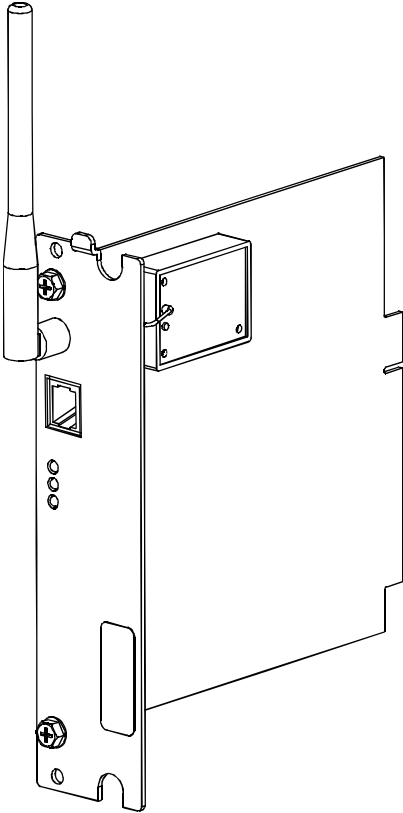


DMXrfNet^{II} & DMXNet^{II}

Operation & Installation ■ ■ ■



right by our customers. ■ ■ ■

datamax·o'neil

Overview

This document describes the installation and use of the DMXrfNet^{II} and DMXNet^{II} Card options for the H-Class, I-Class, and A-Class printers. After verifying the contents of the kit and the tools needed, follow the steps below to install and begin using the option. Keep this documentation for future reference.



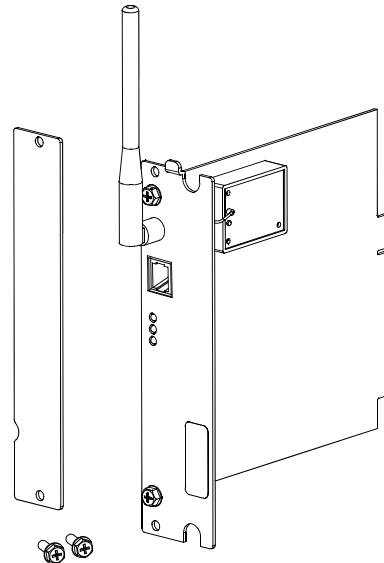
For your safety and to avoid equipment damage, always turn 'Off' power and unplug the printer's power cord before beginning this installation.

Contents of the Kit

Note: *If your card is already installed proceed to "Card Setup and Operation"*

This kit contains the following items:

- Network Card Assembly
- Rear Cover Plate
- Screws



(Appearance may vary depending on card configuration.)

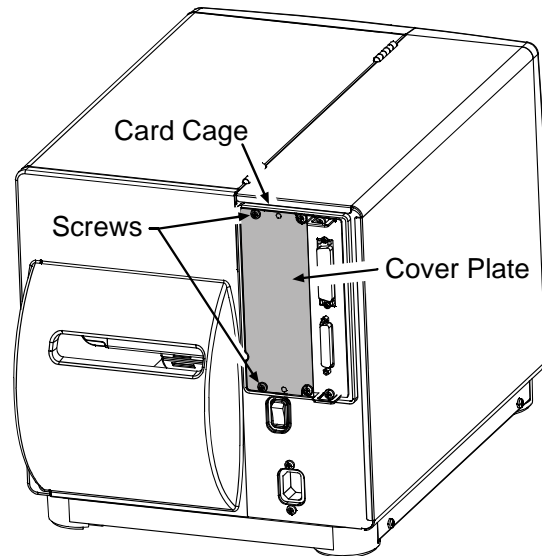
Firmware Update Required

If you are installing this card into an existing printer, you must upgrade the printers firmware to support this network card. Updated firmware can be downloaded from the Datamax-O'Neil FTP site at <ftp.datamax-oneil.com>. Refer to the printers operator's manual for more information on updating the printers firmware. Be sure the firmware file that you download is **version 11.04** or greater. Before installing new firmware verify (via a Configuration Label) that the printer bootloader is version 11.01 or greater.

Card Installation

The following illustrations depict installation into an I-Class printer, other model installations are similar.

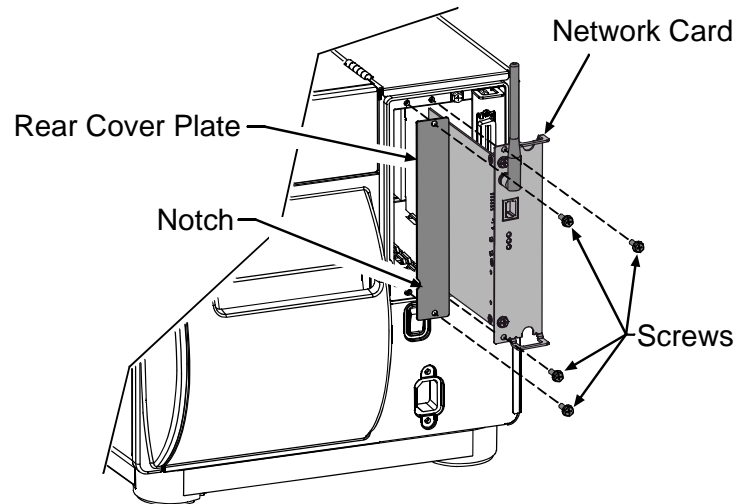
1. Turn 'Off' the Power Switch and unplug the power cord from the AC Receptacle.
2. Remove the two **Screws** and **Cover Plate** from the rear of the printer.



When handling the Network Card, observe proper electrostatic discharge precautions to prevent damage.

3. Slide the **Network Card** into the center slot of the printer. Be sure the **Network Card** is positioned between the guides while inserting. Secure using the two **Screws** provided in the kit.
4. Position the **Rear Cover Plate** (supplied in the kit) as shown and secure using the two previously removed **Screws**.

Note: On some A-Class models, the Network Card is installed upside-down.



Introduction

These network cards can be equipped in the following configurations:

- Wired and Wireless Ethernet
- Wired Ethernet
- Wireless Ethernet (H-Class only)

External Hardware Descriptions

The functions of the Interface Card's external hardware are defined below. Depending on the configuration of your card some items may not be present.

Connectors

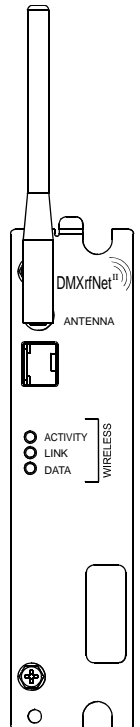
- **ANTENNA** is used to connect an antenna or coaxial cable for RF reception and transmission via this Multimedia Communication Exchange (MMCX) Reverse Pin type connector.
- **10/100 BaseT** is used to connect a 10/100 BaseT Ethernet cable via this RJ45 network connector.

Indicator Lights

- **ACTIVITY** is a green indicator that flashes when the Card is not connected and scanning. The indicator will turn on when a connection is made.
- **LINK** is a yellow indicator that comes on when the Card is associated with an Access Point or Ad-hoc peer.
- **DATA** is a green indicator that flashes when there is data transmitted between the printer and Host access point.

Label

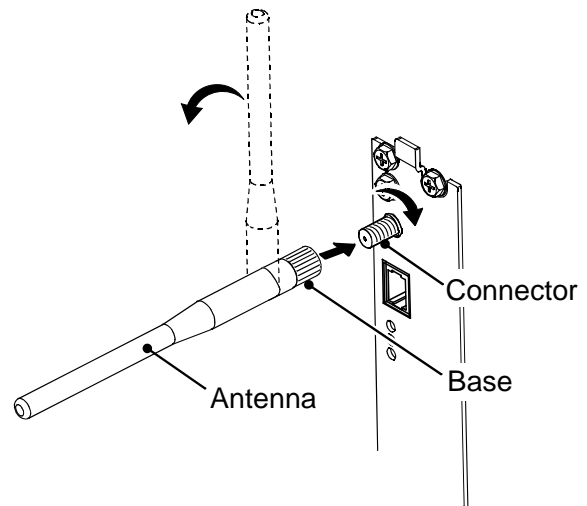
This **Label** contains the MAC address of the Radio module on the network card and is not usually needed. The MAC address of the printer is listed on the printer's Configuration and Network Report test labels.



Installing the Antenna (wireless equipped cards only)

1. Extend the **Antenna** then align the **Base** to the **Connector**.
2. Turn the **Base** clockwise until fully seated and tight on the **Connector**.
3. Raise and position the **Antenna**.

To avoid permanent damage, do not pull on the antenna when handling the Network Card.



Network Card Reset

It is recommended that the printer's communication settings be reset to factory defaults to avoid any conflicts in configuration. To reset the printer's communication settings:

1. Turn on the printer and press the **MENU BUTTON**.
2. Using the **DOWN BUTTON** scroll to 'COMMUNICATIONS' and press **ENTER**.
3. Using the **DOWN BUTTON** scroll to 'NIC ADAPTER' and press **ENTER**.
4. Using the **DOWN BUTTON** scroll to 'SET FACTORY DEFAULTS' and press **ENTER**. When prompted press the **YES KEY**. The printer will then reset and return to Ready Mode.
5. Once completed, turn the printer OFF.

Network Card Setup

The Print Server makes IP requests at power-up, so before making a network connection to the printer consider how your IP addressing needs to be assigned. The IP addressing of the Internal Ethernet Print Server can be configured in one of two ways: Using a static IP Address or Using IP Discovery (DHCP, BootP, or RARP). **At factory default settings IP DISCOVERY is ENABLED.**

1. With Printer Off, connect the network cable then turn on Printer.
2. The printer will now search for a DHCP server. Once the printer has obtained an IP address the message "IP Address xxx.xxx.xxx.xxx" will be displayed briefly signifying that an IP address has been obtained. Allow up to 90 seconds for the printer to retrieve an IP address.
3. At this point it is recommended to print a Network Report. This Network Report is generated by the printer and lists important default information such as the IP and MAC Addresses as well as SSID for wireless equipped cards. To print the 'Network Report': Press the **PAUSE, FEED, CANCEL** buttons at the same time.
4. Verify the printer has obtained a valid IP address for your network. If a valid IP address was not obtained or you wish to use a different static address this can be set via the printer's front panel.

Enter the printer's menu and navigate to the Communications/NIC Adapter menu branch. Set the "IP Discovery" menu item to Disable, then set the "IP Address" menu item to desired value, continue the same procedure with "Subnet Mask" and "Gateway Address" menu items if necessary. Exit the printer's menu, When prompted to save changes press the **YES KEY**.

```
NETWORK REPORT
CURRENT PRINTER INFO
MACO: 00:0D:70:0B:31:90
IP ADDRESS: 192.168.10.26
SUBNET MASK: 255.255.255.0
GATEWAY: 192.168.10.26
DHCP: *ENABLED
SNMP: *ENABLED
PORT NUMBER: 9100
NETBIOS NAME: DMX_0B3190
WLAN MODULE - DISABLED -
MODULE FW VERSION: 4.3.0.24
RADIO FW VERSION: 1.1.1.111.8.4.0.145
PORT STATUS: CONNECTED: ESS
SSID: 000b2802d55e
MACR: 00:0B:28:02:D5:5E
BSS ADDRESS: PROVIDED BY DHCP
```

The information on this label will vary depending on your configuration and firmware version.

Once the previous steps have been successfully completed you may now use the IP Address to:

> Install a printer driver, and start printing from your Windows[®] applications. See section, **Installing the Printer Driver**.

-or-

> If your card is equipped with wireless capabilities, see section **Network Card Setup - Wireless** for setup.

-or-

> Browse to the printer's internal web pages for advanced configuration. See section, **Printer's Internal Web Pages**.

Network Card Setup - Wireless (Infrastructure Mode)

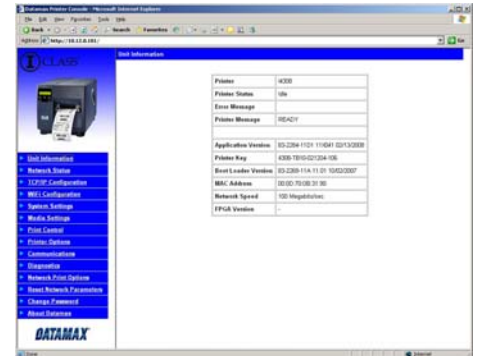
After a successful setup is made via a wired connection, the Wireless connection (if equipped) can now be configured in infrastructure mode using a static or DHCP issued IP address.



1. Open your web browser. Type in the IP Address of the printer. The Default IP is: 192.168.10.26.

Note: If you have assigned different IP Address to the printer, make sure to enter the correct IP Address.

2. The page to the right will appear:



3. Click on the TCPIP Configuration menu item. Locate and set the following items:

> Activate the "Enable Wireless" setting by clicking on the check box.

For static IP setup:

> Enter valid static IP addresses for "IP Address", "Subnet Mask", and "Default Gateway"

> Un-check the "Enable IP Discovery" check box.

Scroll down to the bottom of the page, enter the password (default is "sysadm") and click apply.

4. Click on the WiFi Configuration menu item. Locate and set the following items:

> Set the SSID field to match the SSID of your access point.

> Set WLAN Network Type drop down box to "Infrastructure".

> Set any WLAN Security Settings if necessary.

For static IP setup:

> Set the "Static BSS Address". This is the address assigned to the radio portion of the network card, it must be a unique address.

Scroll down to the bottom of the page, enter the password (default is "sysadm") and click apply.

5. Click on the Reset Network Parameters menu item, enter the password and click Reset.

Once the previous steps have been successfully completed you may now use the IP Address to:

> Install a printer driver, and start printing from your Windows[®] applications. See section, **Installing the Printer Driver**.

-or-

> Browse to the printer's internal web pages for advanced configuration. See section, **Printer's Internal Web Pages**.

Network Card Setup - Wireless (Adhoc Mode)

To configure the wireless card in Adhoc mode, you must configure your host computer to match the default settings of the printer. Your wireless network type must be Adhoc. Refer to your operating system's or your wireless network card documentation for information on how to configure your computer.



1. Power on the printer. Enter the printer's menu and navigate to the Communications/NIC Adapter/Quick Setup menu branch. Scroll down to the "WLAN Adhoc" menu item and press the **ENTER** button. When prompted press the **YES KEY**. The printer will now reset set the printer to the following settings:

Wireless Mode: **Enabled**

IP: **192.168.10.26**

SSID: *MAC Address of the printer (unique value for each printer, listed on the Network Report Label).*

Subnet Mask: **255.255.255.0**

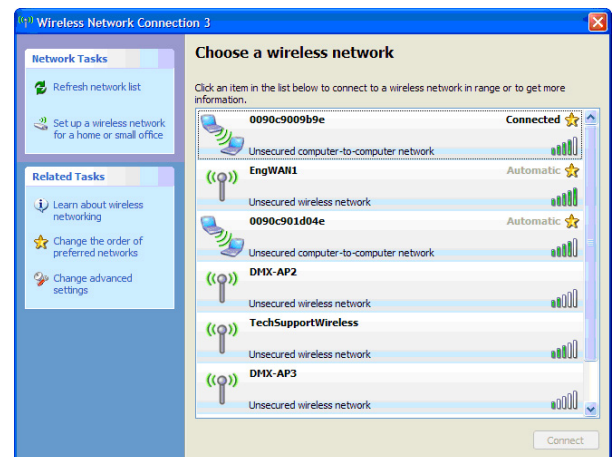
Gateway: **192.168.10.26**

BSS: **192.168.10.1** (this is the IP of the radio card and is not to be used for data transfer)

2. Make sure your host computer's network IP settings are in the same range, (but not identical) to the printers IP address. (e.g. 192.168.10.20). Also be sure that Subnet Mask is set to 255.255.255.0 and the Gateway is set to 0.0.0.0 or the host computer's IP address, (in this case 192.168.10.20).
3. The default SSID is the MAC address of the printer. The printer's MAC address can be found on the label affixed to the backplate of the wireless card or on the Network Report, it is listed as "MACR".

From Windows, you may now "View Wireless Networks". From the list of available wireless networks select the printer's SSID (printers MAC Address) that you wish to connect to and then click on the Connect button.

If you do not see the MACR/SSID listed be sure you have the host computer configured for Adhoc wireless networks.



This process will vary depending on your wireless device installed in your host computer and your operating system version.

Note: The MAC address is case sensitive and must be in lower-case letters.

Once the previous steps have been successfully completed you may now use the IP Address to:

> Install a printer driver, and start printing from your Windows® applications. See section, **Installing the Printer Driver**.

-or-

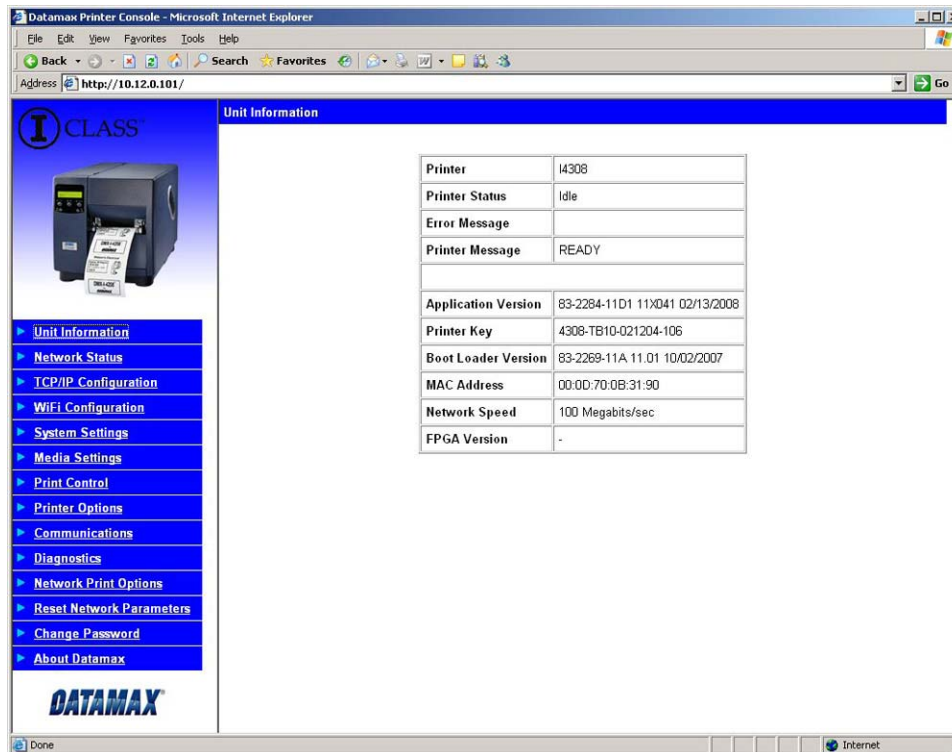
> Browse to the printer's internal web pages for advanced configuration. See section, **Printer's Internal Web Pages**.

Printer's Internal Web Pages

1. Open your web browser. Type in the IP Address of the printer. The Default IP is: 192.168.10.26.

Note: If you have assigned a different IP Address to the printer, make sure to enter the correct IP Address.

2. The following page will appear:



The printer's internal web pages are divided into 14 pages that are accessible via the navigation bar on the left-hand side.

Most of the items on these pages mimic the printer's internal menu. For more information on the function of these settings see the corresponding function in the Operator's Manual.

The **TCP/IP Configuration** and **WiFi Configuration** pages contain many items associated with the setup of the network card as well as wireless security settings. The following tables provide information on each of the items listed on these pages.

Note: You must provide a password to change any settings, the default password is "sysadm".

Note: After changes are sent to the printer, (on all web pages) the printer must be reset in order for the changes to take effect. This can be done from the "Reset Network Parameters" web page.

Note: If any address parameters were changed such as IP address, subnet or gateway, the printer might not be viewable from the current host if they are no longer on the same subnet.

TCP/IP Configuration Page

Static IP Settings							
IP Address	These are the static address the printer will use when "IP Discovery" is set to disabled or a valid IP could not be retrieved from a DHCP server.						
Subnet Mask							
Default Gateway							
DHCP Settings							
Enable IP Discovery (DHCP, BOOTP, ect.)	<p>Controls IP Address discovery, where:</p> <ul style="list-style-type: none"> • Checked: Broadcasts over the network to receive addresses from the responsible server at startup. Manual modifications to IP Address, Subnet Mask, or Gateway are not allowed; and, if no server is found, the specified static value will be used. • Unchecked: Uses the stored static IP, Subnet Mask, and / or Gateway Address. 						
Network Services							
Enable SNMP Service	<p>Allows management protocols, where:</p> <ul style="list-style-type: none"> • Sends messages to SNMP-compliant devices. • Sends no messages. 						
Enable Telnet Service	<p>Allows Telnet protocol to transfer data, where:</p> <ul style="list-style-type: none"> • Telnets to remote computers or server systems. • Disables Telnet. 						
Enable FTP Service	<p>Allows FTP protocol to transfer data, where:</p> <ul style="list-style-type: none"> • Enables FTP • Disables FTP 						
Wireless Settings							
Enable Wireless	Enables or disables the Wireless communication (if equipped) of the network card.						
Advanced Settings							
Port Number	Selects the Port to use for all network communications; Default is 9100						
Max Transmission Units	<p>Sets the Maximum Transmission Unit packet size, where:</p> <p>Packet size, in bytes. (512-65515); Default is 1500</p>						
Gratuitous ARP (Minutes) (0=disable)	<p>Sets time interval for ARP transmission packets, where:</p> <p>(0-2048 minutes); Default is 0</p>						
Duplex Capability	<p>Allows the User to specify the line duplex and speed of the wired Ethernet connection.</p> <table border="0" style="width: 100%;"> <tr> <td style="width: 50%;">Auto-Negotiate (default)</td> <td style="width: 50%;">10 BaseT Full Duplex</td> </tr> <tr> <td>100 BaseT Full Duplex</td> <td>10 BaseT Half Duplex</td> </tr> <tr> <td>100 BaseT Half Duplex</td> <td></td> </tr> </table>	Auto-Negotiate (default)	10 BaseT Full Duplex	100 BaseT Full Duplex	10 BaseT Half Duplex	100 BaseT Half Duplex	
Auto-Negotiate (default)	10 BaseT Full Duplex						
100 BaseT Full Duplex	10 BaseT Half Duplex						
100 BaseT Half Duplex							
Advertise Capability	<p>Selects the method in which the Duplex Capability setting is advertised, where:</p> <ul style="list-style-type: none"> • Automatic (advertises the selected Duplex Capability setting) • All Capabilities (advertises all capabilities) 						
SNMP Trap Destination Address	Is the address in standard octet format where SNMP traps will be sent when SNMP service is installed on your receiver. When zeroed, no traps are sent.						
NetBIOS (WINS) Settings							
NetBIOS Name	Is the name used to reference the printer instead of the IP address. A WINS or DNS server is required for this capability.						
Primary WINS Server	The IP address of the primary WINS Server.						
Secondary WINS Server	The IP address of a secondary WINS Server.						
Primary DNS Server	The IP address of the primary DNS Server.						
Secondary DNS Server	The IP address the secondary DNS Server.						

Wifi Configuration Page

WLAN Network Settings	
SSID	Service Set Identifier that identifies the Module to connect to an AP. To make this connection, the Module and AP must have the same SSID. The SSID cannot contain spaces. Default setting is the MAC address of the wireless module.
WLAN Network Type	Specifies the type of network in which the Module will be used: <ul style="list-style-type: none"> • Infrastructure = connects to WLAN using an AP. • Ad Hoc = used to connect two peer-to-peer devices. • Unique = resets card to Adhoc mode and uses the MAC address as the SSID (<i>default</i>)
Ad Hoc Mode Channel	When Wireless Network Type is Ad Hoc, selects the channel used for communication. The two peer-to-peer devices must use the same channel. Range is 1 to 14 channels. Default channel is 1.
Access Point Density	Specifies a rate that, if not sustainable with the current association, causes the Module to look for an AP with which it can maintain the specified rate. A high setting causes the Module to more readily switch to another AP. <ul style="list-style-type: none"> • Low - 2 Mbps cannot be sustained. (<i>default</i>) • Medium - 5.5 Mbps cannot be sustained. • High - 11 Mbps cannot be sustained.
WLAN Region Code	Module Operation Region Specifies the wireless channels allowed. The AP controls the channel used during Infrastructure mode. Default is US.
WLAN Security Settings	
Wireless Security Mode	Configures the security settings. <ul style="list-style-type: none"> Disable = security is disabled. (<i>default</i>) wep64 = 64-bit key length (sometimes referred to as 40-bit) wep128 = 128-bit key length wpa-psk = WPA Pre-Shared Key wpa-leap = WPA LEAP wpa-leap64 = Migration mode w/ Cipher suite TKIP+40 bit WEP using EAP(LEAP). <i>Requires LEAP username and password.</i> wpa-leap128 = Migration mode w/Cipher suite TKIP+128 bit WEP using EAP(LEAP). <i>Require LEAP username and password.</i> wpa-psk64 = Migration mode w/Cipher suite TKIP+40 bit WEP using WPA PSK. <i>Requires WPA Passphrase.</i> wpa-psk128 = Migration mode w/Cipher suite TKIP+128 bit WEP using WPA PSK. <i>Requires WPA Passphrase.</i>
WPA Passphrase (Preshared Key)	Enter your WPA passphrase.
Re-enter Passphrase	Confirms WPA passphrase entry
Leap User ID	User ID for Leap security mode
Leap Password	Password for Leap security mode
Re-enter Leap Password	Confirm password for Leap security mode
WEP Authentication	Enables or disables WEP authentication: <ul style="list-style-type: none"> • Automatic = automatically detects the authentication. (<i>default</i>) • Open System = communicates the key across the network. • Shared Key = allows communication only with devices with identical WEP settings.
Default Key	Selects the default WEP Key from 1 – 4 if Shared Key or Both is selected for WEP Authentication. Default is WEP Key 1.
WEP Key 1 through 4	Specify up to four WEP key values: <ul style="list-style-type: none"> • If WEP Encryption = 64, enter 10 hexadecimal digits for each key. • If WEP Encryption = 128, enter 26 hexadecimal digits for each key.


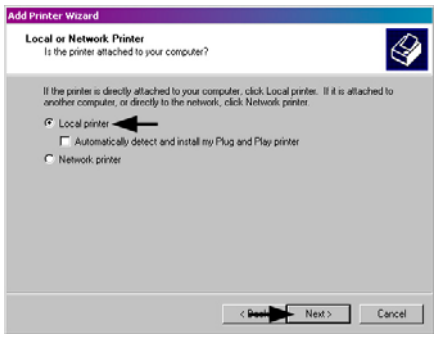
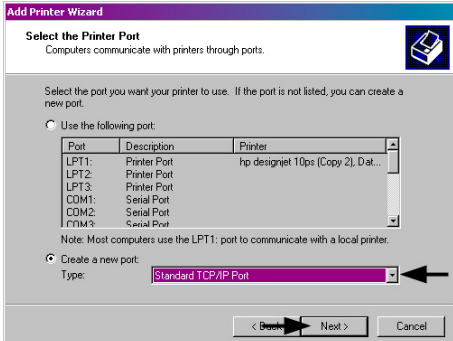

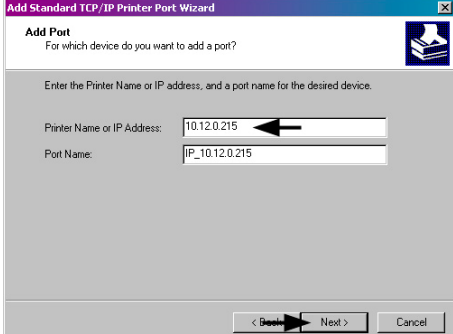
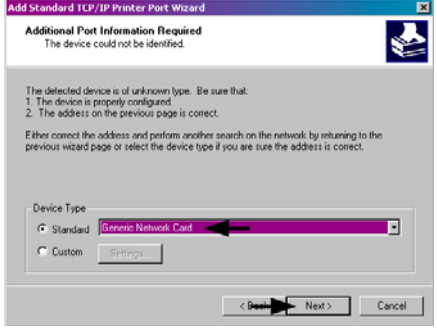
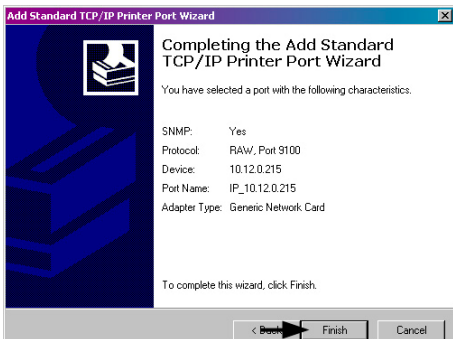
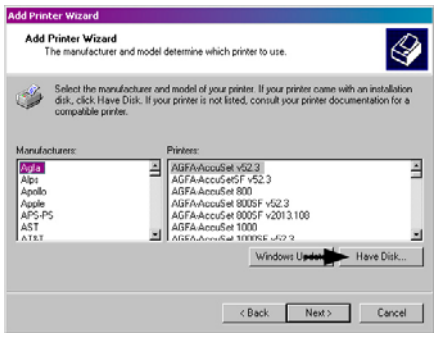
Wifi Configuration Page (*continued...*)

Advanced Settings	
Maximum Transmission Rate	Specifies the Module's maximum wireless transmission rate. Default is 2 Mbps.
Use Fixed Rate for Transmission	Sets the 802.11 behavior for Ad Hoc mode. Default is 0.

WLAN IP Settings	
DHCP	Displays the current DHCP mode status.
DHCP Fallback	This is the IP address to use with DHCP is enabled and a DHCP server cannot be found.
Retain DHCP Values	This instructs the wireless LAN to retain the latest DHCP provided IP address. This address will be used in the event a DHCP server cannot be found on a subsequent restart.
Persistent DHCP	This instructs the wireless LAN to copy the latest DHCP provided IP address to a static address.
Enable MAC Cloning	This instructs the wireless interface to assume the MAC address of the printer when connecting to the wireless network.
DHCP Client Name	Specifies the Module's DHCP client name. This should be different than the NetBIOS name specified on the TCP/IP page.
DHCP Fixed Interval Retransmission	Sets the DHCP retransmission mode to either Exponential (not checked) or Fixed interval (checked). Default is not checked.
DHCP Retransmit Interval	Sets the DHCP retransmission interval to use when "Enable DHCP Fixed Interval Retransmission" is set to fixed. This is an integer with a range of 1-64. Default is 15.
DHCP Acquire Time Limit	Sets the number of seconds the DHCP should attempt to acquire an IP address before using the fallback IP address, if wl-dhcp-fb is on. An integer with a range of 1-255. Default is 150.
DHCP Fallback IP Address	Displays the fallback IP address. Default is 192.168.10.1
DHCP Fallback Subnet	Displays the fallback subnet mask. Default is 255.255.255.0
DHCP Fallback Gateway	Sets the fallback gateway address. Default is 0.0.0.0.
Static BSS Address	Specifies the radio module's static IP address; up to four octets separated by a period. If Enable DHCP is <i>checked</i> , this parameter is ignored. Default is 0.0.0.0.
Subnet Mask	Displays the radio module's subnet mask; up to four octets separated by a period. Default is 255.255.255.0
Default Gateway	Displays the Module's LAN IP address; up to four octets separated by a period. Default is 192.168.0.1.
Primary DNS	Displays the primary DNS server address for DNS lookups. If DHCP is enabled, the IP address provided by the DHCP server is used. Default is 0.0.0.0.
Secondary DNS	Displays the secondary DNS server address for DNS lookups when the primary DNS server is unavailable. Default is 0.0.0.0.

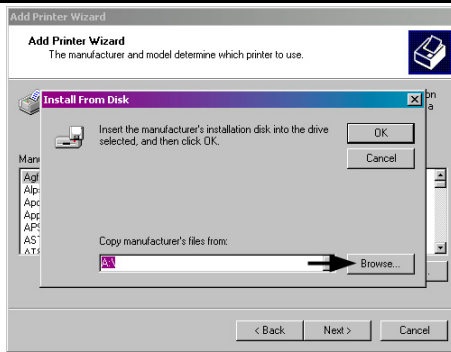
Installing the Printer Driver

The following screen shots are taken from Windows[®] 2000, other Windows[®] versions will be similar.

<p>1</p> <p>Start the Windows "Add Printer Wizard". The following screen should appear, click 'Next>'.</p>	
<p>2</p> <p>Make sure that 'Local Printer' is selected and then click 'Next'.</p>	
<p>3</p> <p>Select on 'Create a new port:' and then select 'Standard TCP/IP Port' from the drop down menu. Click 'Next'</p>	
<p>4</p> <p>Click 'Next'.</p>	
<p>5</p> <p>In the 'Printer Name or IP Address:' field enter the IP address of your printer. The 'Port Name' field <u>does not</u> need to be changed. When finished click 'Next'.</p>	
<p>6</p> <p>Make sure 'Standard' is selected and then click 'Next'.</p>	
<p>7</p> <p>Confirm your settings and then click 'Finish'.</p>	
<p>8</p> <p>Click on 'Have Disk'.</p>	

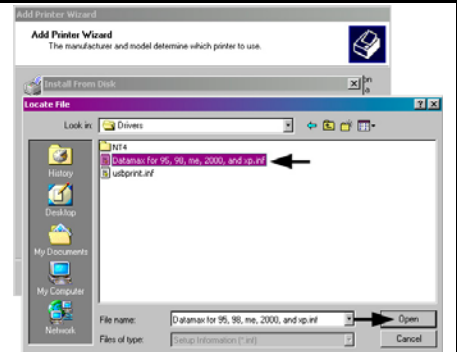
9

Insert the Accessories CD-Rom and click 'Browse'.



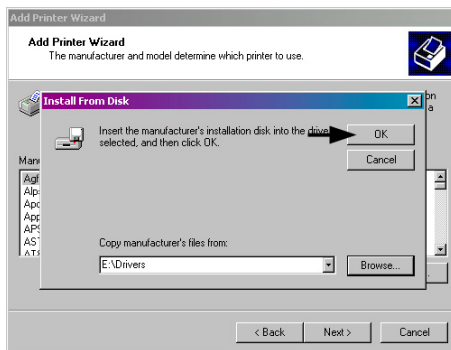
10

Browse to the "\DRIVERS\Seagull" folder on the CD-ROM, make sure the file "for 95, 98, me, 2000, and xp.inf" is selected and click 'OK'.



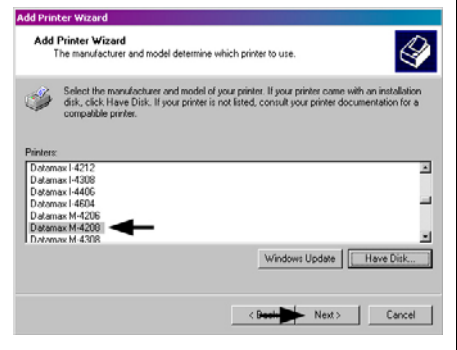
11

Click 'OK'.



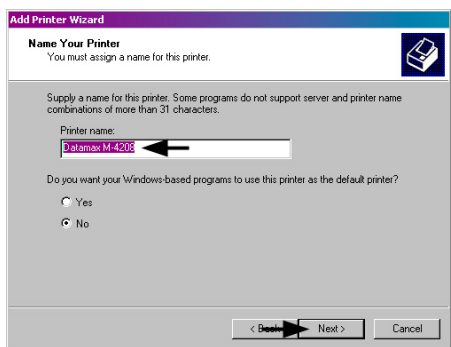
12

Choose your printer from the list and then click 'Next'.



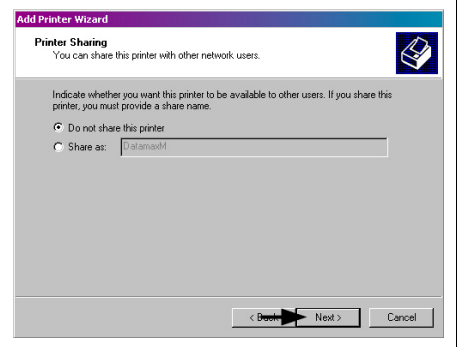
13

Name your printer in the 'Printer name:' field. Next select whether or not to set this printer as your default printer. Then Click 'Next'.



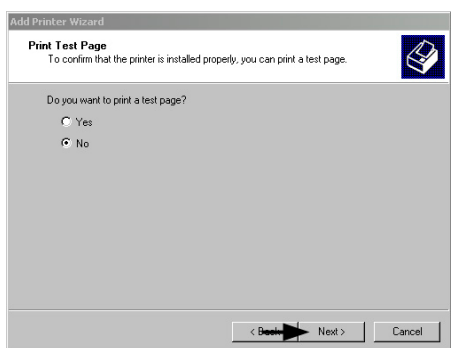
14

Select whether or not to share this printer on your network. Then Click 'Next'



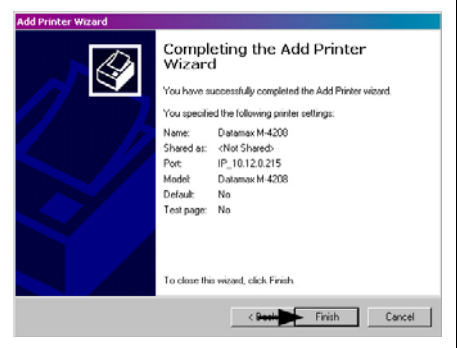
15

Select 'No' then Click 'Next'.



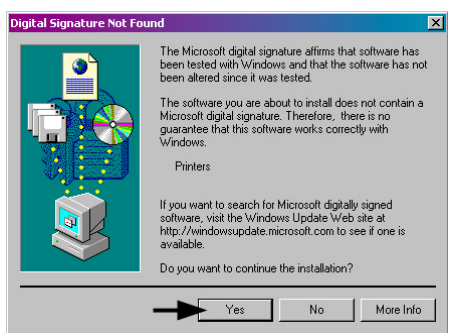
16

Confirm your settings and then click 'Finish'.



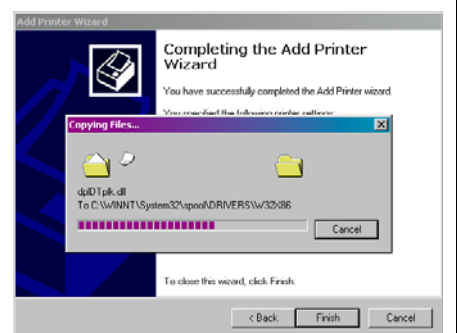
17

If prompted with the "Digital Signature Not Found" window, click 'Yes' to continue installation.



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Your computer will now copy the necessary files from the CD-ROM. The driver and port installation is now complete. The printer can be selected through any Window's application.



Wireless and Wired Ethernet Specifications

The following list and table describes the key features and specifications of the wireless/wired card.

- 802.11b/g wireless LAN (Wi-Fi) standards-based technology
- Highly integrated module includes radio, baseband and MAC processor, and application processor
- Wired 10/100Mbps RJ-45 Ethernet port.
- Extended temperature and environmental specifications
- Built-in TCP/IP and UDP features provide flexible LAN connectivity options
- Built-in Web server enables remote configuration capabilities
- Built in WEP, WPA, and LEAP security protocols

Specification	Description
Technology	IEEE 802.11b/g DSSS, Wi-Fi compliant
Frequency	2.400 – 2.4835 GHz (US/Can/Japan/Europe) 2.471 – 2.497 GHz (Japan)
Modulation	DBPSK (1 Mbps), DQPSK (2 Mbps), and CCK (5.5 and 11 Mbps)
Channels	USA/Canada: 11 channels (1 – 11) Europe: 13 channels (1 – 13) Japan: 14 channels (1 – 14) France: 4 channels (10 – 13)
Data Rate	11, 5.5, 2, 1 Mbps (raw wireless rate)
RF Power	+15 dBm (typical) Approx.32 mW
Sensitivity	-82 dBm for 11 Mbps -86 dBm for 5.5 Mbps -88 dBm for 2 Mbps -90 dBm for 1 Mbps
Security	WEP, WEP 64, WEP128, WPA-PSK, WPA-LEAP WPA-PSK, and LEAP standard encryption, 64 or 128 bits
Antenna	One U.FL coaxial connector, 50Ω, supports receive diversity
Operating Temperature	Industrial: -40°C – +85°C (see Note 1 below) (Meets IEEE 802.11 industrial temperature range)

Note 1: Temperatures above +80°C reduce wireless performance. Module operates from -40°C cold start.



The Communications Card is designed to prevent damage to sensitive components due to electrostatic discharge during normal operation; however, when handling the card take proper static-control precautions to prevent damage.

Optimize Your Wireless Network

For the best wireless coverage, consider where you place the access point, where you place the adapters, and how you adjust the antennas. Some recommendations are:

- Position the access point in line of sight to the wireless adapters, and in a central location within the area to be used for wireless communications. Try to position the access point in a place that is higher than networked computers and equipment.
- Position the access point away from other radio equipment operating at a frequency of 2.4 gigahertz (GHz), such as microwave ovens and cordless telephones.
- Keep your wireless equipment away from large metallic objects, such as computer cases, display monitors, and appliances, as well as other electromagnetic devices, such as televisions, radios, cordless telephones, and microwave ovens that might interfere with wireless transmissions.

Position your wireless equipment so that large masonry structures, such as fireplaces, are not obstructing the radio path. Building construction, such as metal framing, ultraviolet-resistant window film, metallic paint, concrete or masonry walls, or multiple floors and walls reduce radio signal strength.

