

ZEBRA MOBILE PRINTERS

Wireless Configuration Guide

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Information Needed for Network Configuration

Before you start to configure your printer for use on a Local Area Network (LAN), you will need some basic information which will enable you to establish the network configuration for your printer.

Use Table 1 opposite as a guide to obtain information on important networking settings. If you don't know this information, you should obtain it from the network administrator.

Table 1: Network Information Needed For Printer Set-up

1. What is your wireless LAN's ESSID (Extended Service Set Identifier)?: _____
2. Does the network supports DHCP (Dynamic Host Configuration Protocol)?
 - YES _____ (If "yes", proceed to question 3)
 - NO _____ (If "no", fill out information below)
 1. IP address _____:_____:_____:_____
 2. Subnet Mask: _____:_____:_____:_____
 3. Gateway: _____:_____:_____:_____
3. If the Wireless network has WEP (Wired Equivalent Privacy) enabled then you need to know if it uses 40 bit or 128 bit WEP encryption and the encryption keys:
 - 40 bit key: _____
 - 128 bit key: _____
 - Which encryption key index is your network using (circle one): 1, 2, 3, 4
4. Authentication Information (not available with Frequency Hopping [FHSS] radios)

If you are using Cisco's LEAP authentication scheme you will need:

 - User Name: _____ Password: _____

If you are using the Kerberos authentication scheme you will need:

 - User Name: _____ Realm: _____
 - Password: _____ KDC: _____
5. Zebra Mobile Network Printers support POP3 (Post Office Protocol 3) The information you will need to set up POP3 is:
 - The IP address of the POP3 server: _____:_____:_____:_____
 - The user name of the POP3 account: _____
 - The password of the POP3 account: _____
 - You will also need to decide how frequently you want the printer to check for new e-mail. This is called the poll frequency.
Poll Frequency: _____

Using Label Vista to Configure Your Wireless Printer

INTRODUCTION TO LABEL VISTA

Label Vista™ is a program that allows users with little or no programming background to design labels which can be printed on the full range of Zebra Technologies Corporation's mobile printers. It combines an intuitive graphically based user environment along with powerful, but easily mastered, editing tools.

In addition, Label Vista provides utilities making it easy to configure your printer for a variety of purposes, including setting them up for wireless communications either on a Local Area Network (LAN) or using the international Bluetooth™ communications standard.

Label Vista utilizes a subset of Zebra's Portable Printer Control Language (CPCL). Label files created in Label Vista are fully compatible with other labels created using the complete set of CPCL commands.

System Requirements For Label Vista

- 1) An IBM-compatible PC with a CD-ROM drive and the minimum configuration to run Windows 95/98/NT/2000/XP will have sufficient memory to run Label Vista. You will need a serial (RS232-C) data port and approximately 10 MB of disk space for the full Label Vista installation.
- 2) Serial communications cable (Zebra P/N BL11757-000) to connect your Zebra Mobile Printer to the 9 pin serial port of your PC.

You may need to supply adapter cables between the serial communications cable and your computer if (1) your serial port has 25 pins or (2) the connector gender of your computer does not agree with the communications cable. Zebra's standard communication cable has a 9-pin female connector.

- 3) Label Vista™ Label Creation Utility Software, Revision 2.17 or higher. Label Vista can be installed from the Accessories CD which was packaged with your printer or can be downloaded directly from Zebra's Web site at: <http://www.zebra.com>

Label Vista Installation

Important: Please close all applications including Microsoft™ Office and Microsoft Outlook before proceeding.


Place the Label Vista CD-ROM in your CD drive, and double click on the "Setup.exe" icon to start the installation. You will be prompted for the location of the Label Vista installation.

NOTE: the Label Vista installation procedure will automatically load TrueType™ fonts included in the software package. You should insure that these fonts will not conflict with any of your system's existing fonts, and that this installation will not exceed your system's maximum number of installed fonts.

RUNNING LABEL VISTA

After Label Vista has been installed, the program can be started by navigating through the Start button on the bottom of the screen to the Programs section, and selecting Label Vista.

Contextual help

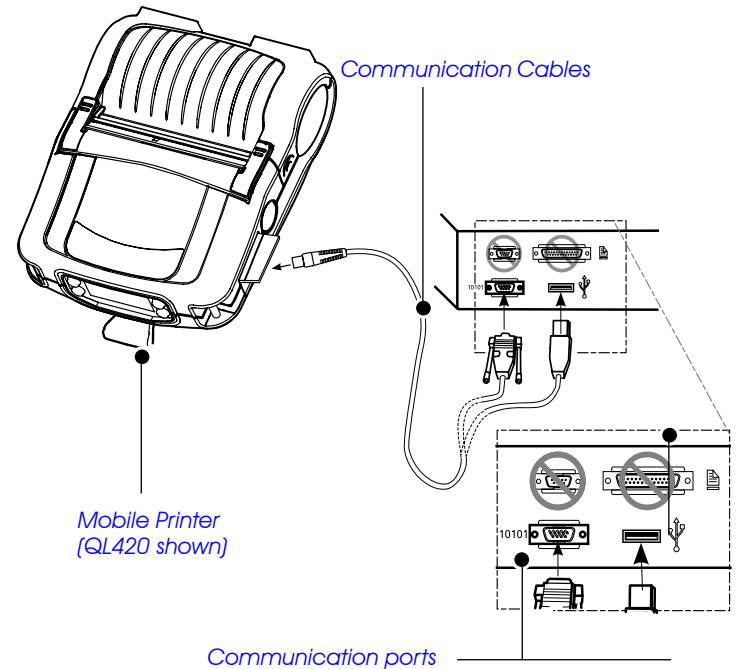
Label Vista has extensive contextual help support. To use the help utility, select the  icon and click on a feature of Label Vista you need information about (a menu item, an icon ,etc.).

continued

CONNECTING YOUR PRINTER

Label Vista installs drivers to allow you to communicate with Zebra portable printers.

Connect the printer's communication cable from either your computer's COM1 or COM2 (Serial I/O) connector or its USB port to the mobile printer's I/O connector as shown opposite. Note that only QL Plus and RW series printers support USB connections. (Refer to the section of this manual on the Printer menu for more information on setting up communications parameters from your computer to your printer.)



Using the Printer Menu Com Port Setup

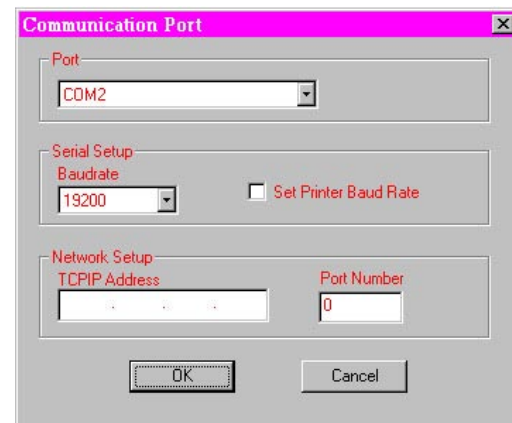
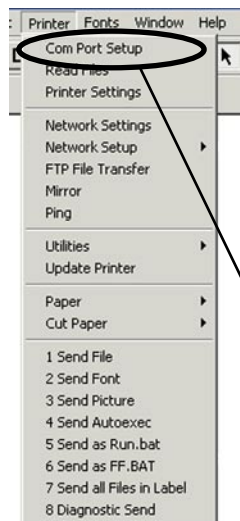
Once you have Label Vista running, and your printer connected to your P.C., click on the Printer selection on the menu bar, then the Com Port Setup selection.

Communications Port sets up the communications port via the ComPort dialog box. The mobile printer user may select the communications port and the rate at which data is transferred.. The **Com1** or **Com2** selections allow bi-directional serial communications with the printer; the other options do not apply.

Two network protocols are available to communicate to Zebra mobile printers equipped with network capabilities: **NETWORK TCPIP** and **NETWORK LPD**. In order to communicate with the printer, choose the protocol that the printer is configured for. If you are unsure as to which protocol the printer is using, turn the printer off and while holding the feed key down turn the printer back on. This will print the printer's 2-key report. The protocol that the printer is configured to use is listed under the RF-LAN section. If the printer is using a Symbol MOM card choose the **NETWORK SYMBOL MOM CARD** option. This is a TCP protocol that does not close the network connection.

In order to talk to a network printer the IP address and port must also be entered. The printer's current IP address and port are also listed on the 2-key report. Configuring **Baudrate** allows selection of the rate at which data is sent over either COM port. Baud rates range from 2400 to 115200 b.p.s.

Checking the **Set Printer Baud Rate** box allows Label Vista to automatically set the Baud rate for the program and the printer.



Wireless Network Printer Setup With WLAN 802.11b Radio

You will need information for the Network you will connect to. It will be useful if you get this information before you start the setup procedure. Refer to the information you compiled in Table 1 when completing the set-up process.

NETWORK SETUP USING LABEL VISTA

Label Vista has Network setup wizards to help the user to configure his/her wireless network printer quickly and easily.

The three types of setup are:

- Quick Network Setup (no Encryption)
- Network Setup with Encryption
- POP3 Setup

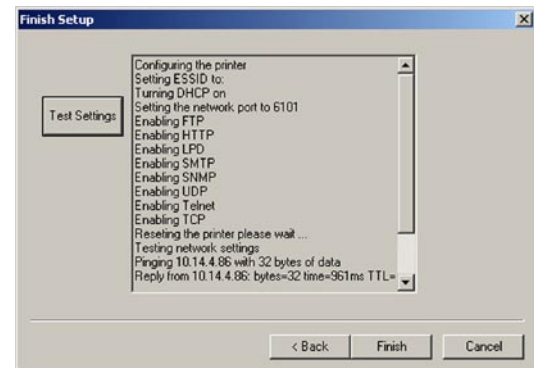
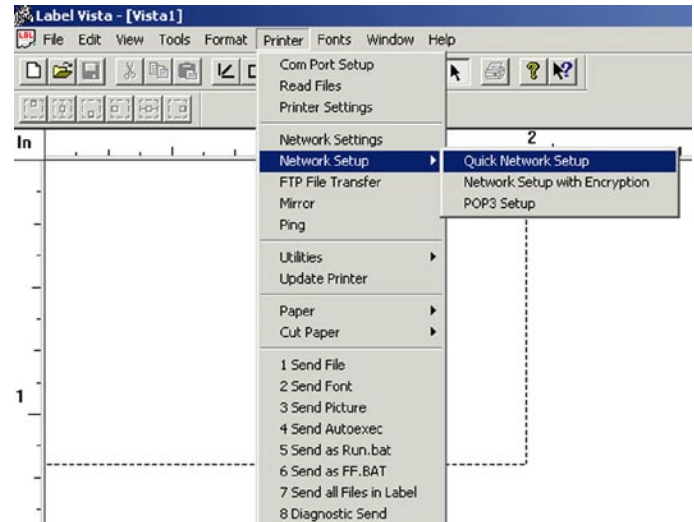
Label Vista will also allow you to set the Authentication settings.

QUICK NETWORK SETUP

Use this option if you do not need to use data encryption on your wireless network.

Once your printer is connected via cable to your PC, open Label Vista. Ensure that communications to the printer is set per the preceding section. To verify communication between your PC and the printer click on Printer/ Read files. If there is communication, a window showing the files in the printer memory will be displayed after a few seconds.

- Open Label Vista and select "Printer" on the top bar menu. On the drop down menu, go to Network Setup. Then select: Quick Network Setup.
- Follow the prompts provided by the set up Wizard, using the information filled in on Table 1.
- At the end of the setup process you will be prompted to click on "Test Settings" to make sure the connection and settings have been established. After selecting "Test Settings" you will see actual communication between the printer and Access Point tak-



continued

ing place. You may then exit the wizard by clicking on the “Finish” button.

Verifying Communications

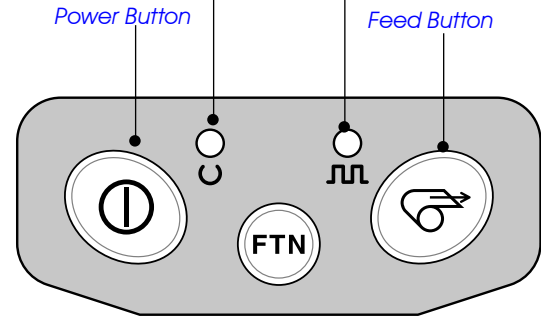
If your printer is equipped with a display, you can verify that the printer has established communication with the Access Point. The antenna symbol on the upper left hand side corner of the LCD will be shown.

You can scroll the screens of the printer LCD until you get to the WLAN TCP-IP screen. The IP address and the ESSID of the Access Point will be shown. If the printer is not associated with a network radio access point, the antenna icon will be missing and the ESSID field will be blank.

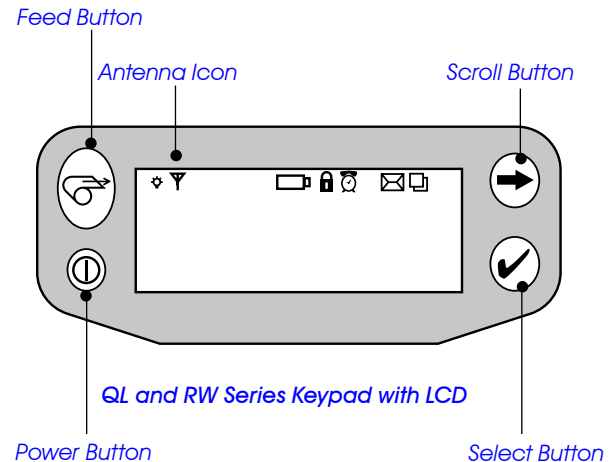
If your printer does not have an LCD the “Power” LED will blink if the printer is not associated with an access point.

A blinking power LED indicates that the printer is not linked to an access point on the network, or the printer’s battery needs re-charging

A rapidly blinking indicator means radio communications with a host is taking place



QL Series Keypad



QL and RW Series Keypad with LCD

continued

Printing a Configuration Label

If your printer does not have an LCD you can print a Configuration Label (2-key report) and verify the network settings in the printer.

To print out a Configuration Label follow these steps:

1. Turn the printer off. Load the media compartment with journal media (media with no black bars printed on the back)
2. Press and hold the Feed Button.
3. Press and release the Power button and keep the Feed button pressed. When printing starts, release the Feed button.

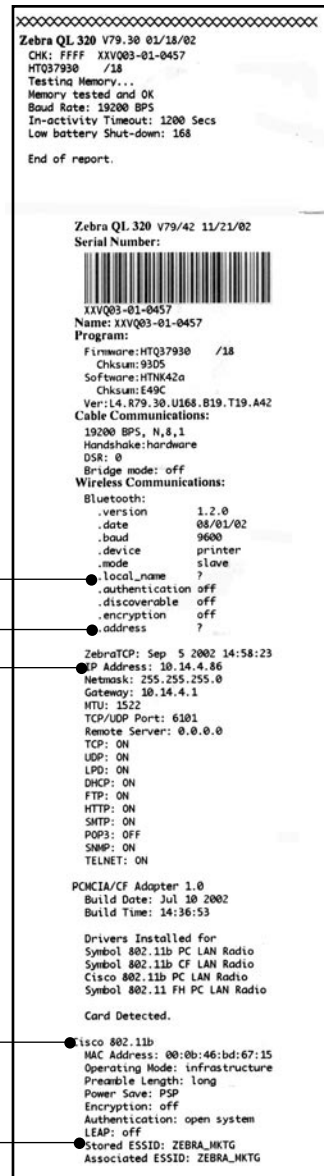
The printer will generate a configuration label as shown opposite.

A "?" value for the Bluetooth .local_name and .address parameters indicates no Bluetooth radio is installed.

The IP Address was automatically assigned by DHCP

This printer has a Cisco 802.11b radio

ESSID setup was successful and this printer is associated to the Access Point



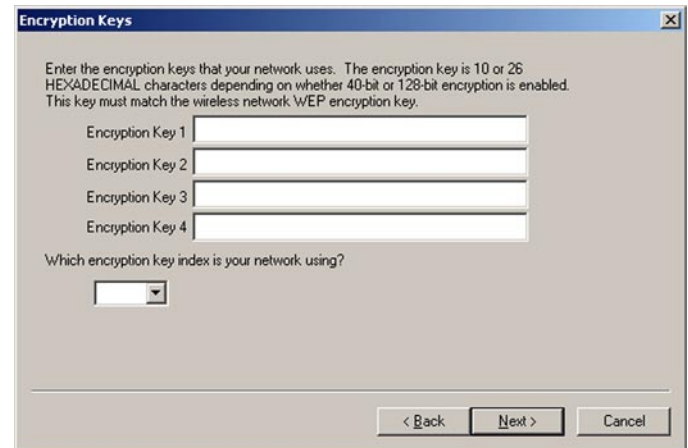
continued

NETWORK SETUP WITH ENCRYPTION

- As was described in Quick Network Setup, open Label Vista and click on “Printer” on the top menu. From the drop down menu go to Network Setup and select Network Setup with Encryption. Follow the wizard steps by clicking Next and by entering the information from Table 1 as it was done in the Quick Network Setup.

If you don’t know some of the requested information, contact your network administrator.

- Continue the setup by following the wizard windows. Just as in the Quick Network Setup you must:
- Enter the network port
- Enable the applicable network protocols. Consult with your network administrator to find out which protocols you want to enable. Note that if your printer has a Frequency Hopping (FHSS) radio installed you can only use 40 bit encryption.
- Test the settings and click “Finish” to end the wizard and finish the setup procedure.



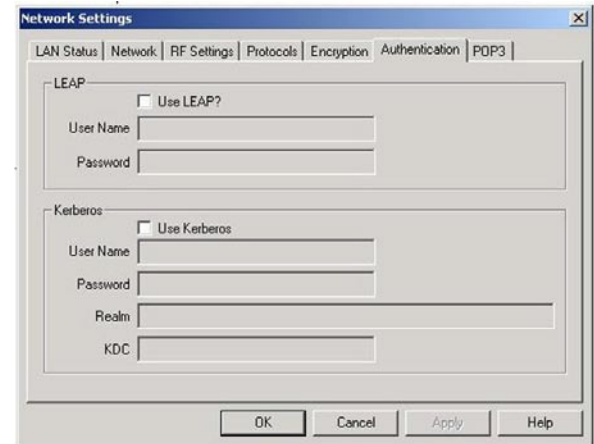
continued

AUTHENTICATION SETTINGS

If you have a printer with a Cisco 802.11b/Symbol 802.11b radio and your network supports either the LEAP or Kerberos security, you can set authentication with Label Vista by doing the following:

In Label Vista's top menu click on Printer and select Network Settings from the drop down menu. Click on the "Authentication" tab and then check the box next to either LEAP or Kerberos depending on your authentication system. Enter the appropriate authentication information you recorded in Table 1. (See picture opposite). Contact your network administrator if you don't know the required authentication information.

NOTE: If you have an 802.11 FH (Frequency Hopping) radio installed, LEAP and Kerberos authentication are not available.



The screenshot shows the 'Network Settings' dialog box with the 'Authentication' tab selected. The dialog has a title bar with a close button and a menu bar with options: LAN Status, Network, RF Settings, Protocols, Encryption, Authentication, and POP3. The 'Authentication' section is divided into two panels: 'LEAP' and 'Kerberos'. The 'LEAP' panel has a checkbox for 'Use LEAP?' which is unchecked, and two text input fields for 'User Name' and 'Password'. The 'Kerberos' panel has a checkbox for 'Use Kerberos' which is unchecked, and four text input fields for 'User Name', 'Password', 'Realm', and 'KDC'. At the bottom of the dialog are four buttons: 'OK', 'Cancel', 'Apply', and 'Help'.

continued

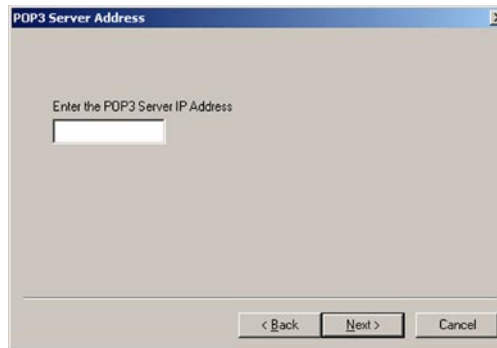
POP 3 (POST OFFICE PROTOCOL 3) SETUP

POP 3 (Post Office Protocol 3) is usually used to retrieve e-mail from a mail server, but it can also be used for sending print jobs to a wireless mobile network printer. The printer should already be configured for wireless operation and associated with an access point before running the POP3 setup wizard. (See the previous two sections).

- Open Label Vista. In the top menu bar select Printer / Network Setup / POP3 Setup.
- The POP3 window will come up, and present a list of information you will need to continue. Remember that the printer should already be associated with an access point in order to proceed. Contact your network administrator if you don't know the information requested.
- Enter the POP3 Server IP address and click "next". (Contact your network administrator to obtain this address).
- Next, you will need to enter the User Name and Password for the e-mail account being used. Click "Next".
- You must now enter the frequency (in seconds) the printer will check the POP3 account for new mail. Note that the recommended frequency should be set to greater than thirty seconds to avoid printer unresponsiveness. Click on "Next".
- Select the POP3 desired options as shown in the last window.

If the "Print Body of E-Mails" option is selected, the printer will print messages as they are received. E-mail messages sent to the printer should be in ASCII text.

If you send an e-mail message to the printer that can be interpreted as a CPCL command, the printer will attempt to execute that command.



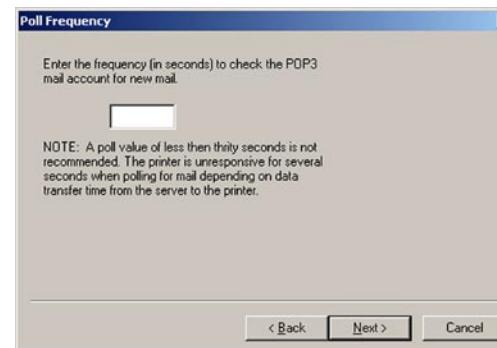
The screenshot shows a dialog box titled "POP3 Server Address". It contains a text input field with the label "Enter the POP3 Server IP Address". At the bottom of the dialog, there are three buttons: "< Back", "Next >", and "Cancel".

Select POP3 networking option & enter the POP3 Server IP address



The screenshot shows a dialog box titled "User name and password". It contains two text input fields: "User Name" and "Password". The label "Enter the user name and password for the POP3 account" is positioned above the fields. At the bottom of the dialog, there are three buttons: "< Back", "Next >", and "Cancel".

Enter the POP3 User name and password



The screenshot shows a dialog box titled "Poll Frequency". It contains a text input field with the label "Enter the frequency (in seconds) to check the POP3 mail account for new mail.". Below the input field, there is a note: "NOTE: A poll value of less than thirty seconds is not recommended. The printer is unresponsive for several seconds when polling for mail depending on data transfer time from the server to the printer." At the bottom of the dialog, there are three buttons: "< Back", "Next >", and "Cancel".

Enter how often the printer will query the POP3 server.

continued

If you select the “Save E-Mail attachments to Printer” option, e-mail attachments will be saved in the printer’s flash memory. The size of the attachments that can be saved is limited to the memory remaining. Attachment file names will be truncated to 11 characters (8 character file name and a three character extension.)

Click “Finish” when you have finished selecting the POP3 options.

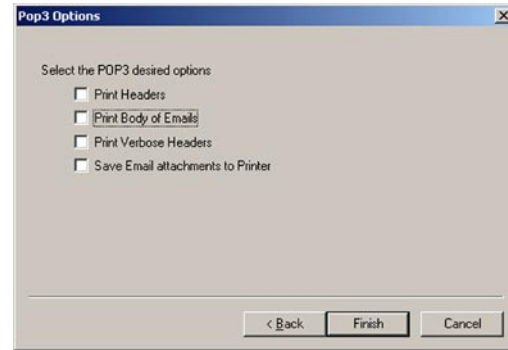
Once you have finished setting up your printer it will become recognized as a unique device on your network with its own IP address.

FTP MIRROR

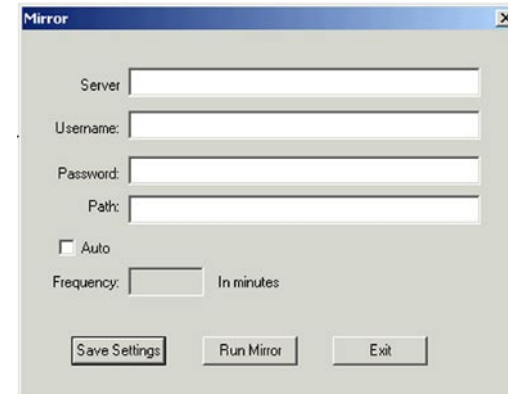
Zebra QL series printers support a file mirroring process that allows the printer to synchronize files with those stored on an FTP server. Since the process relies solely on the FTP standard, no other special utilities are required. The files on the FTP server can be printer firmware files, fonts, or lists of printer configuration commands (such as commands to change the printer’s WEP key). In order for this file synchronization process to work properly, it is only required that the FTP server support “Unix style” directory listings and that the modification time stamps of the files stored on the FTP server are accurate.

Setting Up Mirror In Label Vista

The Mirror dialog box is a selection under the Printer menu in Label Vista. You must fill out the FTP server information and your user name and password as requested. Clicking on the “Auto” check box will instruct the printer to synchronize its files per the number of minutes you enter in the Frequency box.



Select the options for displaying your POP3 messages.



Select the options for setting up the file mirroring process

Setting Up Mirror With Parameter Commands

NOTE: Refer to pg. 18 for more general information on parameter commands.

The following set/get variables are available to enable FTP mirroring:

ip.mirror.auto: on/off

getvar example: !U1 getvar "ip.mirror.auto"

setvar example: ! U1 setvar "ip.mirror.auto" "on"

If "on", the printer will automatically synchronize files upon power-up, and then per the frequency setting. (see **ip.mirror.freq**, below)

ip.mirror.username: 20 bytes (string)

getvar example: !U1 getvar "ip.mirror.username"

setvar example: ! U1 setvar "ip.mirror.username" "test"

Username to use for FTP login

ip.mirror.password: 20 bytes (string)

getvar example: !U1 getvar "ip.mirror.password"

setvar example: ! U1 setvar "ip.mirror.password" "secret"

Password for FTP account

ip.mirror.server: 40 bytes (string)

getvar example: !U1 getvar "ip.mirror.server"

setvar example:

! U1 setvar "ip.mirror.server" "192.168.1.1"

Server ip address or name (if DNS server information is provided via DHCP).

ip.mirror.path: 50 bytes (string)

getvar example: !U1 getvar "ip.mirror.path"

setvar example: ! U1 setvar "ip.mirror.path" "/zebra/ql"

Path on the FTP server where the mirror directory is located. Defaults to "companyname/model".

NOTE: this must be an absolute path (i.e. it must start with / or ~)

ip.mirror.freq: 0-99 minutes

getvar example: !U1 getvar "ip.mirror.freq"

setvar example: ! U1 setvar "ip.mirror.freq" "25"

Number of minutes to wait before performing another file synchronization. If this value is "0", the mirror process will be performed only once when the printer powers-up. Setting a low value will cause the printer to spend most of its time performing the mirror process. This parameter only applies if **ip.mirror.auto** is "on".

ip.mirror.fetch

do example: ! U1 do "ip.mirror.fetch" "yes"

Forces the mirror process to be run immediately. The printer will immediately contact the FTP server defined by "**ip.mirror.server**", log on with the defined username and password and look for mirror file updates.

Refer to Section 14 of the CPCL Programming Manual for more information on configuring FTP mirror with parameter commands.

Bluetooth™ Setup with Label Vista

Bluetooth settings that are configurable by Label Vista:

- Authentication
- Discoverable Mode
- Friendly Name
- PIN

By default, a Zebra Bluetooth printer comes with Authentication turned OFF, Discoverable turned ON, and the “Friendly Name” of the printer set as the printer’s serial number.

The printer will always be a “slave device” in Bluetooth parlance. It will not look for other Bluetooth devices to connect to, and will never initiate the communication link itself.

In order to change the Bluetooth settings the printer needs to be connected to a PC through a serial cable as detailed in the first section.

- To change the Bluetooth parameters in the printer, open Label Vista from the top main menu and select Printer / Utilities / Bluetooth settings.
- Once in the Bluetooth window (see opposite) you can change any parameters that are not grayed out.

AUTHENTICATION

Authentication offers three choices: OFF, SET PIN and GENERATED.

OFF: Authentication and encryption are turned off in the printer.

SETPIN: When setting a PIN value, authentication will be enabled and the PIN will be the value set by the user in the PIN field.

Select this option and enter your selected PIN in the box (see picture). When authentication is enabled and a master device attempts to communicate with the printer, the printer will require this PIN before it accepts the connection.

The screenshot shows a 'BlueTooth Settings' dialog box with the following fields and values:

Address:	00:80:37:17:AA:8C	Baud rate:	57600
Operating Mode:	slave	Local Name:	Cameo3××L003-01-0
Authentication:	OFF	Friendly Name:	××L003-01-0041
Pin:	?	Library Version:	1.2.0
Discoverable:	ON	Library Date:	08/01/02

At the bottom of the dialog are 'OK' and 'Cancel' buttons.

continued

GENERATED: Selecting this option will also enable authentication.

This option is available for backwards compatibility only and may not be supported in future editions of the Bluetooth library.

To enable authentication make sure you are using Bluetooth library version 1.2.3 or higher and select the SETPIN option.

PIN

Enter your desired PIN in this box. You can use between 4 and 10 characters and any combination of letters and numbers (ASCII characters) is allowed. (See SETPIN option above.) NOTE: This feature is available only when application software is at revision "44u" or higher.

DISCOVERABLE

Discoverable is set ON or OFF. If Discoverable is turned OFF, the printer will not be discovered by any other device but can still be connected if the application developer knows the printer's Bluetooth address. The printer's Bluetooth address can be found by printing a Configuration Label (2-key report), or by scrolling through the LCD if available. (Refer to pg. 9 of this manual or the printer's User's Guide for instructions on printing a Configuration Label.)

FRIENDLY NAME

The "Friendly Name" is the name that a master device will see when the printer is discovered. By default, the friendly name is the printer's serial number. It can be changed to whatever name the end user desires.

The picture opposite shows a Configuration Label (2-key report) with the Bluetooth configurable settings highlighted.

*Printer serial number.
Used as Bluetooth
default "friendly
name".*

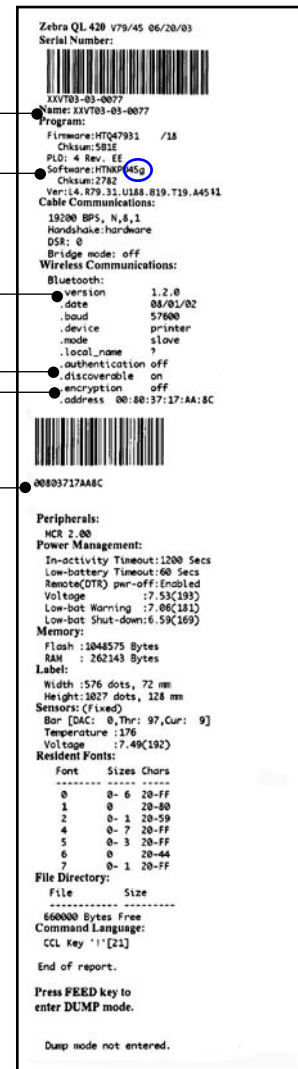
*Last 3 digits of the
Software number are its
revision*

Bluetooth version:

*Discoverable and
Authentication
parameters can be
turned "off."*

*Encryption is turned on
when Authentication
parameter is "On."*

*Bluetooth Address.
Barcode representing
the address is printed
above. The Bluetooth
address cannot be
changed.*



Typical 2-Key Reset Report

Using Parameter Commands to Configure a Network Printer

QL series printers use a series of parameter commands to set and retrieve network configurations. This set of commands is referred to as the "set/get/do" commands., and is available in the printer applications version 40 and above. The software version can be ascertained by performing a two-key reset. The number in the "Software:" listing on the second report must end in 40 or above (e.g. "Software: HTLK40d")

These commands follow a standard format as described below.

NOTE: All commands must be terminated with a CR/LF (0x0D, 0x0A). Actions and parameter names must be specified in lowercase. Parameter values should be specified in lowercase unless the parameter value itself is case sensitive, such as a printer's WLAN eSSID.

Refer to the Mobile Printer Programming Manual for a more detailed description of the "set/get/do" commands and examples of their use. The Manual is available on the Internet at: <http://www.zebra.com>

PARAMETER COMMAND FORMAT

Three commands are available: **setvar**, **getvar**, and **do**.

- "**setvar**" commands are used to configure printer operating parameters to specified values.
- "**getvar**" commands are used to query the printer for its parameter values.
- "**do**" commands are used to instruct the printer to perform various functions.

The formats of these commands are as follows:

getvar Command

The **getvar** command is used to get the current value of printer parameters. This command must be terminated by a CR/LF (0x0D, 0x0A). The printer will respond with the parameter value of "?" if the parameter does not exist (usually due to

incorrect spelling of the parameter name) or it has not been configured yet. The parameter name should be specified in lower case.

Format:

```
getvar "{parameter name}"
```

{parameter name} = The name of the parameter to be retrieved. Please refer to the parameter list for valid parameter names.

setvar Command

The **setvar** command is used to set parameter values in the printer. This command must be terminated by a CR/LF (0x0D, 0x0A). The parameter name and values must be in lower case unless the parameter value itself is case sensitive, such as a printer's WLAN eSSID.

Format:

```
setvar "{parameter name}" "{value}"
```

{parameter name} = The name of the parameter to be set. Please refer to the parameter list for valid parameter names.

{value} = The new value to assign to the specified parameter above.

do Command

The **do** command can be used to instruct the printer to perform predefined actions. Some do commands require one or more parameters. These parameters should be enclosed in double quotes. This command must be terminated by a CR/LF (0x0D,

continued

0x0A). The printer will perform the specified function immediately after receiving the command.

Format:

do "{action name}" "{parameter}"

{action name} = The action to perform. Please refer to the parameter list for valid action names.

{parameter} = some actions require one or more parameters. The parameters should be specified as required by the corresponding action, enclosed within double quotes. For actions that do not require a parameter an empty parameter list should be specified, i.e. "".

Configuration Parameters

The following is a list of parameters which can be used to configure a printer for network use. This is not intended to be a complete guide to using these parameters, only a brief synopsis of the commands available. Always refer to the Mobile Printer Programming Manual for more details and examples of their use and syntax.

NETWORKING PARAMETERS

The following parameters can be used only with the network application versions 40 and above. Any changes made using the **setvar** command will not take effect until the printer's power has been cycled or the device.reset command is issued.

These parameters determine the internet protocol settings of a printer. Their use and definitions exceed the scope of this document, but more detailed exposition of the full set of .ip parameters may be found in the CPCL Mobile Printer Programming Manual.

card.mac_addr

type: getvar

Example: ! U1 getvar "card.mac_addr"

This parameter will report the MAC address of the network card installed in the printer.

ip.addr

type: getvar; setvar

setvar choices : Any valid IP address

getvar example: ! U1 getvar "ip.addr"

setvar example: ! U1 setvar "ip.addr" "10.14.4.235"

This parameter refers to the IP address of the printer. The DHCP setting ("ip.dhcp.enable" parameter) must be "off" to change the printer's IP address.

ip.bootp.enable

type: getvar; setvar

setvar choices: "on" – Printer will use BOOTP to get its IP information on startup.

"off" – Printer will not use BOOTP.

Default:"off"

getvar example: ! U1 "getvar" "ip.bootp enable"

setvar example: ! U1 setvar "ip.bootp.enable" "on"

This parameter will turn BOOTP on or off. BOOTP is a method for acquiring an IP address, netmask, and gateway automatically on printer power-up. It requires a BOOTP server on the local network.

If you are using static ip addressing, BOOTP must be "off".

NOTE: It is not recommended that BOOTP and DHCP both be enabled at the same time since this may increase the printer power-up initialization time. You should contact your network administrator to determine whether your network supports either BOOTP or DHCP and enable only the proper parameter on the printer.

continued

ip.dhcp.enable

type: getvar; setvar

setvar choices: on, "off"

Default "on"

getvar example: ! U1 getvar "ip.dhcp.enable"

setvar example: ! U1 setvar "ip.dhcp.enable" "off"

This parameter refers to DHCP setting. DHCP must be set to "off" before setting a static IP address.

NOTE: It is not recommended that BOOTP and DHCP both be enabled at the same time since this may increase the printer power-up initialization time. You should contact your network administrator to determine whether your network supports either BOOTP or DHCP and enable only the proper parameter on the printer.

ip.dhcp.cid_prefix

type: getvar; setvar

setvar choices: Any text string up to 10 characters in length

Default ""

This parameter defines the prefix to be pre-pended to the DHCP client identifier (option 61) when DHCP is enabled and "ip.dhcp.cid_type" is set to "0".

NOTE: This parameter is only applicable if "ip.dhcp.enable" is set to "on".

ip.dhcp.cid_type

type: getvar; setvar

setvar choices:

- "0": synthetic string
- "1": use printer's MAC address

Default: "1"

getvar example: ! U1 getvar "ip.dhcp.cid_prefix"

setvar example: ! U1 setvar "ip.dhcp.cid_prefix" "ZEB"

This parameter defines the type of Client Identifier (option 61) that will be sent if DHCP is enabled. A value of "1" means the type is "Ethernet" and the printer's MAC address will be used. A value of "0" means the type is "synthetic" and the client identifier sent will be "ip.dhcp.cid_prefix" concatenated

with "ip.dhcp.cid_value".

NOTE: This parameter is only applicable if "ip.dhcp.enable" is set to "on".

ip.dhcp.cid_value

type: getvar; setvar

setvar choices: Any text string up to 20 characters in length

Default: If "ip.dhcp.cid_type" is "0" - the default is the printer's friendly name (see parameter "device.friendly_name")

If "ip.dhcp.cid_type" is "1" - the default is the printer's MAC address

getvar example: ! U1 getvar "ip.dhcp.cid_value"

setvar example: ! U1 setvar "ip.dhcp.cid_value" "PRT001"

This parameter defines the unique value to be used as the client identifier (option 61) if DHCP is enabled and "ip.dhcp.cid_type" is "1".

NOTE: This parameter is only applicable if "ip.dhcp.enable" is set to "on".

ip.ftp.enable

type: getvar; setvar

setvar choices: "on", "off"

Default "on"

getvar example: ! U1 getvar "ip.ftp.enable"

setvar example: ! U1 setvar "ip.ftp.enable" "off"

This parameter refers to the FTP protocol setting.

ip.gateway

type: getvar; setvar

setvar choices: Any valid gateway address.

Default: "0.0.0.0"

getvar example: ! U1 getvar "ip.gateway"

setvar example: ! U1 setvar "ip.gateway" "38.10.4.1"

This parameter refers to the gateway address. This value is ignored if DHCP is enabled.

continued

ip.http.enable

type: getvar; setvar

setvar choices: "on", "off"

Default: "on"

getvar example: ! U1 getvar "ip.http.enable"

setvar example: ! U1 setvar "ip.http.enable" "on"

This parameter refers to the HTTP protocol / web server setting.

ip.lpd.enable

type: getvar; setvar

setvar choices: "on", "off"

Default: "on"

getvar example: ! U1 getvar "ip.lpd.enable"

setvar example: ! U1 setvar "ip.lpd.enable" "on"

This parameter refers to the LPD protocol setting. LPD communications from the host should be directed to port 515.

ip.netmask

type: getvar; setvar

setvar choices : Any valid netmask.

Default : "255.255.255.0"

getvar example: ! U1 getvar "ip.netmask"

setvar example: ! U1 setvar "ip.netmask" "255.255.0.0"

This parameter refers to the subnet mask address. This value is ignored if DHCP is enabled.

ip.ping_remote

type: do

do parameters: ip address; number of times to ping

do example: ! U1 do "ip.ping_remote "10"

This parameter directs the printer to ping a specified address "x" number of times. The address to be pinged is set by setvar

ip.remote.

wlan.international

type: getvar ,setvar

setvar choices: "on", "off"

default: "on" for 802.11 FH radios; "off" for 802.11b radios

getvar example: ! U1 getvar "wlan.international_mode"

sevar example:

! U1 setvar "wlan.international_mode" "on"

Setting this parameter "on" allows a printer to operate in wireless networks with settings different from standard US/Canada wireless network settings. Setting this parameter "off" instructs the printer to operate according to US/Canada wireless network standards. Two radio cards are currently supported: Symbol Spectrum24 802.11b and Symbol Spectrum24 802.11 Frequency Hopping (FH).

NOTE: This parameter must be set according to the wireless network infrastructure used. Setting this parameter to "on" for an 802.11b card in a network without active wireless access points with non US/Canada settings stops the printer from communicating via its 802.11b card. Setting this parameter to "on" for 802.11 FH radios causes the printer to take an additional 4 seconds to initiate the 802.11 FH card.

VIRTUAL PRIVATE NETWORK (VPN) COMMANDS

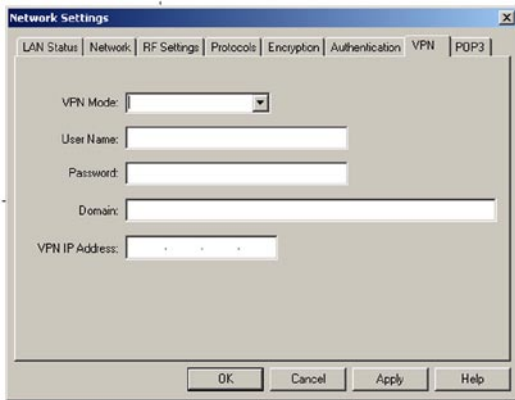
A Virtual Private Network (VPN) allows users in remote locations to “log in” securely onto a network and use it as though they were logged-in locally. The use of VPN ensures privacy, integrity and authentication of the customer’s wireless local area network and wireless wide area communications.

The QL and RW series of Zebra Mobile printers support VPN. Currently the printers support Symbol’s **AirBEAMSafe** VPN.

VPN SETTINGS USING LABEL VISTA

You can enable VPN in Zebra Mobile printers with the Label Vista application as follows:

Connect your printer via a serial or USB cable to your PC. Open the “Label Vista” application and go to “Printer” on the top bar menu. Click on the VPN tab and you will find the list of parameters that need to be configured in the printer for use on the VPN .



VPN MODE.

This parameter activates the VPN function and allows you to select the type of VPN server you are connecting to. At present

the only type of VPN server supported is “AirBEAM safe” from Symbol.

USER NAME:

Obtains or changes the username that allows access to the VPN server.

PASSWORD:

Obtains or changes the password required to log-on to the VPN server.

DOMAIN:

Obtain or change the domain name of the VPN server you are connecting to.

VPN IP ADDRESS:

This is the virtual IP address of the printer that is assigned by the VPN server.

If you don’t know the value of the above parameters, you should contact the Systems Administrator of your company to obtain the value of the parameters needed.

You can also configure your printer for VPN using “get, set, do” parameters in the CPCL programming language:

ip.vpn.mode

type: getvar; setvar

getvar example: ! U1 getvar “ip.vpn.mode”

setvar example: ! U1 setvar “ip.vpn.mode” “AIRBEAM SAFE”

This parameter activates the VPN function allowing you to select the VPN server type. At present the only VPN server type supported is “AirBEAM safe”.

continued

ip.vpn.username

type: getvar; setvar

getvar example: ! U1 getvar "ip.vpn.username"

setvar example: ! U1 setvar "ip.vpn.username" "Zebrauser"

Obtains or changes the username that allows access to the VPN server

ip.vpn.password

type: getvar; setvar

getvar example: ! U1 getvar "ip.vpn.password"

setvar example: ! U1 setvar "ip.vpn.password" "secret"

Obtains or changes the password required to log-on to the VPN server.

ip.vpn.domain

Type: getvar; setvar

getvar example: ! U1 getvar "ip.vpn.domain"

setvar example: ! U1 setvar "ip.vpn.domain" "domain2"

Obtains or changes the domain name of the VPN server you are connecting to.

ip.vpn.addr

type: getvar

getvar example: ! U1 getvar "ip.vpn.addr"

Obtains the virtual IP address of the printer that is assigned by the VPN server.

Using CPCL to Configure a Network Printer

Encore and Cameo series Zebra Mobile Printers with MOM radios are programmed by commands in the CPCL language. Label Vista acts as an interface between the user and the actual CPCL command structure, but it creates files using a sub-set of this language.. Users desiring more precise control of the printer's network configuration can use CPCL commands directly to set and read may network settings.

Cameo and Encore Network Printers

Cameo and Encore network printers utilize the LAN command to configure a printer for a wireless network. This command is structured as below:

NOTE: More detailed information on the CPCL language and the LAN command may be found in the Mobile Printer Programming Manual available on-line at Zebra's Web site: <http://www.zebra.com>

LAN COMMAND

Syntax:

```
! U1 LAN {Operation} {Options}...{Operation} {Options}
```

The LAN command can be used to interrogate and configure the Wireless LAN (WLAN) card in a Zebra Cameo3 or Encore 3 Network Printer. The entire LAN command must be terminated by a CRLF pair (0x0D0x0A).

{Operation} is a required element. { Options } is a variable element associated with the preceding Operation. Options can either set or retrieve information.

An error will be returned if an invalid operation is specified (see 'LAN Command Response' for error codes). Any desired number of Operations can be entered after the initial !U1 LAN command.

The possible Operations are:

IPADDR – This operation allows manual specification of the printer's TCP/IP address. (See the DHCP operation below) for

a description of automatic address assignment.) The option accompanying this operation must be a valid TCP/IP address in the typical notation of a set of four decimal numbers between 0 and 255 separated by dots. (E.g., 100.150.200.150 is a valid address.) This value will most likely need to be assigned by the administrator of the network the printer will operate on. If an invalid address is specified, this operation has no effect other than to print an error message.

GATEWAY-IPADDR- This operation can be used to set the gateway IP address of the printer. The option accompanying this operation must be a valid TCP/IP address in the typical notation of a set of four decimal numbers between 0 and 255 separated by dots.

REMOTE-IPADDR- This operation can be used to set the remote IP address of the printer. (Available in printer application versions 30A and higher.)

The option accompanying this operation must be a valid TCP/IP address in the typical notation of a set of four decimal numbers between 0 and 255 separated by dots.

SUBMASK- This operation can be used to set the subset mask of the printer. (Available in printer application versions 30A and higher.)

The option accompanying this operation must be a valid TCP/IP address in the typical notation of a set of four decimal numbers between 0 and 255 separated by dots.

SSID- This operation allows the assignment of an RF SSID (Radio Frequency System Set ID). This ID allows several RF networks to operate independently in the same area without interference. The printer must have the same SSID as the RF Access Point to which it is supposed to link. The option for this

continued

operation may be any string up to 32 characters long.

MODE – This operation sets the operating mode of the printer. The two options are LPD and TCP.

- LPD is the standard printer protocol used by Unix and available for Windows NT.
- TCP affords the ability to allow bare sends using only the TCP protocol.

GET-STATUS – This operation causes the printer to report its current WLAN status. The two options are PRINT and REPLY. If PRINT is used, the status dump is printed. If REPLY is used, the status dump is sent out over the CABLE. The status report is of the following form:

LAN Status report:

ipAdr = nnn.nnn.nnn.nnn - a typical TCP/IP address.

userName = {the user name} - a descriptive username set in the radio.

fwVersion = {LAN firmware version} - a descriptive firmware version set in the radio.

swVersion = {LAN software version} - a descriptive software version set in the radio.

MAC addr = {hh:hh:hh:hh:hh:hh}

associated = {link state} - YES (linked) or NO (not linked)

GET-CONFIG – This operation causes the printer to report its current WLAN configuration. The two options are PRINT and REPLY

- If PRINT is used, the configuration is printed.
- If REPLY is used, the configuration is sent out over the CABLE. The configuration report is of the following form, similar to the GET-STATUS report above:

LAN Config report:

ipAdr = nnn.nnn.nnn.nnn - a typical TCP/IP address.

powerMode = {power mode state} - SAVE or FULL

quiet = {quiet state} - YES or NO. YES means the radio

only transmits normal data, NO means the radio transmits link status information on power up and status change.

protocol = {protocol selected}

essID = {SSID string}

DHCP = {DHCP state}

DHCP_SAVE = {DHCP_SAVE state}

SOFT_RESET – This operation resets the WLAN card. The SOFT_RESET operation should be tried first if re-setting the LAN card is desired, before using the RESET operation.

RESET – This operation performs a “hard” reset of the WLAN card.

DHCP – This operation allows for control over setting of the WLAN card’s IP address. The options for this operation are enabled (ON) or disabled (OFF). If DHCP is enabled, the WLAN card will attempt to obtain an IP address from a DHCP server. If DHCP is disabled, the WLAN card will use the IP address programmed into its non-volatile storage.

Syntax: DHCP {option}

Where {option} = ON or OFF

Example: ! U1 LAN DHCP ON

DHCP-SAVE – This operation controls the storage of addresses obtained by DHCP. If ON, a new address obtained from DHCP will be stored. If OFF, the new address will be used for this session only, leaving the previously stored address unchanged.

Syntax: DHCP-SAVE {option}

Where {option} = ON or OFF

Example: ! U1 LAN DHCP-SAVE ON

DHCP-TIMEOUT – This operation allows for control of number of times the DHCP client will attempt to obtain an address from the DHCP server. The argument is the number of times the client will make a request before giving up. The client can be told to never give up by making the argument 0.

continued

Syntax: DHCP-TIMEOUT {0 – 15}

Example: ! U1 LAN DHCP-TIMEOUT 5

PORT – This operation allows for setting of the TCP port that the printer will listen on while in TCP mode.

LAN COMMAND: SETTING THE IP ADDRESS FOR NETWORK PRINTERS

1. Create the following document in a text editor such as Notepad, replacing “192.0.11.195” with your Network Printer’s address, and “ZebraNet” with the SSID of your RF Access Point. It may be necessary to obtain this information from your network administrator:

! UTILITIES

LAN IPADDR 192.0.11.195 SSID ZebraNet MODE LPD PRINT

NOTE: Insure each line, including the last, is terminated with <CRLF>. Save the file in a convenient location.

2. Connect the printer to the serial port of a PC loaded with the Label Vista™ program as detailed in the section on installing and running Label Vista. Open Label Vista and select the “Diagnostic Send” utility under the Printer menu.

3. Use the “Browse” button to navigate to the file you created in step 1 and click on the “Send” button. The file will be sent to the printer, and the dialog box will indicate the download progress.

Once the IP address has been downloaded successfully, it will stay resident in the printer’s memory until a new IP address is sent. The IP address can be verified by performing a “2 key reset” on the printer as detailed on page 8 of this manual.



The printer will produce a line of interlocking “x” characters to insure all elements of the print head are working, and then print out a status report.

The resulting printout should include a Wireless Communications section. You should verify that the following lines are included, with your IP address and SSID:

ipAdr = (your IP address)

associated = YES

protocol = LPD

essID = (Your SSID)

DHCP = OFF

If there is no Wireless Communications section or the parameter values do not match what is expected, please refer to the **Network Printer Troubleshooting** discussion following this section.

Details of this method of setting the IP address are covered earlier in this section in the discussions of the IPADDR, SSID and MODE operations.

LAN Command Response:

If an operation unsupported by the LAN command is given, the printer will generate the following message:

***Invalid LAN option {operation} where {operation} is the invalid operation

If an operation with an option unsupported by the LAN command is given, the printer will print the following message:

Illegal{operation}option {option}

where {option} is the invalid option.

NETWORK PRINTER TROUBLESHOOTING

If the printer does not behave as described in this section, please take the following diagnostic steps:

1. Perform a 2 key reset on the printer. Refer opposite for an annotated sample of a status report.
2. Under the status report's Program heading, the software should have a label similar to HTLANxxx. If not, the LAN application is not loaded on this printer and LAN operation is not supported. Call Zebra tech support.
3. Under the RF LAN INFORMATION section, if you see: "Could not get WLAN status" or "Could not get WLAN config" the internal radio is not responding. If you repeat step 1 with the same result, call Zebra tech support.
4. Under the RF LAN INFORMATION section, verify that the SSID and IP address are set to the values you expect as described in the Printer Setup section above. If not, repeat the printer setup. If the information is still not correct, call Zebra tech support.
5. Verify that the printer is associating with the RF Access Point. Bring the printer as close as you can to the RF Access Point you are using and do a 2 key reset. Check that the value for the associated parameter under RF LAN INFORMATION is YES. If not, call Zebra tech support .
6. If you do not get a label when you try printing, verify that the printer is on.

Serial Number:

XXEC00-10-0044 ● *Unit Serial Number*

Program:
Firmware: HTE27915 /18
Chksum: 116B
Software: HTLAN28M ● *Application: Network Printers will have "HTLAN" prefix.*
Chksum: A7EB
Ver: L4. R79. 15. U126. B15. T19. A00

Cable Communications:
19200 BPS, N, 8, 1
Handshake: Xon-Xoff/hardware

Wireless Communications:

RF LAN INFORMATION:
Release: 3.23
Date: 11/21/2000
ipAdr = 10.14.2.204 ● *I.P Address*
fwVersion = S4.40 000720 ● *Radio Software Version*
swVersion = Version 4.40 ●
MAC addr = 00:a0:f8:8e:35:05
associated = YES ● *Unit is associated with LAN : Yes/No*
Device ID = XXEC00-10-0042
subnet = 255.255.255.0
protocol = LPD
powermode = SAVE
essID = ZebraNet ● *SSID Address*
DHCP = OFF
DHCP_SAVE = OFF

10.14.2.204 ● *I.P Address*

Configuring Wireless Printers Using HTTP & Telnet

Once a printer is part of a network, it can be configured using “http” or “Telnet” protocols. The printer must have the appropriate files installed to allow use of http and it must have a “web page” file in its memory. This html file can be created using html protocol and formatting with any text editor and downloaded to the printer. Zebra also supplies a sample printer web page (sample.html) shown opposite, which can be used as a template.

Setting Configuration Protocols With Label Vista

Label Vista has the capability of selecting either http or Telnet protocols in the /Printer/Network settings window. Click on the “Protocols” tab and select the “HTTP” check box to set your printer for that protocol.

In a similar manner, select the “TELNET” check box to configure the printer via telnet. Note that there is no need for an .html “Web page” file to be present in the printer to allow use of the Telnet protocol.

Configuring With A Web Browser Via http

If your printer is on a network and has a web page loaded into memory, you can view and change its configuration using a web browser such as Netscape™ or Internet Explorer™. Type in the printer’s IP address to view its web page. Changes to the printer’s configuration can be made via the menus that have been built into the printer’s web page.

The web page can utilize the full set of “get, set, do” commands that are detailed in Section 14 of the CPCL Programmers Manual, so a completely customized web page can be constructed, allowing you to view and configure virtually any of the printer’s operating parameters. The example to the right is how the default web page appears on a browser.

Zebra Sample Web Page

This is an example of querying and setting the printer’s values via a web page. For further information, please refer to the programmer’s manual.

The baud rate is:

The ESSID is:

Default web page: sample.html

The Default Web Page

The html file that follows (sample.html) defines the default web page supplied by Zebra which is shown above. It can be used as a template to create more elaborate web pages. Note that “get, set, do” parameters described in the CPCL Programmer’s Manual, Section 14 are utilized within the .html code to allow configuration of specific parameters.

```
<!-- ** THIS FILE DOES CONTAINS REALTIME DATA ** -->
<HTML>
<HEAD>
<TITLE>Zebra</TITLE>
</HEAD>
<BODY>

<center><h1>Zebra Sample Web Page</h1><br>
</center>
```

continued

This is an example of querying and setting the printer's values via a web page.

For further information, please refer to the programmer's manual.<P>

```
<FORM ACTION="setvars.cgi" METHOD="POST">
```

```
The baud rate is: <INPUT SIZE=6 MAXLENGTH=6 NAME="comm.baud"
VALUE="<!--#exec cgi="/getvar.cgi comm.baud"-->"><br>
```

```
The ESSID is: <INPUT SIZE=20 MAXLENGTH=20 NAME="wlan.essid"
VALUE="<!--#exec cgi="/getvar.cgi wlan.essid"-->"><br>
```

```
<BR>
```

```
<INPUT TYPE="reset" VALUE="Undo Changes"><INPUT TYPE="submit"
VALUE="Save Changes"> <P>
```

```
</FORM>
```

```
</BODY>
```

```
</HTML>
```

Wavelink Avalanche™ Network Management Implementation

NOTE: Wavelink Avalanche capability can only be implemented on the QL Plus and RW series of Mobile Printers.

Wavelink Avalanche is a software system designed to manage mobile network devices. The Avalanche system consists of three core components:

The **“Avalanche Administrative Console”** is the central user interface through which the administrator issues commands to the Agents. The console allows the administrator to view all known devices, identify device settings and software loads, configure profiles, schedule updates, and immediately identify the success or failure of updates to each device.

The **“Avalanche Agent”** stores the configuration settings and software to be deployed, along with the rules used to assign these settings to the mobile devices under Avalanche management. The Agent can run centrally and communicate across a WAN, or multiple agents can be deployed to locations throughout the network.

The **“Avalanche Enabler”** resides on the mobile device to be managed. Enablers are operating system and, sometimes, device specific. The Enabler communicates with the Avalanche Agent over the network or serial connection and updates are performed as necessary.

Zebra’s implementation of the *“Enabler”* has complete emulation of Avalanche Enabler protocol, including the following:

Automatic Agent Discovery

In the event that an Agent’s address is not explicitly provided, the mobile device will send out broadcast requests, searching for an available Agent. If an available Agent responds, the Agent’s information is stored and connection procedures begin.

Agent Login And Authentication.

In order to facilitate a secure connection, Avalanche Agents and Enablers each offer authentication procedures to validate the identity of the other party in the connection.

Operational Properties Exchange.

After successful connection and authentication, the Agent requests an update of the mobile device’s operating parameters, a set of static parameters that the Agent is aware of. These parameters are mainly network oriented (ESSID, WEP, etc).

Package Synchronization (Update/Delete).

The Avalanche Agent and Enabler both use the concept of a “package” to transfer updates down to the mobile device. Each package is a collection of files that the mobile unit needs to handle. Each package can be either stored or executed. See below for Zebra printer specific applications of each file action.

File Storage

When a file is sent to the printer as part of an update package and is flagged for storage, it is simply written to the printer’s internal file system. No other processing is involved.

For example, if the image file “flower.pcx” is flagged for storage, the image file is written to the file system and is available for use to be printed on a label.

File Execution

When a file is sent to the printer as part of an update package and is flagged for execution, the contents of that file are fed into the printer’s command interpreter. This functionality can be used to modify any and all of the printer’s internal parameters, execute a CPCL “Set/Get/Do” command, or remotely print labels.

continued

Ping

The Avalanche Administrative Console user can ping Avalanche enabled mobile devices.

Update Now

An Administrative Console user can force a device to immediately perform an update.

Text Messaging

From the Administrative Console a user can create and send text messages to Avalanche enabled mobile printers. The message will show up immediately on the printer's LCD, and/or print out. In addition the printer can be set to beep upon receiving a message. Print, display and beep options are configurable by user

INSTALLING THE WAVELINK AVALANCHE AGENT AND CONSOLE MANAGER

Required Applications and Tools

- New Mobile Printer Application – (Avalanche enabled)
- Label Vista v3.0 or higher (includes Avalanche Support)
- Wavelink Avalanche Console

Download the most recent Wavelink Avalanche Agent & Console Manager setup executable from the Wavelink Web site at <http://www.wavelink.com> and install both the Avalanche Agent and Console Manager to a networked PC.

When setup is complete, start the Agent, and open the Console Manager GUI by double clicking the appropriate icons.

Connect the Console Manager to the Avalanche Agent. (The Agent IP should be the local host IP, 127.0.0.1, if it is installed on the same PC as the Console Manager.)

Once connected to an Agent, either local or remote, expand the tree view on the left and delete all entries under the Serial Ports section by right clicking on each and selecting Delete.

Avalanche Printer Configuration with Label Vista

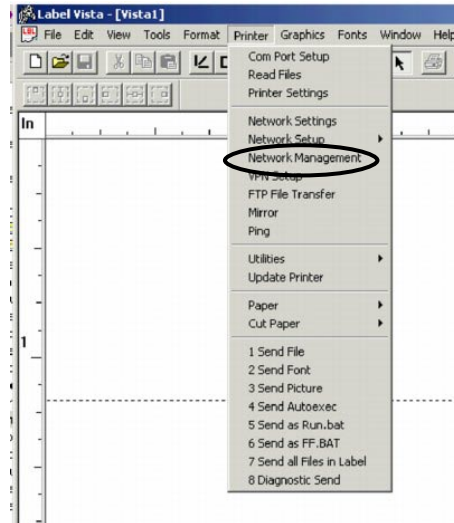
In order for the mobile printers to successfully become part of an existing Avalanche system, the printer must first be set up and configured properly.

NOTE: Avalanche can only be implemented on the QL Plus and RW series of Mobile Printers.

Configure the Network Settings on the Mobile Printer

Using Label Vista, configure the printer to connect to the Access Point by entering the ESSID and other network info.

Turn the printer off, then perform a two-key report to verify that a network connection is made and an IP address is acquired.



Configure the Avalanche Enabler on the Mobile Printer

Using Label Vista, connect to the network printer (via serial cable, USB or TCP/IP).

From the Printer menu, select the Network Management option. The Network Management dialog should appear, and the Network Management tab should be active.

Select "Avalanche" from the Type drop down list.

continued

Click on the Wavelink Avalanche tab and set the resulting fields as follows:

Model Name = printer's model number (e.g. QL320)

Encryption = none

Update Interval = 90000 = 90 seconds

UDP Timeout = default setting: 0

TCP Connect Timeout = default setting: 0

User Name = Not supported in this version of Label Vista. Typically not used, unless required by your Avalanche network configuration.

Password = Not supported in this version of Label Vista. Typically not used, unless required by your Avalanche network configuration.

Remote Agent IP Address = IP address of the server that is running the Avalanche Agent application.

Available Agent IP Address = default setting: 0.0.0.0

Set the check boxes :

Update on Startup = if checked enables Avalanche to check for updates at startup.

Update at Interval = if checked: enables Avalanche to check for updates at the interval determined by the Update Interval setting.

Turn the printer OFF.

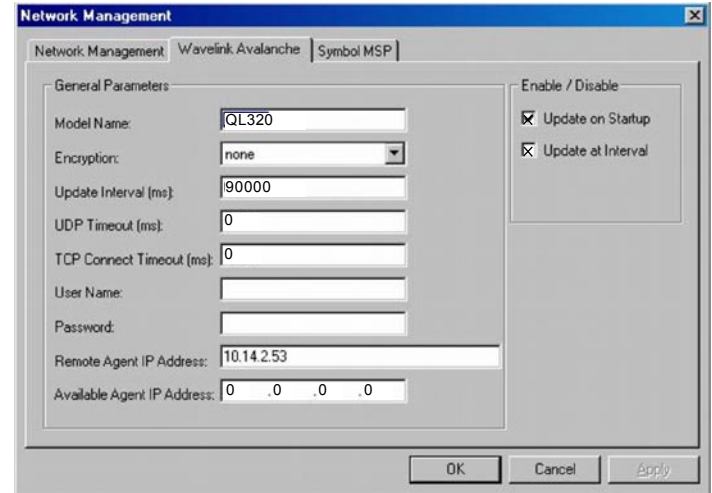
The above settings will make the printer perform an update upon start-up and every 90 seconds thereafter.

Verify Printer Registration & Properties

- Turn the printer ON.
The Printer will acquire an IP address and the first Avalanche Update should occur.
- Using the Avalanche Console Manager, verify that a new device entry, corresponding to network printer, has successfully been created.
- Right click on the new device entry and select Client Settings. The dialog box will appear with Ping Client, Send

Text Message and Update Now buttons on a fist tab. The second tab of the dialog box contains printer properties.

- Properties can be added, changed and deleted. Each of the above operations require selecting the Update Now action.



continued

Configuration Utility

Avalanche parameters can also be set using a configuration utility in conjunction with the Avalanche Console Manager. This "PrintConfig" utility is available for download from the Zebra Web site at www.zebra.com. It must be installed as a package in the Avalanche Console Manager. Once installed, it allows the user to set Avalanche parameters via pull down menu choices and will then create an update file. This file will then be sent to the printer on the next scheduled Avalanche update.

Setting Avalanche Parameters with CPCL

You can also configure your printer for Wavelink Avalanche using the CPCL "get, set, do" commands to perform the same parameter settings as in the Label Vista set-up procedure.

The following table lists the Label Vista Avalanche settings and their equivalent CPCL commands.

Label Vista Parameter	CPCL Command
Model Name	netmanage.avalanche.model_name
Encryption	netmanage.avalanche.encryption_type
Update Interval	netmanage.avalanche.interval
UDP Timeout	netmanage.avalanche.udp_timeout
User Name	(not supported)
Password	(not supported)
Remote Agent IP Address	netmanage.avalanche.agent_addr
Available Agent IP Address	netmanage.avalanche.available_agent
Check Boxes	CPCL Command
Update on Startup	netmanage.avalanche.startup_update
Update at Interval	netmanage.avalanche.interval_update

For more information on using CPCL commands to configure your printer's Avalanche settings refer to the latest version of the CPCL manual, available on the Zebra Web site at www.zebra.com.

TROUBLESHOOTING PROBLEMS WITH AVALANCHE

To troubleshoot problems with Avalanche the advanced user can use the CPCL language "netmanage" GETVAR parameters as troubleshooting tools.

"netmanage.status_code"
"netmanage.state_code"
"netmanage.error_code"

Status Codes:

To obtain the device's status code use:
! U1 getvar netmanage.status_code. One of the following status codes will be returned:

- 0 OK
- 1 Error, check State and Error codes.

State Codes (What is the printer doing?)

To obtain the device's state code use:
! U1 getvar netmanage.state_code. One of the following state codes will be returned:

- 0 Printer Idle
- 1 Agent Discovery
- 2 Agent Connection
- 3 Processing Messages
- 4 Agent Disconnection

Error Codes:

To obtain the device's error status use:
! U1 getvar netmanage.error_code.
One of the following error codes will be returned:

- 0 No Error
- 1 No Agent Found
- 2 Send Data failed during Discovery.
- 3 Received Data failed during Discovery.
- 4 Agent Authentication failed.
- 5 Agent Connection failed.
- 6 Socket Connect failed.
- 7 Device Registration failed.

continued

- 8 Message Send failed.
- 9 Message Received failed.
- 10 Message too large to process.
- 11 Data Timeout.
- 12 Unknown Encryption Type used.
- 13 Unknown Command Received.
- 14 Device Properties Update failed.
- 15 User Authentication failed.
- 16 Package Update failed.
- 17 No license available for device.
- 18 Device out of resources.
- 19 Device needs data.
- 20 Device needs to be synced.
- 21 Unknown State reached

Symbol™ MSP Network Management Implementation

NOTE: MSP can only be implemented on the QL Plus and RW series of Mobile Printers.

What is Mobility Services Platform (MSP)?

MSP is an application from Symbol Technologies, Inc. that provides a unified management tool for:

- Mobile devices
- Mobile applications
- Mobility network elements
- The MSP solution is comprised of:
 - MSP Appliance – rack mounted computer that contains the MSP software and MSP console
 - MSP Console – Web-based portal interface to all MSP functionality
 - MSP Agents – Smart software components that facilitate device-specific management

What is an MSP Agent?

- Device- resident management services that enable monitoring, asset tracking, configuration, provisioning, troubleshooting, etc.
- Different device types use different agent types
 - Mobile devices use device-resident active agents
 - Wireless infrastructure devices use passive SNMP agents
 - Barcode scanners use host-resident active agents

MSP Agent Configuration

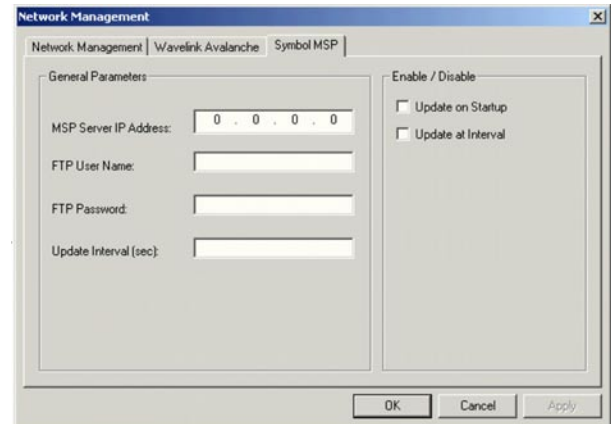
To start using a Zebra Printer with MSP Agent Level 2, an initial device configuration is necessary. This

includes setting up the device using Label Vista version 3.3 or later, which is available for download from www.zebra.com. The CPCL language Programming Manual is a helpful reference for configuring printers and is also available from www.zebra.com.

Follow the steps below to properly configure your device.

1. To get a printer on a network using Label Vista, select Printer-Network Settings. That will allow you to configure the printer based on your current network settings (DHCP on/off, essid of the access point, security options, etc.)
2. To enable MSP Agent Level 2, select “Printer – Network Management”.

From the Network Management type list box select “msp”. Select the “Symbol MSP” tab and enter the MSP server IP address, FTP user



continued

name and password, update interval and check the “Update on Startup” and “Update at Interval” check boxes.

3. An INFO.MSP file needs to be resident on the printer. This file is loaded at the factory, and if it is lost or corrupted can be downloaded from www.zebra.com. You can verify completion by performing a two-key report with the printer and verifying that the INFO.MSP file is listed in the directory section of the resulting print-out.
4. MSP Packages are created using Symbol’s Air-Beam package builder application. When the package is installed in the printer the result will be reported back to the server.

Setting MSP Parameters with CPCL

You can also configure your printer for MSP using the CPCL “get, set, do” commands to perform the same parameter settings as in the Label Vista set-up procedure.

The following table lists the Label Vista Symbol MSP settings and their equivalent CPCL commands.

Label Vista Parameter	CPCL Command
MSP Server IP Address	netmanage.msp.server
FTP User Name	netmanage.msp.ftp_username.doc
FTP Password	netmanage.msp.ftp_password
Update Interval	netmanage.msp.interval
Check Boxes	CPCL Command
Update on Startup	netmanage.msp.startup_update_enable
Update at Interval	netmanage.msp.interval_update_enable

For more information on using CPCL commands to configure your printer’s settings refer to the latest version of the CPCL

manual, available on the Zebra Web site at www.zebra.com.

CPCL Language Configuration Parameters

The following list of parameters can be used to configure a printer for use with Symbol MSP. This is only a brief synopsis of the commands available. Always refer to the Mobile Printer CPCL Language Programming Manual for more details and examples of the use and syntax of CPCL commands.

netmanage.msp.server

Type: getvar, setvar

getvar example: ! U1 GETVAR “netmanage.msp.server”

Returns IP address of the server

setvar example:

! U1 SETVAR “netmanage.msp.server” “1.1.1.1”

This parameter sets the MSP Network Management IP address of the server.

netmanage.msp.ftp_username

type: getvar, setvar

getvar example: ! U1 GETVAR “netmanage.msp.ftp_username”

Returns the current MSP Network Management FTP Server user name stored in the printer.

setvar example:

! U1 SETVAR “netmanage.msp.ftp_username” “user”

This example sets the device’s MSP Network Management Device FTP Server user name to “user”.

netmanage.msp.ftp_password

Type: getvar, setvar

This parameter sets and gets MSP Network Management FTP Server user password.

getvar example: ! U1 GETVAR “netmanage.msp.ftp_password”

Retrieves the device’s MSP Network Management Device FTP Server user password.

setvar example:

! U1 SETVAR “netmanage.msp.ftp_password” “junk”

continued

Sets the device's MSP Network Management Device FTP Server user password to "junk".

netmanage.msp.interval

Type: getvar, setvar

This parameter sets or retrieves the MSP Network Management Update Interval time in seconds.

getvar example: ! U1 GETVAR "netmanage.msp.interval"

This example retrieves the device's MSP Network Management Update Interval time setting.

setvar example:

! U1 SETVAR "netmanage.msp.interval" "300"

This example sets the device's MSP Network Management Update Interval to 300 seconds

netmanage.msp.startup_update_enable

type: getvar, setvar

This parameter sets and gets MSP Network Management Start Up Update enable setting.

getvar example:

! U1 GETVAR "netmanage.msp.startup_update_enable"

Returns the current MSP Network Management Start Up Update enable setting stored in the printer.

setvar example:

! U1 SETVAR "netmanage.msp.startup_update_enable" "on"

Sets the device's MSP Network Management Start Up Update enable setting to "on". Setvar options are either "on" or "off"

netmanage.msp.interval_update_enable

type: getvar, setvar

This parameter sets and gets MSP Network Management Interval Update enable setting.

getvar example:

! U1 GETVAR "netmanage.msp.interval_update_enable"

Returns the current MSP Network Management Interval Update enable setting stored in the printer.

setvar example:

! U1 SETVAR "netmanage.msp.interval_update_enable" "on"

This example sets the device's MSP Network Management Interval Update enable setting to "on". Setvar options are either "on" or "off"

netmanage.msp.ftp_path

type: getvar, setvar

This parameter sets and gets MSP Network Management FTP Server Path.

getvar example: ! U1 GETVAR "netmanage.msp.ftp_path"

Returns the current MSP Network Management FTP Server path stored in the printer.

setvar example:

! U1 SETVAR "netmanage.msp.ftp_password" "WNMS"

This example sets the device's MSP Network Management Device FTP Server path to "WNMS".

Wireless Security- EAP-FAST and WPA EAP-FAST

INTRODUCTION

EAP-FAST (Extensible Authentication Protocol-Flexible Authentication via Secure Tunneling) is an IEEE 802.1x authentication protocol developed by Cisco Systems®. It is a wireless security protocol that does not require an advanced password policy or digital certificates. This authentication protocol requires a specially formatted file called a PAC (**Protected Access Credential**) file to be stored on the client (i.e. a mobile printer) requiring wireless access to the network. The PAC file contains an initial pre-shared key that is also known by the authentication server. PAC keys may be continuously updated once the client has been authenticated. This EAP method has an option called “auto-provisioning”, which allows a client to originally receive a PAC file wirelessly from the authentication server, but this method is less secure, and is *not* supported by Zebra mobile printers.

EAP-FAST is implemented using a RADIUS (**R**emote **A**uthentication **D**ial-**I**n **U**ser **S**ervice) server to authenticate a user (a Zebra mobile printer) before allowing wireless access onto the network.

You must ensure compatibility of your printer with the EAP-FAST protocol. At the time of writing the following mobile printer models and radio options will support EAP-FAST:

Model	Radio Option		
	802.11b CF	802.11b PCMCIA	Zebra 802.11b
QL 220, QL 220 Plus	yes	no	yes
QL 320, QL 320 Plus	yes	no	yes
QL 420, QL 420 Plus	yes	no	yes
RW 220	yes	no	yes
RW 420	yes	no	yes

NOTE: EAP-FAST is not supported on Zebra mobile printers with the PCMCIA radio option.

CONFIGURING THE NETWORK FOR EAP-FAST AUTHENTICATION

EAP-FAST is implemented using a RADIUS (**R**emote **A**uthentication **D**ial-**I**n **U**ser **S**ervice) server to authenticate a user (in this case a Zebra mobile printer) before allowing wireless access onto the network.

You must have your server configured in a manner similar to the following:

NOTE: It is the responsibility of end users to determine the proper configuration parameters for their particular network. The following discussion is intended as an example to follow when configuring a WLAN network for use with this protocol.

These settings are based on typical settings for a Cisco Aironet 1200 access point. This access point also acts as the EAP authenticator, transferring the data between the printer and the RADIUS server. This access point should have a firmware version of 12.3(7)JA or later. Earlier firmware versions may not support local EAP-FAST authentication.

- Set Open Authentication with EAP, Network EAP, and no Key Management

continued

- Set WEP Encryption to Mandatory.
- Configure a RADIUS server entry. Select the IP address for the access point since it will serve as the local authentication server.

NOTE: The Cisco access point local RADIUS Server listens on TCP ports 1812 and 1813. Select the access point's IP address in the Default Server Priorities (EAP Authentication section).

- Ensure the EAP FAST protocol is selected for the Local Radius Server Authentication Setting. Enter the IP address of the access point in the Network Access Servers section and the server's "shared secret".
- Ensure that a username and password are entered for the user. The printer will use these to log onto the network.
- Generate the PAC file, which **must** be named "zebra.pac". (The Cisco access point PAC generator requires that a TFTP server be running to receive the file.) Enter the IP address of the server.

NOTE: The PAC file is encrypted and cannot be viewed with a text editor.

CONFIGURING THE PRINTER FOR EAP-FAST AUTHENTICATION

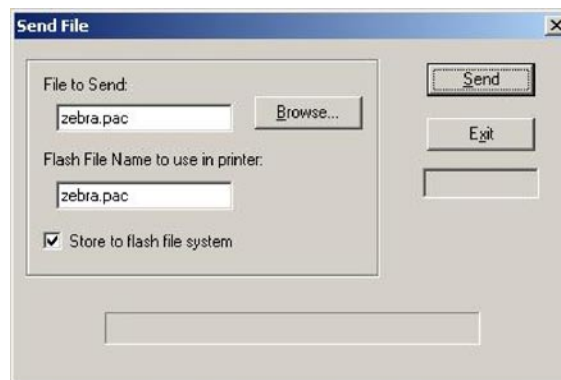
To configure a Zebra mobile printer for EAP-FAST authentication you must have Label Vista, Zebra's label creation program and a communications application such as HyperTerminal installed on your computer.

NOTE: Label Vista can be downloaded from: <http://www.zebra.com>

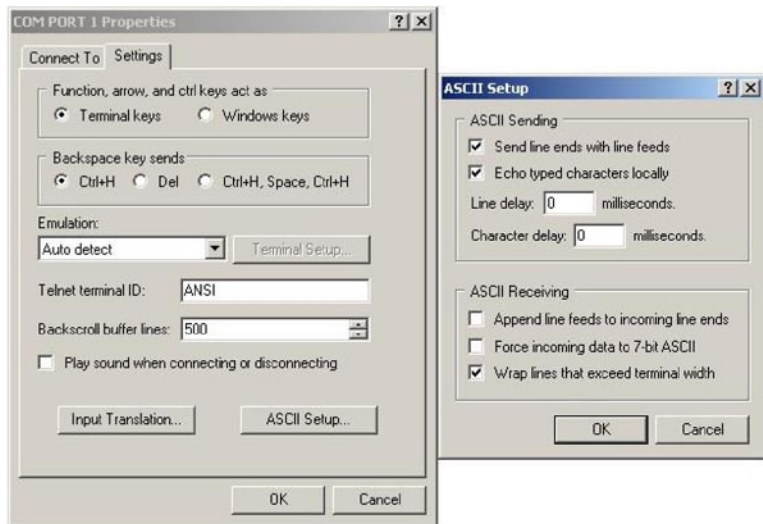
You will also need a serial communications cable to connect your computer and the mobile printer. Refer to the following table for serial download cable part numbers:

Model	Serial Cable p/n
QL 220/220 Plus	BL16555-1 or BL17757-000
QL 320/320 Plus	
QL 420/420 Plus	
RW 220	BL17205-1
RW 420	

Connect the printer to a PC and run Label Vista. Match the com port setting to the printer (refer to the printer's 2-key self test for settings) using the Printer/Com Port Setup dialog box. Send the "zebra.pac" file by selecting Printer/Send File and make sure to check the "Store to flash file system" option.



To set up the printer to use EAP-FAST a few configuration parameters need to be edited on the printer. Run HyperTerminal. Create a connection name and set it to the com port you are using. Match the com port settings to the printer. Select File/Properties/Settings/ASCII Setup and check the top two check boxes in the ASCII Sending section.



Type the following in the terminal window in HyperTerminal and terminate with a carriage return:

```
! U1 DIR
```

If you are connected correctly you will see a file listing which should include the “zebra.pac” file. The following is an example. The files you see may be different.

```
! U1 DIR    Directory
   _DEVPROP .PRF      557
   ZPL_CFG  .CFG      76
   TIMSTAMP .PRF     169
   CUSTOMØ  .PRF      55
   INFO     .MSP     8634
   _WEPCFG  .WKF       2
   _AUTORUN .PRF      48
   DEFAUL~1.XML 17193
   ZEBRA    .PAC      296
   INDEX    .WML     4777
   _LOCAL   .PRF      73
   IP       .LBL      99
```

924000 Bytes Free

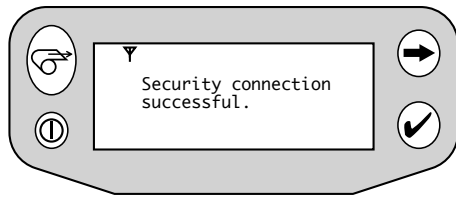
Type each of the following command strings and terminate each with a carriage return. The fields in blue italics will be unique to your network and printer:

```
! U1 setvar "wlan.essid" "MyESSID"
! U1 setvar "wlan.8021x.authentication" "fast"
! U1 setvar "wlan.8021x.eap.username" "MyUsername"
! U1 setvar "wlan.8021x.eap.password" "MyPassword"
! U1 setvar "wlan.8021x.eap.privkey_password" "MyCertPassword"
```

Or if your PAC file is not password protected:

```
! U1 setvar "wlan.8021x.eap.privkey_password" ""
! U1 setvar "wlan.8021x.enable" "on"
```

At this point you are done with the configuration of the printer. Turn the printer off and then back on to initialize all the settings for the radio. If your printer has an LCD display you should see the following for a couple of seconds prior to the regular menu appearing:



The access point's event log should also contain information regarding the printer's successful connection.

CONFIGURING FOR WPA EAP-FAST AUTHENTICATION

Next, we will modify the access point settings and the Zebra mobile printer configuration to use WPA EAP-FAST. WPA increases security further by using TKIP (Temporal Key Integrity Protocol) as an encryption scheme instead of WEP.

You must ensure compatibility of your printer with the WPA EAP-FAST protocol. At the time of writing the following mobile printer models and radio options will support WPA EAP-FAST:

Model	Radio Option		
	802.11b CF	802.11b PCMCIA	Zebra 802.11b
QL 220	yes	no	yes
QL 220 Plus			
QL 320	yes	yes	yes
QL 320 Plus	yes	no	yes
QL 420	yes	yes	yes
QL 420 Plus	yes	no	yes
RW 220	yes	no	yes
RW 420	yes	no	yes

All the access point settings are the same as described previously for standard EAP-FAST except for the changes below:

- Set the access point to use a cipher as the encryption mode, and select TKIP as the cipher type.
- Configure the Authenticated Key Mangement to be manda-

tory using WPA.

- The WPA Pre-shared key should be set to ASCII.

To configure the Zebra mobile printer for WPA EAP-FAST authentication type the following command strings and terminate them with carriage returns. The fields in blue italics will be unique to your network and printer.

NOTE: If you previously configured your printer for standard EAP-FAST, only the lines in red need to be typed in:

```
! U1 setvar "wlan.essid" "MyESSID"
! U1 setvar "wlan.wpa.authentication" "fast"
! U1 setvar "wlan.8021x.eap.username" "MyUsername"
! U1 setvar "wlan.8021x.eap.password" "MyPassword"
! U1 setvar "wlan.8021x.eap.privkey_password" "MyCertPassword"
```

Or if your PAC file is not password protected:

```
! U1 setvar "wlan.8021x.eap.privkey_password" ""
! U1 setvar "wlan.wpa.enable" "on"
```

At this point you are done with the configuration of the printer. Turn the printer off and then back on to initialize all the settings for the radio. If your printer has an LCD display you should see the "Security connection successful." message for a couple of seconds prior to the regular menu appearing.

Wireless Security- EAP-TLS and WPA EAP-TLS

INTRODUCTION

Extensible Authentication Protocol- Transport Level Security is an IEEE 802.1x EAP security method that uses digital certificates for mutual server and client authentication. EAP-TLS requires a RADIUS (Remote Authentication Dial-In User Service) server to authenticate a user (i.e. a Zebra mobile printer) before allowing wireless access onto the network. Both the server and the client prove their identities via PKI (Public Key Infrastructure) cryptography passing X.509 digital certificates to each other. Encryption keys are then generated securing all communications traffic between the wireless client and the network.

NOTE: It is the responsibility of end users to determine the proper configuration parameters for their particular network. The following discussion is intended as an example to follow when configuring a WLAN network for use with Zebra Mobile Printers and this protocol.

The following discussion assumes the use of a Cisco Aironet 1200 access point (the EAP authenticator), and a Windows version of the popular FreeRadius authentication server. The firmware level on the Cisco access point should be 12.3(7)JA or higher. More information on FreeRadius appears later in this section.

You must ensure compatibility of your printer with the EAP-TLS protocol. At the time of writing the following mobile printer models and radio options will support EAP-TLS:

Model	Radio Option		
	802.11b CF	802.11b PCMCIA	Zebra 802.11b
QL 220 Plus	yes	no	yes
QL 320 Plus	yes	no	yes
QL 420 Plus	yes	no	yes
RW 220	yes	no	yes
RW 420	yes	no	yes

You can verify compatibility by performing a 2-key self test (power on the printer with the Feed button pressed, and release it once the self test starts printing) to print the unit's configuration. Verify that the Software Version in the Program Section begins with "SH". If your printer does not show this information, then you do not have a printer with the capability for EAP-TLS authentication.

NOTE: EAP-TLS is not supported on Zebra mobile printers with the PCMCIA radio option.

CONFIGURING THE NETWORK FOR EAP-TLS AUTHENTICATION

Configure the Access Point

EAP-TLS is implemented using a RADIUS (Remote Authentication Dial-In User Service) server to authenticate a user (in this case a Zebra mobile printer) before allowing wireless access onto the network.

You must have your server configured in a manner similar to the following:

NOTE: These settings are based on typical settings for a Cisco Aironet 1200 access point. This access point also acts as the EAP authenticator, transferring the data between the printer and the RADIUS server. The access point should have a firmware version of 12.3(7)JA or later. Earlier firmware versions may not support local EAP-TLS authentication.

- Set Open Authentication with EAP and no Key Management
- Set WEP Encryption to Mandatory
- Configure a RADIUS server entry. Select the IP address and enter its shared secret. By default the FreeRadius server listens on TCP ports 1812 and 1813. Select the RADIUS server's IP address in the Default Server Priorities (EAP Authentication section).
- Ensure the EAP TLS protocol is selected for the Local Radius Server Authentication Setting. Enter the IP address of the access point in the Network Access Servers section and the server's "shared secret".

continued

Configure the FreeRadius Server

NOTE: The FreeRadius server is available under the GNU General Public License (GPL), and is freely downloadable from the Internet. For our example we will be using a Windows version of the server that can be downloaded from the FreeRadius.net website (<http://www.freeradius.net>). This version of the FreeRadius server requires the Windows XP operating system.

Download and install the server. In the FreeRadius.net group click the 'Edit Clients.conf' icon. At the bottom of the file add the following lines to create our test network. This will allow for a range of access points that must also be configured with this same shared secret.

```
client 192.168.1.0/24 {
  secret = password
  shortname= private-network-3
}
```

Save the file and open the "Eap.conf" file for editing. If necessary, edit the line that reads 'default_eap_type' to select the TLS protocol:

```
default_eap_type = tls
```

Save the file if changes are made.

Next we will verify the user credentials that our printer will use to login to the network. Open the Users file. Verify that the user "FreeRADIUS.net-Client" is uncommented as below:

```
# Test TLS Certificate based user
FreeRADIUS.net-Client User-Password = "demo"
Reply-Message = "Hello, %u"
```

Save the file if changes are made.

The RADIUS server should now be configured correctly. Start the server in debug mode by selecting the appropriate icon. Once the server is initialized it will be ready to process requests and authenticate users.

CONFIGURING THE PRINTER FOR EAP-TLS AUTHENTICATION

The necessary certificate files must be acquired and stored on the printer to enable configuration for EAP-TLS. Then the appropriate printer parameters to enable EAP-TLS authentication must be configured. The following description uses the demo certificates supplied with the Windows version of FreeRadius. Locate the 'DemoCerts' folder of your FreeRadius installation. At the time of this writing the default path and version is:

```
C:\Program Files\FreeRADIUS.net-1.0.2-r0.0.8\etc\raddb\certs\
FreeRADIUS.net\DemoCerts
```

Three certificate files are required in order to successfully authenticate our printer using EAP-TLS (a root certificate from a certificate authority, a client certificate, and a client private key certificate). The certificates must be in PEM format. They need to have specific filenames, and must be stored in the printer's flash file system. Copy the following three files from the FreeRadius 'DemoCerts' folder and place them in a temporary folder. Rename the certificate files as shown below. The file names are case sensitive.

Change file name from	to
FreeRADIUS.net-Root.crt	CacertSv.nrd
FreeRADIUS.net-Client.crt	certCln.nrd
FreeRADIUS.net-Client.pem	privkey.nrd

NOTE: Certificate files are normally generated by a trusted 3rd-party Certificate Authority (CA). If you are using different certificate files from the example above the TLS section of the "Eap.conf" file will need to be edited to reference the appropriate files. The root certificate file and client certificate files must also be renamed as above and saved to the printer's file system.

To configure a Zebra mobile printer we will use Zebra's Label Vista utility and a communications application such as HyperTerminal.

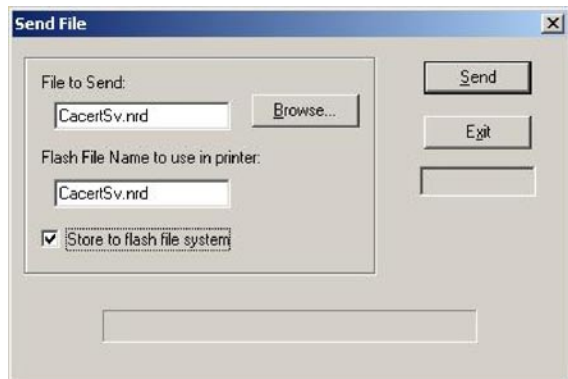
Label Vista can be downloaded from <http://www.zebra.com>.

continued

You will also need a serial communications cable to connect your computer and the mobile printer. Refer to the following table:

Model	Serial Cable p/n
QL 220 Plus	BL16555-1 or BL17757-000
QL 320 Plus	
QL 420 Plus	
RW 220	BL17205-1
RW 420	

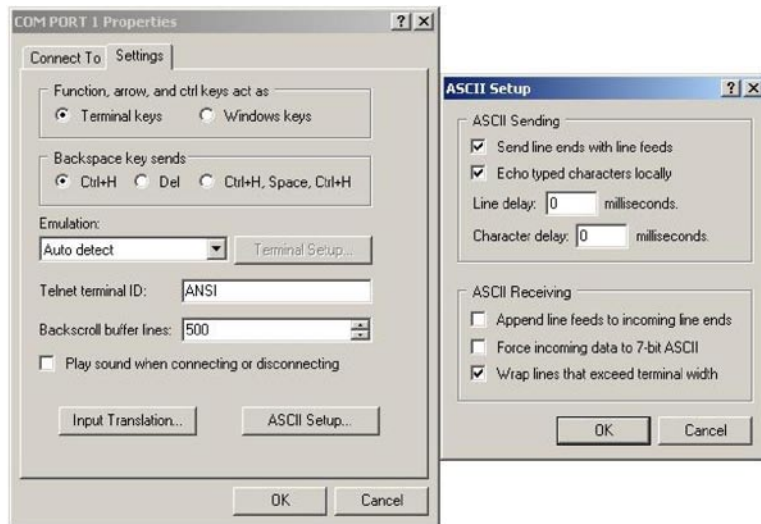
Connect the printer serially to a PC and run Label Vista. Match the com port setting to the printer (refer to the printer's 2-key self test for settings) using Printer/Com Port Setup. Send the CacertSv.nrd file by selecting Printer/Send File and make sure to check off the "Store to flash file system" option.



Repeat this process to store the remaining two certificate files on the printer.

To set up the printer to use EAP-TLS a few configuration parameters need to be edited on the printer. Run HyperTerminal. Create a connection name and set it to the com port you are

using. Match the com port settings to the printer. Select File/Properties/Settings/ASCII Setup and check the top two check boxes in the ASCII Sending section:



Type the following in the terminal window in HyperTerminal and terminate with a carriage return:

```
! U1 DIR
```

If you are connected correctly you will see a file listing containing the three certificate files stored earlier. The following is an example. The files you see may be different.

```
Directory
_DEVPROP.PRF      557
ZPL_CFG .CFG      76
TIMESTAMP.PRF    169
CUSTOM0 .PRF     55
INFO .MSP       8634
_WEPCFG .WKF      2
_AUTORUN.PRF     48
DEFAULT~1.XML   17193
CERTCLN .NRD    1554
INDEX .WML     4777
PRIVKEY .NRD    887
CACERTSV.NRD   1480
_LOCAL .PRF     73
IP .LBL        99
908000 Bytes Free
```

Type each of the following command strings and terminate each with a carriage return. The fields in blue italics will be unique to your network and printer:

```
! U1 setvar "wlan.essid" "MyESSID"
! U1 setvar "wlan.8021x.authentication" "eap-tls"
```

If your private key certificate is not password protected, type:

```
! U1 setvar "wlan.8021x.eap.privkey_password" ""
```

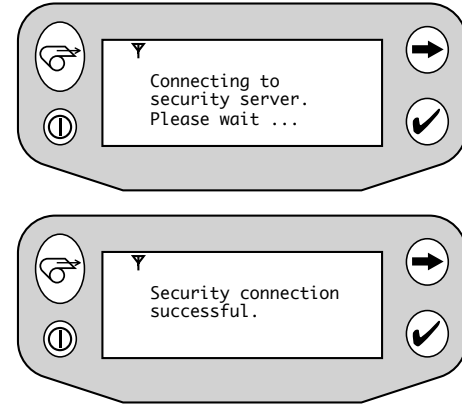
If your private key certificate *is* password protected, type:

```
! U1 setvar "wlan.8021x.eap.privkey_password" "MyCertPassword"
```

Then type the final line:

```
! U1 setvar "wlan.8021x.enable" "on"
```

At this point you are done with the configuration of the printer. Turn the printer off and then back on to initialize all the settings for the radio. If your printer has an LCD display you should see the following messages for a couple of seconds prior to the regular menu appearing:



CONFIGURING THE ACCESS POINT FOR WPA EAP-TLS AUTHENTICATION

WPA increases security further by using TKIP (Temporal Key Integrity Protocol) as an encryption scheme instead of WEP. All the access point settings are the same as described previously for standard EAP-TLS except for the changes below

- Set the access point to use a cipher as the encryption mode, and select TKIP as the cipher type.
- Configure the Authenticated key Management to be mandatory using WPA.
- The WPA Pre-shared key should be set to ASCII.

continued

CONFIGURING THE PRINTER FOR WPA EAP-TLS AUTHENTICATION

Configure the Zebra mobile printer for WPA EAP-TLS authentication type by typing the following command strings. Terminate them with carriage returns. The fields in blue will be unique to your network and printer.

If you previously configured your printer for standard EAP-TLS, only the lines in red need to be typed in:

```
! U1 setvar "wlan.essid" "MyESSID"  
! U1 setvar "wlan.wpa.authentication" "eap-tls"
```

If your private key certificate is not password protected, type:

```
! U1 setvar "wlan.8021x.eap.privkey_password" ""
```

Or if your private key certificate *is* password protected, type:

```
! U1 setvar "wlan.8021x.eap.privkey_password"  
"MyCertPassword"
```

Then type the final line:

```
! U1 setvar "wlan.wpa.enable" "on"
```

At this point you are done with the configuration of the printer. Turn the printer off and then back on to initialize all the settings for the radio. If your printer has an LCD display you should see the security connection messages for a couple of seconds prior to the regular menu appearing.

Wireless Security- EAP-TTLS and WPA EAP-TTLS

INTRODUCTION

Extensible Authentication Protocol- Tunnelled Transport Level Security (EAP-TTLS) is an IEEE 802.1x EAP security method that uses an initial TLS handshake to authenticate a server to a client using PKI (Public Key Infrastructure) cryptography X.509 digital certificates. Using the secure tunnel established by the TLS handshake, a RADIUS (Remote Authentication Dial-In User Service) server is used to authenticate a client using legacy username and password authentication before allowing wireless access onto the network. The server proves its identity to the client (our Zebra mobile printer) by passing a digital certificate to the printer. A root certificate is stored on the printer which will be used to help prove the identity of the server. The printer authenticates to the server by sending its username and password inside the secure TLS tunnel. Encryption keys are then generated securing all communications traffic between the wireless client and the network

NOTE: It is the responsibility of end users to determine the proper configuration parameters for their particular network. The following discussion is intended as an example to follow when configuring a WLAN network for use with this protocol.

The following discussion assumes the use of a Cisco Aironet 1200 access point (the EAP authenticator), and a Windows version of the popular FreeRadius authentication server. The firmware level on the Cisco access point should be 12.3(7)JA or higher. More information on FreeRadius appears later in this section.

You must ensure compatibility of your printer with the EAP-TTLS protocol. At the time of writing the following mobile printer models and radio options will support EAP-TTLS:

Model	Radio Option		
	802.11b CF	802.11b PCMCIA	Zebra 802.11b
QL 220 Plus	yes	no	yes
QL 320 Plus	yes	no	yes
QL 420 Plus	yes	no	yes
RW 220	yes	no	yes
RW 420	yes	no	yes

You can verify compatibility by performing a 2-key self test (power on the printer with the Feed button pressed, and release it once the self test starts printing) to print the unit's configuration. Verify that that the Software Version in the Program Section begins with "SH". If your printer does not show this information, than you do not have a printer with the capability for EAP-TTLS authentication.

NOTE: EAP-TTLS is not supported on Zebra mobile printers with the PCMCIA radio option.

CONFIGURING THE NETWORK FOR EAP-TTLS AUTHENTICATION

Configure the Access Point

EAP-FAST is implemented using a RADIUS (Remote Authentication Dial-In User Service) server to authenticate a user (in this case a Zebra mobile printer) before allowing wireless access onto the network.

You must have your server configured in a manner similar to the following:

NOTE: These settings are based on typical settings for a Cisco Aironet 1200 access point. This access point also acts as the EAP authenticator, transferring the data between the printer and the RADIUS server. The access point should have a firmware version of 12.3(7)JA or later. Earlier firmware versions may not support local EAP-FAST authentication.

continued

- Set Open Authentication with EAP, Network EAP, and no Key Management
- Set WEP Encryption to Mandatory
- Configure a RADIUS server entry. Select the IP address and enter its shared secret. (We will edit the shared secret on the RADIUS server in the next step). By default the FreeRadius server listens on TCP ports 1812 and 1813. Select the RADIUS server's IP address in the Default Server Priorities (EAP Authentication section).

Configure the FreeRadius Server

NOTE: The FreeRadius server is available under the GNU General Public License (GPL), and is freely downloadable from the Internet. For our example we will be using a Windows version of the server that can be downloaded from the FreeRadius.net website (<http://www.freeradius.net>). This version of the FreeRadius server requires the Windows XP operating system.

Download and install the server. In the FreeRadius.net group click the 'Edit Clients.conf' icon. At the bottom of the file add the following lines to create our test network. This will allow for a range of access points that must also be configured with this same shared secret.

```
client 192.168.1.0/24 {
    secret = password
    shortname= private-network-3
}
```

Save the file and open the "Eap.conf" file for editing. If necessary, edit the line that reads 'default_eap_type' to select the TTLS protocol:

```
default_eap_type =ttls
```

Save the file if changes are made.

Open the Radiusd.conf file. Locate the PAP module and change the encryption_scheme to clear text as shown below. Save the file if changes are made.

```
# DEFAULT: crypt
```

```
pap {
    encryption_scheme = clear
}
```

Next we will verify the user credentials that our printer will use to login to the network. Open the Users file. Just below the user 'FreeRADIUS.net-Client' add a TTLS user 'ttls' as shown below:

```
# Test TTLS user
ttls Auth-Type := pap, User-Password == "password"
    Service-Type = Login-User
```

Save the file if changes are made.

The RADIUS server should now be configured correctly. Start the server in debug mode by selecting the appropriate icon. Once the server is initialized it will be ready to process requests and authenticate users.

CONFIGURING THE PRINTER FOR EAP-TTLS AUTHENTICATION

The necessary certificate files must be acquired and stored on the printer to enable configuration for EAP_TTLS. Then the appropriate printer parameters to enable EAP-TTLS authentication must be configured. The following description uses the demo certificates supplied with the Windows version of FreeRadius. Locate the 'DemoCerts' folder of your FreeRadius installation. At the time of this writing the default path and version is:

```
C:\Program Files\FreeRADIUS.net-1.0.2-r0.0.8\etc\raddb\certs\
FreeRADIUS.net\DemoCerts
```

Only one certificate file is required in order to successfully authenticate our printer using EAP-TTLS (a root certificate from a certificate authority), and a user name and password that has also been properly configured in the RADIUS server (in this example the 'ttls' user that we setup previously). The certificate file must be in PEM format. It needs to have a specific filename, and must be stored in the printer's flash file system. Copy the following file from the FreeRadius 'DemoCerts' folder and place

continued

it in a temporary folder. Rename the certificate file as shown below. The file name is not case sensitive.

FreeRADIUS.net-Root.crt -> CacertSv.nrd

NOTE: Certificate files are normally generated by a trusted 3rd-party Certificate Authority (CA). If you are using different certificate files from the example above the TTLS section of the "Eap.conf" file will need to be edited to reference the appropriate files. The root certificate file and client certificate files must also be renamed as above and saved to the printer's file system.

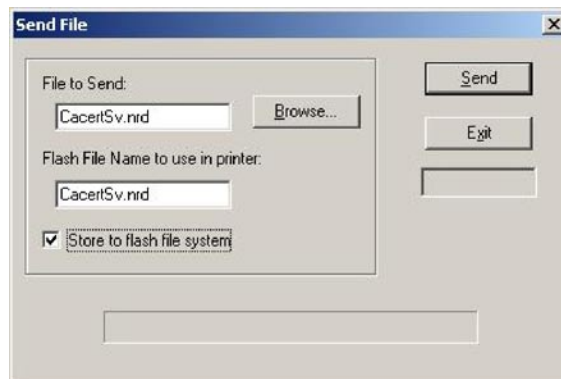
To configure a Zebra mobile printer we will use Zebra's Label Vista utility and a communications application such as HyperTerminal.

Label Vista can be downloaded from <http://www.zebra.com>.

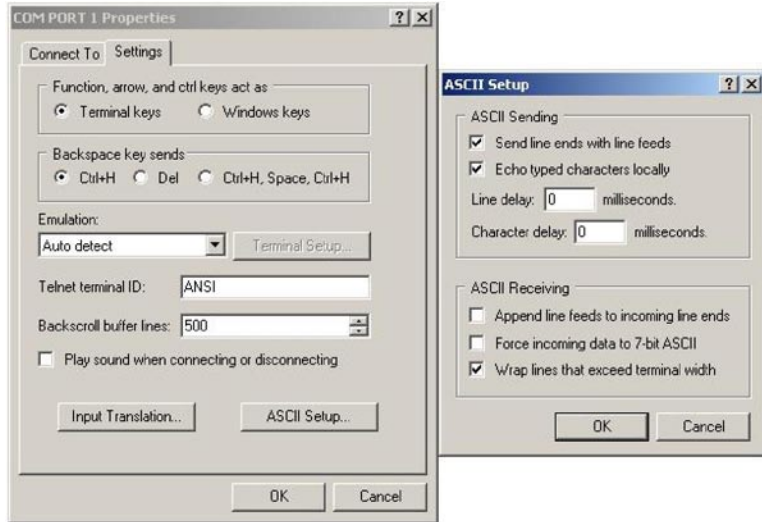
You will also need a serial communications cable to connect your computer and the mobile printer. Refer to the following table:

Model	Serial Cable p/n
QL 220 Plus	BL16555-1 or BL17757-000
QL 320 Plus	
QL 420 Plus	
RW 220	BL17205-1
RW 420	

Connect the printer serially to a PC and run Label Vista. Match the com port setting to the printer (refer to the printer's 2-key self test for settings) using Printer/Com Port Setup. Send the "CacertSv.nrd" file by selecting Printer/Send File and make sure to check off the "Store to flash file system" option.



To set up the printer to use EAP-TTLS a few configuration parameters need to be edited on the printer. Run HyperTerminal. Create a connection name and set it to the com port you are using. Match the com port settings to the printer. Select File/ Properties/Settings/ASCII Setup and check the top two check boxes in the ASCII Sending section:



Type the following in the terminal window in HyperTerminal and terminate with a carriage return:

```
! U1 DIR
```

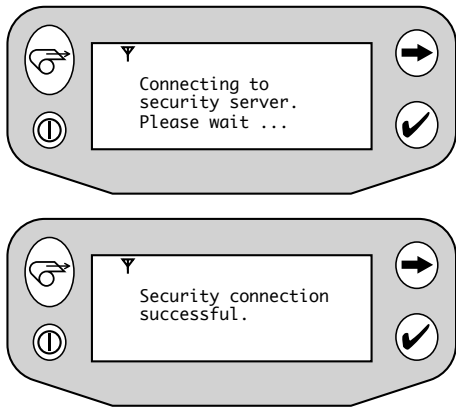
If you are connected correctly you will see a file listing containing the certificate file stored earlier. The following is an example. The files you see may be different:

```
Directory
_DEVPROP.PRF      557
ZPL_CFG .CFG      76
TIMESTAMP.PRF    169
CUSTOM0 .PRF     55
INFO .MSP        8634
_WEPCFG .WKF      2
_AUTORUN.PRF     48
DEFAULT~1.XML    17193
INDEX .WML        4777
CACERTSV.NRD     1480
_LOCAL .PRF       73
IP .LBL           99
908000 Bytes Free
```

Type each of the following command strings and terminate each with a carriage return. The fields in blue italics will be unique to your network and printer:

```
! U1 setvar "wlan.essid" "MyESSID"
! U1 setvar "wlan.8021x.authentication" "ttls"
! U1 setvar "wlan.8021x.eap.username" "MyUsername"
! U1 setvar "wlan.8021x.eap.password" "MyPassword"
! U1 setvar "wlan.8021x.enable" "on"
```

At this point you are done with the configuration of the printer. Turn the printer off and then back on to initialize all the settings for the radio. If your printer has an LCD display you should see the following messages for a couple of seconds prior to the regular menu appearing:



CONFIGURING THE ACCESS POINT FOR WPA EAP-TTLS AUTHENTICATION

WPA increases security further by using TKIP (Temporal Key Integrity Protocol) as an encryption scheme instead of WEP. All the access point settings are the same as described previously for standard EAP-TTLS except for the changes below

- Set the access point to use a cipher as the encryption mode, and select TKIP as the cipher type.
- Configure the Authenticated key Management to be mandatory using WPA.
- The WPA Pre-shared key should be set to ASCII.

CONFIGURING THE PRINTER FOR WPA EAP-TTLS AUTHENTICATION

Configure the Zebra mobile printer for WPA EAP-TTLS authentication type by typing the following command strings. Terminate them with carriage returns. The fields in blue will be unique to your network and printer.

If you previously configured your printer for standard EAP-TTLS, only the lines in red need to be typed in:

```
! U1 setvar "wlan.essid" "MyESSID"  
! U1 setvar "wlan.wpa.authentication" "ttls"  
! U1 setvar "wlan.8021x.eap.username" "MyUsername"  
! U1 setvar "wlan.8021x.eap.password" "MyPassword"  
! U1 setvar "wlan.wpa.enable" "on"
```

At this point you are done with the configuration of the printer. Turn the printer off and then back on to initialize all the settings for the radio. If your printer has an LCD display you should see the security connection messages for a couple of seconds prior to the regular menu appearing.

Wireless Security- PEAP and WPA PEAP

INTRODUCTION

Protected Extensible Authentication Protocol (PEAP) is an IEEE 802.1x EAP security method that uses an initial TLS handshake to authenticate a server to a client using PKI (Public Key Infrastructure) cryptography X.509 digital certificates. Using the secure tunnel established by the TLS handshake, a RADIUS (Remote Authentication Dial-In User Service) server is used to authenticate a client using legacy username and password authentication before allowing wireless access onto the network. The server proves its identity to the client (our Zebra mobile printer) by passing a digital certificate to the printer. An optional root certificate is stored on the printer which will be used to help prove the identity of the server. The printer authenticates itself to the server by sending its username and password inside the secure TLS tunnel. Encryption keys are then generated securing all communications traffic between the wireless client and the network

NOTE: It is the responsibility of end users to determine the proper configuration parameters for their particular network. The following discussion is intended as an example to follow when configuring a WLAN network for use with this protocol.

The following discussion assumes the use of a Cisco Aironet 1200 access point (the EAP authenticator), and a Windows version of the popular FreeRadius authentication server. The firmware level on the Cisco access point should be 12.3(7)JA or higher. More information on FreeRadius appears later in this section. The version of PEAP supported in the TLS tunnel is the Microsoft implementation of MS-CHAPv2.

You must ensure compatibility of your printer with the PEAP protocol. At the time of writing the following mobile printer models and radio options will support PEAP:

Model	Radio Option		
	802.11b CF	802.11b PCMCIA	Zebra 802.11b
QL 220 Plus	yes	no	yes
QL 320 Plus	yes	no	yes
QL 420 Plus	yes	no	yes
RW 220	yes	no	yes
RW 420	yes	no	yes

You can verify compatibility by performing a 2-key self test (power on the printer with the Feed button pressed, and release it once the self test starts printing) to print the unit's configuration. Verify that that the Software Version in the Program Section begins with "SH". If your printer does not show this information, than you do not have a printer with the capability for PEAP authentication.

NOTE: PEAP is not supported on Zebra mobile printers with the PCMCIA radio option.

CONFIGURING THE NETWORK FOR PEAP AUTHENTICATION

Configure the Access Point

PEAP is implemented using a RADIUS (Remote Authentication Dial-In User Service) server to authenticate a user (in this case a Zebra mobile printer) before allowing wireless access onto the network.

You must have your server configured in a manner similar to the following:

NOTE: These settings are based on typical settings for a Cisco Aironet 1200 access point. This access point also acts as the EAP authenticator, transferring the data between the printer and the RADIUS server. The access point should have a firmware version of 12.3(7) JA or later. Earlier firmware versions may not support local PEAP authentication.

- Set Open Authentication with EAP, and no Key Management
- Set WEP Encryption to Mandatory
- Configure a RADIUS server entry. Select the IP address and enter its shared secret. (We will edit the shared secret on the RADIUS server in the next step). By default the FreeRadius server listens on TCP ports 1812 and 1813. Select the RADIUS server's IP address in the Default Server Priorities (EAP Authentication section).

Configure the FreeRadius Server

NOTE: The FreeRadius server is available under the GNU General Public License (GPL), and is freely downloadable from the Internet. For our example we will be using a Windows version of the server that can be downloaded from the FreeRadius.net website (<http://www.freeradius.net>). This version of the FreeRadius server requires the Windows XP operating system.

Download and install the server. In the FreeRadius.net group click the 'Edit Clients.conf' icon. At the bottom of the file add the following lines to create our test network. This will allow for a range of access points that must also be configured with this same shared secret.

```
client 192.168.1.0/24 {
    secret = password
    shortname= private-network-3
}
```

Save the file and open the "Eap.conf" file for editing. If necessary, edit the line that reads 'default_eap_type' to select the PEAP protocol:

```
default_eap_type = peap
```

Save the file if changes are made.

Next we will create user credentials that our printer will use to login to the network. Open the Users file. Just below the user 'FreeRADIUS.net-Client' add a PEAP user 'peap' as shown below:

```
# Test PEAP user
peap Auth-Type := eap, User-Password == "password"
    Service-Type = Login-User
```

Save the file if changes are made.

The RADIUS server should now be configured correctly. Start the server in debug mode by selecting the appropriate icon. Once the server is initialized it will be ready to process requests and authenticate users.

CONFIGURING THE PRINTER FOR PEAP AUTHENTICATION

Any necessary certificate files must be acquired and stored on the printer to enable PEAP authentication. Then the appropriate printer parameters to enable PEAP authentication must be configured.

NOTE: Use of this certificate file is optional. The PEAP draft strongly recommends the use of this certificate, but does not require it. If this file is present, it must be the appropriate root certificate for the authenticating server, and is used to verify the server's identity. If it is not present the server's identity is automatically trusted. Certificate files are normally generated by a trusted 3rd-party Certificate Authority (CA).

The following description uses the demo certificates supplied with the Windows version of FreeRadius. Locate the 'DemoCerts' folder of your FreeRadius installation. At the time of this writing the default path and version is:

```
C:\Program Files\FreeRADIUS.net-1.0.2-r0.0.8\etc\raddb\certs\
FreeRADIUS.net\DemoCerts
```

Note that if using certificate files for authentication, only one such file is required in order to successfully authenticate our printer using PEAP (a root certificate from a certificate authority), along with a user name and password that has also been properly configured in the RADIUS server. (In this

example we will use the 'peap' user that we setup previously). The certificate file must be in PEM format. It needs to have a specific filename, and must be stored in the printer's flash file system. Copy the following file from the FreeRadius 'DemoCerts' folder and place it in a temporary folder. Rename the certificate file as shown below. The file name is not case sensitive.

FreeRADIUS.net-Root.crt -> CacertSv.nrd

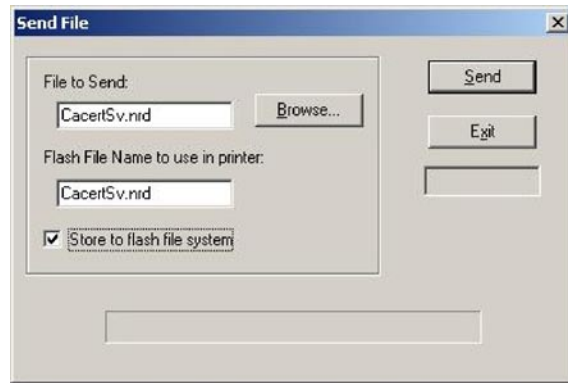
To configure a Zebra mobile printer we will use Zebra's Label Vista utility and a communications application such as HyperTerminal.

NOTE: Label Vista can be downloaded from <http://www.zebra.com>.

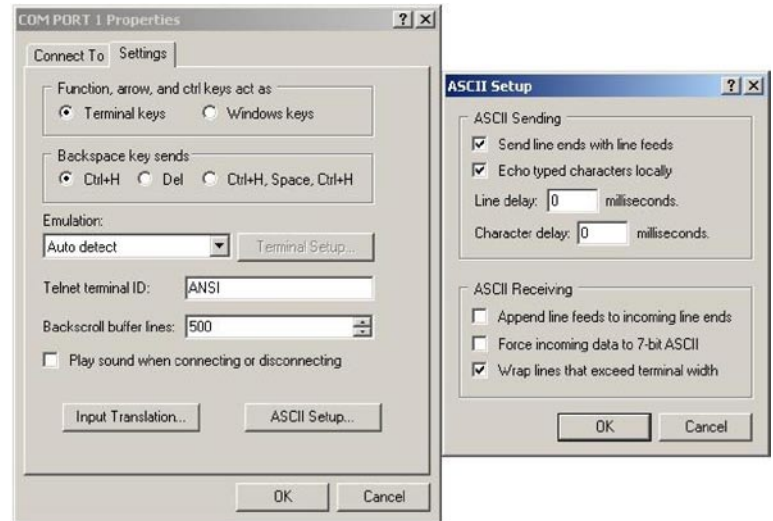
You will also need a serial communications cable to connect your computer and the mobile printer. Refer to the following table:

Model	Serial Cable p/n
QL 220 Plus	BL16555-1 or BL17757-000
QL 320 Plus	
QL 420 Plus	
RW 220	BL17205-1
RW 420	

Connect the printer serially to a PC and run Label Vista. Match the com port setting to the printer (refer to the printer's 2-key self test for settings) using Printer/Com Port Setup. Send the "CacertSv.nrd" file by selecting Printer/Send File and make sure to check off the "Store to flash file system" option.



To set up the printer to use PEAP a few configuration parameters need to be edited on the printer. Run HyperTerminal. Create a connection name and set it to the com port you are using. Match the com port settings to the printer. Select File/Properties/Settings/ASCII Setup and check the top two check boxes in the ASCII Sending section:



Type the following in the terminal window in HyperTerminal and terminate with a carriage return:

```
! U1 DIR
```

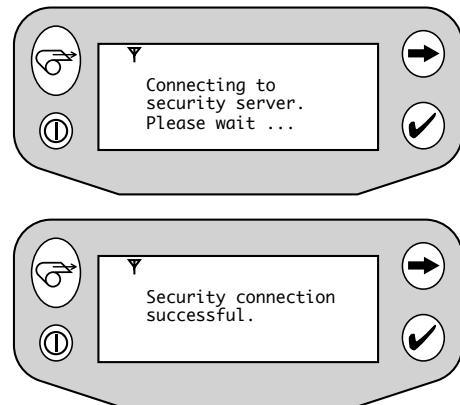
If you are connected correctly you will see a file listing containing the three certificate files stored earlier. The following is an example. The files you see may be different:

```
Directory
_DEVPROP.PRF      557
ZPL_CFG .CFG      76
TIMESTAMP.PRF    169
CUSTOM0 .PRF     55
INFO .MSP        8634
_WEPCFG .WKF      2
_AUTORUN.PRF     48
DEFAULT~1.XML    17193
INDEX .WML        4777
CACERTSV.NRD     1480
_LOCAL .PRF       73
IP .LBL          99
908000 Bytes Free
```

Type each of the following command strings and terminate each with a carriage return. The fields in blue italics will be unique to your network and printer:

```
! U1 setvar "wlan.essid" "MyESSID"
! U1 setvar "wlan.8021x.authentication" "peap"
! U1 setvar "wlan.8021x.eap.username" "MyUsername"
! U1 setvar "wlan.8021x.eap.password" "MyPassword"
! U1 setvar "wlan.8021x.enable" "on"
```

At this point you are done with the configuration of the printer. Turn the printer off and then back on to initialize all the settings for the radio. If your printer has an LCD display you should see the following messages for a couple of seconds prior to the regular menu appearing:



CONFIGURING THE ACCESS POINT FOR WPA PEAP AUTHENTICATION

WPA increases security further by using TKIP (Temporal Key Integrity Protocol) as an encryption scheme instead of WEP. All the access point settings are the same as described previously for standard PEAP except for the changes below:

- Set the access point to use a cipher as the encryption mode, and select TKIP as the cipher type.
- Configure the Authenticated key Management to be mandatory using WPA.
- The WPA Pre-shared key should be set to ASCII.

CONFIGURING THE PRINTER FOR WPA PEAP AUTHENTICATION

Configure the Zebra mobile printer for WPA PEAP authentication type by typing the following command strings. Terminate them with carriage returns. The fields in blue will be unique to your network and printer.

If you previously configured your printer for standard PEAP, only the lines in red need to be typed in:

```
! U1 setvar "wlan.essid" "MyESSID"
! U1 setvar "wlan.wpa.authentication" "peap"
```

```
! U1 setvar "wlan.8021x.eap.username" "MyUsername"  
! U1 setvar "wlan.8021x.eap.password" "MyPassword"  
! U1 setvar "wlan.wpa.enable" "on"
```

At this point you are done with the configuration of the printer. Turn the printer off and then back on to initialize all the settings for the radio. If your printer has an LCD display you should see the security connection messages for a couple of seconds prior to the regular menu appearing.



www.zebra.com

Zebra Technologies International, LLC

333 Corporate Woods Parkway
Vernon Hills, Illinois 60061-3109 USA

Phone: +1.847.634.6700

Toll-Free: +1.800.423.0422

Fax: +1.847.913.8766