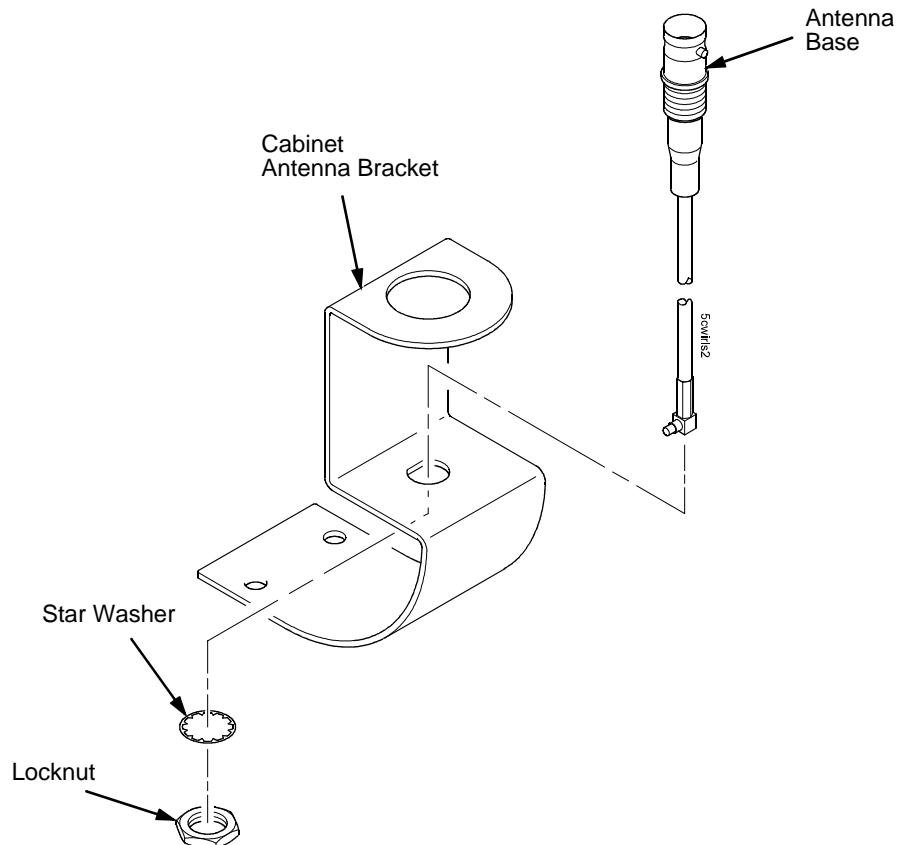


# Wireless Ethernet Addendum

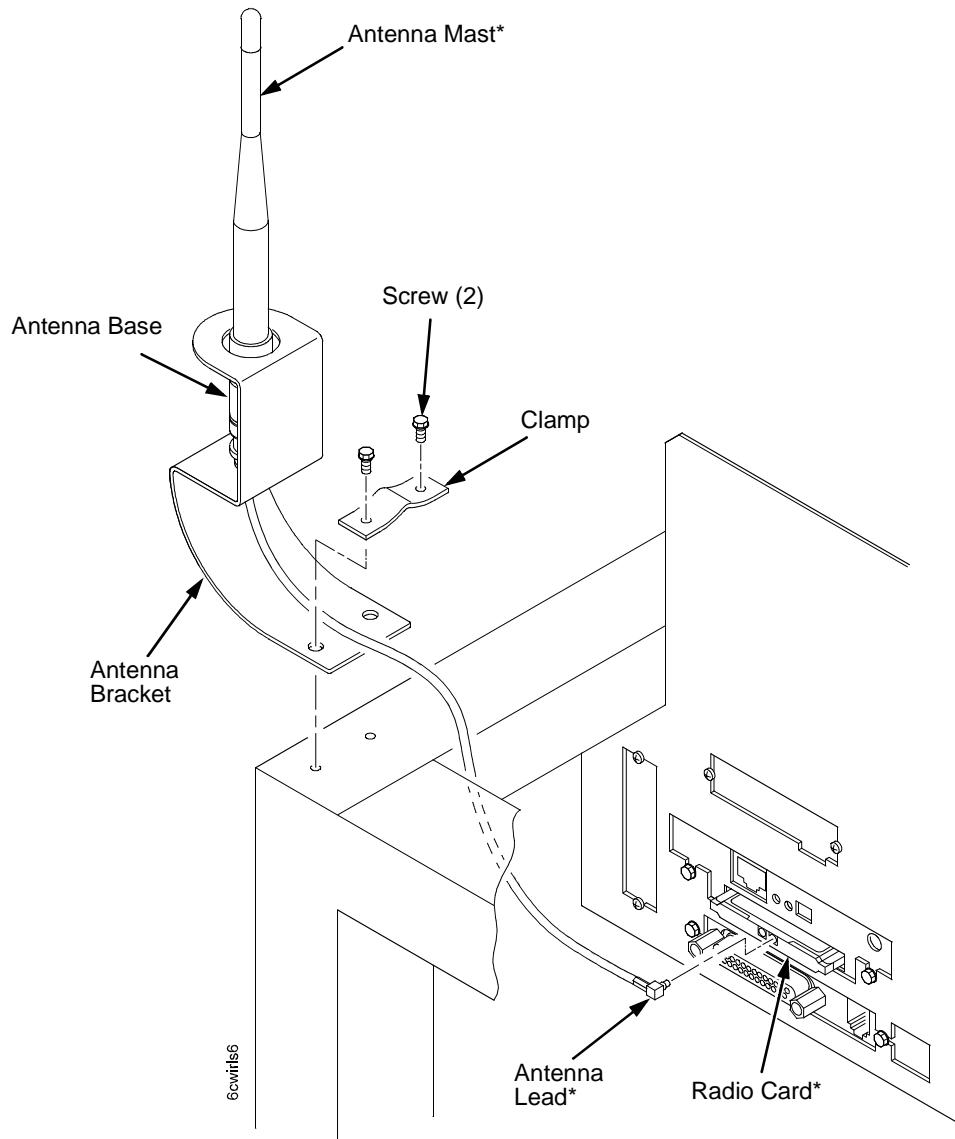
Please refer to the *6400i Ethernet Interface User's Manual* for complete instructions on attaching the Ethernet Interface to your network.

## Installing The Antenna Bracket On A Cabinet Model



**Figure 1. Install the Antenna Base on the Bracket**

1. Insert the antenna base into the cabinet antenna bracket as shown in Figure 1.
2. Install the star washer and locknut to secure the antenna base to the bracket. (Figure 1.)

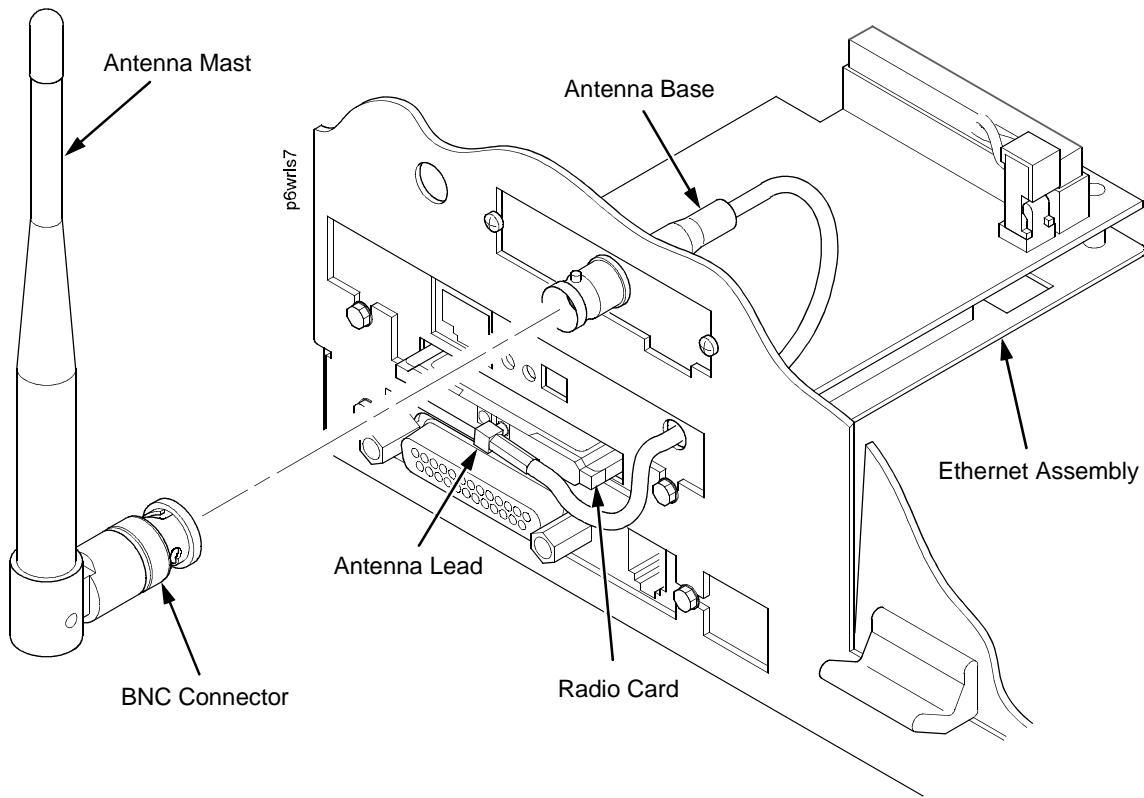


**Figure 2. Installing the Antenna Bracket on a Cabinet Model**

3. Position the antenna bracket as shown in Figure 2 and install the clamp and hold-down screws.

\* The customer is responsible for obtaining and installing the antenna and radio card.

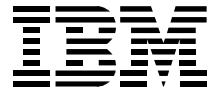
## Attaching The Radio Card And Antenna



**Figure 3. Installing the Radio Card and Antenna**

**NOTE:** The pedestal model is shown in Figure 3. On a cabinet model a vertical bracket holds the antenna base, but mast attachment is the same. The radio card and antenna lead install the same way on all models.

1. Slide the radio card into the slot in the ethernet assembly with the label side facing up. (Figure 3.)
2. Push the card gently inward until the connector at the rear of the card is fully engaged in the ethernet assembly. (Figure 3.)
3. Attach the antenna lead to the radio card. Press the lead inward until it snaps in place. (Figure 3.)
4. Attach the antenna mast to the antenna base with the BNC connector. (Figure 3.)



## Wired Or Wireless Configuration Using The Control Panel

**NOTE:** Make sure the Wireless Access Point is configured according to the manufacturer's installation guide.

The IBM wireless print server Ethernet Card can function as either a wired or wireless connection to your network.

To configure IBM's Print Server Ethernet card, configure the wired or wireless portion of the card so that it can be seen on the network. This involves network-related settings (e.g., an IP address within TCP/IP environments) configured through the built-in command shell, npsh, or from the control panel.

## IP Network Configuration Using The Control Panel

You can set the Ethernet card's IP settings from the printer control panel.

**IMPORTANT** When the printer is first powered on, the message "E-NET INIT" displays on the control panel. This process takes about two minutes. To prevent a loss of Ethernet configuration information, do not change the Ethernet settings while this message displays. When the initialization is complete, "E-NET READY" displays, and you can safely change the Ethernet settings from the control panel.

You need to set either the wired or wireless network IP addresses separately according to the TCP/IP environment that the printer is connected. There are four listed parameters from the printer control panel that are IP address related. These parameters are located in the "Ethernet Address" menu and the "Wireless Address" menu:

- **IP Address**

This is the host for IP addresses that have four segments. They are displayed as SEG1, SEG2, SEG3, and SEG4 which can be set to any value in the range of 0 to 255.

- **Subnet Mask** (for the IP address)

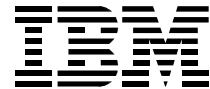
This is the subnet mask for the host IP that has four segments. They are displayed as SEG1, SEG2, SEG3, and SEG4 which can be set to any value in the range of 0 to 255.

- **Gateway Address**

These are the gateway IP addresses that have four segments. They are displayed as SEG1, SEG2, SEG3, and SEG4 which can be set to any value in the range of 0 to 255.

- **Subnet Mask** (for the gateway)

This is the subnet mask for the gateway that has four segments. They are displayed as SEG1, SEG2, SEG3, and SEG4 which can be set to any value in the range of 0 to 255.



- **DHCP**

The DHCP can be set to Enable or Disable.

## Wireless Network Configuration Using The Control Panel

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Some of the “Wireless Params” must be configured to match the Access Point settings:

**NOTE:** The “Ethernet Params” is configured the same way as the 10/100 Ethernet adapter card. Please refer to the *6400i Ethernet Interface User’s Manual*.

- **Operation Mode**

This is the operation mode of the wireless network. The option includes Infrastructure or Ad Hoc mode. This must match the Access Point’s configuration.

- **SSID Name**

This is the Service Set Identifier which must be identical to the Access Point’s SSID name. The SSID name can be configured to a maximum of 32 alphanumeric characters. The SSID name and alphanumeric characters are divided into three parts in the control panel menu as “SSID Name (01-15)”, “SSID Name (16-30)” and “SSID Name (31-32)”.

- **Default Key**

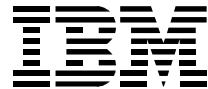
The default key must configure to match the Access Point’s configuration. If the Access Point is configured to use “Open System”, the default key should be set to 0. If the Access Point is configured to use 40-bit or 128-bit WEP encryption key, the encryption key must be set to match the same setting as the Access Point’s setting. See the following section on how to set up the encryption key. In addition, there are four keys (1-4) that an Access Point can use. If the Access Point is set to use key 1, the default key must be set to 1 to match the Access Point’s setting.

- **Xfer Rate Auto**

This is the wireless transfer rate that can be set to enable or disable. It is set to enable when the operation mode is “Infrastructure” so that the Ethernet can automatically detect the optimal transfer rate. If the operation mode is “Ad Hoc” and the transfer rate is known, the user can enable or disable the corresponding transfer rate accordingly in the menu “Xfer Rate 1Mb”, “Xfer Rate 2Mb”, “Xfer Rate 5.5Mb” or “Xfer Rate 11Mb”.

- **Channel**

This is the frequency used for wireless communication. The 2.4GHz band spectrum is divided into different channels (1-15). It is set to “Default” so that the Ethernet can detect the correct channel to communicate with the Access Point in infrastructure mode. If the operation mode is “Ad Hoc” and the channel is known, the user can set the corresponding channel in this menu.



- **Ant. Diversity**

This is used to select the antenna for communication. It is recommended to set this to “Diverse” for the Ethernet to detect for optimal communication. It can also be set to “Primary” or “Auxiliary”.

- **Preamble**

This is the preamble used in the wireless packets. It is recommended to set to “Default” so that the Ethernet can detect the correct preamble. The preamble is approximately 8 bytes of the packet header generated by the AP and is attached to the packet prior to transmission. The preamble length is transmission data rate dependable. The “short” preamble is 50% shorter than the “long” preamble. It must match the Access Point’s preamble configuration.

## **Encryption Key Configuration Using The Control Panel**

As mentioned above, there are four encryption keys that can be configured through the control panel. For each encryption key x (where x can be 1 to 4), the following control menu can be used to set up the key:

- **Enc Key x Format**

This is the format of the key. It can be set to either ASCII or Hexadecimal.

- **Enc Key x Width**

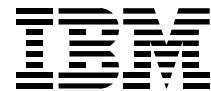
This is the number of bits used for encryption. This can be set to either 40 Bits or 128 Bits and must match the Access Point’s configuration.

- **Encryption Key x**

This is the key value. If the “Enc Key x Width” is set to 40 Bits, the key values can be entered in the following 5 sub menus (BYTE 1, ..., BYTE 5). If the “Enc Key x Width” is set to 128 Bits, the key values can be entered in the following 13 sub menus (BYTE 1, ..., BYTE 13). The key values must configure to match the corresponding key in the Access Point’s key configuration.

## **Equivalent Wireless Network Configuration Using The Telnet Command**

```
store ifc 2 wlan ssid <network-name>
store ifc 2 wlan mode adhoc|pseudo|managed
store ifc 2 wlan speed auto|(1 2 5 11)
store ifc 2 wlan channel default|(1-15)
store ifc 2 wlan antenna diverse|primary|aux
store ifc 2 wlan preamble default|long|short
store ifc 2 wlan defkey disable|(1-4)
store ifc 2 wlan key <key-num> <key-sequence>
```



## Wireless Network Indicator

The wireless Ethernet has LEDs which can produce three colors each: green, red, and yellow. Table 1 shows the STAT LED states for various system conditions:

**Table 1. Wireless Ethernet STAT LED States**

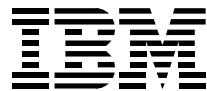
System Condition	STAT LED
System is running <b>without</b> an IP address.	Green, 2 Hz flash
System is running <b>with</b> an IP address.	Green, 1 Hz flash
System error.	Red 2Hz flash
System is in upgrade mode <b>with</b> an IP address.	Yellow, 1 Hz flash
System is in upgrade mode <b>without</b> an IP address.	Yellow, 2 Hz flash

Table 2 shows the NET LED states for various network conditions when a WLAN radio card is inserted into the wireless Ethernet. The Ethernet (wired) interface will not affect the NET\_LED while a WLAN radio card is present.

**Table 2. Wireless Ethernet NET LED States**

WLAN Network Condition	NET LED
Network-link quality is good	Green
Network-link quality is fair	Yellow
Network-link quality is bad	Red
Network-link not present	Off
Network-link present and transmitting	Link quality + blink

Table 3 shows the NET LED states for various network conditions when no WLAN radio card is found or present.



**Table 3. Wireless Ethernet NET LED States (No WLAN)**

<b>Wired Ethernet Network Condition (No WLAN)</b>	<b>NET LED</b>
Network-link quality is present	Green
Network-link quality is not present	Off
Network-link present and transmitting	Blink
Network-link not present	Off
Network-link present and transmitting	Link quality + blink

## Wireless Ethernet DIP Switches

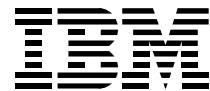
On the back of the printer, you will find a small window where you can access two DIP switches labeled 1 and 2. The functions of the DIP switches are explained in Table 4. For more information on DIP Switches, refer to the *6400i Ethernet Interface User's Manual*.

**NOTE:** The Wireless Ethernet DIP switch functionality is the same as the 10/100Base-T Ethernet adapter.

**NOTE:** The DIP switches are not marked with "off" or "on" labels. Instead, the status of the switch is indicated by its position, up or down.

**Table 4. Wireless Ethernet DIP Switch Settings**

<b>DIP Switch</b>		<b>Comments</b>
<b>1</b>	<b>2</b>	
up	up	<b>Normal operation.</b> With both DIP switches in the "off" position, the NIC boots up using the settings in flash memory rather than the default settings.
down	up	<b>Factory default.</b> With the DIP switches in this configuration, the NIC boots up and all settings stored in flash memory are erased except the Ethernet address and key value.
up	down	<b>Default IP.</b> With the DIP switches in this configuration, the NIC boots up with factory default settings. However, the stored settings in flash memory are intact. Setting DIP switch 2 to "on" does not clear any settings stored in flash memory; it boots the unit in a different state with the settings in flash memory temporarily ignored.
down	down	<b>Reserved.</b> This DIP switch configuration is not for customer use.



## Wireless Store Commands

These commands change the settings stored in flash memory and do not affect the current or working settings in memory: a power cycle is needed before the stored settings become current. Refer to the *6400i Ethernet Interface User's Manual* for a complete list of commands.

### Set the network name (SSID)

```
store ifc <ifnum> wlan ssid <network name>
<ifnum> is the interface number for the WLAN interface.
<network name> is a 1 to 32 ASCII character string.
```

### Set network mode

```
store ifc <ifnum> wlan mode <net-mode>
<ifnum> is the interface number for the WLAN device.
<net-mode> is the type of network operation mode: "adhoc", "pseudo" or
"managed". "pseudo" stands for pseudo IBSS (Proprietary adhoc).
```

### Set transfer rate (speed)

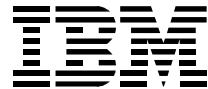
```
store ifc <ifnum> wlan speed <speed-flags>
<ifnum> is the interface number for the WLAN device.
<speed-flags> are the speeds being selected. They are entered as a list of
integers, separated by 'space' characters. The following values are
supported: 1 for 1Mbps, 2 for 2Mbps, 5 for 5.5Mbps, and 11 for 11Mbps.
Using the word "auto" instead of any number will set the card to use automatic
negotiation.
```

### Set channel number

```
store ifc <ifnum> wlan channel <channel-num>
<ifnum> is the interface number for the WLAN device.
<channel-num> selects the RF channel number (1 to 15) used in adhoc
mode. The word "default" will inform the device driver to use the card's
factory set default channel.
```

### Set antenna type

```
store ifc <ifnum> wlan antenna <antenna-type>
<ifnum> is the interface number for the WLAN device.
<antenna-type> is the type of antenna to be used: "primary", "aux" (auxiliary
or external) and "diverse". "diverse" allows the WLAN card to decide on the
optimal antenna during operation.
```



## **Set preamble length**

```
store ifc <ifnum> wlan preamble <len-type>
```

<ifnum> is the interface number for the WLAN device.  
<len-type> is the type of preamble length required. It can be "long", "short", or "default". "default" allows the card to use its own factory default.

## **Set power management mode**

```
store ifc <ifnum> wlan pmm on|off|<sleep-time>
```

<ifnum> is the interface number for the WLAN device.  
<sleep-time> is the amount of time, from 1 to 1000 milliseconds, the WLAN device is allowed to stay in low-power mode (sleep mode). A value greater than zero enables power save mode. If the value is zero, power management mode is set to normal (power-save disabled). "off" can also be used to disable power-save mode. The string "on" will enable power-save mode with a default sleep-time of 100ms.

## **Set transmit power**

```
store ifc <ifnum> wlan txpwr <power>
```

<ifnum> is the interface number for the WLAN device.  
<power> is the power level as a percentage of full power (1 - 100).

## **Set options**

```
store ifc <ifnum> wlan opts <option-list>
```

<ifnum> is the interface number for the WLAN device.  
<option-list> is a space-separated list of options that need to be enabled or disabled. An option is enabled by including it in the list and disabled by preceding it with a '-' character in the list. A Supported option is "intnl", for international mode.

## **Set the default key for WLAN encryption**

```
store ifc <ifnum> wlan defkey <key-num>
```

<ifnum> is the interface number for the WLAN device.  
<key-num> is the number identifying one of the four keys (1 - 4). A value of zero or the word "disable" disables the encryption.



## Set the key to a given value

```
store ifc <ifnum> wlan key <key-num> <key-value>
```

<ifnum> is the interface number for the WLAN interface.  
<key-num> is the number identifying one of the four keys (1-4).  
<key-value> is the encryption key value for <key-num>. The value must consist of 5 or 13 double- or quad-digit HEX numbers, separated by colon (':') or dash ('-') characters for readability (e.g. D1C2-B3A4-9586-7768-594A-3B2C-1D). Alpha characters are NOT case sensitive. All zeroes disable encryption for <key-num>. If '\$' is the first character the remainder of the argument is treated as a literal string with all alpha-numeric characters allowed (except spaces). Key length is inferred from the length of the key-value so leading zeroes of longer keys must be explicitly entered (not blanked).

## List Commands

```
list ifc
```

Lists the current UTP interface settings (e.g., link integrity).

For the wireless Ethernet, the WLAN interface settings will also be included. The WLAN parameters displays in the following manner, after the interface list has been displayed:

### WLAN

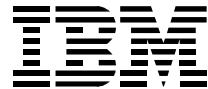
ifnum	= <ifnum>
ssid	= <network name>
mode	= <net-mode>
channel	= <channel-num>
antenna	= <antenna-type>
speed	= <speed-flags>
preamble	= <len-type>
pmm	= <sleep-time>
defkey	= <key-num>
txpwr	= <power>
opts	= <option-list>
Status	= <status>
Quality	= <comms-quality>

Where:

<ifnum> is the interface number for the WLAN device.

<network name> is a 1 to 32 ASCII character string.

<net-mode> is the type of network mode of operation: "adhoc", "pseudo" or "managed".



<channel-num> is the RF channel being used for communication.

<antenna-type> is the type of antenna ("Primary", "Auxiliary" or "Diverse").

<speed-flags> is the speeds being used for communication ([1 2 5 11], or "auto").

<len-type> indicates the selected preamble length ("long", "short" or "default").

<sleep-time> indicates the power-save sleep-time in milliseconds.

If power-save is disabled (time is set to zero), "normal (power-save off)" displays.

<key-num> is the number identifying one of the four encryption keys, starting from one. Encryption is disabled if "Encryption disabled" is displays.

<power> is a percentage indicating the approximate fraction of full power.

<option-list> is a list of options that are enabled (disabled options are not shown).

<status> is the current access point association status ("disassociated" or "associated with <MAC address>").

<comms-quality> indicates the strength or quality (in percent) of the wireless signal.

**NOTE:** The "list stored ifc" command does not display the "Status" or "Quality" lines.

## Wireless Maintenance Spare Parts

**Table 5. IBM Wireless Spare Parts**

IBM Spare Parts	Parts Numbers
Interface card, Wireless Ethernet	75P2246
Cable, Power, Radio Card	75P2247
Cable Assy., Radio, Parallel	75P2248
Cable, Antenna	75P2249

## Troubleshooting

Refer to the *6400i Ethernet Interface User's Manual* for complete network attachment information. Refer to the WLAN radio card manufacturer's documentation for problems with the radio interface.