



**ZXP Series 7™ and ZXP Series 8™
Card Printer**

**Wireless
Reference Manual**



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Important Use only the supplied antenna. Unauthorized antennas, modifications or attachments could damage the transmitter and may violate FCC regulations or local regulatory requirements in your country.

Compliance and Regulatory Statements

FCC Compliance Statement (USA)

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

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

This equipment has been tested and found to comply with the limits for Class A Digital Devices, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a residential environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the product manuals, 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, the user is encouraged to do one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced RF service technician for help.

Important

1. The radio must be installed with a minimum 20 cm separation between the user and the antenna.
2. The radio must not be co-located or used in simultaneous transmitting condition with another radio.
3. The host system shall have a label to indicate that the system contains a certified module. An example is “Contains FCC ID : I28-W2WLAN11G, IC ID: 3798B-W2WLAN11G.”
4. The radio is for indoor use only in the 2412-2472 MHz frequency range.

Modification Warning

The user is cautioned that any changes or modifications not expressly approved by Zebra Technologies could void the user’s authority to operate the equipment. To ensure compliance, this printer must be used with fully shielded communication cables.

RF Exposure Statement

This transmitter complies with FCC radiation exposure limits set forth for an uncontrolled environment. The antenna(s) used for this transmitter must be installed to provide a separation distance of at least 20 cm from all persons. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter, except in accordance with FCC multi-transmitter product procedures.

 :

Approved Antenna information

Only Zebra approved antennas are allowed and cannot be replaced by the user.

802.11 b/g
Antenna PN: Laird Technologies WCR2400SMRP
Gain: 1.3 dBi @ 2.4 GHz
Impedance: 50 Ω

Mexico — NOM-121-SCT1-2009

Este equipo ha sido diseñado para operar con las antenas que enseguida se enlistan y para una ganancia máxima de antena de 3.1 dBi. El uso con este equipo de antenas no incluidas en esta lista o que tengan una ganancia mayor que 3.1 dBi quedan prohibidas. La impedancia requerida de la antena es de 50 ohms.

Canadian DOC Compliance Statement

Cet appareil numérique de la classe B est conforme à la norme NMB-003 du Canada.
This Class B digital apparatus complies with Canadian ICES-003.

Industry Canada (IC) Warning

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes : (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

This device complies with Industry Canada license-exempt RSS standard(s). Operation is subject to the following two conditions: 1) This device may not cause interference., 2) This device must accept any interference, including interference that may cause undesired operation of the device.

Brasil — Aviso da Anatel

Este equipamento opera em caráter secundário, isto é, não tem direito a proteção contra interferência prejudicial, mesmo de estações do mesmo tipo, e não pode causar interferência a sistemas operando em caráter primário.

“Este produto está homologado pela ANATEL, de acordo com os procedimentos regulamentados pela Resolução 242/2000, e atende aos requisitos técnicos aplicados”

Para maiores informações, consulte o site da ANATEL www.anatel.gov.br

This equipment's operation is of a secondary character; that is, it doesn't have the right to protection against damaging interference, even from stations of the same type, nor can it cause interference to systems with a primary operating character.

Japan Restricted Frequencies

この周波数帯は 5.725 5.825 GHz の日本で利用できるされません。
For 5.725 - 5.825 GHz, this frequency band will not be available in Japan.

Taiwan Restricted Frequencies

5.15-5.25 GHz, 該頻段將在臺灣不可用。
For 5.15 - 5.25 GHz, this frequency band will not be available in Taiwan.

Korean Compliance Statement

이 기기는 가정용 (B 급) 전자파 적합기기로서 주로 가정에서 사용하는 것을 목적으로 하며, 모든 지역에서 사용할 수 있습니다.

The equipment is for home use (Class A) and has acquired electromagnetic conformity registration, so it can be used not only in residential area but other areas as well.

해당 무선설비기기는 운용 중 전파혼신 가능성이 있으므로 인명 안전과 관련된 서비스는 할 수 없습니다.

This radio device is not allowed to be used for human safety since it has possibility of radio interference during operation.

European Regulatory Information

AT	BE	BG	HR	CY	CZ	DK	EE
FI	FR	DE	GR	HU	IS	IE	IT
LV	LI	LT	LU	MT	NL	NO	PL
PT	RO	SK	SI	ES	SE	CH	GB



Note • Member states in the EU with restrictive use for this device are crossed out. This device is also authorized for use in all EFTA member states (CH, IS, LI, NO).

	<p>Important Notice:</p> <p>This device is a portable RF printer intended for commercial and industrial use in all EU and EFTA member states.</p>
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NCC

經型式認證合格之低功率射頻電機，非經許可，公司、商號或使用者均不得擅自變更頻率、加大功率或變更原設計之特性及功能。低功率射頻電機之使用不得影響飛航安全及干擾合法通信；經發現有干擾現象時，應立即停用，並改善至無干擾時方得繼續使用。前項合法通信，指依電信法規定作業之無線電通信。低功率射頻電機須忍受合法通信或工業、科學及醫療用電波輻射性電機設備之干擾。

According to “Administrative Regulations on Low Power Radio Waves Radiated Devices” Without permission granted by the NCC, any company, enterprise, or user is not allowed to change frequency, enhance transmitting power or alter original characteristic as well as performance to an approved low power radio-frequency devices. The low power radio-frequency devices shall not influence aircraft security and interfere legal communications; If found, the user shall cease operating immediately until no interference is achieved. The said legal communications means radio communications is operated in compliance with the Telecommunications Act.

The low power radio-frequency devices must be susceptible with the interference from legal communications or ISM radio wave radiated devices.

WLAN Radio Specification

802.11 b

- 2.4 GHz
- DSSS (DBPSK, DQPSK and CCK)
- RF power 17 mW (ZebraNet n Print Server)

802.11 g

- 2.4 GHz
- OFDM (16-QAM and 64-QAM with BPSK and QPSK)
- RF power 17 mW (ZebraNet n Print Server)

Icons

Throughout this manual, different icons highlight important information, as follows:



Note • Indicates information that emphasizes or supplements important points of the main text.



Important • Advises you of information that is essential to complete a task, or points out the importance of specific information in the text.



Provides an example or scenario to demonstrate or clarify a section of text.



Electrostatic Discharge • Warns you of the potential for electrostatic discharge damage to parts and assemblies.



Electric Shock • Warns you of a potential electric shock situation.



Hot Surface • Warns you of a situation where excessive heat could cause a burn.



Caution • Advises you that failure to take or avoid a specific action could result in physical harm to you, or could result in physical damage to the hardware.

Zebra Contacts

Support and Services: <http://www.zebra.com/contact>

Knowledge Base: <https://km.zebra.com>



Contents



1 • Introduction	1
2 • Networking Basics	3
2.1 Overview	3
2.2 Channels and communication modes	4
2.3 Security	5
2.4 Authentication	5
2.5 Network name (SSID)	5
2.6 Encryption	6
2.7 Media access control address authentication	6
3 • Installing the Printer	7
4 • Configuring the Printer	9
4.1 Overview	9
4.2 Configuration Options	10
4.3 Network Settings	11
4.4 Printer Web Page Option	12
4.5 ZXP Toolbox Option	16
4.6 Operator Control Panel Option	21
4.7 Using ZXP Toolbox Wireless Settings Load/Save	32
4.8 Using the RADIO CONTROL Menu	33
4.9 Using the SET DEFAULTS Menu	35
4.10 Simple Roaming Used During Connection	36
4.11 Setting Up an Ad-Hoc (Peer) Network	37
4.12 Multi-homing Considerations	41

- 5 • Monitor Wireless Performance 43**
 - 5.1 Overview 43
 - 5.2 Wireless Info Pages..... 44
 - 5.3 Signal Strength 46
 - 5.4 Noise Floor 47
 - 5.5 Data Rate 47
 - 5.6 DHCP & MAC Address Info Page 48
 - 5.7 Wireless Statistics Info Page 49
 - 5.8 Wireless Statistics Success and Failure Rates 50
 - 5.9 Main Status Display Wireless Errors 51
 - 5.10 Viewing Wireless Information via Printer Web Page 53
 - 5.11 Viewing Wireless Information via Driver Toolbox..... 54

- 6 • Troubleshooting 57**
 - 6.1 Introduction 57
 - 6.2 Wireless Troubleshooting Checklist..... 58
 - 6.3 Cannot Print Over Wireless Network..... 59
 - 6.4 Improve Wireless Signal Strength 61
 - 6.5 PSK 4-way Handshake Timeout 64

- 7 • Technical Specifications 65**

- 8 • Glossary..... 69**

Introduction

1.1 Overview

This manual provides the following information about installing and connecting ZXP Series 7 and ZXP Series 8 Card Printers to a wireless network:

1. The Networking basics chapter contains overview information about wireless networking and the wireless features of the Printer.
2. The information for installing to a wireless network will be useful if you are installing the printer to a wireless network for the first time, or if you wish to change printer or network settings after you have installed the printer.
3. The Troubleshooting chapter contains a checklist on how to quickly diagnose set-up and configuration issues.

References to “the Printer” in this document apply to either the ZXP Series 7 Card Printer or the ZXP Series 8 Card Printer.



Networking Basics

2.1 Overview

ZXP Series 7 and ZXP Series 8 Card Printers have an internal print server that supports both wired and wireless Ethernet connectivity. The wired Ethernet capability is standard with the printer while the wireless capability is an option that can be ordered as a factory-installed printer option. The wireless option is field upgradeable by a Zebra-authorized field technician, but requires partial disassembly of the printer to remove the wired daughter card and replace it with a wired/wireless daughter card (see separate document that describes daughter card installation in the printer).

The printer supports simultaneous wired and wireless connections, a capability referred to as multi-homing, in this case having two separate interfaces with separate IP addresses. To connect to a wireless network, the printer uses wireless protocol IEEE 802.11b/g that communicates data through radio transmission. After installing the printer to a wireless network, cables are not required to communicate with the computers or devices that are part of the network.

A wireless local area network (WLAN) is a collection of two or more computers, printers, and other devices linked by radio waves. A WLAN uses high-frequency airwaves (radio) to communicate information from one point to another.

To connect a computer or device to a wireless network, the computer or device must have a wireless network adapter. The Printer uses an internal networking component that contains a wireless radio. No cabling is necessary between networked devices that use wireless technology, although it is possible to use a USB or wired Ethernet cable to configure your printer for a wireless network.

2.2 Channels and communication modes

The band of radio signals used for IEEE 802.11b/g wireless networking is segmented into specific frequencies, or channels. For IEEE 802.11b/g wireless networks, 13 channels are available. Each country/region specifies the channels that are authorized for use. For example, in North America, only channels 1 through 11 are allowed. In Japan, channels 1 through 14 can be used (channel 14 – 802.11b only). In most of Europe, channels 1 through 13 are allowed. Because existing standards change frequently, you should check with your local regulatory agencies for authorized channel use. In most countries/regions channels 10 and 11 may be used without restriction.

Channel selection depends on the communication mode of the network. The communication mode defines how devices (i.e., computers and printers) communicate on a wireless network.

There are two primary types of wireless communication modes: infrastructure and ad-hoc.

- In infrastructure mode, the printer communicates with network computers through a wireless access point (AP) or a base station. The access point acts as a central hub or gateway connecting wireless and, optionally, wired devices (most access points have an integrated Ethernet controller to connect to an existing wired-Ethernet network).
- In the ad-hoc mode, which is sometimes called peer-to-peer mode, the printer communicates with your computer directly, rather than through an access point or base station. Each device on an ad-hoc network must have a wireless network adapter. The adapter enables each device to communicate with the other devices on the network. Ad-hoc mode is usually limited to simple, small wireless networks because performance degrades significantly after connecting too many network devices. This option is most often used if you are connecting only two network devices that are not sharing an Internet connection. Only WEP security is available in ad-hoc mode.

2.3 Security

As with other networks, security for wireless networks focuses on access control and privacy. Traditional wireless network security includes the use of Service Set Identifiers (SSIDs), open or shared-key authentication and static Wired Equivalent Privacy (WEP) keys or WiFi protected access (WPA or WPA2).

It is highly recommended that you implement a wireless security scheme (preferably WPA2) prior to setup. While the printer can connect to an open AP, running an open wireless AP may allow anyone within range of the AP full access to all devices connected to the AP with potentially damaging results. While WEP security is still in use today, WEP security has been broken for many years. There are tools available on the Internet that will allow anyone with even basic networking knowledge to break the WEP security and derive the WEP key within 3 minutes, giving them full access to devices on your network. The best security is obtained by using WPA2 security with CCMP/AES encryption.

Authentication and encryption are two different mechanisms to network security. Authentication verifies the identity of a user or device before granting access to the network, making it more difficult for unauthorized users to access network resources. Encryption encodes the data being sent across the network, making the data unintelligible to unauthorized users. Both of these mechanisms are on wireless networks.

2.4 Authentication

The Printer supports Open System authentication. A network with Open System authentication does not screen network users based on their identities and usually involves supplying the correct SSID. Such a network might use Wired Equivalent Privacy (WEP) encryption to provide a first level of security, or WiFi protected access (WPA/WPA2) to provide security by encrypting data sent over radio waves from one wireless device to another wireless device. The printer allows for WEP, WPA or WPA2.

2.5 Network name (SSID)

Wireless devices are configured with the name of the network to which they will connect. The network name is also called the SSID and identifies the ESS (Extended Service Set) that is normally associated with larger infrastructure networks. The SSID should not be considered a security feature because it can be easily identified. However, as a network administration or management feature, it does provide basic network access control.

It is common practice to setup access points such that the SSID is not broadcast (i.e., hidden or invisible). The printer can connect to invisible access points, although the user must know the SSID name and correctly enter it into the printer. There is a belief that hiding the SSID adds extra security to the network. This is, in fact, false as a device connecting to a network must send the SSID in the clear and the SSID can be easily obtained from the association management frame. Hiding the SSID makes it more error prone to connect to a network.

2.6 Encryption

To reduce your network exposure to eavesdropping, establish a wireless security key for your network. The printer supports the WEP RC4 encryption, WPA TKIP encryption and WPA2 CCMP encryption (a form of AES encryption), which hinders unauthorized users from accessing data transmitted over the radio waves. For WEP, a single static WEP key (40 or 104 bits) is installed in the printer. Each computer or device is configured with the same key to communicate on that network. The most secure encryption is achieved using WPA2 with CCMP.

WPA and WPA2 security provides the means to deploy dynamic encryption keys to devices on the network. There are two approaches that are used for key deployment which are usually referred to as Personal and Enterprise. In the Personal mode, a Pre-Shared Key (PSK) is deployed on each network access point and device. The PSK is then used to derive Transient Keys which are used between an access point and the devices which are connected to it. In the Enterprise mode, an authentication server is used to deploy keys using one of several available Extensible Authentication Protocols (EAP).

For WPA or WPA2 Personal, a single, 8 – 63 character passphrase is entered into the access point. The same passphrase must be entered into the printer. The access point and printer each derive the same 32 byte PSK from the passphrase using the password-based key derivation function 2 (PBKDF2) from RFC 2898. The importance of picking a secure passphrase cannot be overstressed. The most prevalent security attack against WPA-PSK is a brute force dictionary attack, using a list of common words to “guess” your passphrase. So a passphrase like “darthvader” could result in your security being quickly compromised.

When constructing your passphrase, keep the following suggestions in mind:

- Use more than 8 characters. The more characters, the more secure.
- Use a combination of uppercase, lower case, numeric and punctuation characters.
- Use random characters, avoid using recognizable words from any language.

2.7 Media access control address authentication

Some WLAN vendors support authentication based on the physical address, or MAC address, of the client Network Interface Card (NIC). In this scenario, an access point allows association by a client only if that client’s MAC address matches an address in an authentication table used by the access point. This is not configurable through the printer.

Installing the Printer



Important • Only use the antenna that is shipped with the printer to ensure regulatory compliance for the transmit power.

The printer with the wireless option ships with the wireless radio installed in the printer. An antenna is shipped in the box with the printer. The antenna must be connected to the rear of the printer before using the wireless interface. Lightly push the antenna onto the printer antenna connector and rotate the knurled antenna connector until finger tight.

The antenna used for this transmitter must be installed to provide a separation distance of at least 20 cm (8 inches) from all persons and must not be co-located or operating in conjunction with any other antenna or transmitter. This means that the printer must be positioned such that during use the antenna is no closer than 20 cm to the body of any persons in the area of the printer and that during normal use of the printer the distance is maintained. The antennas for any other transmitters should be separated from the printer antenna by at least 20 cm. This is required for RF exposure compliance.

The antenna orientation is important to maximize the wireless signal strength. Inspect the access point antenna(s) and try to put the printer antenna in a similar orientation. After connecting the printer to the wireless network, the antenna orientation can be adjusted to maximize signal strength.

802.11b/g has an indoor open range of 100 ft at maximum data rate and 300 ft at minimum data rate. As the distance between the printer and the access point increases, the signal strength decreases. If there are intervening walls, unpredictable signal strength attenuation will occur. Decreasing signal strength results in automatic data rate reduction. At the longest distance, network traffic can become very slow.

3: Installing the Printer

Printer location is important to ensure that adequate signal strength is achieved. Follow these suggestions:

- Position the printer as close to the access point that it will connect to as possible.
- If possible, orient the printer such that there is a clear line of sight between the printer antenna and the access point antenna.
- Locate the printer such that there are no intervening walls in the line of sight between antennas.
- Do not put the printer in a cabinet, especially not a metal one.
- Do not locate large metal objects close to the printer antenna.
- Do not locate the printer close to devices that emit RF radiation in the 2.4 GHz range. Such devices might include: microwave ovens, cordless phones, wireless surveillance cameras, baby monitors, wireless video transmitter and Bluetooth® devices.

Once you have your printer connected to a wireless network, the printer can provide information on the quality of the connection to the network. If the quality is poor, there are several approaches that can be taken to improve the quality.

Configuring the Printer

4.1 Overview

To set up the printer for wireless printing, you need to know:

- The name of your wireless network, also known as the Service Set Identifier (SSID).
- If encryption was used to secure your network.
- The security key (WEP key, WPA passphrase, or hex key) that allows other devices to communicate on the network if encryption was used to secure your network.
- If the access point you will connect to doesn't broadcast the SSID, you will need to know the BSSID (MAC Address of the wireless interface) for the AP. Make sure that you have the correct MAC address, your AP may have several.

If your wireless access point is using Wired Equivalent Privacy (WEP) security, the WEP key should be exactly 10 or 26 hexadecimal characters. Hexadecimal characters are A–F, a–f, and 0–9.

If your wireless access point is using WiFi Protected Access (WPA or WPA2) security, the WPA passphrase should be from 8 to 63 ASCII characters. ASCII characters in a WPA passphrase are case-sensitive.

If your wireless network is not using security, then you will not need a security key. Using a wireless network with no security is not recommended because it can allow intruders to use your network resources without your consent. Intruders could then read and decode your transmissions with readily available tools found on the Internet.

4.2 Configuration Options



Note • Make sure you copy down the security key and SSID exactly, including any capital letters, and store it in a safe place for future reference. If you do not know the SSID of the network that your computer is connected to, launch the wireless utility of the computer network adapter and look for the network name. If you cannot find the SSID or the security information for your network, see the documentation that came with the wireless access point, or contact your network support person.

There are three ways to configure the printer to connect to a wireless network:

- Configure the printer through the printers Web Page using wired Ethernet; refer to [Section 4.4](#) on page 12 for details.
- Configure the printer through the Windows Printer Driver Toolbox using USB or wired Ethernet; refer to [Section 4.5](#) on page 16 for details.
- Configure the printer through the Operator Control Panel.; refer to [Section 4.6](#) on page 21 for details.

4.3 Network Settings

Every device connected to an Ethernet network must be assigned an IP Address, Subnet Mask and Default Gateway Address. An IPv4 Address consists of a 32-bit binary number, which is typically presented as four decimal numbers (one for each 8-bit byte) separated by decimal points (for example: 192.168.0.100). The subnet mask determines what subnet an IP address belongs to. A typical subnet would be 255.255.255.0. As applied to the previous example, devices with IP Addresses in the range of 192.168.0.1 through 192.168.0.255 would all be in the same subnet. The default gateway is the node connecting the internal networks and the outside network (Internet).

In order to configure the printer, these settings must be known or DHCP must be used to automatically configure the printer. If the network has a DHCP server, the printer can request the network settings from the DHCP server after establishing a connection to the access point. Otherwise, these settings must be known and manually entered into the printer. Check with your network administrator if you are not sure about whether to use DHCP or manual settings.

When using DHCP, be aware that the DHCP server may periodically change the IP Address assigned to the printer. If this happens, the Windows Printer Driver may no longer be able to communicate with the printer. To prevent this, DHCP servers can be configured to lock an IP Address to a specific MAC address. Obtain the wireless MAC address from the Operator Control Panel (make sure you get the correct MAC Address, there are two, one for wired and one for wireless) and use this to configure the DHCP server. Some DHCP servers are configured to reject DHCP requests from unknown devices. Again, the MAC address can be used to configure the DHCP server or access point to recognize the printer.

If you plan to use both wired and wireless Ethernet interfaces at the same time, see the “Multi-homing Considerations” section. The configuration of the IP Address and Subnet Mask on each interface must be set correctly depending upon whether the two interfaces are connected to the same network or totally separate networks. Improperly configured network settings may result in a communications failure.

4.4 Printer Web Page Option



Note • The screens shown in this section are for the ZXP Series 7 Card Printer; the screens for the ZXP Series 8 are virtually identical.

Configuring Wireless through the Printer Web Page requires that the printer be connected to a computer through wired Ethernet. Set the DHCP mode, IP Address, Subnet Mask, and Default Gateway as needed for the wired interface.

If DHCP is enabled, use the OCP INFO soft-key to determine the IP Address for the wired Ethernet. Open a browser window on a computer connected to the same network as the printer and enter the printer IP address; e.g., <http://10.1.23.26>

The printer web page should then display:

ZXP Series 7 Card Printer / 10.1.23.26

Products Drivers Partners

Home
Set IP Address
Wireless Parameters
Syslog Server
Printer Statistics
Printer Information
Sensors
Media
Laminator
IP Route Table
Printer Commands
Job Queue
Test Cards
Printer Settings
Reset Printer

Console

NETWORK INFO
DHCP ENABLED
IP: 10.1.23.26
MASK: 255.255.255.0
GW: 10.1.23.1
MAC: 00:07:4d:49:00:97

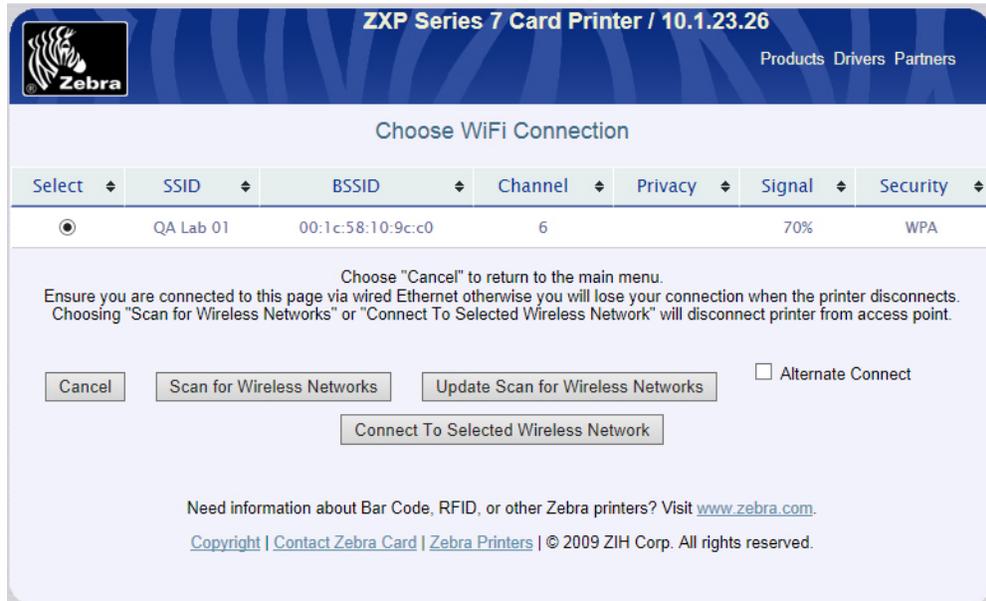
Zebra Card Printer Solutions
30601 Agoura Road
Agoura Hills, California 91301 USA
(805) 579-1800
www.zebracard.com

Need information about Bar Code, RFID, or other Zebra printers? Visit www.zebra.com.

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Click on the “**Wireless Parameters**” entry from the list of the left of the web page, and enter User name (admin) and Password (1234).

The web page should look like:



If the access point you want to connect to is not shown, Click **Scan for Wireless Networks** until it is shown. Pick the desired access point using the Select radio button on the left of the list.

Note that **Scan for Wireless Networks** clears the Access Point list and scans for Access Points. **Update Scan for Wireless Networks** appends additional Access Points found without first clearing the Access Point list.

Note the **Alternate Connect** check box.

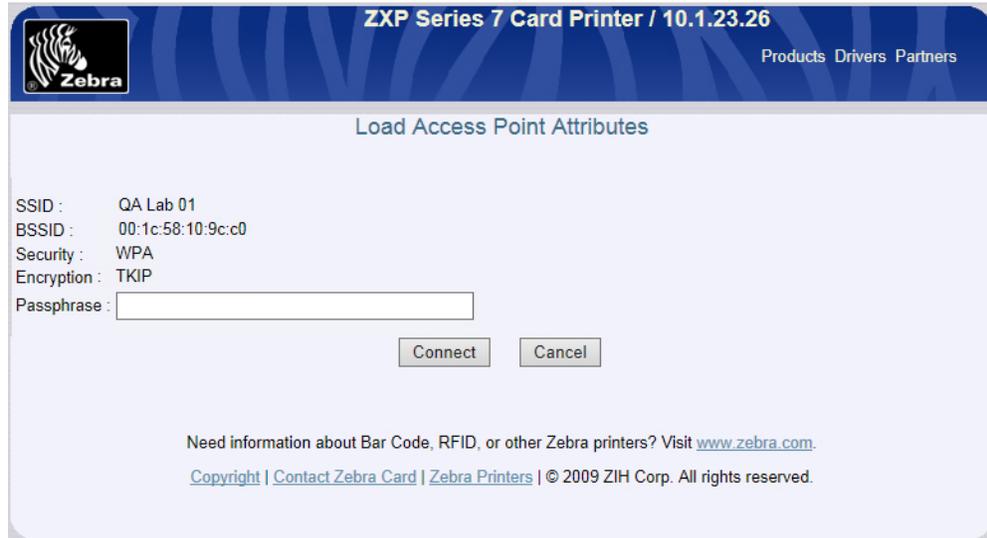
- If **Alternate Connect** is left unchecked, the printer automatically selects the highest Security & Encryption available.
- If the **Alternate Connect** check box is checked, the user will be allowed to select the Security & Encryption that will be used if more than one is available.

Click **Connect To Selected Wireless Network** to proceed.

4: Configuring the Printer

Printer Web Page Option

The web page changes to:



The screenshot shows the Zebra printer's web interface. At the top, there is a blue header with the Zebra logo on the left, the text "ZXP Series 7 Card Printer / 10.1.23.26" in the center, and "Products Drivers Partners" on the right. Below the header, the main content area is titled "Load Access Point Attributes". It displays the following configuration details:

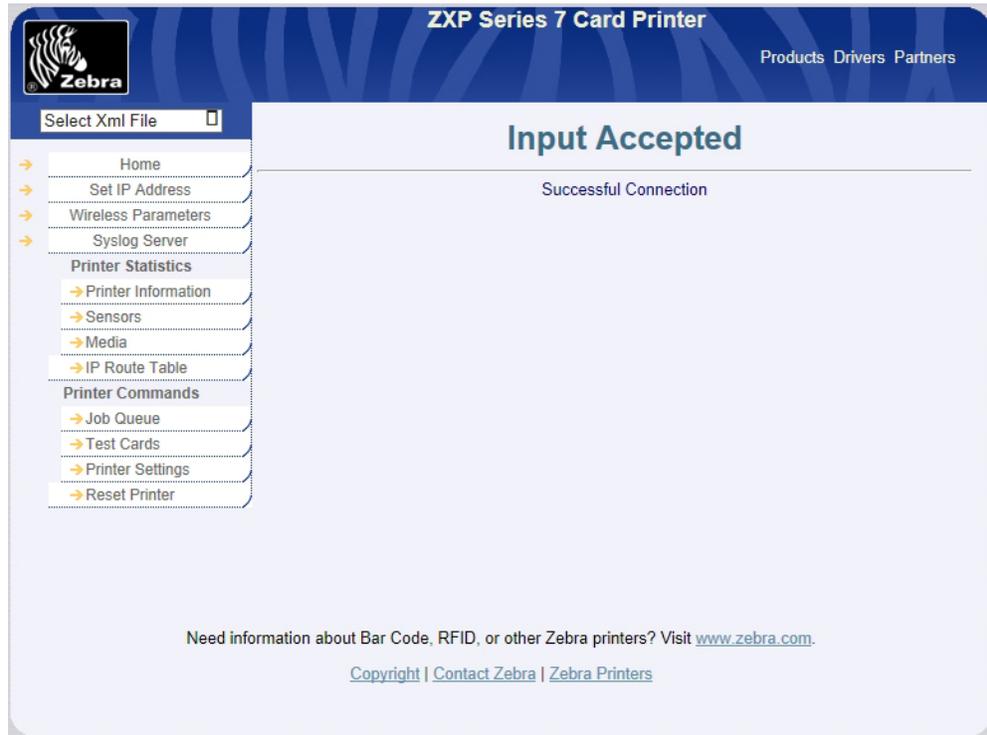
- SSID : QA Lab 01
- BSSID : 00:1c:58:10:9c:c0
- Security : WPA
- Encryption : TKIP
- Passphrase :

Below the configuration details are two buttons: "Connect" and "Cancel". At the bottom of the page, there is a footer with the text: "Need information about Bar Code, RFID, or other Zebra printers? Visit www.zebra.com. Copyright | [Contact Zebra Card](#) | [Zebra Printers](#) | © 2009 ZIH Corp. All rights reserved."

Enter any information required, like: SSID, Security, Encryption, and Passphrase (in the above example, only the Passphrase needs to be entered as indicated by the edit box).

Click **Connect**. Wait for connection to complete or for an error message.

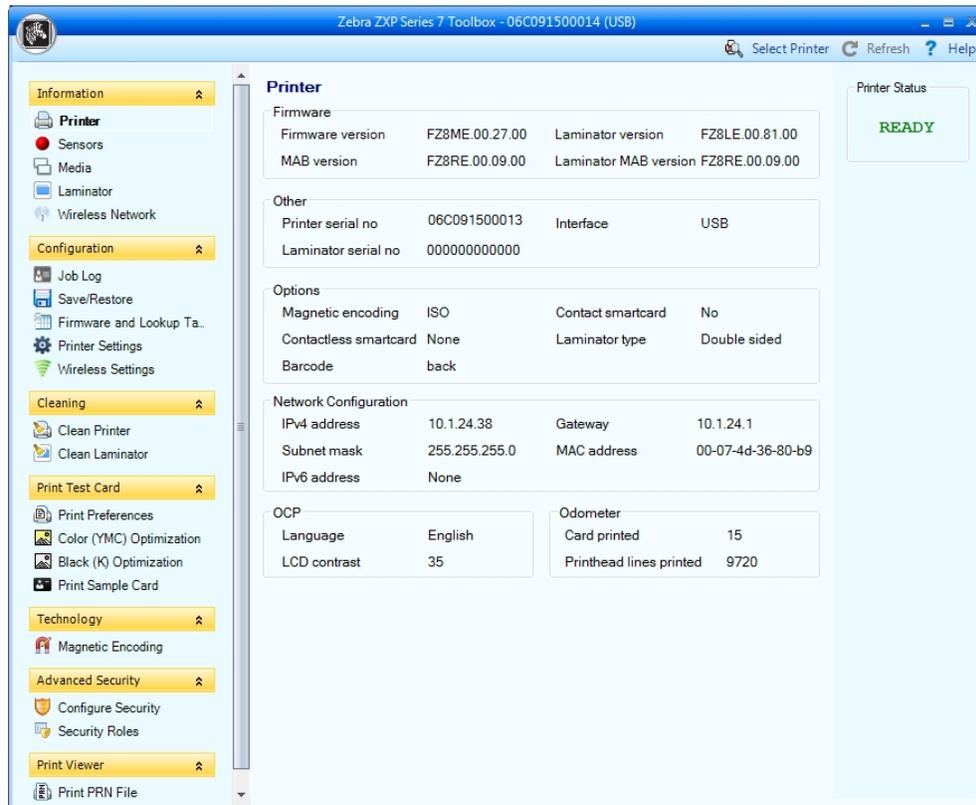
When successfully connected to the wireless network, the web page changes to:



The wireless parameters were automatically saved so that the printer will automatically connect the next time the printer is powered on. The wired Ethernet connection can now be disconnected if desired.

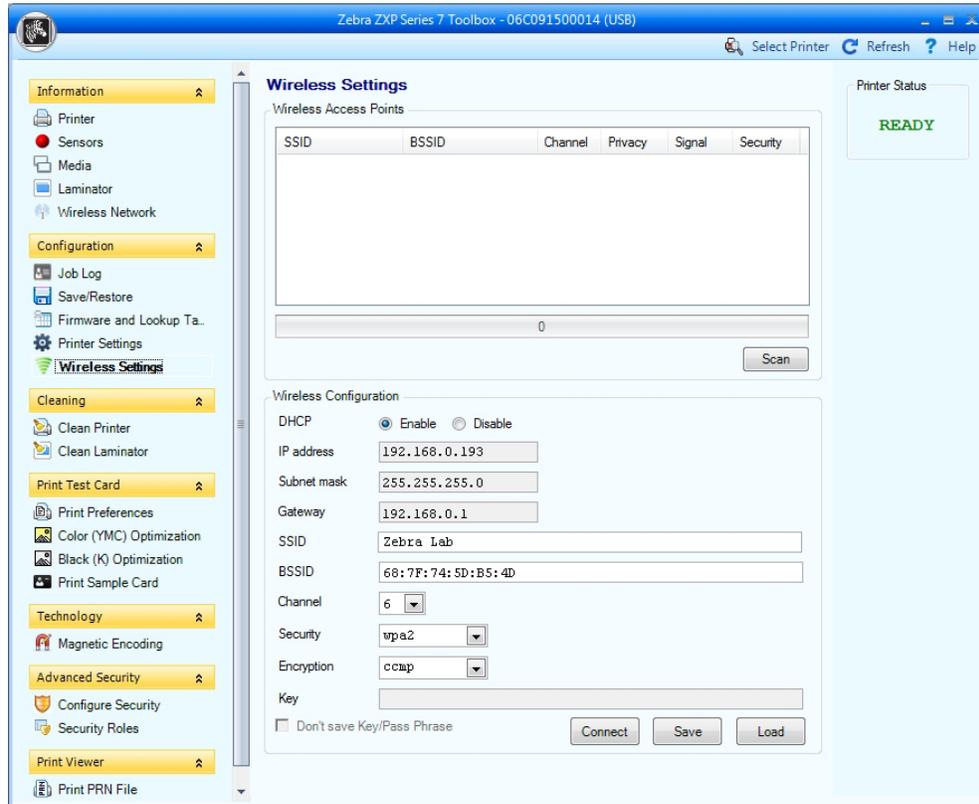
4.5 ZXP Toolbox Option

This requires that the printer be connected to a computer through USB or wired Ethernet with the Windows printer driver installed and functional. Refer to the appropriate Printer User's Manual for instructions on driver installation. Once the Windows printer driver is installed and functioning, open the ZXP Toolbox. The following screen will be displayed:



Under the **Configuration** section, click on **Wireless Settings**.

The following screen will be displayed:



There are two approaches that can be used to configure the printer's wireless settings:

- If all the necessary information is known (**SSID, BSSID, Channel, Security, Encryption, and Passphrase**) these parameters can be directly entered into the **Wireless Configuration**.
- The alternate approach is to request that the printer scan for wireless access points and select one. This automatically fills in most of the **Wireless Configuration** parameters.

Step 1:

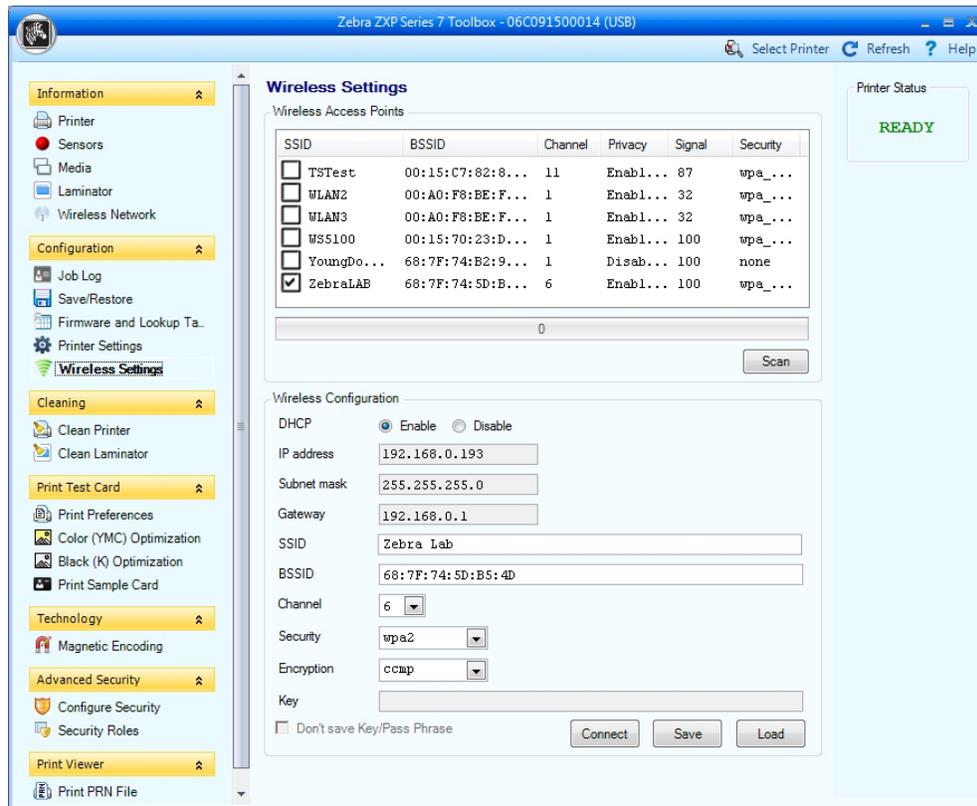
Make any changes needed to **DHCP Enable, IP Address, Subnet Mask, and Gateway**.

If directly entering the wireless settings, skip to Step 4.

4: Configuring the Printer ZXP Toolbox Option

Step 2:

Press the **Scan** button to initiate a scan. Once the scan is complete, scroll through the wireless access points and select the one you want to connect to using the associated checkbox. The display should look like:



Step 3:

If the **SSID** is not displayed (access point configured to not broadcast **SSID**), enter the **SSID**. Select the desired **Security** and **Encryption**. The choices will be limited to what the access point can accept. If the access point is configured for **WEP**, you must choose correctly between **WEP40** and **WEP104** (there is no way to determine the **WEP** key size via the ZXP Toolbox). Skip to Step 5.

Step 4:

Enter the **SSID**, **BSSID** (format xx:xx:xx:xx:xx:xx), **Channel**, **Security**, and **Encryption**. The **Channel** setting is a hint to the printer about which channel the access point will be located on. Providing the correct channel will result in a faster connection to the access point when powering up the printer. If you enter the wrong channel it will not cause the connection to fail. The printer will first scan for the access point on the indicated channel and if not found will widen the search to all channels. Some wireless access points can be configured to auto select their channel when powered on (channel used may be different each time). In this case set the channel to zero, which tells the printer to scan all channels to find the access point before connecting. If you don't know the correct channel, setting the channel to zero is the best choice.

Set the **Security** entry before **Encryption**. The **Encryption** choices will be limited by the Security setting.

IMPORTANT! When using manual entry of wireless settings, you must be careful to enter all the data correctly or the printer may fail to connect to an access point. If you are not sure about the settings, check with your IT department. Most access points provide a web page for configuration. If you can access this web page you can determine the proper settings for **SSID**, **BSSID**, **Channel**, **Security**, and **Encryption**. Be careful with the **Security** and **Encryption** settings. An access point may be configured to allow only certain **Security/Encryption** capabilities, like only **WPA2/CCMP**. In this case, trying to connect with **WPA/TKIP** would fail.

Step 5:

Enter the **Key** (if using **WEP40** or **WEP104**) or the **Passphrase** (if using **WPA** or **WPA2**). If the security is **WEP**, you must enter exactly 10 (**WEP40**) or 26 (**WEP104**) hex characters (0 – 9, A – F). If the security is **WPA** or **WPA2**, you must enter at least 8 printable ASCII characters for the passphrase. The key or passphrase must be identical to the one that has been entered into the wireless access point. Check with your IT department to get the correct key or passphrase.

IMPORTANT! Entering an incorrect **WEP** key will not result in a failure to connect, but communications with the printer will not work through the wireless interface. Entering an incorrect **WPA/WPA2** passphrase will result in a connection failure. It is very important to use the correct key or passphrase and enter it correctly.

4: Configuring the Printer ZXP Toolbox Option

Step 6:

Press the **Connect** button. A dialog box displays to indicate that the connection process has been initiated. Press **Ok** to remove the dialog. Under the **Information** section on the left side of the Toolbox click **Wireless Network**. The following dialog appears:

The screenshot shows the Zebra ZXP Series 7 Toolbox interface. The title bar reads "Zebra ZXP Series 7 Toolbox - 06C091500014 (USB)". The left sidebar contains several expandable sections: Information, Configuration, Cleaning, Print Test Card, Technology, and Advanced Security. The "Wireless Network" section is selected and expanded. The main content area displays the following information:

- Wireless Network**
- Status**

State	connected	Noise floor	-93dBm
Channel	6	Security	wpa2
RSSI	-37dBm	Crypto	ccmp
SNR	56db	Rate	54
SSID	Zebra LAB	Link lost	1
BSSID	68-7f-74-5d-b5-4d		
- Sent**

Byte sent	62969
Unicast packets	560
Non unicast packets	0
Discard packets	0
Errors	0
- Received**

Byte received	5734
Unicast packets	62
Non unicast packets	0
Discard packets	0
Errors	0
- Wireless Radio Setting**

Multicast transmission frame	145	RTS failure	0
Failed	3	ACK failure	62
Retry	18	Rx frag	28232
Multi retry	8	Multicast receive frame	27078
Framed up	41	FCS error	75714
RTS success	0	Transmission frame	209
Tx Success	98 %	Tx Retry	8 %
Rx Success	27 %	Rx Duplicate	0 %
RTS succwss	0 %		
- Network Configuration**

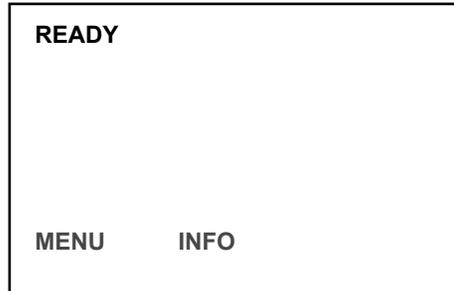
IP address	192.168.0.193	Gateway	192.168.0.1
Subnet mask	255.255.255.0	MAC address	00-19-88-06-41-87

At the bottom right, there is a "Save" button and a note: "Click save button to save all wireless info as XML files."

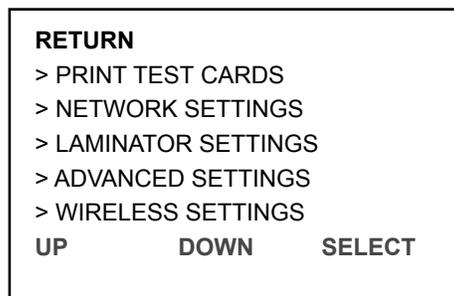
Check the **Status** section. If the connection succeeded, the **State** parameter should be “connected”. If the **State** is “inactive”, then the connection failed, probably due to the **WPA/WPA2** passphrase being incorrect. If the **State** is “scanning”, then the access point wasn’t found and periodic scans are underway to find the access point. This may mean that the **SSID** or **BSSID** was entered incorrectly. If you are connecting with **WEP** security, the only way to know that the **WEP** key is correct is to try to communicate with the printer through the wireless interface. If the communication fails then it is likely the **WEP** key was entered wrong.

4.6 Operator Control Panel Option

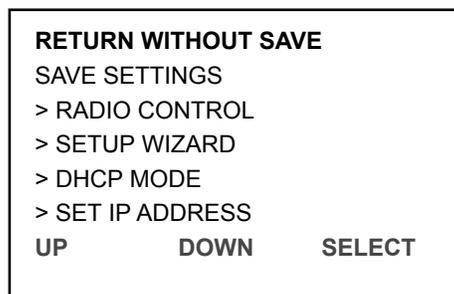
When powered up, the OCP will display the following:



Press the **MENU** soft-key and the display changes to:



Press the **DOWN** soft-key until “WIRELESS SETTINGS” is highlighted in reverse video then press **SELECT** and the display changes to:



4: Configuring the Printer

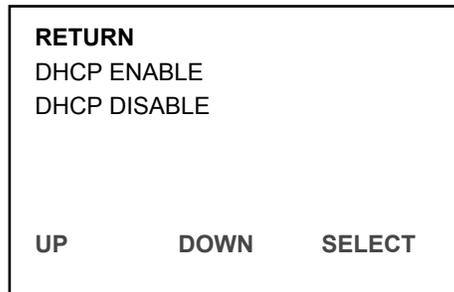
Operator Control Panel Option

There are several selections hidden. These can be seen by pressing the **DOWN** soft-key. The selections are as follows:

Menu Selection	Description
RETURN WITHOUT SAVE	Exit the current menu, returning to the previous menu.
SAVE SETTINGS	Save any setting that have been changed then return to the previous menu. The printer will then remember these settings after a power cycle.
RADIO CONTROL	Turn the radio on or off.
SETUP WIZARD	Enter the setup wizard, which takes you through the steps to connect to an access point one step at a time.
DHCP MODE	Enable/disable DHCP mode.
SET IP ADDRESS	Set the IP Address. Only needed if DHCP is disabled.
SET SUBNET MASK	Set the Subnet Mask. Only needed if DHCP is disabled.
SET DEFAULT GATEWAY	Set the Default Gateway. Only needed if DHCP is disabled.
SET DEFAULTS	Erase all the wireless settings. If the radio is on, the radio is turned off. If you want the defaults to be permanent, you will need to also select "SAVE SETTINGS".

Step 1:

Determine whether you plan to enable DHCP to automatically obtain the IP Address, Subnet Mask, and Gateway Address. Enter the DHCP Mode menu by pressing the **DOWN** soft-key until “DHCP MODE” is highlighted then press **SELECT** and the display changes to:



Use the **UP** and **DOWN** soft-keys to highlight “DHCP ENABLE” or “DHCP DISABLE” then press the **SELECT** soft-key.

If you enabled DHCP, you do not need to enter an IP Address, Subnet Mask, and Default Gateway. Skip to Step 5.

If you disable DHCP, it is very important that you enter the correct IP Address, Subnet Mask and Default Gateway for the network. If any of them are entered wrong, the communications may fail. The IP Address that you use must not be assigned to any other device on your network. If you are not sure what settings to use, check with your IT department.

You can also inspect the settings for a computer on your network. On Windows XP, click Start then Run. In the Open box type “cmd” then click Ok to open a Command Prompt window and type “ipconfig /all” at the prompt. You can then see the IP Address, Subnet Mask, and Default Gateway the computer is configured to use. It is likely that you can use the same Subnet Mask and Gateway settings in your printer. You will need to use a different and unused IP Address. To verify that the one you plan to use is available, type “ping xx.xx.xx.xx” at the command prompt where xx.xx.xx.xx is the IP Address you plan to use. If the ping times out, that means that no device on the network with that IP Address responded. This is not a guarantee that the IP Address is available as a device with that IP Address could be powered down or temporarily disconnected from the network.

4: Configuring the Printer

Operator Control Panel Option

Step 2:

Enter the Set IP Address menu by pressing the **DOWN** soft-key until “SET IP ADDRESS” is highlighted then press **SELECT** and the display changes to:



IP: 000.000.000.000

CHANGE NEXT EXIT

Use the **CHANGE** soft-key to change the selected digit. Each press of **CHANGE** increases the digit value by 1 with a roll-over to zero when necessary. The selected digit will flash. Use the **NEXT** soft-key to advance to the next digit in the sequence. Pressing **NEXT** when the last digit is selected will result in the first digit being selected.

Press **EXIT** to save the current IP Address and exit the menu. Before pressing **EXIT**, all of the digits on the display must match the desired IP Address.

Step 3:

Enter the Set Subnet Mask menu by pressing the **DOWN** soft-key until “SET SUBNET MASK” is highlighted then press **SELECT** and the display changes to:



MASK: 000.000.000.000

CHANGE NEXT EXIT

Use the **CHANGE** soft-key to change the selected digit. Each press of **CHANGE** increases the digit value by 1 with a roll-over to zero when necessary. The selected digit will flash. Use the **NEXT** soft-key to select the next digit in the sequence. Pressing **NEXT** when the last digit is selected will result in the first digit being selected.

Press **EXIT** to save the current Subnet Mask and exit the menu. Before pressing **EXIT**, all of the digits on the display must match the desired Subnet Mask.

Step 4:

Enter the Set Default Gateway menu by pressing the **DOWN** soft-key until SET DEFAULT GATEWAY is highlighted then press **SELECT** and the display changes to:



Use the **CHANGE** soft-key to change the selected digit. Each press of **CHANGE** increases the digit value by 1 with a roll-over to zero when necessary. The selected digit will flash. Use the **NEXT** soft-key to select the next digit in the sequence. Pressing **NEXT** when the last digit is selected will result in the first digit being selected.

Press **EXIT** to save the current Default Gateway Address and exit the menu. Before pressing **EXIT**, all of the digits on the display must match the desired Default Gateway Address.

Step 5:

Save the current configuration to permanent storage. This will insure that the DHCP Mode, IP Address, Subnet Mask, and Default Gateway are remembered by the printer after a power cycle. Use the **UP** and **DOWN** soft-keys to highlight SAVE SETTINGS, then press the **SELECT** soft-key. This will return you to the Wireless Settings menu.

4: Configuring the Printer

Operator Control Panel Option

Step 6:

From the Wireless Settings menu, enter the Setup Wizard menu by pressing the **DOWN** soft-key until **SETUP WIZARD** is highlighted; then press **SELECT** and the display changes to:

BEGIN CONNECTING YOUR
PRINTER TO A WIRELESS
ACCESS POINT. PRESS
SCAN TO START.

SCAN **EXIT**

Press the **SCAN** soft-key to begin scanning for access points that are within range of your printer, or press **EXIT** to exit this menu and return to the Wireless Settings menu.

After pressing the **SCAN** soft-key, the display changes to:

WAIT WHILE SCAN
COMPLETES. USE NEXT
TO SCROLL THROUGH
AP'S AND SELECT ONE.

CANCEL

The printer will conduct active scans on all the channels allowed for your regulatory domain. The scanning process is repeated multiple times over all the channels to insure that all AP's are identified. This can take over a minute to complete. Once the scanning process completes the display changes to:

SSID: Test
MAC:00:a0:f8:be:fe:72
Chan = 1 SIG = 52%
SEC MODE: WPA
CRYPTO: TKIP
MAX SPEED: 54 Mbps

NEXT **SELECT** **CANCEL**

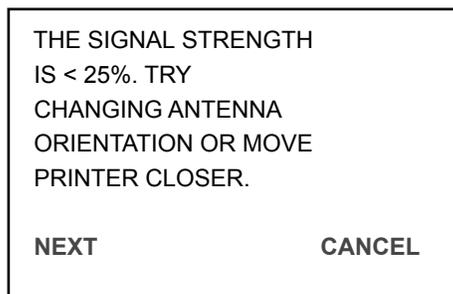
The OCP will display the information for a single access point.

- The 1st line indicates the SSID.
- The 2nd line indicates the BSSID or MAC Address for the access point. If the SSID name is too long to fit on the top line of the display, it will wrap to the 2nd line and the BSSID will not be displayed. If the SSID of the access point is not broadcast (hidden or invisible), the SSID will display as: SSID: <HIDDEN>
- The 3rd line indicates the channel the access point operates on (can be 1 – 13) and the signal strength in percent (more information on signal strength is provided later in this document).
- The 4th line indicates the security mode the access point is configured to use. This could be: NONE, WEP, WPA, WPA2 or WPA & WPA2 (both available simultaneously).
- The 5th line indicates the type of encryption being used by the access point. This could be: NONE, RC4 (used for WEP), TKIP, CCMP (a variant of AES) or TKIP & CCMP (both available simultaneously). The 5th line indicates the maximum data rate supported by the access point. This will usually be 11 Mbps if the access point is only capable of 802.11b and 54 Mbps if the access point is capable of 802.11g.

Pressing the **NEXT** soft-key advances the display to the next access point found during the scan. When the last access point found is displayed, pressing **NEXT** will cause the first access point to display again. The **CANCEL** soft-key can be pressed at any time to abort the Setup Wizard and return to the main Wireless menu.

By knowing the SSID and/or BSSID, the access point you wish to connect to can be found in the scan list. There may be occasions where the access point of interest is not displayed. This can happen due to noise or interference during the scanning. If you can't find the access point, press the **CANCEL** soft-key and retry the Setup Wizard until the access point is found. Once the access point you wish to use is displayed on the OCP, press the **SELECT** soft-key.

If the signal strength for the selected access point is less than 25%, the display changes to:

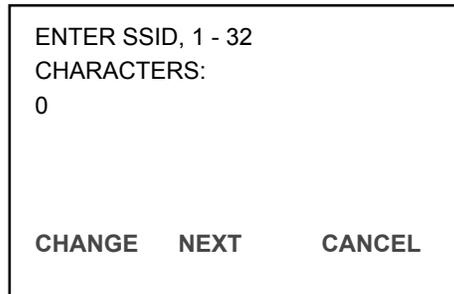


When the signal strength is less than 25%, it is likely that you will have problems connecting to the access point or have problems after the connection is established. This is only a alert to offer you the opportunity to resolve potential problems by improving the signal strength before continuing. Press the **CANCEL** button to exit the Setup Wizard or **NEXT** to continue connecting to this access point.

4: Configuring the Printer

Operator Control Panel Option

If the SSID is hidden, it is necessary to enter the SSID manually, otherwise this step is bypassed. The display for manually entering the SSID looks like:



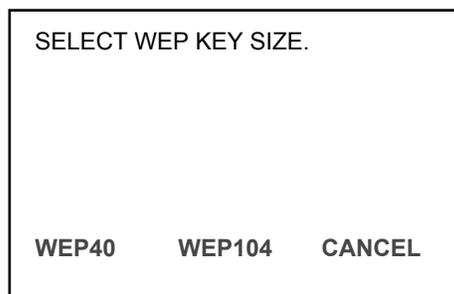
ENTER SSID, 1 - 32
CHARACTERS:
0

CHANGE **NEXT** **CANCEL**

The SSID must be entered one character at a time. Each character can be any visible ASCII character. The character that is currently being set will slowly blink. Use the **CHANGE** soft key to cycle through the ASCII character set until the desired character is shown (Remember that the SSID is case sensitive). If there are more characters that need to be set, then press the **NEXT** soft-key to add another character and use the **CHANGE** soft-key to select the correct ASCII character.

When the last character has been set (and while it is still blinking) press the **EXIT** soft-key to complete the SSID entry. (IMPORTANT - Do not press the **NEXT** soft-key after the last character has been set, otherwise you will need to repeat this entire step.) Note that entering the SSID text incorrectly will prevent successful connection to the access point.

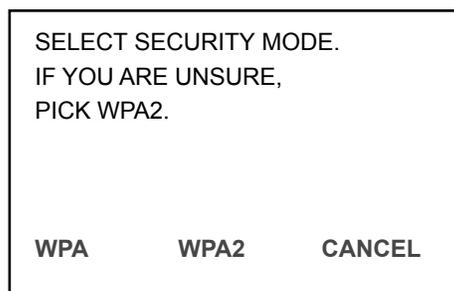
If the access point security is set to WEP, the display changes to:



SELECT WEP KEY SIZE.

WEP40 **WEP104** **CANCEL**

If the access point security supports both WPA and WPA2, the display changes to:



SELECT SECURITY MODE.
IF YOU ARE UNSURE,
PICK WPA2.

WPA **WPA2** **CANCEL**

When selecting the WEP key size, you must know the key size that the access point is configured with. Once you press either the **WEP40** or **WEP104** soft-key, you will need to enter the WEP key and the display changes to:

```
ENTER WEP KEY, 10 HEX
CHARACTERS:
0000000000

CHANGE  NEXT  EXIT
```

-OR-

```
ENTER WEP KEY, 26 HEX
CHARACTERS:
0000000000000000000000000000000000
00000

CHANGE  NEXT  EXIT
```

Use the **CHANGE** soft-key to scroll through the hex character choices (0 -9, A – F). Use the **NEXT** soft-key to select the next character position to change. The blinking character indicates the character position that is selected. When the display exactly matches the WEP key of the access point, press the **EXIT** soft-key.

For WPA and WPA2, you may need to select the encryption mode if more than one is available. If this is the case, the display changes to:

```
SELECT ENCRYPTION
MODE. IF YOU ARE
UNSURE, PICK CCMP.

CCMP  TKIP  CANCEL
```

4: Configuring the Printer

Operator Control Panel Option

Press either the **CCMP** or **TKIP** soft-key to select the encryption mode. Remember that CCMP is the stronger encryption. For WPA and WPA2, after the security mode and encryption modes have been selected or automatically determined (if only one mode is available, the selection display is bypassed), the WPA Passphrase must be entered. The display changes to:

ENTER WPA PASSPHRASE
8 – 63 CHARACTERS:
0

CHANGE NEXT EXIT

The passphrase must be entered one character at a time. Each character can be any visible ASCII character. The character that is currently being set will slowly blink. Use the **CHANGE** soft key to cycle through the ASCII character set until the desired character is shown (Remember that the passphrase is case sensitive). If there are more characters that need to be set, then press the **NEXT** soft-key to add another character and use the **CHANGE** soft-key to select the correct ASCII character.

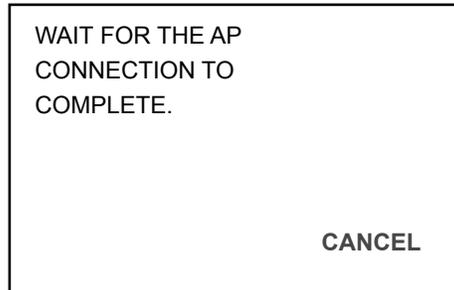
When the last character has been set (and while it is still blinking) press the **EXIT** soft-key to complete the passphrase entry. The **EXIT** key will not work until at least 8 characters have been entered. (IMPORTANT - Do not press the **NEXT** soft-key after the last character has been set otherwise you will need to repeat this entire step.) Note that entering the passphrase text incorrectly will prevent successful connection to the access point.

At this point, all the information has been collected that is necessary to connect to the access point. Please be aware that not all of the Setup Wizard screens shown above will be seen. The printer will bypass screens that are unnecessary to display. For instance, if an access point is setup with only WPA security, only TKIP security and the SSID is broadcast, only the “Enter WPA Passphrase” setup screen will be seen. The display should now be:

THE PRINTER IS READY
TO CONNECT TO THE AP.
PRESS CONNECT TO
PROCEED.

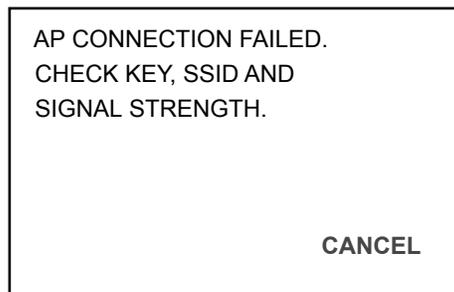
CONNECT CANCEL

The **CANCEL** soft-key can be used to exit the Setup Wizard without connecting. Press the **CONNECT** soft-key to connect to the access point. The printer will conduct a wireless authentication and association, and then proceed with security key handshaking with the access point if necessary. The display changes to:



If the connection completes successfully, the current wireless settings are automatically saved so that the printer will automatically re-connect after a power cycle. The display changes back to the main wireless menu. The “RETURN WITHOUT SAVE” selection can be used to exit from the wireless menu.

The antenna icon on the OCP will be active, providing an indication of the signal strength with up to 4 bars. If connection to the access point fails, the display will change to:



If this occurs, there is likely a problem with the data entered or the signal strength is too low to reliably connect to the access point. Try improving the signal strength if below 50%. Make sure that the SSID and security key/passphrase is correct then retry the Setup Wizard. If connection still fails, refer to the troubleshooting section for additional help.

4.7 Using ZXP Toolbox Wireless Settings Load/Save

When configuring wireless through the toolbox, after you establish a successful connection, you can click the **Save** button to save all the wireless settings as a profile to an XML file. The **Load** button can then be used to load the settings from a previously saved profile XML file. This provides a means to quickly restore connection to a particular access point or select connection to one of several access points available using different profiles. It might also be useful to setup a group of printers to all connect to the same access point.

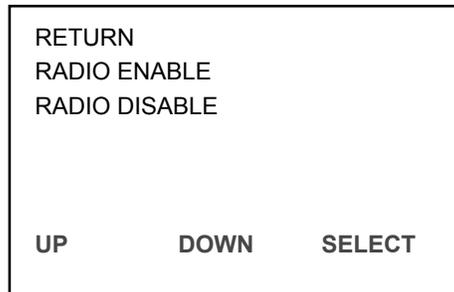
IMPORTANT!

- When using the **Save** button (not recommended) the **WEP** key or **WPA** passphrase can be saved in the XML file.
- If you are concerned about the security risk of exposing the key or passphrase in a plain text file, then check the **Don't save Key/Pass Phrase** check box (recommended). In this case, the key or passphrase will not be saved to the file.

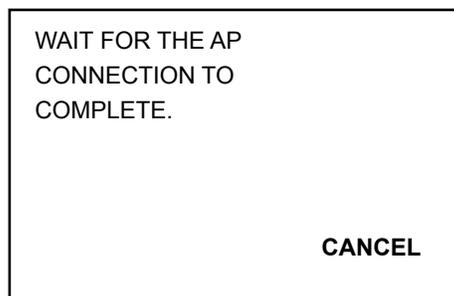
When the **Load** button is used, the key or passphrase will need to be manually entered if not saved in the file.

4.8 Using the RADIO CONTROL Menu

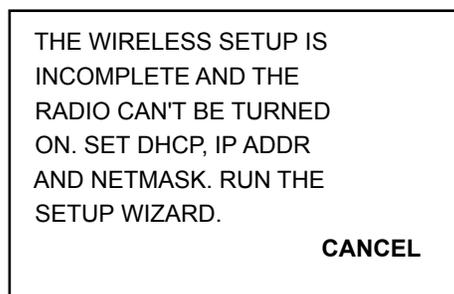
The Radio Control menu allows you to turn the radio on and off. After selecting the menu, the display changes to:



Use the **UP** and **DOWN** soft-key to select enable or disable then press **SELECT**. If the radio is connected and you select disable, the radio is disconnected from the access point. If the radio is not connected and you select enable and the stored wireless parameters are valid, a connection to the access point is attempted. The display changes to:



If the connection succeeds, the display changed back to the main wireless menu. Before attempting a connection, the wireless parameters are checked to see if they are valid (this doesn't guarantee that a connection will occur as the parameters may be valid but not correct for the access point). If the parameters are found to be invalid, the display changes to:

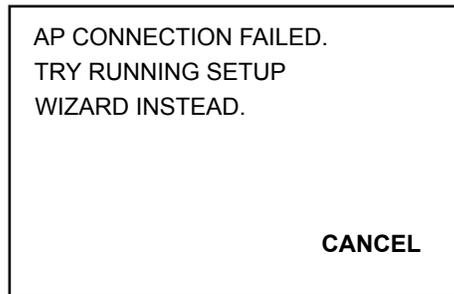


In this case, the Setup Wizard should be run again to establish valid wireless parameters.

4: Configuring the Printer

Using the RADIO CONTROL Menu

If the wireless parameters are valid, but the connection still fails, the display changes to:



This could happen if the access point itself has been modified and the wireless parameters stored in the printer are incorrect. Run the Setup Wizard to establish new parameters that work.

If you change the state of the radio, the resulting change is not saved. If you wish the state to be permanent, make sure you execute **SAVE SETTINGS** in the main wireless menu.

4.9 Using the SET DEFAULTS Menu

Executing this menu results in all the wireless parameters being set to default and permanently saved.

This might be useful if you wish to flush the wireless settings from the printer for security purposes or to enter all the settings from scratch for troubleshooting.

Once this is executed, you will need to conduct the entire setup procedure in order to connect to an access point.

4.10 Simple Roaming Used During Connection

While the printer does not support full roaming such as might be available in a mobile wireless device such as an iPhone, the printer does support a limited roaming capability during connection. When the printer tries to establish a connection to an access point, it takes the following steps until connection is established:

1. Scan for the configured access point (using both SSID and BSSID) on the configured channel. If no access point found, proceed to step 2. If found, connection is attempted. If connection successful, proceed to step 6 (done). If connection fails, proceed to step 3.
2. Scan for the configured access point (using both SSID and BSSID) on all channels. If no access point found, proceed to step 3. If found, connection is attempted. If connection successful, proceed to step 6 (done). If connection fails, proceed to step 3.
3. Scan for all access points with the correct SSID (BSSID ignored) that have the identical security settings as the configured access point on all channels. If no access point found, proceed to step 5. If multiple access points found, connection is attempted on access point with best signal strength. If connection successful, proceed to step 6 (done). If connection fails, proceed to step 4. If single access point found, connection is attempted. If connection successful, proceed to step 6 (done). If connection fails, proceed to step 5.
4. Delete access point to which connection failed in step 3. If another access point with the correct SSID and correct security settings is available, go to step 3. Otherwise, go to step 5.
5. Exhausted all connection attempt, delay for 5 seconds, then go to step 1.
6. Connection succeeded, done.

This approach will handle the following conditions:

- Configured access point can't be reached (power is off).
- Configured access point can't accept another station (load balancing is forcing the printer to connect to a different access point).

4.11 Setting Up an Ad-Hoc (Peer) Network

On wireless computer networks, ad-hoc mode is a method for wireless devices to directly communicate with each other. Operating in ad-hoc mode allows all wireless devices within range of each other to discover and communicate in peer-to-peer fashion without using access points. To set up an ad-hoc wireless network, each wireless adapter must be configured for ad-hoc mode versus the alternative infrastructure mode. In addition, all wireless adapters on the ad-hoc network must use the same SSID and the same channel number. An ad-hoc network tends to feature a small group of devices all in very close proximity to each other. Performance suffers as the number of devices grows, and a large ad-hoc network quickly becomes difficult to manage.

WiFi devices in ad-hoc mode offer minimal security against unwanted incoming connections. Only WEP security is available in the ad-hoc mode. Ad-hoc WiFi devices cannot disable SSID broadcast like infrastructure mode devices can. Attackers generally will have little difficulty connecting to an ad-hoc device if they get within signal range.

The security hole provided by ad-hoc networking is not the ad-hoc network itself but the bridge it provides into other networks, usually in the corporate environment. If a computer using an ad-hoc connection is also using a wired or wireless infrastructure network at the same time, it is providing a bridge to the secured organizational network through the unsecured Ad-hoc connection. Bridging is in two forms. A direct bridge requires the configuration of a bridge between the two connections and is thus unlikely to be initiated unless explicitly desired. An indirect bridge is the shared resources on the computer. The indirect bridge provides two security hazards. The first is that critical organizational data obtained via the secured network may be on the computer drive and thus exposed to discovery via the unsecured Ad-hoc network. The second is that a computer virus or otherwise undesirable code may be placed on the computer via the unsecured ad-hoc connection and thus has a route to the organizational secured network. In this case, the person placing the malicious code need not “crack” the passwords to the organizational network, the legitimate user has provided access via a normal and routine log-in. The malefactor simply needs to place the malicious code on the unsuspecting user's end node system via the open (unsecured) ad-hoc connection.

4: Configuring the Printer

Setting Up an Ad-Hoc (Peer) Network

The WiFi networking standards (including 802.11g) require only that ad-hoc mode communication supports a maximum of 11 Mbps bandwidth. You should expect that WiFi devices supporting 54 Mbps or higher in infrastructure mode, will drop back to a maximum of 11 Mbps when changed to ad-hoc mode. Ad-hoc mode should generally be viewed as “slower” than infrastructure mode for this reason. Some wireless cards can be configured to provide 54 Mbps operation in ad-hoc mode. If this is desirable, all peers that will join the ad-hoc network must be configured for 802.11g 54 Mbps. To configure this using Windows XP:

1. Open the **Network Connections** windows.
2. Right click the wireless network connection and select **Properties**.
3. At the top of the dialog, click **Configure**.
4. Click the **Advanced** tab.
5. Under **Property**, look for the appropriate setting, like **IBSS Mode**.
6. Select the desired Value and click **OK**.

In order to establish the ad-hoc network with the Printer for the first time, you must setup the ad-hoc network on a computer first with a wireless adapter then connect the printer to the ad-hoc network. Once the printer has successfully connected to the ad-hoc network, it will save the necessary parameters to re-connect to the same network the next time the printer is powered on. If the ad-hoc network is not found when powered on, the printer will establish the ad-hoc network with the same settings used when first connected to the ad-hoc network. A computer can then connect to the ad-hoc network at a later time and access the printer. Once the printer has been connected to the ad-hoc network, the order that the printer and computers are powered on doesn't matter. The printer will only look for the ad-hoc network or establish an ad-hoc network on the same channel as the ad-hoc network that the printer was first connected to.

Before establishing an ad-hoc network, you will need to establish IP Addresses and Subnet Mask for the computers and printer. It is likely that a DHCP server will be unavailable. The computers may power up and assign themselves Automatic Private IP Addresses in the range of 169.254.0.0 to 169.254.255.255 if a DHCP server is unreachable. If this is the case, then you will need to disable DHCP in the printer and assign an unused static IP Address to the printer that is within this range and set the printer Subnet mask to 255.255.0.0. A better approach would be to assign static IP addresses to the printer and all the computers that will be part of the ad-hoc network. IP addresses in the range 192.168.0.0 to 192.168.0.255 with a Subnet Mask of 255.255.255.0 are often used for this purpose. Remember that each device must have a unique IP address and common Subnet Mask.

Be careful about the computer IP Address and Subnet Mask that the wired Ethernet connection is using. If the computer wired IP address is on the same Subnet as the wireless interface (i.e., both are using a 192.168.0.X IP Address with Subnet Mask of 255.255.255.0) then communications over the wireless interface may fail because the Ethernet packets intended for the wireless interface may be routed through the wired interface. This issue can be addressed by disabling the computer wired interface or assigning a static IP Address to the wireless interface that puts it on a different Subnet than the wired interface.

If you plan to use both wired and wireless Ethernet printer interfaces at the same time, see the “Multi-homing Considerations” section. The configuration of the IP Address and Subnet Mask on each printer interface must be set correctly depending upon whether the two interfaces are connected to the same network or totally separate networks. Improperly configured network settings may result in a communications failure.

Instructions for establishing an ad-hoc network on a computer or laptop may vary between OS versions and wireless adaptors. The following steps are generic but should be helpful for getting started:

1. There is usually a wireless icon in the task bar which can be used to access a wireless **Setup Utility**. Right click on the icon and open the **Utility**.
2. Add an ad-hoc network. There may be an **Add** button you can click, followed by clicking on “**Create an ad hoc network**”.
3. You should be presented with a dialog to enter the **SSID** or network name. The name can be 1 – 32 text characters. Pick a name that is meaningful and easy to remember. Write it down! Click **Next**.
4. You should now enter a dialog for **Security** and **Channel** selection. The security choices are: **None** or **WEP**. It is highly recommended that you choose **WEP**. While **WEP** security is poor, it is better than none. Try to pick a channel that is quiet or not heavily used. Your **Setup Utility** may offer Site Management and Congestion analysis that will help you pick the best channel. Once the selections have been made click **Next**.
5. If you selected **WEP** security, you will now need to enter the **WEP** key. You can enter either a 40 bit key (10 Hex characters) or a 104 bit key (26 Hex characters). Save the key, you will need to use it when you connect the printer to the wireless network. Click **Next**.
6. Now click **Connect** to establish the ad-hoc network. Nothing exciting happens as the network has no peers as yet. No signal strength will be shown.

Once you have created the ad-hoc network, power on your printer and follow the same instructions as detailed above in the “Configure the Printer through the Operator Control Panel” section.

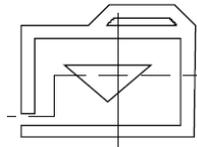
4: Configuring the Printer

Setting Up an Ad-Hoc (Peer) Network

After scanning is complete and you are scrolling through the access points, you will notice that ad-hoc networks are announced by replacing “MAC:xx.xx.xx.xx.xx.xx” with “ADH:xx.xx.xx.xx.xx.xx” as shown below:

```
SSID: Test
ADH:00:a0:f8:be:fe:72
Chan = 1 SIG = 52%
SEC MODE: WEP
CRYPTO: RC4
MAX SPEED: 54 Mbps
NEXT      SELECT  CANCEL
```

Once you have selected the ad-hoc network, selected the WEP key size, entered the WEP key and pressed connect, the printer should connect to the ad-hoc network. The computer wireless antenna icon should show signal bars. The printer OCP should also show a solid antenna icon. When there are more peers connected to the ad-hoc network than just the printer, the printer will also turn on an additional OCP icon that looks like a folder:



The folder icon is useful to determine whether another peer is connected to the same ad-hoc network as the printer. When using the OCP Info display to see the Wireless Info, an ad-hoc connection will display as follows:

```
WIRELESS INFO
SSID: Ed2
CHAN = 5 SIG = 100%
NOISE FLOOR --90 dBm
AD-HOC WEP RC4
54 Mbps
PREV      NEXT  EXIT
```

4.12 Multi-homing Considerations

The printer has both wired and wireless Ethernet interfaces that can be used at the same time. This capability is referred to as multi-homing, where a device has multiple interfaces with a different IP address assigned to each interface. If you intend to use this capability, care must be taken with regard to the IP addresses assigned and whether both interfaces connect to the same network or different networks. If instead you intend to use only one interface then the remainder of this section doesn't apply. It is recommended, however, that if you plan to use only the wireless interface that you disable DHCP on the wired interface and set the wired interface network settings (IP Address, Subnet Mask and Gateway Address) to a different subnet than the one the wireless interface is using. This can be as simple as setting the wired interface IP Address to: 0.0.0.0. This will prevent a wireless interface communications error if the wired interface is plugged into a network.

The primary multi-homing issue depends upon whether both wired and wireless interfaces are configured for the same subnet. For example, if both interfaces are configured with a Subnet Mask of 255.255.255.0, the wired interface IP Address is set to 192.168.0.11 and the wireless interface IP Address is set to 192.168.0.47, both interfaces are on the same subnet. The Subnet Mask determines the span of the subnet. In this case, any IP Address in the range of 192.168.0.0 to 192.168.0.255 falls within the same subnet. If the wired interface IP Address was changed to 192.168.1.11, the interfaces would be on different subnets. If the Subnet Mask was changed to 255.255.0.0 for both interfaces, then both interfaces would be on the same subnet again and the IP Address range for that subnet would be 192.168.0.0 to 192.168.255.255.

When both wired and wireless interfaces are configured for the same subnet and connected to a network, the printer can no longer distinguish between the two interfaces when routing Ethernet packets to the network. While packets are received on both interfaces, packets that are being routed to the network are likely to be returned on the wired interface. This is because the routing algorithm will look for the first interface available that satisfies the routing requirements based upon the destination IP Address. Given this, both interfaces must connect to the same network so that any host that sends packets to the printer is reachable on both interfaces.

There may be occasions where it is desirable to connect the printer to two entirely separate networks. In this scenario, the hosts on one network are not reachable through the other network. To make this work correctly, the two networks must be on different subnets. The IP Address and Subnet Mask settings must be properly set to achieve this. For example, if both interfaces are configured with a Subnet Mask of 255.255.255.0, the wired interface IP Address is set to 192.168.0.11 and the wireless interface IP Address is set to 192.168.1.47, both interfaces are on different subnets.

If the configuration of the printer network settings is not done correctly, communications may fail due to packets being sent on the wrong interface. When configured for different subnets, the printer does not provide a bridge between the two networks.



Monitor Wireless Performance

5.1 Overview

Once you have connected your printer to a wireless access point there are several ways that you can monitor the performance. Performance monitor is important to insure that the wireless connection is working reliably.

5.2 Wireless Info Pages

Wireless information is available through the OCP using the **INFO** button. Press the **INFO** soft-key and the display changes to:

```
PRINTER INFO
MCB FZ8ME.02.05.00
HCB FZ8ME.01.05.00
MAB FZ8RE.01.00.00
MSN: 06C092500013
PH S/N: 91-00254
PREV      NEXT      EXIT
```

The revision numbers and serial numbers displayed for your printer may be different. At any time you can press the **EXIT** soft-key to return to the normal status display. Press the **NEXT** soft-key several times until the display changes to:

```
WIRELESS INFO
SSID: Ed2
CHAN = 6SIG = 100%
NOISE FLOOR =-90 dBm
WPA2 CCMP
54 Mbps
PREV      NEXT      EXIT
```

This screen provides information about the status of the wireless information and if connected to an access point additional information. If the radio is turned off or not connected to a wireless access point, a display such as the following will be shown:

```
WIRELESS INFO

RADIO OFF

PREV      NEXT      EXIT
```

The “RADIO OFF” status location may be populated with one of several strings as shown in the following table:

Radio Status	Description
RADIO OFF	The radio is turned off.
RADIO DISCONNECTED	The radio has not yet started the process of connecting to an access point or the link with the access point has been lost. The radio will shortly attempt to reconnect.
RADIO INACTIVE	The radio is inactive because the association with an access point failed.
RADIO CONNECTING	The radio is in the process of connecting to an access point (scanning, associating or key handshaking).

When connected to an access point, the display shows the SSID of the access point, the wireless channel, the current signal strength in percent, the noise floor, the security mode, the type of encryption being used (if applicable) and the current data rate that recent packets have been received.

5.3 Signal Strength

In addition to the signal strength value available on the Wireless Info screen, the printer also uses an antenna icon on the OCP to indicate signal strength. The antenna icon has a body and four bars associated with it. Thus five separate icon states are available from no bars (just icon body) to four bars. The signal strength is based upon the SNR (Signal to Noise Ratio) with which data packets are being received by the radio. The SNR is translated into a percentage in order to make the number more intelligible to the user. For those that are interested, the SNR can be derived from the signal strength in percent by using this equation:

$$\text{SNR (dB)} = 40 * \text{Signal Strength (\%)} / 100$$

The following table outlines the SNR bands that are used to determine how many bars to display for the antenna icon:

SNR (dB)	Bars	Signal Strength %	Quality
40 and above	4	100	Robust connection, always fast.
25 to 39.99	3	62 - 99	Robust connection, mostly fast.
15 to 24.99	2	37 - 61	Robust connection, usually fast.
5 to 14.99	1	12 -36	Connection slow with packet retries and intermittent loss of link.
0 to 4.99	0	0 - 11	Insufficient signal to connect.
	0 - blinking		Connection in progress.

It is very important to recognize that good signal strength is absolutely necessary for reliable operation. Signal strength below 25% is likely to cause problems. Signal strength above 50% will provide robust operation. Signal strength is not merely a factor of the distance between the printer antenna and the access point antenna. Other factors such as ambient noise, intervening walls and other nearby wireless equipment can result in poor signal strength. See the Troubleshooting chapter for suggestions for improving signal strength.

5.4 Noise Floor

The noise floor is an instantaneous measure of the ambient noise that the wireless radio sees when it is not transmitting or receiving a packet. There is always ambient thermal noise near a level of -100 dBm that cannot be avoided. Added to this is man-made noise coming from: microwave ovens, cordless telephones, baby monitors, wireless cameras, remote car starters, DECT and residential wireless phones and Bluetooth products to name just a few. When you add the noise sources together, the typical noise floor the wireless radio should see is approximately -90 ± 5 dBm. A more negative number is better (-95 is less noise than -90). The noise floor value can be useful to evaluate whether the ambient noise is too high for robust wireless operation. If the noise floor is higher than -85 dBm, then you may want to take steps to reduce the noise level the wireless radio sees (see the Troubleshooting chapter). By using the Signal Strength and Noise Floor values, the actual signal level can be calculated as follows:

$$\text{Signal Level (dBm)} = \text{Noise Floor (dBm)} + (40 * \text{Signal Strength (\%)} / 100)$$

5.5 Data Rate

The data rate shown in the Wireless Info display can provide some insight into how well the wireless interface is working. When there is a good SNR, the radio should typically show the maximum data rate the access point can support (11 Mbps for 802.11b and 54 Mbps for 802.11g). You may notice at times that lower speeds are displayed. This is expected as long as the maximum speed appears most of the time, particularly when a print job is being received. When the SNR is poor, data will be sent at a slower speed to improve the signal quality (receiver sensitivity is better at slower data rates). If you consistently see a low data rate, then you may want to take steps to improve the signal quality; see *Troubleshooting* on page 57

5.6 DHCP & MAC Address Info Page

Using first the **INFO** button then the **NEXT** button, go to the next page after the Wireless Info page shown above. The display should look like:

```
WIRELESS INFO
DHCP Enabled
IP: 192.168.0.100
Mask: 255.255.255.0
GW: 192.168.0.1
MAC:00:19:88:06:4f:87
PREV      NEXT      EXIT
```

This screen shows the DHCP state, which can be **Enabled** or **Disabled**. If enabled, the screen can show one of the states shown in the following table:

State	Description
RADIO DISCONNECTED	Radio is not currently connected to an AP.
DHCP WAIT	Waiting for DHCP to be ready.
DHCP INITIALIZING	DHCP initializing.
DHCP: Request Sent	Request sent to DHCP server.
DHCP Timeout	Timeout due to no response to request.

If DHCP is disabled or the printer has received a response from a DHCP server, the Info Page displays the current IP Address, Subnet Mask and Default Gateway Address. The last line of the display shows the MAC Address of the wireless interface (different from the wired interface). If a DHCP Timeout occurs, the printer will fall-back to using the last good network settings that have been used. In this case, the display will indicate the timeout and also display the network settings that are currently being used, which are not settings received from a current transaction with a DHCP server:

```
WIRELESS INFO
DHCP Timeout
IP: 192.168.0.100
Mask: 255.255.255.0
GW: 192.168.0.1
MAC:00:19:88:06:4f:87
PREV      NEXT      EXIT
```

5.7 Wireless Statistics Info Page

Pressing the NEXT soft-key again will display the Wireless Statistics screen, as follows:

```
WIRELESS STATISTICS
RX BYTES: 18862
DISCARDS: 0
TX BYTES: 361
DISCARDS: 0
ERRORS: 0
PREV    NEXT    EXIT
```

The RX Bytes value is the total number of bytes that have been received by the printer via its radio. The number of discards represents the number of RX packets that were discarded because there was no buffer available to receive the packet. This should almost always be zero. A discard is not a hard failure as the packet will be resent by the sender at a later time. The TX Bytes value is the total number of bytes that have been sent by the printer to the radio. The number of discards represents the number of TX packets that were discarded because the packet was malformed or dropped due to a communication error with the radio. This should almost always be zero. A discard is not a hard failure as the packet will be resent by the printer at a later time. The final value is a catchall error counter for errors. This should be zero as it indicates a hard error. A non-zero error counter may mean that there is a hardware failure. The wireless statistics counts are reset to zero on power-up.

5.8 Wireless Statistics Success and Failure Rates

Pressing the NEXT soft-key again will display the Wireless Statistics Success and Failure Rates screen, as follows:

WIRELESS STATISTICS		
TX SUCCESS = 100%		
TX RETRY = 6%		
RX SUCCESS = 96%		
RX DUPLICATE = 0%		
RTS SUCCESS = 67%		
PREV	NEXT	EXIT

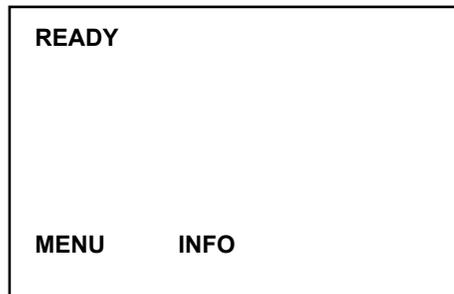
The meaning of these values is described in the following table:

Statistic Name	Description
TX SUCCESS	The percentage of packets successfully transmitted by the printer's radio. A higher number is better.
TX RETRY	The percentage of packets that need to be retransmitted. A lower number is better. A retry happens because the access point failed to receive the packet correctly.
RX SUCCESS	The percentage of packet successfully received by the radio. A higher number is better. A packet receive fails due to a Frame Check Sequence error, meaning the packet was corrupted during transmission.
RX DUPLICATE	The percentage of frames that are received more than one. A lower number is better. This can happen if the access point does not receive an ACK from the printer for the original frame.
RTS SUCCESS	The percentage of times in which CTS is received in response to an RTS. Higher is better.

The above numbers do not represent hard failures. Under normal circumstances, Success rates will be lower than 100% and the Retry & Duplicate rates will be higher than 0%. These rates do provide some information about the quality of the link. If you see low TX/RX Success Rates or high Retry/Duplicate Rates, you may be experiencing an unacceptably high error rate and need to take steps to improve the link quality (see Troubleshooting chapter). The statistics are cleared only when the printer is powered up.

5.9 Main Status Display Wireless Errors

During normal operation the OCP displays the printer status, such as the following:



If the wireless interface is experiencing hard errors, an indication of this will be added to the normal status display, such as the following:



A wireless error is not considered an alarm condition, such as “Out of Cards”, so the display does not change to **ALARM**. The wireless error display is simply informative. In most cases communications with the printer will have been lost, so the wireless error condition will usually not be seen by a host.

5: Monitor Wireless Performance

Main Status Display Wireless Errors

The wireless errors are detailed in the following table:

Wireless Error Text	Code	Description
WIFI ACCESS POINT MISSING	19002	After power up, the printer tried to connect to the access point specified by the wireless settings, but the access point was not found during the scan. The printer will periodically retry to connect to the access point.
WIFI LINK LOST	19003	The connection to the access point was lost. This may be due to poor signal strength, interference or the access point power has been lost. The printer will periodically retry to connect to the access point.
WIFI INCOMPATIBLE NETWORK	19004	After power up, the printer tried to connect to the access point specified by the wireless settings, but found the access point settings incompatible. This could occur if the access point configuration is modified. To correct, re-run the Setup Wizard to establish new wireless settings.
WIFI ASSOCIATION FAILED	19005	During association with an access point, the association failed. This could be a result of poor signal quality. If the signal strength is low, take steps to improve it, then re-run the Setup Wizard to establish new wireless settings.
WIFI CONNECTION FAILED	19006	The key handshake following the association failed. This may be because the WEP key or WPA passphrase is wrong. To correct, make sure that you have the correct key passphrase then re-run the Setup Wizard to establish new wireless settings.

5.10 Viewing Wireless Information via Printer Web Page

From the **Home** page, click **Wireless Parameters** tab; and view **Choose WiFi Connection** page. Click on **Cancel** button at the bottom of the page. View **Set/Edit WiFi Address** page, and click the **WiFi Diagnostics** tab. The following page is displayed:

The screenshot shows the Zebra printer web interface for an XZP Series 7 Card Printer at IP 172.29.1.60. The page title is "WiFi Diagnostics". On the left, a navigation menu includes "Home", "Set WiFi Address", "Available Networks", and "WiFi Diagnostics" (which is selected). The main content area displays three sections of statistics:

Receive Statistics			
Receive Bytes	1048108	Receive Data Rate	2 MBps
Receive Discards	0	Success Rate	20%
Receive Errors	0	Duplicate Rate	0%

Transmit Statistics			
Transmit Bytes	12529	Success Rate	99%
Transmit Discards	0	Retry Rate	0%
Transmit Errors	0		

Radio Statistics	
Average Signal-To-Noise	36
Average Noise Floor	-96 dBm
Ready To Send Success	0%
Link Loss	0

At the bottom of the page, there is a link to www.zebra.com and a copyright notice: "Copyright | Contact Zebra | Zebra Printers | © 2009 ZIH Corp. All rights reserved."

Note that the same information available from OCP Wireless Info pages is available in this web page.

5: Monitor Wireless Performance

Viewing Wireless Information via Driver Toolbox

5.11 Viewing Wireless Information via Driver Toolbox

Open the ZXP Toolbox and under the **Information** section, click on **Wireless Network**. The following screen will be displayed:

The screenshot displays the Zebra ZXP Series 7 Toolbox software interface. The window title is "Zebra ZXP Series 7 Toolbox - 06C091500014 (USB)". The interface is divided into a left sidebar and a main content area. The sidebar contains several expandable sections: Information, Configuration, Cleaning, Print Test Card, Technology, Advanced Security, and Print Viewer. The "Wireless Network" option under the Information section is highlighted with an orange arrow. The main content area displays the "Wireless Network" status and configuration details.

Wireless Network

Status

State	connected	Noise floor	-93dBm
Channel	6	Security	wpa2
RSSI	-37dBm	Crypto	comp
SNR	56db	Rate	54
SSID	Zebra LAB	Link lost	1
BSSID	68-71-74-5d-b5-4d		

Sent

Byte sent	62969
Unicast packets	560
Non unicast packets	0
Discard packets	0
Errors	0

Received

Byte received	5734
Unicast packets	62
Non unicast packets	0
Discard packets	0
Errors	0

Wireless Radio Setting

Multicast transmission frame	145	RTS failure	0
Failed	3	ACK failure	62
Retry	18	Rx frag	28232
Multi retry	8	Multicast receive frame	27078
Framed up	41	FCS error	75714
RTS success	0	Transmission frame	209
Tx Success	98 %	Tx Retry	8 %
Rx Success	27 %	Rx Duplicate	0 %
RTS succwss	0 %		

Network Configuration

IP address	192.168.0.193	Gateway	192.168.0.1
Subnet mask	255.255.255.0	MAC address	00-19-88-06-4f-87

Printer Status: **READY**

Click save button to save all wireless info as XML files.

See next page for details.

This Wireless Network screen provides some additional information not available through the OCP or the printer web page:

RSSI – received signal strength indicator.

SNR – the signal to noise ratio in dB for the received signal.

Link lost – the number of times the connection to the access point has been lost.

Unicast packets – the number of unicast packets that have been sent or received.

Non unicast packets – the number of non unicast packets that have been sent or received.

Multicast transmission frame - Increments when the multi-cast bit is set in the destination MAC address of a successfully transmitted MSDU.

Failed - Increments when an MSDU is not transmitted successfully.

Retry - Increments when an MSDU is successfully transmitted after one or more retransmissions.

Multi retry - Increments when an MSDU is successfully transmitted after more than one retransmission.

Framed up - Increments when a frame is received that the Sequence Control field is indicating a duplicate count. Happens if the AP failed to receive an ACK from the STA for the original frame.

RTS success - Increments when a CTS is received in response to an RTS.

RTS failure - Increments when a CTS is not received in response to an RTS.

ACK failure - Increments when an ACK is not received when Expected. The number of MMPDUs and MPDUs unacknowledged by the peer.

Rx frag - Increments for each successfully received MPDU of type Data or Management.

Multicast receive frame - Increments when a MSDU is received with the multi-cast bit is set in the destination MAC address of a successfully.

FCS error - Increments when a Frame Check Sequence error (FCS) is detected in a received MPDU. Due to wireless link interference.

At the bottom of the ZXP Toolbox **Wireless Network** page there is a **Save** button. Pressing this button will save all of the data displayed on this page to two XML files. This may be useful as a diagnostic tool if you are having problems with the wireless connection. These XML files can be emailed for analysis.



Troubleshooting

6.1 Introduction

This section is an aid to troubleshoot wireless connections. The first steps to take is to become familiar with what kind of wireless link you use, and with what type of equipment. From there, you can proceed and find identify problem and take the necessary steps to take to resolve the issue.

6.2 Wireless Troubleshooting Checklist

Before beginning to troubleshoot the wireless printer, verify the following:

- The power cord is connected to the printer, and the printer is on.
- The antenna is attached to the printer, and the polarity of the antenna matches that of the access point.
- Your SSID is correct. If you are not sure if your SSID is correct, run the wireless setup wizard again.
- Your WEP key or WPA passphrase is correct. Log into the wireless access point and check the security settings. A security key is like a password. All devices on the same wireless network using WEP, WPA, or WPA2 share the same security key. If you are not sure if your security information is correct, run the wireless setup wizard again.
- The wireless network is working properly. Try accessing other computers on your wireless network. If your network has Internet access, try connecting to the Internet over a wireless connection.
- The printer is within the range of the wireless network. For most networks, the printer should be within 100 feet (30 meters) of the wireless access point.
- The printer is located away from obstacles that could block the wireless signal. Remove any large metal objects between the access point and the printer. Make sure the printer and wireless access point are not separated by poles, walls, or support columns containing metal or concrete.
- The printer is located away from other electronic devices that may interfere with the wireless signal. Many devices can interfere with the wireless signal, including microwave ovens, baby monitors, motors, cordless phones, security system cameras, other wireless networks, and some Bluetooth devices.
- The printer driver is installed on the computer from which you are performing a task.
- The correct printer port is selected.
- The computer and printer are both connected to the same wireless network.

6.3 Cannot Print Over Wireless Network

If you encountered problems while installing, or if your printer does not appear in the printers folder or as a printer option when sending a print job, you can try uninstalling and reinstalling the software.

These are possible solutions. Try one or more of the following:

1. Make Sure Your Computer Is Connected To Your Wireless Access Point

- See if you have access to the Internet by opening your Web browser and accessing any site.
- If there are other computers or resources on your wireless network, check to see if you can access them from your computer.

2. Move the Computer and/or Printer Closer To the Wireless Access Point

Although the possible distance between devices in 802.11b or 802.11g networks is 300 feet, the maximum range for optimal performance is generally 100–150 feet.

3. Move Your Access Point to Minimize Interference

There may be temporary interference from other devices such as microwave ovens or other appliances, cordless phones, baby monitors, and security system cameras. Make sure your access point is not positioned too closely to these devices.

4. Check Whether the Printer Is On the Same Wireless Network as The Computer

The SSID of the printer must match the SSID of the wireless network. Type the IP address of the wireless access point in the Web address field of your browser. If you do not know the IP address of the wireless access point start with item a. If you know your access point IP address, start with f:

- a. Click **Start**.
- b. Click **All Programs** or **Programs->Accessories->Command Prompt**.
- c. Type **ipconfig**.
- d. Press **Enter**.
- e. The “Default Gateway” entry is typically the wireless access point. The IP address appears as four sets of numbers separated by periods, such as 192.168.0.100. Your IP address might also start with the numbers 10 or 169. This is determined by your operating system or wireless network software.
- f. Type the wireless access point IP address into your browser. Type your user name and password for the wireless access point when prompted and Click **OK**.
- g. On the main page, click **Wireless** or another selection where settings are stored. The SSID appears.

5. Check Your Security Keys

A security key is like a password. All devices on the same wireless network must share the same security key.

- **WEP key:** Exactly 10 or 26 hexadecimal characters. Hexadecimal characters are A-F, a-f, and 0-9.
- **WPA or WPA2 passphrase:** From 8 to 63 ASCII characters. ASCII characters in a WPA passphrase are case-sensitive. The currently recommended minimum length for a passphrase is twenty characters.

Note: If you do not know this information, see the documentation that came with the wireless network, or contact the person who set up your wireless network.

6. Check Your Advanced Security Settings

- If you are using MAC address filtering to limit access to your wireless network, you must add the printer MAC address to the list of addresses allowed to connect to the wireless access point.
- If you set the wireless access point to issue a limited number of IP addresses, you must change this so that the printer can be added.

Note: If you do not know how to make these changes, see the documentation that came with the wireless network, or contact the person who set up your wireless network.

7. Ping the Access Point to Make Sure the Network Is Working

If you do not already know it, find the IP address of the access point.

- a. Click **Start**.
- b. Click **All Programs** or **Programs ->Accessories->Command Prompt**.
- c. Type **ping** followed by a space and the IP address of the wireless access point. For example: ping 192.168.0.100
- d. Press **Enter**.
- e. Check to see whether the access point responds:
 - If the access point responds, you will see several lines appear that start with "Reply from." It is possible that the printer did not connect to the wireless network. Turn off and then restart the printer to try to connect again.
 - If the access point does not respond, it will take several seconds and then you will see "Request timed out." You will need to take steps to repair the connection between the PC and the wireless network.

8. Ping the Printer to See if it is Accessible

Use the **INFO** and **NEXT** soft-keys on the OCP to display the wireless IP Address. As shown above, print the printer with this address. If a timeout results, then the printer is not connected to the wireless network.

6.4 Improve Wireless Signal Strength

A common reason wireless printers fail to communicate over a network is poor wireless signal quality. If the signal is too weak, too distorted, or blocked by an object, it cannot carry information between the access point and the printer. To determine if the printer is receiving a strong signal from the access point, Use the **INFO** and **NEXT** soft-keys on the OCP to display to display the Wireless Info pages and Statistics. The Signal Strength and Noise Floor values may indicate poor signal strength or noisy environment. Drops in signal strength can be intermittent, however, and although the signal quality appears high, it may drop during certain conditions.

If you think signal strength is a problem between your access point and the printer, try one or more of the following:

1. Move the Printer Closer to the Wireless Access Point

If the printer is too far away from the access point, it will not be able to communicate with other devices on the network. For most indoor wireless networks, the maximum distance between the access point and the printer is approximately 100 feet (30 meters). This distance could be longer or shorter, depending upon the layout of the network and the limitations of the access point.

2. Remove Obstacles between the Access Point and the Printer

The wireless signal from your access point will pass through most objects. Most walls, floors, furniture and other objects will not block the wireless signal. However, there are materials that are too dense for the signal to pass through. Objects containing metal and concrete can block the signal, including:

- Cubicle walls
- Ducts
- Window frames
- Poles and interior support columns
- Metal office furniture and cabinets
- Elevators
- Steel doors
- Walls and other structural elements reinforced by rebar

Arrange your printer and access point so that the signal is not blocked by any of these objects.

3. Remove Sources of Interference

Other types of radio frequencies can cause problems with the wireless signal on your network. These sources of interference can cause printing issues that seem to come and go. Some common sources of interference are:

- Microwave ovens
- Cordless phones
- Refrigerators and other appliances
- Bluetooth devices
- Other wireless networks
- Motors

Turn off these potential sources of interference where possible. Avoid using microwaves and cordless phones when printing over your wireless network.

If another wireless network is operating in the vicinity, change the wireless channel on the access point.

Do not place your access point on a printer. Printers can also interfere with the wireless signal.

4. Arrange the Network to Reduce Signal Absorption

Even when the wireless signal is able to pass through an object, it is slightly weakened. If it passes through too many objects, it can be significantly weakened. All objects absorb part of the wireless signal when it passes through them, but certain types of objects absorb enough to cause communications problems. To avoid signal absorption, avoid placing the following items between your access point and your printer:

- Multiple walls or floors
- Stacks of paper or books
- Crowds of people
- Objects containing water, such as fish tanks
- Plants

Place your access point as high in the room as possible to avoid signal absorption.

5. Add an Additional Access Point

If the access point is too far away from the printer or the current access point has too many wireless clients attached to it, try adding a second wireless access point to your network that is closer to the printer. Make sure that you use different channels for the two access points. Note that 1, 6, and 11 are the preferred channel choices (in the United States).

6. Conduct Site Survey

The location of your wireless network may have too many access points within range of the printer. Access points on the same or adjacent channels can interfere with each other, causing reduced signal strength, retries and corrupted packets.

To find out about the access points in the area, use a tool such as NetStumbler or InSSIDer. NetStumbler (also known as Network Stumbler) is a tool that facilitates detection of Wireless LANs using the 802.11b and 802.11g WLAN standards. It will provide information on access points found, the channels they are using and the signal strength. Armed with this information, you may be able to reconfigure your wireless network to reduce interference and improve signal strength.

6.5 PSK 4-way Handshake Timeout

During WPA or WPA2 security negotiation 4 or 6 EAPOL frames are exchanged during the process which is often referred to as the 4-way handshake and group handshake.

The security negotiation algorithms require the use of cryptographic algorithms and thus require some time to complete. For each EAPOL frame sent to the printer, it may take as long as 850 ms for the printer to respond with an EAPOL frame. Some Access Points (CISCO for instance) are configured with timeouts shorter than this and thus timeout before the 4-way handshake completes. The printer indicates this situation as a failure to connect. The only solution is to re-configure the 4-way handshake timeout in the AP to be greater than 850 ms (suggested timeout value is 1,000 ms or 1 second).

Technical Specifications

The wireless interface complies with IEEE 802.11-2007 with exceptions noted below:

IEEE 802.11 Standards

Standard	Supported	Description
802.11a	N	54 Mbps, 5 GHz standard
802.11b	Y	Enhancements to 802.11 to support 5.5 and 11 Mbps
802.11d	N	International (country-to-country) roaming extensions
802.11e	N	Enhancements: QoS, including packet bursting
802.11g	Y	54 Mbps maximum rate, 2.4 GHz standard
802.11h	N	Spectrum Managed 802.11a (5 GHz) for European compatibility
802.11i	Partial	Enhanced security (see Securities table below)
802.11j	N	Extensions for Japan

Securities

Security	Supported
None	Y
WEP (40 & 104 bit) – Only Open Authentication	Y
WPA-PSK (Personal)	Y
WPA2-PSK (Personal)	Y

Network Stack Protocols

Protocol	Description	Supported
IPv4	Internet Protocol	Y
IPv6	Internet Protocol	Y
Raw TCP Port 9100	Transmission Control Protocol	Y
Raw UDP Port 9100	User Datagram Protocol	Y
FTP Client	File Transfer Protocol	N
ICMP	Internet Control Message Protocol	Y
FTP Server	File Transfer Protocol	N
DHCP Client	Dynamic Host Configuration Protocol	Y
DHCP Options		N
DHCP Address Retention	When the printer reboots, if it had previously acquired a DHCP IP address it will provide that address in a DHCP request packet to the server. It is expected that if the address is still available then the server will provide it back to the printer.	N
BOOTP Client	Bootstrap Protocol	N
ARP Client	Address Resolution Protocol	Y
RARP Client	Reverse Address Resolution Protocol	N
Gleaning (PING)	Method of specifying IP address by pinging	N
Static IP	Manual assignment of IP address	Y
DNS	Domain Name System	Y
WINS	Windows Internet Naming Service	N
ESI Discovery		N
ESI Multicast address		N
Auto IP	Server-less dynamic IPv4 address assignment	N
LPR/LPD	Line Printer Remote protocol /Line Printer Daemon protocol	N
IPP v1	Internet Printing Protocol	N
IPP v2	Internet Printing Protocol	N
SSH	Secure Shell	N
SSL	Secure Sockets Layer	N
IP Access Control		N
IP Filtering		N
IPSec	Internet Protocol Security	N
Fast IPSec		N
IKE	Internet Key Exchange	N
Open Crypto		N
SNMP v1	Simple Network Management Protocol	Y

Network Stack Protocols

Protocol	Description	Supported
SNMP v2	Simple Network Management Protocol	Y
SNMP – Traps		N
HTTP Server		Y
HTTP static pages		Y
HTTP HTML		Y
NTP Client	Network Time Protocol	N
Telnet Configuration		N
POP3 Client	Post Office Protocol	N
POP3 attachments		N
SMTP Client	Simple Mail Transfer Protocol	N
SMTP Alerts		N
TFTP Sever	Trivial File Transfer Protocol	N

Other Features

Feature	Specification
Roaming	Supported
Fast Re-association	Not Supported
CCX v3	Not Supported
CCX v4	Not Supported
CCX v5	Not Supported
Ad-Hoc Network (IBBS)	Supported (Security NONE or WEP only)
Data Rates	1, 2, 5.5, 11, 6, 9, 12, 18, 24, 36, 48 and 54 Mbps
Frequency Range	2.401 to 2.483 GHz
Receive Sensitivity	-89 dBm (1 Mbps) -85 dBm (11 Mbps) -69 dBm (54 Mbps)
Transmit Output Power	10 dBm
External Antenna Type	Reverse SMA plug connector, 1 dBi gain

7: Technical Specifications

The wireless radio ships from the factory configured for one of three possible regions. The region cannot be changed by the user. The region determines the channel utilization. For all three regions, the maximum power output for any channel is 10 dBm as specified above. The following table defines the regions, channel utilization and countries which are included in the region:

Region	Channels	Countries
USA	1 – 11	Canada, Colombia, Dominican Republic, Grenada, Guatemala, Guam, Mexico, Panama, Puerto Rico, Taiwan, United States, Uzbekistan
EUROPE	1 – 13	United Arab Emirates, Armenia, Netherlands Antilles, Austria, Australia, Aruba, Azerbaijan, Bosnia & Herzegovina, Barbados, Belgium, Bulgaria, Bahrain, Saint Bartheleme, Brunei, Darussalam, Belarus, Switzerland, Chile, China, Costa Rica, Cyprus, Czech Republic, Germany, Denmark, Ecuador, Estonia, Egypt, Spain, Finland, France, Georgia, Great Britain, Greece, Greenland, Honduras, Hong Kong, Croatia, Haiti, Hungary, Indonesia, Ireland, Israel, India, Iceland, Iran, Italy, Jamaica, Jordan, Cambodia, North Korea, Kuwait, Kazakhstan, Lebanon, Liechtenstein, Sri Lanka, Lithuania, Luxembourg, Latvia, Monaco, Morocco, Macao, Macedonia, Malta, Netherlands, Norway, Nepal, Oman, Peru, Papua New Guinea, Philippines, Pakistan, Poland, Portugal, Qatar, Romania, Russian Federation, Saudi Arabia, Sweden, Singapore, Slovenia, Slovakia, El Salvador, Syrian Arab Republic, Thailand, Trinidad & Tobago, Tunisia, Turkey, Ukraine, Uruguay, Vietnam, Yemen, South Africa, Zimbabwe, Albania, Argentina, Brazil, Algeria, South Korea, Malaysia, Bolivia, Belize, New Zealand, Venezuela
JAPAN	1- 13	Japan (channel 14 not available)

Glossary

10/100 Base-T

A technical term for Ethernet. 10/100 refers to the speed at which the Ethernet network functions. 10 indicates 10 megabits per second (Mb/s) for normal Ethernet, and 100 indicates 100 Mb/s for Fast Ethernet.

802.11a

A type of wireless networking that provides up to 54 Mbps transmission in the 5 GHz band.

802.11b

A type of wireless networking that provides up to 11 Mbps transmission (with a fall-back to 5.5, 2, and 1 Mb/s) in the 2.4 GHz band.

802.11g

A type of wireless networking that provides up to 54 Mbps transmission in the 2.4 GHz band.

Access Point

A device that shares a single Internet connection with multiple computers or other devices. The basic access point controls network traffic.

Ad-hoc network

A type of wireless network in which devices directly communicate with each other rather than through a Wireless Access Point (WAP). Also referred to as peer-to-peer. Ad-hoc networks are typically small and simple, for example, a wireless PC and a wireless printer. Ad-hoc networks are independent basic service stations (IBSS), or direct-connect wireless networks.

Authentication

Authentication is a wireless network security strategy. On a network with authentication, devices use a shared key as a password and communicate only with devices that know the key. Unlike WEP, authentication does not encrypt the data sent between wireless devices. However, authentication can be used in conjunction with WEP. Authentication keys and WEP keys can be identical.

AutoIP

A process by which a device on a network automatically assigns an IP address to itself.

BOOTP

Bootstrap Protocol (BOOTP) is an Internet protocol that enables a device to discover its own IP address, the IP address of a BOOTP server on the network, and a file to be loaded into memory to boot the machine. This enables the device to boot without requiring a hard or floppy disk drive.

Broadcast packet

A packet sent from one device on a network to all devices on the network.

BSS (Basic Service Set)

Basic Service Set describes the type of wireless network that you are using. The BSS type can be one of the following: Infrastructure network or Ad-Hoc network.

Channel

A specific radio frequency used by two or more wireless devices to communicate with each other. All devices on the network must use the same channel. The number of channels available varies by country/region.

dBm

The power ratio in decibels (dB) of the power referenced to one milliwatt (mW). Examples: 0 dBm = 1 milliwatt, 10 dBm = 10 milliwatt and 20 dBm = 100 milliwatt.

DHCP (Dynamic Host Configuration Protocol)

A protocol used to automatically assign an IP address to each device on a network.

DHCP IP address

An IP address automatically assigned by a DHCP server.

DHCP server

A computer or access point that gives a unique IP address to each device on the network from a dynamically managed pool of IP addresses. Unique addresses prevent conflicts. When a user logs in, the server “loans” the user an IP address for the duration of the network connection. When a user logs off, the IP address is returned to the pool for use by another device.

Digital Certificate

An electronic means of proving the identity of a network user or device. Certificates contain detailed information about the user's device in a standard format. Digital certificates are typically issued by a trusted third-party Certificate Authority (CA). Locally administered, or self-signed, certificates are valid in some instances.

EAP

Extensible Authentication Protocol (EAP) is a general protocol for authentication that also supports multiple authentication methods, such as token cards, one-time passwords, certificates, and public key authentication.

Encryption keys

A sequence of characters or digits that a wireless device uses to encode data. Encryption keys can be static (as they are in WEP) or dynamic (as they are in WPA).

Encryption

A network security that encodes the data sent across a wireless network making the data unintelligible to unauthorized users. The printer supports WEP and WPA.

Ethernet

A popular form of wired computer networking for Local Area Networks.

EWS (embedded Web server)

A server that is completely contained within a device. An EWS provides management information about the device. This is helpful for managing single devices on a small network. By using a Web browser to access an EWS, network users can perform such operations as obtaining network printer status updates, simple troubleshooting and changing device configuration settings.

Firewall

A combination of hardware and software tools that protects a network from unwanted entry.

Gateway

A dedicated device (access point or computer) that connects two different networks. For example, a computer on an Ethernet network may act as a gateway between the network and the Internet.

Infrastructure network

A type of wireless network in which devices communicate with each other through a Wireless Access Point (WAP), such as a wireless network hub, access point, or gateway.

IP address (Internet Protocol address)

Each computer that connects to a network or the Internet, must have a unique address. IP address numbers are in the form x.x.x.x—for example, 169.254.100.2. Most networks use DHCP or AutoIP to dynamically assign IP addresses. However, a device can be manually assigned a static IP address.

LAN (Local Area Network)

A high-speed type of computer network that connects devices that are a relatively short distance from one another. An Ethernet network is one type of LAN.

MAC (Media Access Control) address

A hardware address that uniquely identifies each device on a network. You can usually find the MAC address printed on the device.

MAC filtering

A method of limiting access to your wireless network by specifying which MAC addresses may communicate on the network. This setting may be specified on wireless access points.

Mbps (megabits per second)

The measure for the rate at which a network functions. For example, 1 Mbps equals 1,000,000 bits per second (or 125,000 bytes per second).

Network adapter/card

A device that lets computers or printers talk to each other over a network.

Network name

A network name is an alphanumeric, case-sensitive character string that provides basic access control to a wireless network. A network name is also known as a Service Set Identifier (SSID).

Node

A network connection point, typically a computer.

Packet

A message sent from one device on a network to other devices on the network.

Peer-to-peer

See Ad-hoc network.

Ping

A test to see if your computer can communicate with another device.

Protocol

A language that devices on a network use to communicate with each other. A popular network protocol is TCP/IP.

Security key

A password, such as a WEP key or a WPA pass phrase, used to make a network secure.

Server

A computer on a network that manages network resources. A network might have a number of different server types. For example, a print server manages one or more printers, a file server stores and manages files, and a network server manages network traffic.

Signal strength

Measure of how strongly a transmitted signal is being received.

SSID (Service Set Identifier)

A unique identifier (up to 32 characters) attached to the header of packets sent over a wireless LAN. An SSID provides basic access control to a wireless network. It can also be used to logically segment a wireless subgroup of users and devices. An SSID prevents access by any client device that does not have the SSID. By default, an access point broadcasts its SSID in its beacon. An SSID is also referred to as a Network Name because it is a name that identifies a wireless network.

Static IP address

An IP address that is manually assigned to a device on a network. A static IP address remains fixed until changed manually. Alternative methods for assigning IP addresses are DHCP and AutoIP.

Subnet mask

A number that identifies the IP addresses that belong to a subnet.

Switch

A device similar to a network hub that can connect different networks together

Switch

A network device that manages network traffic in order to minimize collisions and maximize speed.

TCP/IP

Transmission Control Protocol/Internet Protocol (TCP/IP) is the network communication protocol used on the Internet. The printer's built-in networking feature supports LANs that use TCP/IP.

TKIP

See WPA. Temporal Key Integrity Protocol (TKIP).

Unicast packet

A packet sent from one device on a network to another device on the network.

WEP key

A WEP key, or encryption key, is a sequence of alphanumeric characters or hexadecimal digits. After creating a WEP key, you must remember it or store it in a secure location. You may not be able to retrieve the WEP key if you lose it. A WEP key is either 64 or 128 bits long. The first 24 bits of the key are provided automatically. When creating the WEP key, the person creating the key provides the remaining bits (40 bits in the case of a 64-bit key, or 104 bits in the case of a 128-bit key).

WEP

Wired Equivalent Privacy (WEP) provides security by encrypting data sent over radio waves from one wireless device to another wireless device. WEP encodes the data sent across the network making the data unintelligible to unauthorized users. Only devices that share the same WEP settings as the printer will be able to communicate with the printer. WEP depends on encryption keys that are static and provides less security than WPA (TKIP).

WiFi (Wireless Fidelity)

A term used generically when referring to any type of 802.11 network, whether 802.11b/g, 802.11a, dual-band, or other. Any products tested and approved as "WiFi Certified" are certified as inter-operable with each other, even if they are from different manufacturers. Typically, however, any WiFi product using the same radio frequency (2.4 GHz for 802.11b or 11g; 5 GHz for 802.11a) will work with any other WiFi product, even if not WiFi Certified.

Wireless Access Point (WAP)

A Wireless Access Point (WAP) is a device through which devices (for example, computers and printers) on an infrastructure wireless network communicate with one another. A WAP is also called a base station.

Wireless network adapter

Each node (computer or device) on the WLAN uses a wireless network adapter into which a wireless transceiver, with a small, integrated antenna, is built. Wireless network adapters might be internal (inserted in a computer or device), external (housed in a separate case), or built-in.

WPA (WiFi Protected Access)

WPA provides security by encrypting data sent over radio waves from one wireless device to another wireless device and by controlling access to network resources through authentication protocols. Only devices that share the same WPA settings as the printer will be able to communicate with the printer. WPA uses encryption keys that change frequently. WPA provides better security than WEP. WPA typically uses TKIP encryption. WPA is not supported on ad hoc wireless networks.

WPA2

A newer version of WPA which typically uses CCMP (AES) encryption. Older access points are less likely to support this. Other possible security settings are WPA and WEP.