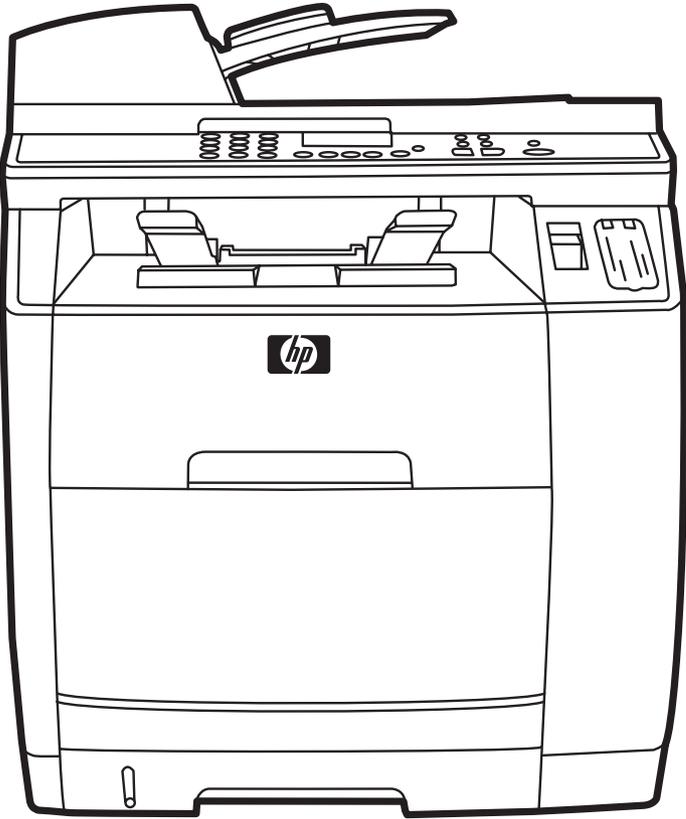


# HP Color LaserJet 2820/2830/2840 Advanced Networking Reference Guide





HP Color LaserJet 2820/2830/2840 all-in-one

## **Advanced Networking Reference Guide**

---

## Copyright and License

© 2004 Copyright Hewlett-Packard Development Company, LP

Reproduction, adaptation, or translation without prior written permission is prohibited, except as allowed under the copyright laws.

The information contained in this document is subject to change without notice.

The only warranties for HP products and services are set forth in the express warranty statements accompanying such products and services. Nothing herein should be construed as constituting an additional warranty. HP shall not be liable for technical or editorial errors or omissions contained herein.

Part number Q3948-90947

Edition 1, 12/2004

## FCC Requirements (United States)

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

Reorient or relocate the receiving antenna.

Increase separation between equipment and receiver.

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

Consult your dealer or an experienced radio/TV technician.

Any changes or modifications to the printer that are not expressly approved by HP could void the user's authority to operate this equipment.

Use of a shielded interface cable is required to comply with the Class B limits of Part 15 of FCC rules.

This equipment complies with FCC rules, Part 68. On the back of this equipment is a label that contains, among other information, the FCC registration number and ringer equivalence number (REN) for this equipment. If requested, this information must be provided to the telephone company. The REN is used to determine the quantity of devices which may be connected to the telephone line. Excessive RENs on the telephone line may result in the devices not ringing in response to an incoming call. In most, but not all, areas, the sum of the RENs should not exceed five (5.0). To be certain of the number of devices that may be connected to the line, as determined by the total RENs, contact the telephone company to determine the maximum REN for the calling area.

This equipment uses the following USOC jacks: RJ11C.

An FCC-compliant telephone cord and modular plug is provided with this equipment. This equipment is designed to

be connected to the telephone network or premises wiring using a compatible modular jack which is Part 68 compliant. This equipment cannot be used on telephone company-provided coin service. Connection to Party Line Service is subject to state tariffs. If this equipment causes harm to the telephone network, the telephone company will notify you in advance that temporary discontinuance of service may be required. If advance notice is not practical, the telephone company will notify the customer as soon as possible. Also, you will be advised of your right to file a complaint with the FCC if you believe it is necessary. The telephone company may make changes in its facilities, equipment, operations, or procedures that could affect the operation of the equipment. If this happens, the telephone company will provide advance notice in order for you to make the necessary modifications in order to maintain uninterrupted service. If trouble is experienced with this equipment, please see the numbers in the front of this manual for repair and (or) warranty information. If the trouble is causing harm to the telephone network, the telephone company may request you remove the equipment from the network until the problem is resolved. The following repairs can be done by the customer: Replace any original equipment that came with the device. This includes the print cartridge, the supports for trays and bins, the power cord, and the telephone cord. It is recommended that the customer install an AC surge arrestor in the AC outlet to which this device is connected. This is to avoid damage to the equipment caused by local lightning strikes and other electrical surges.

## Trademark Credits

Adobe Photoshop® and PostScript are trademarks of Adobe Systems Incorporated.

Corel® is a trademark or registered trademark of Corel Corporation or Corel Corporation Limited.

Microsoft®, Windows®, and Windows NT® are U.S. registered trademarks of Microsoft Corporation.

UNIX® is a registered trademark of The Open Group.

ENERGY STAR® and the ENERGY STAR logo® are U.S. registered marks of the United States Environmental Protection Agency. Details on the proper use of the marks are explained in the "Guidelines for Proper use of the ENERGY STAR® Name and International Logo."





# Table of contents

## 1 Networking

Set up the device and use it on the network .....	2
To configure a network port-connected device configuration (direct mode or peer-to-peer printing) .....	2
To configure a direct-connected shared device (client server printing) .....	3
To change from a direct-connected shared device to a network port-connected device configuration .....	3
Using the embedded Web server or HP Toolbox .....	4
Set my network password .....	5
Using the printer control panel .....	6
Network configuration page .....	6
Configuration page .....	6
IP configuration .....	6
Link speed and duplex settings .....	7
Supported network protocols .....	8
TCP/IP configuration .....	10
Server-based, AutoIP, and manual TCP/IP configuration .....	10
Server-based TCP/IP configuration .....	10
Default IP address configuration (AutoIP) .....	10
TCP/IP configuration tools .....	11
Using BOOTP .....	12
Why use BOOTP? .....	12
BOOTP on UNIX .....	12
Using DHCP .....	15
UNIX systems .....	15
Windows systems .....	15
NetWare systems .....	18
To discontinue DHCP configuration .....	18
Configuring for LPD printing .....	19
Introduction .....	19
LPD setup overview .....	20
LPD on UNIX systems .....	21
LPD on Windows NT/2000 systems .....	23
LPD on Windows XP systems .....	26
LPD on Mac OS systems .....	28
TCP/IP .....	30
Introduction .....	30
IP address .....	30
Configuring IP parameters .....	32
Subnets .....	33
Gateways .....	33
Troubleshooting .....	35
Verifying that the printer is on and online .....	35

Resolving communication problems with the network.....35

**Index**

# 1

# Networking

This section provides information about using your printer on a network.

- [Set up the device and use it on the network](#)
- [Using the embedded Web server or HP Toolbox](#)
- [Set my network password](#)
- [Using the printer control panel](#)
- [Supported network protocols](#)
- [TCP/IP configuration](#)
- [Using BOOTP](#)
- [Using DHCP](#)
- [Configuring for LPD printing](#)
- [TCP/IP](#)
- [Troubleshooting](#)

---

**NOTE**

Configuring TCP/IP settings are complicated and should only be performed by experienced network administrators. BOOTP will require a (PC, Unix, Linux, and so on.) server to configure specific TCP/IP settings for the product. DHCP will also require a server, but the TCP/IP settings will not be fixed for the device. Finally, the manual method to configure specific TCP/IP settings can be done from the control panel or the embedded Web server. For additional help or network configuration, contact your network provider.

---

## Set up the device and use it on the network

Hewlett-Packard recommends that you use the HP software installer on the CD-ROMs that came with the device to set up printer drivers for the following network setups.

### To configure a network port-connected device configuration (direct mode or peer-to-peer printing)

In this configuration, the device is connected directly to the network, and all computers on the network print directly to the device.

---

#### NOTE

This mode is the recommended network configuration for the device.

1. Connect the device directly to the network by inserting a network cable into the device network port.
2. At the device, use the control panel to print a Configuration page.
3. Insert the device CD-ROM into your computer. If you have already set up your device, click **Install Software** to start the software installer. If the software installer does not start, navigate to the hpsetup.exe file on the CD-ROM and double-click the file.
4. Click **Install HP Color LaserJet Software**.
5. On the **Welcome** screen, click **Next**.
6. On the **Installer updates** screen, click **Yes** to search for installer updates on the Web.
7. For Windows 2000/XP, on the **Installation Options** screen, choose the installation option. Hewlett-Packard recommends a typical installation, if your system supports it.
8. On the **License Agreement** screen, read the license agreement, indicate that you accept the terms, and then click **Next**.
9. For Windows 2000/XP, on the **HP Extended Capabilities** screen, choose whether you want extended capabilities, and then click **Next**.
10. On the **Destination Folder** screen, choose the destination folder, and then click **Next**.
11. On the **Ready to Install** screen, click **Next** to begin installation.

---

#### NOTE

If you want to change your settings, instead of clicking **Next**, click **Back** to return to previous screens, and then change the settings.

12. On the **Connection Type** screen, select **Through the network**, and then click **Next**.
13. On the **Identify Printer** screen, identify the device either by searching or by specifying a hardware or IP address, which is listed on the Configuration page you printed earlier. In most cases an IP address is assigned, but you can change it if you want by clicking **Specify the printer by Address** on the **Identify Printer** screen. Click **Next**.
14. Allow the installation process to complete.

## To configure a direct-connected shared device (client server printing)

In this configuration, the device is connected to a computer through a USB cable, the computer is connected to the network, and the device is shared with other computers on the network.

1. Insert the device CD-ROM into your computer. If you have already set up your device, click **Install Software** to start the software installer. If the software installer does not start, navigate to the hpsetup.exe file on the CD-ROM and double-click the file.
2. Click **Install HP Color LaserJet Software**.
3. On the **Welcome** screen, click **Next**.
4. On the **Installer updates** screen, click **Yes** to search for installer updates on the Web.
5. For Windows 2000, on the **Installation Options** screen, choose the installation option. Hewlett-Packard recommends a typical installation, if your system supports it.
6. On the **License Agreement** screen, read the license agreement, indicate that you accept the terms, and then click **Next**.
7. For Windows 2000, on the **HP Extended Capabilities** screen, choose whether you want extended capabilities, and then click **Next**.
8. On the **Destination Folder** screen, choose the destination folder, and then click **Next**.
9. On the **Ready to Install** screen, click **Next** to begin installation.

---

### NOTE

---

If you want to change your settings, instead of clicking **Next**, click **Back** to return to previous screens, and then change the settings.

10. On the **Connection Type** screen, select **Directly to this computer**, and then click **Next**.
11. Connect the USB cable.
12. Allow the installation process to complete.
13. On the Windows taskbar, click **Start**, click **Settings**, and then click **Printers**.
  - In Windows XP, click **Start**, click **Control Panel**, and then double-click **Printers and Faxes**.
14. In the dialog box, right-click the device, and then click **Sharing**.
15. Select **Share this printer**, type the printer name if necessary, and then click **OK**.

## To change from a direct-connected shared device to a network port-connected device configuration

To change from a direct connection to a network configuration, complete the following steps.

1. Uninstall the printer driver for the direct connect device.
2. Install the driver as a network configuration by using the steps in [To configure a network port-connected device configuration \(direct mode or peer-to-peer printing\)](#).

## Using the embedded Web server or HP Toolbox

You can use the embedded Web server (EWS) or HP Toolbox to view or change your IP configuration settings. To access the embedded Web server, type the IP address for the device in the address line of the browser.

You can view HP Toolbox when the device is directly connected to your computer or when it is connected to the network. You must perform a complete software installation to use HP Toolbox.

Open HP Toolbox in one of these ways:

- In the Windows system tray, double-click the HP Toolbox Device Status and Alerts icon.
- On the Windows **Start** menu, click **Programs** (or **All Programs** in Windows XP), click **HP**, click **HP Color LaserJet 2820/2830/2840**, and then click **HP Toolbox**.

In HP Toolbox, click **Device Settings**, and then click the **Network Settings** tab.

From the **Networking** tab (EWS) or the **Network Settings** tab (HP Toolbox), you can change the following configurations:

- Host Name
- Manual IP Address
- Manual Subnet Mask
- Manual Default Gateway

---

### NOTE

Changing the network configuration may require you to change the browser URL before you can communicate with the printer again. The printer will be unavailable for a few seconds while the network resets.

## Set my network password

Use HP Toolbox to set a network password.

1. Open HP Toolbox and click **Device Settings**.
2. Click the **Network Settings** tab.

---

### NOTE

---

If a password has been set for the device previously, you will be prompted to type the password. Type the password, and then click **Apply**.

3. Click **Password**.
4. In the **Password** box, type the password you want to set, and then in the **Confirm password** box, type the same password again to confirm your choice.
5. Click **Apply** to save the password.

## Using the printer control panel

The HP Color LaserJet 2820/2830/2840 all-in-one allows you to set up an IP address automatically using BOOTP or DHCP. For more information, see [Default IP address configuration \(AutoIP\)](#).

### Network configuration page

The Network configuration page lists the current settings and properties of the device. To print the Network configuration page from the device, complete the following steps.

1. On the control panel menu, press **MENU**.
2. Use the < or the > button to select **Reports**, and then press **ENTER**.
3. Use the < or the > button to select **Network Report**, and then press **ENTER**.

### Configuration page

The Configuration page lists the current settings and properties of the device. You can print a Configuration page from the device or HP Toolbox. To print the Configuration page from the device, complete the following steps.

1. On the control panel menu, press **MENU**.
2. Use the < or the > button to select **Reports**, and then press **ENTER**.
3. Use the < or the > button to select **Config report**, and then press **ENTER**.

A second page also prints. On that page, the **Fax Settings** and **Imaging Settings** sections provide details about the device fax settings (HP Color LaserJet 2830/2840 all-in-one models only) and memory card settings (HP Color LaserJet 2840 all-in-one only).

### IP configuration

You can configure the IP address manually or automatically.

#### Manual configuration

1. On the control panel menu, press **MENU**.
2. Use the < or the > button to select **Network config**, and then press **ENTER**.
3. Use the < or the > button to select **TCP/IP config**, and then press **ENTER**.
4. Use the < or the > button to select **Manual**, and then press **ENTER**.
5. Use the alphanumeric keypad to type the IP address, and then press **ENTER**.
6. If the IP address shown on the control-panel display is correct, press **ENTER**, and then repeat step 5 for the subnet mask and default gateway settings.

If the IP address is incorrect, use the < or the > button to select **NO**, and then press **ENTER**. Repeat step 5 with the correct IP address, and then repeat step 5 for the subnet mask and default gateway settings.

## Automatic configuration

1. On the control panel menu, press **MENU**.
2. Use the < or the > button to select **Network config**, and then press **ENTER**.
3. Use the < or the > button to select **TCP/IP config**, and then press **ENTER**.
4. Use the < or the > button to select **Automatic**, and then press **ENTER**.

It may take several minutes before the automatic IP address is ready for use.

---

### NOTE

---

If you want to disable or enable specific automatic IP modes (such as BOOTP, DHCP, or AutoIP), these settings can be changed by using the embedded Web server or HP Toolbox only.

## Link speed and duplex settings

---

### NOTE

---

Incorrect changes to the link speed and duplex settings might prevent the printer from communicating with other network devices. For most situations, the printer should be left in automatic mode. Also note that changes will cause the printer to power cycle. Changes should only be made while the printer is idle.

1. On the control panel menu, press **MENU**.
2. Use the < or the > button to select **Network config**, and then press **ENTER**.
3. Use the < or the > button to select **Link Speed**, and then press **ENTER**.
4. Use the < or the > button to select one of the following settings.
  - 10T Full
  - 10T Half
  - 100T Full
  - 100T Half

---

### NOTE

---

The setting must match with the network device to which you are connecting (a network hub, switch, gateway, router, or computer).

5. Press **ENTER**. The printer will power cycle.

## Supported network protocols

The HP Color LaserJet 2820/2830/2840 all-in-one supports the TCP/IP network protocol. It is the most widely used and accepted networking protocol. Many networking services utilize this protocol. The following table lists the networking services/protocols that are supported on the HP Color LaserJet 2820/2830/2840 all-in-one.

The following operating systems support network printing:

- Windows 98 SE
- Windows Me
- Windows 2000
- Windows XP
- Macintosh OS X v10.2 and later

### Printing

Service name	Description
port9100 (Direct Mode)	Printing service
Line printer daemon (LPD)	Printing service

### Network device discovery

Service name	Description
SLP (Service Location Protocol)	Device Discovery Protocol, used to help find and configure network devices. Used primarily by Microsoft based applications.
mDNS (multicast Domain Name Service - commonly referred to as Rendezvous)	Device Discovery Protocol, used to help find and configure network devices. Used primarily by Apple Macintosh based Applications.

### Messaging and management

Service name	Description
HTTP (Hyper Text Transfer Protocol)	Allows web browsers to communicate with embedded Web server.
EWS (embedded Web server)	Allows a user to manage the device through a web browser.
SNMP (Simple Network Management Protocol)	Used by network applications for device management. SNMP v1 and standard MIB-II (Management Information Base) objects are supported.

## IP addressing

Service name	Description
DHCP (Dynamic Host Configuration Protocol)	For Automatic IP address assignment. DHCP server provides device with IP address. Generally requires no user intervention for printer to obtain IP address from a DHCP server.
BOOTP (Bootstrap Protocol)	For Automatic IP address assignment. BOOTP server provides device with IP address. Requires administrator to input devices MAC hardware address on BOOTP server in order for printer to obtain an IP address from that server.
Auto IP	For Automatic IP address assignment. If neither a DHCP server nor a BOOTP server is present, this service allows the printer to generate a unique IP address.

## TCP/IP configuration

To operate properly on a TCP/IP network, the printer must be configured with valid TCP/IP network configuration parameters, such as an IP address that is valid for your network.

---

### CAUTION

---

Changes to these settings might result in a loss of functionality with your device. For example, network scanning, network faxing, or HP Web JetAdmin might stop working with certain settings changes.

### Server-based, AutoIP, and manual TCP/IP configuration

When in a factory-default state and powered on, the printer will first try to obtain its TCP/IP configuration using a server-based method, such as BOOTP or DHCP. If the server-based method fails, the printer will then be configured using the AutoIP protocol. The printer may also be configured manually. Manual-based tools include a Web browser, the printer control panel, or the HP Toolbox utility. TCP/IP configuration values assigned manually will be retained when the printer is powered off/on. The printer can also be reconfigured to use either server-based only (BOOTP and/or DHCP), and/or AutoIP only, or manual configuration of TCP/IP settings at any time.

### Server-based TCP/IP configuration

In its factory-default state, the printer will first try BOOTP. If this fails it will then try DHCP. If this fails, it will then obtain an IP address via AutoIP. In addition, a default IP address will not be assigned if a network cable is not attached to the printer.

### Default IP address configuration (AutoIP)

A default IP address will be assigned via the AutoIP protocol if the server based methods fail. When DHCP or BOOTP fails to obtain an IP address, the printer uses a link-local addressing technique to assign a unique IP address. Link-local addressing may be referenced as AutoIP. The IP address assigned will be in the range of 169.254.1.0 to 169.254.254.255 (commonly referenced as 169.254/16), and should be valid. However, it can be further modified for your network using supported TCP/IP configuration tools if necessary. With link-local addresses, subnetting is not used. The subnet mask will be 255.255.0.0, and cannot be changed. Link-local addresses will not route off the local link, and access to or from the Internet will not be available. The default gateway address will be the same as the link-local address. If a duplicate address is sensed, the printer will automatically reassign its address, if necessary, in accordance with standard link-local addressing methods. The IP address configured on your printer may be determined by inspecting the network configuration page for the printer. Since it may take some time for the server-based protocols to time out, the AutoIP process can be sped up by disabling the BOOTP and DHCP services on the printer. This can be done via a Web browser.

## TCP/IP configuration tools

Depending on your printer and operating system, the printer can be configured with valid TCP/IP parameters for your network in the following ways:

- Using Software—You can use the HP Toolbox software, or you can use the device Embedded Web server by entering the IP address in your Web browser.
- BOOTP—You can download the data from a network-based server using BOOTP (Bootstrap Protocol) each time the printer is turned on. The BOOTP daemon, `bootpd`, must be running on a BOOTP server that is accessible by the printer.
- DHCP—You can use Dynamic Host Configuration Protocol (DHCP). This protocol is supported in HP-UX, Solaris, Red Hat Linux, SuSE Linux, Windows NT/2000/XP, NetWare and Mac systems. (Refer to your network operating system manuals to verify that your server operating system supports DHCP.)

---

### NOTE

Linux and UNIX systems: For more information, see the `BOOTPD` man page. On HP-UX systems, a sample DHCP configuration file (`dhcptab`) may be located in the `/etc` directory. Since HP-UX presently does not provide Dynamic Domain Name Services (DDNS) for its DHCP implementations, HP recommends that you set all printer lease durations to **infinite**. This ensures that printer IP addresses remain static until such time as Dynamic Domain Name Services are provided.

---

## Using BOOTP

BOOTP (Bootstrap Protocol) provides a convenient way to automatically configure the printer for TCP/IP network operation. When powered on, printer sends a BOOTP request message onto the network. A properly configured BOOTP server on the network will respond with a message that contains basic network configuration data for printer. The BOOTP server's response may also identify a file that contains extended configuration data for the print server. The TFTP protocol (which is not a supported feature for this printer) is required to download this. Thus, the TFTP configuration file that may be located on the BOOTP server, or a separate TFTP server will be ignored. BOOTP servers are typically UNIX or Linux systems. Windows NT/2000/XP and NetWare servers can respond to BOOTP requests. Windows NT/2000/XP servers are configured through Microsoft DHCP services. For setup of NetWare BOOTP servers, refer to your NetWare documentation.

---

### NOTE

If the printer and the BOOTP/DHCP server are located on different subnets, IP configuration may fail unless the routing device supports "BOOTP Relay" (allows the transfer of BOOTP requests between subnets).

## Why use BOOTP?

Using BOOTP to download configuration data has the following benefits:

- Enhanced configuration control of the printer. Configuration by other methods, such as a printer control panel, are limited to select parameters.
- Ease of configuration management. Network configuration parameters for the entire network can be in one location.
- Ease of printer configuration. Complete network configuration can be automatically downloaded each time the printer is powered on.

---

### NOTE

BOOTP operation is similar to DHCP, but the resulting IP parameters will be the same when powered off/on. In DHCP, IP configuration parameters are leased and may change over time. When in its factory-default state and powered on, the printer will attempt to automatically configure itself using several dynamic methods, one of which is BOOTP.

## BOOTP on UNIX

This section describes how to configure the print server using BOOTP (Bootstrap Protocol) services on UNIX servers. BOOTP is used to download network configuration data from a server to the printer over the network.

## Systems that use Network Information Service (NIS)

If your system uses NIS, you may need to rebuild the NIS map with the BOOTP service before performing the BOOTP configuration steps. Refer to your system documentation.

## Configuring the BOOTP server

For the printer to obtain its configuration data over the network, the BOOTP server must be set up with the appropriate configuration files. BOOTP is used by the printer to obtain configuration data located in the `/etc/bootptab` file on a BOOTP server. When the printer is powered on, it broadcasts a BOOTP request that contains its MAC (hardware) address. A BOOTP server daemon searches the `/etc/bootptab` file for a matching MAC address, and if successful, sends the corresponding configuration data to the printer as a BOOTP reply. The configuration data in the `/etc/bootptab` file must be properly entered. The BOOTP reply may contain the name of a configuration file containing optional enhanced configuration parameters. Again, this file will be ignored by the printer.

---

### NOTE

---

HP recommends that the BOOTP server be located on the same subnet as the printers it serves.

---

### NOTE

---

BOOTP broadcast packets may not be forwarded by routers unless the routers are properly configured.

## Bootptab file entries

An example of a `/etc/bootptab` file entry for a networked printer is shown below. Note that the configuration data contains tags to identify the various printer parameters and their settings.

Entries and tags supported are listed in the [Tags supported in a BOOTP/DHCP boot file](#) table.

```
picasso:\
:hn:\
:ht=ether:\
:vm=rfc1048:\
:ha=0001E6123456:\
:ip=192.168.40.39:\
:sm=255.255.255.0:\
:gw=192.168.40.1:\
:lg=192.168.40.3:\
:T144= hnpn/picasso.cfg :
```

## Tags supported in a BOOTP/DHCP boot file

Option	Description
Nodename	The name of the peripheral. This name identifies an entry point to a list of parameters for a specific peripheral. Nodename must be the first field in an entry. (In the example above, nodename is "picasso".)
ht	The hardware type tag. For the printer, set this to <b>ether</b> for Ethernet. This tag must precede the <b>ha</b> tag.

**Tags supported in a BOOTP/DHCP boot file (continued)**

Option	Description
vm	The BOOTP report format tag (required). Set this parameter to <b>rfc1048</b> .
ha	The hardware address tag. The hardware (MAC) address is the link-level, or station address of the printer. It can be found on the printer network configuration page as the <b>HARDWARE ADDRESS</b> .
ip	The IP address tag (required). This address will be the printer's IP address.
sm	The subnet mask tag. The subnet mask will be used by the printer to identify the portions of an IP address that specify the network/subnetwork number and the host address.
gw	The gateway IP address tag. This address identifies the IP address of the default gateway (router) that the printer will use for communications with other subnets.
ds	DNS (Domain Name System) server's IP address tag. Only a single name server can be specified.
lg	The syslog server's IP address tag. It specifies the server that the printer sends syslog messages to.
hn	The host name tag. This tag does not take a value but causes the BOOTP daemon to download the host name to the printer. The host name will be printed on the printer network configuration page, or returned an SNMP sysName request by a network application.
dn	Domain name tag. Specifies the domain name for the printer (for example, <a href="http://support.hp.com">support.hp.com</a> ). It does not include the host name; it is not the Fully Qualified Domain Name (such as <a href="http://printer1.support.hp.com">printer1.support.hp.com</a> ).
tr	DHCP T1 timeout, specifying the DHCP lease renewal time (seconds).
tv	DHCP T2 timeout, specifying the DHCP lease rebind time (seconds).

**NOTE**

A colon (:) indicates the end of a field, and a backslash (\) indicates that the entry is continued on the next line. Spaces are not allowed between the characters on a line. Names, such as host names, must begin with a letter and can contain only letters, numbers, periods (for domain names only), or hyphens. The underline character () is not allowed. Refer to your system documentation or online help for more information.

## Using DHCP

Dynamic Host Configuration Protocol (DHCP, RFC 2131/2132) is one of several auto configuration mechanisms that the printer uses. If you have a DHCP server on your network, the printer automatically obtains its IP address from that server.

---

**NOTE**

---

DHCP services must be available on the server. Refer to your system documentation or online help to install or enable DHCP services.

---

**NOTE**

---

If the printer and BOOTP/DHCP server are located on different subnets, IP configuration may fail unless the routing device allows the transfer of DHCP requests between subnets.

### UNIX systems

For more information on setting up DHCP on UNIX systems, see the BOOTPD man page. On HP-UX systems, a sample DHCP configuration file (dhcptab) may be located in the /etc directory. Since HP-UX presently does not provide Dynamic Domain Name Services (DDNS) for its DHCP implementations, HP recommends that you set all print server lease durations to **infinite**. This ensures that print server IP addresses remain static until Dynamic Domain Name Services are provided.

### Windows systems

The printer supports IP configuration from a Windows NT/2000/XP DHCP server. This section describes how to set up a pool, or “scope,” of IP addresses that the Windows server can assign or lease to any requester. When configured for BOOTP or DHCP operation and powered on, the printer automatically sends a BOOTP or DHCP request for its IP configuration. If properly set up, a Windows DHCP server will respond with the print server’s IP configuration data.

---

**NOTE**

---

This information is provided as an overview. For specific information or for additional support, see the information supplied with your DHCP server software.

---

**NOTE**

---

To avoid problems resulting from IP addresses that change, HP recommends that all printers be assigned IP addresses with infinite leases or reserved IP addresses.

### Windows NT 4.0 Server

To set up a DHCP scope on a Windows NT 4.0 server, perform the following steps:

1. At the Windows NT server, open the Program Manager window and double-click the **Network Administrator** icon.
2. Double-click the **DHCP Manager** icon to open this window.
3. Select **Server** and select **Server Add**.
4. Type the server IP address, then click **OK** to return to the DHCP Manager window.
5. In the list of DHCP servers, click on the server you have just added, then select **Scope** and select **Create**.

6. Select **Set up the IP Address Pool**. In the IP Address Pool section, set up the IP address range by typing the beginning IP address in the Start Address box and the ending IP address in the End Address box. Also type the subnet mask for the subnet to which the IP address pool applies. The starting and ending IP addresses define the end points of the address pool assigned to this scope.

---

**NOTE**

If desired, you can exclude ranges of IP addresses within a scope.

7. In the Lease Duration section, select **Unlimited**, then select **OK**. HP recommends that all printers be assigned infinite leases to avoid problems resulting from IP addresses that change. Be aware, however, that selecting an unlimited lease duration for the scope causes all clients in that scope to have infinite leases. If you want clients on your network to have finite leases, you can set the duration to a finite time, but you should configure all printers as reserved clients for the scope.
8. Skip this step if you have assigned unlimited leases in the previous step. Otherwise, select **Scope** and select **Add Reservations** to set up your printers as reserved clients. For each printer, perform the following steps in the Add Reserved Clients window to set up a reservation for that printer:
  - a. Type the selected IP address.
  - b. Obtain the MAC address or hardware address from the configuration page, and type this address in the Unique Identifier box.
  - c. Type the client name (any name is acceptable).
  - d. Select **Add** to add the reserved client. To delete a reservation, in the DHCP Manager window, select **Scope** and select **Active Leases**. In the Active Leases window, click on the reservation you want to delete and select **Delete**.
9. Select **Close** to return to the DHCP Manager window.
10. Skip this step if you are not planning to use WINS (Windows Internet Naming Service). Otherwise perform the following steps when configuring your DHCP server:
  - a. From the DHCP Manager window, select DHCP Options and select one of the following:
    - Scope—if you want Name Services only for the selected scope.
    - Global—if you want Name Services for all scopes.
  - b. Add the server to the Active Options list. From the DHCP Options window, select **WINS/NBNS Servers (044)** from the Unused Options list. Select **Add**, then select **OK**. A warning may appear requesting that you set the node type. You do this in step 10d.
  - c. You must now provide the IP address of the WINS server by doing the following:
    - Select **Value**, then **Edit Array**.
    - From the IP Address Array Editor, select **Remove** to delete any undesired addresses previously set. Then type in the IP address of the WINS server and select **Add**.
    - Once the address appears in the list of IP addresses, select **OK**. This returns you to the DHCP Options window. If the address you have just added appears in the list of IP addresses (near the bottom of the window) go to step 10d. Otherwise, repeat step 10c.

- d. In the DHCP Options window, select **WINS/NBT Node Type (046)** from the **Unused Options** list. Select **Add** to add the node type to the **Active Options** list. In the Byte box, type 0x4 to indicate a mixed node, and select **OK**.
11. Click **Close** to exit to Program Manager.

## Windows 2000 Server

To set up a DHCP scope on a Windows 2000 server, perform the following steps:

1. Run the Windows 2000 DHCP manager utility. Click **Start**, then select **Settings** and **Control Panel**. Open the **Administrative Tools** folder and run the DHCP utility.
2. In the DHCP window, locate and select your Windows 2000 server in the DHCP tree. If your server is not listed in the tree, select **DHCP** and click the **Action** menu to add the server.
3. After selecting your server in the DHCP tree, click the **Action** menu and select **New Scope**. This runs the Add New Scope Wizard.
4. In the Add New Scope Wizard, click **Next**.
5. Enter a Name and Description for this scope, then click **Next**.
6. Enter the range of IP addresses for this scope (beginning IP address and ending IP address). Also, enter the subnet mask. Then click **Next**.

---

### NOTE

---

If subnetting is used, the subnet mask defines which portion of an IP address specifies the subnet and which portion specifies the client device.

7. If applicable, enter the range of IP addresses within the scope to be excluded by the server. Then click **Next**.
8. Set the IP address lease duration for your DHCP clients. Then click **Next**. HP recommends that all printers be assigned reserved IP addresses. This can be accomplished after you set up the scope (see step 11).
9. To configure DHCP options for this scope later, select **No** and then click **Next**. To configure DHCP options now, select **Yes** and click **Next**.
  - a. If desired, specify the IP address of the router (or default gateway) to be used by clients. Then click **Next**.
  - b. If desired, specify the Domain Name and DNS (Domain Name System) servers for clients. Click **Next**.
  - c. If desired, specify the Domain Name and DNS (Domain Name System) servers for clients. Click **Next**.
  - d. Select **Yes** to activate the DHCP options now, and click **Next**.
10. You have successfully set up the DHCP scope on this server. Click **Finish** to close the wizard.
11. Configure your printer with a reserved IP address within the DHCP scope:
  - a. In the DHCP tree, open the folder for your scope and select **Reservations**.
  - b. Click the **Action** menu and select **New Reservation**.

- c. Enter the appropriate information in each field, including the reserved IP address for your printer.

---

**NOTE**

The MAC address for your printer is available on the printer's network configuration page.

- d. Under Supported types, select **DHCP only**, then click **Add**.

---

**NOTE**

---

Selecting Both or BOOTP only will result in a configuration through BOOTP due to the sequence in which the printer initiates configuration protocol requests.

- e. Specify another reserved client, or click **Close**. The reserved clients added will be displayed in the Reservations folder for this scope.

12. Close the DHCP manager utility.

## NetWare systems

NetWare 5.x servers provide DHCP configuration services for network clients, including your HP printer. To set up DHCP services on a NetWare server, refer to Novell documentation and support.

## To discontinue DHCP configuration

---

**CAUTION**

---

Changes to an IP address on your printer may require updates to printer or system printing configurations for clients or servers. If you do not want your printer configured through DHCP, you must reconfigure the printer with a different configuration method. You can manually modify the TCP/IP parameters through a supported Web browser using the printer's embedded Web server, the printer's control panel, or HP Toolbox. If you change to BOOTP configuration, the DHCP-configured parameters are released and the TCP/IP protocol is initialized. If you change to Manual configuration, the DHCP-configured IP address is released and the user-specified IP parameters are used. **Therefore, if you manually provide the IP address, you should also manually set all of the configuration parameters, such as subnet mask and default gateway.**

---

# Configuring for LPD printing

## Introduction

The printer contains an LPD (Line Printer Daemon) Server to support LPD printing. This chapter describes how to configure the printer for use with various systems that support LPD printing. These instructions include:

- LPD on UNIX Systems
  - Configuring BSD-based UNIX systems using LPD
  - Configuring print queues using the SAM utility (HP-UX systems)
- LPD on Windows NT/2000 Systems
- LPD on Mac OS Systems

---

### NOTE

For other systems not listed, refer to your operating system documentation and online help.

Recent versions of Novell NetWare (NetWare 5.x with NDPS 2.1 or greater) support LPD printing. For setup instructions and support, refer to the documentation supplied with NetWare. Also, refer to the Technical Information Documentation (TID) on Novell's support Web site.

---

## About LPD

Line printer daemon (LPD) refers to the protocol and programs associated with line-printer spooling services that may be installed on various TCP/IP systems.

Some of the widely used systems which are supported by your printer using LPD include:

- Berkeley-based (BSD) UNIX systems
- HP-UX
- Solaris
- IBM AIX
- Linux
- Windows NT/2000/XP
- Mac OS

The UNIX configuration examples in this section show the syntax for BSD-based UNIX systems. The syntax for your system may vary. See your system documentation for the correct syntax.

---

### NOTE

The LPD functionality can be used with any host implementation of LPD that complies with the RFC 1179 document. The process for configuring printer spoolers, however, may differ. See your system documentation for information on configuring these systems.

---

The LPD programs and protocol include the following:

## LPD programs and protocols

Program Name	Purpose of Program
lpr	Queues jobs for printing.
lpq	Displays print queues.
lprm	Removes jobs from print queues.
lpc	Controls print queues.
lpd	Scans and prints the files if the specified printer is connected to the system.  If the specified printer is connected to another system, this process forwards the files to an LPD process on the remote system where the files are to be printed.

## Requirements for configuring LPD

Before you can use LPD printing, your printer must be properly connected to the network and have a valid IP address. This information is listed on the printer network configuration page. You must also have the following:

- An operating system that supports LPD printing.
- Superuser (root) or Administrator access to your system.
- The LAN hardware address (or station address) of the print server. This address is printed on the printer network configuration page and is of the form:

HARDWARE ADDRESS: xxxxxxxxxxxx

where x is a hexadecimal digit (for example, 0001E6123ABC).

## LPD setup overview

The following steps are necessary to configure the printer for LPD printing:

1. Setting up IP parameters.
2. Setting up print queues.
3. Printing a test file.

The following sections provide detailed descriptions for each step.

### Step 1. Setting up IP parameters

TCP/IP configuration parameters (such as IP address, subnet mask, default gateway) can be configured on the printer in a variety of ways. These values can be configured manually, or they can be automatically downloaded using DHCP or BOOTP each time the printer is turned on. For more information, see [Configuring IP parameters](#).

## Step 2. Setting up print queues

You must set up a print queue for each printer or printer personality (PCL or PostScript) that you use on the system. The printer supports only one type of queue (raw). Therefore, it does not matter what queue name is given as the printer will treat each one the same. The printer treats data from any source as the same and has no provisions for adding carriage returns, tagging binary Postscript data, special PJI sequences, user-defined strings, etc., to the job stream data. This printer also supports automatic PostScript binary mode stream detection, and thus it does not require (or allow) a special queue type for this service.

## Step 3. Printing a test file

Print a test file by using the LPD commands or by using other methods provided for your OS. For instructions, see the information provided for your system.

## LPD on UNIX systems

### Configuring print queues for BSD-based systems

Edit the `/etc/printcap` file to include the following entries:

```
printer_name|short_printer_name:\
:lp=:\
:rm=node_name:\
:rp=remote_printer_name_argument:\ (this can be any queue name desired by the
user)
:lf=/usr/spool/lpd/error_log_filename:\
:sd=/usr/spool/lpd/printer_name:
```

where `printer_name` identifies the printer to the user, `node_name` identifies the printer on the network, and `remote_printer_name_argument` is the print queue designation.

For more information on `printcap`, see the `printcap` man page.

### Example: Printcap entry printers

```
lj1_raw|raw1:\
:lp=:\
:rm=laserjet1:\
:rp=raw:\
:lf=/usr/spool/lpd/lj1_raw.log:\
:sd=/usr/spool/lpd/lj1_raw:
```

Make sure your users know the printer names for the printers, since they must type those names on the command line for printing.

Create the spooling directory by making the following entries. At the root directory, type:

```

mkdir /usr/spool/lpd
cd /usr/spool/lpd
mkdir printer_name_1 printer_name_2
chown daemon printer_name_1 printer_name_2
chgrp daemon printer_name_1 printer_name_2
chmod g+w printer_name_1 printer_name_2

```

where `printer_name_1` and `printer_name_2` refer to the printers to be spooled. You may spool several printers. The following example shows the command to create the spooling directories for printers used for printing.

### Example: Creating spooling directory

```

mkdir /usr/spool/lpd
cd /usr/spool/lpd
mkdir lj1_raw lj1_raw
chown daemon lj1_raw lj1_raw
chgrp daemon lj1_raw lj1_raw
chmod g+w lj1_raw lj1_raw

```

### Configuring print queues using SAM (HP-UX systems)

On HP-UX systems you can use the SAM utility to configure remote print queues.

Before you execute the SAM program, select an IP address for the printer and set up an entry for it in the `/etc/hosts` file on your system running HP-UX.

1. Start the SAM utility as a superuser.
2. Select **Peripheral Devices** from the **Main** menu.
3. Select **Printers/Plotters** from the **Peripheral Devices** menu.
4. Select **Printers/Plotters** from the **Printers/Plotters** menu.
5. Select **Add a Remote Printer** from the **Actions** list, then select a printer name.

**Examples:** `my_printer` or `printer1`

6. Select a remote system name.
 

**Example:** `hplj1` (node name of the printer)
7. Select a remote printer name, and then type the queue name. (The name can be anything, such as `raw` for example.)
8. Check for a remote printer on a BSD system. You must type `Y`.
9. Click **OK** at the bottom of the menu. If the configuration is successful, the program prints the message:

**The printer has been added and is ready to accept print requests.**

10. Click **OK** and select **Exit** from the **List** menu.

11. Select **Exit Sam**.

---

**NOTE**

---

By default, the lpsched is not running. Make sure you turn the scheduler on when you set up your print queues.

## Printing a test file

To verify that the printer and print server connections are correct, print a test file.

1. At the UNIX system prompt type:

```
lpr -Pprinter_name file_name
```

where `printer_name` is the designated printer and `file_name` refers to the file to be printed.

**Examples** (for BSD-based systems):

```
PostScript File: lpr -Praw1 psfile.ps
```

For HP-UX systems, substitute `lp -d` for `lpr -P`.

2. To get print status, type the following at the UNIX prompt:

```
lpq -Pprinter_name
```

where `printer_name` is the designated printer.

**Examples** (for BSD-based systems):

```
lpq -Praw1
```

For HP-UX systems, substitute `lpstat` for `lpq -P` to get print status.

This completes the process for configuring the printer to use LPD.

## LPD on Windows NT/2000 systems

This section describes how to configure Windows NT/2000 networks to use the printer LPD (Line Printer Daemon) services.

The process consists of two parts:

- Installing TCP/IP software (if not already installed).
- Configuring a network LPD printer.

### Installing TCP/IP software (Windows NT)

This procedure lets you check whether you have TCP/IP installed on your Windows NT system, and to install the software if necessary.

---

**NOTE**

---

You may need your Windows system distribution files or CD-ROMs to install TCP/IP components.

1. To check whether you have Microsoft TCP/IP Printing protocol and TCP/IP printing support:
  - Windows 2000—Click **Start, Settings, Control Panel**. Then double-click the **Network and Dial-up Connections** folder. Double-click the **Local Area Connection** for your network and click **Properties**.  
If Internet Protocol (TCP/IP) is listed and enabled in the list of components used by this connection, the necessary software is already installed. (See [Configuring a network printer for Windows 2000 systems](#).) If not, go to step 2.
  - NT 4.0—Click **Start, Settings, Control Panel**. Then double-click the **Network** option to display the Network dialog box.  
If TCP/IP Protocol is listed in the **Protocols** tab, and Microsoft TCP/IP Printing is listed in the **Services** tab, you have already installed the necessary software. (See [Configuring a network printer for Windows NT 4.0 systems](#).) If not, go to step 2.
2. If you have not previously installed the software:
  - Windows 2000—In the Local Area Connection Properties window, click **Install**. In the Select Network Component Type window, select **Protocol** and click **Add** to add the **Internet Protocol (TCP/IP)**.  
Follow the instructions on the screen.
  - NT 4.0—Click the **Add** button for each tab and install the **TCP/IP Protocol** and the **Microsoft TCP/IP Printing** service.  
Follow the instructions on the screen.  
When prompted, type the full path to the Windows NT distribution files (you may need your Windows NT workstation or server CD-ROM).
3. Enter TCP/IP configuration values for the computer:
  - Windows 2000—On the **General** tab in the Local Area Connection Properties window, select **Internet Protocol (TCP/IP)** and click **Properties**.
  - NT 4.0—You may be automatically prompted for TCP/IP configuration values. If not, select the **Protocols** tab in the Networks window and select **TCP/IP Protocol**. Then click **Properties**.  
If you are configuring a Windows server, type the IP address, default gateway address, and subnet mask in the appropriate spaces.  
If you are configuring a client, check with your network administrator to learn whether you should enable automatic TCP/IP configuration or whether you should type a static IP address, default gateway address, and subnet mask in the appropriate spaces.
4. Click **OK** to exit.
5. If prompted, exit Windows and restart your computer for the changes to take effect.

### **Configuring a network printer for Windows 2000 systems**

Set up the default printer by performing the following steps.

1. Verify that the Print Services for Unix is installed (required for LPR port availability):

- a. Click **Start, Setup**, and **Control Panel**. Double-click the **Network and Dial-up Connections** folder.
  - b. Click the **Advanced** menu and select **Optional Networking Components**.
  - c. Select and enable **Other Network File and Print Services**.
  - d. Click **Details**, and verify that **Print Services for Unix** is enabled. If not, enable it.
  - e. Click **OK**, and then **Next**.
2. Open the **Printers** folder (from the Desktop, click **Start, Settings**, and **Printers**).
  3. Double-click **Add Printer**. From the Add Printer Wizard welcome screen, click **Next**.
  4. Select **Local printer**, and disable automatic detection for Plug and Play printer installation. Click **Next**.
  5. Select **Create a new port**, and select **LPR Port**. Click **Next**.
  6. In the Add LPR compatible printer window:
    - a. Enter the DNS name or IP address of the printer.
    - b. For the name of the printer or print queue on the printer, enter (in lowercase) any queue name desired. (Queue names have no effect on output.)
    - c. Then click **OK**.
  7. Select the manufacturer and printer model. (If necessary, click **Have Disk** and follow the instructions to install the printer driver.) Click **Next**.
  8. Choose to keep the existing driver, if prompted. Click **Next**.
  9. Enter a printer name, and choose whether this printer will be the default printer. Click **Next**.
  10. Choose whether this printer will be available to other computers. If shared, enter a share name that identifies the printer to other users. Click **Next**.
  11. If desired, enter a location and other information for this printer. Click **Next**.
  12. Choose whether to print a test page, and click **Next**.
  13. Click **Finish** to close the wizard.

### **Configuring a network printer for Windows NT 4.0 systems**

At the Windows NT 4.0 system, set up the default printer by performing the following steps.

1. Click **Start**, select **Settings**, and click **Printers**. The Printers window opens.
2. Double-click **Add Printer**.
3. Select **My Computer**, then click **Next**.
4. Click **Add Port**.
5. Select **LPR Port**, and click **New Port**.
6. In the Name or address of server providing lpd box, type the IP address or DNS name of the printer.

---

#### **NOTE**

---

NT clients can enter the IP address or name of the NT server that is configured for LPD printing.

7. In the Name of printer or print queue on that server box, type (in lowercase) the name of the print queue desired. Then click **OK**.
8. Ensure that the port is selected in the **Add Printer** list of the available ports, then click **Next**.
9. Follow the remaining instructions on the screen to complete the configuration.

## Verifying the configuration

From within Windows NT, print a file from any application. If the file prints correctly, the configuration was successful.

If the print job is not successful, try printing directly from DOS using the following syntax:

```
lpr -S<ipaddress> -P<queuename> filename
```

where `ipaddress` is the IP address of the print server, `queuename` is the name of choice (such as "raw"), and `filename` is the file you wish to print. If the file prints correctly, the configuration was successful. If the file does not print, or prints incorrectly, see [Troubleshooting](#).

## Printing from Windows clients

If the LPD printer on the NT/2000 server is shared, Windows clients can connect to the printer on the NT/2000 server using the Windows Add Printer utility in the Printers folder.

## LPD on Windows XP systems

This section describes how to configure Windows XP networks to use the printer LPD (Line Printer Daemon) services.

The process consists of two parts:

- Adding Windows optional networking components
- Configuring a network LPD printer

### Adding Windows optional networking components

1. Click **Start**.
2. Click **Control Panel**.
3. Click **Network and Internet Connections**.
4. Click the **Network Connections** icon.
5. Select **Advanced** in the top menu bar. In the drop-down list, select **Optional Networking Components**.
6. Select **Other Network File and Print Services** and click **Next**. (If you select **Details** before selecting **Next**, you will see "Print Services for UNIX (R)" as a component of Other Network File and Print Services.) The files being loaded will be shown.
7. Close the Network Connections window. LPR port is now an option in the **Properties** of a printer under **Ports, Add Port**.

## Configuring a network LPD printer

### Adding a new LPD printer

1. Open the **Printers** folder (from the desktop, click **Start, Printers and Faxes**).
2. Click **Add Printer**. On the Add Printer Wizard welcome screen, click **Next**.
3. Select **Local printer**, then uncheck the automatic detection for Plug and Play printer installation. Click **Next**.
4. Select **Create a new port**, and select **LPR Port** from the pull-down menu. Click **Next**.
5. In the Add LPR Compatible Printer window, do the following:
  - a. Type the Domain Name System (DNS) name or Internet protocol (IP) address of the printer.
  - b. Type (in lowercase) the name of the print queue. (The name you use is not important.)
  - c. Click **OK**.
6. Select the manufacturer and printer model. (If necessary, click **Have Disk** and follow the instructions to install the printer driver.) Click **Next**.
7. Click **Yes** to keep the existing driver, if prompted. Click **Next**.
8. Type a printer name and (if desired) click this printer as default (if desired). Click **Next**.
9. Select whether to share this printer with other network computers (for example, if your system is a printer server). If shared, type a share name to identify the printer to other users. Click **Next**.
10. If desired, enter a location and other information for this printer. Click **Next**.
11. Click **Yes** to print a test page, then click **Next**.
12. Click **Finish** to close the wizard.

### Creating an LPR port for an installed printer

1. Click **Start, Printers and Faxes**.
2. Right-click the **Printer** icon, and select **Properties**.
3. Select the **Ports** tab and **Add Port**.
4. Select **LPR Port** from the Printer Ports dialog box, and select **New Port**.
5. In the field labeled **Name or address of server providing lpd**, enter the DNS name or IP address of the printer.
6. In the dialog box labeled Name of printer or print queue on that server, (in lowercase) type the name of the print queue for the printer (for example: `raw`, `anything`, etc.).
7. Select **OK**.
8. Select **Close** and **OK** to close the Properties box.

## LPD on Mac OS systems

### Mac OS 9 and earlier versions

The following explains how to configure LPD printers using LaserWriter driver 8.5.1 or later versions to print using LPR.

You may use the Desktop Printer Utility to setup your Mac OS-based computer for LPR printing. The implementation of LPR printing by the LaserWriter 8 driver is compliant with RFC 1179 and should work with any RFC 1179-compliant device. IP printing in LaserWriter 8.5.1 is not available on Mac OS 8.0, but is available on Mac OS 8.1. IP printing is also available when the LaserWriter 8.5.1 printing software is installed on computers running Mac OS 7.5 through Mac OS 7.6.1.

You should also have installed the HP Mac printer support software provided before configuring for LPD so that the proper PPD file is available

### Configuring IP printing

1. Launch the Desktop Printer Utility.
2. Select **Printer (LPR)** and click **OK**. Note that the term LPR is synonymous with LPD.
3. In the PostScript Printer Description (PPD) File section, click on **Change** and select the PPD for your printer.
4. In the LPR section, click on **Change** to bring up the Internet Printer window.
5. Enter the printer IP address or domain name for **Printer Address**.
6. Enter the queue name, if used. Otherwise, leave it blank.
7. Click on **Verify** to verify that the printer was found.
8. Click **OK**.
9. Click the **File** menu and select **Save**.
10. Enter a name and location for the desktop printer icon and click **OK**. The default name is the printer IP address, and the default location is on the desktop.
11. Click **Quit**.

### Mac OS 10.2x and later versions

1. Open the Printer List window from Printer Center (Mac OS X 10.2.8 or earlier) or the Printer Setup Utility (Mac OS X 10.3 Panther or later).
2. Click the **Add Printer** button.
3. Choose **LPR Printers using IP** from the pop-up menu.
4. Enter the printer IP address or DNS name.
5. Leave the checkbox **Use Default Queue on Server** selected.
6. You can select your printer from the **Printer Model** menu (in essence you are selecting the printer PPD file previously installed).
7. Select your printer from the list.

8. Click **Add**.
9. Close the Printer List window.

## Introduction

This section is intended to provide information to help you gain a basic understanding of TCP/IP.

Similar to a common language that people use to communicate with each other, TCP/IP (Transmission Control Protocol/Internet Protocol) is a suite of protocols designed to define the way computers and other devices communicate with each other over a network.

TCP/IP is rapidly becoming the most used set of protocols. The main reason this is happening is the fact that the Internet is based on TCP/IP. If you have a network that you wish to connect to the Internet, you must be using TCP/IP to communicate.

## Internet Protocol (IP)

When information is sent across the network, the data is broken down into small packets. Each packet is sent independently of one another. Each packet is encoded with IP information, such as the IP address of the sender and receiver. IP packets can be routed over routers and gateways, devices that connect a network with other networks.

IP communications is connectionless. When IP packets are sent, there is no guarantee that they arrive at their destination in the proper sequence. That task can be performed by higher level protocols and applications thereby allowing IP communications to be efficient.

Each node or device that will communicate directly onto the network requires an IP address.

## Transmission Control Protocol (TCP)

TCP handles breaking the data into packets and recombining the packets on the receiving end by providing a connection-oriented, reliable, and guaranteed delivery service to another node on the network. When data packets are received at their destination, TCP calculates a checksum for each packet to verify the data is not corrupt. If the data in the packet has been corrupted during transmission, TCP discards the packet and requests that the packet be resent.

## User Datagram Protocol (UDP)

UDP provides similar services to TCP. However, UDP does not acknowledge data receipt and supports request/reply transactions with no added reliability or guarantee of delivery. UDP is used when acknowledgment and reliability are not required, such as during a “discovery broadcast.”

## IP address

Every host (workstation or node) on an IP network requires a unique IP address for each network interface. This address is a software address that is used to identify both the network and specific hosts located on that network. Each IP address can be divided into two separate parts: the network portion and the host portion. It is possible for a host to query a server for a dynamic IP address each time the device boots up (for example, using DHCP and BOOTP).

---

**NOTE**

---

When assigning IP addresses, always consult the IP address administrator. Setting the wrong address can disable other equipment operating on the network or interfere with communications.

### **IP address: network portion**

Network addresses are managed by an organization in Norfolk, Virginia, recognized as InterNIC. InterNIC has been contracted by the National Science Foundation to manage the Internet addresses and domains. Network addresses are distributed to organizations that are in turn responsible for making sure all attached devices or hosts on the network are properly numbered. For more information on the network portion of an IP address, see [IP address structure and class](#) and [Subnets](#) in this section.

### **IP address: host portion**

Host addresses numerically identify specific network interfaces on an IP network. Usually a host has only one network interface; thus, only one IP address. Because no two devices can share the same number at the same time, administrators typically maintain address tables to assure correct assignment of addresses in the host network.

### **IP address structure and class**

An IP address is comprised of 32 bits of information and divided into 4 sections containing 1 byte each section or 4 bytes total:

xxx . xxx . xxx . xxx

For efficiency in routing, networks were broken down into three classes, so routing can begin simply by identifying the leading byte of information in the IP address. The three IP addresses that InterNIC assigns are class A, B, and C. The network class determines what each of the four IP address sections identify as shown below:

#### **IP address class format**

<b>Class</b>	<b>First Address Byte xxx.</b>	<b>Second Address Byte xxx.</b>	<b>Third Address Byte xxx.</b>	<b>Fourth Address Byte xxx</b>
A	Network.	Host.	Host.	Host.
B	Network.	Network.	Host.	Host.
C	Network.	Network.	Network.	Host.

As illustrated in [Network class characteristics](#), each network class differs by the leading bit identifier, the address range, the number of each type available, and the maximum number of hosts each class allows.

## Network class characteristics

Class	Network Class Characteristics	Address Range	Maximum Number of Networks in the Class	Maximum Hosts in the Network
A	0	0.0.0.0 to 127.255.255.255.	126.	Over 16 Million.
B	10.	128.0.0.0 to 191.255.255.255.	16,382.	65,534.
C	110.	192.0.0.0 to 223.255.255.255.	Over 2 Million.	254.

## Configuring IP parameters

TCP/IP configuration parameters (such as IP address, subnet mask, default gateway) can be configured on the printer in a variety of ways. These values can be configured manually (for example, through Telnet, the embedded Web server, the arp and ping commands, and HP management software), or they can be automatically downloaded using DHCP or BOOTP each time the printer is turned on.

When powered on, a new printer that is unable to retrieve a valid IP address from the network will automatically assign itself a default IP address. The default IP address will depend on the type of network to which the printer is connected. On a small private network, a technique called link-local addressing is used to assign a unique IP address in the range of 169.254.1.0 to 169.254.254.255, which should be valid. On a large or enterprise network, a temporary address of 192.0.0.192 will be assigned until it is properly configured for your network. The IP address configured on your printer may be determined by inspecting the printer Configuration page.

## Dynamic Host Configuration Protocol (DHCP)

DHCP allows a group of devices to use a set of IP addresses that are maintained by a DHCP server. The device or host sends a request to the server, and if an IP address is available, the server assigns it to that device.

## BOOTP

BOOTP is a bootstrap protocol used to download configuration parameters and host information from a network server. BOOTP uses UDP for its transport. In order for devices to boot and load configuration information into RAM, they must communicate through the bootstrap protocol BOOTP as a client with their server.

To configure the device, the client broadcasts a boot request packet containing at least the hardware address of the device (printer hardware address). The server answers with a boot reply packet containing the information the device needs to configure.

## Subnets

When an IP network address for a particular network class is assigned to an organization, no provision is made for more than one network being present at that location. Local network administrators use subnets to partition a network into several different subnetworks. Splitting a network into subnets can result in better performance and improved use of limited network address space.

### Subnet mask

The subnet mask is a mechanism used to divide a single IP network into several different subnetworks. For a given network class, a portion of an IP address that would normally be used to identify a node is used, instead, to identify a subnetwork. A subnet mask is applied to each IP address to specify the portion used for subnetworks, and the portion used to identify the node. For example, see [Example: Subnet mask 255.255.0.0 applied to class A network](#).

#### Example: Subnet mask 255.255.0.0 applied to class A network

Class A Network Address	Network 15	xxx	xxx	xxx
Subnet Mask	255	255	0	0
IP Address fields with Subnet Mask applied	Network	Subnet	Host	Host
Example of a node's IP Address on Subnet 1	15	1	25	7
Example of a node's IP Address on Subnet 254	15	254	64	2

As illustrated in [Example: Subnet mask 255.255.0.0 applied to class A network](#), the Class A IP network address "15" has been assigned to company ABC. To allow additional networks at company ABC's site, the subnet mask of 255.255.0.0 is used. This subnet mask specifies that the second byte of the IP address will be used to identify up to 254 subnets. Using this designation, each device is uniquely identified on its own subnet, but company ABC can incorporate up to 254 subnetworks without violating their assigned address space.

## Gateways

Gateways (routers) are used to connect networks together. Gateways are devices that act as translators between systems that do not use the same communication protocols, data formatting, structures, languages, or architectures. Gateways repackage the data packets and change the syntax to match that of the destination system. When networks are divided into subnets, gateways are required to connect one subnet to another.

### Default gateway

The default gateway is the gateway or router that, if not specified, will be used to move packets between networks. It is specified by an IP address.

If multiple gateways or routers exist, then the default gateway is typically the address of the first, or nearest, gateway or router. If no gateways or routers exist, then the default gateway will typically assume the IP address of the network node (such as the workstation or printer).

# Troubleshooting

## Verifying that the printer is on and online

Check the following items to make sure the printer is ready to print.

1. Is the printer plugged in and turned on?  
Make sure that the printer is plugged in and turned on. If the problem persists, you might have a defective power cable, power source, or printer.
2. Is the printer **READY** light on?  
If the light is blinking, you might need to wait until the current job is completed.
3. Is the printer control panel display blank?
  - Make sure the printer is turned on.
  - Make sure the printer is installed correctly.
4. Does a message other than **Ready** appear on the printer control panel display?
  - See your printer documentation for a complete list of control panel messages and corrective actions.

## Resolving communication problems with the network

Check the following items to verify that the printer is communicating with the network. This information assumes you have already printed a Network configuration page (see [Network configuration page](#)).

1. Are there any physical connection problems between the workstation or file server and the printer?  
Verify that the network cabling, connections, and router configurations are correct. Verify that the network cable lengths meet network specifications.
2. Are your network cables connected properly?  
Make sure that the printer is attached to the network using the appropriate port and cable. Check each cable connection to make sure it is secure and in the right place. If the problem continues, try a different cable or ports on the hub or transceiver. The amber activity light and the green link status light next to the port connection on the back of the printer should be lit.
3. Are the link speed and duplex settings set correctly?  
Hewlett-Packard recommends leaving this setting in automatic mode (the default setting). See [Link speed and duplex settings](#).

4. Can you "ping" the printer?

Use the command prompt to ping the printer from your computer. For example:

```
ping 192.168.45.39
```

Ensure that the ping displays round-trip times.

If you are able to ping the printer, verify that the IP address configuration for the printer is correct on the computer. If it is correct, delete and then add the printer again.

If the ping command failed, verify that the network hubs are on, and then verify that the network settings, the printer, and the computer are all configured for the same network.

5. Have any software applications been added to the network?

Make sure they are compatible and that they are installed correctly with the correct printer drivers.

6. Are other users able to print?

The problem may be workstation-specific. Check the workstation network drivers, printer drivers, and redirection (capture in Novell NetWare).

7. If other users are able to print, are they using the same network operating system?

Check your system for proper network operating system setup.

8. Is your protocol enabled?

Check the status of your protocol on the Network configuration page. See [Network configuration page](#). You can also use the embedded Web server or HP Toolbox to check the status of other protocols. See [Using the embedded Web server or HP Toolbox](#).

9. Does the printer appear in HP Web Jetadmin or other management application?

- Verify network settings on the Network configuration page.
- Confirm the network settings for the printer using the printer control panel (for printers with control panels).

# Index

- B**
  - BOOTP 12, 32
  - BOOTP/TFTP
    - configuring 13
- C**
  - Configuration page 6
  - configurations
    - AutoIP 10
    - manual TCP/IP 10
    - network 1
    - server-based 10
    - TCP/IP 11
- D**
  - device discovery 8
- E**
  - EWS. *See* embedded Web server
- G**
  - gateways
    - overview 33
- I**
  - information pages
    - Configuration 6
    - Network configuration 6
  - Internet protocol (IP)
    - overview 30
  - IP address
    - BOOTP 32
    - class 31
    - host portion 31
    - network portion 31
    - overview 30
    - structure 31
  - IP addressing 9
- L**
  - LPD
    - about 19
    - adding Windows optional networking components 26
    - configuring a network LPD printer 27
    - configuring a network printer for Windows 2000 24
    - configuring a network printer for Windows NT 25
    - configuring Mac OS 10.2x and later versions 28
    - configuring Mac OS 9 or earlier versions 28
    - configuring UNIX 21
    - configuring Windows 2000 23
    - configuring Windows NT 23
    - configuring Windows XP 26
    - creating an LPR port 27
    - programs and protocols 20
    - requirements 20
    - setup steps 20
- M**
  - messaging and management, network 8
- N**
  - network
    - AutoIP configuration 10
    - BOOTP 12
    - configuring 1
    - device discovery 8
    - DHCP 15
    - discontinue DHCP configuration 18
    - embedded Web server 4
    - HP Toolbox 4
    - IP addressing 9
    - manual TCP/IP configuration 10
    - messaging and management 8
    - NetWare systems 18
    - server-based configuration 10
    - supported protocols 8
    - TCP/IP configuration 10
    - TCP/IP configuration tools 11
    - UNIX systems 15
    - using printer control panel 6
    - Windows systems 15
  - Network configuration page 6
- P**
  - printing environment 8
- R**
  - reports, device
    - Configuration page 6
    - Network configuration page 6

## S

### SAM

configuring print queues 22

### settings

Configuration page 6

Network configuration page 6

### subnet mask

overview 33

### subnets

overview 33

supported network protocols 8

## T

### TCP/IP

installing for Windows NT 23

overview 30

TCP/IP configuration 10

### Transmission Control Protocol (TCP)

overview 30

### troubleshooting

Configuration page, printing 6

Network configuration page, printing 6

## U

### User Datagram Protocol (UDP)

overview 30



© 2004 Hewlett-Packard Development Company, L.P.

[www.hp.com](http://www.hp.com)



Q3948-90947