DP83816AVNG
MacPHYTER-II Accelerated Adoption Package
(MAAP)
Version 1.0.0

User's Guide

October 2002

MAAP Purpose and Contents

The purpose of the MacPHYTER-II Accelerated Adoption Package (MAAP) is to provide National Semiconductor Corporation's customers with a vehicle to quickly design and market systems containing the MacPHYTER-II chip. Customers are encouraged to copy MAAP components to expedite their design process. The MAAP contains:

- One MacPHYTER-II card
- MAAP licensing agreement

The MacPHYTER-II Demo card contains a Wake-On-Lan (WOL) header to power the card when power is not available from the PCI bus.

Information and Specifications

This section contains specifications of the MacPHYTER-II Demo card, as well as a description of the card's LEDs and a listing of the available software drivers.

MacPHYTER-II Demo Card Specifications

The specifications for the Demo card are listed in Table 1.

Table 1: Demo Card Specifications

Size	6.3 cm x 12.3 cm
Mass	55 grams
Bus Connection	PCI v2.2
Media Connection	RJ-45
Standards Supported	IEEE 802.3, 802.3u, 802.3x, PCI 2.2, PC 97, 98, 99, ACPI 1.0
Chipset	National Semiconductor Corp. DP83816 (MacPHYTER-II)
Speeds Supported	100 Mbps Half & Full Duplex, 10 Mbps Half & Full Duplex
PCB Layers	4

LEDs Description

Three Light Emitting Diodes (LEDs) on the card indicate the card's status: 100 Mbps Link, 10 Mbps Link, and Network Activity. These LEDs are shown in Figure 1.

- 100 Mbps Link
  The LED farthest from the RJ-45 connector indicates 100 Mbps Link. When illuminated, the MacPHYTER-II card has successfully established link at 100 Mbps, and is ready to send and transmit data at 100 Mbps.

- 10 Mbps Link
  The middle LED indicates 10 Mbps Link. When illuminated, the MacPHYTER-II card has successfully established link at 10 Mbps, and is ready to send and transmit data at 10 Mbps.

- Network Activity
  The LED nearest to the RJ-45 connector indicates network activity. It is lit when the MacPHYTER-II card is sending or receiving data.

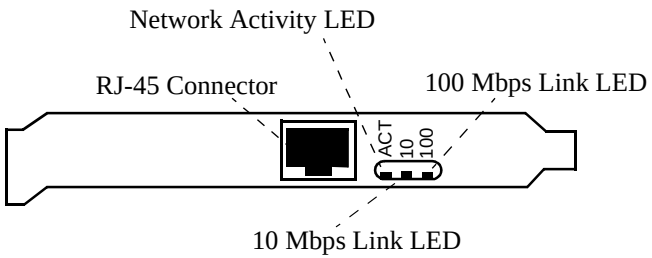

Figure 1: Status LEDs on the exterior side of the Demo Card.

Software Drivers

A driver for the MacPHYTER-II card is currently available for the following operating systems:

- Microsoft Windows XP
- Microsoft Windows 2K (NDIS 5)
- Microsoft Windows NT 4.0 (NDIS 4)
- Microsoft Windows ME (NDIS 5)
- Microsoft Windows 98 and 98SE (NDIS 4 and 5)
- Microsoft Windows 95 (NDIS 4)
- Microsoft Windows CE 3.x and 4.x
- Novell Netware 4.x, 5.x, 6.x
- Linux 2.4
- UINXware 7.x
- OpenServer 5.x
- DOS: ODI, NDIS 2, Packet Drivers
- VxWorks
- FreeBSD
- PXE solution

This user's guide provides instructions for installing the drivers for the following operating systems: Microsoft Windows XP, 2K, 98SE, ME, NT, 95 and Linux.

NDIS and Windows

The Network Driver Interface Specification (NDIS) is a proprietary Microsoft standard for software drivers of Network Interface Controller (NIC) cards. The NDIS ensures that all drivers for a given media have the same Applications Program Interface (API).

With each major operating system release, Microsoft provides a new version of the Network Driver Interface Specification. NDIS 4 was created for Windows 95 and NT 4.0, while NDIS 5 was created for Windows 2K and XP. For backward compatibility, Windows versions can usually use drivers that comply with previous NDIS versions. A MacPHYTER-II driver is available for NDIS 4 and 5.

In general, you should use the driver with the newest NDIS version that will work with your operating system (e.g. NDIS 5 for Windows XP, NDIS 4 for Windows NT). Some users, however, may require a driver with a particular NDIS version for their environment.

Installation

This section describes the installation of the MacPHYTER-II card into a personal computer (PC). To install the card, you need:

- the MacPHYTER-II Demo card
- a PC with an available PCI slot
- screwdrivers to open the PC and secure the Demo card
- a Category 5 twisted-pair RJ-45 cable
- a wrist strap
- a blank, formatted floppy disk

Installing the card consists of four required stages: Copying the Driver to a Floppy Disk, Inserting the Card, Connecting the Network, and Installing the Driver.

I. Copying the Driver to a Floppy Disk

You need to first copy the software driver from the URL below to a floppy disk. For this stage you will need the blank floppy, and a computer equipped with a floppy disk drive that has internet access.

1. Insert the blank floppy into the computer.
2. Connect to the following URL on the web:

   http://www.national.com/appinfo/networks/

   Under “Design Resources” choose “Software Drivers”. Then choose the driver you need.
3. If you are running Windows, you should use the highest NDIS version available for your version of Windows. You may also use an earlier NDIS version if you choose. See “NDIS and Windows” in this User’s Guide for details.
4. Copy *all* of the drivers you need to the floppy disk.
5. Eject the floppy.

II. Inserting the Card

The second stage in the installation sequence is inserting the card into the PC. For this stage you will need the MacPHYTER-II card and the screwdrivers. Unplug the PC before opening it to avoid electrocution. Be sure to ground yourself before handling the MacPHYTER-II card to avoid ElectroStatic Discharge (ESD) damage to the card.

1. Shutdown the PC, and disconnect the power cord.
2. Open the chassis of the PC.
3. Choose an unused PCI slot and remove its metal bracket by loosening the screw on the inside. You will no longer need this metal bracket as the MacPHYTER-II card has its own. You will need the screw, however.
4. Remove the MacPHYTER-II card from the ESD-safe packaging.

   Warning: Static charge from your body can permanently damage the MacPHYTER-II card. Do not handle the card without first electrically grounding yourself via wrist strap or by touching a large piece of metal.

5. Insert the MacPHYTER-II card into the empty PCI slot in the PC. Orient the card so that the RJ-45 connector points out of the computer (See Figure 2).

   Warning: The card may fit backwards (with the RJ-45 pointing in) into the PCI slot. Starting the computer with the card inserted backwards may damage the card and/or the PC.

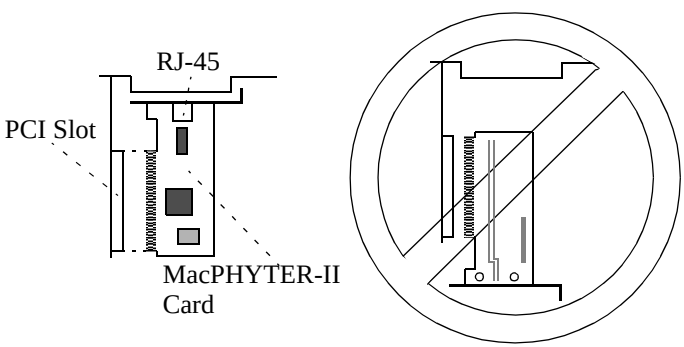

Figure 2: Correct orientation of the MacPHYTER-II card (top view).

6. When you are certain the card is oriented correctly, press firmly on the card to ensure that it is completely seated in the PCI slot. Secure the MacPHYTER-II card using the screw from step 3.
7. Close the computer, and reconnect the power cord.

III. Connecting the Network

The third stage in the installation sequence is connecting the MacPHYTER-II card to the network. In this stage, you will need only the twisted-pair Category 5 network cable.

After you have inserted the card and closed the PC, connect one end of the twisted-pair cable to the RJ-45 connector on the MacPHYTER-II card, and the other end to another PC or a network hub or switch (see Figure 4). When connecting the card to another PC, the cable will need to be *crossover*, meaning that pins 1 and 2 must be swapped with pins 3 and 6, respectively, between the two ends of the cable. A crossover cable should not be used when connecting the MacPHYTER-II card to a network hub or switch. The difference between a crossover and non-crossover ("straight") cable is shown in Figure 3.

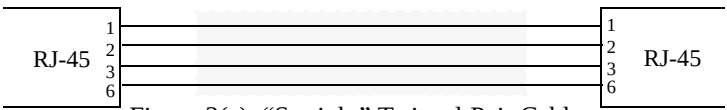

Figure 3(a): "Straight" Twisted-Pair Cable

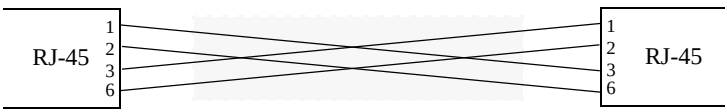

Figure 3(b): "Crossover" Twisted-Pair Cable

The next time you turn on the PC, one of the two green link lights on the MacPHYTER-II card should become illuminated almost immediately. This signifies that the card has established link with the device at the other end of the cable and is ready to send and receive data.

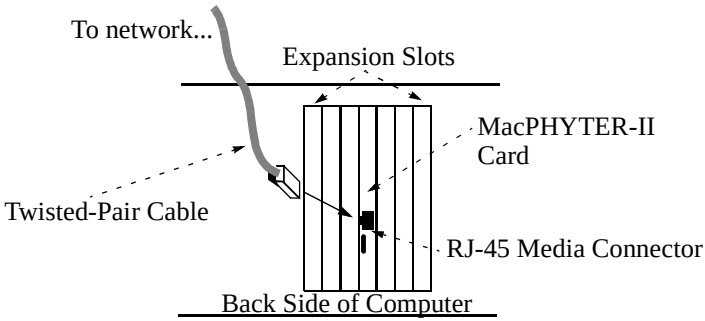

Figure 4: Connecting the network to the MacPHYTER-II Card.

IV. Installing the Driver

The fourth stage in the installation sequence is installing the driver for the MacPHYTER-II card. The following subsections describe the procedure for installing the driver under Windows XP and 2K, Windows NT 4.0, Windows 98SE and ME, Windows 95, Linux 2.4, and Novell NetWare 4.x.

Windows XP and 2K Driver Installation

Follow this sequence for installation under Windows XP and 2K.

1. Restart the computer. Boot Windows XP/2K.
2. Log in as `Administrator`. Windows XP/2K will draw the desktop then bring up a window entitled “Found New Hardware,” and another one entitled “Found New Hardware Wizard.” If these windows do not appear, double-click on “My Network Places.” This should cause them to appear.
3. Bring the “Found New Hardware Wizard” window to the front and click on the “Next” button. The Wizard will then ask if you want it to search for a suitable driver or if you want to choose a driver yourself. Choose the second option, then click the “Next” button.
4. A window subtitled “Hardware Type” may appear. If it does, select “Network Adapters” from the list, then click “Next.”
5. After a few seconds, a window subtitled “Select Network Adapter” will appear. Click on the “Have Disk…” button. A smaller window entitled “Install from Disk” will appear.

6. Insert the driver floppy. Click “Open” in the “Locate File” dialog box, then click “OK.”
7. A second window subtitled “Select Network Adapter” will appear with “National Semiconductor Corp. DP83815/816 10/100 MacPhyter 3v PCI Adapter” highlighted. Click on “Next.”
8. A window subtitled “Start Device Driver Installation” will appear. Click “Next.”
9. Windows XP/2K may issue a warning that the driver has not been digitally signed by Microsoft. The MacPHYTER-II driver will acquire a Microsoft digital signature when it completes WQHL certification. In the meantime, you can ignore this warning.
10. If Windows XP/2K brings up a “Files Needed” dialog box saying that the file `DP83815.sys` is needed, navigate to the floppy drive (A:) then click “OK.”
11. A window should then appear saying that Windows XP/2K has finished installing the MacPHYTER-II driver. Click “Finish.” The PC does not need to be restarted.

Microsoft Windows NT 4.0 Driver Installation

1. Restart the computer. Boot Windows NT 4.0.
2. Log in as `administrator`.
3. After the desktop comes up, right-click on the “Network Neighborhood” icon. Choose “Properties” from the menu that comes up. A window entitled “Network” will appear. Click on the fourth tab, “Adapters.” Then click on the “Add...” button.
4. A smaller window entitled “Select Network Adapter” will appear. Click on the “Have Disk...” button.
5. Insert the driver floppy. If using a driver floppy, type `A:` in the field at the bottom of the window. This assumes that your floppy drive is `A:`. Use the correct drive letters for your system. Click “OK.”
6. A window entitled “Select OEM Option” will appear, with “National Semiconductor Corp. DP83815/816 10/100 MacPhyter 3v PCI Adapter” highlighted. Click “OK.”
7. A window will appear entitled “National Semiconductor Corp. DP83815/816 10/100 MacPhyter 3v PCI Adapter.” This window allows you to choose default settings for the adapter. You can leave the settings as they are and choose “OK.”
8. The “Network” window will reappear with the MacPHYTER-II card listed under “Network Adapters.” Click “close.”

9. A window will appear entitled “Microsoft TCP/IP properties.” Use this window to set the TCP/IP properties (IP address, subnet mask, gateway, etc.) for the MacPHYTER-II card. Click “OK.”
10. The PC will need to be restarted. Windows will prompt you to restart automatically. Remove the floppy disk before restarting.

Microsoft Windows 98SE and ME Driver Installation

Follow this sequence for installation under Microsoft Windows 98SE and ME.

1. Restart the computer.
2. During the boot process, a window will appear entitled “Add New Hardware Wizard,” saying that it will complete the installation of the PCI Ethernet Controller. Insert the driver floppy, then press “Next.”
3. A window will appear presenting you with two options: (1) have Windows locate the driver for you or (2) display all drivers in a specific location so that you can choose one yourself. Choose option (2), then click on “Next.”
4. A window may appear asking you to select the type of device. If this window appears, select “Network Adapters” from the list, then click “Next.”
5. A window will appear entitled “Select Device.” Click on the “Have Disk” button. A window entitled “Install from Disk” will appear. Click on the “Browse” button.
6. Navigate to the floppy drive, select the file `net83815.inf`, then click “OK”.
7. The “Install from Disk” window will reappear. Choose “OK.” The “Select Device” window will then reappear. Again choose “OK.”
8. Windows will begin copying the driver files to the hard disk. If it presents a dialog box saying that it cannot locate `DP83815.sys`, choose “Browse” to select the directory the file is in, then double-click on `DP83815.sys`. When it finishes, it will present a window saying that the driver has been successfully installed. Click on “Finish.”
9. After the driver files have been copied, the machine will need to be restarted. It will prompt you to restart automatically. Remove the floppy disk before restarting.

Microsoft Windows 95 Driver Installation

Follow this sequence for installation under Microsoft Windows 95.

1. Restart the computer.
2. During the boot process, a window will appear entitled "Update Device Driver Wizard," saying that it will complete the installation of the PCI Ethernet Controller. Insert the driver floppy, then press "Next." Windows will begin searching for a driver.
3. Windows should find the driver automatically, and give the name of the adapter: "National Semiconductor Corp. DP83815/816 10/100 MacPhyter 3v PCI Adapter." If you see this message, click "Finish," then go to step 4.
4. Windows will begin copying the driver files to the hard drive. Have the Windows 95 CD or floppy disks handy. Windows will prompt you to use them as necessary. If it presents a dialog box saying that it cannot locate `DP83815.sys`, click on "Browse," then double-click on `DP83815.sys` in the A: directory. Then click "OK."
5. After the driver files have been copied, the machine will need to be restarted. It will prompt you to restart automatically.
6. Remove the floppy disk before restarting.

Linux 2.4 Driver Installation

Follow this sequence for installation under Linux 2.4.

1. Start the computer.
2. Boot Linux and log in as `root`.
3. The MacPHYTER-II driver requires Linux kernel version 2.4. Check the version of your kernel by typing

   ```
   uname -r
   ```

   at the prompt. If it reports a version other than 2.4, you will need to acquire version 2.4 of the kernel and compile it for your PC. Version 2.4 of the kernel is available from:

   ```
   http://kernel.org
   ```

Instructions for compiling the kernel can be found in the Linux Kernel HOW-TO, by Brian Ward, available from the Linux Documentation Project (LDP) at:

```
http://www.ibiblio.org/Linux/HOWTO/Kernel-HOWTO.html
```

4. Check that the kernel has been compiled with loadable module support. At the prompt type

   ```
   cd /proc
   /bin/ls
   ```

   If `modules` appears in the list of files, then the kernel was compiled with loadable module support. If `modules` is not listed, then you must recompile the kernel with loadable module support. The Linux Kernel HOW-TO mentioned in the previous step describes this procedure.

5. Once you have version 2.4 of the kernel with loadable module support running, you are ready to install the MacPHYTER-II driver. Using the driver floppy, copy the driver to the machine by inserting the floppy and typing the following at the prompt:

   ```
   mkdir /nsc
   mount -t msdos /dev/fd0 /nsc
   cp /nsc/*.o /lib/modules/2.4.0/Kernel/
   drivers/net/
   umount /dev/fd0
   rmdir /nsc
   ```

   These commands assume that the floppy is accessed via `/dev/fd0`. Use the correct devices for your system.

6. After copying the Linux MacPHYTER-II driver to the modules directory, you need to update the module dependency database. Type

   ```
   /sbin/depmod -a
   ```

   at the prompt.

7. You can now load the Linux MacPHYTER-II driver into the kernel by typing

   ```
   /sbin/modprobe dp83815
   ```

   This command only gives output if there is an error. If you do not see any messages, then the driver is successfully installed. The PC does not need to be rebooted.

8. In order to use the MacPHYTER-II card, the network interface corresponding to the card needs to be enabled and configured using the `ifconfig` and `route` commands. This process is beyond the scope of this document, but described in the Linux Net HOWTO available from the Linux documentation project:

   ```
   http://www.ibiblio.org/Linux/HOWTO/Net-HOWTO/index.html
   ```

   Linux can be configured to automatically load the Mac-PHYTER-II driver during the boot sequence. The process for doing this differs between Slackware and Redhat/Debian.

Configuration Under Slackware

1. To have the driver loaded automatically at boot time under Slackware, using a text editor such as `vi` or `emacs`, add the lines

   ```
   # Load the MacPhyter Linux Driver

   /sbin/modprobe dp83815
   ```

   to the end of the file `/etc/rc.d/rc.modules` (or `/etc/rc.d/rc.local` if `rc.modules` does not exist).

2. Reboot the machine by typing

   ```
   /sbin/reboot
   ```

Configuration Under RedHat and Debian

1. To have the driver loaded automatically at boot time under RedHat or Debian, using a text editor such as `vi` or `emacs`, add the line:

   ```
   # Load the MacPhyter Linux Driver

   /sbin/modprobe dp83815
   ```

   to the end of the file
   `/etc/rc.d/init.d/modules.init`.

2. Reboot the machine by typing

   ```
   /sbin/reboot
   ```

Note: For either Slackware or RedHat/Debian, you can unload the MacPHYTER-II Driver at any time by typing

```
/sbin/rmmod dp83815
```

and reload it by typing

```
/sbin/modprobe dp83815
```

Both commands must be issued as `root`. You will need to reconfigure the network interface using `ifconfig` and `route` after reloading the driver.

Novell NetWare 4.x Driver Installation

Follow this sequence for installation under Novell NetWare 4.x.

1. Start the computer and boot DOS.
2. Insert the MacPHYTER-II driver floppy. Copy the MacPHYTER-II driver to the NetWare server directory by typing:

   ```
   copy a:\c83815.lan c:\nwserver
   copy a:\c83815.ldi c:\nwserver
   ```

   This command assumes your NetWare server files are stored in `c:\nwserver`.

3. Start the NetWare server by typing:

   ```
   c:\nwserver\server
   ```

4. To use the MacPHYTER-II driver, you must have version 3.71 or higher of the Novell Multiprocessor Media Support Module (`msm.nlm`) and version 3.61 or higher of the Novell Ethernet Topology Specific Module (`ethertsm.nlm`). You can determine which versions of the these modules you have installed by typing

   ```
   modules
   ```

   at the NetWare server prompt. Look for `msm.nlm` and `ethertsm.nlm` in the listing. If you see `msm.nlm` with version 3.71 or higher, and `ethertsm.nlm` with version 3.61 or higher in the list, then go to step 6. If they are not in the list or have earlier version numbers, you need to acquire the latest versions and install them on your computer. This process is explained in the next step.

5. Updated versions of `msm.nlm` and `ethertsm.nlm` are available as patches from the Novell support web page:

   ```
   http://support.novell.com
   ```

   This page allows you to enter the version of NetWare you are running and search for patches for it. The patches `iwsp6a.exe` for NetWare 4.11 and `odi33f.exe` for NetWare 4.1 contain versions of `msm.nlm` and `ethertsm.nlm` that work with the MacPHYTER-II driver. However, Novell is continually generating new patches, and you should download the most recent ones. Instructions for installing the patches are provided near the patches themselves on the Novell web page.

6. When you have verified that the correct versions of the `msm.nlm` and `ethertsm.nlm` modules are installed, load the MacPHYTER-II driver by typing the following at the NetWare server prompt, all on one line (replace the “x” in “SLOT=x” with the slot number of the PCI slot containing the MacPHYTER-II card):

```
LOAD C:\NWSERVER\C83815 SLOT=x
FRAME=ETHERNET_802.2 NAME=C83815_1_E82
```

If you receive the error:

```
Loader cannot find public symbol: CMSMInitParser
```

then your `msm.nlm` and `ethertsm.nlm` modules need to be updated. If you see the statement:

```
Debug symbol information for C83815.LAN
loaded
```

then the MacPHYTER-II driver is installed and ready. The machine does not need to be rebooted.

7. To use the driver you need to bind a protocol to it. Type the following at the NetWare server prompt (replace the "y" in "NET=y" with the network address for your LAN segment):

   ```
   BIND IPX C83815_1_E82 NET=y
   ```

   You should now be able to log in to your NetWare server from a client via the MacPHYTER-II card.

8. Log in to your NetWare server from a client as `supervisor`. Insert the driver floppy into the client and copy the `c83815.lan` and `c83815.ldi` files to the SYSTEM directory on the server. Also add the "LOAD" and "BIND" commands from steps 6 and 7 to the end of the `autoexec.ncf` file in the SYSTEM directory on the server. This causes the MacPHYTER-II driver to be automatically loaded and configured during startup.

Installing TCP/IP under Windows 95 or 98 (Optional)

Many Microsoft Windows programs require TCP/IP to access the network. To install TCP/IP, you need the Microsoft Windows CD or floppy disks. The process for installing TCP/IP is the same for Microsoft Windows 95 and Microsoft Windows 98. Under Windows 2K and XP, TCP/IP is installed automatically when you install the MacPHYTER-II driver.

1. Turn on the computer and boot Windows.
2. Click on the "Start" menu, then choose "Settings" and then "Control Panel."
3. Open the "Network" icon.
4. A window entitled "Network" will appear. Go to the "Configuration" subpage, and click on the "Add…" button.
5. A window entitled "Select Network Component Type" will appear. Click on "Protocol" from the list of network components, then click on the "Add…" button.
6. A window entitled "Select Network Protocol" will appear. Chose "Microsoft" from the list of manufacturers, then choose "TCP/IP" from the list of network protocols, then click "OK."
7. The "Network" window will reappear. It should now show the TCP/IP protocol in the list of installed network components. Click on TCP/IP, then choose "Properties."
8. A window entitled "TCP/IP Properties" will appear. Use this page to set the TCP/IP parameters for the card, such as the IP address, DNS configuration, gateway, subnet mask, etc. When you have entered all of this information, click "OK."
9. The "Network" window will reappear. Click "OK."
10. The computer will need to be restarted. It will prompt you to restart automatically. Remove all floppy disks and CDs before restarting the computer.

Troubleshooting

This section describes the problems that commonly occur during installation, along with their solutions.

- Microsoft Windows does not automatically detect that the MacPHYTER-II card has been installed.

  In this case it is possible that the card is not securely seated in its PCI slot. None of the copper PCI connectors should be visible when the card is completely seated.

  It is also possible that the PCI slot containing the card is faulty or has been disabled in the BIOS. Try using a different PCI slot.

  The MacPHYTER-II card may be conflicting with other PCI cards in the system. Remove other PCI cards and restart Windows.

  Windows 95 and 98 can be forced to look for the MacPHYTER-II card. Through the “Start” menu, view “Settings > Control Panel”. Then open the “Add New Hardware” icon and follow the instructions.

  Windows 2K and XP has a Wizard to help you with hardware that is installed but not detected or working correctly. To access this wizard, click on “My Computer” using the right mouse button, then choose “Properties” from the menu that appears. A new window will appear. Click on the “Hardware” tab, then click on the “Hardware Wizard…” button, then follow the instructions.

- The Linux driver prints the error message, “Initialization of DP83816 failed.”

  The Linux driver usually prints this message when it is unable to access the MacPHYTER-II card. Check that the card is securely seated in its PCI slot, or try using a different PCI slot. Also try removing other PCI cards and restarting the machine to isolate conflicts.

Unlike Microsoft Windows, It is not possible to force Linux to search for the MacPHYTER-II card. However, it is possible to obtain detailed debugging information from the Linux kernel. For instance, all PCI cards that the kernel sees are listed in the file:

```
/proc/pci
```

At any time you can view the contents of this file to see if the MacPHYTER-II card (Vendor ID: 100B Device ID: 0020) is listed.
You can also view recent error and status messages from the Linux kernel and MacPHYTER-II driver by viewing the file

```
/var/log/messages.*
```

Messages at the end of this file are the most recent.

- There is no link light when the MacPHYTER-II card is connected to another PC or network hub or switch.

  In this case it is possible that the MacPHYTER-II card is not seated properly in the PCI slot. It is also possible that the network cable is too long (IEEE standard 802.3 section 14.4.2 recommends that the cables not exceed 100 meters in length), or that the cable is faulty. Remember that a crossover cable must be used to connect the card to another PC, but not to a network switch or hub. See the “Connecting the Network” section of this User’s Guide for a description of crossover cables.

  Finally, check that the PC is turned on! The MacPHYTER-II card cannot establish link without power from the PC.

- The MacPHYTER-II Demo card links at 10 Mbps instead of 100 Mbps.

  This occurs if the device connected to the MacPHYTER-II card is not capable of 100 Mbps communication. When this happens the card links and communicates at 10 Mbps to accommodate the remote device, even though the MacPHYTER-II card is capable of 100 Mbps communication.

If you are running Microsoft Windows, the driver might be configured to force the MacPHYTER-II card into 10 Mbps mode. To see if this is the case, open the Control Panels window in the “Settings” sub-menu under the “Start” menu. Then open on the “Network” icon. Click on the MacPHYTER-II card in this list of adapters and click on the “Properties” button. Then click on the “Advanced” tab, and click the “Network Media” property. This property should be set to “Auto Sense.” Any other setting forces the card into a specific mode. This is not a problem with Linux, since the Linux MacPHYTER-II driver cannot force the card into a particular mode.

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