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Broadcom 440X 10/100 Integrated Controller User Guide

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Release: 440X-UM104-R, September 5, 2004

Introduction: Broadcom 440X 10/100 Integrated Controller User Guide

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Functional Description

The Broadcom 440X 10/100 Integrated Controller connects a PCI workstation to a 10/100-Mbps Ethernet network. The BCM440X LAN on Motherboard device is a fully-integrated 10/100 Ethernet MAC/PHY.

Features

The following lists the Broadcom 440X 10/100 Integrated Controller features for all supported operating systems:

- Combination 10/100 Ethernet
 - PCI 2.3 and LAN on Motherboard (LOM)
 - Meets PCI Power Management Interface Specification v1.1 for Advanced Power Management
 - Fully WHQL certified software drivers for Windows 2000 and Windows XP
 - Integrated MAC/PHY 10/100 PCI Ethernet
 - IEEE 802.3u compliant transmit and receive engines
 - Transmit and receive FIFOs (2 kB transmit and 4 kB receive)
 - Full-duplex and half-duplex operation
 - Internal 64-entry Content Addressable Memory (CAM) for perfect address filtering
 - MII management interface allows control of internal transceiver functions
 - Internal MAC and PHY loopbacks
 - Support for PXE 2.1 available (Windows 2000, Intel APITEST, DOS UNDI)
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Network Link and Activity Indication

The state of the network link and activity is indicated by the two LEDs on the RJ-45 connector, as

described in [Table 1](#).

Table 1. 10/100 LED

LED	LED Appearance	Network State
Link	N/A	No link (cable disconnected)
	Solid color	Link
Activity	Off	No network activity
	Blinking	Network activity

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System Requirements

Before you install the Broadcom 440x 10/100 Integrated Controller, verify that your system meets the requirements listed for your operating system:

Windows 2000, Windows XP, Windows 98 Second Edition, and Windows ME Requirements

- Pentium-based computer that meets Windows 2000, Windows XP, Windows 98 Second Edition, and Windows ME software requirements
- One open 32-bit or 64-bit PCI slot
- PCI v2.2 33/66 MHz Bus Interface
- 128-MB RAM (minimum)
- Microsoft Windows 2000, Windows XP, Windows 98 Second Edition, and Windows ME.

Linux Requirements

- Pentium-based computer that meets Linux software requirements
- One open 32-bit or 64-bit PCI slot
- PCI v2.2 33/66-MHz Bus Interface
- 128 MB RAM (minimum)



NOTE: Although the driver should work with many Linux® kernel versions and distributions, it has only been tested on Red Hat® 7.1, 7.2, AND 7.3 Linux distributions for i386 and IA64 (kernel version 2.4.x). Furthermore, the driver has only been tested as a loadable module.

Safety Precautions



WARNING: The adapter is being installed in a system that operates with voltages that can be lethal. Before removing your system's cover, observe the following precautions to protect yourself and to prevent damage to the system components.

- Remove any metallic objects or jewelry from your hands and wrists.
 - Make sure to use only insulated or nonconducting tools.
 - Verify that the system is powered OFF and unplugged before accessing internal components.
 - Installation or removal of adapters must be performed in a static-free environment. The use of a properly grounded wrist strap or other personal antistatic devices and an antistatic mat is strongly recommended.
-

Preinstallation Checklist

1. Verify that your computer meets the hardware and software requirements listed under [System Requirements](#).
 2. Verify that your system is using the latest BIOS.
 3. If your system is active, shut it down.
 4. When system shutdown is complete, turn off the power and unplug the power cord.
 5. Holding the adapter card by the edges, remove it from its shipping package and place it on an antistatic surface.
 6. Check the adapter for visible signs of damage, particularly on the card edge connector. Never attempt to install any damaged adapter.
-

Installing the Adapter

The following instructions apply to installing the Broadcom 440X Integrated Controller in most systems. Refer to the manuals that were supplied with your system for details about performing these tasks on your particular system.

1. Review the [Precautions](#) and [Pre-Installation Checklist](#). Before installing the adapter, ensure the system power is OFF and unplugged from the power outlet, and that proper electrical grounding procedures have been followed.
2. Remove the system cover, and select any empty PCI slot. If you do not know how to identify a PCI slot, refer to your system documentation.
3. Remove the blank cover-plate from the slot that you selected.
4. Holding the PCI card by the edges, align the adapter's connector edge with the PCI connector dock in the system.



NOTE: The connector dock in a 32-bit PCI slot is shorter than in a 64-bit PCI slot. Although the adapter is designed to fit in either slot type, when installed in a 32-bit PCI slot, part of the adapter's connector edge will remain undocked. This is perfectly normal.

5. Applying even pressure at both corners of the card, push the adapter card until it is firmly seated in the PCI slot. When properly seated, the adapter's port connectors are aligned with the slot opening, and its faceplate is flush against the system chassis.



CAUTION: Do not use excessive force when seating the card, as this may damage the system or the adapter. If the card resists seating, remove it from the system, realign it, and try again.

6. Secure the adapter with the adapter clip or screw.
7. Replace the system cover and disconnect any personal antistatic devices.
8. Power the system on.

After the system returns to proper operation, the adapter hardware is fully installed. Go to [Connecting the network cables](#).

Connecting the Network Cables

The adapter has one RJ-45 connector used for attaching the system to an Ethernet copper-wire segment. When automatic link negotiation is disabled, the port can be configured for 10 Mbit/s or 100 Mbit/s, signaling either half-duplex or full-duplex operation.

Perform the following procedure for connecting a network cable to the Broadcom 440X 10/100 Integrated Controller:

1. Prepare an appropriate cable. The table lists the cable requirements for connecting to 10/100BASE-T ports:

10/100BASE-T Cable Specifications

Port Type	Connector	Media	Maximum Distance
10BASE-T	RJ-45	Category 3, 4, or 5 UTP	100 meters (328 feet)
100BASE-T	RJ-45	Category 5 UTP	100 meters (328 feet)

2. Connect one end of the cable to the Broadcom 440X 10/100 Integrated Controller.
3. Connect the other end of the cable to an RJ-45 Ethernet network port.



NOTE: After the cable is properly connected at both ends, the adapter port LEDs should be functional. See [Table 1](#) for a description of adapter port LED operation. For driver installation and configuration instructions, refer to the software configuration for that specific driver.

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Installing the Driver Software

When Windows first starts after a new hardware device (such as a Broadcom Ethernet controller) has been installed, or after the existing device driver has been removed, the operating system automatically detects the new hardware and prompts you to install the driver software for that device. When the **Found New Hardware Wizard** starts, click **Cancel**.



NOTE: A network device driver must be installed before the Broadcom Ethernet controller can be used with your Windows operating system. Drivers are located on the installation CD.

To install the driver software

1. Insert the installation CD in the CD-ROM drive.
 2. Open the Drivers folder, which contains the Setup.exe file, and then double-click **Setup.exe**.
 3. Click **Next**, and then click **Yes** to agree to the License Agreement.
-

Updating the Driver Software

To update the driver software

1. Start Windows and log on. You must have network administrator permissions to update the driver software.
2. In **Control Panel**, click **System** to view **System Properties**.
3. Click the **Hardware** tab, and then click **Device Manager**.
4. Right-click the name of the Broadcom 440X 10/100 Controller, and then click **Update Driver**.

5. Follow the on-screen instructions provided by the **Hardware Update Wizard**.
-

Viewing or Changing the Properties of the Controller

To view or change the properties of the Broadcom Ethernet controller

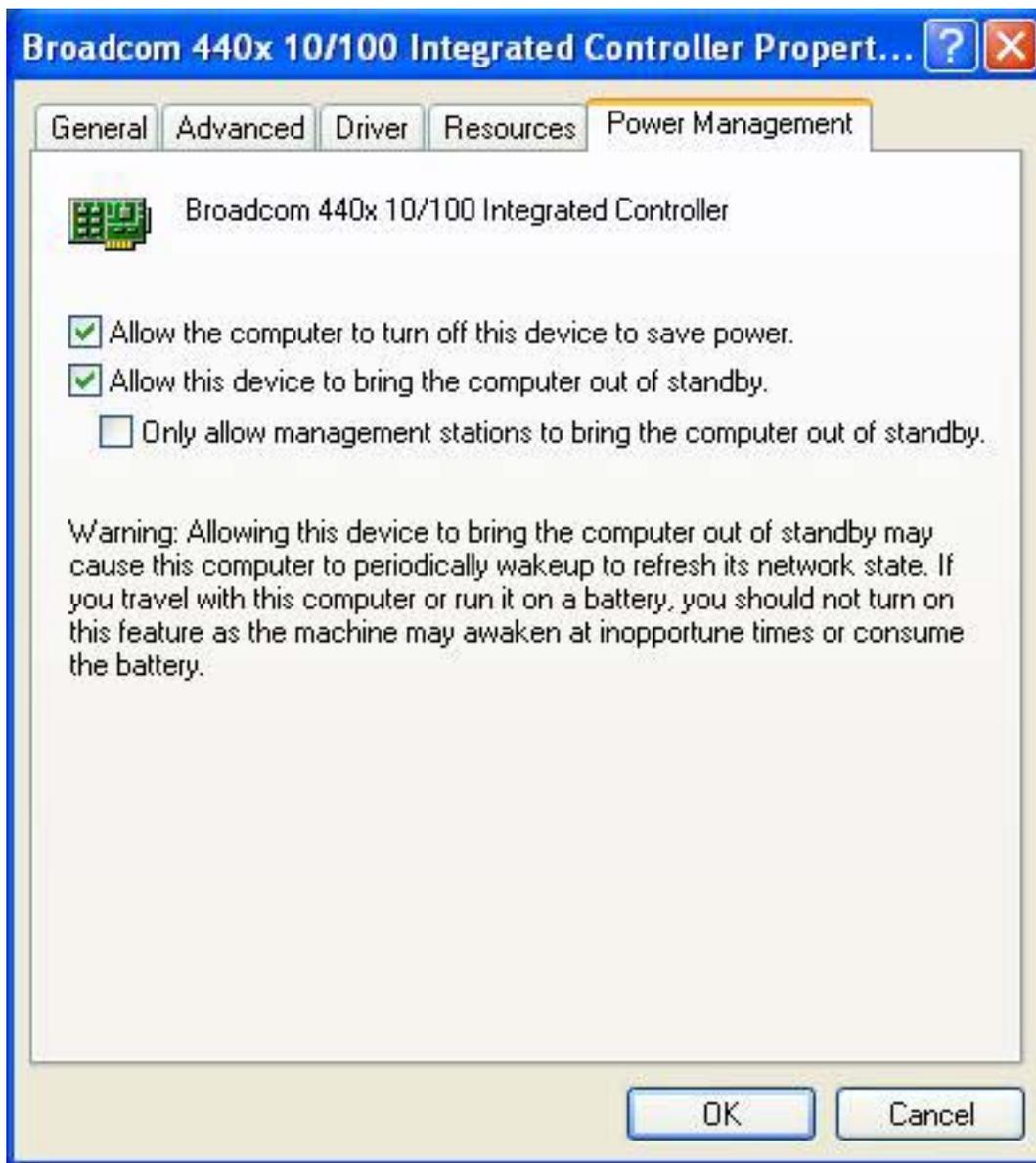
1. In Control Panel, click or double-click **Broadcom Control Suite 2**.
 2. Click the **Advanced** tab.
 3. See [Advanced](#) for a detailed description of the available properties as well as for instructions for viewing and changing the value of a particular property.
-

Removing the Driver Software

1. In Control Panel, double-click **Add or Remove Programs**.
 2. Click **Broadcom 440X 10/100 Integrated Controller**, and then click **Change/Remove**.
 3. Select **Remove**, and then click **Next**.
 4. Click **OK**.
-

Setting Power Management Options

You can set Power Management options to allow the operating system to turn off the controller to save power or to allow the controller to wake up the computer. If the device is busy doing something (servicing a call, for example), however, the operating system will not shut down the device. The operating system attempts to shut down every possible device only when the computer attempts to go into hibernation. To have the controller stay on at all times, do not click the **Allow the computer to turn off the device to save power** check box.



NOTES:

- To enable Wake on LAN (WOL) when the computer is on standby, select the **Allow the device to bring the computer out of standby** check box.
- If you select **Only allow management stations to bring the computer out of standby**, the computer can be brought out of standby *only by Magic Packet*, regardless of the settings in Wake Up Capabilities.

Using Broadcom Advanced Control Suite 2: Broadcom 440X 10/100 Integrated Controller User Guide

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Overview

Broadcom Advanced Control Suite 2 (BACS2) is an integrated utility that provides useful information about the Broadcom 440X 10/100 Integrated Controller network adapter that is installed in your computer. BACS2 also enables you to perform detailed tests and diagnostics on the adapter, as well as to view and modify property settings and view network traffic statistics.

BACS2 contains three panes:

- In the Information/Task pane, users can view available information and perform certain tests and diagnostics on the adapter by clicking a specific tab.



NOTE: The Hardware and Cable Analysis tabs and some of the features and properties that are shown on BACS2 illustrations are not available for the Broadcom 440X 10/100 Integrated Controller. The functions, features, and properties that are available are included in this documentation.

- To the left of the Information/Task pane is the Device Name pane, in which the name of the adapter is listed.
- A third pane contains the Menu bar.

Types of Information Provided by Broadcom Advanced Control Suite 2

Broadcom Advanced Control Suite 2 provides the following information about the Broadcom 440X

10/100 Integrated Controller network adapter:

- Driver Status
- MAC Address
- Link Status
- IP Address
- Memory Address
- Physical Address
- Speed
- Duplex
- Slot No.
- Driver Name
- Driver Version
- Driver Date
- Bus Type
- Bus No.
- Device No.
- Function No.
- Interrupt Request
- Properties

[Vital Sign](#). At-a-glance information on the adapter.

[Resources](#). Shows the resource settings for the adapter.

[Advanced](#). Shows the available properties and their settings for the adapter.

[Statistics](#). Provides detailed performance statistics for the adapter.

Testing and Diagnostics Functions

The following testing and diagnostics functions are provided for the Broadcom 440X 10/100 Integrated Controller network adapter:

[Network Test](#). Confirms network connectivity to a remote station.

[Diagnostics](#). Performs comprehensive diagnostics on the network adapter.

Installing the Broadcom Advanced Control Suite 2 Software

The Broadcom Advanced Control Suite 2 (BACS2) software can be installed from the [Installation CD](#) or by using the [silent install](#) option.



NOTES:

- To prevent an error from occurring, type `change user /install` from the DOS command prompt before installing the BACS2 software on a computer running Windows 2000 Advanced Server with Terminal Services.
- Before you begin the installation, close all applications, windows, or dialog boxes.

Installing from the Installation CD

1. Insert the Installation CD into the CD-ROM drive.
2. Open the BACS folder on the Installation CD that contains the BACS2 Setup.exe file.
3. Double-click **Setup.exe**.
4. Click **Next** in **Broadcom Management Programs Setup**.
5. Read the license agreement, and then click **Yes**.
6. In **Select Features**, click the check box next to the feature(s) you want to install:

Control Suite. Installs Broadcom Advanced Control Suite 2.

CIM Provider. Installs CIM Provider.

7. Click **Next**, and then click **OK** at the end of the installation process.

Using Silent Installation

Before you perform the silent installation, copy the installation files to your hard disk to perform the silent installation from the hard disk, rather than from the CD-ROM drive. Installing from the hard disk is recommended because the **setup /s** command automatically generates a Setup.log file in the directory from which it is run. If you perform a silent installation from the CD-ROM drive, a log file cannot be generated, which causes the silent installation to fail.

To perform a silent installation

1. Copy the BACS folder on the Installation CD to your hard disk. This folder contains the BACS2 Setup.exe file
2. Change to the BACS directory.
3. From a command prompt, type `setup /s`, and then press ENTER.

Updating Broadcom Advanced Control Suite 2



NOTE: Before you begin the update, close all applications, windows, or dialog boxes.

Follow the instructions for [Installing from the Installation CD](#) or [Using Silent Installation](#).

Removing Broadcom Advanced Control Suite 2

1. In Control Panel, click **Add or Remove Programs**.
 2. Click **Broadcom Management Programs** and click **Change/Remove**.
 3. In **InstallShield Wizard**, click **Remove**, and then click **Next**.
 4. Click **OK** to remove the application and all of its features.
 5. Click **OK**.
 6. Restart your computer.
-

Starting Broadcom Advanced Control Suite 2

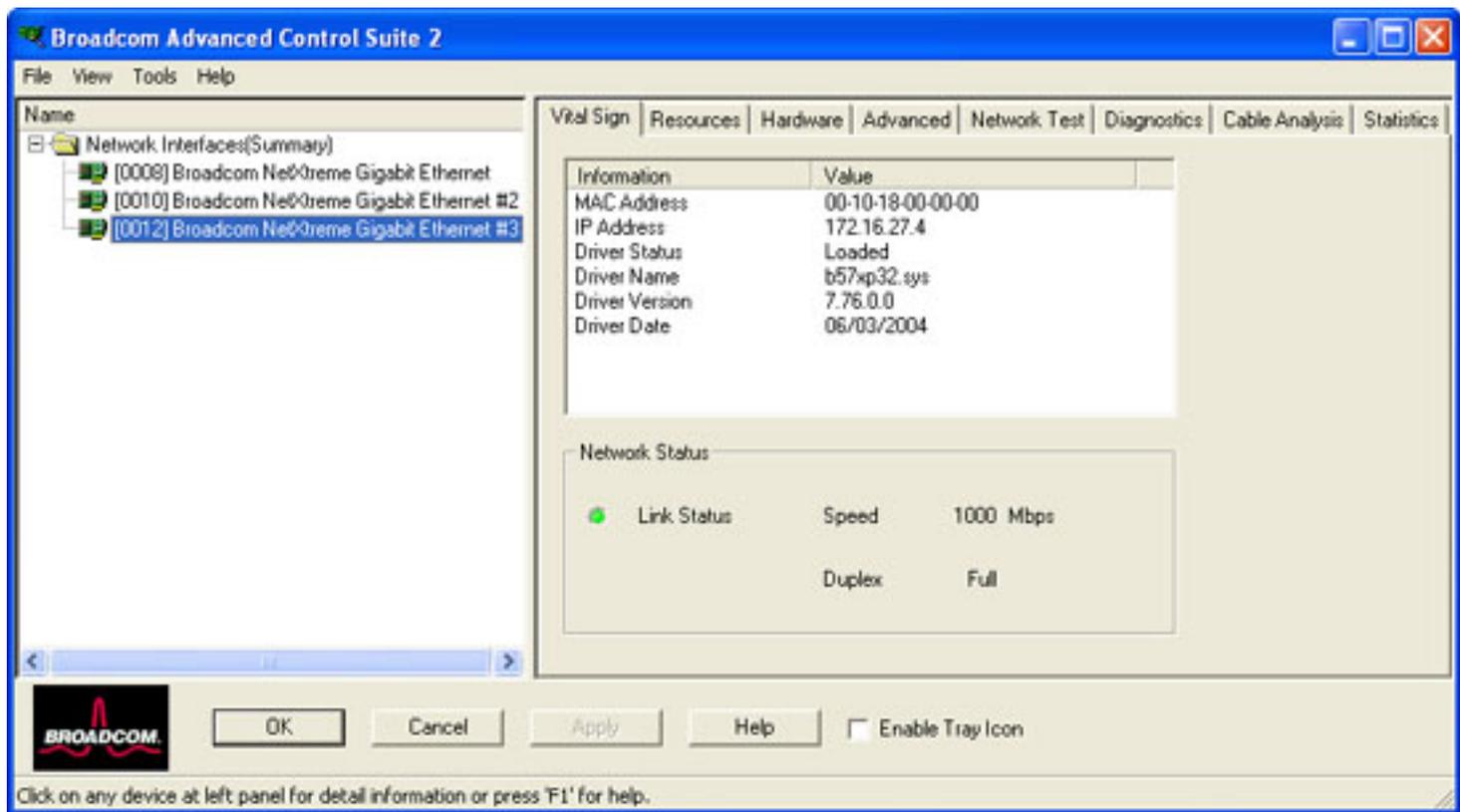
In Control Panel, click (or double-click) **Broadcom Control Suite 2**.

Using Broadcom Advanced Control Suite 2

[Start BACS2](#). Click the tab that provides the information of interest or from which you can perform a desired test or diagnostic or set adapter properties.

Vital Sign

The Vital Sign tab contains information about the Broadcom 440X 10/100 Integrated Controller, the link status of the adapter, and network connectivity. To view this information, click the name of the device listed in the **Device Name** pane.



MAC Address. This is a physical MAC (media access control) address that is assigned to the device by the manufacturer. The physical address is never all 0s.

IP Address: The network address that is associated with the device. If the IP address is all 0s, this means that the associated driver has not been bound with Internet Protocol (IP).

Driver Status. The status of the driver that is associated with the selected device.

Loaded. Normal operating mode. The driver that is associated with the device has been loaded by Windows and is functioning.

Not Loaded. The driver that is associated with the device has not been loaded by Windows.

Information Not Available. The value is not obtainable from the driver that is associated with the device.

Driver Name/Version/Date. The file name, version, and creation date of the software driver that is associated with the device.

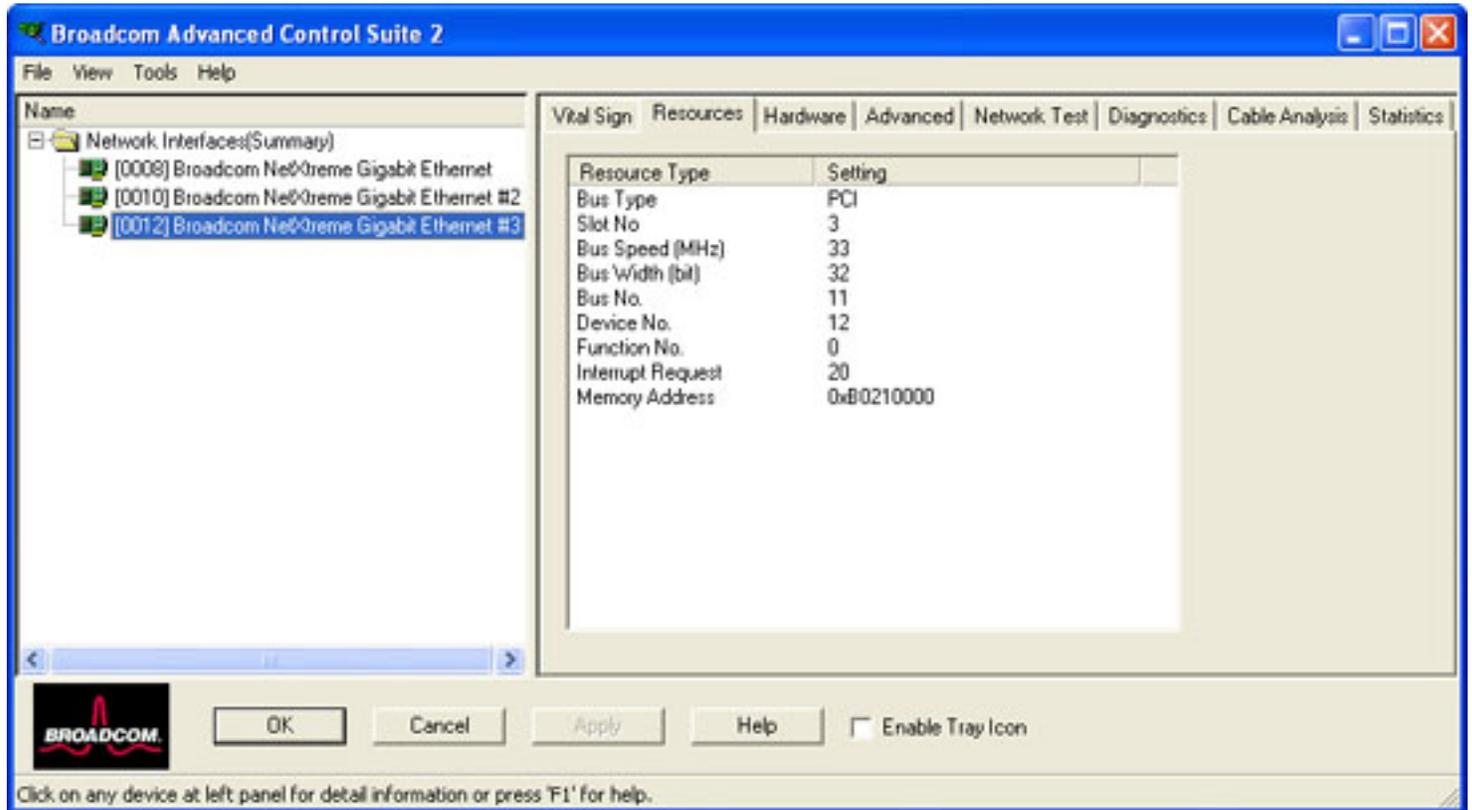
Network Status: The following network status information is provided:

Link Status. The indicator is green if a link is established. A red indicator means that a link is not established.

Speed. The link speed of the device.

Duplex. The duplex mode in which the device is operating.

Resources



Bus Type. The type of input/output (I/O) interconnect used by the controller.

Slot No. The PCI slot number on the system board occupied by the controller. This item is not available for PCI-E type controllers.

Bus Speed (MHz). The bus clock signal frequency used by the controller. This item is not available for PCI-E type controllers.

Bus Width (bit). The number of bits that the bus can transfer at a single time to and from the controller. This item is not available for PCI-E type controllers.

Bus No. Indicates the number of the bus in which the controller is installed.

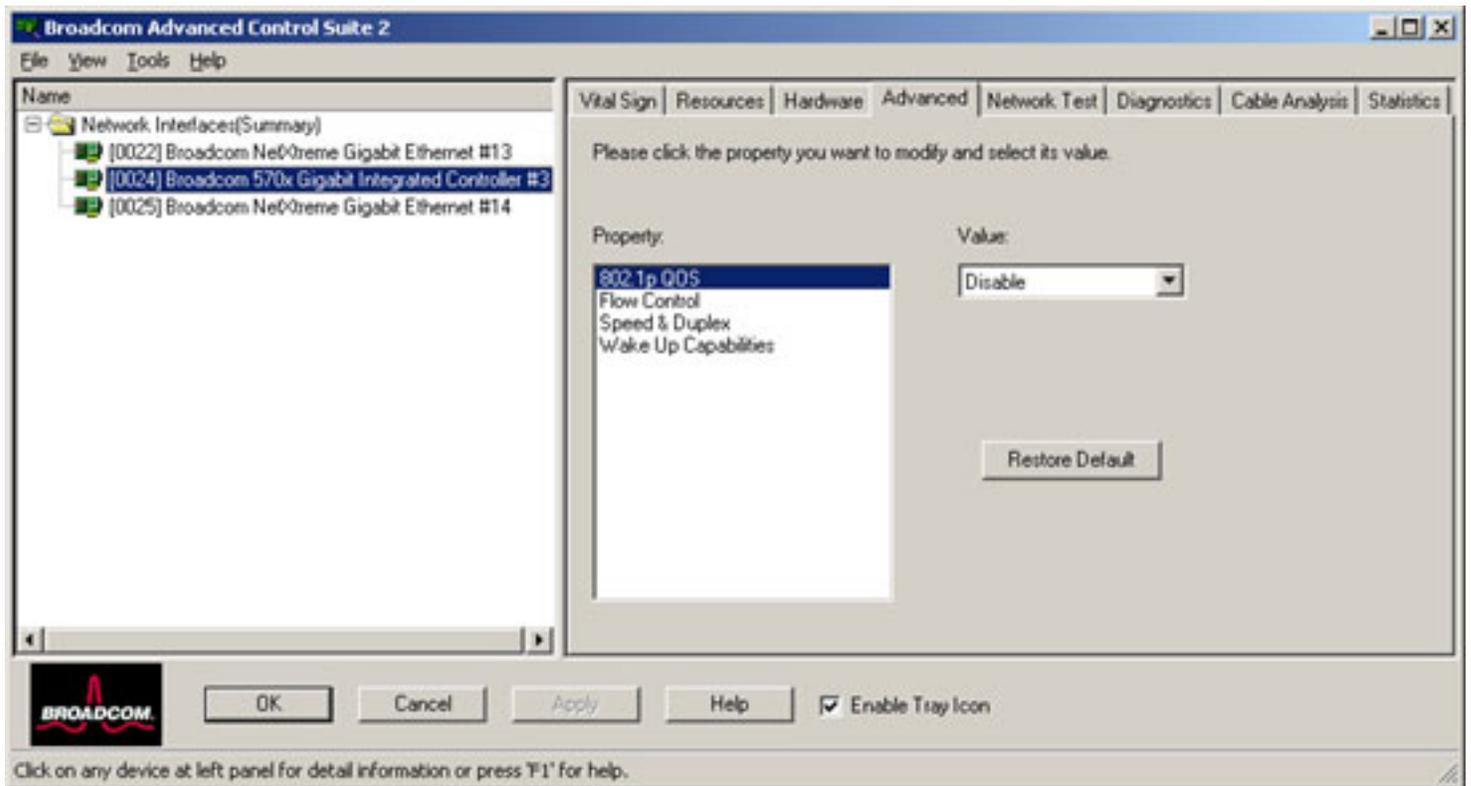
Device No. The number assigned to the device by the operating system.

Function No. The port number of the adapter. For a single-port adapter, the function number is 0. For a two-port adapter, the function number for the first port is 0, and the function number for the second port is 1.

Interrupt Request. The interrupt line number that is associated with the device. Valid numbers range from 2 to 25.

Memory Address. The memory mapped address that is assigned to the device. This value can never be 0.

Advanced



From the Advanced tab, you can view and change the settings of the available properties of the selected device. The potentially available properties and their respective settings are described below. To view the setting of a property, click the name of the property in the **Property** list. The property setting is displayed in the **Value** box. To change the setting, click an item in the **Value** list or type a new value, as appropriate (selection options are different for different properties).

802.1p QoS

The 802.1p QoS property enables *quality of service*, which is an Institute of Electrical and Electronics Engineering (IEEE) specification that treats different types of network traffic differently to ensure required levels of reliability and latency according to the type of traffic. This property is disabled by default. Unless the network infrastructure supports QoS, do not enable QoS. Otherwise, problems may occur.

Flow Control

The Flow Control property enables or disables the receipt or transmission of PAUSE frames. PAUSE frames enable the network controller and a switch to control the transmit rate. The side that is receiving the PAUSE frame momentarily stops transmitting.

Enable (default). PAUSE frame receipt and transmission is enabled.

Disable. PAUSE frame receipt and transmission are disabled.

Speed & Duplex

The Speed & Duplex property sets the connection speed and mode to that of the network. Note that Full-Duplex mode allows the controller to transmit and receive network data simultaneously.

10 Mb Full. Sets the speed at 10 Mbit/s and the mode to Full-Duplex.

10 Mb Half. Sets the speed at 10 Mbit/s and the mode to Half-Duplex.

100 Mb Full. Sets the speed at 100 Mbit/s and the mode to Full-Duplex.

100 Mb Half. Sets the speed at 100 Mbit/s and the mode to Half-Duplex.

Auto (default). Sets the speed and mode for optimum network connection (recommended).



NOTES

- Auto is the recommended setting. This setting allows the network adapter to dynamically detect the line speed of the network. Whenever the network capability changes, the network adapter automatically detects and adjusts to the new line speed and duplex mode.
- 10 Mb Half and 100 Mb Half settings force the network adapter to connect to the network in Half-Duplex mode. Note that the network adapter may not function if the network is not configured to operate at the same mode.
- 10 Mb Full and 100 Mb Full settings force the network adapter to connect to the network in Full-Duplex mode. The network adapter may not function if the network is not configured to operate at the same mode.

Wake Up Capabilities

The Wake Up Capabilities property enables the network adapter to wake up from a low-power mode when it receives a network wake-up frame. Two types of wake-up frames are possible: Magic Frame and Wake Up Frame.

Both (default) . Selects both Magic Frame and Wake Up Frame as the wake-up frame.

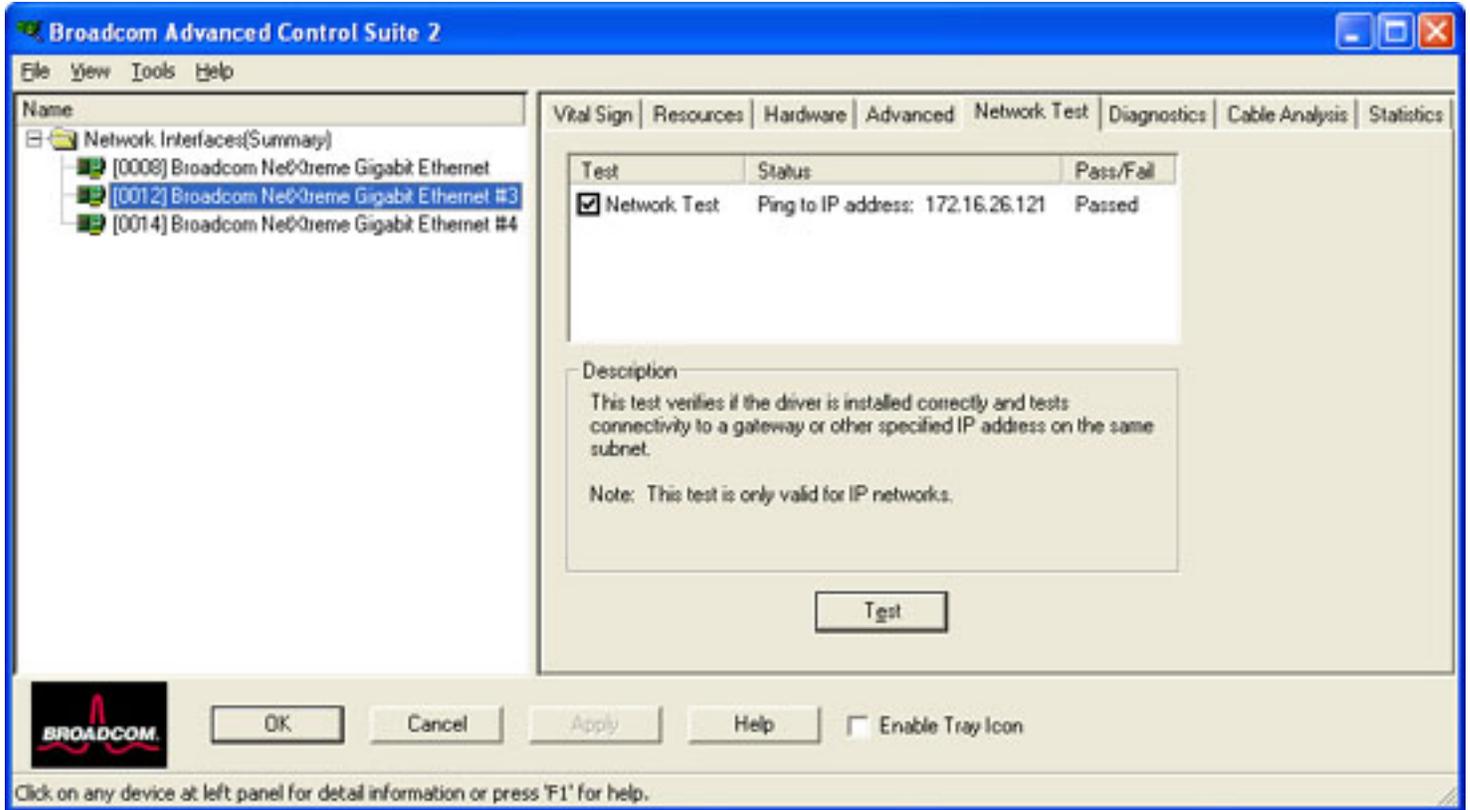
Magic Frame. Selects Magic Frame as the wake-up frame.

None. Selects no wake-up frame.

Wake Up Frame. Selects Wake Up Frame as the wake-up frame and allows the network adapter to wake the system when an event such as a ping or an Address Resolution Protocol (ARP) request is received.

Network Test

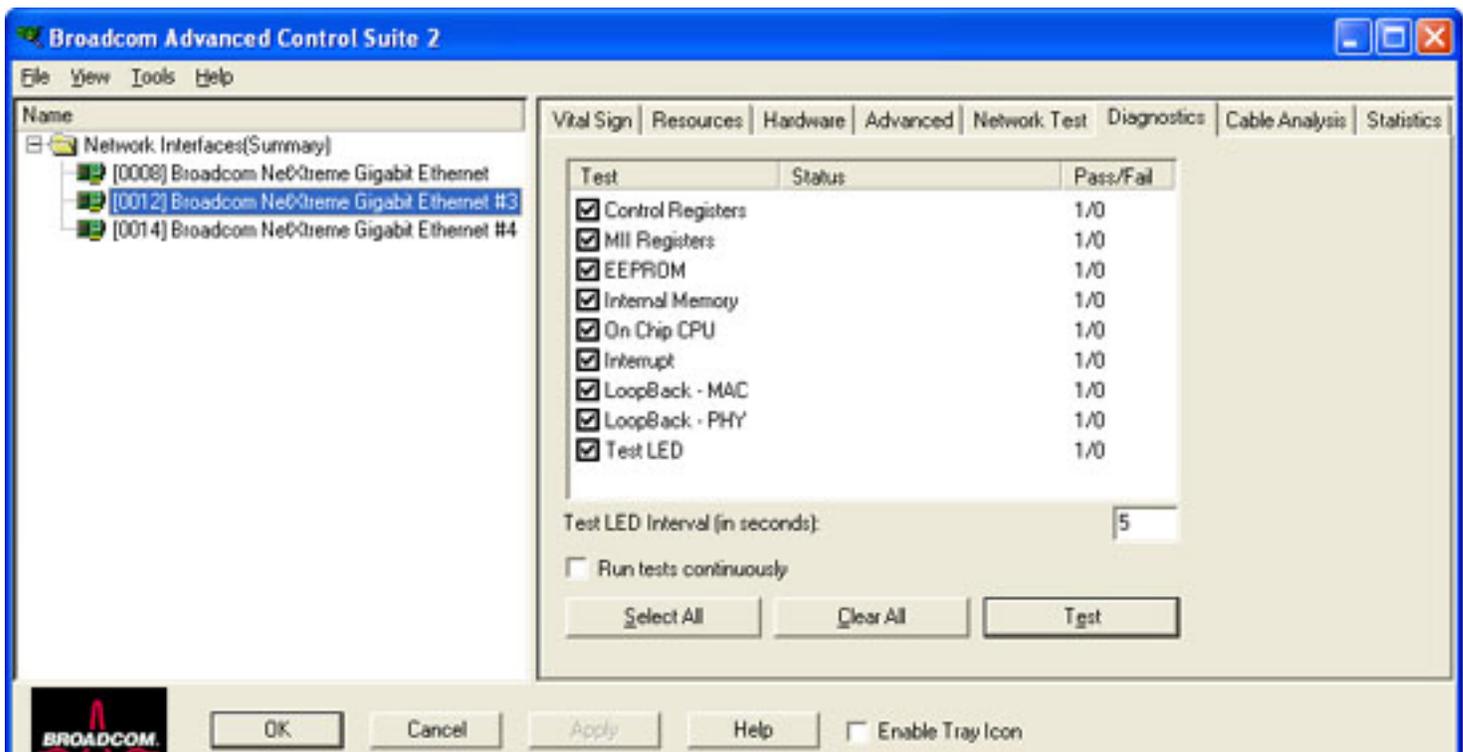
From the Network Test tab, you can verify IP network connectivity. This test verifies if the driver is installed correctly and tests connectivity to a gateway or other specified IP address on the same subnet. The Network test uses TCP/IP. The network test sends ICMP packets to remote systems and waits for a response. If a gateway is configured, the test automatically sends packets to that system. If a gateway is not configured or if the gateway is unreachable, the test prompts you for a destination IP address.



Diagnostics

From the Diagnostics tab you can perform diagnostic tests on the physical components of the Broadcom 440X 10/100 Integrated Controller network adapter. The tests are continuously performed on the selected physical components. The number of passes and fails in the Pass/Fail column increments each time the tests are performed. For example, if a test is performed four times and there are no fails, the value in the Pass/Fail column is 4/0. However, if there were 3 passes and 1 fail, the value in the Pass/Fail column is 3/1.

 NOTE: The network connection is temporarily lost when these tests are running.



Control Registers. This test verifies the read and write capabilities of the network adapter registers by writing various values to the registers and verifying the results. The device driver uses these registers to perform network functions such as sending and receiving information. A test failure indicates that the device may not be working properly.

MII Registers. This test verifies the read and write capabilities of the registers of the physical layer (PHY). The physical layer is used to control the electrical signals on the wire and for configuring network speeds such as 1000 Mbit/s.

EEPROM. This test verifies the content of the electrically erasable programmable read-only memory (EEPROM) by reading a portion of the EEPROM and computing the checksum. The test fails if the computed checksum is different from the checksum stored in the EEPROM. An EEPROM image upgrade does not require a code change for this test.

Internal Memory. This test verifies that the internal memory of the device is functioning properly. The test writes patterned values to the memory and reads back the results. The test fails if an erroneous value is read back. The device cannot function if its internal memory is not functioning properly.

On-Chip CPU. This test verifies the operation of the internal CPUs in the device (not supported for the Broadcom 440X 10/100 Integrated Controller network adapter).

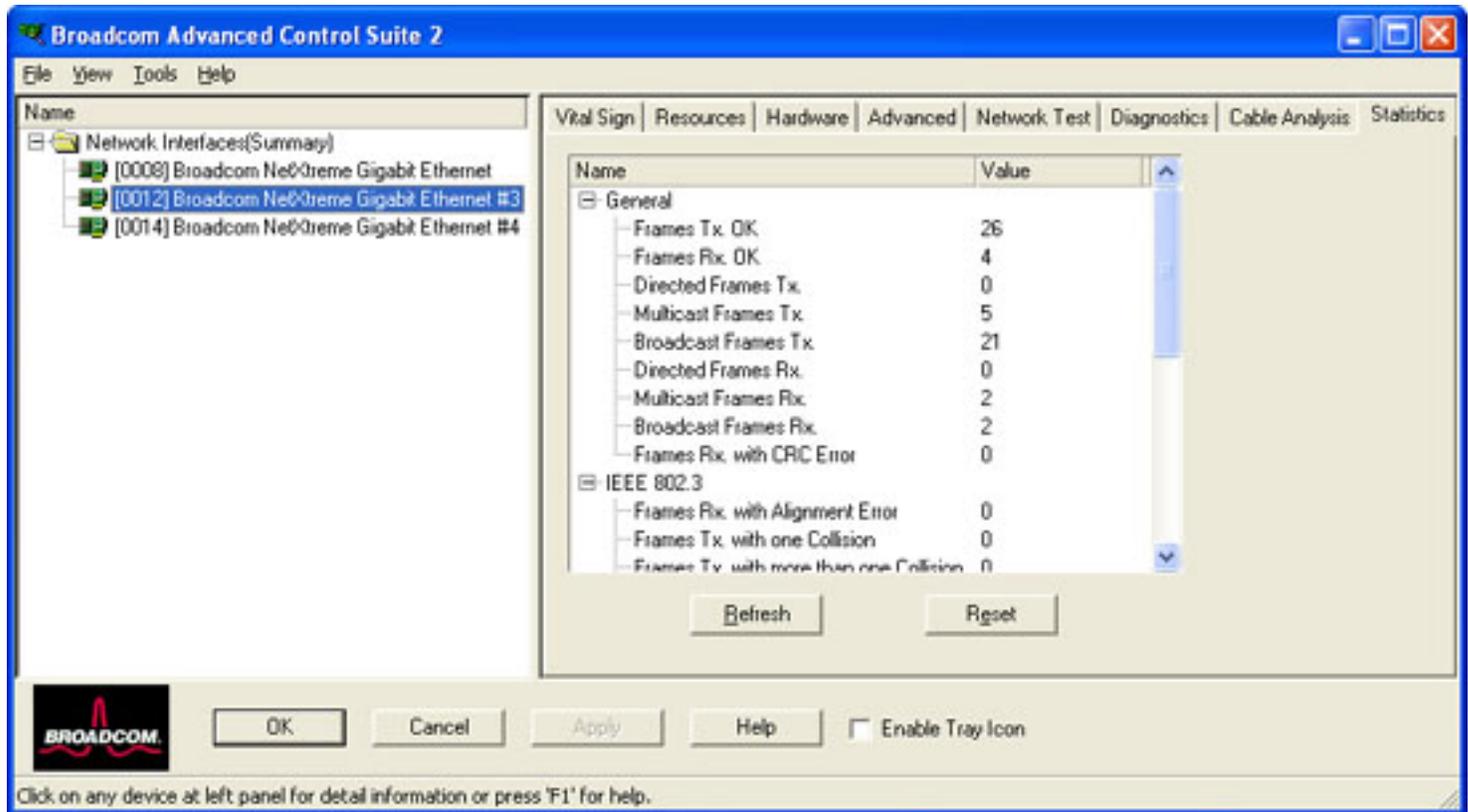
Interrupt. This test verifies that the Network Device Driver Interface Specification (NDIS) driver is able to receive interrupts from the device.

Loopback MAC and Loopback PHY. These tests verify that the NDIS driver is able to send packets to and receive packets from the device.

Test LED. This test causes all of the LEDs to blink 5 times for the purpose of identifying the device.

Statistics

From the Statistics tab, you can view network traffic statistics.



General Statistics

Frames Tx OK. A count of the frames that are successfully transmitted. This counter is incremented when the transmit status is reported as Transmit OK.

Frames Rx OK. A count of the frames that are successfully received. This does not include frames received with frame-too-long, frame check sequence (FCS), length, or alignment errors, or frames lost due to internal MAC sublayer errors. This counter is incremented when the receive status is reported as Receive OK.

Directed Frames Tx. A count of directed data frames that are successfully transmitted.

Multicast Frames Tx. A count of frames that are successfully transmitted (as indicated by the status value Transmit OK) to a group destination address other than a broadcast address.

Broadcast Frames Tx. A count of frames that were successfully transmitted (as indicated by the transmit status Transmit OK) to the broadcast address. Frames transmitted to multicast addresses are not broadcast frames and therefore, are excluded.

Directed Frames Rx. A count of directed data frames that are successfully received.

Multicast Frames Rx. A count of frames that are successfully received and are directed to an active nonbroadcast group address. This does not include frames received with frame-too-long, FCS, length, or alignment errors, or frames lost due to internal MAC sublayer errors. This counter is incremented as indicated by the Receive OK status.

Broadcast Frames Rx. A count of frames that are successfully received and are directed to a broadcast group address. This count does not include frames received with frame-too-long, FCS, length, or alignment errors, or frames lost due to internal MAC sublayer errors. This counter is incremented as indicated by the Receive OK status.

Frames Rx with CRC Error. The number of frames received with CRC errors.

IEEE 802.3 Statistics

Frames Rx with Alignment Error. A count of the frames that are not an integral number of octets in length and do not pass the FCS check. This counter is incremented when the receive status is reported as Alignment Error.

Frames Tx with one Collision. A count of the frames that are involved in a single collision and are subsequently transmitted successfully. This counter is incremented when the result of a transmission is reported as Transmit OK, and the attempt value is 2.

Frames Tx with more than one Collision. A count of the frames that are involved in more than one collision and are subsequently transmitted successfully. This counter is incremented when the transmit status is reported as Transmit OK, and the value of the attempts variable is greater than 2 and less than or equal to the attempt limit.

Frames Tx after Deferral. A count of the frames that were delayed being transmitted on the first attempt because the medium was busy. The frames involved in any collision are not counted.

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Broadcom Boot Agent Driver Software: Broadcom 440X 10/100 Integrated Controller User Guide

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[Server Setup](#)

Overview

The Broadcom 440X 10/100 Integrated Controller supports Preboot eXecution Environment (PXE). PXE is a software module that allows your networked computer to boot with the images provided by remote servers across the network. The Broadcom PXE driver complies with the PXE 2.1 specification and is released with both monolithic and split binary images. This provides flexibility to users on different environments where the motherboard may or may not have built-in base code.

PXE operates in a client/server environment. A network consists of one or more boot servers that provide boot images to multiple computers through the network. Broadcom PXE implementation has been tested successfully in the following environments:

- **Linux® Red Hat® PXE server.** Broadcom PXE clients are able to remote-boot and utilize network resources (NFS mount, and so on) and to do Linux installation. In the case of a remote boot, the Linux universal driver binds seamlessly with the Broadcom UNDI (Universal Network Driver Interface) and provides a network interface in the Linux remote-booted client environment.
 - **Microsoft® Windows 2000.** Using Windows Remote Installation Services (RIS), Broadcom PXE clients are able to perform remote installations from the network.
 - **Intel® APITEST.** The Broadcom PXE driver passes all API compliance test suites.
 - **DOS UNDI.** Universal NDIS seamlessly binds with Broadcom UNDI to provide NDIS2 interface to the upper-layer protocol stack. This allows computers to connect to network resources in a DOS environment.
 - **Microsoft Windows NT® 4.0 Remote Boot Server**
-

Setting up the Client

1. Select and program the proper PXE image.
2. Enable/disable the PXE driver with the Broadcom DOS utility that is provided.
3. Set up the BIOS for the boot order.

Selecting/Programming the Proper PXE Image

PXE is released with three different images:

b44pxe.lom. This is a monolithic image that consists of both PXE base-code (BC) and UNDI code. This image should be used on the adapter where the motherboard does not have a built-in BC. However, an adapter programmed with this image is still operational in the motherboard's BIOS with built-in BC. The BC on the adapter is not used.

b44undi.lom. This is an UNDI image that consists of UNDI code only (split implementation). This module should be programmed on the adapter where the motherboard's BIOS has built-in BC.

basecode.lom. This is a BC image that consists of BC code only (split implementation). This module should be programmed on the motherboard's BIOS.

The PXE image can be programmed to the adapter serial EEPROM or the motherboard BIOS LAN on Motherboard (LOM). For LOM, the PXE image has to be integrated into the OEM BIOS. For the adapter, the PXE image is programmed into the EEPROM during the manufacturing process.

Boot Method

By default, PXE detects if the BIOS supports BBS (BIOS Boot Specification). If the BIOS supports BBS, then PXE uses BBS as the boot method.

PXE Speed

By default, PXE is set to auto-negotiate.

Setup BIOS

To boot from the network with PXE, make PXE the first bootable device under BIOS. This procedure depends on server BIOS implementation. Refer to the server user manual for information.

Setting up the Server

Windows 2000

The current version of Windows 2000 does not include a network driver for the Broadcom 440X 10/100 Integrated Controller. To do remote installation with PXE, include a network driver for the Broadcom 440X 10/100 Integrated Controller as a part of the client installation image on the server. Refer to Microsoft Knowledge Base Article - 246184, "How to Add Third-Party OEM Network Adapters to RIS Installations." See also [Troubleshooting](#) for details.

DOS UNDI/APITEST

To boot in DOS and connect to a network for the DOS environment, download the Intel® PXE PDK from the Intel website. This PXE PDK comes with a TFTP/ProxyDHCP/Boot server. The PXE PDK can be downloaded from Intel by going to <http://www.intel.com/support/network/adapter/pro100/bootagent/30619.htm> and searching on **PXE PDK**.

Red Hat Linux

Red Hat® Linux® 8.0 (or later) distribution has PXE server support. It allows users to do a complete Linux installation over the network. Similarly, Red Hat 8.0 is also distributed with boot images—boot kernel (vmlinux) and initial ram disk (initrd). These images are on the Red Hat CD disk#1:

```
/images/pxeboot/vmlinux
```

```
/images/pxeboot/initrd.img
```

The initrd.img file distributed with Red Hat 8.0 does not have a Linux network driver for the Broadcom 440X 10/100 Integrated Controller. This version requires a driver disk for drivers that are not part of the standard distribution. You can create a driver disk for the Broadcom 440X 10/100 Integrated Controller from the image distributed with the Installation CD. Refer to Red Hat documentation for how to install PXE server on Linux.

In this version, it prompts you to insert a driver disk for drivers that are not part of the standard distribution. You can create a driver disk for the Broadcom 440X 10/100 Integrated Controller from the Red Hat CD-ROM or from the support website. Refer to the Linux Readme.txt file for more information.

A remote boot does not require a standard Linux network driver for the Broadcom 440X 10/100 Integrated Controller. After the PXE client downloads the Linux kernel and initial ram disk, the Linux universal driver that came with the Linux distribution binds with the UNDI code of the PXE to form a Linux network driver.

Windows NT® 4.0 Remoteboot Server

For instructions on setting up the Windows NT 4.0 Remoteboot Server, refer to [Remoteboot](#) (Chapter 15) from the Microsoft TechNet website.

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NDIS2 Driver Software: Broadcom 440X 10/100 Integrated Controller User Guide

[Preinstallation Requirements](#)

[Installing the NDIS2 Driver Software for Use on MS-DOS Platforms](#)

Preinstallation Requirements

Networking software that is appropriate to the operating system (such as Microsoft LAN Manager 2.2 for MS-DOS) must already be running on your computer.

Installing the NDIS2 Driver Software for Use on MS-DOS Platforms

The NDIS2 driver software can be run from an MS-DOS startup disk using Microsoft Network Client 3.0 or from the hard disk using Microsoft LAN Manager 2.2.

Creating a Startup Disk to Run Microsoft Network Client

To perform this installation you must have the following items:

- Windows NT Server 4.0 CD-ROM
- A blank MS-DOS system disk (3.5" high-density floppy disk)
- Access to the Broadcom NDIS2 driver file (B44.dos). This file is located on the Installation CD.



NOTES:

- **Windows NT Server 4.0 users.** When running **Setup for Microsoft Network Client v3.0 for MS-DOS**, click any network card from the list (**NE2000 Compatible**, for example) to create the startup disk.
- After creating the startup disk, follow the instructions in [Modifying the Startup Disk](#).

To create a startup disk

1. Create a folder called NCADMIN in the root of the C drive.
2. Copy the NCADMIN.CN_, NCADMIN.EX_, and NCADMIN.HL_ files from the I386 folder on the Windows NT Server 4.0 CD-ROM.
3. Open a command prompt window and change the directory to C:\NCADMIN.
4. Type `expand -r ncadmin.*` and press ENTER.
5. Close the command prompt window by typing `exit` and then pressing ENTER.
6. Start Windows Explorer.
7. Open the NCADMIN folder and double-click **ncadmin.exe**.
8. Follow the on-screen instructions to make the network startup disk (choose **NE2000 Compatible** from the list of adapters).

Modifying the Startup Disk

To modify the startup disk

1. Edit A:\Net\Protocol.ini with Notepad or a similar text editor.
 - A. Change `DriverName=$` to `DriverName=B44$`.
 - B. Remove all other parameter entries under the `[MS$NE2CLONE]` or equivalent section such as `IOBASE=0x300` or `INTERRUPT=3`, and so on.

Example Protocol.ini file for IP

```
[network.setup]
```

```
version=0x3110  
netcard=ms$ne2clone,1,MS$NE2CLONE,1  
transport=tcpip,TCPIP  
lana0=ms$ne2clone,1,tcpip
```

```
[MS$NE2CLONE]
```

```
DriverName=B44$
```

```
[protman]
```

```
DriverName=PROTMAN$  
PRIORITY=MS$NDISHLP
```

```
[tcpip]
```

```
NBSessions=6  
DefaultGateway=0  
SubNetMask=255 0 0 0  
IPAddress=192 168 0 1  
DisableDHCP=0  
DriverName=TCPIP$
```

BINDINGS=MS\$NE2CLONE

LANABASE=0

Example Protocol.ini file for IPX

[network.setup]

version=0x3110
netcard=ms\$ne2clone,1,MS\$NE2CLONE,1
transport=ms\$ndishlp,MS\$NDISHLP
transport=ms\$nwlink,MS\$NWLINK
lana0=ms\$ne2clone,1,ms\$nwlink
lana1=ms\$ne2clone,1,ms\$ndishlp

[MS\$NE2CLONE]

DriverName=B44\$

[protman]

DriverName=PROTMAN\$
PRIORITY=MS\$NDISHLP

[MS\$NDISHLP]

DriverName=ndishlp\$
BINDINGS=ms\$ne2clone

[ms\$nwlink]

DriverName=nwlink\$
FRAME=Ethernet_802.2
BINDINGS=MS\$NE2CLONE
LANABASE=0

Example Protocol.ini file for NetBEUI

[network.setup]

version=0x3110
netcard=ms\$ne2clone,1,MS\$NE2CLONE,1
transport=ms\$ndishlp,MS\$NDISHLP
transport=ms\$netbeui,MS\$NETBEUI
lana0=ms\$ne2clone,1,ms\$ndishlp
lana1=ms\$ne2clone,1,ms\$netbeui

```
[MS$NE2CLONE]
```

```
DriverName=B44$
```

```
[protman]
```

```
DriverName=PROTMAN$  
PRIORITY=MS$NDISHLP
```

```
[MS$NDISHLP]
```

```
DriverName=ndishlp$
```

```
BINDINGS=MS$NE2CLONE
```

```
[MS$NETBEUI]
```

```
DriverName=netbeui$  
SESSIONS=10  
NCBS=12  
BINDINGS=MS$NE2CLONE  
LANAB
```

2. Edit A:\Net\System.ini.

A. Change netcard= to netcard=B44.dos.

B. Check for references to C:\NET and change C:\NET to A:\NET if necessary.

Example System.ini file

```
[network]
```

```
sizworkbuf=1498  
filesharing=no  
printsharing=no  
autologon=yes  
computername=MYPC  
lanroot=A:\NET  
username=USER1  
workgroup=WORKGROUP  
reconnect=yes  
dospophotkey=N  
lmlogon=0  
logondomain=  
preferredredir=basic  
autostart=basic  
maxconnections=8
```

```
[network drivers]
```

```
netcard=B44.dos
transport=ndishlp.sys,*netbeui
devdir=A:\NET
LoadRMDrivers=yes
```

3. Copy **B44.dos** to **A:\Net**.
4. Create the appropriate Autoexec.bat file in drive A for the chosen protocol as shown below.

For TCP/IP

```
path=a:\net
a:\net\net initialize
a:\net\netbind.com
a:\net\umb.com
a:\net\tcptsr.exe
a:\net\tinyrfc.exe
a:\net\nmtsr.exe
a:\net\emsbfr.exe
a:\net\net start basic
net use z: \\SERVERNAME\SHARENAME
```

For IPX

```
SET PATH=A:\NET
A:\NET\net initialize
A:\NET\nwlink
A:\NET\NET START BASIC
net use z: \\SERVERNAME\SHARENAME
```

For NetBEUI

```
SET PATH=A:\NET
A:\NET\NET START BASIC
net use z: \\SERVERNAME\SHARENAME
```

5. Create a Config.sys file on the startup disk in drive A as shown below.

```
files=30
device=a:\net\ifshlp.sys
lastdrive=z
```

Installing the DOS NDIS2 Driver Software on the Hard Disk

To install the DOS NDIS2 Driver Software on the hard disk

1. Verify that the system has Microsoft LAN Manager 2.2 installed, with a protocol such as NetBEUI configured.

2. Create a folder on your hard disk to store the NDIS 2.01 driver.

Example: C:\LANMAN

3. Copy the B44.dos file to this folder.
4. Edit the Config.sys file by adding the following lines:

```
DEVICE = C:\LANMAN\PROTMAN.DOS
DEVICE = C:\LANMAN\B44.DOS
DEVICE = C:\LANMAN\NETBEUI.DOS
```

5. Edit the Autoexec.bat file by adding the following lines:

```
C:\LANMAN\NETBIND.EXE
C:\LANMAN\NET START WORKSTATION
C:\LANMAN\NET USE drive letter:\server name\resource name
```

6. Edit the Protocol.ini file (located in C:\LANMAN) to configure the driver to bind with NetBEUI or any other protocols.

Example

```
[PROTOCOL MANAGER]
```

```
DriverName = PROTMAN$
```

```
[NETBEUI_XIF]
```

```
DriverName = netbeui$
```

```
BINDINGS = B44
```

```
[B44]
```

```
DriverName = "B44$"
```

7. Restart the computer to complete the installation.



Note: The driver loads during system configuration and displays the Broadcom banner, controller name, MAC address, IRQ number, detected line speed, and the controller BusNum and DevNum. If the driver fails to load, an *initialization fail* message is displayed.

DOS ODI Driver Software: Broadcom 440X 10/100 Integrated Controller User Guide

[Installing the Driver Software](#)

[Configuring Parameters for the B44.com Driver](#)

The Open Data-Link Interface (ODI) driver software allows LAN drivers to work together irrespective of differences between the hardware and/or the protocol stacks of communicating computers. An intervening layer, called the link support layer (LSL), is responsible for routing different packet types between LAN drivers and protocol stacks.

Installing the Driver Software

Installing the DOS/ODI driver software involves the following steps:

1. Verifying that the DOS 6.22 operating system files are installed on your computer hard disk or are available on a removable storage device.
2. Installing the DOS/ODI driver software in the DOS environment.
3. If necessary, reconfiguring the driver software after installation.

Preinstallation Requirements

1. Verify that the Broadcom Ethernet controller driver software has been installed on your computer and install it if it has not (see [Installing the Driver Software](#)). Otherwise, you cannot use a Broadcom Ethernet controller in the DOS environment.
2. Install the DOS 6.22 files on your computer hard disk or have them available on a removable storage device.

Installing the DOS ODI Driver on DOS 6.22

1. Copy the DOS ODI driver file to the root directory of the hard disk.
2. Copy Lsl.com, Ipxodi.com, and Vlm.com to the same directory (these files are provided by Novell).
3. Edit the Autoexec.bat file by adding the following lines:

```
C:\LSL  
C:\B44  
C:\IPXODI
```

C:\VLM

4. Edit the Net.cfg file and place the file in the same location as the Autoexec.bat file (located in drive C) to configure the driver to bind with different frame types.

Example

```
LINK DRIVER B44
FRAME ETHERNET_802.2
FRAME ETHERNET_802.3
FRAME ETHERNET_II
FRAME ETHERNET_SNAP

NetWare DOS Requester
FIRST NETWORK DRIVE=F
NETWARE PROTOCOL=NDS BIND

PROTOCOL IPXODI
```

5. Restart the computer to complete the installation. As the files are being loaded, the computer attempts to attach to a Netware server using the frame types specified in Net.cfg. If the connection is successful, a dialog box is displayed.
6. Change to drive F and log on to the Netware server.



NOTE: The driver loads during system configuration, and the Broadcom banner, the controller name, the MAC address, the IRQ number, the detected line speed, and the BUSNUM and DEVNUM of the controller are displayed. If the driver fails to load, an *initialization fail* message is displayed.

Configuring Parameters for the B44.com Driver (in the Net.cfg file)

The following are optional custom keywords used in the Net.cfg file:

BUSNUM
DEVNUM

The keywords **BUSNUM** and **DEVNUM** are used concurrently and have been included for manufacturing purposes. Do not use them unless you are familiar with PCI device configuration. These two keywords are needed if multiple Broadcom 440X 10/100 Integrated Controllers are installed on a computer, and each controller must be loaded in a specific order.

BUSNUM specifies the PCI bus number and **DEVNUM** specifies the device number that is assigned to the board when it is configured by the PCI BIOS.

The values for these adapter parameters are displayed in hexadecimal notation when the driver loads (the Net.cfg file expects hexadecimal values). A PCI device scan utility can also be used to find this

information. If the driver loads on a single controller, the displayed values can be used in the Net.cfg file.

If a PCI scan utility displays card 1 at bus 4 and device 11 (hexadecimal), and card 3 at bus 3 and device 13 (hexadecimal), the following load instructions are written to the Net.cfg file (load card 3 first, and optionally load card 1 second):

```
LINK DRIVER B44
BUSNUM 3
DEVNUM 13 (13 hex = 19 decimal)
LINK DRIVER B44
BUSNUM 4
DEVNUM 11 (11 hex = 17 decimal)
```

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DOS Diagnostics: Broadcom 440X 10/100 Integrated Controller User Guide

[Introduction](#)

[Prerequisites](#)

[Diagnostic Test Descriptions](#)

Introduction

B44UDIAG is a DOS based program that runs a series of diagnostic tests on the Broadcom 440X 10/100 Integrated Controller. If any test fails, the B44UDIAG program displays an error and exits to DOS.

The following options are available:

Option	Operation
-l <i>file</i>	Logs the data to a file.
-c <i>num</i>	Specifies the card to be tested.
-I <i>num</i>	Iteration number.
-t <i>id</i>	Disables tests.
-T <i>id</i>	Enables tests.
-r <i>num</i>	Input radix.
-lbm <i>number of packets</i>	Option to specify the number of packets in the MAC loopback test.
-lbp <i>number of packets</i>	Option to specify the number of packets in the PHY loopback test.
-lbh <i>number of packets</i>	Option to specify the number of packets in the 100BASE-T external loopback test.
-lbt <i>number of packets</i>	Option to specify the number of packets in the 10BASE-T external loopback test.
-elog <i>file</i>	Produces a log file with only error information.
-com <i>value</i>	Enables com port (Value 1..4) (internal use only).
-ppxe	Programs PXE from file.

- x Searches devices based on vendor ID only.
- info Option to display Dev ID, Ven ID, Sven ID, SSystem ID.
- mc Force to accept full length MAC address.

To run B44UDIAG

Create a MS-DOS 6.22 bootable floppy disk containing the B44UDIAG.EXE file. Next, start the computer with the boot disk in the floppy disk drive. At the MS-DOS prompt, type `b44udiag -options`, as shown in the following example.

Example

```
A:\ b44udiag -l test.log -c 1 -I 2 -t A3 -lbn 3000 -lbp 3000 -lbh 3000 -lbt 3000
```

Prerequisites

Operating System: MS-DOS 6.22

Software: B44UDIAG.EXE

Diagnostic Test Descriptions

The diagnostic tests are divided into 3 groups: Register Tests, Miscellaneous Tests, and Data Tests. They are designated Group A, Group B, and Group C, respectively.

Name	Function
Group A: Register Tests	
A1. Indirect Control Register Test	By using an indirect addressing method, the test writes 0s and 1s to the test bits to ensure that the read-only bits are not changed and that the read/write bits are changed.
A2. Control Register Test	The test writes 0s and 1s to the test bits to ensure that the read-only bits are not changed and that the read/write bits are changed.

- A3. Interrupt Test
Verifies the interrupt functionality by enabling interrupt and waiting for interrupts to occur. It waits for 500 ms and reports an error if it cannot generate interrupts.
- A4. Built-In Self-Test
Runs the built-in self-test.
- A5. CAM Test
This test runs the content addressable memory (CAM) read/write test. There are 48-bit patterns written to 64 entries of CAM space. The test reads back the 64 entries and checks them against 6 patterns such as FFFF, 0000, 5555, AAAA, 55AA, AA55.

Group B: Miscellaneous Tests

- B1. LED Test
This test forces the link state for each link speed/duplex.
- B2. EEPROM Test
This test reads the serial EEPROM and verifies its integrity by performing a cyclic redundancy check (CRC).
- B3. MII Test
The test writes 0s and 1s to the test bits to ensure that the read-only bits value are not changed and that the read/write bits are changed.
- B4. Link Status Test
This test reports the current link status.

Group C: Data Tests

- C1. MAC Loopback Test
This test transmits a 128-byte packet with the incrementing data pattern and checks the TX and RX flags and data integrity.
- C2. PHY Loopback Test
This test is the same as the MAC Loopback Test, except that the data is routed back through a physical layer device.
- C5. PHY Loopback with CAM Enabled Test
This test is the same as the PHY Loopback Test with CAM matching enabled.
- C8. MIB MAC Loopback Test
This test tests each bit in the MIB counters and ensures that the MIB counter bits are incremented when MAC looping a packet.

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Troubleshooting: Broadcom 440X 10/100 Integrated Controller User Guide

[Hardware Diagnostics](#)

[Checking Port LEDs](#)

[Troubleshooting Checklist](#)

[Checking if Current Drivers are Loaded](#)

[Testing Network Connectivity](#)

[Software Problems and Solutions](#)

 NOTE: For further information, go to [Broadcom Support](#).

Hardware Diagnostics

Loopback diagnostic tests are available for testing the adapter hardware. These tests provide access to the adapter internal/external diagnostics, where packet information is transmitted across the physical link (for DOS, see [DOS Diagnostics](#); for Windows see [Diagnostics](#)).

Checking Port LEDs

See [Network Link and Activity Indication](#) to check the state of the network link and activity.

Troubleshooting Checklist

The following checklist provides recommended actions to take to resolve problems that you may encounter when using the Broadcom 440X 10/100 Integrated Controller.

LAN on Motherboard

1. Inspect all cables and connections. Verify that the cable connections at the network adapter and the switch are attached properly. Verify that the cable length does not exceed the specified maximum (100 meters) and that the cable is the proper type (Category 3, 4, or 5 UTP for 10BASE-T operation, and Category 5 UTP for 100BASE-T operation).
2. Check the properties settings and change them if they are in conflict with another device.
3. Verify that your computer is using the latest BIOS.

Network PCI Card

1. Remove any metallic object or jewelry from your hands and wrists.
2. Ensure to use only insulated or nonconducting tools.
3. Verify that the system is powered OFF and unplugged before accessing internal components.
4. Installation or removal of adapters must be performed in a static-free environment. The use of a properly grounded wrist strap or other personal antistatic devices and an antistatic mat is strongly recommended.
5. Ensure the card is properly seated in a PCI card slot. Check for specific hardware problems, such as obvious damage to board components or the PCI edge connector.
6. Try inserting the adapter in another slot. If the new position works, the original slot in your system may be defective.
7. Replace the failed adapter with one that is known to work properly. If the second adapter works in the slot where the first one failed, the original adapter is probably defective.
8. Install the adapter in another functioning system and run the tests again. If the adapter passed the tests in the new system, the original system may be defective.
9. Remove all other adapters from the system and run the tests again. If the adapter passes the tests, the other adapters may be causing contention.

Checking if Current Drivers are Loaded

Go to [Broadcom Advanced Control Suite 2](#) to view vital adapter information, network status, and network connectivity.

Testing Network Connectivity

Use the **ping** command to determine if the network connection is working.



NOTE: Network connectivity can also be tested using the [Network Test](#) feature in Broadcom Advanced Control Suite 2.

1. Click **Start**, and then click **Run**.
2. Type `cmd` in the **Open** box, and then click **OK**.
3. Type `ipconfig /all` to view the network connection to be tested.

4. Type `ping IP address`, and then press ENTER.

The ping statistics that are displayed indicate whether the network connection is working or not.

Software Problems and Solutions

Microsoft Remote Installation Service(RIS) Instructions for Windows RIS Servers

Problem: Microsoft Remote Installation Service (RIS) installation fails for Windows 2000 and Windows XP.

Solution: Refer to the Microsoft Knowledge Base Article, "How to Add Third-Party OEM Network Adapters to RIS Installations."

To deploy a Windows 2000 Image

1. Verify that Windows Service Pack 3 or later has been installed on the Windows 2000 RIS server.
2. Follow the steps described in the Microsoft Knowledge Base Article - 246184 at <http://support.microsoft.com/default.aspx?scid=kb%3ben-us%3b246184>.
3. If Service Pack 3 or later has not been installed on the Windows 2000 RIS server, modify the b44win.inf file as described below. In the .inf file that is to be placed in the RemoteInstall\Setup\Language\Images\Dir_Name\i386 folder, remove **NTx86.5.1** in the [Manufacturer] section (see the following example).

Original	Revised
[Manufacturer] %V_BCM% = Broadcom, NTx86.5.1	[Manufacturer] %V_BCM% = Broadcom

4. Follow the steps in the Microsoft Knowledge Base Article - 246184 at <http://support.microsoft.com/default.aspx?scid=kb%3ben-us%3b246184>, skipping step 1, as this has been done above.

To deploy a Windows XP Image

1. Follow the steps described in Microsoft Knowledge Base Article - 315279 at <http://support.microsoft.com/default.aspx?scid=kb%3ben-us%3b315279>.
2. Modify the b44win.inf file as described below. In the .inf file that is to be placed in the RemoteInstall\Setup\Language\Images\Dir_Name\i386 folder:
 - a. Remove the [Broadcom] section (see the following example).

```

;-----Win2K and Win9x Device List-----
[Broadcom]
; very generic Broadcom 4401 A1 NIC or LOM
%BCM4401.DeviceDesc% = BCM4401, PCI\VEN_14E4&DEV_4401
.
.
; MSI LOM
%BCM4401_msi_two.DeviceDesc% = BCM4401_msi_two, PCI
\VEN_14E4&DEV_4401&SUBSYS_590C1462
;-----end of Win2k and Win9x Device List-----

```

- b. Remove **NTx86.5.1** in two locations (see the following example).

Original	Revised
[Manufacturer] %V_BCM% = Broadcom, NTx86.5.1	[Manufacturer] %V_BCM% = Broadcom
[Broadcom.NTx86.5.1]	[Broadcom]

3. Follow the steps in the Microsoft Knowledge Base Article - 315279 at <http://support.microsoft.com/default.aspx?scid=kb%3ben-us%3b315279>, skipping step 1, as shown above.

Broadcom Boot Agent

Problem: Unable to obtain network settings through DHCP using PXE.

Solution: For proper operation make sure that the STP (spanning tree protocol) is disabled or that portfast mode (for Cisco) is enabled on the port to which the PXE client is connected. For instance, set spantree portfast 4/12 enable.

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Specifications: Broadcom 440X 10/100 Integrated Controller User Guide

[10/100BASE-T Cable Specifications](#)

[Performance Specifications](#)

[Power Requirements](#)

[Environmental Specifications](#)

10/100BASE-T Cable Specifications

Port Type	Connector	Media	Maximum Distance
10BASE-T	RJ-45	Category 3, 4, or 5 UTP	100m (328 feet)
100BASE-T	RJ-45	Category 5 UTP	100m (328 feet)

Performance Specifications

The following table lists specifications for the single-port BCM4401 device.

Feature	Specification
PCI clock	33 MHz maximum
PCI Data/Address	32-bit
PCI data burst transfer rate	132 Mbps (32-bit bus)
PCI modes	Master/slave
10/100BASE-T	10/100 Mbps (full-duplex)

Power Requirements

Specification	Measurement
Operating voltage	+3.3V ± 10%
Power consumption	500 mW max 150 mA @ +3.3VDC

Environmental Specifications

Condition	Operating Specification	Nonoperating Specification
Temperature	0°C to 55°C (+32°F to +131°F)	-40°C to +85°C (-40°F to +185°F)
Relative humidity	5% to 85% (non-condensing) 40°C, 16 hour dwells at extremes	5% to 95% (non-condensing) 10°C/hour
Altitude	Up to 10,000 feet	Up to 35,000 feet
Shock	10g, 1/2 sine wave, 11 ms	60g, 1/2 sine wave, 11 ms
Vibration, peak-to-peak displacement	0.005 inches maximum (5 Hz to 32 Hz)	0.1 inch maximum (5 Hz to 17 Hz)
Vibration, peak acceleration	0.25g (5 Hz to 500 Hz) (Sweep Rate = 1 octave/minimum)	0.25g (5 Hz to 500 Hz) (Sweep Rate = 1 octave/minimum)

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Regulatory Information: Broadcom 440X 10/100 Integrated Controller User Guide

[FCC Class B Notice](#)

[VCCI Class B Notice](#)

[CE Notice](#)

[Canadian Regulatory Information \(Canada Only\)](#)

FCC Class B Notice

The equipment complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: 1) The device may not cause harmful interference, and 2) This equipment must accept any interference received, including interference that may cause undesired operation.

The 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. The 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 the 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 the 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 assistance.

Do not make mechanical or electrical modifications to the equipment.



NOTE : If the device is changed or modified without the permission of Broadcom, the user may void his or her authority to operate the equipment.

VCCI Class B Notice

The equipment is a Class B product based on the standard of the Voluntary Control Council for

Interference from Information Technology Equipment (VCCI). If used near a radio or television receiver in a domestic environment, it may cause radio interference. Install and use the equipment according to the instruction manual.



CAUTION: The potential exists for this equipment to become impaired in the presence of conducted radio frequency energy between the frequency range of 59–66 MHz. Normal operation will return upon removal of the RF energy source.

CE Notice



The CE mark on this equipment indicates that this equipment meets or exceeds the following technical standards: EN55022:1998, EN55024:1998, and EN60950:1992.

Canadian Regulatory Information (Canada Only)

This digital apparatus does not exceed the Class B limits for radio noise emissions from digital apparatus set out in the Radio Interference Regulations of the Canadian Department of Communications. Note that Canadian Department of Communications (DOC) regulations provide, that changes or modifications not expressly approved by Broadcom Corporation could void your authority to operate this equipment. This Class B digital apparatus meets all requirements of the Canadian Interference-Causing Equipment Regulations.

Cet appareil numérique de la classe B respecte toutes les exigences du Règlement sur le matériel brouilleur du Canada.

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