer's USB port.

Insert the OptiView Wireless Network Analyzer's CD into the CD-ROM drive.

Use the OptiView Integrated Network Analyzer's Windows Explorer to navigate to the CD and copy the file OPVWNA-V3.EXE (located in the ...\sw directory) from your PC to the analyzer (recommended directory is d:\temp).

You are now ready to Install the Software on the Analyzer.

Transferring the Software from your PC to the OptiView Integrated Network Analyzer

These methods are described in the online Help. Online Help is available from the Startup menu of the OptiView Wireless Network Analyzer CD. Insert the CD in your PC and it will automatically load the Startup menu.

Installing the Software on the Analyzer

After the file OPVWNA-V3.EXE has been copied to the analyzer (preferably to the D: drive), perform the following steps to complete the installation:

Note

The Wireless Network Analyzer PCMCIA Card must NOT be installed in the analyzer during the software installation. After the software installation, the card can be inserted into the PCMCIA slot. Windows will then detect the card and add it as new hardware using the correct driver.

Use the Integrated Network Analyzer's Windows Explorer to navigate to the directory where the OPVWNA-V3.EXE file has been stored.

Double-click on the OPVWNA-V3.EXE file to run it.

Follow the InstallShield Wizard instructions to install the software. Reboot the analyzer as indicated in the InstallShield Wizard.

Note

If a previous version of the application is already installed, follow the InstallShield instructions to remove it. After rebooting the analyzer to finish the removal, start at step 1 to install the OPVWNA-V3.EXE file.

Use one of the following methods:

Using a USB CD drive, perform the following steps:

Note

Remove the Fluke Networks Wireless LAN adapter (WNA WLAN adapter) from the analyzer before installing the software update. If you accidentally install the software with the adapter installed, you may have to reboot your analyzer.

1. Insert the OptiView WNA Options CD into the external CD drive. Autostart should launch the user interface. If not, use Windows Explorer and double-click on launch.exe on the WNA Options CD.
2. Select the **Install Software** button.
3. Select the Install OPVWNA-Vx.xx button. The InstallShield Wizard is executed and the installation begins. Follow the on-screen instructions to complete the installation.
4. Insert the WNA WLAN adapter and initialization begins. Refer to **Installing the Wireless LAN Card** on page 10

Using a USB Flash Drive, perform the following steps:

Note

Remove the Fluke Networks Wireless LAN adapter (WNA WLAN adapter) from the analyzer before installing the software update. If you accidentally install the software with the adapter installed, you may have to reboot your analyzer.

1. Using a PC, copy the file opvwna-vxxx.exe from the OptiView WNA Options CD to the USB flash drive. The file is located in the \software directory on the CD.
2. Install the USB flash drive in one of the three USB ports on the analyzer.

3. Open the Windows Explorer application and execute the file opvwna-vxxx.exe and the InstallShield Wizard is started. Follow the on-screen instructions to complete the installation.

4. Insert the WNA WLAN adapter and initialization begins.

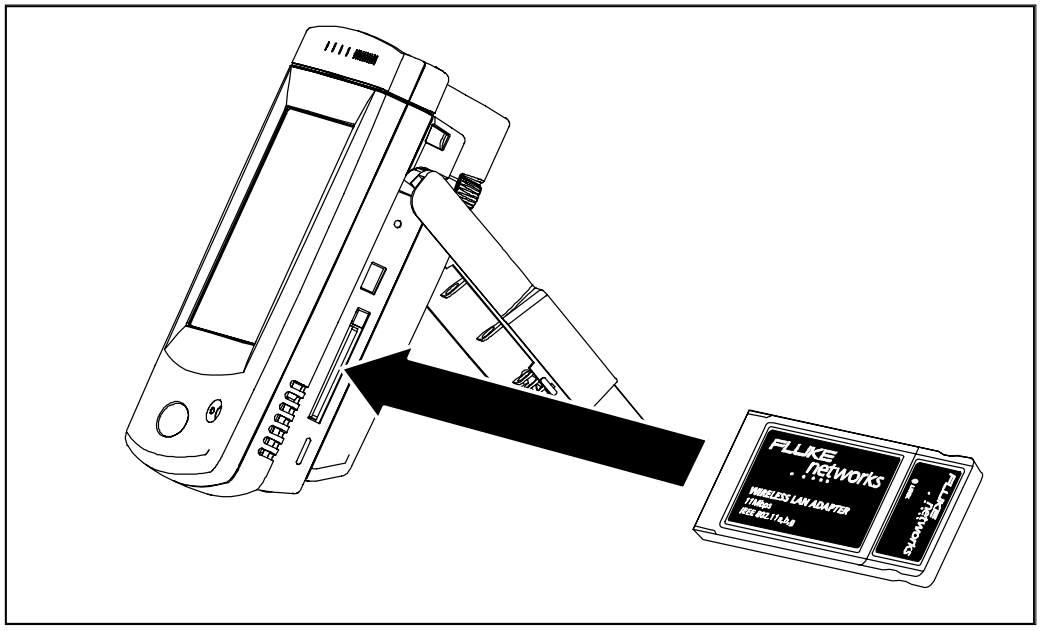
Installing the Wireless LAN Card

Notes

The OptiView Wireless Network Analyzer software must be installed BEFORE installing the 802.11a/b/g/n Wireless LAN Card.

You can use the Wireless LAN PCMCIA card that came with your Version 4 product, or you can use the card that came with your Version 3 product that has the external antenna. The Version 3 card improves the ***Locate*** *function performance but does not support 802.11n.*

The WLAN PC Card is installed in the PC Card (PCMCIA) slot located on the right side of the OptiView Integrated Network Analyzer. When inserting the card, make sure it is properly aligned while sliding it into the card slot. It should slide in freely. Do not force it into the slot.



apo06f.eps

Figure 2. Wireless LAN Card Installation

On Windows XP Service Pack 2, with the Windows Firewall turned **On**, you will be prompted with the following screen the first time the WLAN card is inserted:

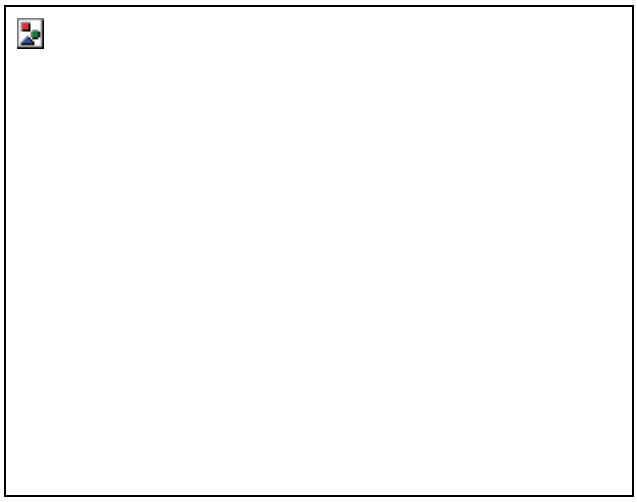


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Figure 3. Forcing Windows to Look for the WLAN Card Driver Locally

Select **No, not this time**, and press **Next**.

You will also be prompted with the following message telling you that the driver has not passed Windows testing. Press **Continue Anyway** to complete the installation:

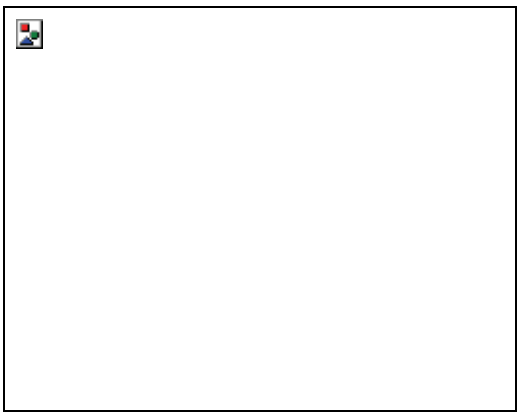

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Figure 4. Hardware Installation Message

Using the OptiView Wireless Network Analyzer

Starting the OptiView Wireless Network Analyzer

On the Windows desktop, select the OptiView Wireless Network Analyzer (OPVWNA) icon to launch the software.

Note

*The Windows Firewall should be turned **off** to enable discovery. If the firewall is **on**, you will be prompted with the following screen after launching the software:*

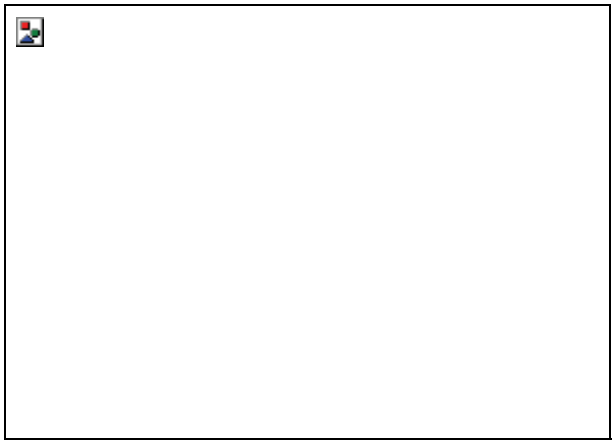

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Figure 5. Allowing Discovery Through the Windows XP Firewall

*Select **Unblock** to allow discovery by the OptiView Wireless Network Analyzer on the wireless network. If you select **Keep Blocking**, no discovery will take place.*

*The firewall security settings are configured in the **Windows Security Center** screen. Select the*  *icon on the taskbar to open the **Windows Security Center** screen. At the bottom of this screen, select **Windows Firewall**. The **Exceptions** tab allows you to enable/disable the OptiView Wireless Network Analyzer program block. Enable the checkbox next to the **OptiView WNA** entry to unblock the firewall.*

Upon a successful launch of the software, the OptiView Wireless Network Analyzer Front Page will appear as shown below. Monitoring of your WLAN is

automatically started. Devices present on your wireless network are discovered and displayed.

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Figure 6. OptiView Wireless Network Analyzer Front Page

1. The top of the screen gives immediate visibility into the security level and potential security vulnerabilities. You can use the pull-down menu above the device list to filter the list by device type or network configuration.

Notes

IP and Name information can be discovered if the analyzer has been configured to autolink using a default SSID. See the ***Initial Setup*** *section later in this guide for more details.*

The color coding and icon legend for the ***Front Page*** *screen and throughout the user interface can be viewed by pressing the* ***Legend*** *button located at the bottom of the screen.*

2. Highlight an entry in the device list and key configuration parameters are displayed in the lower left section.
3. The overall network health is displayed in the lower center section. The application continuously monitors 802.11a/b/g channels and reports key statistics important for maintaining your network (e.g. signal strength, retry

rates, signal-to-noise, etc.). Use the pull-down menu to display the parameters of choice.

4. The overall network summary is displayed in the lower right. It provides statistics on network device types, authorization levels, and security.
5. Use the row of tabs at the top of the **Front Page** to gain access to detailed information about your wireless LAN environment, troubleshooting tools, and tests that are available in the product. The online Help provides information about each feature.
6. Reports are available from most of the screens to aid in documenting your network.

Initial Setup

Refer the the **Initial Setup** topic in the online Help for more information on initial configuration of the product.

Troubleshooting Your Analyzer

Resetting and Powering the Analyzer Completely Off

If you suspect the Windows environment has locked up, you may have to reset the OptiView Integrated Network Analyzer. This is done by pressing the **Reset** button. If you are not sure if the Windows environment or the analyzer (hardware) has locked up, you may have to completely power down the analyzer by forcing the power off as described below.

Resetting the Analyzer

The **Reset** button resets the Windows portion of the analyzer without shutting down the data acquisition board. The **Reset** button should only be used if the Windows environment has stopped responding.

Forcing Power Off

Power can be forced off by pressing and holding the **On/Off** button for approximately 7 seconds.

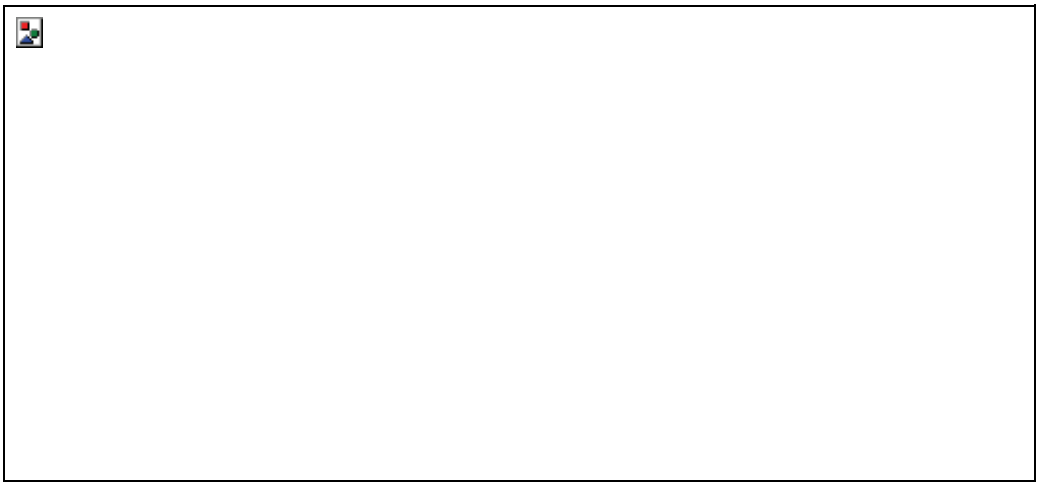

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Figure 7. Reset Button Location

Before Calling Technical Support

Before calling technical support, you can perform these basic analyzer troubleshooting steps to pinpoint many problems:

Do you suspect Windows has locked up?

If yes, press the **Reset** button.

Do you suspect the analyzer has locked up?

If yes, completely power-down the analyzer. See **Forcing Power Off** on page 15.

Does the analyzer power-up?

Connect the AC adapter/charger to determine if the internal battery (or internal and external batteries) is the culprit. The analyzer will not power-up if the batteries are completely discharged.

If the analyzer only powers up with the AC adapter connected, the internal battery may be completely discharged.

The external battery has a charge indicator on the underside of the battery pack. The external battery will need to be removed from the analyzer to view the charge indicator. Press the charge indicator button to determine if the external battery is charged.

Does the Windows wireless setup not support your network's security settings?

If your analyzer is running Windows XP Service Pack 1, and the Windows security settings do not support your wireless network, you may have to go to http://support.microsoft.com/default.aspx?scid=kb;en-us;826942 and download the wireless patches. These patches are included in Service Pack 2.

Known Issues/Limitations

1. When doing a capture within a WPA environment, the analyzer can decrypt Broadcast frames (UI will ask you to link). Frames not destined for the analyzer can not be decrypted.
2. If you are analyzing multiple Access Points with different security configuration (WEP keys, WPA certificate, WPA passphrase, User ID and password), IP address, Name and Packet Stats will not be discovered for those devices with a different WEP key than the one currently set in the OptiView Wireless Network Analyzer **Setup** | **Configuration** screen.

3. In the **Capture** screen, the **Source/Destination MAC** filter supports Access Point, and Access Point to client filtering. It does not support client-to-client filtering. Entering two client MAC addresses will yield unexpected results.
4. Decoder issue: Shows incorrect **Source/Destination MAC** addresses if the option "Configuration, Display, Display Network Address" is not checked.

Using the Online Help System

The help system is an integral part of the OptiView Wireless Network Analyzer. While using the analyzer user interface, help can be accessed by selecting the **Help** button located on the bottom-right of the user interface screen.

When the Help is launched, the current screen topic is displayed. You can also select a topic from the **Contents** tab (left pane), choose an **Index** entry, or perform a full text **Search** on any help topic or term.

The **Hide** button collapses the left pane of the help screen giving you more room to view Help topics. The **Hide** button is replaced by the Show button. The **Show** button expands the left pane of the Help screen.

You can also press the **Back** and **Forward** buttons to move through the sequence of previous viewed topics.

The **Print** button allows you to either print the selected topic or print the selected heading and all subtopics.

WLAN Card Specifications

- Frequency range:

  USA: 2.400 - 2.483GHz, 5.15 - 5.35GHz , 5.47 - 5.725GHz, 5.725 - 5.85GHz

  Europe: 2.400 - 2.483GHz , 5.15 - 5.35GHz, 5.47 - 5.725GHz

  Japan: 2.400 - 2.497GHz, 4.90 - 5.091GHz , 5.15 - 5.35GHz, 5.47 - 5.725GHz

  China: 2.400 - 2.483GHz, 5.725 -5.85GHz

- Modulation technique:

  802.11n a/b/g

  DSSS (DBPSK, DQPSK, CCK)

  OFDM (BPSK, QPSK, 16-QAM, 64-QAM)

  DSSS (Direct Sequence Spread Spectrum) with

  DBPSK (Differential Binary Phase Shift Keying 1Mbps)

  DQPSK (Differential Quaternary Phase Shift Keying 2Mbps), and

  CCK (Complementary Code Keying 5.5&11Mbps), and

  OFDM (Orthogonal Frequency Division Multiplexing with BPSK for 6,9Mbps

  QPSK for 12,18Mbps 、 16QAM for 24,36Mbps 、 64QAM for 48,54Mbps)

- Channel Support:
  802.11n b/g

  US/Canada: (1 - 11)

  Major European country: (1 - 13)

  France: (10 - 13)

  Japan: 11b: (1-13 or 14), 11g: (1 - 13)

  China: (1 - 13)

  802.11n a

  1). US/Canada: 12 non-overlapping channels (36,40,44,48,52,56,60,64;

  100,104,108,112,116,120,124,128,132,136,140;

  149,153,157,161,165)

2). Europe: 19 non-overlapping channel (36,40,44,48,52,56,60,64;

100,104,108,112,116,120,124,128,132,136,140)

3). Japan: 19 non-overlapping channels (184,188,192,196,8,12,16; 36,40,44,48,52,56,60,64;

100,104,108,112,116,120,124,128,132,136,140)

4). China: 5 non-overlapping channels (149,153,157,161,165)

- Operating Voltage: 3.3V +/- 5%
- Output Power:

  - 802.11a/b/g 17 dBm peak power
  - 802.11n 2.4Ghz HT20 18dBm peak power, 2.4Ghz HT40 18dBm peak power, 5Ghz HT20 18dBm peak power 5Ghz HT40 17dBm peak power
- Dimension: 112mm(L) x 48mm(W) x 0.787mm(T)
- Security:

  64-bit, 128-bit, 152-bit WEP encryption

  802.1X authentication

  AES-CCM & TKIP Encryption
- Operating Temperature: 0 – 55 degrees Celsius
- Storage Temperature: -20 – 80 degrees Celsius
- Wi-Fi Alliance: WECA compliant
- WHQL: Microsoft® 2000, XP compliant
- FAA: S/W audio On/Off support

  EMC Certificate:
  - FCC part 15 (USA)
  - Pre IC RSS210 certified
  - Telec (Japan)
  - ETSI, EN301893, EN60950 (Europe)
  - VCCI Class B
- Media Access Protocol : CSMA/CA with ACK architecture 32-bit MAC
- Embedded Antenna : Dual band metal PIFA antenna x2 and chip antenna x1

  Frequency Range:
  - USA: 2.412 - 2.462GHz, 5.15 - 5.35GHz, 5.725 - 5.825GHz, 2.400 - 2.483GHz

- Europe: 2.412 - 2.472GHz, 5.15 - 5.35GHz, 5.47 - 5.725GHz, 2.400 - 2.483GHz
- Japan: 2.421 - 2.484GHz, 5.15 - 5.25GHz, 2.400 - 2.483GHz, 4.90 - 5.091GHz, 5.15 - 5.25GHz
- China: 2.412 - 2.484GHz, 5.725 - 5.85GHz, 2.400 - 2.483GHz

Modulation Technique:
- 802.11b/g: DSSS (DBPSK, DQPSK, CCK), OFDM for data rate > 20 Mbps
- 802.11a: OFDM (BPSK,QPSK, 16-QAM, 64-QAM)

Host Interface: Cardbus form factor with 32-bit interface

Channels Support:
- 802.11b/g
  US/Canada: 11 (1 - 11)
  Europe: 13 (1 - 13)
  France: 4 (10 - 13)
  Japan: 14 (1 - 14)
  China: 13 (1 - 13)
- 802.11a
  US/Canada: 12 non-overlapping channels (5.15 - 5.35GHz, 5.725 - 5.825GHz)
  Europe: 19 non-overlapping channel (5.15 - 5.35GHz, 5.47 - 5.725GHz)
  Japan: 4 non-overlapping channels (5.15 - 5.25GHz)
  China : 5.725 - 5.85 GHz

Operating Voltage: 3.3V +/- 5%

Power Consumption:

	802.11a	**802.11b**	**802.11g**
Continuous Tx:	490-510mA @18dBm	570-590mA @18dBm	610-640mA @18dBm
Continuous Rx:	340-350mA	360-380mA	420-440mA
FTP Tx :	420-440mA	510-530mA	530-545mA
FTP Rx :	400-420mA	470-485mA	490-510mA
Standby mode:	360-380mA	440-450mA	450-470mA
Power saving mode:	50mA	50mA	50mA
RF Kill :	40mA	40mA	40mA

Output Power:

- 802.11b/g 18 dBm peak power
- 802.11a
  US : 5.150 - 5.250: 15 dBm, 5.250 - 5.350: 18 dBm, 5.470 - 5.725: not allowed,
  5.725 - 5.825: 17 dBm
  Europe : 5.150 - 5.250 and 5.250 - 5.350: 18 dBm, 5.470 - 5.725: 17 dBm,
  5.725 - 5.825: Not allowed.
  Japan : 5.150 - 5.250: 18 dBm, 5.250 - 5.350: not allowed,
  5.470 - 5.725: not allowed, 5.725 - 5.825: not allowed

Operating Distance:

- 802.11a
  Outdoor:
40m@72Mbps,85m@54Mbps,250m@48Mbps,310m@36Mbps
  Indoor:20m@72Mbps,25m@54Mbps,35m@48Mbps,40m@36Mbps
- 802.11b

Outdoor:300m@11Mbps,465m@5.5Mbps,500m@2Mbps,515m@1Mbps
  Indoor: 60m@11Mbps,70m@5.5Mbps,83m@2Mbps,85m@1Mbps
- 802.11g

Outdoor: 82m@54Mbps,100m@48Mbps,300m@36Mbps
Indoor:20m@54Mbps,25m@48Mbps,35m@36Mbps

Operating System: Windows® 98SE, ME, 2000, XP

Dimension: 119mm (L) * 54mm (W) * 9.4mm (H)

Security:

- 64-bit, 128-bit, 152-bit WEP Encryption
- 802.1X Authentication
- AES-CCM & TKIP Encryption

Operating Mode: Infrastructure & Ad-hoc mode

Transfer Data Rate:
- 802.11b/g: 11, 5.5, 2, 1 Mbps, auto-fallback, up to 54 Mbps
- 802.11g (Super mode): up to 108 Mbps
- 802.11a (Normal mode): 54, 48, 36, 24, 18, 12, 9, 6Mbps, auto-fallback
- 802.11a (Turbo mode): 108,96,72,48,36,24,18,12 Mbps, auto-fallback

Operating Temperature: 0 – 70 degrees Celsius

Storage Temperature: -20 – 80 degrees Celsius

Wi-Fi Alliance: WECA Compliant

WHQL: Microsoft® 2000, XP Compliant

FAA: S/W audio On/Off support

EMC Certificate:
- FCC part 15 (USA)
- Pre IC RSS210 certified
- Telec (Japan)
- ETSI, EN301893, EN60950 (Europe)

Media Access Protocol : CSMA/CA with ACK architecture 32-bit MAC

Embedded Antenna : Embedded Dual Band Antenna

External Antenna:

- VSWR 2.0

- Antenna Gain:

2.4GHz - 2.485GHz: 2dBi

4.9GHz - 5.875GHz: 3.5dBi

- Cable Length: 120cm