connection is active. Make sure that either of the following icons appears in the title bar of the Main tab: . If you do not see either of these icons, data services are not available in your current location and you cannot exchange multimedia messages.

I can't send or receive text messages

- Make sure your SIM card is inserted correctly (see Inserting the SIM card and battery) and your phone is turned on (see Turning your phone on and off).
- Contact Cingular Wireless to verify that your plan includes text messaging services, that these services have been correctly activated, and that they are available at your location. Cingular Wireless should be able to tell you if text messaging services have been experiencing transmission delays. Delays can also occur between the time that a message is sent and the time it is received.
- Verify with the recipient that the receiving device can handle text messages.
- If a text message arrives but does not display an alert, perform a soft reset (see Performing a soft reset).

I can't send or receive multimedia messages

- Make sure your phone is turned on (see Turning your phone on and off).
- Contact Cingular Wireless to verify that your plan includes multimedia messaging services (MMS), that these services have been correctly activated, and that they are available at your location. Cingular Wireless should be able to tell you if multimedia messaging services have been experiencing transmission delays. Delays can also occur between the time that a message is sent and the time it is received.
- Make sure that either of the following icons appears in the title bar of the Main tab: . If you do not see either of these icons, data services are not available in your current location and you cannot exchange multimedia messages.
- Verify with the recipient that the receiving device can handle multimedia messages.

- If a message arrives but does not display an alert, perform a soft reset (see Performing a soft reset).

Web

I can't tell if data services are available

When your phone is on, icons appear in the title bar in the Main tab in the Phone application to indicate whether data services are available and whether a data connection is active. Make sure that either of the following icons appears in the title bar of the Main tab: . If you do not see either of these icons, data services are not available in your current location and you cannot connect to the Internet.

My Treo won't connect to the Internet

Your Treo 680 supports GPRS and EDGE wireless data networks. To connect to the Internet, you must subscribe to and activate data services with Cingular Wireless, and you must be in a location with data coverage.

1. Press and hold **Power/End** to turn off your phone. Then press and hold the same button to turn it back on again.
2. Press **Phone** and look for either of the following icons in the title bar of the Main tab: .
3. If you see these icons, you are in a data coverage area. Try connecting to the Internet again. If you do not see either of these icons, press **Applications** , select **Prefs** , and continue with the following steps.
4. Select **Network**.
5. Select the **Service** pick list and select **MEdia Net**.
6. Select **Connect**.
7. If the connection is successful, go the web browser. If you still can't make a connection, perform a soft reset (see Performing a soft reset).
8. If your phone did not turn on automatically after the soft reset, press and hold **Power/End** to turn on your phone, and try connecting to the Internet.

9 Contact Cingular Wireless to verify the following:
   - Your subscription plan includes high-speed data services.
   - Data services have been activated on your account.
   - Data coverage is available in your location.
   - There are no data service outages in your location.

I can't access a web page

First, make sure you have Internet access: Open the web browser and try to view another web page you've loaded before. To ensure you're viewing the page directly from the Internet, press **Menu** , select **Go**, and then select **Refresh**.

If you can view the other web page after you refresh it, but you still can't access the page you were originally trying to view, the page may contain elements that are not supported by the web browser. These include Flash, Shockwave, VBScript, WMLScript, and other plug-ins.

Some websites use a redirector to their true home page. If the web browser on your Treo 680 can't follow the redirector, try using a desktop browser to see the landing page of the redirector, and then enter that address in the web browser on your Treo 680.

TIP Your Treo can open your email application when you select an email address on a web page. If nothing happens when you select the link, make sure your email application is already set up.

It takes a long time for a web page to load

If it is taking longer than usual to load web pages, you may have traveled from an EDGE service area to a GPRS service area. Although GPRS data service is considered a high-speed data service, it seems slow if you are used to EDGE speed.

1 Press **Phone** and look for either of the following icons in the title bar of the Main tab to confirm that you have a data connection:
2 Try opening a different web page to see if the problem persists.
   - If you can open a different web page, it is likely that the original web site is

experiencing problems, and the problem is not related to your Treo.

- If the problem persists on a different web page, you may have a problem with your connection to the Cingular Wireless network.

3. To be sure there is not a problem with your connection to the Cingular Wireless network, press and hold **Power/End** to turn off your phone. Then press and hold the same button to turn it back on again.
4. Try opening the web page again to see if it loads faster.

An image or map is too small on my screen

The web browser has two modes: Optimized and Wide Page. Optimized Mode resizes all images and page elements to fit in a single column on the Treo 680 screen. Switch to Wide Page Mode to see the full-size image (see Viewing a web page).

You may also be able to save the image on your Treo 680 or an expansion card and then view the image later on your computer.

A secure site refuses to permit a transaction

Some websites don't support certain browsers for transactions. Please contact the site's webmaster to make sure the site allows transactions using Blazer™ web browser from your Treo.

My Bluetooth DUN connection isn't working

Check all of the following:

- Press **Applications** and select **Bluetooth**. Make sure the **Bluetooth** setting is **On**.
- You have already formed a partnership between your Treo 680 and your computer (see Creating a partnership between your Treo and your computer).
- The Bluetooth feature on your computer is turned on.
- Your Treo is within 30 feet of your computer.

TIP Bluetooth range is up to 30 feet in optimum environmental conditions. Performance and range may be affected by physical obstacles, radio interference from nearby electronic equipment, and other factors.

If the problem persists, try the following:

- Turn the **Bluetooth** setting **Off** and then turn it back on again.
- Try moving your Treo closer to your computer. The effective range for a computer varies between manufacturers.
- Confirm that no obstructions, including your body, are between your Treo and your computer.
- If the problem persists, create a new partnership with your computer (see Creating a partnership between your Treo and your computer).

Camera

Here are some tips for taking good pictures with the built-in camera:

- Clean the camera's lens with a soft, lint-free cloth.
- Take pictures in bright lighting conditions. Low-light images may be grainy, due to the sensitivity of the camera.
- Hold the Treo 680 as still as possible. Try supporting your picture-taking arm against your body or a stationary object (such as a wall).
- Keep the subject of the picture still. Exposure time is longer with lower light levels, so you may see a blur.
- For best results, verify that you have the brightest light source coming from behind you, lighting the subject's face. Avoid taking indoor pictures with the subject in front of a window or light.
- Make sure the subject is at least 18 inches away from the camera to ensure good focus.

Remember that when you synchronize your Treo 680 with your computer, your camera images are stored in the My Pictures/Palm Photos folder on your hard drive (see Viewing pictures and videos on your computer).

Making room on your Treo

Keep in mind that your Treo 680 includes an expansion card slot, and that you can store applications and information on expansion cards (sold separately). However, you still need free memory on the Treo 680 itself to run applications from an expansion card. For more info on using expansion cards, see Using expansion cards.

If you store a large number of records or install many third-party applications, the internal memory on your Treo 680 may fill up. Here are some common ways to clear space:

- **Email:** Messages that have large attachments can quickly consume memory on your Treo. Delete messages with large attachments. If you have hundreds of messages with or without attachments, you may want to delete older messages to make room (see the *User Guide for the VersaMail Application* on your computer).
  - **Windows:** Start>Programs>Palm
  - **Mac**: Insert the Palm Installation CD and click the link to the *User Guide for the VersaMail Application* in the **Documentation** folder.
- **Pictures & Videos:** Large images take up a lot of memory. Move images to an expansion card or synchronize them to your computer, and then delete the images from your Treo (see Viewing pictures and videos on your computer).
- **Music:** Music files often consume a lot of memory. Move music files to an expansion card, or delete large files from your Treo.

- **Messaging:** Multimedia content can also consume a lot of memory. Move multimedia content to an expansion card, or delete large files from your Treo (see Deleting messages).
- **Internet:** If you set a large web browser cache, you may want to use the web browser's advanced Memory Management settings to clear all recent pages (see Customizing your web browser settings).
- **Third-party applications:** You can delete infrequently used applications (see Removing applications) or move them to an expansion card (see Copying applications between an expansion card and your Treo).

Third-party applications

Some third-party applications can cause conflicts on your Treo 680. For example, third-party applications that were not written with the Treo keyboard and 5-way navigator in mind may cause strange behavior or errors when using the keyboard and 5-way navigator in these applications. Third-party applications that modify wireless features may require extra troubleshooting.

If you recently installed an application and your device seems to be stuck, try the following:

1. Perform a soft reset (see Performing a soft reset).
2. If the problem persists, perform a system reset (see Performing a system reset).
3. Delete the most recently installed application from your Treo 680 (see Removing applications).
4. If the problem persists, perform another system reset.
5. If possible, synchronize your Treo 680 with your computer to back up your most recent info.
6. If you're unable to perform the preceding steps or the problem persists, locate your **Backup** subfolder

on your computer and rename the folder (for example, BackupOld).

Windows: C:\Program Files\Palm\<device name>

Mac: Mac hard drive> : Applications : Palm : Users : <device name>

NOTE Can't find a Palm folder in Program Files? Then look for a palmOne or Handspring folder instead. For more info, see I can't find my user folder.

7 Perform a hard reset (see Performing a hard reset).

8 Sync to restore your info in Calendar, Contacts, Tasks, Memos, and Pictures & Videos.

9 If the problem is resolved, begin reinstalling your third-party applications one at a time by double-clicking a single file in the original Backup subfolder that you renamed, and sync after each application you install.

10 If the problem recurs, delete the last application you installed and report the problem to its developer.

I can't exit a game or third-party application

Press **Option** + **Applications** to return to Applications View.

Getting more help

Contact the author or vendor of the third-party software if you require further assistance.

Error messages

Your Treo 680 is designed to minimize interruptions when a system error occurs. If your Treo 680 encounters a system error, it automatically resets itself and resumes functioning as normal. If possible, it even turns the phone back on if it was on before the error occurred.

Sometimes you might want to know more about an error. Your Treo 680 uses a special interface to show error messages in greater detail.

1 Press **Phone** .

2 Enter **#*377**, and then press **Send** .

3 Review the screen with details about the conditions that led up to the most recent automatic reset.

4 Select **OK**.

NOTE Third-party developers create their own error messages. If you do not understand an error message, please contact the developer of the application for help.

Where to learn more

Whether you're on the go or at your computer, there are several ways to learn more about using your Palm® Treo™ 680 smart device.

For a quick introduction

Quick Tour: The Quick Tour introduces you to many of the features on your Treo 680. It is already installed on your Treo, and you can open it any time. Press **Applications** , and then select **Quick Tour** .

While using your Treo

On-device User Guide: A copy of this guide is included right on your Treo 680. The on-device guide is specially formatted for your Treo 680 screen. To view the on-device guide, press **Applications** , and then select **My Treo** .

Tips: Many of the built-in applications include helpful tips for getting the most out of your Treo. To view these tips, open an application, press **Menu** , select **Options**, and then select **Tips**.

Information: Many dialog boxes have a Tips icon in the upper-right corner. Select the **Tips** icon to learn about the tasks you can perform in that dialog box.

Online support from Palm: For up-to-date downloads, troubleshooting, and support information, go to www.palm.com/treo680cingular-support.

If you need more information

Books: Many books on Palm OS® devices are available in local or online book retailers (look in the computers section), or visit www.palm.com/mytreo680cingular.

Online forums: Consult online user discussion groups to swap Treo information and learn about Treo topics you may find nowhere else. Visit www.palm.com/mytreo680cingular for details.

Customer service from Cingular Wireless: For questions about your mobile account or features, contact Cingular Wireless at 1-866-CINGULAR (1-866-246-4852), or dial 611 from your Treo.

Terms

Alt (alternative) Alt

A keyboard key. Enter a letter on the keyboard, and then press Alt Alt to access variations such as international characters and symbols.

Applications View

The screen on your Palm® Treo™ 680 smart device from which you can open all applications.

Auto-off interval

The time of inactivity that passes before the screen on your Treo 680 turns off. The wireless features on your Treo 680 are unaffected by this setting.

Beam

The process of sending or receiving an entry or application using the infrared (IR) port on your Treo.

Bluetooth® wireless technology

Technology that enables devices such as Treo 680s, mobile phones, and computers to connect wirelessly to each other so that they can exchange information over short distances. For more info, visit www.bluetooth.com.

CSD (circuit-switched data)

A dial-up Internet connection. You pay for the connection time, not how much information you transfer. Contrast with GPRS.

Device name

The name associated with your Treo 680 and with the info in your desktop software. The device name (sometimes called the *username*) distinguishes your Treo 680 from all other Palm OS® devices. When you first synchronize your Treo 680, you are asked to give it a device name. This name appears in the User list in Palm Desktop software. Every Palm OS device that is synchronized with the same computer must have a unique device name.

Dialog box

A set of options and command buttons that is enclosed by a border and that enables you to carry out a specific task.

EDGE (Enhanced Data rates for GSM Evolution)

An enhanced version of GPRS that delivers data speeds that are up to three times faster than standard GPRS connections. (Additional charges may apply.)

Favorite

A button that provides quick access to a phone number (speed-dial button) or commonly used application (such as Web or Messaging). You can define an unlimited number of favorite buttons in the Phone application.

GPRS (General Packet Radio Service)

A mobile Internet connectivity technology that allows persistent data connections. (Additional charges may apply.)

HotSync®

The technology that synchronizes your Treo and your computer with the simple press of a button.

HotSync manager

The computer application that manages the synchronization of your Treo with your computer.

Infrared (IR)

A way of transmitting information using light waves; this is called *beaming*. The IR port on your Treo enables you to transfer information to other IR devices within a short radius.

Lithium Ion (Li-Ion)

The rechargeable battery technology used in the Treo 680.

MMS (Multimedia Messaging System)

An enhanced form of messaging that enables you to send pictures, videos, animations, sounds, and ringtones almost instantly.

Option key

The keyboard key that enables you to access the alternative feature that appears above the letter on each key.

Palm® Desktop software

A PIM application for computers that helps you manage your personal information and keep your personal information synchronized with your Treo.

Palm OS

The operating system of your Treo 680. Palm OS is known for its simplicity of use and for the large number of compatible third-party applications that can be added to your Treo 680.

Palm™ Quick Install

The component on your Windows computer that enables you to install Palm OS applications and other information on your Treo.

Partnership

Two Bluetooth devices—for example, your Treo 680 and a hands-free device—that can connect because each device finds the same passkey on the other device. Once you form a partnership with a device, you don't need to enter a passkey to connect with that device again. Partnership is also known as paired relationship, pairing, trusted device, and trusted pair on some devices.

Phone

The application on your Treo 680 that enables you to make and receive phone calls.

PIM (personal information manager)

A genre of software that includes applications such as Palm Desktop software, Microsoft Outlook, Lotus Notes, and ACT!. PIMs generally store contacts, schedules, tasks, and memos.

PIN (personal identification number)

The four-digit password assigned to your SIM card by Cingular Wireless. Turning on the PIN lock secures your wireless account. See also PUK.

PIN2 (personal identification number 2)

A code that protects certain network settings such as call barring or fixed dialing.

PUK (PIN unlock key)

A special extended password assigned to your SIM card. If you enter the wrong PIN more than three times, your SIM card will be blocked and you must call Cingular Wireless for the PUK.

Quick key

A letter that you can press and hold to activate a favorite from any tab in the Phone app. For example, create a speed-dial button for your mother's number and enter the letter **M** for "Mom"

as the Quick Key. Then when you want to call her, go to the Phone app and press and hold M. Your Treo 680 dials the number.

SIM (Subscriber Identity Module) card

The smartcard, inserted in your Treo 680, that contains your mobile account information, such as your phone number and the services to which you subscribe. Phonebook entries and SMS messages can also be stored on the SIM card.

Slide

A collection of text, pictures, videos, and sounds that are grouped together within a multimedia message created in the Messaging application. During playback, all the items within a particular slide appear on the same screen. If a multimedia message contains multiple slides, each slide can be viewed separately during playback.

SMS (Short Messaging Service)

The service that exchanges short text messages almost instantly. Text messages are typically sent to a mobile phone number, rather than an email address (although this too is possible). These messages can usually include up to 160 characters; messages with more than 160 characters are automatically split into several messages. You can send and receive SMS messages while you are on a voice call.

Streaming

Technology that enables you to access media content—for example, watch video or listen to an audio program—directly from the Internet on your Treo 680 without needing to download a file to save on your Treo 680.

User folder

The folder on your computer that contains the information you enter in Palm Desktop software and the information you enter on your Treo 680 and synchronize with Palm Desktop software.

Regulatory information

FCC Notice

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

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

Antenna Care/Unauthorized Modifications

Use only the supplied integral antenna. Unauthorized antenna modifications or attachments could damage the unit and may violate FCC regulations. Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

FCC RF Safety Statement

In order to comply with FCC RF exposure safety guidelines, users MUST use one of the following types of bodyworn accessories.

1 A Palm® brand body-worn accessory that has been tested for SAR compliance and is intended for use with this product.

2 An accessory that contains NO metal (snaps, clips, etc.) and provides AT LEAST 1.5 cm of separation between the users body and the unit.

Do NOT use the device in a manner such that it is in direct contact with the body (i.e., on the lap or in a breast pocket). Such use will likely exceed FCC RF safety exposure limits See www.fcc.gov/oet/rfsafety/ for more information on RF exposure safety.

Specific Absorption Rates (SAR) for Wireless Devices

The SAR is a value that corresponds to the relative amount of RF energy absorbed in the head of a user of a wireless handset.

The SAR value of a device is the result of an extensive testing, measuring and calculation process. It does not represent how much RF the device emits. All device models are tested at their highest value in strict laboratory settings. But when in operation, the SAR of a device can be substantially less than the level reported to the FCC. This is because of a variety of factors including its proximity to a base station antenna, device design and other factors. What is important to remember is that each device meets strict federal guidelines. Variations in SARs do not represent a variation in safety.

All devices must meet the federal standard, which incorporates a substantial margin of safety. As stated above, variations in SAR values between different model devices do not mean variations in safety. SAR values at or below the federal standard of 1.6 W/kg are considered safe for use by the public.

To view the highest reported (FCC) SAR values of the Palm® Treo™ 680 smart device, visit www.palm.com/38086.

FCC Radiofrequency Emission

This device meets the FCC Radiofrequency Emission Guidelines and is certified with the FCC as.
FCC ID number: O8F850.
Industry Canada ID number: 3905A-850
More information on the device's SAR can be found from the following FCC Website:
https://gullfoss2.fcc.gov/prod/oet/cf/eas/reports/GenericSearch.cfm.

(The following information comes from a consumer information Website jointly sponsored by the U.S. Food and Drug Administration (FDA) and the Federal Communications Commission (FCC), entitled "Cell Phone Facts: Consumer Information on Wireless Phones." The information reproduced herein is dated July 29, 2003. For further updates, please visit the Website: http://www.fda.gov/cellphones/qa.html.)

What is radiofrequency energy (RF)? Radiofrequency energy (RF) is another name for radio waves. It is one form of electromagnetic energy that makes up the electromagnetic spectrum. Some of the other forms of energy in the electromagnetic spectrum are gamma rays, x-rays and light. Electromagnetic energy (or electromagnetic radiation) consists of waves of electric and magnetic energy moving together (radiating) through space. The area where these waves are found is called an electromagnetic field.

Radio waves are created due to the movement of electrical charges in antennas. As they are created, these waves radiate away from the antenna. All electromagnetic waves travel at the speed of light. The major differences between the different types of waves are the distances covered by one cycle of the wave and the number of waves that pass a certain point during a set time period. The wavelength is the distance covered by one cycle of a wave. The frequency is the number of waves passing a given point in one second. For any electromagnetic wave, the wavelength multiplied by the frequency equals the speed of light. The frequency of an RF signal is usually expressed in units called hertz (Hz). One Hz equals one wave per second. One kilohertz (kHz) equals one thousand waves per second, one megahertz (MHz) equals one million waves per second, and one gigahertz (GHz) equals one billion waves per second.

RF energy includes waves with frequencies ranging from about 3000 waves per second (3 kHz) to 300 billion waves per second (300 GHz). Microwaves are a subset of radio waves that have frequencies ranging from around 300 million waves per second (300 MHz) to three billion waves per second (3 GHz).

How is radiofrequency energy used? Probably the most important use of RF energy is for telecommunications. Radio and TV broadcasting, wireless phones, pagers, cordless phones, police and fire department radios, point-to-point links and satellite communications all rely on RF energy.

Other uses of RF energy include microwave ovens, radar, industrial heaters and sealers, and medical treatments. RF energy, especially at microwave frequencies, can heat water. Since most food has a high water content, microwaves can cook food quickly. Radar relies on RF energy to track cars and airplanes as well as for military applications. Industrial heaters and sealers use RF energy to mold plastic materials, glue wood products, seal leather items such as shoes and pocketbooks, and process food. Medical uses of RF energy include pacemaker monitoring and programming.

How is radiofrequency radiation measured? RF waves and RF fields have both electrical and magnetic components. It is often convenient to express the strength of the RF field in terms of each component. For example, the unit "volts per meter" (V/m) is used to measure the electric field strength, and the unit "amperes per meter" (A/m) is used to express the magnetic field strength. Another common way to characterize an RF field is by means of the power density. Power density is defined as power per unit area. For example, power density can be expressed in terms of milliwatts (one thousandth of a watt) per square centimeter (mW/cm2) or microwatts (one millionth of a watt) per square centimeter (μW/cm2).

The quantity used to measure how much RF energy is actually absorbed by the body is called the Specific Absorption Rate or SAR. The SAR is a measure of the rate of absorption of RF energy. It is usually expressed in units of watts per kilogram (W/kg) or milliwatts per gram (mW/g).

What biological effects can be caused by RF energy? The biological effects of radiofrequency energy should not be confused with the effects from other types of electromagnetic energy.

Very high levels of electromagnetic energy, such as is found in X-rays and gamma rays, can ionize biological tissues. Ionization is a process where electrons are stripped away from their normal locations in atoms and molecules. It can permanently damage biological tissues including DNA, the genetic material. Ionization only occurs with very high levels of electromagnetic energy such as X-rays and gamma rays. Often the term radiation is used when discussing ionizing radiation (such as that associated with nuclear power plants).

The energy levels associated with radiofrequency energy, including both radio waves and microwaves, are not great enough to cause the ionization of atoms and molecules. Therefore, RF energy is a type of non-ionizing radiation. Other types of non-ionizing radiation include visible light, infrared radiation (heat) and other forms of electromagnetic radiation with relatively low frequencies.

Large amounts of RF energy can heat tissue. This can damage tissues and increase body temperatures. Two areas of the body, the eyes and the testes, are particularly vulnerable to RF heating because there is relatively little blood flow in them to carry away excess heat.

The amount of RF radiation routinely encountered by the general public is too low to produce significant heating or increased body temperature. Still, some people have questions about the possible health effects of low levels of RF energy. It is generally agreed that further research is needed to determine what effects actually occur and whether they are dangerous to people. In the meantime, standards-setting organizations and government agencies are continuing to monitor the latest scientific findings to determine whether changes in safety limits are needed to protect human health.

FDA, EPA and other US government agencies responsible for public health and safety have worked together and in connection with WHO to monitor developments and identify research needs related to RF biological effects.

What levels of RF energy are considered safe? Various organizations and countries have developed standards for exposure to radiofrequency energy. These standards recommend safe levels of exposure for both the general public and for workers. In the United States, the FCC has used safety guidelines for RF environmental exposure since 1985.

The FCC guidelines for human exposure to RF electromagnetic fields are derived from the recommendations of two expert organizations, the National Council on Radiation Protection and Measurements (NCRP) and the Institute of Electrical and Electronics Engineers (IEEE). In both cases, the recommendations were developed by scientific and engineering experts drawn from industry, government, and academia after extensive reviews of the scientific literature related to the biological effects of RF energy.

Many countries in Europe and elsewhere use exposure guidelines developed by the International Commission on Non-Ionizing Radiation Protection (ICNIRP). The ICNIRP safety limits are generally similar to those of the NCRP and IEEE, with a few exceptions. For example, ICNIRP recommends different exposure levels in the lower and upper frequency ranges and for localized exposure from certain products such as hand-held wireless telephones. Currently, the World Health Organization is working to provide a framework for international harmonization of RF safety standards.

The NCRP, IEEE, and ICNIRP all have identified a whole-body Specific Absorption Rate (SAR) value of 4 watts per kilogram (4 W/kg) as a threshold level of exposure at which harmful biological effects may occur. Exposure guidelines in terms of field strength, power density and localized SAR were then derived from this threshold value. In addition, the NCRP, IEEE, and ICNIRP guidelines vary depending on the frequency of the RF exposure. This is due to the finding that whole-body human absorption of RF energy varies with the frequency of the RF signal. The most restrictive limits on whole-body exposure are in the frequency range of 30-300 MHz where the human body absorbs RF energy most efficiently. For products that only expose part of the body, such as wireless phones, exposure limits in terms of SAR only are specified.

The exposure limits used by the FCC are expressed in terms of SAR, electric and magnetic field strength, and power density for transmitters operating at frequencies from 300 kHz to 100 GHz. The specific values can be found in two FCC bulletins, OET Bulletins 56 and 65: http://www.fcc.gov/oet/info/documents/bulletins/#56; http://www.fcc.gov/oet/info/documents/bulletins/#65.

Why has the FCC adopted guidelines for RF exposure? The FCC authorizes and licenses products, transmitters, and facilities that generate RF and microwave radiation. It has jurisdiction over all transmitting services in the U.S. except those specifically operated by the Federal Government. While the FCC does not have the expertise to determine radiation exposure guidelines on its own, it does have the expertise and authority to recognize and adopt technically sound standards promulgated by other expert agencies and organizations, and has done so. (Our joint efforts with the FDA in developing this website is illustrative of the kind of inter-agency efforts and consultation we engage in regarding this health and safety issue.)

Under the National Environmental Policy Act of 1969 (NEPA), the FCC has certain responsibilities to consider whether its actions will significantly affect the quality of the human environment. Therefore, FCC approval and licensing of transmitters and facilities must be evaluated for significant impact on the environment. Human exposure to RF radiation emitted by FCC-regulated transmitters is one of several factors that must be considered in such environmental evaluations. In 1996, the FCC revised its guidelines for RF exposure as a result of a multi-year proceeding and as required by the Telecommunications Act of 1996.

Radio and television broadcast stations, satellite-earth stations, experimental radio stations and certain wireless communication facilities are required to undergo routine evaluation for RF compliance when they submit an application to the FCC for construction or modification of a transmitting facility or renewal of a license. Failure to comply with the FCC's RF exposure guidelines could lead to the preparation of a formal Environmental Assessment, possible Environmental Impact Statement and eventual rejection of an application. Technical guidelines for evaluating compliance with the FCC.
RF safety requirements can be found in the FCC's OET Bulletin 65: http://www.fcc.gov/oet/info/documents/bulletins/#65.

Low-powered, intermittent, or inaccessible RF transmitters and facilities are normally excluded from the requirement for routine evaluation for RF exposure. These exclusions are based on standard calculations and measurement data indicating that a transmitting station or equipment operating under the conditions prescribed is unlikely to cause exposures in excess of the guidelines under normal conditions of use. Such exclusions are not exclusions from compliance, but, rather, exclusions from routine evaluation. The FCC's policies on RF exposure and categorical exclusion can be found in Section 1.1307(b) of the FCC's Rules and Regulations [(47 CFR 1.1307(b)].

How can I obtain the Specific Absorption Rate (SAR) value for my wireless phone? The FCC requires that wireless phones sold in the United States demonstrate compliance with human exposure limits adopted by the FCC in 1996. The relative amount of RF energy absorbed in the head of a wireless telephone-user is given by the Specific Absorption Rate (SAR), as explained above. The FCC requires wireless phones to comply with a safety limit of 1.6 watts per kilogram (1.6 W/kg) in terms of SAR.

Information on SAR for a specific phone model can be obtained for many recently manufactured phones using the FCC identification (ID) number for that model. The FCC ID number is usually printed somewhere on the case of the phone. Sometimes it may be necessary to remove the battery pack to find the number. Once you have the ID number, go to the following Web address: www.fcc.gov/oet/fccid. On this page, you will see instructions for entering the FCC ID number. Type the FCC ID number exactly as requested (the Grantee Code is the first three characters, the Equipment Product Code is the rest of the FCC ID number). Then click on "Start Search." The "Grant of Equipment Authorization" for your telephone should appear. Read through the grant for the section on "SAR Compliance," "Certification of Compliance with FCC Rules for RF Exposure" or similar language. This section should contain the value(s) for typical or maximum SAR for your phone.

Phones and other products authorized since June 2, 2000, should have the maximum SAR levels noted directly on the "Grant of Equipment Authorization." For phones and products authorized between about mid-1998 and June 2000, detailed information on SAR levels is typically found in the exhibits associated with the grant. Once a grant is accessed, the exhibits can be viewed by clicking on "View Exhibit." Grants authorized prior to 1998 are not part of the electronic database but, rather, have been documented in the form of paper records.

The FCC database does not list phones by model number. However, consumers may find SAR information from other sources as well. Some wireless phone manufacturers make SAR information available on their own Web sites. In addition, some non-government websites provide SARs for specific models of wireless phones. However, the FCC has not reviewed these sites and makes no guarantees of their accuracy. Finally, phones certified by the Cellular Telecommunications and Internet Association (CTIA) are required to provide SAR information to consumers in the instructional materials that come with the phones.

Do hands-free kits for wireless phones reduce risks from exposure to RF emissions? Since there are no known risks from exposure to RF emissions from wireless phones, there is no reason

to believe that hands-free kits reduce risks. Hands-free kits can be used with wireless phones for convenience and comfort. These systems reduce the absorption of RF energy in the head because the phone, which is the source of the RF emissions, will not be placed against the head. On the other hand, if the phone is mounted against the waist or other part of the body during use, then that part of the body will absorb more RF energy. Wireless phones marketed in the U.S. are required to meet safety requirements regardless of whether they are used against the head or against the body. Either configuration should result in compliance with the safety limit.

Do wireless phone accessories that claim to shield the head from RF radiation work? Since there are no known risks from exposure to RF emissions from wireless phones, there is no reason to believe that accessories that claim to shield the head from those emissions reduce risks. Some products that claim to shield the user from RF absorption use special phone cases, while others involve nothing more than a metallic accessory attached to the phone. Studies have shown that these products generally do not work as advertised. Unlike "hand-free" kits, these so-called "shields" may interfere with proper operation of the phone. The phone may be forced to boost its power to compensate, leading to an increase in RF absorption. In February 2002, the Federal trade Commission (FTC) charged two companies that sold devices that claimed to protect wireless phone users from radiation with making false and unsubstantiated claims. According to FTC, these defendants lacked a reasonable basis to substantiate their claim.

What are wireless telephone base stations? Fixed antennas used for wireless telecommunications are referred to as cellular base stations, cell stations, PCS ("Personal Communications Service") stations or telephone transmission towers. These base stations consist of antennas and electronic equipment. Because the antennas need to be high in the air, they are often located on towers, poles, water tanks, or rooftops. Typical heights for freestanding base station towers are 50-200 feet.

Some base stations use antennas that look like poles, 10 to 15 feet in length, that are referred to as "omni-directional" antennas. These types of antennas are usually found in rural areas. In urban and suburban areas, wireless providers now more commonly use panel or sector antennas for their base stations. These antennas consist of rectangular panels, about 1 by 4 feet in dimension. The antennas are usually arranged in three groups of three antennas each. One antenna in each group is used to transmit signals to wireless phones, and the other two antennas in each group are used to receive signals from wireless phones.

At any base station site, the amount of RF energy produced depends on the number of radio channels (transmitters) per antenna and the power of each transmitter. Typically, 21 channels per antenna sector are available. For a typical cell site using sector antennas, each of the three transmitting antennas could be connected to up to 21 transmitters for a total of 63 transmitters. However, it is unlikely that all of the transmitters would be transmitting at the same time. When omni-directional antennas are used, a cellular base station could theoretically use up to 96 transmitters, but this would be very unusual, and, once again, it is unlikely that all transmitters would be in operation simultaneously. Base stations used for PCS communications generally require fewer transmitters than those used for cellular radio transmissions, since PCS carriers usually have a higher density of base station antenna sites.

Are wireless telephone base stations safe? The electromagnetic RF signals transmitted from base station antennas stations travel toward the horizon in relatively narrow paths. For example, the radiation pattern for an antenna array mounted on a tower can be likened to a thin pancake centered around the antenna system. The individual pattern for a single array of sector antennas is wedge-shaped, like a piece of pie. As with all forms of electromagnetic energy, the power decreases rapidly as one moves away from the antenna. Therefore, RF exposure on the ground is much less than exposure very close to the antenna and in the path of the transmitted radio signal. In fact, ground-level exposure from such antennas is typically thousands of times less than the exposure levels recommended as safe by expert organizations. So exposure to nearby residents would be well within safety margins.

Cellular and PCS base stations in the United States are required to comply with limits for exposure recommended by expert organizations and endorsed by government agencies responsible for health and safety. Measurements made near cellular and PCS base station antennas mounted on towers have confirmed that ground-level exposures are typically thousands of times less than the exposure limits adopted by the FCC. In fact, in order to be exposed to levels at or near the FCC limits for cellular or PCS frequencies an

individual would essentially have to remain in the main transmitted radio signal (at the height of the antenna) and within a few feet from the antenna. This is, of course, very unlikely to occur.

When cellular and PCS antennas are mounted on rooftops, RF levels on that roof or on others near by would probably be greater than those typically encountered on the ground. However, exposure levels approaching or exceeding safety guidelines should be encountered only very close to or directly in front of the antennas. In addition, for sector-type antennas, typically used for such rooftop base stations, RF levels to the side and in back of these antennas are insignificant. General guidelines on antenna installations and circumstances that might give rise to a concern about a facility's conformance with FCC regulations can be found in A Local Government Official's Guide to Transmitting Antenna RF Emission Safety: Rules, Procedures, and Practical Guidance. This Guide can be accessed at: http://www.fcc.gov/oet/rfsafety.

Who regulates exposure to radiation from microwave ovens, television sets and computer monitors? The Food and Drug Administration is responsible for protecting the public from harmful radiation emissions from these consumer products.

Does the FCC routinely monitor radiofrequency radiation from antennas? The FCC does not have the resources or the personnel to routinely monitor the emissions for all the thousands of transmitters that are subject to FCC jurisdiction. However, the FCC does have measurement instrumentation for evaluating RF levels in areas that may be accessible to the public or to workers. If there is evidence for potential non-compliance with FCC exposure guidelines for a FCC-regulated facility, staff from the FCC's Office of Engineering and Technology or the FCC Enforcement Bureau can conduct an investigation, and, if appropriate, perform actual measurements. Circumstances that could give rise to a concern about a facility's conformance with FCC regulations can be found in A Local Government Official's Guide to Transmitting Antenna RF Emission Safety: Rules, Procedures, and Practical Guidance. This Guide can be accessed at: http://www.fcc.gov/oet/rfsafety. Potential exposure problems should be brought to the FCC's attention by contacting the FCC RF Safety Program at: 202-418-2464 or by email: rfsafety@fcc.gov.

Does the FCC maintain a database that includes information on the location and technical parameters of all the transmitting towers it regulates? Each of the FCC Bureaus maintains its own licensing database system for the service(s) it regulates (e.g., television, cellular service, satellite earth stations.) The FCC issues two types of licenses: site specific and market based. In the case of site specific licensed facilities, technical operating information is collected from the licensee as part of the licensing process. However, in the case of market based licensing (e.g., PCS, cellular), the licensee is granted the authority to operate a radio communications system in a geographic area using as many facilities as are required, and the licensee is not required to provide the FCC with specific location and operating parameters of these facilities.

Information on site specific licensed facilities can be found in the "General Menu Reports" (GenMen) at http://gullfoss2.fcc.gov/cgi-bin/ws.exe/genmen/index.hts.

The various FCC Bureaus also publish on at least a weekly basis, bulk extracts of their licensing databases. Each licensing database has its own unique file structure. These extracts consist of multiple, very large files. The FCC's Office of Engineering and Technology (OET) maintains an index to these databases at http://www.fcc.gov/oet/info/database/fadb.html. Entry points into the various databases include frequency, state/county, latitude/longitude, call-sign and licensee name. For further information on the Commission's existing databases, you can contact Donald Campbell at dcampbel@fcc.gov or 202-418-2405.

Can local and state governmental bodies establish limits for RF exposure? Although some local and state governments have enacted rules and regulations about human exposure to RF energy in the past, the Telecommunications Act of 1996 requires the Federal Government to control human exposure to RF emissions. In particular, Section 704 of the Act states that, "No State or local government or instrumentality thereof may regulate the placement, construction, and modification of personal wireless service facilities on the basis of the environmental effects of radio frequency emissions to the extent that such facilities comply with the Commission's regulations concerning such emissions." Further information on federal authority and FCC policy is available in a fact sheet from the FCC's Wireless Telecommunications Bureau at www.fcc.gov/wtb.

Do wireless phones pose a health hazard? The available scientific evidence does not show that any health problems are associated with using wireless phones. There is no proof, however, that wireless phones are absolutely safe. Wireless phones emit low levels of radiofrequency energy (RF) in the microwave range while being used. They also emit very low levels of RF when in the stand-by mode. Whereas high levels of RF can produce health effects (by heating tissue), exposure to low level RF that does not produce heating effects causes no known adverse health effects. Many studies of low level RF exposures have not found any biological effects. Some studies have suggested that some biological effects may occur, but such findings have not been confirmed by additional research. In some cases, other researchers have had difficulty in reproducing those studies, or in determining the reasons for inconsistent results.

What is FDA's role concerning the safety of wireless phones? Under the law, FDA does not review the safety of radiation-emitting consumer products such as wireless phones before they can be sold, as it does with new drugs or medical devices. However, the agency has authority to take action if wireless phones are shown to emit radiofrequency energy (RF) at a level that is hazardous to the user. In such a case, FDA could require the manufacturers of wireless phones to notify users of the health hazard and to repair, replace or recall the phones so that the hazard no longer exists.

Although the existing scientific data do not justify FDA regulatory actions, FDA has urged the wireless phone industry to take a number of steps, including the following:

- Support needed research into possible biological effects of RF of the type emitted by wireless phones;
- Design wireless phones in a way that minimizes any RF exposure to the user that is not necessary for device function; and
- Cooperate in providing users of wireless phones with the best possible information on possible effects of wireless phone use on human health

FDA belongs to an interagency working group of the federal agencies that have responsibility for different aspects of RF safety to ensure coordinated efforts at the federal level. The following agencies belong to this working group:

- National Institute for Occupational Safety and Health
- Environmental Protection Agency
- Federal Communications Commission
- Occupational Safety and Health Administration
- National Telecommunications and Information Administration

The National Institutes of Health participates in some interagency working group activities, as well.

FDA shares regulatory responsibilities for wireless phones with the Federal Communications Commission (FCC). All phones that are sold in the United States must comply with FCC safety guidelines that limit RF exposure. FCC relies on FDA and other health agencies for safety questions about wireless phones.

FCC also regulates the base stations that the wireless phone networks rely upon. While these base stations operate at higher power than do the wireless phones themselves, the RF exposures that people get from these base stations are typically thousands of times lower than those they can get from wireless phones. Base stations are thus not the primary subject of the safety questions discussed in this document.

What kinds of phones are the subject of this update? The term "wireless phone" refers here to hand-held wireless phones with built-in antennas, often called "cell," "mobile," or "PCS" phones. These types of wireless phones can expose the user to measurable radiofrequency energy (RF) because of the short distance between the phone and the user's head. These RF exposures are limited by Federal Communications Commission safety guidelines that were developed with the advice of FDA and other federal health and safety agencies. When the phone is located at greater distances from the user, the exposure to RF is drastically lower because a person's RF exposure decreases rapidly with increasing distance from the source. The so-called "cordless phones," which have a base unit connected to the telephone wiring in a house, typically operate at far lower power levels, and thus produce RF exposures well within the FCC's compliance limits.

What are the results of the research done already? The research done thus far has produced conflicting results, and many studies have suffered from flaws in their research methods. Animal

experiments investigating the effects of radiofrequency energy (RF) exposures characteristic of wireless phones have yielded conflicting results that often cannot be repeated in other laboratories. A few animal studies, however, have suggested that low levels of RF could accelerate the development of cancer in laboratory animals. However, many of the studies that showed increased tumor development used animals that had been genetically engineered or treated with cancer-causing chemicals so as to be pre-disposed to develop cancer in the absence of RF exposure. Other studies exposed the animals to RF for up to 22 hours per day. These conditions are not similar to the conditions under which people use wireless phones, so we don't know with certainty what the results of such studies mean for human health.

Three large epidemiology studies have been published since December 2000. Between them, the studies investigated any possible association between the use of wireless phones and primary brain cancer, glioma, meningioma, or acoustic neuroma, tumors of the brain or salivary gland, leukemia, or other cancers. None of the studies demonstrated the existence of any harmful health effects from wireless phone RF exposures. However, none of the studies can answer questions about long-term exposures, since the average period of phone use in these studies was around three years.

What research is needed to decide whether RF exposure from wireless phones poses a health risk? A combination of laboratory studies and epidemiological studies of people actually using wireless phones would provide some of the data that are needed. Lifetime animal exposure studies could be completed in a few years. However, very large numbers of animals would be needed to provide reliable proof of a cancer promoting effect if one exists. Epidemiological studies can provide data that is directly applicable to human populations, but 10 or more years' follow-up may be needed to provide answers about some health effects, such as cancer. This is because the interval between the time of exposure to a cancer-causing agent and the time tumors develop—if they do—may be many, many years. The interpretation of epidemiological studies is hampered by difficulties in measuring actual RF exposure during day-to-day use of wireless phones. Many factors affect this measurement, such as the angle at which the phone is held, or which model of phone is used.

What is FDA doing to find out more about the possible health effects of wireless phone RF? FDA is working with the U.S. National Toxicology Program and with groups of investigators around the world to ensure that high priority animal studies are conducted to address important questions about the effects of exposure to radiofrequency energy (RF).

FDA has been a leading participant in the World Health Organization International Electromagnetic Fields (EMF) Project since its inception in 1996. An influential result of this work has been the development of a detailed agenda of research needs that has driven the establishment of new research programs around the world. The Project has also helped develop a series of public information documents on EMF issues.

FDA and the Cellular Telecommunications & Internet Association (CTIA) have a formal Cooperative Research and Development Agreement (CRADA) to do research on wireless phone safety. FDA provides the scientific oversight, obtaining input from experts in government, industry, and academic organizations. CTIA-funded research is conducted through contracts to independent investigators. The initial research will include both laboratory studies and studies of wireless phone users. The CRADA will also include a broad assessment of additional research needs in the context of the latest research developments around the world.

What steps can I take to reduce my exposure to radiofrequency energy from my wireless phone? If there is a risk from these products--and at this point we do not know that there is--it is probably very small. But if you are concerned about avoiding even potential risks, you can take a few simple steps to minimize your exposure to radiofrequency energy (RF). Since time is a key factor in how much exposure a person receives, reducing the amount of time spent using a wireless phone will reduce RF exposure.

If you must conduct extended conversations by wireless phone every day, you could place more distance between your body and the source of the RF, since the exposure level drops off dramatically with distance. For example, you could use a headset and carry the wireless phone away from your body or use a wireless phone connected to a remote antenna.

Again, the scientific data do not demonstrate that wireless phones are harmful. But if you are concerned about the RF exposure from these products, you can use measures like those described above to reduce your RF exposure from wireless phone use.

What about children using wireless phones? The scientific evidence does not show a danger to users of wireless phones, including children and teenagers. If you want to take steps to lower exposure to radiofrequency energy (RF), the measures described above would apply to children and teenagers using wireless phones. Reducing the time of wireless phone use and increasing the distance between the user and the RF source will reduce RF exposure.

Some groups sponsored by other national governments have advised that children be discouraged from using wireless phones at all. For example, the government in the United Kingdom distributed leaflets containing such a recommendation in December 2000. They noted that no evidence exists that using a wireless phone causes brain tumors or other ill effects. Their recommendation to limit wireless phone use by children was strictly precautionary; it was not based on scientific evidence that any health hazard exists.

What about wireless phone interference with medical equipment? Radiofrequency energy (RF) from wireless phones can interact with some electronic devices. For this reason, FDA helped develop a detailed test method to measure electromagnetic interference (EMI) of implanted cardiac pacemakers and defibrillators from wireless telephones. This test method is now part of a standard sponsored by the Association for the Advancement of Medical instrumentation (AAMI). The final draft, a joint effort by FDA, medical device manufacturers, and many other groups, was completed in late 2000. This standard will allow manufacturers to ensure that cardiac pacemakers and defibrillators are safe from wireless phone EMI.

FDA has tested hearing aids for interference from handheld wireless phones and helped develop a voluntary standard sponsored by the Institute of Electrical and Electronic Engineers (IEEE). This standard specifies test methods and performance requirements for hearing aids and wireless phones so that no interference occurs when a person uses a "compatible" phone and a "compatible" hearing aid at the same time. This standard was approved by the IEEE in 2000.

FDA continues to monitor the use of wireless phones for possible interactions with other medical devices. Should harmful interference be found to occur, FDA will conduct testing to assess the interference and work to resolve the problem.

Which other federal agencies have responsibilities related to potential RF health effects? Certain agencies in the Federal Government have been involved in monitoring, researching or regulating issues related to human exposure to RF radiation. These agencies include the Food and Drug Administration (FDA), the Environmental Protection Agency (EPA), the Occupational Safety and Health Administration (OSHA), the National Institute for Occupational Safety and Health (NIOSH), the National Telecommunications and Information Administration (NTIA) and the Department of Defense (DOD).

By authority of the Radiation Control for Health and Safety Act of 1968, the Center for Devices and Radiological Health (CDRH) of the FDA develops performance standards for the emission of radiation from electronic products including X-ray equipment, other medical devices, television sets, microwave ovens, laser products and sunlamps. The CDRH established a product performance standard for microwave ovens in 1971 limiting the amount of RF leakage from ovens. However, the CDRH has not adopted performance standards for other RF-emitting products. The FDA is, however, the lead federal health agency in monitoring the latest research developments and advising other agencies with respect to the safety of RF-emitting products used by the public, such as cellular and PCS phones.

The FDA's microwave oven standard is an emission standard (as opposed to an exposure standard) that allows specific levels of microwave leakage (measured at five centimeters from the oven surface). The standard also requires ovens to have two independent interlock systems that prevent the oven from generating microwaves the moment that the latch is released or the door of the oven is opened. The FDA has stated that ovens that meet its standards and are used according to the manufacturer's recommendations are safe for consumer and industrial use. More information is available from: www.fda.gov/cdrh.

The EPA has, in the past, considered developing federal guidelines for public exposure to RF radiation. However, EPA activities related to RF safety and health are presently limited to advisory functions. For example, the EPA now chairs an Inter-agency Radiofrequency

Working Group, which coordinates RF health-related activities among the various federal agencies with health or regulatory responsibilities in this area.

OSHA is responsible for protecting workers from exposure to hazardous chemical and physical agents. In 1971, OSHA issued a protection guide for exposure of workers to RF radiation [29 CFR 1910.97]. However, this guide was later ruled to be only advisory and not mandatory. Moreover, it was based on an earlier RF exposure standard that has now been revised. At the present time, OSHA uses the IEEE and/or FCC exposure guidelines for enforcement purposes under OSHA's "general duty clause" (for more information see: http://www.osha-slc.gov/SLTC/radiofrequencyradiation/index.html.

NIOSH is part of the U.S. Department of Health and Human Services. It conducts research and investigations into issues related to occupational exposure to chemical and physical agents. NIOSH has, in the past, undertaken to develop RF exposure guidelines for workers, but final guidelines were never adopted by the agency. NIOSH conducts safety-related RF studies through its Physical Agents Effects Branch in Cincinnati, Ohio.

The NTIA is an agency of the U.S. Department of Commerce and is responsible for authorizing Federal Government use of the RF electromagnetic spectrum. Like the FCC, the NTIA also has NEPA responsibilities and has considered adopting guidelines for evaluating RF exposure from U.S. Government transmitters such as radar and military facilities.

The Department of Defense (DOD) has conducted research on the biological effects of RF energy for a number of years. This research is now conducted primarily at the U.S. Air Force Research Laboratory located at Brooks Air Force Base, Texas. The DOD Web site for RF biological effects information is listed with other sites in conjunction with a question on other sources of information, below.

Who funds and carries out research on the biological effects of RF energy? Research into possible biological effects of RF energy is carried out in laboratories in the United States and around the world. In the U.S., most research has been funded by the Department of Defense, due to the extensive military use of RF equipment such as radar and high-powered radio transmitters. In addition, some federal agencies responsible for health and safety, such as the Environmental Protection Agency (EPA) and the U.S. Food and Drug Administration (FDA), have sponsored and conducted research in this area. At the present time, most of the non-military research on biological effects of RF energy in the U.S. is being funded by industry organizations. More research is being carried out overseas, particularly in Europe.

In 1996, the World Health Organization (WHO) established the International EMF Project to review the scientific literature and work towards resolution of health concerns over the use of RF technology. WHO maintains a Web site that provides extensive information on this project and about RF biological effects and research (www.who.ch/peh-emf).

FDA, EPA and other US government agencies responsible for public health and safety have worked together and in connection with WHO to monitor developments and identify research needs related to RF biological effects.

How does FCC audit cell phone RF? After FCC grants permission for a particular cellular telephone to be marketed, FCC will occasionally conduct "post-grant" testing to determine whether production versions of the phone are being produced to conform with FCC regulatory requirements. The manufacturer of a cell phone that does not meet FCC's regulatory requirements may be required to remove the cell phone from use and to refund the purchase price or provide a replacement phone, and may be subject to civil or criminal penalties. In addition, if the cell phone presents a risk of injury to the user, FDA may also take regulatory action. The most important post-grant test, from a consumer's perspective, is testing of the RF emissions of the phone. FCC measures the Specific Absorption Rate (SAR) of the phone, following a very rigorous testing protocol. As is true for nearly any scientific measurement, there is a possibility that the test measurement may be less than or greater than the actual RF emitted by the phone. This difference between the RF test measurement and actual RF emission is because test measurements are limited by instrument accuracy, because test measurement and actual use environments are different, and other variable factors. This inherent variability is known as "measurement uncertainty." When FCC conducts post-grant testing of a cell phone, FCC takes into account any measurement uncertainty to when determining whether regulatory action is appropriate. This approach ensures that when FCC takes regulatory action, it will have a sound, defensible scientific basis.

FDA scientific staff reviewed the methodology used by FCC to measure cell phone RF, and agreed it is an acceptable approach, given our current understanding of the risks presented by cellular phone RF emissions. RF emissions from cellular phones have not been shown to present a risk of injury to the user when the measured SAR is less than the safety limits set by FCC (an SAR of 1.6 w/kg). Even in a case where the maximum measurement uncertainty permitted by current measurement standards was added to the maximum permissible SAR, the resulting SAR value would be well below any level known to produce an acute effect. Consequently, FCC's approach with measurement uncertainty will not result in consumers being exposed to any known risk from the RF emitted by cellular telephones.

FDA will continue to monitor studies and literature reports concerning acute effects of cell phone RF, and concerning chronic effects of long-term exposure to cellular telephone RF (that is, the risks from using a cell phone for many years). If new information leads FDA to believe that a change to FCC's measurement policy may be appropriate, FDA will contact FCC and both agencies will work together to develop a mutually-acceptable approach.

Static Electricity, ESD, and Your Palm® Device

Electrostatic discharge (ESD) can cause damage to electronic devices if discharged into the device, so you should take steps to avoid such an occurrence.

Description of ESD Static electricity is an electrical charge caused by the buildup of excess electrons on the surface of a material. To most people, static electricity and ESD are nothing more than annoyances. For example, after walking over a carpet while scuffing your feet, building up electrons on your body, you may get a shock—the discharge event—when you touch a metal doorknob. This little shock discharges the built-up static electricity.

ESD-susceptible equipment Even a small amount of ESD can harm circuitry, so when working with electronic devices, take measures to help protect your electronic devices, including your Palm® device, from ESD harm. While Palm has built protections against ESD into its products, ESD unfortunately exists and, unless neutralized, could build up to levels that could harm your equipment. Any electronic device that contains an external entry point for plugging in anything from cables to docking stations is susceptible to entry of ESD. Devices that you carry with you, such as your Palm device, build up ESD in a unique way because the static electricity that may have built up on your body is automatically passed to the device. Then, when the device is connected to another device such as a docking station, a discharge event can occur.

Precautions against ESD Make sure to discharge any built-up static electricity from yourself and your electronic devices *before* touching an electronic device or connecting one device to another. The recommendation from Palm is that you take this precaution before connecting your Palm device to your computer, placing a device in a cradle, or connecting it to any other device. You can do this in many ways, including the following:

- Ground yourself when you're holding your device by simultaneously touching a metal surface that is at earth ground. For example, if your computer has a metal case and is plugged into a standard three-prong grounded outlet, touching the case should discharge the ESD on your body.
- Increase the relative humidity of your environment.
- Install ESD-specific prevention items, such as grounding mats.

Conditions that enhance ESD occurrences Conditions that can contribute to the buildup of static electricity in the environment include the following:

- Low relative humidity.
- Material type. (The type of material gathering the charge. For example, synthetics are more prone to static buildup than natural fibers like cotton.)
- The rapidity with which you touch, connect, or disconnect electronic devices.

While you should always take appropriate precautions to discharge static electricity, if you are in an environment where you notice ESD events, you may want to take extra precautions to protect your electronic equipment against ESD.

Precaution against hearing loss Protect your hearing. Listening to this device at full volume for a long period of time can damage your hearing.

A pleine puissance, l'écoute prolongée du baladeur peut endommager l'oreille de l'utilisateur. Consultez notre site web www.palm.com/fr pour plus d'informations.

Waste disposal Please recycle appropriately. For appropriate recycling and disposal instructions please visit: www.palm.com/environment.

Specifications

Radio	• GSM 850/900/1800/1900 quad band world phone • GPRS class 10, class B • EDGE up to 59kbps per time-slot • Supports CSD (circuit-switched data)
Phone features	• Speakerphone • Hands-free headset jack (2.5mm, 3 or 4-barrel connector) • Microphone mute option • TTY/TDD compatible • 3-way calling
Processor technology	Intel PXA270 Bulverde processor, 312MHz
Expansion	SD/MultiMediaCard/SDIO card slot
Battery	• 1200mAH, rechargeable lithium ion • Removable for replacement
Palm OS® version	Palm OS 5.4.9
Camera (camera version only)	• Still image capture resolution (640 x 480) • 2x digital zoom • Video capture resolution (320 x 240) • Automatic light balance
Size	4.44 in. x 2.33 in. x 0.84 in. (112.9mm x 59.3mm x 22.4mm)
Weight	5.6 ounces (157 grams)

Connectivity	• IR • Bluetooth® wireless technology (1.2 compliant)
Display	• Touch-sensitive LCD screen (includes stylus) • 65,536 colors (16-bit color) • User-adjustable brightness • 320 x 320 resolution
Keyboard	• Built-in QWERTY keyboard plus 5-way navigator • Backlight for low lighting conditions
Included software	• Phone (including Favorites and Dial Pad) • Pictures & Videos (includes camera and camcorder) • Messaging (text and multimedia) • Blazer® web browser (Internet) • Pocket Tunes™ • Xpress Mail (download required) • Good Link (download required) • VersaMail® (email) • Contacts • Calendar • Memos • Tasks • Voice Memo • Documents To Go Professional® • Calculator Basic and Advanced • World Clock • Palm® Desktop software

System requirements	• Windows 2000 or XP with USB port • Mac OS 10.2 –10.3 with USB port • Later versions may also be supported
Operating and storage temperature range	• 32°F to 104°F (0°C to 40°C) • 5% to 90% relative humidity (RH)

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