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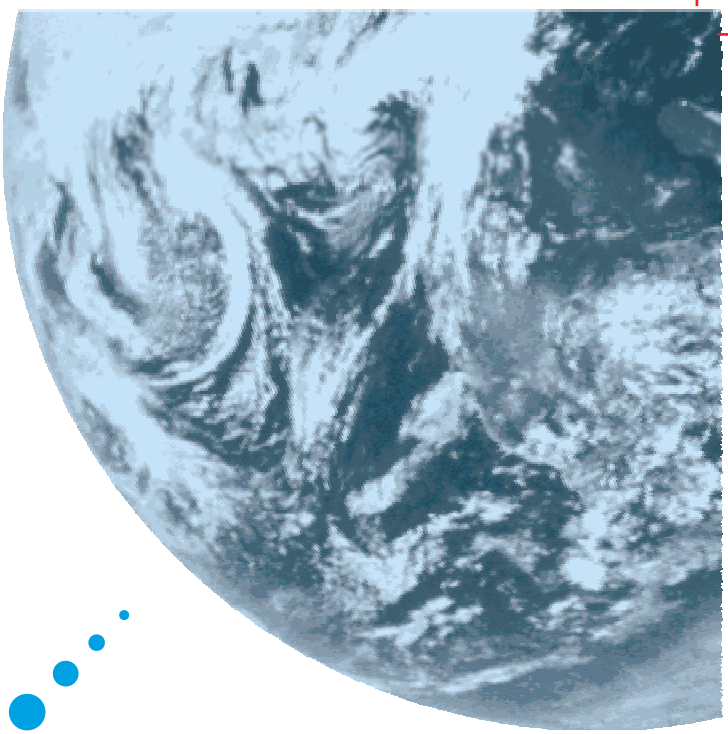
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Agilent Technologies

E7473A, E7474A, E7475A, E7490A

Wireless Solutions



Getting Started Guide

Agilent Technologies

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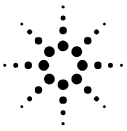
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Getting Started Guide

Agilent Technologies E7473A, E7474A, E7475A, E7490A Wireless Solutions

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Agilent Technologies, Inc.
Santa Rosa Systems Division
1400 Fountaingrove Parkway
Santa Rosa, CA 95403-1799

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Safety and Regulatory Information

Review this product and related documentation to familiarize yourself with safety markings and instructions before you operate the system. This product has been designed and tested in accordance with appropriate international standards.

For more details on Safety and Regulatory Information, refer to Chapter 7, “Safety and Regulatory Information”

MUST READ FIRST

WARNING

The WARNING notice denotes a hazard. It calls attention to a procedure, practice, or the like, that, if not correctly performed or adhered to, could result in personal injury. Do not proceed beyond a WARNING notice until the indicated conditions are fully understood and met.

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Welcome to Your Agilent Wireless Solutions

Thank you for choosing Agilent Technologies, Inc.. In this getting started guide, you'll find the setup instructions you need to begin taking measurements.

Follow These Steps

To Do This	See This	And Check This
1 Install the software.	Chapter 1, "Installing the Software"	If you have purchased a computer from Agilent with your system, the software came pre-installed. Go to step 2.
2 Set up your system.	Chapter 2, "Setting Up Your System"	You'll find all system configuration information, including **GPS** (Global Positioning System) setup here.
3 Verify the system.	Chapter 4, "Verifying the System"	Perform these tests to ensure that your system is ready to make measurements.
4 Start the software.	Chapter 3, "Starting and Learning to Use the Software"	An online tutorial and online help instruct you how to use your system.

If You Need Help...

To Do This...	See This
Get training	**http://agilent.com/find/drive_test** Check the web site for information about training registration, software updates, phone support, FAQs, and more.
Get help	Chapter 5, "Solving Problems and Updating Your System" Find GPS installation tips and more.
Check specification or confirm the contents of your system.	Chapter 6, "Hardware and Software Specifications" ***Agilent E74xx System Options and Accessories Guide*** (refer to Chapter 3, "Viewing and Printing Online Documents")

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Online Getting Started Guide

If you would like an additional copy of this Guide, check the following web site for the latest PDF[1] version:

http://www.agilent.com/find/manuals and then search for your system type

This PDF version has also be loaded with your application software, if you chose the typical installation. For more information on accessing this and other online documentation, refer to "Additional Documentation" on page 3-14.

Systems Covered by this Guide

The following table outlines the wireless solutions covered by this guide. For more detailed lists of system options and accessories, refer to the online *Agilent E74xx System Options and Accessories Guide*. This guide has been loaded with application, if you chose the typical installation. For more information on accessing this guide and other online documentation, refer to "Additional Documentation" on page 3-14.

System Part Number	Description
Agilent E7473A	CDMA Cellular and PCS Network Test System
Agilent E7474A	TDMA Cellular and PCS Network Test System
Agilent E7475A	GSM900, DCS1800 and GSM1900 Network Test Systems
Agilent E7490A	CDMA Base Station Over Air Maintenance Test System

1. Portable Document Format - online version that can be viewed using Adobe ® Acrobat reader.
   For more information about this reader, refer to http://www.adobe.com

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1

Installing the Software

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What You'll Find in This Chapter

To Do This	See This
Install the system software	"Installing the Software" on page 1-3
Install the License Manager software	"Agilent Technologies License Manager" on page 1-5
Install Adobe Reader	"Installing Adobe Reader" on page 1-6
Install Socket I/O card software	"Installing Socket PCMCIA I/O Card Software" on page 1-7

Read This First

If you purchased your laptop computer as part of Agilent 86154A option 010 or option 030, the software came factory-installed. Skip this procedure and go to Chapter 2, "Setting Up Your System".

The factory-installed software does not include Adobe Reader.

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Installing the Software

Before you begin installing the software, ensure that your computer system is configured with the minimum requirements. Check "Personal Computer Recommendations, Minimum" on page 6-68 for information.

Follow These Steps

Do This	See This
1 Insert the CD-ROM into the CD-ROM drive, choose **Start>Run**, and type **d:\setup** where d: is the drive containing the software CD-ROM. Click **OK**.	A Welcome dialog box appears instructing you to close any currently running Windows applications before you begin installation.
2 Click **Next** when you are ready to continue the installation. Type your name and the name of the company you work for, then click **Next**.	The "Choose Destination Location" dialog box appears. The default folder for installation is C:\Program Files\Agilent Technologies\E74xx (depending on the system you're installing).
3 If you wish to install the program in a folder other than the default, click **Browse** to display text. When the correct destination folder appears in the field, click **Next**.	The Setup Type box appears.
4 Select the type of installation you want: typical, compact, or custom, and click **Next**. •Typical: Includes Agilent E74xx application, online help files, tutorial and documentation. •Compact: Includes Agilent E74xx application and online help files •Custom: Lets you select individual components.	The Destination Folder box appears. Agilent Technologies recommends using the Typical installation. Refer to page 6-68 to see if you have enough disk space available to perform the Typical installation before proceeding.

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Do This	See This
5 Select the destination folder for the program. The default folder is "C:\Program Files\Agilent Technologies\ E74xx" or you can select a different folder that can be found on your system. Click **Next**.	The list of folders found on your system is displayed. Agilent Technologies recommends using the default folder
6 Read the list of software installation options and check that Setup Type, Target Folder, and User Information are correct, and click **Next**.	The software installs from CD to PC.
7 Click **Finish** to complete the installation.	Depending on the files installed or updated you may be prompted to reboot your system.

NOTES

- It is recommended that new users go through the online tutorial before using the software. Refer to Chapter 3, "Starting and Learning to Use the Software" for instructions on running the online tutorial.
- When you run the software, disable the Windows 95 Advanced Power Management Support capabilities to significantly improve the performance of the system.

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Agilent Technologies License Manager

The hardware key that came with your Agilent Technologies system enables and secures the functionality you purchased from Agilent. The Agilent License Manager, automatically installed when you install the Agilent Wireless Solutions Software, enables you to manage licensing security information. You can use the software to:

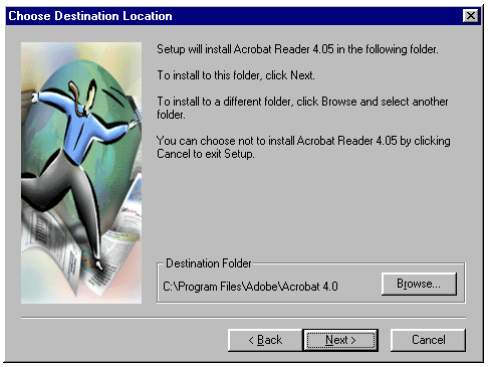
- Add product options to license keys. You can add licenses (temporary or permanent) to the license key by entering a string obtained from an Agilent representative.
- Transfer licensed product options between license keys in order to consolidate licenses onto one key.
- Transfer a license from one key to another.
- Transfer licenses between keys on different computers. You can move license options to license keys on another computer that is located anywhere from the same room to another country.

For more information on learning and using the license manager refer to "Learning the License Manager" on page 3-13. Details on the operation of the license manager can be found in the online help.

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Installing Adobe Reader

NOTE Before starting the installation process, ensure that you have removed previous versions of Adobe reader. This version is Adobe Reader 4.05.

Do This	See This
1 Insert the CD-ROM into the CD-ROM drive, choose **Start>Run**, and type **d:\Acrobat\rs405eng.exe** where d: is the drive containing the software CD-ROM. Click **OK**.	A Welcome dialog box appears detailing copyright information.
2 Click **Next** when you are ready to continue the installation.	The "Choose Destination Location" dialog box appears. The default folder for installation is C:\Program Files\Adobe\Acrobat4.0 
3 If you wish to install the program in a folder other than the default, click **Browse** to display text. When the correct destination folder appears in the field, click **Next**.	The software will install from CD to PC.
4 Once the installation is complete, click **OK**.	A user guide for the Adobe Reader has been provided on the CD in PDF format.

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Installing Socket PCMCIA I/O Card Software

If you have a phone or phone/receiver-based system, a serial I/O card (such as the Socket Ruggedized Serial I/O card) must be installed in the **PCMCIA** slot (Personal Computer Memory Card International Association) to configure the system properly. See Chapter 2, "Setting Up Your System" for instructions on installing the I/O card. The software that is provided with the serial I/O card must be installed at the time the I/O card is installed.

NOTE

See Chapter 3, "Software Setup" of the *Serial I/O ™ and Ruggedized Serial I/O Card ™ User's Guide* for instructions on installing the software for that specific card.

If you are using the USB 4-Port adapter, Agilent 86154A option 036, refer to the *Agilent Technologies Indoor Test System Setup Guide* for more information.

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2

Setting Up Your System

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What You'll Find in This Chapter

To Do This	See This
Connect the hardware	"Hardware Installation Tips" on page 2-3 covers important setup information. "Connecting the Hardware" on page 2-7 covers setup of all types of systems. Refer to this page for the pages that cover your particular system.
Configure hardware automatically.	"Automatic Configuration" on page 2-5
Configure internal GPS.	"Internal GPS & Internal GPS with Differential Setup" on page 2-26
Configure multiple receivers and/or multiple phones.	"Configuring Multiple Receivers and Phones" on page 2-74
Review receiver connection panels and connectors.	"Universal Serial Bus (USB), 4-port Adapter Configuration" on page 2-87
Set pin-out specifications for serial port connection.	"Receiver to PC Serial Port Cable Configuration" on page 2-91
Configure other GPS units.	"RS-232 to GPS Unit Cable Configuration" on page 2-92
Set pin-out specifications for connecting differential GPS receiver to a receiver with an internal GPS.	"RS-232 to Differential Unit Cable Configuration" on page 2-93

NOTE Trimble provides downloadable documentation on the Web. At the time of this printing, you can find the files (Microsoft Word and PDF formats) at `http://www.trimble.com/mpc/placer/download/manuals.htm`. If the URL has changed, use the search facility provided at the Web site (www.trimble.com). For further information about support and training, you can contact Trimble at a phone number on their Web site.

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Hardware Installation Tips

Item	Information
Hardware security key	The hardware security key must be connected to the parallel port of the PC. The application runs with a limited feature set without the key. You cannot configure projects or collect data without the key.
Power supply connections	Make sure that power supply connections to the GPS, the receiver, the PC, and the phones (if applicable) are correct.
PC turn on	After all cables are connected, turn on the PC. **The PC should be the last device you turn on.**
Create a project	Make sure your hardware is properly configured. 1 Verify hardware type and COM port settings. 2 Open application and choose a project from the **Project** drop-down list that best represents your hardware configuration. 3 Click **Configuration** and go to **Hardware** tab. Verify or add descriptions to complete hardware configuration or use the **Automatic Configuration** wizard (refer to "Automatic Configuration" on page 2-5). 4 Click **Collection** to verify that there are no COM errors. If errors appear, repeat previous steps or refer to Chapter 5, "Solving Problems and Updating Your System". 5 Click **Save As** and name current project. 6. Set project as default project under Tools > Options >New Project and click **OK**.

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Item	Information
Configuring hardware	The Wireless Solutions system assigns the serial port of the receiver to COM1 by default. If you want to use a different port, modify the serial port setting for the receiver in the application software as follows. 1 After starting the Wireless Solutions application software, click the **Configuration** button. 2 Select the **Hardware** tab and highlight the Agilent E645x receiver. Click the **Modify** button. 3 Set the desired COM port. It is recommended that you accept the program defaults for other settings. 4 If the system includes a GPS receiver, you must also change its COM port.
Cable handling	Verify all cable connections against the illustrations in the following sections of this chapter. Cables can be damaged. Please handle them carefully.
GPS verification	Can be done two ways: • Use the appropriate Trimble or GPS software, if applicable. • Use your Agilent system software.
GPS software selection	See "Selecting GPS Hardware" on page 3-4 for information on selecting GPS hardware in the GPS software.
Socket Serial I/O card installation	Refer to the User's Guide supplied by Socket Communications for instructions on installing the Socket Serial I/O card and driver software.
Universal Serial Bus, 4-port adapter (Agilent 86154A, option 036)	See "Universal Serial Bus (USB), 4-port Adapter Configuration" on page 2-87 for information on installing and using this piece of hardware.
Troubleshooting	See Chapter 5, "Solving Problems and Updating Your System" for troubleshooting information.

NOTE

For continued protection against fire hazard, replace the line fuse (cigarette lighter/2 amp 32 V FB fuse, Agilent part number 2110-0002) only with the same type of rating (type nA/nV). The use of other fuses or materials is prohibited.

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Automatic Configuration

The Agilent Wireless Solutions Software can automatically configure hardware that has been connected to your laptop. By clicking the **Auto Config** button, you begin the automatic configuration wizard (see Figure 2-1). This wizard checks a defined list of COM ports for recognized hardware. Once all ports have been checked, the attached hardware is automatically set up with the correct settings.

The automatic configuration wizard can be used for setting up new hardware and projects, or for updating previously saved configurations.

You can speed up the configuration process by selecting the types of hardware to be attached to your system and the COM ports used. This limits the list of hardware types and COM ports searched during configuration. To enable this feature select **Tools > Options > Other >"Enable auto-config COM and device customization".** See Figure 2-2, and Figure 2-3 on page 2-6.

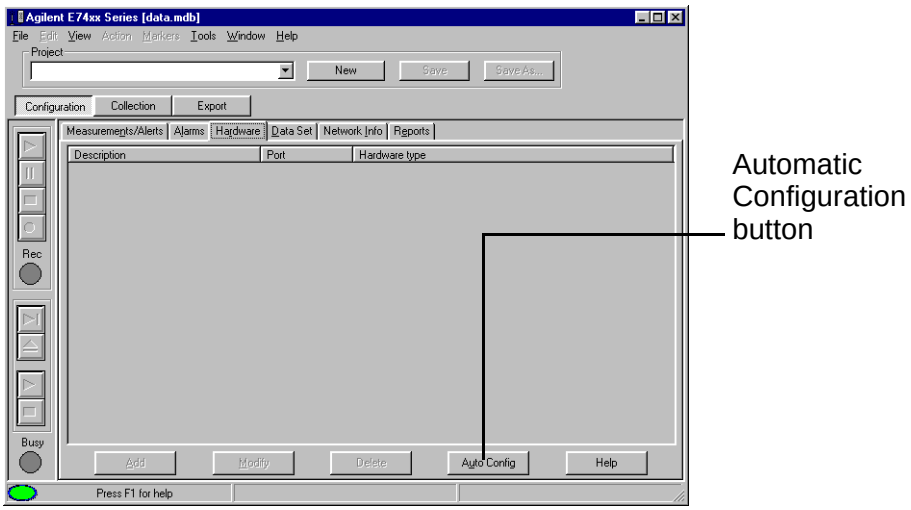


Figure 2-1 Accessing the Automatic Configuration Wizard

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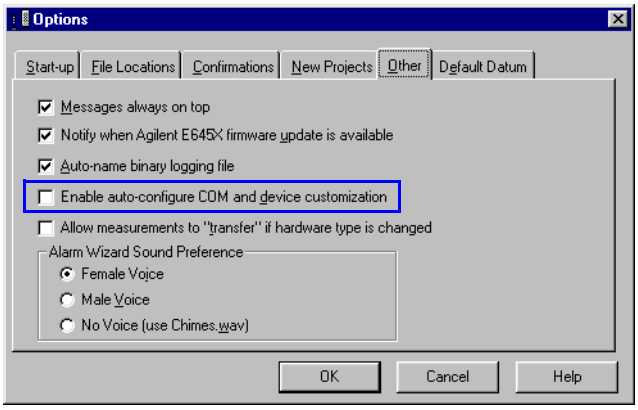


Figure 2-2 Enabling the auto-configuration customization features

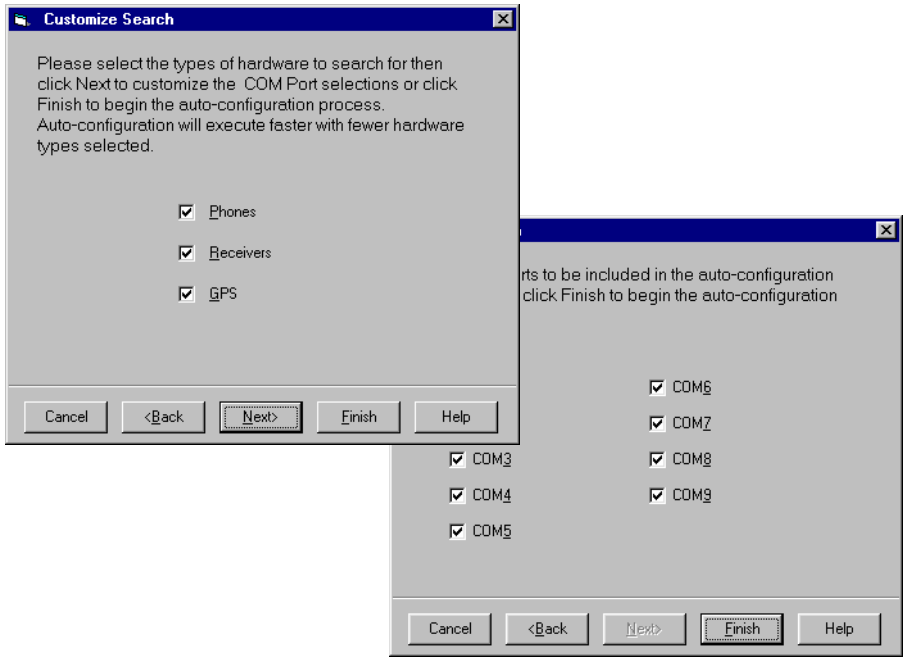


Figure 2-3 Defining COM ports and device types to be searched during the configuration process

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Connecting the Hardware

The software *must* be installed before you install the hardware. If your system includes 86154A option 010, a laptop computer, or 86154A option 030, a pen tablet computer, the software was factory-installed. Otherwise, refer to Chapter 1, "Installing the Software" for instructions.

Table 2-1 directs you to the configuration instructions for receiver, phone, and combination systems with most types of GPS. If you have a GPS that is not listed, use Table 2-1 to find the one that most resembles your own. Also refer to the pin-out illustration "RS-232 to GPS Unit Cable Configuration" on page 2-92.

Table 2-1 GPS System Configurations

If You Have This	with Receiver Only	with Phone Only	with Receiver and Phone
Trimble Placer GPS/DR	page 2-10	page 2-54	page 2-32
Trimble Placer GPS 455	page 2-18	page 2-62	page 2-40
Trimble Placer 455 & Differential	page 2-22	page 2-66	page 2-44
Trimble Placer GPS 455 with Dead Reckoning	page 2-28	page 2-70	page 2-50
Internal GPS & Differential	page 2-26		page 2-48
Trimble Placer GPS 400 or SVeeSix	page 2-14	page 2-58	page 2-36

NOTE Your system can be configured using either Agilent Technologies supplied options or customer-supplied components.

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CAUTIONS

- The input power to the Agilent digital receiver should not exceed -10 dBm. Receiver measurements are not warranted for power levels between -10 dBm and 10 dBm. Power levels greater than 10 dBm damage the instrument.
- For optimum performance, it is recommended that no more than -40 dBm be applied to the input of all other types of receivers.
- Never test the vehicle's battery when your GPS is connected to it. First, disconnect the GPS receiver, and then test your battery. Never "jumpstart" your vehicle's battery with the GPS connected. It may cause severe damage to the GPS receiver.

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NOTES

- Agilent Technologies suggests that you verify that the GPS is working properly before you connect it to the Agilent Wireless Solutions system.
- The Trimble Placer DR, Trimble Placer GPS 400, and SVeeSix Plus DO NOT have battery backup. If the DC power supply is removed (without external lithium battery backup), these GPS receivers will lose their settings after 15 minutes, which causes them to re-set to their default values.
- If the Trimble GPS has no battery backup connected, when the Trimble GPS receiver is turned on again, it will be set to the defaults. You will have to wait some time until the Trimble GPS receiver is locked and tracking the satellites before the correct coordinates are shown. Otherwise, the Trimble GPS receiver will see (by design) the Santa Clara, CA, coordinates. If this happens, allow some time (up to 30 minutes) before doing the actual network test, to ensure the correct coordinates are acquired.

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Receiver-Based System Setup

Trimble Placer GPS/DR

The setup for the Trimble Placer GPS/DR receiver is shown in Figure 2-4. When connecting your system with a Trimble Placer GPS/DR receiver, the 86154A option 211 (adapter cable) is required.

Before you begin the hardware installation procedure, please review "Hardware Installation Tips" on page 2-3.

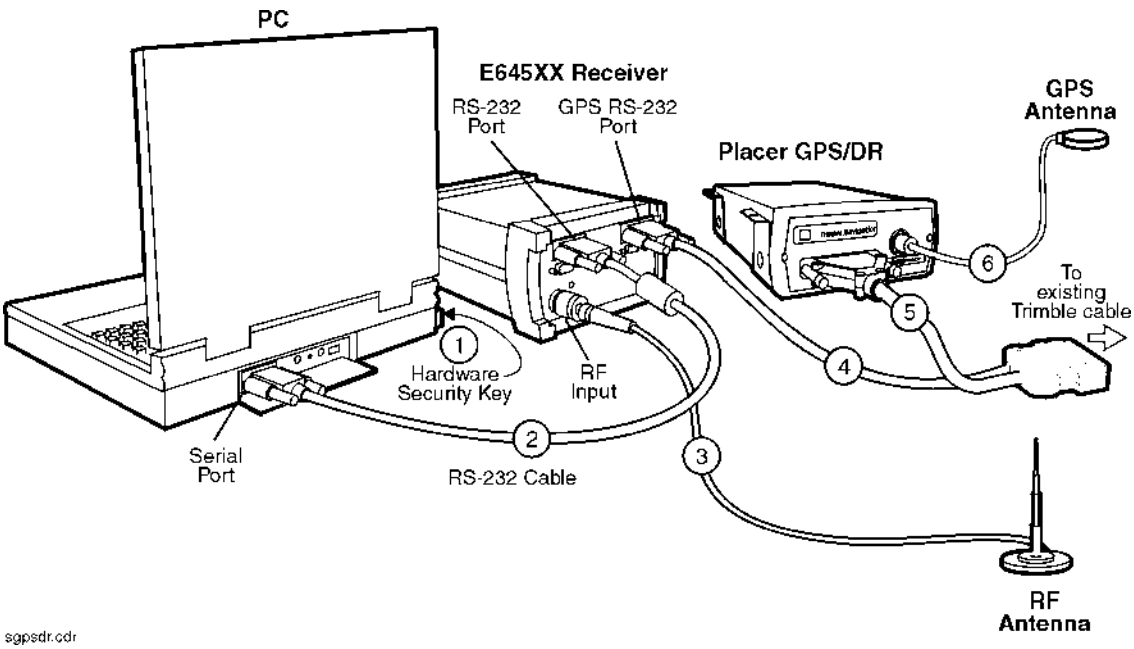


Figure 2-4 Trimble Placer GPS/DR

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Configuring with a Trimble Placer GPS/DR

1. Connect the hardware security key to the parallel port of the PC.
2. Connect the serial port of the PC to the RS-232 port of the Agilent E645x receiver using an RS-232 straight-through cable. The default serial port used by the application is multiplexed serial, COM1. If your PC uses a different COM port, you can specify a different serial port number.
3. Connect the RF antenna to the RF input of the Agilent E645x receiver. Use the supplied Type-N to TNC adapter, if necessary.
4. Connect the end of Agilent cable 86154A option 211, labeled GPS RS-232, to the GPS RS-232 port of the receiver.
5. Connect the 37-pin connector of the Agilent cable 86154A option 211 to the existing Trimble Placer GPS/DR connector. Connect the remaining end of the Agilent cable 86154A option 211 to the Trimble Placer GPS/DR cable.
6. Connect the GPS antenna to the GPS ANT port of the Trimble Placer GPS/DR antenna. Agilent Technologies recommends that a “bulkhead mount” GPS antenna be used whenever possible for improved performance.
7. Connect power to the Trimble Placer GPS/DR and the PC.
8. Turn on the Trimble Placer GPS/DR and the Agilent E645x receiver.
9. Turn on the PC and run the application.
10. Select or create the project you are going to use.
11. Configure the GPS unit for the Trimble Placer GPS/DR with **TAIP** (Trimble ASCII Interface Protocol) protocol:
    a. Select the **Configuration** mode.
    b. Select the **Hardware** tab.
    c. Double-click the GPS icon, or select GPS, then click the **Modify** button.
    d. In the Hardware Type box, select the GPS (Placer DR, 400, SV6; TAIP), and click **OK**.

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Accept the default settings for baud rate, parity, and so forth. See "Selecting GPS Hardware" on page 3-4 for more information.

NOTE If you need to change the GPS coordinate datum, select the **Advanced** tab of GPS hardware configuration box. The default datum can be set using the **Tools > Options** and selecting the Default Datum tab.

For additional information and vehicle connections for Trimble Placer units, refer to Trimble Navigation Limited documentation.

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Trimble Placer GPS 400 or SVeeSix

The setup for the receiver with a Trimble Placer GPS 400 or SVeeSix receiver is shown in Figure 2-5. When using the Trimble Placer GPS 400 or SVeeSix receiver, a standard, straight-through, RS-232 9-pin cable is required.

Before you begin the hardware installation procedure, please review "Hardware Installation Tips" on page 2-3.

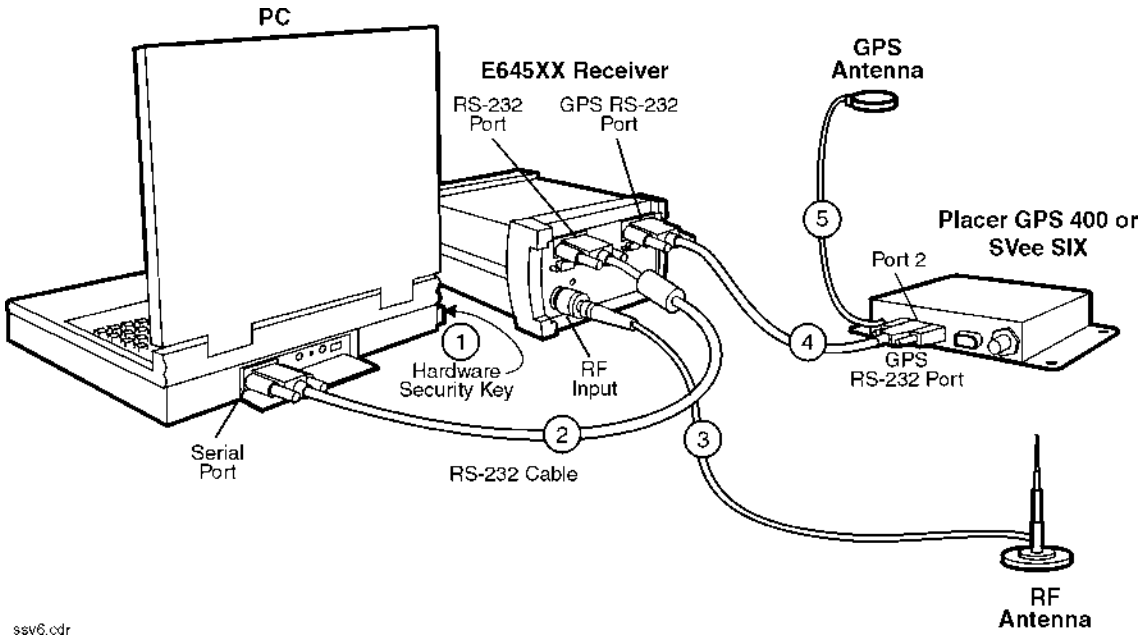


Figure 2-5 Trimble Placer GPS 400 or SVeeSix

NOTE The Trimble Placer SVeeSix Plus operates from 9 to 32 VDC (NO internal battery backup). The red wire must be tied to the positive side of the power supply. The black wire must be tied to the negative side of the power supply. Optionally, the yellow wire may be tied to a backup power source, such as a lithium battery (operates from 3.5 to 14 VDC).

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Configuring a Trimble Placer GPS 400 or SVeeSix

1. Connect the hardware security key to the parallel port of the PC.
2. Connect the serial port of the PC to the RS-232 port of the Agilent E645x receiver using an RS-232 cable. The default serial port used by the application is multiplexed serial, COM1. If your PC uses a different com port, you can specify a different serial port number.
3. Connect the RF antenna to the RF input of the Agilent E645x receiver. Use the supplied Type-N to TNC adapter, if necessary.
4. Connect one end of a standard, straight-through, RS-232 9-pin cable to the GPS RS-232 port of the Agilent E645x receiver. Connect the other end of the RS-232 cable to the Trimble Placer GPS 400 or SVeeSix connector.
5. Connect the GPS antenna to the GPS ANT port of the Trimble Placer GPS 400 or SVeeSix unit.
6. Connect power to the Trimble Placer GPS 400 or SVeeSix and the PC.
7. Turn on the Trimble Placer GPS 400 or SVeeSix, and the PC, and run the application.
8. Select or create the project you are going to use.
9. Select Configuration mode.
   a. Select the Hardware tab.
   b. Double-click the GPS icon, or select GPS then click **Modify**.
   c. In the Hardware Type box, select GPS (Placer DR, 400, SV6; TAIP) if the Trimble Placer SVeeSix has TAIP.
   See part number XXXXX-63.
   d. In the Hardware Type box, select GPS (SV6, SK8; TSIP) if the Trimble Placer SVeeSix has TSIP (Trimble Standard Interface Protocol). See part number XXXXX-61.
   e. In the Hardware Type box, select GPS (NMEA) if the Trimble Placer SVeeSix has NMEA. See part number XXXXX-62.
   f. Click **OK**.

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Accept the default settings for baud rate, parity, and so forth. See "Selecting GPS Hardware" on page 3-4 for more information.

NOTE If you need to change the GPS coordinate datum, select the **Advanced** tab of GPS hardware configuration box. The default datum can be set using the **Tools > Options** and selecting the Default Datum tab.

For additional information and vehicle connections for Trimble Placer units, refer to Trimble Navigation Limited documentation.

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Trimble Placer GPS 455

The setup for the receiver with a Trimble Placer GPS 455 receiver is shown in Figure 2-6.

Before you begin the hardware installation procedure, please review "Hardware Installation Tips" on page 2-3.

If the Trimble Placer GPS 455 receiver is supplied by Agilent as option 210, all necessary cables are included. If the Trimble Placer GPS 455 receiver is customer supplied, 86154A option 212 is required.

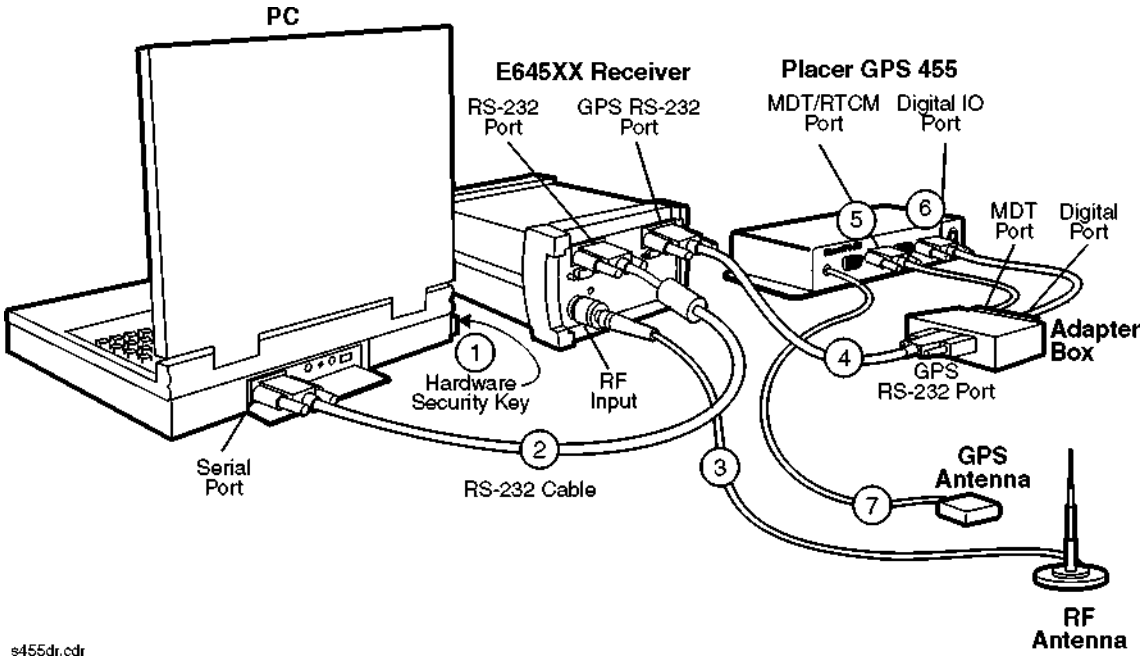


Figure 2-6 Trimble Placer GPS 455

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NOTE The Trimble Placer GPS 455 operates on 10 to 32 VDC (internal battery backup keeps the last GPS settings). The red and white wires must be tied to the positive side of the power supply. The black wire must be tied to the negative side of the power supply. To turn on the GPS receiver when starting the vehicle, the white wire must be tied to the ignition switch.

Configuring a Trimble Placer GPS 455

NOTE Never set your GPS receiver protocol as TAIP and TSIP together. The Agilent Wireless Solutions Software is designed to work with one protocol at a time. Having both protocols active may confuse the system.

1. Connect the hardware security key to the parallel port of the PC.
2. Connect the serial port of the PC to the RS-232 port of the Agilent E645x Receiver using the RS-232 cable included with the system. The default serial port used by the application is multiplexed serial, COM1. If your PC uses a different COM port, you can specify a different serial port number.
3. Connect the RF antenna to the RF input of the Agilent E645x receiver. Use the supplied Type-N to TNC adapter, if necessary.
4. Connect the GPS RS-232 port of the Agilent E645x receiver to the GPS RS-232 port of the adapter box, using the RS-232 straight-through cable.
5. Connect the MDT port of the adapter box to the MDT/RTCM port of the Trimble Placer GPS 455 unit, using the RS-232 straight through cable.
6. Connect the digital port of the adapter box to the Digital IO port of the Trimble Placer GPS 455 unit, using the RS-232 straight-through cable.
7. Connect the GPS antenna to the GPS ANT port of the Trimble Placer GPS 455 unit. Agilent Technologies recommends that a “bulkhead mount” GPS antenna be used whenever possible for improved performance.

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8. Turn on the Trimble Placer GPS 455 unit and the PC.
9. Configure the Trimble Placer GPS 455 unit for the correct settings. See “Selecting GPS Hardware” on page 3-4 for more information.

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Trimble Placer GPS 455 & Differential

The setup for the receiver with a Trimble Placer GPS 455 and Differential receiver is shown in Figure 2-7.

Before you begin the hardware installation procedure, please review "Hardware Installation Tips" on page 2-3.

86154A option 230 provides a differential GPS, with all necessary cables included. A differential GPS may also be customer supplied.

If the Trimble Placer GPS 455 receiver is supplied by Agilent as option 210, all necessary cables are included. If the Trimble Placer GPS 455 receiver is customer supplied, 86154A option 212 is required.

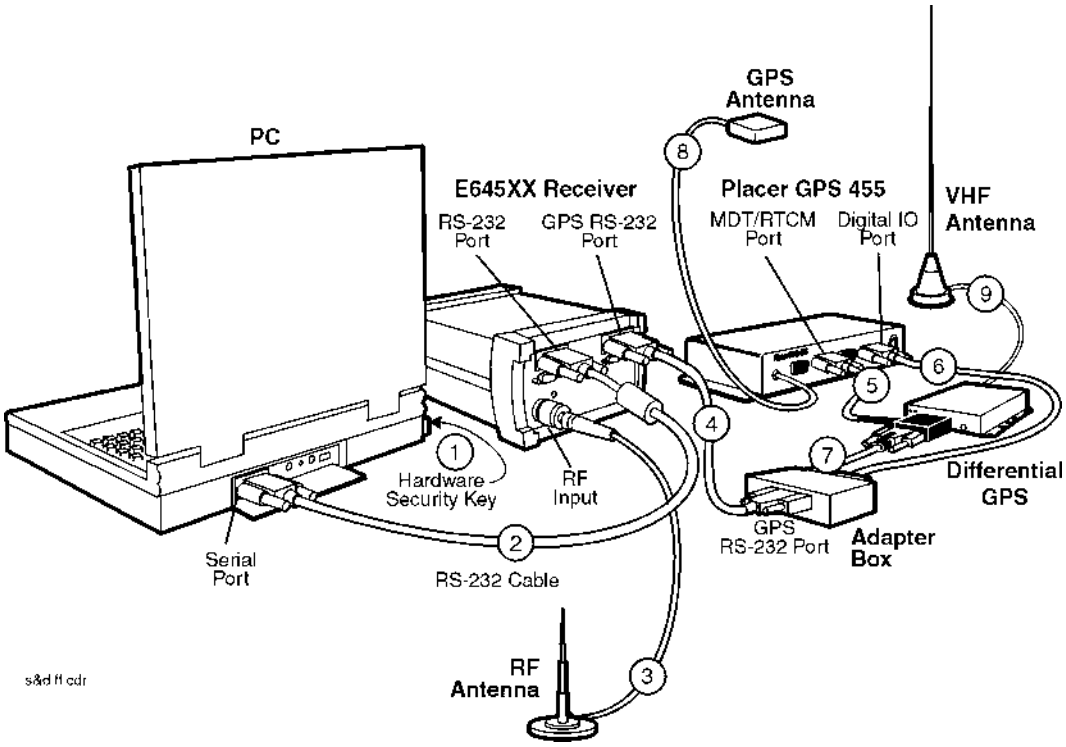


Figure 2-7 Trimble Placer GPS 455 and Differential GPS

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Configuring a Trimble Placer GPS 455 and Differential

1. Connect the hardware security key to the parallel port of the PC.
2. Connect the serial port of the PC to the RS-232 port of the Agilent E645x receiver using the RS-232 cable included with the system. The default serial port used by application is multiplexed serial, COM1. If your PC uses a different COM port, you can specify a different serial port number.
3. Connect the RF antenna to the RF input of the Agilent E645x receiver. Use the supplied Type-N to TNC adapter, if necessary.
4. Connect the GPS RS-232 port of the Agilent E645x receiver to the GPS RS-232 port of the adapter box, using the RS-232 cable.
5. Connect the RTCM port of the Trimble-supplied communications cable to the differential GPS receiver, using the RS-232 cable included with the system. Connect the remaining port of the Trimble-supplied communications cable to the MDT/RTCM port of the Trimble Placer GPS 455 unit.
6. Connect the digital port of the adapter box to the Digital IO port of the Trimble Placer GPS 455 unit, using the RS-232 cable.
7. Connect the MDT/RTCM port of the adapter box to the MDT port of the Trimble-supplied communications “T” cable, connected to the Differential, using the RS-232 cable.
8. Connect the GPS antenna to the GPS ANT port of the Trimble Placer GPS 455 unit. Agilent Technologies recommends that a “bulkhead mount” GPS antenna be used whenever possible for improved performance.
9. Connect the VHF Differential GPS antenna to the Differential GPS unit.
10. Connect power to the differential GPS unit, the Trimble Placer GPS 455 unit, and the PC.
11. Turn the differential GPS unit, the Trimble Placer GPS 455 unit, and the PC on. Refer to “Selecting GPS Hardware” on page 3-4 to configure the Agilent Wireless Solutions Software.

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NOTE Never set your GPS receiver protocol as TAIP and TSIP together. The Agilent Wireless Solutions Software is designed to work with one protocol at a time. Having both protocols active may confuse the system.

Configuring the Differential GPS Communications Port When Using a Differential GPS

1. If your system includes an Agilent E645x receiver 86154A option 230 differential GPS receiver, the baud rate of the Differential Corrections Inc., (DCI) Differential GPS model RDS 3000, and the baud rate of the Trimble GPS receiver unit must be the same.

   Please refer to the manuals supplied by Differential Corrections, Inc. and Trimble Navigation, Limited.

2. Connect the differential GPS to the serial port of the PC.

3. Run the software supplied by DCI with the differential GPS (*rtcmon.exe*). (The file is contained on the disk that comes with 86154A option 230.)

4. Press F1 to set the correct baud rate for the differential GPS. Use the following table to set the baud rate for the Trimble model you are using.

Table 2-2 Trimble Baud Rate Settings

Differential GPS	Use F1 to set the baud rate of the DCI model RDS 3000 differential GPS	Then use F2 to set the baud rate of the PC serial port
Placer GPS/DR	9600	9600
Trimble Placer GPS 455	9600	9600
Agilent E645x with internal GPS (Trimble model SK-8)	4800	4800

When the differential GPS is correctly configured, it will start to send legible information to the PC. If the subscription is active, this information will be correction data, otherwise it will be scanned frequencies.

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NOTE

If you need to change the GPS coordinate datum, select the **Advanced** tab of GPS hardware configuration box. The default datum can be set using the **Tools > Options** and selecting the Default Datum tab.

Please contact DCI for information about getting a subscription to activate your differential GPS. When it is activated, it will be ready to work with the Agilent Technologies system.

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Internal GPS & Internal GPS with Differential Setup

The setup for the internal GPS, including 86154A option 230, Differential GPS, is shown in Figure 2-8. Before you begin the hardware installation procedure, please review "Hardware Installation Tips" on page 2-3.

The internal GPS can not be used with Dead Reckoning. The internal GPS can, and most often will, be used *without* the differential GPS.

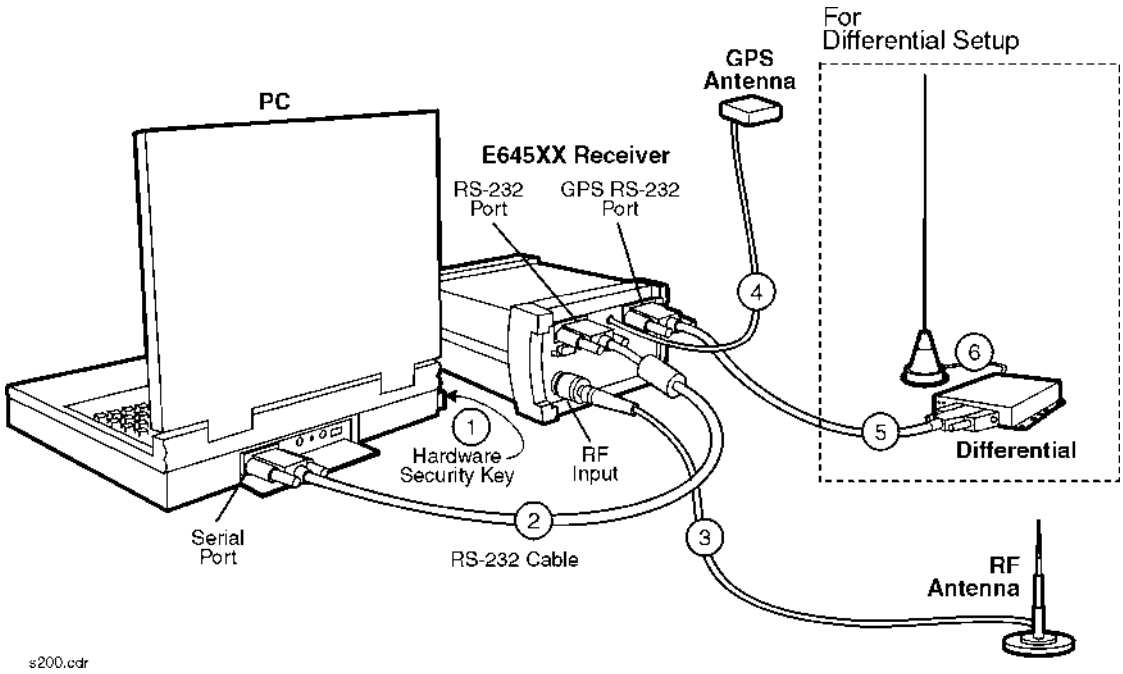


Figure 2-8 Internal GPS and Internal GPS with Differential

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Configuring an Internal GPS

1. Connect the hardware security key to the parallel port of the PC.
2. Connect the serial port of the PC to the RS-232 port of the Agilent E645x receiver using the RS-232 cable included with the system. The default serial port used by the application is multiplexed serial COM1. If your PC uses a different COM port, you can specify a different serial port number.
3. Connect the RF antenna to the RF input of the Agilent E645x receiver. Use the supplied Type-N to TNC adapter, if necessary.
4. Connect the GPS antenna to the GPS ANT port of the Agilent E645x receiver. Agilent Technologies recommends that a "bulkhead mount" GPS antenna be used whenever possible for improved performance.

   If the system includes a differential GPS receiver, continue. If it does not, skip to step 7.
5. Connect the GPS RS-232 port of the Agilent E645x receiver to the differential GPS. The cable is included with the differential GPS receiver, 86154A option 230.
6. Connect the differential GPS VHF antenna to the differential GPS unit.
7. Connect power to the Agilent E645x receiver, the PC, and the differential GPS unit, if used.
8. Turn the differential GPS unit, and the PC, on.
9. Refer to "Selecting GPS Hardware" on page 3-4 to configure the Agilent Wireless Solutions Software.
10. Refer to "Configuring the Differential GPS Communications Port When Using a Differential GPS" on page 2-24 for instructions on setting the COM ports.

NOTE If you have a Differential GPS other than the 86154A option 230, refer to that suppliers manual for configuration instructions.

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Trimble Placer GPS 455 with Dead Reckoning

The setup for the Trimble Placer GPS 455 receiver and GPS antenna is shown in Figure 2-9.

Before you begin the hardware installation procedure, please review "Hardware Installation Tips" on page 2-3.

86154A option 210 provides a Trimble Placer GPS 455 receiver and two GPS antennas. All necessary cables and adapters are included. The speedometer interface is *not* included. If the Trimble Placer GPS 455 receiver and GPS antennas are customer supplied, 86154A option 212 (adapter and cables) is required.

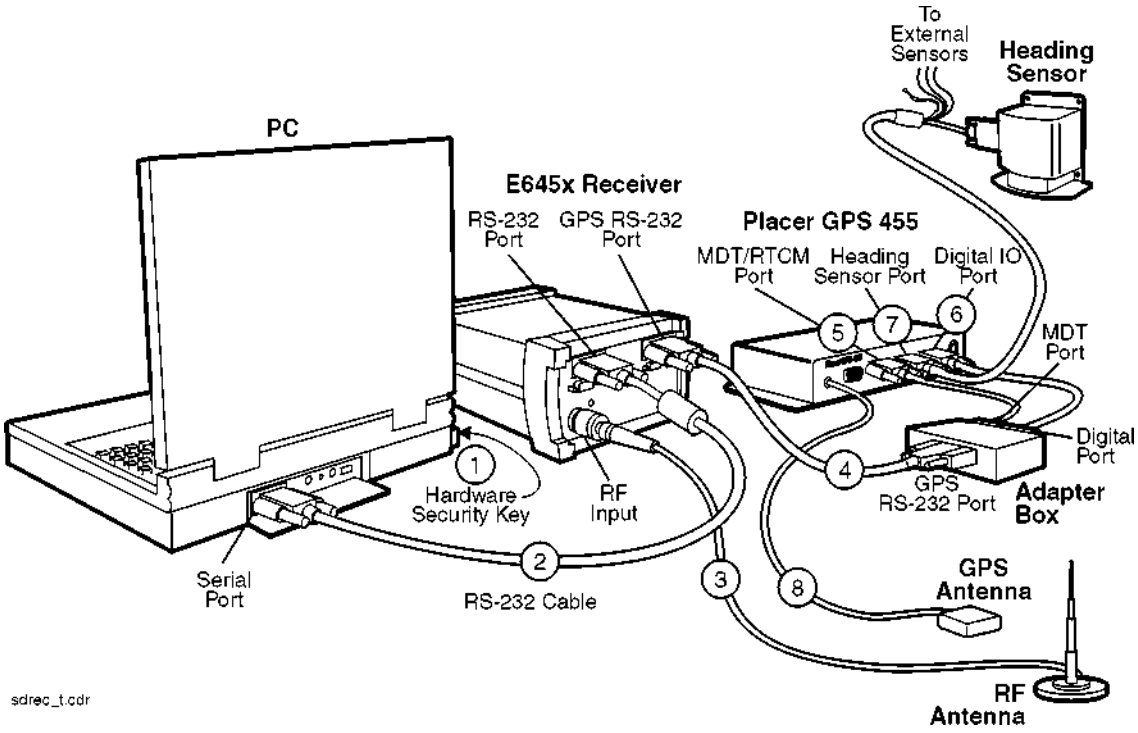


Figure 2-9 Trimble Placer GPS 455 with Dead Reckoning

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Configuring a Trimble Placer GPS 455 with Dead Reckoning

NOTE When the heading sensor is connected to the GPS 455 receiver, Dead Reckoning must be calibrated before the software will provide correct GPS information.

1. Connect the hardware security key to the parallel port of the PC.
2. Connect the serial port of the PC to the RS-232 port of the Agilent E645x receiver using the RS-232 cable included with the system. The default serial port used by the application is multiplexed serial COM1. If your PC uses a different COM port, you can specify a different serial port number.
3. Connect the RF antenna to the RF input of the Agilent E645x receiver. Use the supplied Type-N to TNC adapter, if necessary.
4. Connect the GPS RS-232 port of the Agilent E645x receiver to the GPS RS-232 port of the adapter box, using the RS-232 cable.
5. Connect the MDT port of the adapter box to the MDT/RTCM port of the Trimble Placer GPS 455 unit, using the RS-232 straight-through cable.
6. Connect the digital port of the adapter box to the Digital IO port of the Trimble Placer GPS 455 unit, using the RS-232 cable.
7. Connect the Heading Sensor to the Heading Sensor port of the Trimble Placer GPS 455 through the female 9-pin connector on the DR sensor cable supplied by Trimble. See Figure 2-9. The connector labeled Heading Sensor connects to the heading sensor; the connector labeled Sensors connects to the Placer GPS 455. See Figure 2-10.
8. Connect the GPS antenna to the GPS ANT port of the Trimble Placer GPS 455 unit. Agilent Technologies recommends that a “bulkhead mount” GPS antenna be used whenever possible for improved performance.
9. Connect power to the Trimble Placer GPS 455, the Agilent E645x receiver, and the PC and turn them on.

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10. Calibrate the DR unit using Trimble supplied software *Plcrinit.exe* or *GPSSK*. If you do not have this software, it is available on the Trimble web page. For more details and the URL, refer to page 2-2.
11. Start the Agilent Technologies application software. Verify that both the software and the Trimble Placer GPS 455 are configured for the same communication protocol. Refer to "Selecting GPS Hardware" on page 3-4 to configure the Agilent Wireless Solutions Software.

NOTE Never set your GPS receiver protocol as TAIP and TSIP together. The Agilent Wireless Solutions Software is designed to work with one protocol at a time. Having both protocols active may confuse the system.

NOTE If you need to change the GPS coordinate datum, select the **Advanced** tab of GPS hardware configuration box. The default datum can be set using the **Tools > Options** and selecting the Default Datum tab.

For additional information and vehicle connections for Trimble Placer units, refer to Trimble Navigation Limited documentation.

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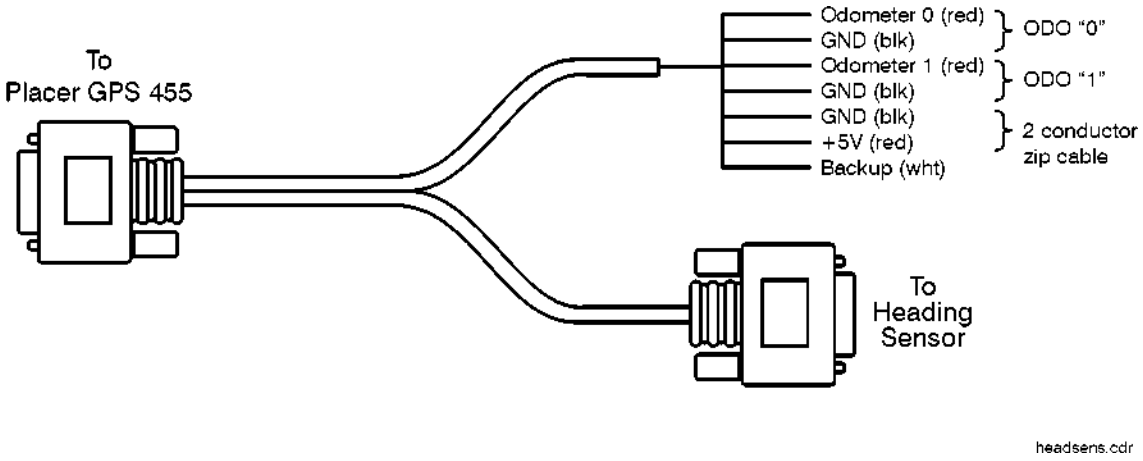


Figure 2-10 Heading Sensor Cable

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Receiver and Phone-Based System Setup

Trimble Placer GPS/DR

The setup for the Trimble Placer GPS/DR receiver and GPS antenna is shown in Figure 2-11.

Before you begin the hardware installation procedure, please review "Hardware Installation Tips" on page 2-3.

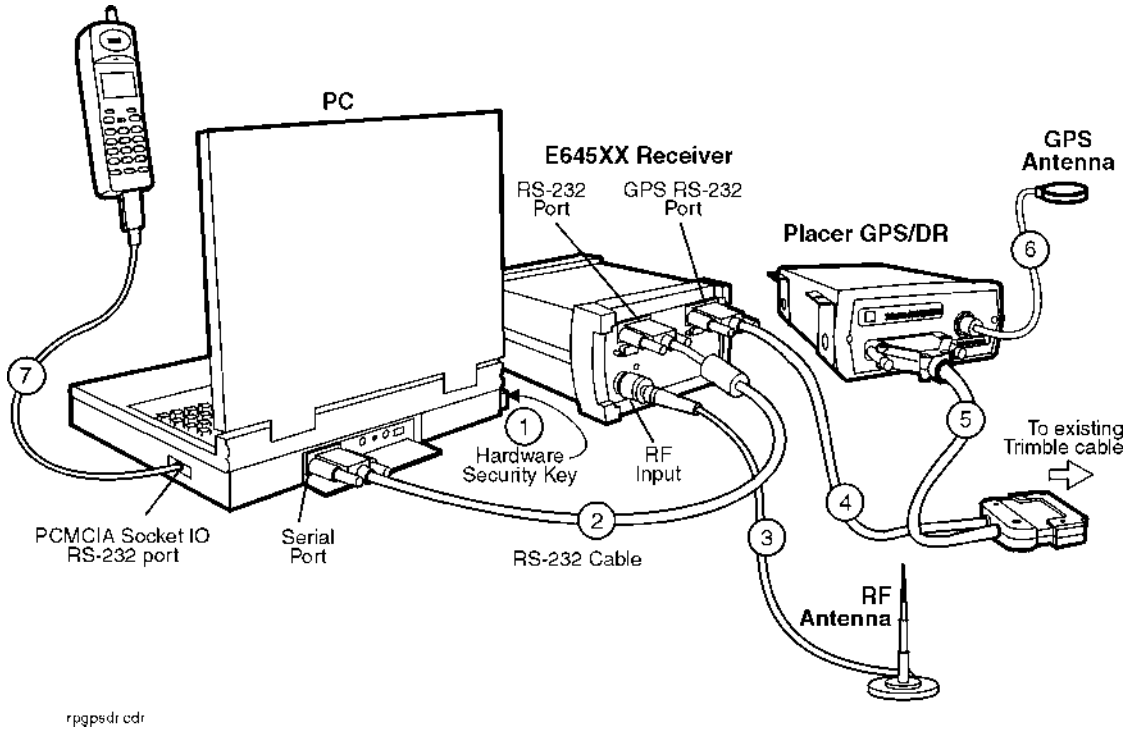


Figure 2-11 Trimble Placer GPS/DR Receiver and Phone

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Configuring a Trimble Placer GPS/DR

1. Connect the hardware security key to the parallel port of the PC.
2. Connect the serial port of the PC to the RS-232 port of the Agilent E645x receiver using an RS-232 straight-through cable. The default serial port used by the application is multiplexed serial, COM1. If your PC uses a different COM port, you can specify a different serial port number.
3. Connect the RF antenna to the RF input of the Agilent E645x receiver. Use the supplied Type-N to TNC adapter, if necessary.
4. Connect the end of Agilent cable 86154A option 211, labeled GPS RS-232, to the GPS RS-232 port of the receiver.
5. Connect the 37-pin connector of the Agilent cable 86154A option 211 to the existing Trimble Placer GPS/DR connector. Connect the remaining end of the Agilent cable 86154A option 211 to the Trimble Placer GPS/DR cable.
6. Connect the GPS antenna to the GPS ANT port of the Trimble Placer GPS/DR antenna. Agilent Technologies recommends that a “bulkhead mount” GPS antenna be used whenever possible for improved performance.
7. Connect the phone cable to a second COM port (different than used in step 1). On most laptop PCs this will require the use of a Socket Serial I/O RS-232 card that is installed into the PCMCIA slot on your PC.
8. Connect power to the Trimble Placer GPS/DR and the PC.
9. Turn on the Trimble Placer GPS/DR, the Agilent E645x receiver and the phone.
10. Turn on the PC and run the application.
11. Select or create the project you are going to use.
12. Configure the GPS unit for the TAIP protocol:
    a. Select Configuration mode.
    b. Select the Hardware tab.

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c. Double-click the GPS icon, or select GPS, then click **Modify.**

d. In the Hardware Type box, select the GPS (Placer DR, 400, SV6; TAIP)

e. Click **OK** when you are satisfied with the settings.

NOTE If you need to change the GPS coordinate datum, select the **Advanced** tab of GPS hardware configuration box. The default datum can be set using the **Tools > Options** and selecting the Default Datum tab.

13. Configure the phone:

a. Select Configuration mode.

b. Select the Hardware tab.

c. Double-click the phone icon or select the phone icon and click **Modify.**

d. In the Hardware Type box, select the phone used.

e. Click the Port Selections and Port Settings tabs to modify and confirm the correct COM port setting for the phone. The port selection should be serial. Select the Com port you are using.

f. Use the default port settings or use the values according to the PCMCIA Socket I/O card you are using.

g. Click **OK** when you are satisfied with the settings.

h. Select Collection mode to start the measurements.

Accept the default settings for baud rate, parity, and others.

For additional information and vehicle connections for Trimble Placer units, refer to Trimble Navigation Limited documentation.

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Trimble Placer GPS 400 or SVeeSix

The setup for the Trimble Placer SVeeSix/Placer GPS 400 is shown in Figure 2-12.

Before you begin the hardware installation procedure, please review "Hardware Installation Tips" on page 2-3.

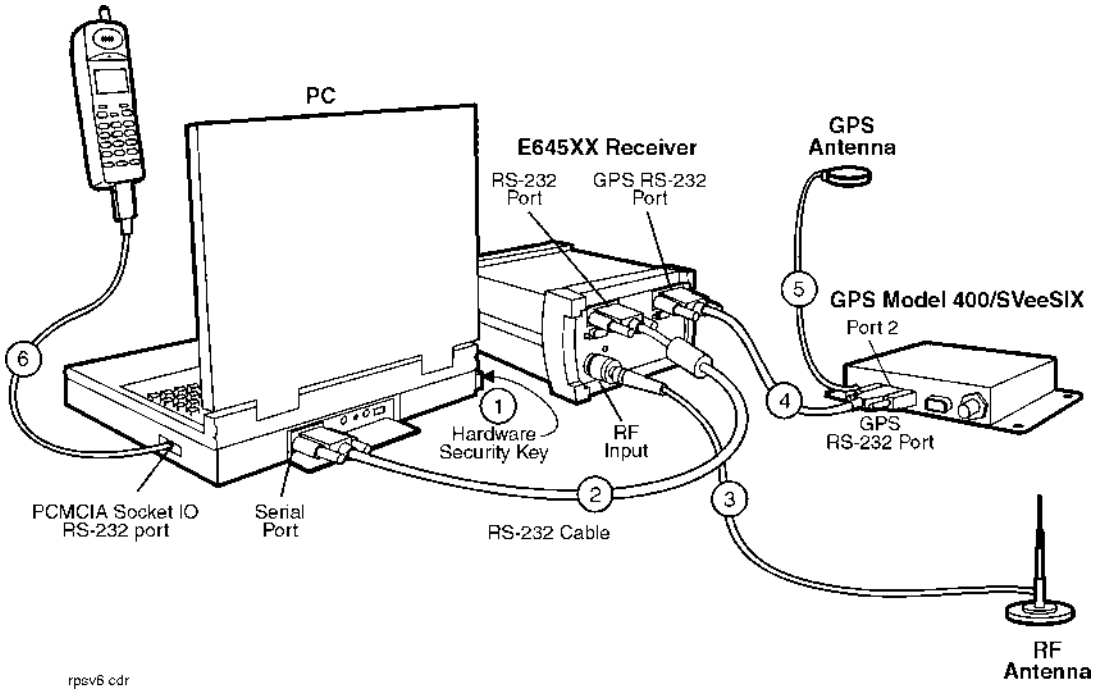


Figure 2-12 Trimble Placer GPS 400 or SVeeSix Receiver and Phone

NOTE The Trimble Placer SVeeSix Plus operates from 9 to 32 VDC (NO internal battery backup). The red wire must be tied to the positive side of the power supply. The black wire must be tied to the negative side of the power supply. Optionally, the yellow wire may be tied to a backup power source, such as a lithium battery (operates from 3.5 to 14 VDC).

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Configuring a Trimble Placer GPS 400 or SVeeSix

1. Connect the hardware security key to the parallel port of the PC.
2. Connect the serial port of the PC to the RS-232 port of the Agilent E645x receiver using the RS-232 cable included with the system. The default serial port used by the application is multiplexed serial, COM1. If your PC uses a different COM port, you can specify a different serial port number.
3. Connect the RF antenna to the RF input of the Agilent E645x receiver. Use the supplied Type-N to TNC adapter, if necessary.
4. Connect one end of a standard, straight-through, RS-232 9-pin cable to the GPS RS-232 port of the Agilent E645x receiver. Connect the other end of the RS-232 cable to the Trimble Placer GPS 400 or SVeeSix connector.
5. Connect the GPS antenna to the GPS ANT port of the Trimble Placer SVeeSix/Placer GPS 400 unit.
6. Connect the phone cable to a second COM port (different than used in step 1). On most laptop PCs this will require the use of a Socket Serial I/O RS-232 card that is installed into the PCMCIA slot on your PC.
7. Connect power to the Trimble Placer GPS 400 or SVeeSix and the PC.
8. Turn on the Trimble Placer GPS 400 or SVeeSix, the PC, and the phone and run the application.
9. Select or create the project you are going to use.
10. Select Configuration mode.
    a. Select the Hardware tab.
    b. Double-click the GPS icon, or select GPS and click **Modify.**
    c. In the Hardware Type box, select GPS (Placer DR, 400, SV6; TAIP) if the Trimble Placer GPS 400 or SVeeSix has TAIP. See part number XXXXX-63.
    d. In the Hardware Type box, select GPS (SV6, SK8; TSIP) if the Trimble Placer SVeeSix has TSIP. See part number XXXXX-61.

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e. In the Hardware Type box, select GPS (NMEA) if the Trimble Placer SVeeSix has NMEA (National Marine Electronics Association: a GPS protocol). See part number XXXXX-62.

f. Click the Port Selections and Port Settings tabs to modify and confirm the correct COM port setting for the GPS.

g. Click **OK** when you are satisfied with the settings.

NOTE If you need to change the GPS coordinate datum, select the **Advanced** tab of GPS hardware configuration box. The default datum can be set using the **Tools > Options** and selecting the Default Datum tab.

11. Configure the phone:

a. Select Configuration mode.

b. Select the Hardware tab.

c. Double-click the phone icon or select the phone icon and click the **Modify** button.

d. In the Hardware Type box, select the phone used.

e. Click the Port Selections and Port Settings tabs to modify and confirm the correct COM port setting for the phone. The port selection should be serial and select the Com port you are using.

f. Use the default port settings or use the values according to the PCMCIA Socket I/O card you are using.

g. Click **OK** when you are satisfied with the settings.

h. Select Collection mode to start the measurements.

Accept the default settings for baud rate, parity, and others.

For additional information and vehicle connections for Trimble Placer units, refer to Trimble Navigation Limited documentation.

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Trimble Placer GPS 455

The setup for the Trimble Placer GPS 455 is shown in Figure 2-13.

Before you begin the hardware installation procedure, please review "Hardware Installation Tips" on page 2-3.

If the Trimble Placer GPS 455 receiver is supplied by Agilent as option 210, all necessary cables are included. If the Trimble Placer GPS 455 receiver is customer supplied, 86154A option 212 is required.

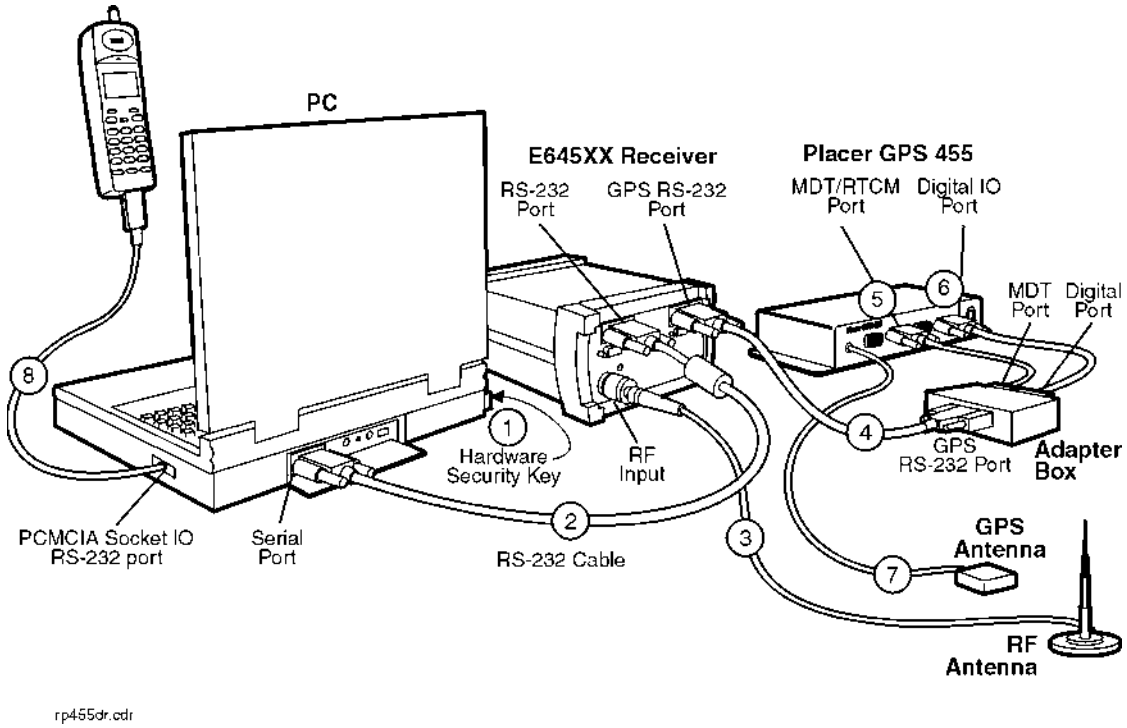


Figure 2-13 Trimble Placer GPS 455 Receiver and Phone

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NOTE The Trimble Placer GPS 455 operates on 10 to 32 VDC (internal battery backup keeps the last GPS settings). The red and white wires must be tied to the positive side of the power supply. The black wire must be tied to the negative side of the power supply. To turn on the GPS receiver when starting the vehicle, the white wire must be tied to the ignition switch.

Configuring a Trimble Placer GPS 455

1. Connect the hardware security key to the parallel port of the PC.
2. Connect the serial port of the PC to the RS-232 port of the Agilent E645x receiver using the RS-232 cable included with the system. The default serial port used by the application is multiplexed serial, COM1. If your PC uses a different COM port, you can specify a different serial port number.
3. Connect the RF antenna to the RF input of the Agilent E645x Receiver. Use the supplied Type-N to TNC adapter, if necessary.
4. Connect the GPS RS-232 port of the Agilent E645x receiver to the GPS RS-232 port of the adapter box, using the RS-232 straight-through cable.
5. Connect the MDT port of the adapter box to the MDT/RTCM port of the Trimble Placer GPS 455 unit, using the RS-232 straight-through cable.
6. Connect the digital port of the adapter box to the Digital IO port of the Trimble Placer GPS 455 unit, using the RS-232 straight-through cable.
7. Connect the GPS antenna to the GPS ANT port of the Trimble Placer GPS 455 unit. Agilent Technologies recommends that a “bulkhead mount” GPS antenna be used whenever possible for improved performance.
8. Connect the phone cable to a second COM port (different than used in step 1). On most laptop PCs this will require the use of a Socket Serial I/O RS-232 card that is installed into the PCMCIA slot on your PC.
9. Turn on the Trimble Placer GPS 455 unit, the PC, and the phone.

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10. Configure the Trimble Placer GPS 455 unit for the correct settings. See "Selecting GPS Hardware" on page 3-4 for more information.
11. Configure the phone:
    a. Select Configuration mode.
    b. Select the Hardware tab.
    c. Double-click the phone icon or select the phone icon and click **Modify.**
    d. In the Hardware Type box, select the phone used.
    e. Click the Port Selections and Port Settings tabs to modify and confirm the correct COM port setting for the phone. The port selection should be serial and select the COM port you are using.
    f. Use the default port settings or use the values according to the PCMCIA Socket I/O card you are using.
    g. Click **OK** when you are satisfied with the settings.
    h. Select Collection mode to start the measurements.

NOTE Never set your GPS receiver protocol as TAIP and TSIP together. The Agilent Wireless Solutions Software is designed to work with one protocol at a time. Having both protocols active may confuse the system.

NOTE If you need to change the GPS coordinate datum, select the **Advanced** tab of GPS hardware configuration box. The default datum can be set using the **Tools > Options** and selecting the Default Datum tab.

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Trimble Placer GPS 455 & Differential

The setup for the Trimble Placer GPS 455 and Differential is shown in Figure 2-14.

Before you begin the hardware installation procedure, please review "Hardware Installation Tips" on page 2-3.

86154A option 230 provides a differential GPS, with all necessary cables included. A differential GPS may also be customer supplied.

If the Trimble Placer GPS 455 receiver is supplied by Agilent as option 210, all necessary cables are included. If the Trimble Placer GPS 455 receiver is customer supplied, 86154A option 212 is required.

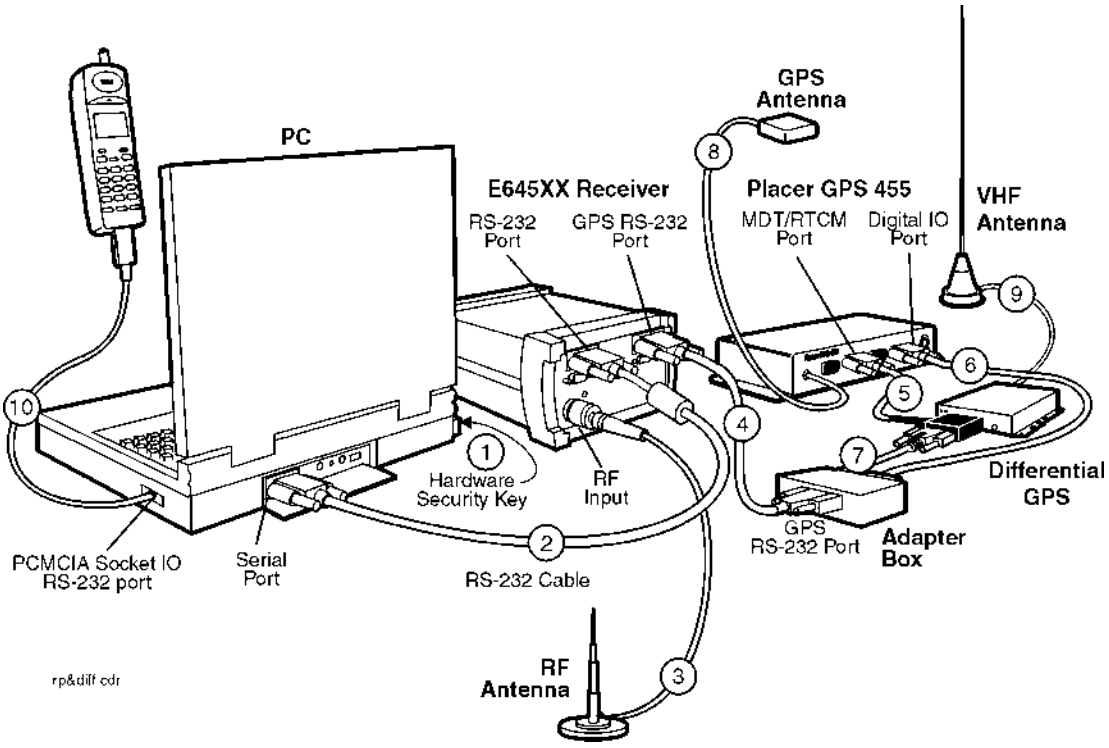


Figure 2-14 Trimble Placer GPS 455 and Differential Receiver and Phone

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Configuring a Trimble Placer GPS 455 and Differential

1. Connect the hardware security key to the parallel port of the PC.
2. Connect the serial port of the PC to the RS-232 port of the Agilent E645x receiver using the RS-232 cable included with the system. The default serial port used by the application is multiplexed serial, COM1. If your PC uses a different COM port, you can specify a different serial port number.
3. Connect the RF antenna to the RF input of the Agilent E645x receiver. Use the supplied Type-N to TNC adapter, if necessary.
4. Connect the GPS RS-232 port of the Agilent E645x receiver to the GPS RS-232 port of the adapter box, using the RS-232 cable.
5. Connect the RTCM port of the Trimble-supplied communications cable to the differential GPS receiver, using the RS-232 cable included with the system. Connect the remaining port of the Trimble-supplied communications cable to the MDT/RTCM port of the Trimble Placer GPS 455 unit.
6. Connect the digital port of the adapter box to the Digital IO port of the Trimble Placer GPS 455 unit, using the RS-232 cable.
7. Connect the MDT/RTCM port of the adapter box to the MDT port of the Trimble-supplied communications “T” cable, connected to the Differential, using the RS-232 cable.
8. Connect the GPS antenna to the GPS ANT port of the Trimble Placer GPS 455 unit. Agilent Technologies recommends that a “bulkhead mount” GPS antenna be used whenever possible for improved performance.
9. Connect the VHF Differential GPS antenna to the Differential GPS unit.
10. Connect the phone cable to a second COM port (different than used in step 1). On most laptop PCs this will require the use of a Socket Serial I/O RS-232 card that is installed into the PCMCIA slot on your PC.
11. Connect power to the differential GPS unit, the Trimble Placer GPS 455 unit, and the PC.

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12. Turn on the differential GPS unit, the Trimble Placer GPS 455 unit, the PC, and the phone. Refer to "Selecting GPS Hardware" on page 3-4 to configure the Agilent Wireless Solutions Software.
13. Configure the Trimble Placer GPS 455 unit for the correct settings. See "Selecting GPS Hardware" on page 3-4 for more information.
14. Configure the phone:
    a. Select Configuration mode.
    b. Select the Hardware tab.
    c. Double-click the phone icon or select the phone icon and click **Modify.**
    d. In the Hardware Type box, select the phone used.
    e. Click the Port Selections and Port Settings tabs to modify and confirm the correct COM port setting for the phone. The port selection should be serial and select the Com port you are using.
    f. Use the default port settings or use the values according to the PCMCIA Socket I/O card you are using.
    g. Click **OK** when you are satisfied with the settings.
    h. Select Collection mode to start the measurements.

NOTE Never set your GPS receiver protocol as TAIP and TSIP together. The Agilent Wireless Solutions Software is designed to work with one protocol at a time. Having both protocols active may confuse the system.

Configuring the Differential GPS Communications Port When Using a Differential GPS

1. If your system includes an Agilent E645x receiver 86154A option 230 differential GPS receiver, the baud rate of the **DCI** (Differential Corrections Inc.) Differential GPS model RDS 3000, and the baud rate of the Trimble GPS receiver unit must be the same.

   Please refer to the manuals supplied by Differential Corrections, Inc. and Trimble Navigation, Limited.

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2. Connect the differential GPS to the serial port of the PC.
3. Run the software supplied by DCI with the differential GPS (*rtcmon.exe*). (The file is contained on the disk that comes with 86154A option 230.)
4. Press **F1** to set the correct baud rate for the differential GPS. Use the following table to set the baud rate for the Trimble model you are using.

Table 2-3 Trimble Baud Rate Settings

Differential GPS	Use F1 to set the baud rate of the DCI model RDS 3000 differential GPS	Then use F2 to set the baud rate of the PC serial port
Placer GPS/DR	9600	9600
Trimble Placer GPS 455	9600	9600
Agilent E645x with internal GPS (Trimble model SK-8)	4800	4800

When the differential GPS is correctly configured, it will start to send legible information to the PC. If the subscription is active, this information will be correction data, otherwise it will be scanned frequencies.

NOTE If you need to change the GPS coordinate datum, select the **Advanced** tab of GPS hardware configuration box. The default datum can be set using the **Tools > Options** and selecting the Default Datum tab.

Please contact DCI for information about getting a subscription to activate your differential GPS. Once activated, it is ready to work with the Agilent Technologies system.

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Internal GPS & Internal GPS with Differential

The setup for the internal GPS, including 86154A option 230, Differential GPS, is shown in Figure 2-15. Before you begin the hardware installation procedure, please review "Hardware Installation Tips" on page 2-3.

The internal GPS can not be used with Dead Reckoning. The internal GPS can, and most often will, be used *without* the differential GPS.

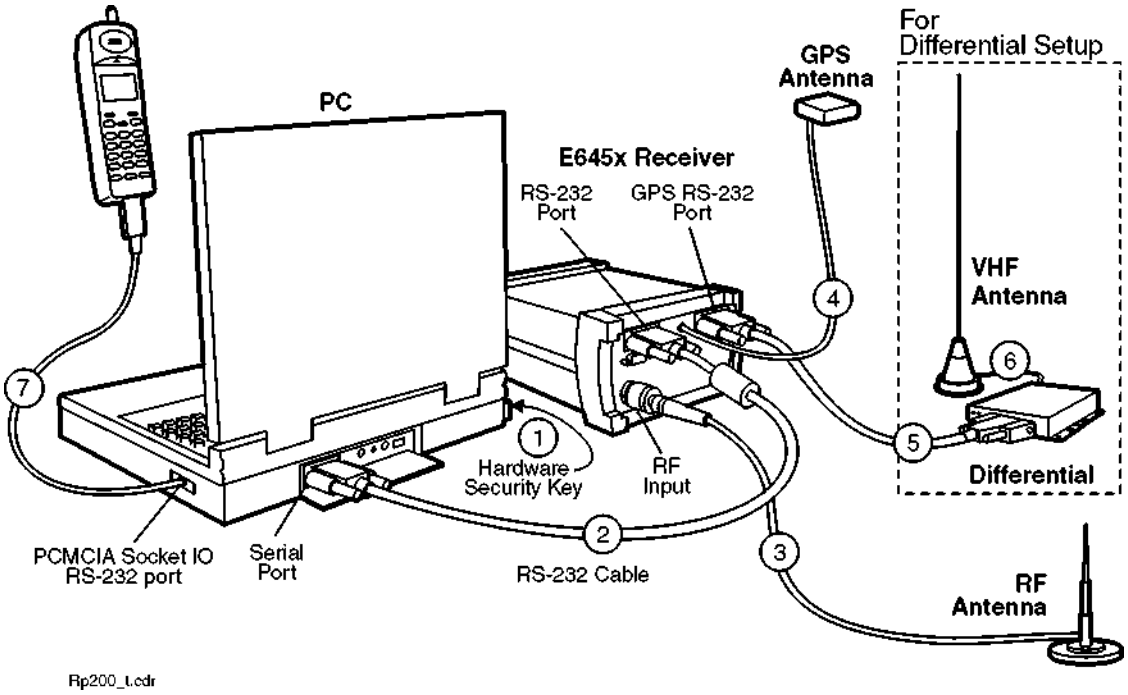


Figure 2-15 Internal GPS and Internal GPS with Differential Receiver and Phone

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Configuring an Internal GPS and Differential

1. Connect the hardware security key to the parallel port of the PC.
2. Connect the serial port of the PC to the RS-232 port of the Agilent E645x receiver using the RS-232 cable included with the system. The default serial port used by the application is multiplexed serial, COM1. If your PC uses a different COM port, you can specify a different serial port number.
3. Connect the RF antenna to the RF input of the Agilent E645x receiver. Use the supplied Type-N to TNC adapter, if necessary.
4. Connect the GPS antenna to the GPS ANT port of the Agilent E645x receiver. Agilent Technologies recommends that a "bulkhead mount" GPS antenna be used whenever possible for improved performance.

   If the system includes a differential GPS receiver, continue. If it does not, skip to step 7.
5. Connect the GPS RS-232 port of the Agilent E645x receiver to the differential GPS. The cable is included with the differential GPS receiver, 86154A option 230.
6. Connect the differential GPS VHF antenna to the differential GPS unit.
7. Connect the phone cable to a second COM port (different than used in step 1). On most laptop PCs this will require the use of a Socket Serial I/O RS-232 card that is installed into the PCMCIA slot on your PC.
8. Connect power to the Agilent E645x receiver, the PC, and the differential GPS unit, if used.
9. Turn on the differential GPS unit, the PC, and the phone.
10. Refer to "Selecting GPS Hardware" on page 3-4 to configure the Agilent Wireless Solutions Software.
11. Refer to "Configuring the Differential GPS Communications Port When Using a Differential GPS" on page 2-46 for instructions on setting the COM ports.

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Trimble Placer GPS 455 with Dead Reckoning

The setup for the Trimble Placer GPS 455 with Dead Reckoning is shown in Figure 2-16.

Before you begin the hardware installation procedure, please review "Hardware Installation Tips" on page 2-3.

If the Trimble Placer GPS 455 receiver is supplied by Agilent as option 210, all necessary cables are included. If the Trimble Placer GPS 455 receiver is customer supplied, 86154A option 212 is required.

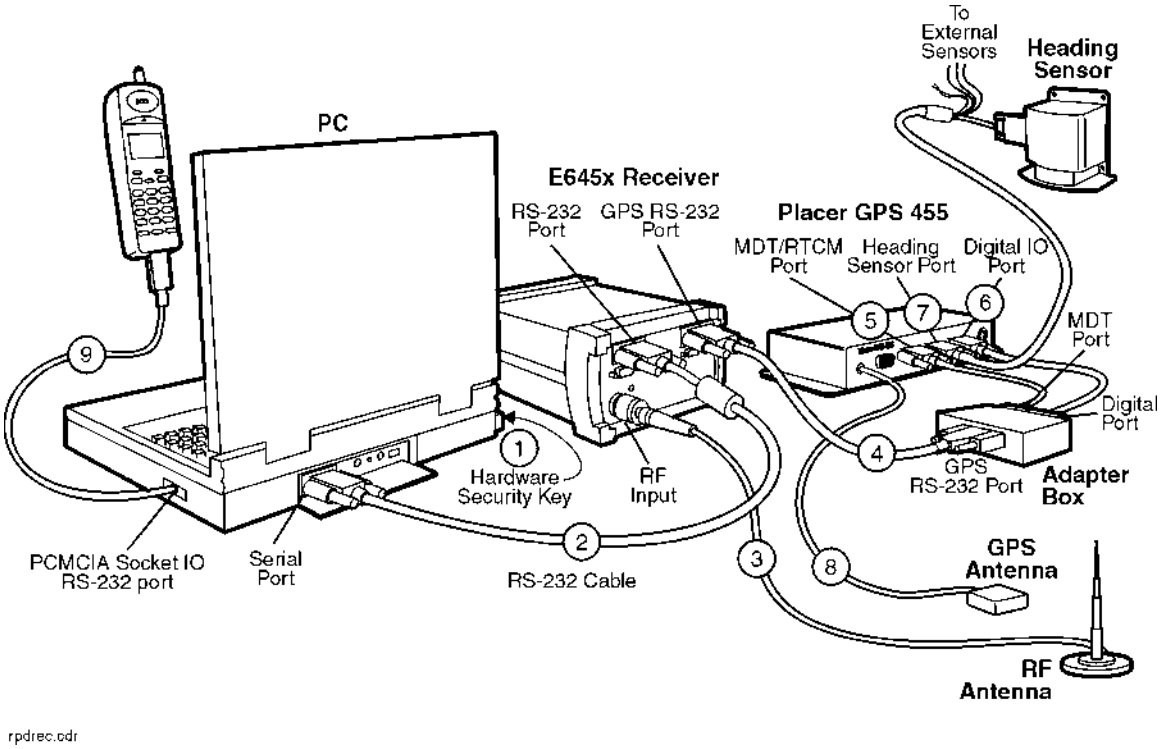


Figure 2-16 Trimble Placer GPS 455 with Dead Reckoning Receiver and Phone

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Configuring a Trimble Placer GPS 455 with Dead Reckoning

NOTE When the heading sensor is connected to the GPS 455 receiver, Dead Reckoning must be calibrated before the software will provide correct GPS information.

1. Connect the hardware security key to the parallel port of the PC.
2. Connect the serial port of the PC to the RS-232 port of the Agilent E645x receiver using the RS-232 cable included with the system. The default serial port used by the application is multiplexed serial, COM1. If your PC uses a different COM port, you can specify a different serial port number.
3. Connect the RF antenna to the RF input of the Agilent E645x receiver. Use the supplied Type-N to TNC adapter, if necessary.
4. Connect the GPS RS-232 port of the Agilent E645x receiver to the GPS RS-232 port of the adapter box, using the RS-232 cable.
5. Connect the MDT port of the adapter box to the MDT/RTCM port of the Trimble Placer GPS 455 unit, using the RS-232 straight through cable.
6. Connect the digital port of the adapter box to the Digital IO port of the Trimble Placer GPS 455 unit, using the RS-232 cable.
7. Connect the Heading Sensor to the HS port of the Trimble Placer GPS 455 through the female 9-pin connector on the DR sensor cable supplied by Trimble. See Figure 2-16. The connector labeled Heading Sensor connects to the heading sensor; the connector labeled Sensors connects to the Placer GPS 455. See Figure 2-17.
8. Connect the GPS antenna to the GPS ANT port of the Trimble Placer GPS 455 unit. Agilent Technologies recommends that a “bulkhead mount” GPS antenna be used whenever possible for improved performance.

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9. Connect the phone cable to a second COM port (different than used in step 1). On most laptop PCs this will require the use of a Socket Serial I/O RS-232 card that is installed into the PCMCIA slot on your PC.
10. Turn on the Trimble Placer GPS 455, the Agilent E645x receiver, the PC, and phone.
11. Calibrate the DR unit using Trimble supplied software *Plcrinit.exe* or GPSSK. If you do not have this software, it is available on the Trimble web page. For more details and the URL, refer to page 2-2.
12. Start the Agilent Technologies application software. Verify that both the software and the Trimble Placer GPS 455 are configured for the same communication protocol.
13. Configure the Trimble Placer GPS 455 unit for the correct settings. See “Selecting GPS Hardware” on page 3-4 for more information.
14. Configure the phone:
    a. Select Configuration mode.
    b. Select the Hardware tab.
    c. Double-click the phone icon or select the phone icon and click **Modify**.
    d. In the Hardware Type box, select the phone used.
    e. Click the Port Selections and Port Settings tabs to modify and confirm the correct COM port setting for the phone. The port selection should be serial and select the Com port you are using.
    f. Use the default port settings or use the values according to the PCMCIA Socket I/O card you are using.
    g. Click **OK** when you are satisfied with the settings.
    h. Select Collection mode to start the measurements.

NOTE Never set your GPS receiver protocol as TAIP and TSIP together. The Agilent Wireless Solutions Software is designed to work with one protocol at a time. Having both protocols active may confuse the system.

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NOTE If you need to change the GPS coordinate datum, select the **Advanced** tab of GPS hardware configuration box. The default datum can be set using the **Tools > Options** and selecting the Default Datum tab.

For additional information and vehicle connections for Trimble Placer units, refer to Trimble Navigation Limited documentation.

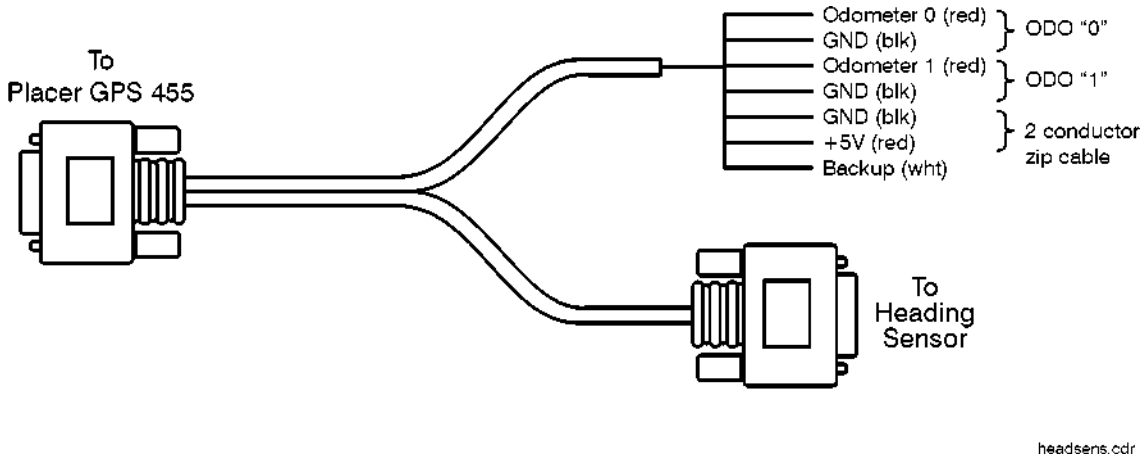


Figure 2-17 Heading Sensor Cable

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Phone-Based System Setup

Trimble Placer GPS/DR

The setup for the Trimble Placer GPS/DR is shown in Figure 2-18.

Before you begin the hardware installation procedure, please review "Hardware Installation Tips" on page 2-3.

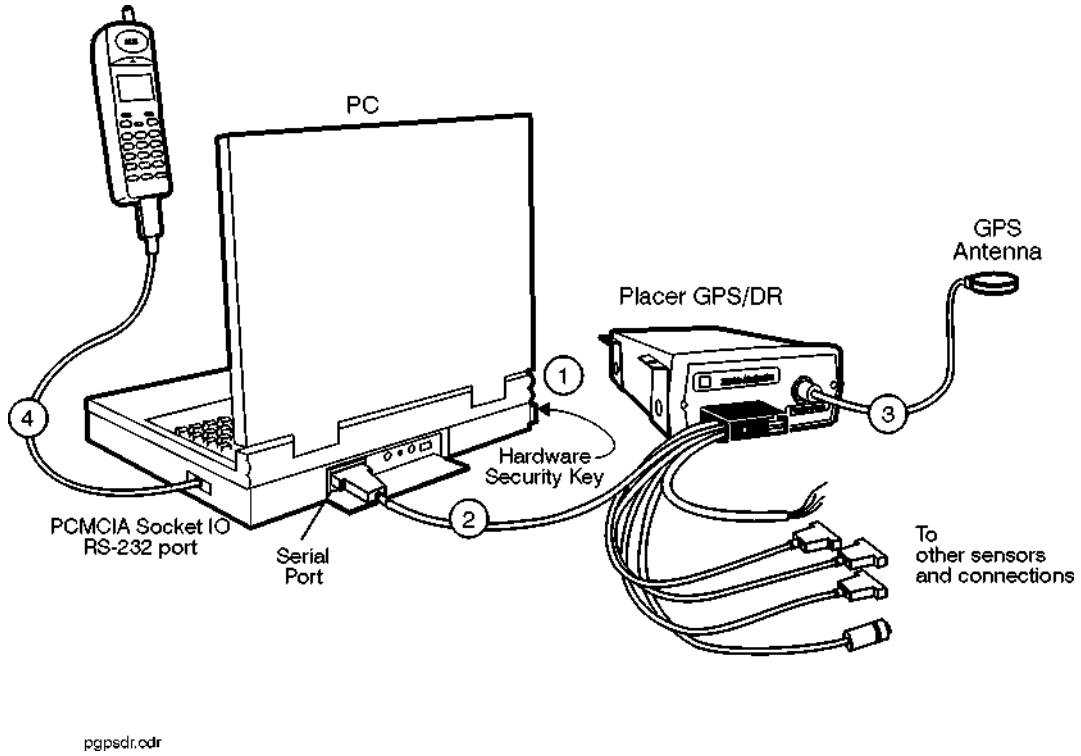


Figure 2-18 Trimble Placer GPS/DR with Phone

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Configuring with a Trimble Placer GPS/DR

1. Connect the hardware security key to the parallel port of the PC.
2. Connect the serial port of the PC to the RS-232 port of the Placer GPS/DR using an RS-232 cable from the Trimble connector. The default serial port used by the application is serial, COM1. If your PC uses a different com port, you can specify a different serial port number.
3. Connect the GPS antenna to the GPS ANT port of the Trimble Placer GPS/DR. Agilent Technologies recommends that a “bulkhead mount” GPS antenna be used whenever possible for improved performance.
4. Connect the phone cable to a second COM port (different than used in step 1). On most laptop PCs this will require the use of a Socket Serial I/O RS-232 card that is installed into the PCMCIA slot on your PC.
5. Connect power to the Trimble Placer GPS/DR and the PC.
6. Turn on the Trimble Placer GPS/DR, the phone, and the PC. Run the application.
7. Select or create the project you are going to use.
8. Configure the GPS unit for the TAIP protocol:
    a. Select Configuration mode.
    b. Select the Hardware tab.
    c. Double-click the GPS icon, or select GPS, then click **Modify.**
    d. In the Hardware Type box, select the GPS (Placer DR, 400, SV6; TAIP)
    e. Click **OK**.

NOTE If you need to change the GPS coordinate datum, select the **Advanced** tab of GPS hardware configuration box. The default datum can be set using the **Tools > Options** and selecting the Default Datum tab.

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9. Configure the phone:
    a. Select Configuration mode.
    b. Select the Hardware tab.
    c. Double-click the phone icon or select the phone icon and click **Modify.**
    d. In the Hardware Type box, select the phone used.
    e. Click the Port Selections and Port Settings tabs to modify and confirm the correct COM port setting for the phone. The port selection should be serial. Select the Com port you are using.
    f. Use the default port settings or use the values according to the PCMCIA Socket I/O card you are using.
    g. Click **OK** when you are satisfied with the settings.
    h. Select Collection mode to start the measurements.

Accept the default settings for baud rate, parity, and others. Verify that the software is also configured for the TAIP protocol. Refer to the GPS selection procedure.

For additional information and vehicle connections for Trimble Placer units, refer to Trimble Navigation Limited documentation.

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Trimble Placer GPS 400 or SVeeSix

The setup for the Trimble Placer GPS 400/Placer SVeeSix is shown in Figure 2-19.

Before you begin the hardware installation procedure, please review "Hardware Installation Tips" on page 2-3.

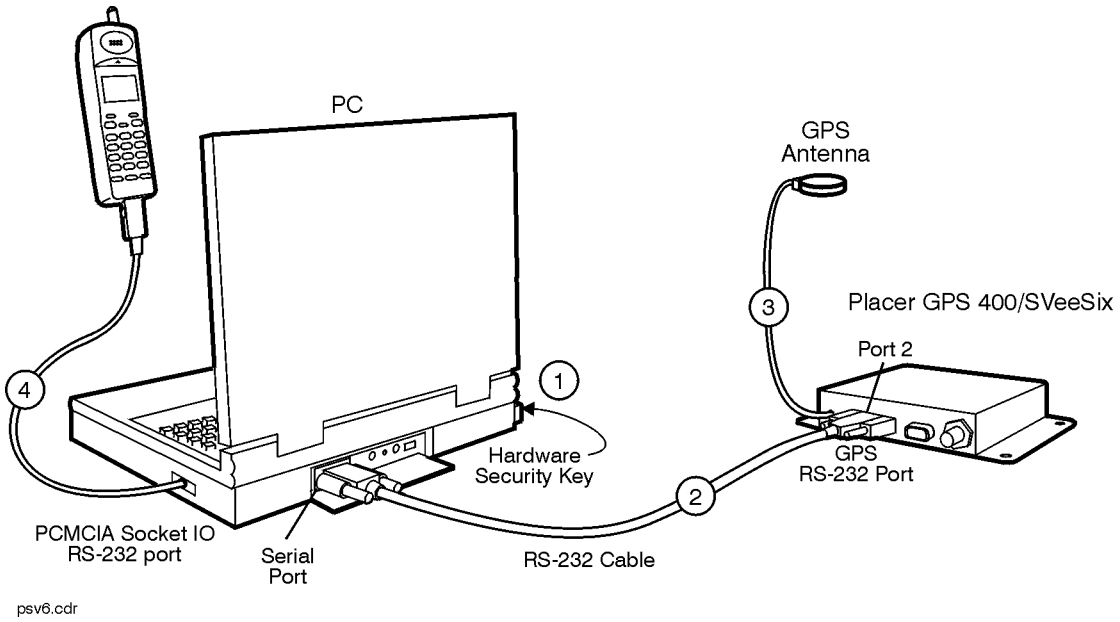


Figure 2-19 Trimble Placer GPS 400 or SVeeSix with Phone

NOTE The Trimble Placer SVeeSix Plus operates from 9 to 32 VDC (NO internal battery backup). The red wire must be tied to the positive side of the power supply. The black wire must be tied to the negative side of the power supply. Optionally, the yellow wire may be tied to a backup power source, such as a lithium battery (operates from 3.5 to 14 VDC).

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Configuring a Trimble Placer GPS 400 or SVeeSix

1. Connect the hardware security key to the parallel port of the PC.
2. Connect the serial port of the PC to the RS-232 port of the Placer GPS 400 or SVeeSix receiver using an RS-232 straight-through cable. The default serial port used by the application is multiplexed serial, COM1. If your PC uses a different com port, you can specify a different serial port number.
3. Connect the GPS antenna to the GPS ANT port of the Trimble Placer GPS 400 or SVeeSix unit.
4. Connect the phone cable to a second COM port (different than used in step 1). On most laptop PCs this will require the use of a Socket Serial I/O RS-232 card that is installed into the PCMCIA slot on your PC.
5. Connect power to the Trimble Placer GPS 400 or SVeeSix and the PC.
6. Turn on the Trimble Placer GPS 400 or SVeeSix, the PC, and the phone. Run the application.
7. Select or create the project you are going to use.
8. Select Configuration mode.
    a. Select the Hardware tab.
    b. Double-click the GPS icon, or select GPS then click **Modify**.
    c. In the Hardware Type box, select GPS (Placer DR, 400, SV6; TAIP) if the Trimble Placer SVeeSix has TAIP. See part number XXXXX-63.
    d. In the Hardware Type box, select GPS (SV6, SK8; TSIP) if the Trimble Placer SVeeSix has TSIP. See part number XXXXX-61.
    e. In the Hardware Type box, select GPS (NMEA) if the Trimble Placer SVeeSix uses NMEA. See part number XXXXX-62.
    f. Click **OK**.

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NOTE If you need to change the GPS coordinate datum, select the Advanced tab of GPS hardware configuration box. The default datum can be set using the **Tools > Options** and selecting the Default Datum tab.

9. Configure the phone:
    a. Select Configuration mode.
    b. Select the Hardware tab.
    c. Double-click the phone icon or select the phone icon and click **Modify.**
    d. In the Hardware Type box, select the phone used.
    e. Click the Port Selections and Port Settings tabs to modify and confirm the correct COM port setting for the phone. The port selection should be serial. Select the Com port you are using.
    f. Use the default port settings or use the values according to the PCMCIA Socket I/O card you are using.
    g. Click **OK** when you are satisfied with the settings.
    h. Select Collection mode to start the measurements.

Accept the default settings for baud rate, parity, and others. Verify that the system software is also configured for the correct GPS protocol.

For additional information and vehicle connections for Trimble Placer units, refer to Trimble Navigation Limited documentation.

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Trimble Placer GPS 455

The setup for the Trimble Placer GPS 455 is shown in Figure 2-20.

Before you begin the hardware installation procedure, please review "Hardware Installation Tips" on page 2-3.

If the Trimble Placer GPS 455 receiver is supplied by Agilent as option 210, all necessary cables are included. If the Trimble Placer GPS 455 receiver is customer supplied, 86154A option 212 is required.

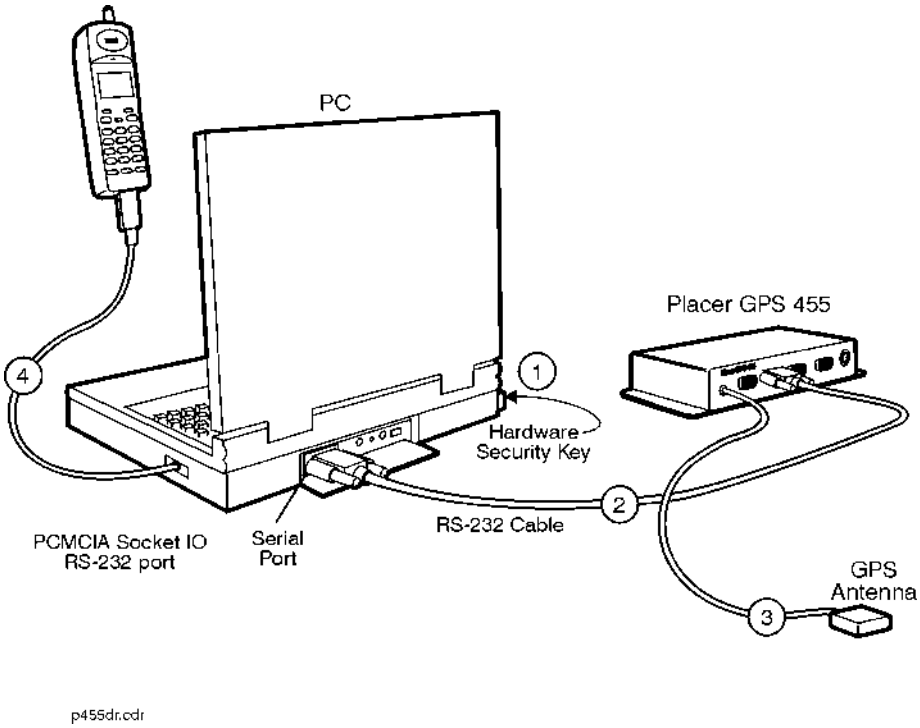


Figure 2-20 Trimble Placer GPS 455 with Phone

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NOTE The Trimble Placer 455 operates on 10 to 32 VDC (internal battery backup keeps the last GPS settings). The red and white wires must be tied to the positive side of the power supply. The black wire must be tied to the negative side of the power supply. To turn on the GPS receiver when starting the vehicle, the white wire must be tied to the ignition switch.

Configuring a Trimble Placer GPS 455

1. Connect the hardware security key to the parallel port of the PC.
2. Connect the serial port of the PC to the MDT port of the Placer GPS 455 Receiver using an RS-232 straight-through cable. The default serial port used by the application is serial, COM1. If your PC uses a different COM port, you can specify a different serial port number.
3. Connect the GPS antenna to the GPS ANT port of the Trimble Placer GPS 455 unit. Agilent Technologies recommends that a “bulkhead mount” GPS antenna be used whenever possible for improved performance.
4. Connect the phone cable to a second COM port (different than used in step 1). On most laptop PCs this will require the use of a Socket Serial I/O RS-232 card that is installed into the PCMCIA slot on your PC.
5. Turn on the Trimble Placer GPS 455 unit, the PC, and the phone.
6. Configure the Trimble Placer GPS 455 unit for the correct settings. See “Selecting GPS Hardware” on page 3-4 for more information.
7. Configure the phone:
   a. Select Configuration mode.
   b. Select the Hardware tab.
   c. Double-click the phone icon or select the phone icon and click **Modify.**
   d. In the Hardware Type box, select the phone used.
   e. Click the Port Selections and Port Settings tabs to modify and confirm the correct COM port setting for the phone. The port selection should be serial. Select the Com port you are using.

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f. Use the default port settings or use the values according to the PCMCIA Socket I/O card you are using.

g. Click **OK** when you are satisfied with the settings.

h. Select Collection mode to start the measurements.

NOTE Never set your GPS receiver protocol as TAIP and TSIP together. The Agilent Wireless Solutions Software is designed to work with one protocol at a time. Having both protocols active may confuse the system.

NOTE If you need to change the GPS coordinate datum, select the Advanced tab of GPS hardware configuration box. The default datum can be set using the **Tools > Options** and selecting the Default Datum tab.

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Trimble Placer GPS 455 & Differential

The setup for the Trimble Placer GPS 455 and differential is shown in Figure 2-21.

Before you begin the hardware installation procedure, please review "Hardware Installation Tips" on page 2-3.

86154A option 230 provides a differential GPS, with all necessary cables included. A differential GPS may also be customer supplied.

If the Trimble Placer GPS 455 DR receiver is supplied by Agilent as option 210, all necessary cables are included. If the Trimble Placer GPS 455 receiver is customer supplied, 86154A option 212 is required.

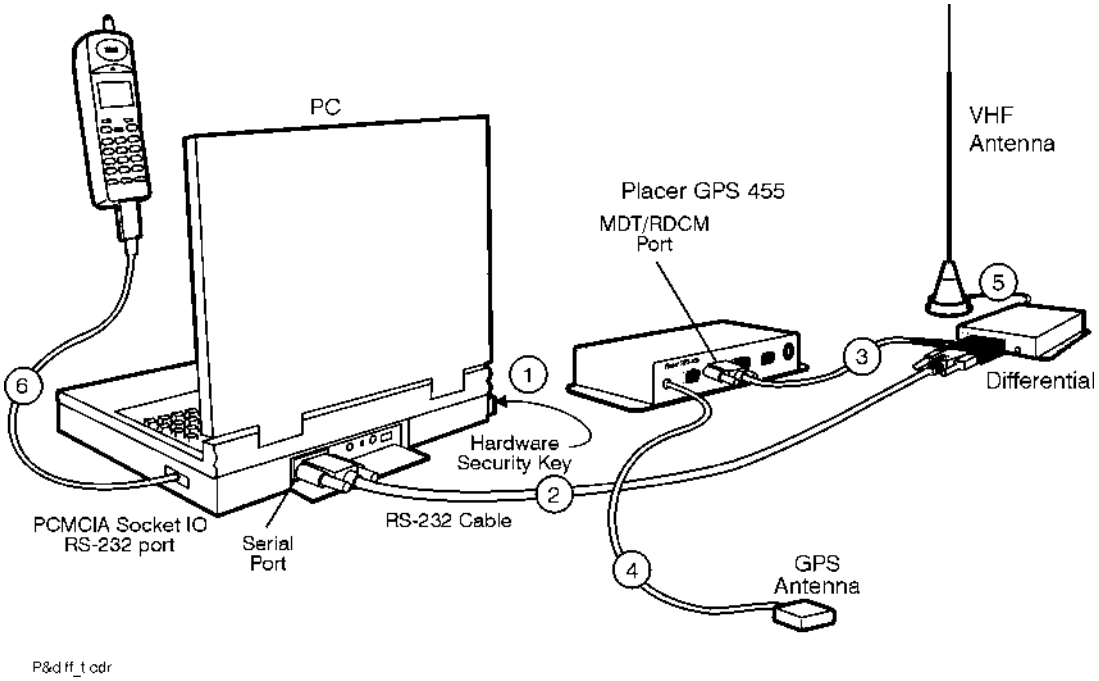


Figure 2-21 Trimble Placer GPS 455 and Differential with Phone

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Configuring a Trimble Placer GPS 455 and Differential

1. Connect the hardware security key to the parallel port of the PC.
2. Connect the serial port of the PC to the RS-232 port of the differential receiver using the RS-232 straight-through cable, connected to the RS-232 “T” cable. The default serial port used by the application is serial, COM1. If your PC uses a different COM port, you can specify a different serial port number.
3. Connect the RTCM port of the Trimble-supplied communications cable to the differential GPS receiver, using the RS-232 “T” cable included with the system. Connect the remaining port of the Trimble-supplied communications cable to the MDT/RTCM port of the Trimble Placer GPS 455 unit.
4. Connect the GPS antenna to the GPS ANT port of the Trimble Placer GPS 455 unit. Agilent Technologies recommends that a “bulkhead mount” GPS antenna be used whenever possible for improved performance.
5. Connect the VHF Differential GPS antenna to the Differential GPS unit.
6. Connect the phone cable to a second COM port (different than used in step 1). On most laptop PCs this will require the use of a Socket Serial I/O RS-232 card that is installed into the PCMCIA slot on your PC.
7. Connect power to the differential GPS unit, the Trimble Placer GPS 455 unit, and the PC.
8. Turn on the differential GPS unit, the Trimble Placer GPS 455 unit, the PC, and the phone. Refer to “Selecting GPS Hardware” on page 3-4 to configure the Agilent Wireless Solutions Software.
9. Configure the phone:
   a. Select Configuration mode.
   b. Select the Hardware tab.
   c. Double-click the phone icon or select the phone icon and click **Modify.**
   d. In the Hardware Type box, select the phone used.

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e. Click the Port Selections and Port Settings tabs to modify and confirm the correct COM port setting for the phone. The port selection should be serial. Select the Com port you are using.

f. Use the default port settings or use the values according to the PCMCIA Socket I/O card you are using.

g. Click **OK** when you are satisfied with the settings.

h. Go to **Collection** to start the measurements.

NOTE Never set your GPS receiver protocol as TAIP and TSIP together. The Agilent Wireless Solutions Software is designed to work with one protocol at a time. Having both protocols active may confuse the system.

Configuring the Differential GPS Communications Port When Using a Differential GPS

1. If your system includes an Agilent E645x receiver 86154A option 230 differential GPS receiver, the baud rate of the Differential Corrections Inc., (DCI) Differential GPS model RDS 3000, and the baud rate of the Trimble GPS receiver unit must be the same.

   Please refer to the manuals supplied by Differential Corrections, Inc. and Trimble Navigation, Limited.

2. Connect the differential GPS to the serial port of the PC.

3. Run the software supplied by DCI with the differential GPS (*rtcmon.exe*). (The file is contained on the disk that comes with 86154A option 230).

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4. Press F1 to set the correct baud rate for the differential GPS. Use the following table to set the baud rate for the Trimble model you are using.

Table 2-4 Trimble Baud Rate Settings

Differential GPS	Use F1 to set the baud rate of the DCI model RDS 3000 differential GPS	Then use F2 to set the baud rate of the PC serial port
Placer GPS/DR	9600	9600
Trimble Placer GPS 455	9600	9600
Agilent E645x with internal GPS (Trimble model SK-8)	4800	4800

When the differential GPS is correctly configured, it will start to send legible information to the PC. If the subscription is active, this information will be correction data, otherwise it will be scanned frequencies.

NOTE If you need to change the GPS coordinate datum, select the Advanced tab of GPS hardware configuration box. The default datum can be set using the **Tools > Options** and selecting the default datum tab.

Please contact DCI for information about getting a subscription to activate your differential GPS. Once activated, it is ready to work with the Agilent Technologies system.

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Trimble Placer GPS 455 with Dead Reckoning

The setup for the Trimble Placer GPS 455 with Dead Reckoning is shown in Figure 2-22.

Before you begin the hardware installation procedure, please review "Hardware Installation Tips" on page 2-3.

86154A option 210 provides a Trimble Placer GPS 455 receiver and two GPS antennas. All necessary cables and adapters are included. The speedometer interface is *not* included. If the Trimble Placer GPS 455 receiver and GPS antennas are customer supplied, 86154A option 212 (adapter and cables) is required.

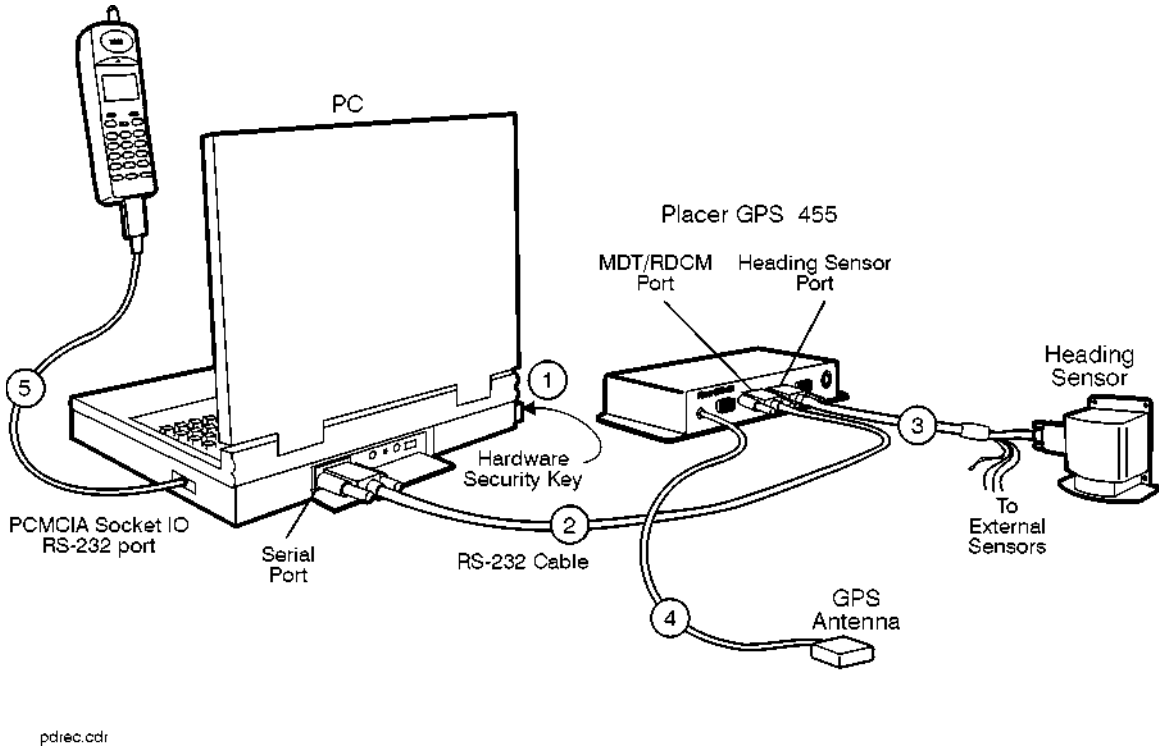


Figure 2-22 Trimble Placer GPS 455 with Dead Reckoning and Phone

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Configuring a Trimble Placer GPS 455 with Dead Reckoning

NOTE When the heading sensor is connected to the GPS 455 receiver, Dead Reckoning must be calibrated before the software will provide correct GPS information.

1. Connect the hardware security key to the parallel port of the PC.
2. Connect the serial port of the PC to the MDT port of the Trimble Placer GPS 455 using an RS-232 straight-through cable. The default serial port used by the application is serial, COM1. If your PC uses a different COM port, you can specify a different serial port number.
3. Connect the Heading Sensor to the HS port of the Trimble Placer GPS 455 through the female 9-pin connector on the DR sensor cable supplied by Trimble. See Figure 2-10. The connector labeled Heading Sensor connects to the heading sensor; the connector labeled Sensors connects to the Placer GPS 455.
4. Connect the GPS antenna to the GPS ANT port of the Trimble Placer GPS 455 unit. Agilent Technologies recommends that a “bulkhead mount” GPS antenna be used whenever possible for improved performance.
5. Connect the phone cable to a second COM port (different than used in step 1). On most laptop PCs this will require the use of a Socket Serial I/O RS-232 card that is installed into the PCMCIA slot on your PC.
6. Turn on the Trimble Placer GPS 455, the phone, and the PC.
7. Calibrate the DR unit using Trimble supplied software *Plcrinit.exe* or GPSSK. If you do not have this software, it is available on the Trimble web page.
8. Start the Agilent Technologies application software. Verify that both the software and the Trimble Placer GPS 455 are configured for the same communication protocol.

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9. Configure the phone:
    a. Select Configuration mode.
    b. Select the Hardware tab.
    c. Double-click the phone icon or select the phone icon and click **Modify.**
    d. In the Hardware Type box, select the phone used.
    e. Click the Port Selections and Port Settings tabs to modify and confirm the correct COM port setting for the phone. The port selection should be serial and select the Com port you are using.
    f. Use the default port settings or use the values according to the PCMCIA Socket I/O card you are using.
    g. Click **OK** when you are satisfied with the settings.
    h. Select Collection mode to start the measurements.

NOTE Never set your GPS receiver protocol as TAIP and TSIP together. The Agilent Wireless Solutions Software is designed to work with one protocol at a time. Having both protocols active may confuse the system.

For additional information and vehicle connections for Trimble Placer units, refer to Trimble Navigation Limited documentation.

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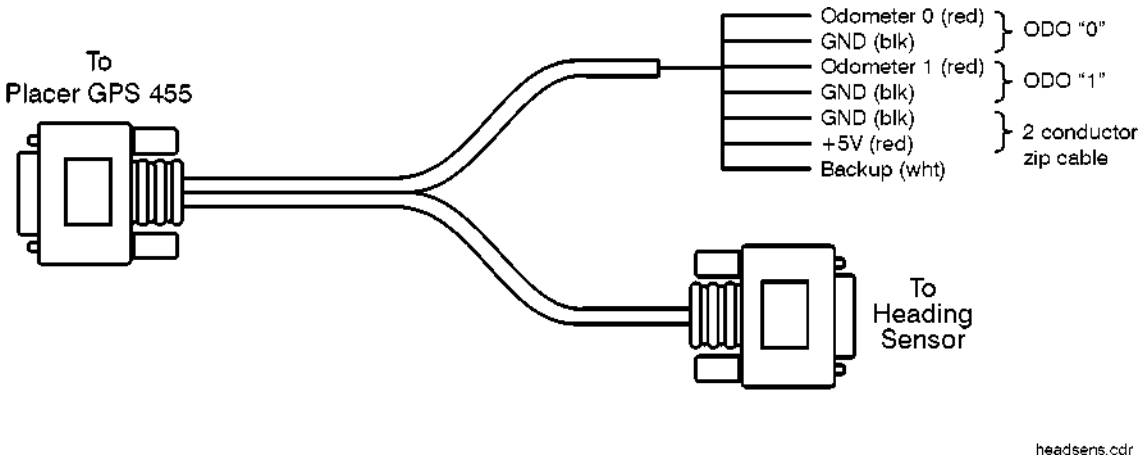


Figure 2-23 Heading Sensor Cable

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Configuring Multiple Receivers and Phones

The Agilent Wireless Solutions support up to four receivers (all options) and/or four phones (option 150 only).

Multiple Receivers

NOTE When connecting multiple receivers, it is recommend that you use the automatic configuration wizard. For more information refer "Automatic Configuration" on page 2-5.

When you configure multiple receivers, only one receiver (the **master receiver**) is physically connected to the computer and is able to supply input from the GPS. You attach an external GPS system (unless it has internal GPS) to the master receiver only. The other receiver(s) receive their GPS signal from the master receiver via the cabling shown in Figure 2-24. If other receivers contain internal GPS systems, their GPS is ignored. When you configure the receivers in the software, do not attempt to configure more than one GPS receiver (the one provided by the master receiver).

If you are using an external GPS, refer to the appropriate section (see Table 2-1 on page 2-7) for instructions on how to connect it to your master receiver. The setup for multiple receivers is shown in Figure 2-24.

Before you begin the hardware installation procedure, please review "Hardware Installation Tips" on page 2-3.

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NOTE

- Each receiver you purchase comes with one short cable. Configuring multiple receivers requires a short cable for each receiver, but only one long cable, so you may end up with some extra cables. Cables can be ordered using Agilent 86154A option 099.
- The Agilent E6450A receiver is not capable of multiple-receiver functionality. However, it can be upgraded to an Agilent E7473A Options 320 or 330. This upgrade is covered by ordering Agilent 86150A special upgrade (see your Agilent Technologies representative for more information).
- To operate multiple receivers, you must be running version A.03.01, or later, of the software, and version 3.00.00, or later, of the firmware.
- To operate multiple phones, you must be running software that supports multiple phone measurement and be using the correct hardware security key.

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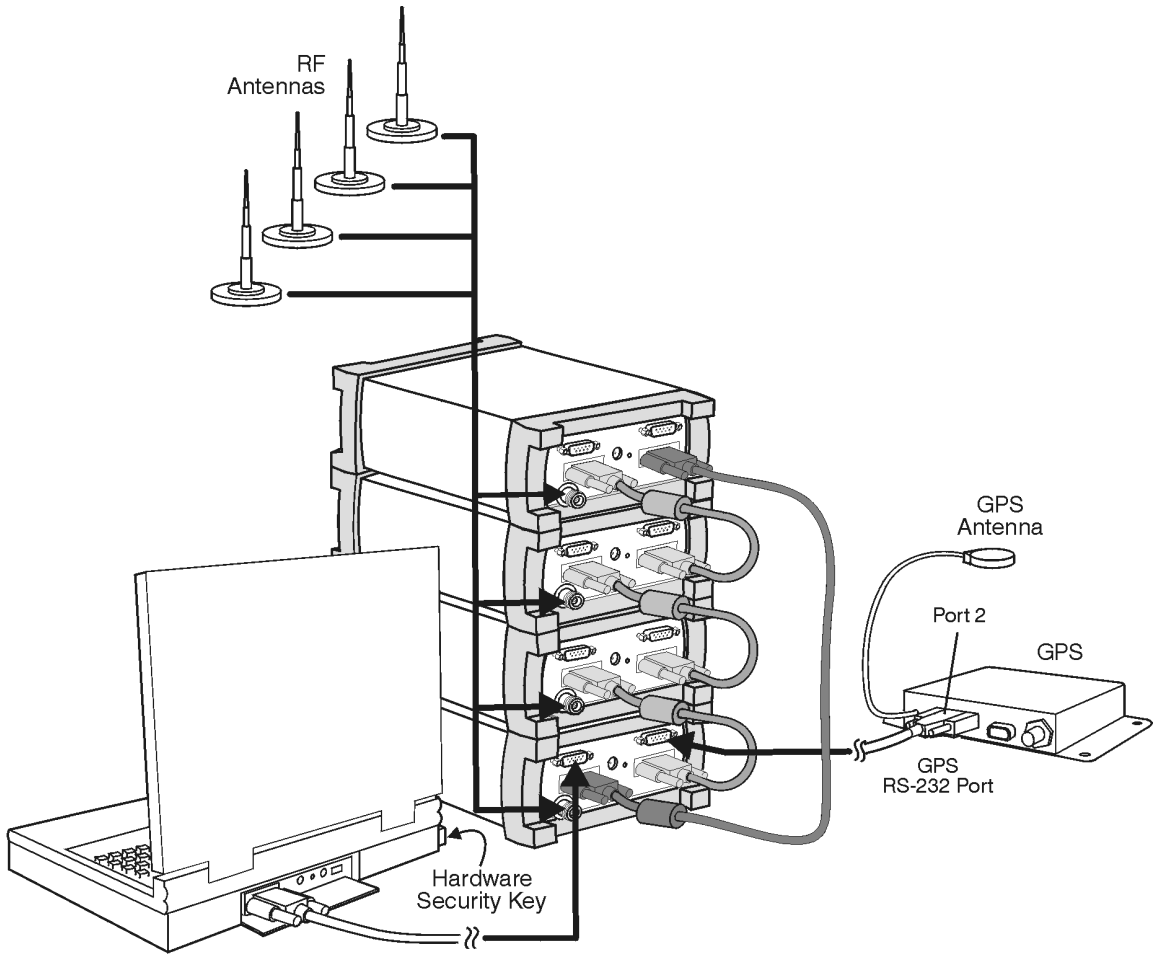


Figure 2-24 Multiple Receiver Configuration

Configuring a multiple receiver system

1. Begin by connecting the receivers to each other using the illustrations shown in Figure 2-24 on page 2-76 and Figure 2-25 on page 2-80 to guide you. Decide which receiver will act as the master receiver, the receiver to

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which you connect the computer and the GPS (or one that has internal GPS).

NOTE You should not connect GPS antennas to other, non-master receivers, which may have internal GPS. Only connect a GPS antenna to the master receiver or GPS system.

a. Attach one end of a short cable to the RX LOOP IN connector on the master receiver. Attach the other end of the short cable to the RX LOOP OUT of the second receiver. The receivers are designed to stack one on top of the other.
b. Continue to attach receivers (up to a total of four receivers) as in step a.
c. When all receivers are connected with short cables, connect one end of a long cable to the RX LOOP OUT connector on the master receiver to the RX LOOP IN on the last receiver in the series.

2. Connect the hardware security key to the parallel port of the PC.
3. Connect the serial port of the PC to the RS-232 port of the master receiver with an RS-232 cable. The default serial port used by the application is multiplexed serial, COM1. If your PC uses a different com port, you can specify a different serial port number in the software when you configure the project.
4. Connect the RF antenna to the RF input of each of the Agilent E645x receivers. Use the supplied Type-N to TNC adapter, if necessary.
5. When applicable, connect the GPS system and antenna as instructed earlier in this guide. See Table 2-1, “GPS System Configurations,” on page 2-7 for the page to which to refer for your specific GPS and receiver.
6. Turn on the GPS system and the PC, and run the application.
7. Select or create the project you are going to use.

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8. To configure each individual receiver:
   a. Select Configuration mode.
   b. Choose the Hardware tab, and click **Add**. The Hardware Editor opens. (Alternatively, you can click the right mouse button to display the Edit menu, and then choose **Add**.)
   c. Enter a description of the receiver in the Description field. It is important with multiple receivers that you are very specific in your descriptions to help you identify a particular receiver in a measurement setup.
   d. Select the type of hardware you want to use from the Hardware Type drop-down list.
   e. Select the COM Port you want from the Port Selection drop-down list.
   f. Click the Port Settings tab to configure the COM port you selected.
   g. Click the Advanced tab, and indicate in the RX Loop Position box the position in which the receiver is located ("Determining Where in the Chain a Receiver Is Positioned" on page 2-79). If all receivers are unique, you can select Auto to accept the default settings which are based on the receivers' physical position.
9. Select Configuration mode.
   a. Select the **Hardware** tab.
   b. Double-click the GPS icon, or select GPS then click **Modify**.
   c. In the Hardware Type box, select the appropriate GPS system.
   d. Click **OK**.

NOTES

- If the receivers are not different models or are in unique situations (such as one receiver with the antenna on the roof and the other receiver with the antenna in an isolation box), you can set the RX loop positions yourself to ensure that you can differentiate between them for measurements and the resulting data.

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- When receiver position is assigned by the system (when you select Auto), an effort is made to match as closely as possible the physical order of the receivers.
- The receiver in position 1 has a higher data rate than receiver 2, which is higher than receiver 3, etc.

Accept the default settings for baud rate, parity, and others. See "Selecting GPS Hardware" on page 3-4 for more information.

NOTE If you need to change the GPS coordinate datum, select the Advanced tab of GPS hardware configuration box. The default datum can be set using the **Tools > Options** and selecting the Default Datum tab.

For additional information and vehicle connections for Trimble Placer units, refer to Trimble Navigation Limited documentation.

Determining Where in the Chain a Receiver Is Positioned

The position of a particular receiver in a chain of receivers is determined by its proximity in the chain to the master receiver (the receiver connected directly to the computer). The connection is made from RX LOOP OUT on one receiver to RX LOOP IN on the next in the chain. Therefore, the receiver that is connected to the master receiver's RX LOOP OUT becomes the second module in the chain. The third module is the one connected to the second one's RX LOOP OUT, and so on. Figure 2-25 on page 2-80 illustrates how the receivers are configured and numbered by the system.

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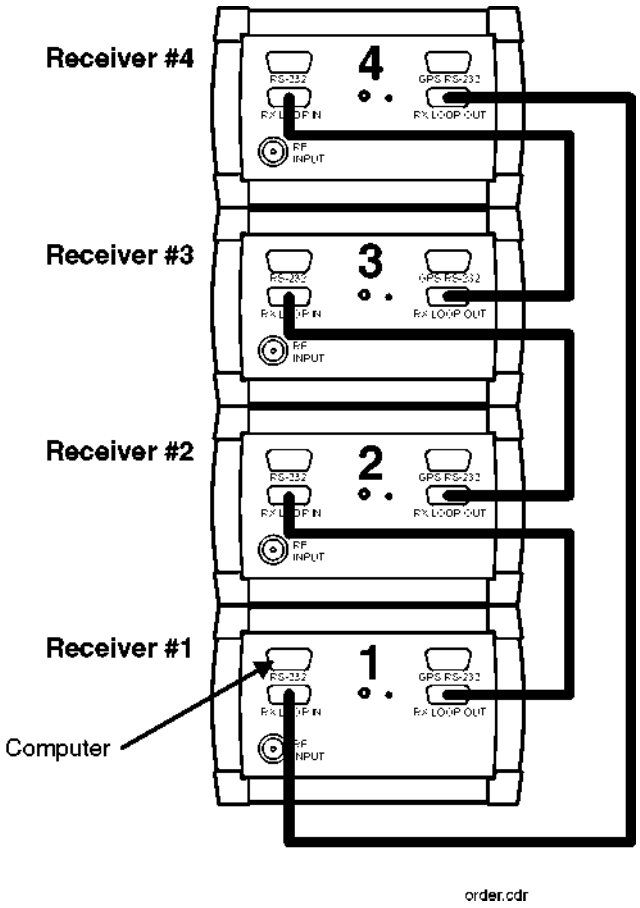


Figure 2-25 Positioning a Series of Receivers

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Multiple Phones (Option 150)

The Wireless Solutions system supports up to four phones. The phones attach to the computer via a PCMCIA card (see Figure 2-26). Agilent Technologies recommends and supports the Socket™ I/O[1] card (86154A option 020) which provides two phone connectors. Refer to the User's Guide that comes with the card for installation instructions. To attach four phones, you will need two Socket™ Port Ruggedized Serial I/O cards and your computer must have two PCMCIA slots.

NOTE NT 4.0 does not support two serial I/O cards.

Agilent 86154A option 036 can also provide four RS-232 Serial ports through a Universal Serial Bus (USB) adapter.

NOTES Be advised that when you add two cards, more resources are required than many laptops have. It is possible that you will experience slowdowns or even crashes. Please refer to Chapter 5, "Troubleshooting Resource Problems, COM Errors and GPS Problems" for recommendations on how to avoid this situation and Chapter 6, "General Hardware Specifications and Minimum System Requirements" for minimum PC requirements.

To operate multiple phones and receivers, you must be running version A.03.01 of the software or later and have the appropriate multiple resource license security key.

Before you begin the hardware installation procedure, please review "Hardware Installation Tips" on page 2-3.

1. The Socket™ Port Ruggedized Serial I/O card is produced by Socket Communications, Inc.

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Checking for a Free Interrupt

Each dual port serial I/O card you insert requires one free interrupt request (IRQ) to operate. Check the following entries in the Windows 95 help index for more information:

- Resources for hardware
- Freeing resource settings used by disabled hardware
- Troubleshooting conflicts

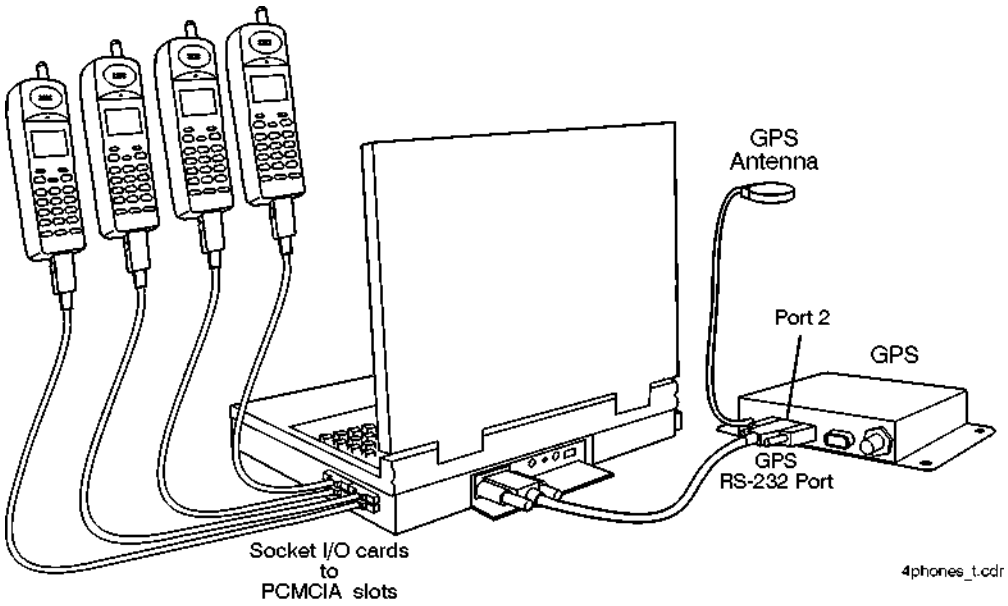


Figure 2-26 Multiple Phone Configuration

Configuring a Multiple Phone System

1. Connect the hardware security key to the parallel port of the PC.
2. Connect the GPS system and antenna as instructed earlier in this guide. See Table 2-1, “GPS System Configurations,” on page 2-7 for the page that covers your specific GPS.
3. Connect the phone cable to a second COM port (different than you use in step 2). On most laptop PCs this will require the use of a Socket Dual I/O card, installed into the PCMCIA slot on your PC. If you are installing

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three or four phones, you'll need to insert a second I/O card and then connect the additional phone cable. To verify COM port allocation:

a. On your Windows desktop, open the Start menu and choose **Settings > Control Panel** and double-click the System icon to open the System Properties window.
b. Select the Device Manager tab.
c. Open Ports (COM and LPT) and check that the COM ports you need are defined and available. Make a note of the COM numbers that are assigned.

NOTE Some I/O cards provide their own icon on the Control Panel. Select it to expedite configuration.

4. Turn on the GPS, the PC, and the phone(s), then start the application.
5. Select or create the project you are going to use.
6. Select Configuration mode.
   a. Select the Hardware tab.
   b. Double-click the GPS icon, or select GPS then click **Modify.**
   c. In the Hardware Type box, select the appropriate GPS.
   d. On the Port Selection tab, select the appropriate COM port (typically COM1). If the GPS is connected to a receiver (or is built into that receiver), connect the receiver to the main COM port.
   e. If the GPS is connected to a PC, select **Serial**. If the GPS is connected to an Agilent receiver, select **Multiplex Serial**.
   f. Click **OK**.

NOTE If you need to change the GPS coordinate datum, select the Advanced tab of GPS hardware configuration box. The default datum can be set using the **Tools > Options** and selecting the Default Datum tab.

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7. Configure each phone individually as follows:
   a. In Configuration mode, select the Hardware tab.
   b. Double-click the phone icon or select the phone icon and click **Modify** to display the Hardware editor. Or, click **Add** to add a new phone.
   c. Enter a description for the phone.

NOTE When you describe (name) a project, the more descriptive you are, the easier it will be later to distinguish among resources when you are creating measurements that use similar or multiple resources.

   d. In the Hardware Type box, select the phone type.
   e. Click the Port Selections and Port Settings tabs to modify and confirm the correct COM port setting for the phone. The port selection should be serial. Select the Com port you are using.
   f. Use the default port settings or use the values according to the PCMCIA Socket I/O card you are using.
   g. Click **OK** when you are satisfied with the settings.
8. Select Collection mode to start the measurements.

Multiple Receivers and Phones

Refer to "Multiple Receivers" on page 2-74 and "Multiple Phones (Option 150)" on page 2-81 for information about installing multiple receivers and multiple phones. There are no special considerations for installing both multiple phones and multiple receivers. Figure 2-27 on page 2-86 illustrates a sample setup.

Before you begin the hardware installation procedure, please review "Hardware Installation Tips" on page 2-3.

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NOTE The GPS must be physically connected through the Agilent receiver and designated in the software as Multiplex Serial.

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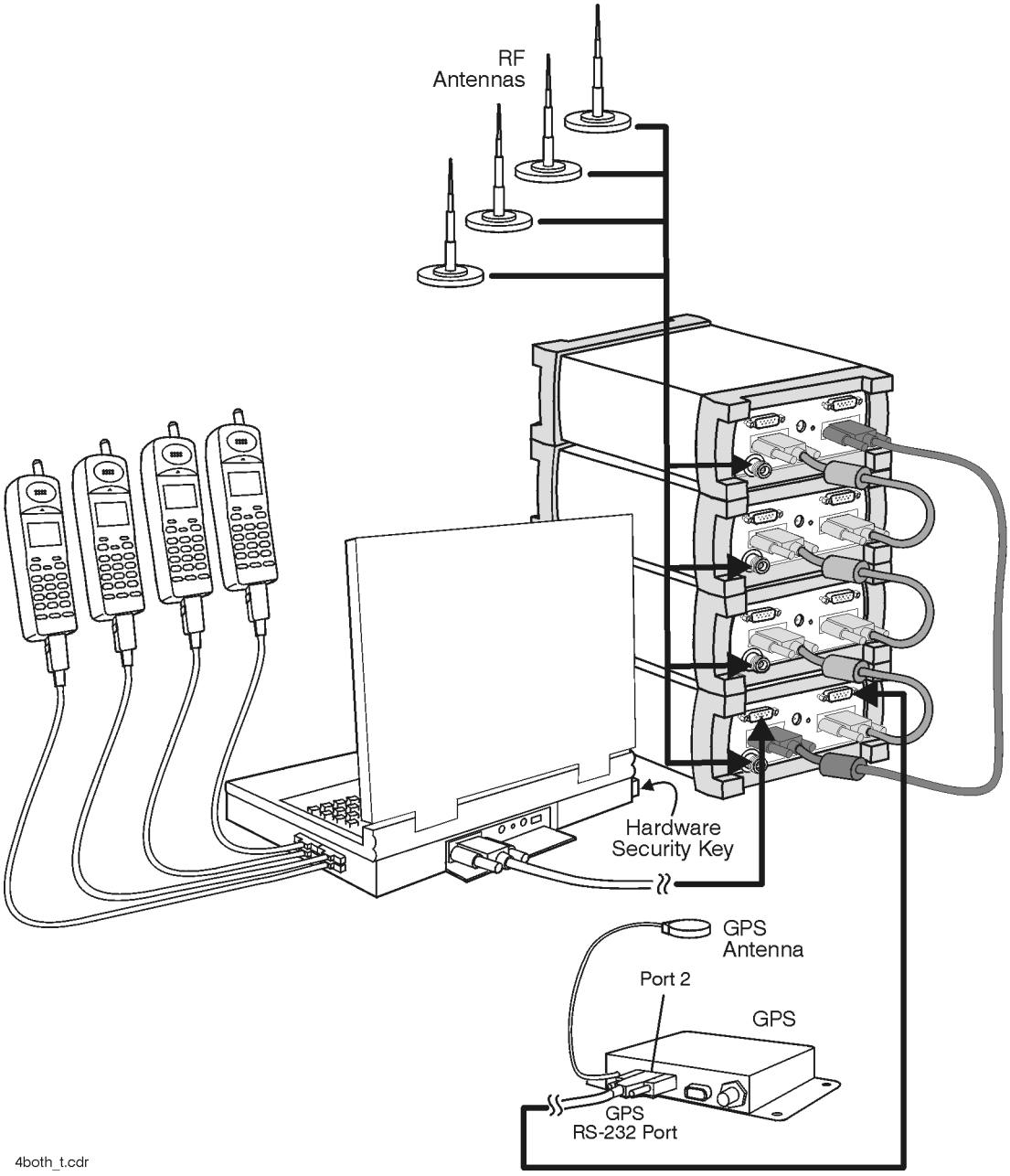


Figure 2-27 Multiple Receiver and Phone Configuration

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Universal Serial Bus (USB), 4-port Adapter Configuration

The USB-to-Serial Converter, EdgePort/4, from Inside Out Networks™ is a true plug-and-play compatible device. It reduces the number of cables required by multiplexing up to four serial ports onto one USB cable.

NOTES

- Currently only Windows 98 provides true USB and plug-and-play capability. These instructions only apply to Windows 98. In the near future, Windows NT (2000) will have plug-n-play USB support.
- The USB serial converter has an optional +5V input which in NOT required for use. The USB connection provides sufficient power to the converter to support four serial devices.

WARNING

Do not connect power to the EdgePort/4 USB. It does not require external power, even though there is a power connector on the back. Any power source that is of an incorrect voltage, such as the receiver battery, can damage the Acceleport 4.

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To Connect the USB Serial Converter for Use with a Laptop or a Non-Agilent Provided Pen Tablet

This procedure is for customers wishing to use the device on laptop systems in a drive test environment, or, indoor customers installing on their own computing device.

1. Plug in the EdgePort/4 to the USB port. The device is recognized by Windows as new hardware.
2. Insert the Windows 98 Inside Out Networks Acceleport 4 driver diskette in the device's floppy drive.

   (For the Fujitsu pen tablet computer, the floppy drive is connected via a connector exposed by removing the battery. This must be done with external power connected.)
3. Follow the directions in the New Hardware wizard to select the floppy drive as the source for the drivers.
4. The drivers load and are configured automatically. The converter is now ready to use.

To Connect the USB Serial Converter for Backpack Usage

1. Unzip the left shoulder strap pocket.
2. Feed the USB connector through the strap, out through the top, then down through the hole in the top of the backpack.
3. Pull the cable in and plug it into the USB serial converter.
4. Fasten the USB hub into the case.

CAUTION The USB connector attaches to the pen tablet on the outside of the case. As you collect data, watch that you don't bump the USB connector against your surroundings. Also, be aware of backpack dimensions and weight. Dropping or bumping the system may cause the measurement system to fail.

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Receiver Connector Panel

Make all connections *before* applying power. The default serial port used by the application is COM1. If desired, you can specify a different serial port in the application.

When the Agilent E645x receiver is turned on, the `ACTIVE` indicator is lighted. The light will turn off for 1-2 seconds during the software start up and configuration process.

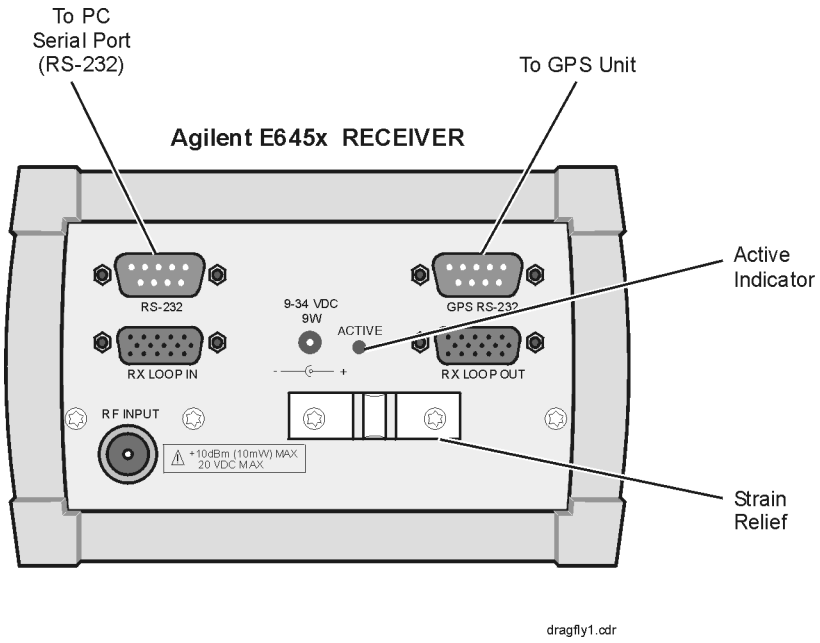


Figure 2-28 The Agilent Receiver Connector Panel

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Internal GPS Receiver Connector Panel

The receiver provides an internal GPS as identified in the application.

Make all connections *before* applying power. The default serial port used by the application is COM1. If desired, you can specify a different serial port in the application.

When the receiver is turned on, the `ACTIVE` indicator is lighted. The light will turn off for 1-2 seconds during the software start up and configuration process.

Once the receiver is turned on and the GPS antenna is properly placed, the GPS is functional; however it may take several minutes to acquire GPS lock.

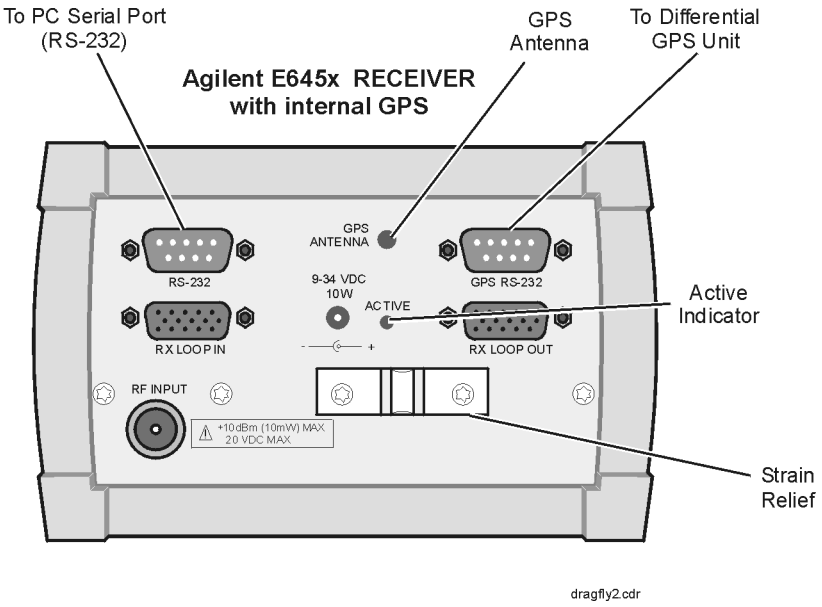


Figure 2-29 The Agilent Digital Receiver with Internal GPS, Connector Panel

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Receiver to PC Serial Port Cable Configuration

Figure 2-30 shows the pin-out specifications for the connection between the Receiver and the PC. The cable provided with the system is a “Null Modem” cable.

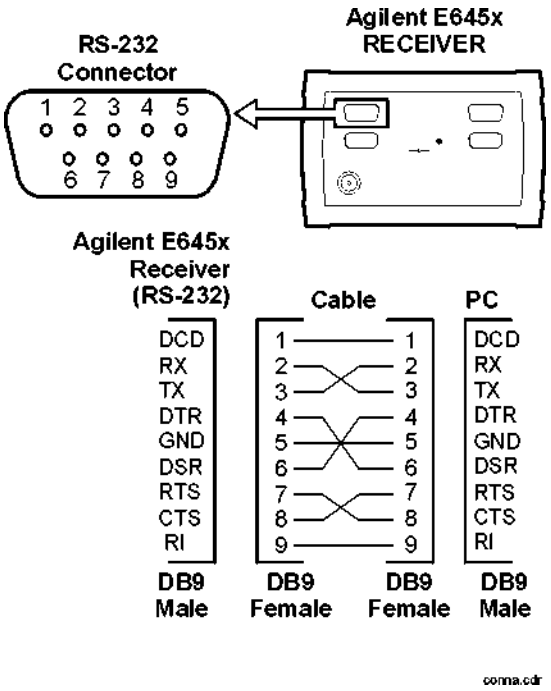


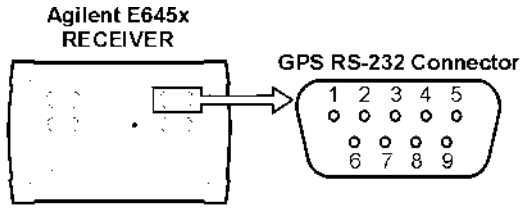
Figure 2-30 Agilent E645x Receiver Connections to PC Serial Port

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RS-232 to GPS Unit Cable Configuration

Figure 2-31 is supplied in case the GPS unit you are using is different from those described in this guide. The Agilent Wireless Solutions Software can usually operate any GPS unit employing the TAIP, TSIP, or NMEA protocols.

NOTE 1PPS must be provided on Pin 9 for CDMA Pilot and Code-Domain Power measurements, to be accurate and stable.



pin#	Connections used
1 DCD	
2 RX -	Input to Agilent E645x Receiver from the GPS unit
3 TX	Output to GPS Unit
4 DTR	
5 GND	Ground
6 DSR	
7 RTS	
8 CTS	
9 1PPS*	1 Pulse per second

* 1PPS (one pulse per second, TTL level or open collector) is supplied by the GPS unit and used as a reference in the Agilent E645x receiver.

The configuration shown is used in the following GPS Protocols:
- TSIP (Trimble Standard Interface Protocol)
- TAIP (Trimble ASCII Interface Protocol)
- NMEA (National Marine Electronics Association)

connb.cdr

Figure 2-31 RS-232 Cable Connecting the Agilent E645x Receiver to a GPS Unit

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RS-232 to Differential Unit Cable Configuration

Figure 2-32 shows the pin-out specifications for connection of the differential GPS receiver to an Agilent E645x receiver (with internal GPS).

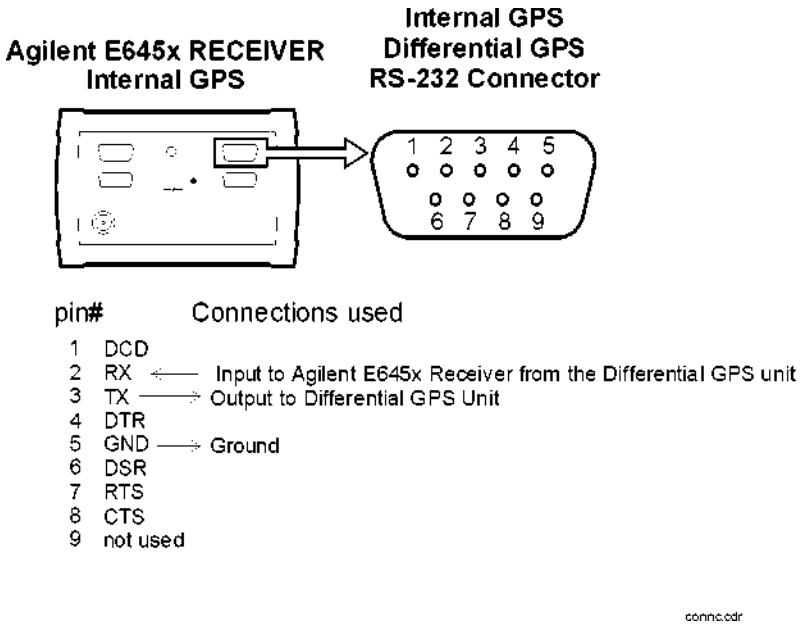


Figure 2-32 RS-232 Cable Connecting the Agilent E645x Receiver to a Differential Unit

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RX Loop In/Out Cable Configuration

Figure 2-32 shows the pin-out numbers for the cable used to connect receivers, in a multiple receiver setup. Connections are made between the Rx Loop in and Rx Loop out of the Agilent E645x receivers. The pin-out numbers apply to both the short and long cables.

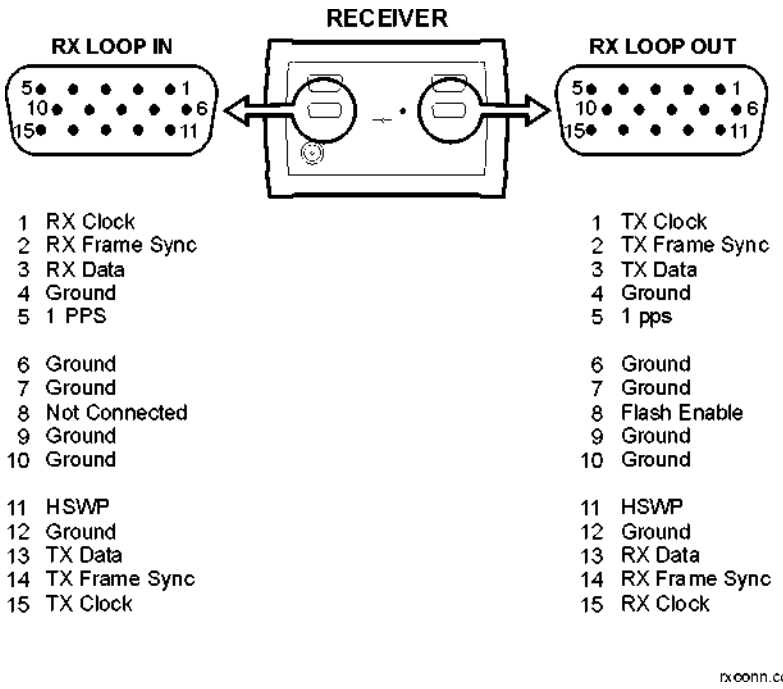


Figure 2-33 Cable Connecting the Agilent E645x Receiver to Another Agilent E645x Receiver

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Mounting the Receiver

The vehicle mounting kit is used to mount the Agilent digital receiver in a vehicle or rack. These parts are supplied with an Agilent digital receiver or can be ordered separately as 86154A Option 510.

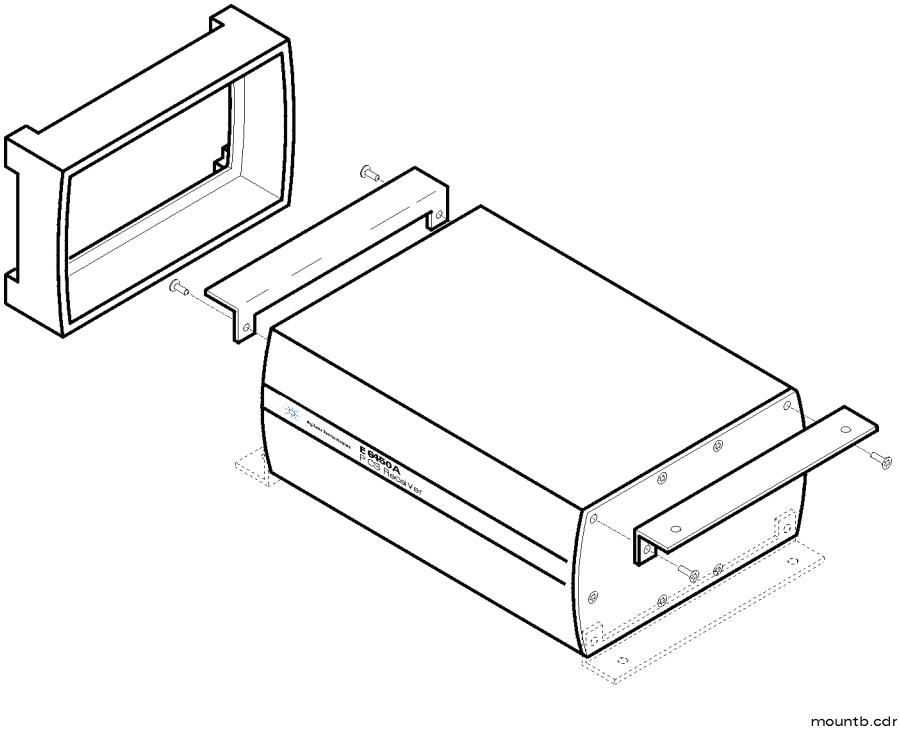


Figure 2-34 Vehicle Mounting Kit (Agilent 86154A Option 510)

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Mounting a Receiver

1. Remove the rubber bumpers from each end of the receiver.
2. To attach the brackets to the top of the receiver, remove the top two screws from the front and rear panels of the receiver.
3. To attach the brackets to the bottom of the receiver, remove the bottom two screws from the front and rear panels of the receiver.
4. Attach the brackets using the two screws you removed in step 2 (for top attachment) or step 3 (for bottom attachment).

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3

Starting and Learning to Use the Software

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What You'll Find in This Chapter

To Do This	See This
Start the software.	"Starting the Agilent Wireless Solutions Software" on page 3-3
Select GPS Hardware.	"Selecting GPS Hardware" on page 3-4
Learn to use the software.	"Using the Online Tutorial" on page 3-7
Get information about taking measurements.	"Using Online Help" on page 3-9
Start and use the License Manager.	"Using the License Manager" on page 3-12
Get an online version of this guide and other documentation (**PDF format**).	"Additional Documentation" on page 3-14

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Starting the Agilent Wireless Solutions Software

Be sure that you have installed the software. Refer to "Installing the Software" on page 1-1for instructions.

Do This	See This
1 Choose the **Start** menu and click **Programs**, then click **Agilent E74xx** (the name of your Agilent Wireless Solutions).	The options include: • Agilent E74xx Help • Agilent E74xx Series (application software) • Agilent E74xx Tutorial • Getting Started Guide • License Manager • Read Me • Support Information
2 Click **Agilent E74xx** to start the software.	The copyright screen appears for a few seconds, then the software appears on your screen, ready to use. **Note:** The first time you start the software you have the opportunity to run the online tutorial, a tool that is designed to help you get the most from the software.

CAUTION

It is possible to exceed Windows 95/98 allocated resource levels by opening too many windows while running your system. This causes erratic behavior of the application and requires the operator to reboot the operating system in order to recover. This will also corrupt an open Wireless Solutions database, with potential loss of data. Windows 95 does not display any warning or feedback when this occurs. Refer to Chapter 5, "Troubleshooting Resource Problems, COM Errors and GPS Problems" for more information.

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Selecting GPS Hardware

The Agilent Wireless Solutions Software is designed to support several types of GPS hardware. The application must be configured for your system in order to operate correctly. The following procedure describes how to select the appropriate GPS hardware.

NOTE

If you are unsure of your GPS communication protocols and configuration, use the automatic configuration wizard to set up your GPS. Refer to "Automatic Configuration" on page 2-5.

Do This	See This
1 Set up the hardware.	Chapter 2, "Setting Up Your System" for your hardware configuration.
2 Turn on the hardware.	Chapter 2, "Setting Up Your System" for your hardware configuration.
3 Turn on the PC and run the Agilent Wireless Solutions Software.	See "Starting the Agilent Wireless Solutions Software" on page 3-3.
4 Create or select a Project**.**	Project name appears in the field.
5 Select Configuration mode.	You switch to Configuration mode.
6 Select the Hardware tab.	See Figure 3-1.
7 Select **GPS**, then click **Modify**, or double-click the **GPS** icon.	You can now select the appropriate GPS protocol. See Figure 3-2.

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Do This	See This
8 In the Hardware Type box, select the appropriate GPS hardware. Click the Port Selections and Port Settings tabs to set the communications protocol for your system.	Refer to Table 4-5 on page 4-19 for a listing of the GPS protocols
9 Click **OK** when you are satisfied with the settings.	
10 Select Collection mode to start measurements.	

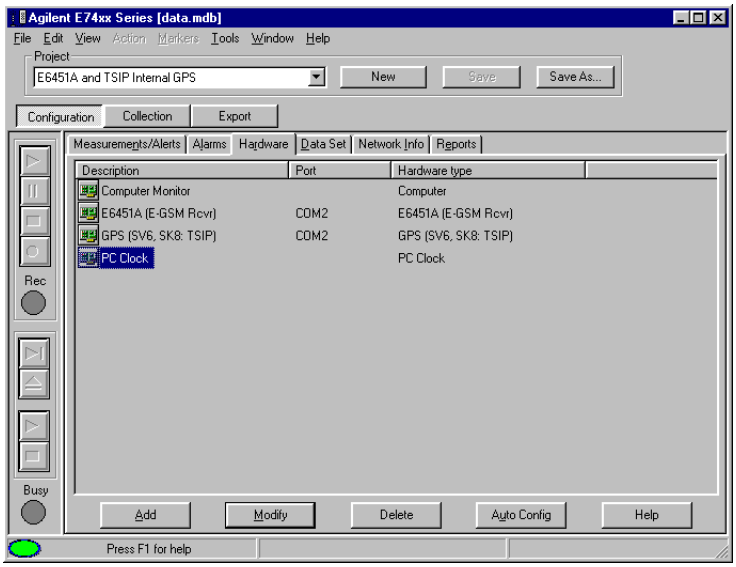


Figure 3-1 A List of Hardware in Configuration Mode

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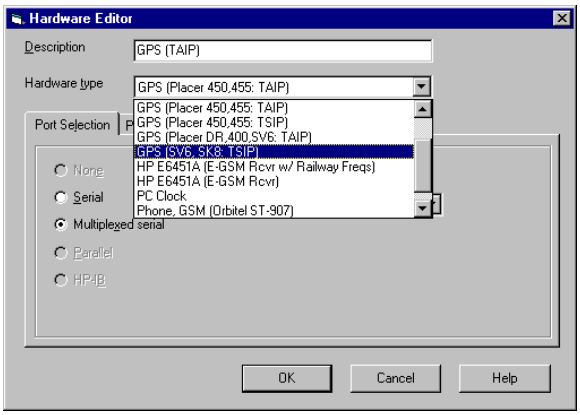


Figure 3-2 Hardware Editor Where You Select Your GPS Protocol

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Using the Online Tutorial

As part of the product, the Agilent Wireless Solutions Software includes an online tutorial. The opening screen is shown in Figure 3-3. *It is strongly recommended that you complete the online tutorial before you perform any measurements.*

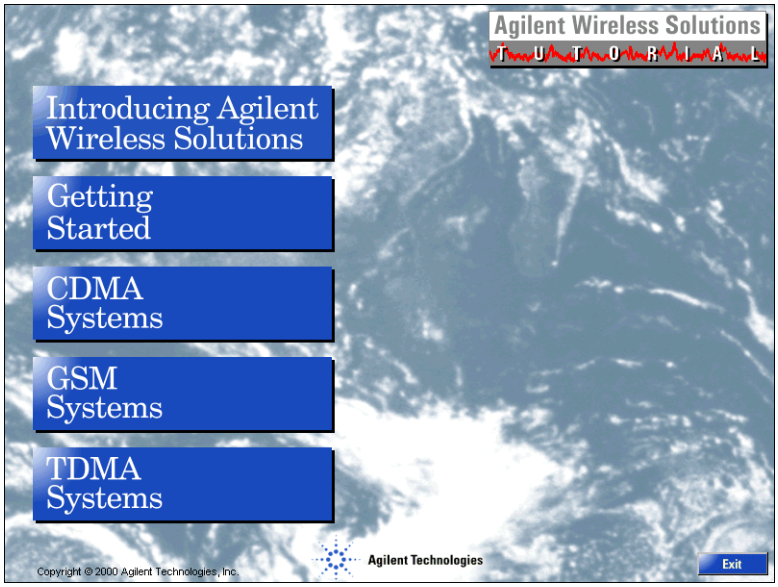


Figure 3-3 The Opening Screen of the Agilent Wireless Solutions Online Tutorial

The tutorial provides an overview of the capabilities of the Agilent Wireless Solutions. It also demonstrates the most important tasks you'll perform, and then guides you through practicing those tasks in the program.

Agilent Technologies supplies Wireless Solutions for GSM, CDMA, and TDMA systems. This tutorial includes training for all types of systems, but it is not necessary to view all parts of the tutorial if you are only going to be analyzing your particular system.

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Run the Tutorial

Do This	See This
1 Choose the Start menu and click Programs, then click Agilent E74xx (the name of your Agilent Wireless Solutions).	The options include: • Agilent E74xx Help • Agilent E74xx Series (application software) • Agilent E74xx Tutorial • Getting Started Guide • License Manager • Read Me • Support Information
2 Click **Agilent E74xx Tutorial** to start the software.	The tutorial begins as shown in Figure 3-3 on page 3-7. **Note:** The first time you start the software you have the opportunity to run the online tutorial, a tool that is designed to help you get the most from the software.

After the Tutorial

When you have finished running the tutorial, you can continue learning about the system by looking at these online help topics.

- Introducing the system
- Getting started
- Receiver Based Procedures
- Phone Based Procedures
- Importing, exporting, and mapping data

See "Using Online Help" on page 3-9 for more information.

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Using Online Help

As part of the product, the software also includes context-sensitive online help and *How Do I?* help, designed to answer many commonly asked operation and application questions. You can also select *Support Help* from the Help menu to see a description of available support resources, including phone numbers. Figure 3-4 shows sample lists of help topics.

.

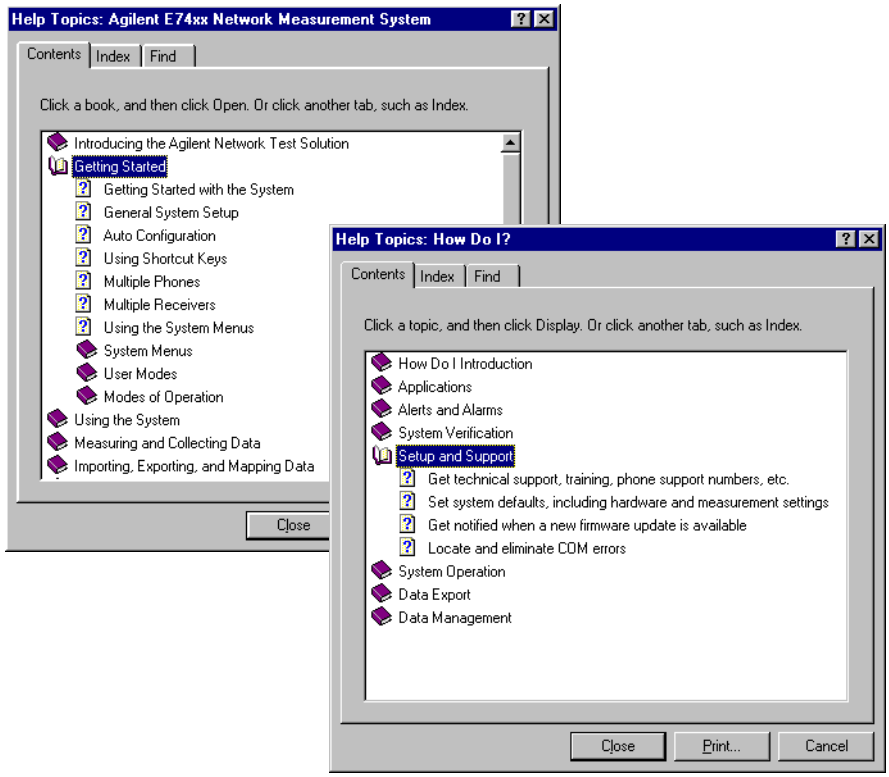


Figure 3-4 Online Help and How Do I Help Contents

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Run the Online Help

NOTE You can press **F1** when running the application software to open help for the displayed screen. If **F1** is not active, you can click the Help button.

Do This	See This
1 Choose the Start menu and click Programs, then click Agilent E74xx (the name of your Agilent Wireless Solutions).	The options include: • Agilent E74xx Help • Agilent E74xx Series (application software) • Agilent E74xx Tutorial • Getting Started Guide • License Manager • Read Me • Support Information
2 Click **Agilent E74xx Help** to start the software. Or, You can choose **Topics** from the Help menu in the Agilent E74xx software. Or, You can choose **How Do I?** from the Help menu in the Agilent E74xx software. Or, You can choose **Support** from the Help menu in the Agilent E74xx software.	The help opens, a sample of which is shown in Figure 3-4 on page 3-9.
3 Click the **Contents** tab to view all the topics in the online help. • Double-click a book icon to view its contents. • Double-click to display the topic you want.	The topic you've selected opens in the help window. Procedures can be left on the screen to guide you as you work in the software.

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Do This	See This
4 Click the **Index** tab to search through an alphabetical list of topics. • Scroll through the list or type in the text box to locate the subject you want. • Double-click the index term when you find it.	The topic you've selected opens in the help window. Procedures can be left on the screen to guide you as you work in the software.
5 Use the **Find** tab to search the online help to find topics that include the words or phrases you type in the text box. • Double-click the topic to open the help window for that topic.	The topic you've selected opens in the help window. Procedures can be left on the screen to guide you as you work in the software.
6 Click **Close** to exit help.	The help window closes.

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Using the License Manager

The hardware key that came with your Agilent Technologies system enables and secures the functionality you purchased from Agilent Technologies.

Starting the License Manager

Do This	See This
1 Choose the Start menu and click Programs, then click **Agilent E74xx** (the name of your Agilent Wireless Solutions).	The options include: • Agilent E74xx Help • Agilent E74xx Series (application software) • Agilent E74xx Tutorial • Getting Started Guide • License Manager • Read Me • Support Information
2 Click **Agilent E74xx License Manager** to start the software.	The License Manager begins showing the enabled software options, Figure 3-5 on page 3-13.

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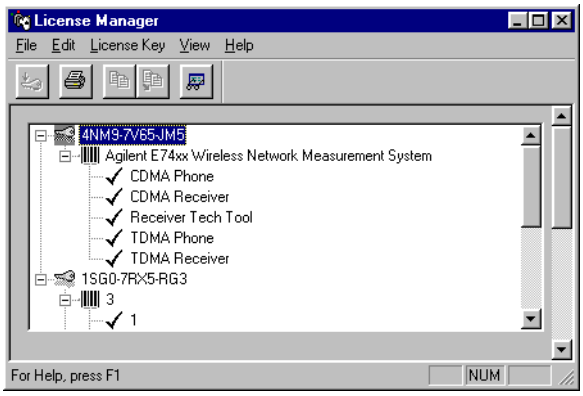


Figure 3-5 License Manager

Learning the License Manager

For further information about the Agilent Technologies License Manager, refer to the following resources:

Resource	Description
Online Help	Available from the software's Help menu or by pressing **F1**, covers all functionality. It is the program's reference and includes step-by-step instructions for basic operations.
Support	Available from the Help menu, directs you to the support provided by Agilent Technologies.

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Additional Documentation

Additional documents are supplied with your system. These include:

- This Getting Started Guide (PDF format)
- *Agilent Indoor Wireless Solutions Getting Started Guide*: a guide that describes how to use the elements of the indoor solution, such as the backpack, the hands-free platform, and the receiver batteries (PDF format).
- *Agilent E74xx System Options and Accessories Guide*: a guide containing system options and accessories, including part numbers (PDF format).

These documents can be viewed online or printed.

Location of Online Documents

The documents were installed with your software application, if you used the typical installation option. The documents were installed in the following location:

C:\Program Files\Agilent Technologies\E74xx\Documents

If you chose not to install the documents during software installation, you can copy them from the CD. The documents can be found in the following location on the CD:

D:\documents

(d: represents the drive letter of your CD-ROM reader.)

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Viewing and Printing Online Documents

Before you can view and print these documents, you must have the Adobe Reader installed on your system. For more information about PDF files and the Adobe Reader, refer to the Adobe Web site (**http://www.adobe.com**).

The Adobe Reader is supplied on your CD. Refer to "Installing Adobe Reader" on page 1-6 for more information.

NOTE The latest version of the Adobe Reader can also be downloaded from the Adobe Web site (**http://www.adobe.com**).

To View a PDF Document Installed with Your System:

Do This	Additional Information
1 From the program task bar, select Start, Programs, Adobe, Adobe Reader	The Reader software is displayed.
2 From the File menu of the Reader, select Open.	A dialog box appears listing the available drives you can read.
3 Select the C: drive and then select the documents folder. *C:\Program Files\Agilent Technologies\E74xx\Documents*	The dialog box displays the PDFs contained on your CD.
4 Choose the document you wish to view.	• **Getting Started Guide.PDF** - a PDF file of this Guide. • **Support Information.PDF** - a guide containing system and accessory options and part numbers. • **Indoor Getting Started Guide.PDF** - a guide that helps you set up your system for indoor measurements (Option 180).
5 Search for the information you require.	This can be done using: • Hypertext links (blue text) • The Adobe Reader search tool, found on the Tools menu.

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To Print a PDF Document or Sections from It:

Do This	Additional Information
1 With the document opened, search for the information you require to be printed.	
2 Note the page number(s) displayed at the bottom of the Reader.	**Note**: The page numbers shown in the document may not correspond to the page numbers displayed by the reader.
3 Select **File > Print** and configure the print options for your printer.	**CAUTION**: when printing sections from the Getting Started Guide, ensure that a page or page range is specified. The Getting Started Guide is approximately 250 pages.

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4

Verifying the System

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What You Will Find In This Chapter

There are four methods you can use to verify your system. These methods are:

Method	Additional Information
1	"Method 1: Using a Signal Generator" on page 4-3
2	"Method 2: Measuring a Known Channel in the System" on page 4-10
3	"Method 3: Measuring the Noise Floor" on page 4-13
4	"Method 4: GPS Measurement Verification Procedure" on page 4-18

If you have a phone-only system, use method 4 to verify your system. If you have an Agilent digital receiver as part of your system, you need to use at least 2 methods. These are method 4 and either method 1, or 2, or 3. Method 1 and 2 provide the highest level of confidence. Method 3 should only be used if you do not have a signal generator *and* there is no known channel in the system.

NOTE

- The verification tests are only used to alert you to possible non-operating conditions. To measure actual receiver specifications, the unit must be measured in a controlled environment, using Agilent Technologies' prescribed measurement techniques.
- Before you start the verification procedures, familiarize yourself with the system, by completing the online tutorial. See Chapter 3, "Using the Online Tutorial".

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Method 1: Using a Signal Generator

This procedure requires the Agilent 8648B signal generator. A similar signal generator can be used, providing it meets or exceeds the frequency ranges of your Agilent digital receiver and can produce an amplitude in the range of -70 dBm to -50 dBm.

CAUTIONS

The input power to the Agilent digital receiver should not exceed -10 dBm. Receiver measurements are not warranted for power levels between -10 dBm and 10 dBm. Power levels greater than 10 dBm damage the instrument.

For optimum performance, it is recommended that no more than -25 dBm be applied to the input of the Agilent digital receiver.

Do *not* connect the signal generator until you have checked the output power level is below -10 dBm.

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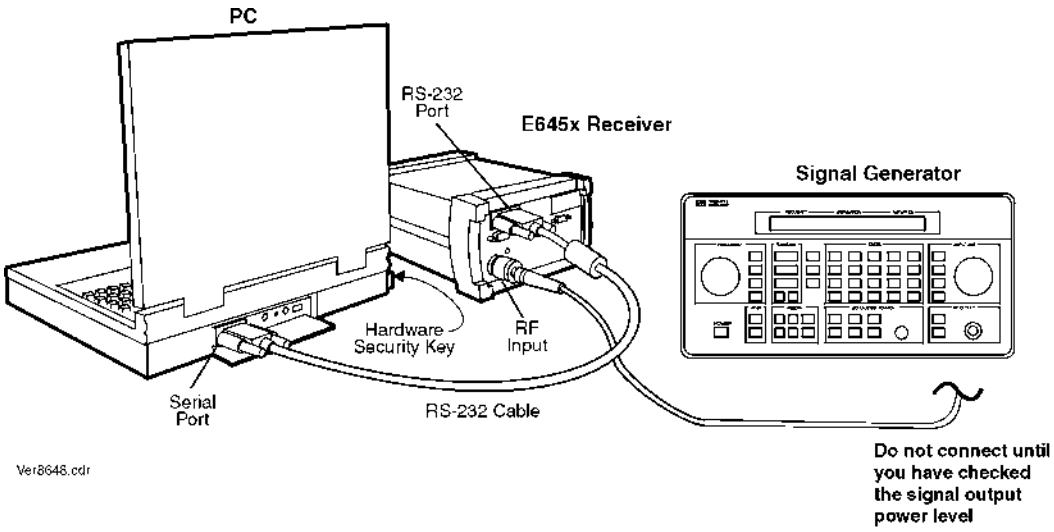


Figure 4-1 System Measurement Verification Setup Using a Signal Generator

Preparing the Hardware

Do This	Additional Information
1 Connect the system as shown in Figure 4-1, but do **not** connect the signal generator output. The Agilent receiver requires a 30 minute warm-up period to meet the guaranteed specifications.	There is a three minute delay after power-up or re-configuration, before the internal temperature sensor is activated and measurements are nominally correct. For more information on how to connect the receiver and laptop, refer to step 1 and step 2 of any of the procedures listed in Chapter 2, "Receiver-Based System Setup"
2 Depending on your system type, set the frequency/power levels using Table 4-1 on page 4-6.	
3 Check that the correct values are set on the signal generator.	Do **not** connect the signal generator at this stage.

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Preparing the Software

Do This	Additional Information
1 Start the application program by going to the Start menu, selecting Programs, Agilent E74xx.	The software starts.
2 Create a new project called ***Verification Test 1 (External generator)***.	We recommend you use the automatic configuration wizard for this process. Refer to Chapter 2, "Automatic Configuration".
3 Click **Configuration** and then add the receiver hardware.	Refer to Chapter 2, "Hardware Installation Tips"
4 Click **Collection** and select the Spectrum VFP (Virtual Front Panel)	
5 Click **Maximize** button in the upper-right corner of the main window. 	The display size increases to fill the available space.
6 Connect the signal generator output to the RF input of the receiver.	
7 Turn on the signal generator.	
8 Set the measurement software as follows: **Band:** Uplink **Frequency:** See Table 4-1 on page 4-6 **Span:** 1 MHz **Averaging:** Running **Averages:** 32	You should see a signal trace showing a single spectral peak in the middle of the display. Figure 4-2 on page 4-6 shows a example trace.

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Table 4-1 Signal Generator Uplink Settings

Model	Frequency and Power Setting
GSM1900, TDMA and CDMA PCS band systems	1879 MHz at –60 dBm
GSM DCS1800 band systems	1748 MHz at –60 dBm
GSM900 band systems	898 MHz at –60 dBm
Cellular CDMA and TDMA band systems	837 MHz at -60 dBm

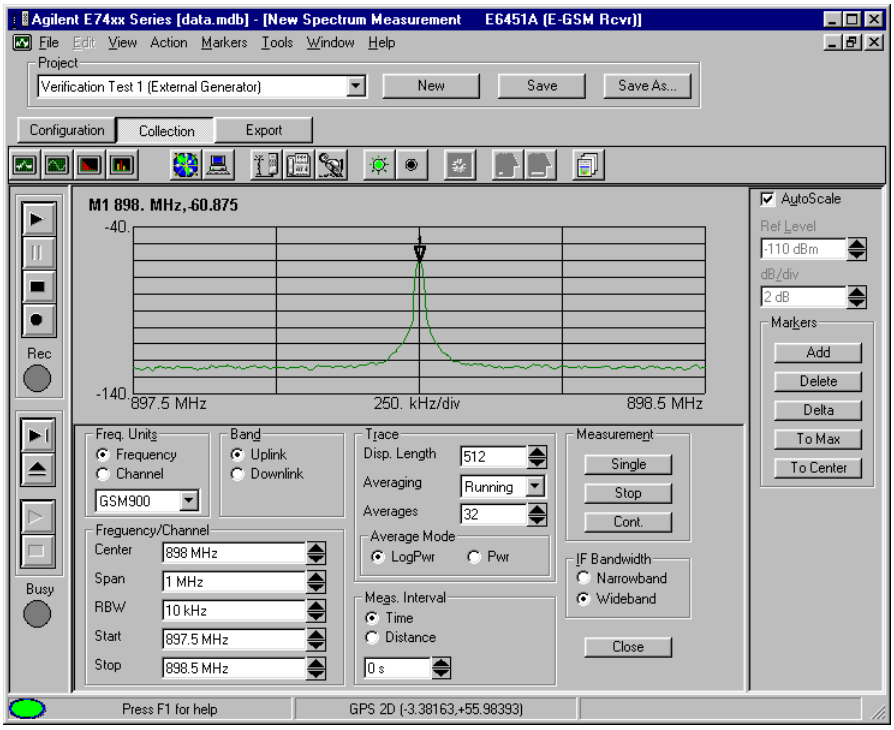


Figure 4-2 Spectrum Display with Marker Set to a Center Frequency of 898 MHz (GSM900 band system)

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Testing the Signal

Do This	Additional Information
1 In the Markers group, click **Add** and **To Max**.	The level and frequency are displayed at the top-left corner of the Spectrum display.
2 In the Band group, select Downlink.	
3 In the Freq/Channel group, change the Center frequency according to the Table 4-2.	
4 On the signal generator, set the frequency according to the Table 4-2.	You should see a signal trace showing a single spectral peak in the middle of the display. Figure 4-3 on page 4-9 shows a example trace.

Table 4-2 Signal Generator Downlink Settings

Model	Frequency and Power Settings
GSM1900, TDMA and CDMA PCS band systems	1959 MHz at -60 dBm
GSM DCS1800 band systems	1843 MHz at -60 dBm
GSM900 band systems	943 MHz at –60 dBm
Cellular CDMA and TDMA band systems	882 MHz at -60 dBm

NOTE Wait for at least one minute before using the displayed marker value. The default trace display is set to display a running average of 32. With time, the marker value will approach the value of the signal generator output.

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Accuracy

The accuracy is calculated as:

Frequency accuracy = signal generator accuracy + 1 ppm.

Amplitude accuracy = ± (0.5 dB + signal generator accuracy + mismatch error + cable loss).

Assuming the Agilent receiver and Agilent 8648B signal generator specifications, with nominal values of mismatch and cable losses of approximately 1 dB, you can expect:

- Frequency reading, approximately: Frequency selected ±450 kHz
- Amplitude reading, approximately: Amplitude selected ±2.5 dB

NOTE You can save the settings of the project at any time. If you experience measurement or configuration problems, you can refer to the settings shown in the corresponding verification test.

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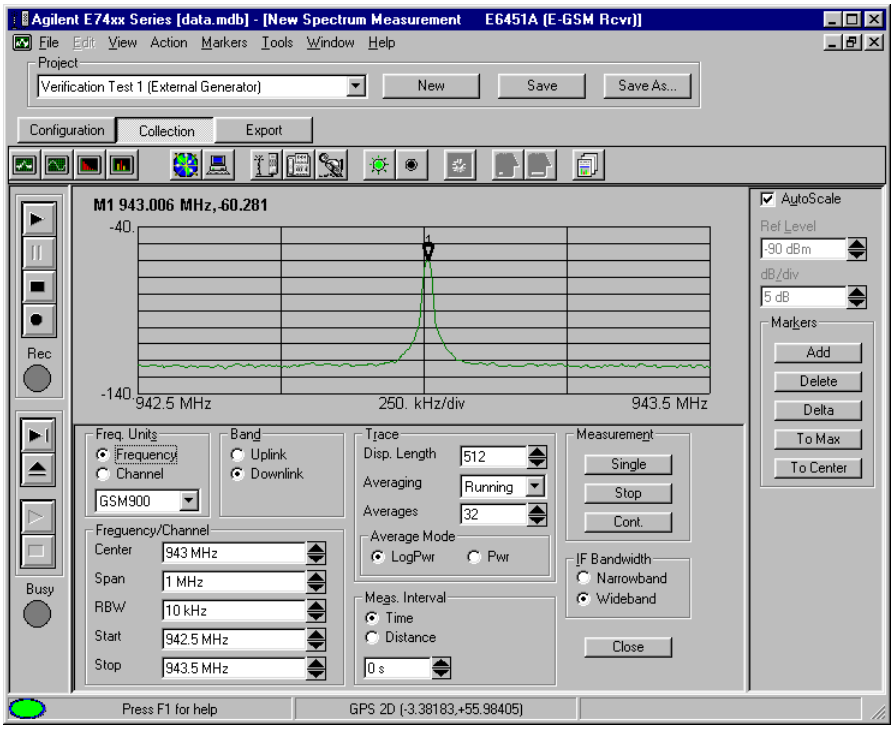


Figure 4-3 Spectrum Display with Marker Set to a Center Frequency of 943 MHz (GSM900 band system)

Passing the Test

If the display shows a single spectral peak, and reports frequency and power levels that match the output of the signal generator, the system has passed the test.

Now continue with the "Method 4: GPS Measurement Verification Procedure" on page 4-18. If you are having problems with setting up these tests, refer to Chapter 5, "Solving Problems and Updating Your System" for additional information.

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Method 2: Measuring a Known Channel in the System

Preparing the Hardware

Do This	Additional Information
1 Connect the system as shown in Figure 4-4. The Agilent receiver requires a 30 minute warm-up period to meet the guaranteed specifications.	There is a three minute delay after power-up or re-configuration, before the internal temperature sensor is activated and measurements are nominally correct. To connect the receiver and laptop, refer to step 1 and step 2 of any of the procedures listed in Chapter 2, "Receiver-Based System Setup"
2 Turn on the Agilent receiver.	

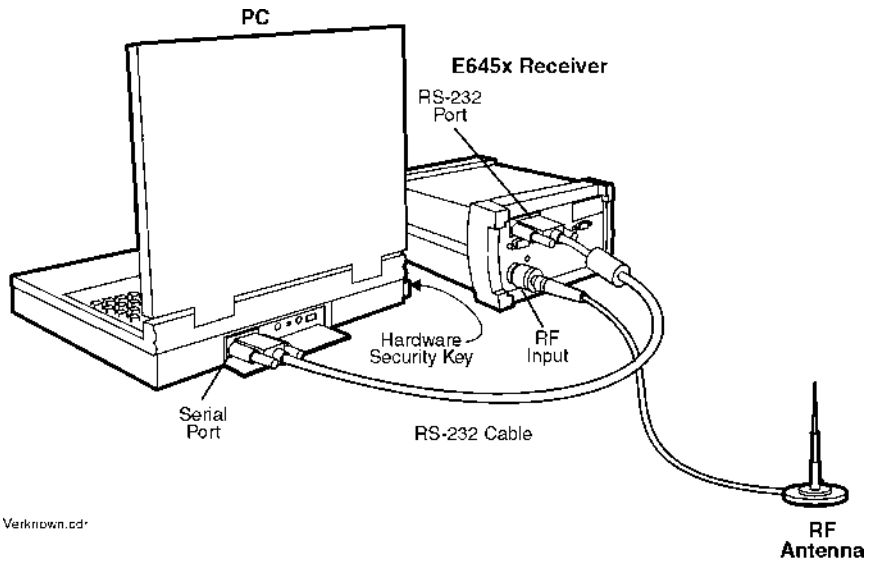


Figure 4-4 System Configuration for Measuring a Known Channel in the System

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Preparing the Software

Do This	Additional Information
1 Start the application program by going to the Start menu. Select Programs, Agilent E74xx.	The software starts.
2 Create a new project called: ***Verification Test 2 (Using the Antenna)***.	It is recommended that you use the automatic configuration wizard for this process. Refer to Chapter 2, "Automatic Configuration".
3 Click **Configuration** and then add the receiver hardware.	Refer to Chapter 2, "Hardware Installation Tips"
4 Click **Collection** and select the Spectrum VFP (Virtual Front Panel)	
5 Click **Maximize** button in the upper-right corner of the main window. 	The display size increases to fill the available space.
6 Select either Frequency or Channel in the Frequency Units.	Frequency is displayed on the Spectrum VFP.
7 Set the measurement software as follows: **Band:** Downlink **Frequency**: User specified **Span**: 2 MHz or 1 MHz depending on the channel used **Averaging**: Running **Averages**: 32	The frequency you specify and enter in the **Center** field, should be known communication frequency or channel.

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Testing the Signal

Do This	See This
In the Markers group, click **Add** and **To Max**.	The level and frequency are displayed at the top-left corner of the Spectrum display.

NOTE Wait for at least one minute before using the displayed marker value. The system is set to display a running average of 32. With time, the marker value will approach the value of the measured signal.

Passing the Test

If the signal trace is of an acceptable amplitude above the noise floor, depending on the distance from transmitters and antenna placement, at the appropriate frequency for the channel measured, the system passed the test.

Now continue with the "Method 4: GPS Measurement Verification Procedure" on page 4-18. If you are having problems with setting up these tests, refer to Chapter 5, "Solving Problems and Updating Your System" for additional information.

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Method 3: Measuring the Noise Floor

NOTE Use this procedure *only* if you do not have a signal generator *and* there is no known channel in the system. Connect a 50 ohm load (customer supplied) to the input of the receiver.

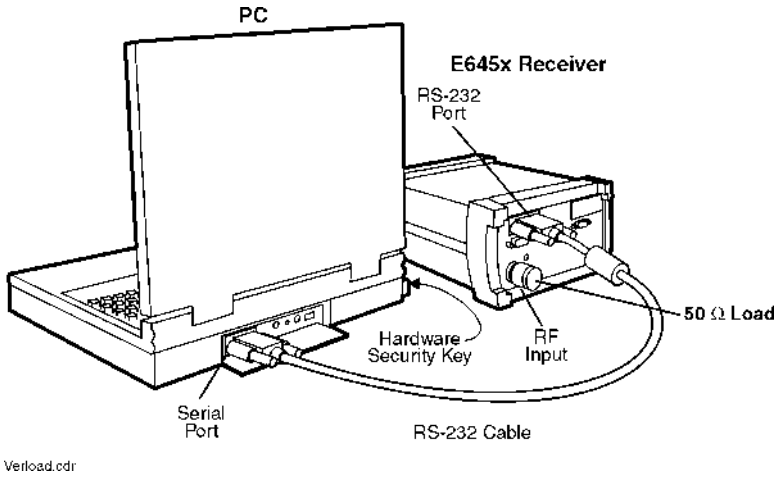


Figure 4-5 System Configuration for Measuring the Noise Floor

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Preparing the Hardware

Do This	Additional Information
1 Connect the system as shown in Figure 4-5 on page 4-13, using a calibrated 50Ω load fitted to the RF input. The Agilent receiver requires a 30 minute warm-up period to meet the guaranteed specifications.	There is a three minute delay after power-up or re-configuration, before the internal temperature sensor is activated and measurements are nominally correct. For more information on how to connect the receiver and laptop, refer to step 1 and step 2 of any of the procedures listed in Chapter 2, "Receiver-Based System Setup"
2 Turn on the Agilent receiver.	

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Preparing the Software

Do This	Additional Information
1 Run the application program by going to the Start menu, selecting Programs, Agilent E74xx.	The software starts.
2 Create a new project called: ***Verification Test 3 (Noise Floor)***.	It is recommended that you use the automatic configuration wizard for this process. Refer to Chapter 2, "Automatic Configuration".
3 Click **Collection** and select the Spectrum VFP (Virtual Front Panel)	
4 Click **Maximize** button in the upper-right corner of the main window. 	The display size increases to fill the available space.
5 Set the measurement software as follows: **Band**: Downlink **Frequency**: See Table 4-3 on page 4-16 for values to use. **Span**: 300 kHz **Averaging**: Running **Averages**: 100	
6 In the Markers group, click **Add** button then **To Max** and note the Marker 1 frequency and level.	The level and frequency are displayed at the top-left corner of the Spectrum VFP.
7 In the Markers group, click **Add** to place a second marker on the display.	
8 Use the mouse to drag Marker 2 to the minimum level of the trace. Note the Marker 2 frequency and level.	

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Do This	Additional Information
9 Calculate the average noise level of the downlink.	Average noise level = (Marker 1 level + Marker 2 level) / 2
10 Select Uplink in the Band group.	Frequency is displayed on the Spectrum VFP.
11 Perform step 6 through step 9 to determine the average noise level of the uplink. Substitute the frequencies from Table 4-4 on page 4-16 in step 5.	Average noise level = (Marker 1 level + Marker 2 level) / 2

Table 4-3 Noise Floor Frequency Settings for Step 5

Model	Marker 1 Frequency (step 5)
PCS CDMA and TDMA band systems	1959 MHz
GSM DCS1800 band systems	1843 MHz
GSM900 band systems	943 MHz
Cellular CDMA and TDMA band systems	882 MHz

Table 4-4 Noise Floor Frequency Settings for Step 11

Model	Marker 1 Frequency (step 11)
PCS CDMA and TDMA band systems	1879 MHz
GSM DCS1800 band systems	1745 MHz
GSM900 band systems	898 MHz
Cellular CDMA and TDMA band systems	837 MHz

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NOTE The measurement is making 100 averages, which will require approximately three minutes to stabilize the noise level. After completion, stop the measurement and note the levels.

Passing the Test

You have passed the if the average noise level is below –122 dBm.

Now continue with the "Method 4: GPS Measurement Verification Procedure" on page 4-18. If you are having problems with setting up these tests, refer to Chapter 5, "Solving Problems and Updating Your System" for additional information.

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Method 4: GPS Measurement Verification Procedure

NOTE

If you have an Agilent digital receiver, make sure that you have tested the receiver using either method 1 (page 4-3), method 2 (page 4-10), or method 3 (page 4-13) described earlier in this chapter.

It is recommended that you know the GPS position, the longitude and latitude, of where you do the test.

Setting Up the Hardware

Do This	Additional Information
1 Connect the GPS receiver as shown in Chapter 2, "Setting Up Your System".	Refer to the section specific to the GPS you own.
2 Click **Configuration** to review or modify the existing GPS hardware settings.	You switch to Configuration mode.
3 Select the Hardware tab.	You can use the Automatic Configuration wizard to help set up the GPS attached to your system. For more information refer to "Automatic Configuration" on page 2-5
4 Highlight the appropriate GPS unit and click **Modify**.	You can now set the appropriate GPS protocol.
5 Use the information in Table 4-5 on page 4-19 to establish the GPS protocol and serial port settings for your particular GPS unit.	The serial port settings are Trimble factory defaults. If you have difficulty determining your serial port configuration, contact Trimble Navigation.

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In order to configure any GPS unit, you have to know the settings of that unit. The default settings of the Trimble GPS units supported by Agilent have been included in the Agilent Wireless Solutions Software. New settings can be selected using Port Settings Tab of the Hardware Editor in Configuration Mode. See Table 4-5 on page 4-19 for the default settings.

Table 4-5 GPS Settings

	Trimble Placer GPS/DR	Trimble Placer GPS 400/ SVeeSix Plus[a]	Trimble Placer GPS 455	Internal GPS (Trimble Placer Model SK-8) or SVeeSix Plus
Protocol	TAIP	TAIP	TAIP[b]	TSIP
Bits per Second	4800	4800	9600	9600
Data Bits	8	8	8	8
Parity	None	None	None	Odd
Stop Bits	1	1	1	1
Flow Control	None	None	None	None

a. The SVeeSix Plus GPS Unit is built by TRIMBLE to work only as TSIP, NMEA, or TAIP according to the last 2 digits of the part number:XXXXX-61 is TSIP only; XXXXX-62 is NMEA only; XXXXX-63 is TAIP only. Verify first what protocol is used, to find out the default settings of that unit.

b. The GPS 455 unit can work as TAIP or TSIP. By default it is configured as TAIP. If you want the unit to work as TSIP, you must set the GPS 455 to TSIP.

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Selecting the Test

Do This	Additional Information
1 Start the application program by going to the Start menu, select Programs, Agilent E74xx.	The software starts.
2 Create a new project called: ***Verification Test 4 (GPS)***.	The Measurement or Hardware configuration is shown. You can use the Automatic Configuration wizard to help set up the GPS receiver. For more information, refer to "Automatic Configuration" on page 2-5
3 Click **Collection** and select the GPS VFP (Virtual front Panel).	
4 Select measurement types: Satellites or Statistics	Assuming the GPS antenna is properly located and the GPS receiver has a fix, the current location parameters, such as latitude, longitude, velocity, and altitude are displayed as shown in Figure 4-6.

NOTE If the GPS receiver is configured for TAIP or NMEA, you can not see the satellite bar chart.

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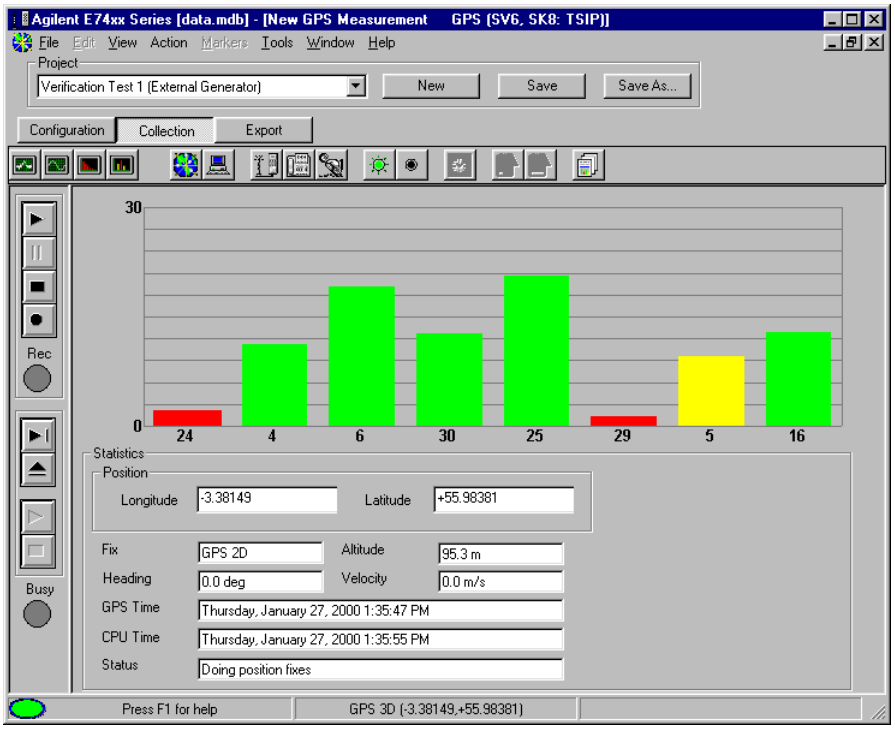


Figure 4-6 GPS Virtual Front Panel Display

NOTE

The units used for displaying the GPS statistics can be changed using the Display controls on the GPS virtual front panel.

If you need to change the GPS coordinate datum, select the Advanced tab of GPS hardware configuration box. The default datum can be set using the **Tools > Options** and selecting the Default Datum tab.

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Passing the Test

If the display shows a clear set of satellite signals and reports the same longitude and latitude of your current location, the system passed the GPS test and is ready to be used.

Figure 4-6 on page 4-21 shows an example of what a typical GPS display should look like.

If you are having problems with setting up these tests, refer to Chapter 5, “Solving Problems and Updating Your System” for additional information.

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5

Solving Problems and Updating Your System

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What You'll Find in This Chapter

To Do This	See This
Troubleshoot resource problems.	"Resource Problems" on page 5-3.
Troubleshoot COM errors.	"COM Errors" on page 5-4. For more information refer to Chapter 2, "Setting Up Your System".
Troubleshoot GPS problems.	"Locating and Eliminating GPS Errors" on page 5-8. For more information refer to Chapter 2, "Setting Up Your System".
Update the software.	"Updating the Software" on page 5-11.
Update the firmware.	"Updating the Firmware" on page 5-12.
Get telephone assistance.	"Calling for Assistance" on page 5-14.
Return an Agilent Technologies instrument for service.	"Returning the Instrument for Service" on page 5-17.

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Troubleshooting Resource Problems, COM Errors and GPS Problems

Resource Problems

CAUTION It is possible to exceed Windows 95/98 allocated resource levels by opening too many windows while running your Wireless Solutions system. This will cause erratic behavior of the application and require the operator to reboot the operating system in order to recover. This will also corrupt an open Wireless Solutions database, with potential loss of data. Windows 95/98 will not display any warning or feedback when this occurs.

The number of allowable open windows is dependent on the types you choose, as different windows require varying amounts of Windows 95/98 resources. The maximum number of windows is approximately 12, although up to 14 can be opened in certain configurations.

To provide the maximum amount of available Windows 95/98 resources to the measurement application, it is strongly recommended that you close all other applications before running the Wireless Solutions software. This includes all applications found in the Startup folder. It is also recommended that you run the Windows 95/98 resource meter in a minimized configuration in order to monitor available remaining resources.

To start the Windows 95/98 resource meter

1. Choose **Start > Programs > Accessories > System Tools > Resource Meter**. The Resource Meter dialog box appears.

2. Click **OK**.

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While this application utilizes system resources, it provides a way of determining when the system is running low on available resources. Opening new windows with less than 20% remaining resources in any of the three categories could cause Windows 95/98 to overrun its resources.

One solution for increasing the potential number of measurements made in a given project without exceeding Windows 95/98 resources is to configure the measurement with the associated virtual front panel turned off. You will be able to record the data but not display it. This can be done in Configuration mode, under the Display/Logging tab found under the Measurement tab.

The only solution for increasing the number of windows available during a measurement is to use Windows NT. It does not have the same systems resource limitations as Windows 95/98.

NOTE While using option 160, real time mapping, operating with a 256-color display setting may cause erratic behavior or memory problems. Adjust your color display to High Color (16 bit) or higher.

COM Errors

The following procedure is suggested for locating and eliminating COM errors when using the Agilent Wireless Solutions system.

NOTES

- To ensure that hardware is configured correctly, it is highly recommended that you use the **Automatic Configuration Wizard** for setting up your projects. for more information on the auto-configure process, refer to “Automatic Configuration” on page 2-5
- You must create the verification tests in chapter 4 as projects prior to troubleshooting COM errors.

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Do This	Additional Information
1 Check the project and configuration being used by the application.	• Does the hardware configuration for the project selected match the actual system hardware? • Are the correct GPS receiver model number, protocol, COM port selection, and port settings shown in Configuration mode on the Hardware tab? • Is the correct coordinate datum being used? • Is the correct Agilent receiver model number and COM port selection shown in Configuration mode on the Hardware tab? • Are the correct phone model number and COM port selection shown in Configuration mode on the Hardware tab?
2 Check system hardware components.	• Is DC power provided to the Agilent digital receiver? • Is the null modem cable connected between the PC and the Agilent digital receiver?

NOTE COM Errors may occur if the SAGEM phone is not set in the correct operating mode. The correct mode is **TRACE**.

When the SAGEM phone is in DATA mode, the interface connection is used for transmitting fax and other data transmission types. When the SAGEM phone is in TRACE mode, the interface connection is used for transmitting measurement reports.

To change the mode, switch on the phone and use the following phone keystrokes:

- **[Menu]**, **[44]**, Down Arrow, **[#]**, **[8]**
- Use the up and down arrows to select TRACE mode, then select OK.

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Do This	Additional Information
2 (Continued) Check system hardware components.	• Is DC power provided to the GPS receiver (external GPS)? • Is the proper RS-232 cable, or cable assembly, connected between the GPS receiver and Agilent E645x receiver (external GPS)? • Is the GPS receiver functioning with the correct GPS antenna connected, and providing a 3-D fix? • Is the correct cable connected between the GPS receiver and the PC (phone-based system)? • Is the phone turned on and does the battery show sufficient power (phone-based system)? • Is the interface cable connected between the phone and the PC (phone-based system)? • Is the second COM port defined and functioning (phone-based system)?
3 Troubleshoot COM errors.	• Verify steps 1 and 2 are true. • Check the Agilent E645x receiver by selecting **Verification Test 1, 2, or 3** project and confirm no COM errors by going to Collection mode and viewing the Spectrum virtual front panel. • Check the GPS receiver by selecting **Verification Test 4 project**, choosing the correct GPS receiver model number, protocol, COM port settings and confirm no COM errors by going to Collection mode and viewing the GPS virtual front panel. • Check the phone by defining a new project with only the correct phone model number and COM port selection, then going to Collection mode and viewing the Phone Measurements virtual front panel (phone-based system).

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Do This	Additional Information
3 (Continued) Troubleshoot COM errors.	• If the previous steps are not successful, refer to the GPS Problems section, "Locating and Eliminating GPS Errors" on page 5-8, or refer to Trimble utilities for more information. • Check the RS-232 interface cable between the PC and Receiver. • If the RS-232 connection between the Receiver and PC is bad (broken or damaged cable or connectors) or communication is broken, then the error displayed will indicate that the Receiver may be in fault. Check the RS-232 cable or replace it. If the fault persists, contact Agilent Technologies.

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Do This	Additional Information
4 If all else fails.	• Define a new project, checking on all items listed in steps 1 and 2. • Use a different database by selecting **File > Open Database**, or creating a new database by selecting **File > New Database**, then defining a new project, checking on all items listed in steps 1 and 2. • Repair the existing database by creating a new database, then using **Tools** >**Database Utilities** > **Repair** to open the original database (usually *data.mdb*). Once repaired, return to the original database by selecting **File** >**Open Database** with the original file name. Select the original project, checking on all items listed in steps 1 and 2. • Use a brand new database. Using Windows Explorer, copy the file *Design.mdb* found in the working directory for the application (usually *\Program Files \Agilent Technologies \E74xx*), to a new file name then repeat step 4. • When nothing else works, re-install the application. Copy the database in question to another location. Uninstall the current installation of the application by using the Add/Remove Program application, found in the Control Panel under **Start > Settings**. Once the application has been uninstalled, re-install the application.

Locating and Eliminating GPS Errors

There is no way to communicate with the GPS receivers if the port settings are unknown. It is strongly recommended that you write down **ALL** GPS receiver

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settings and tape the list to the unit. The primary cause of COM errors between the PC and the GPS receiver is usually incorrect port settings.

The following procedure is suggested for locating and eliminating GPS errors and problems when using the Agilent Wireless Solutions system.

Do This	Additional Information
1 Check hardware connections (verify cabling and power supply).	If you have hardware configuration errors and/or communications errors, exit the Agilent Wireless Solutions Software. Cycle the power on the GPS receiver and the Agilent E645x receiver, then check both RS-232 connections and DC connections. Run the Agilent Wireless Solutions Software again.
2 Start the Agilent Wireless Solutions Software, select your project, select **Collection** mode, and note what error messages occur.	If there are no error messages, the hardware connections are **OK**. Skip to step 3. If there are error messages, write them down and review the entire Troubleshooting section. If you are unable to resolve the error messages, refer to "Calling for Assistance" on page 5-14. There are three main messages when something is wrong: • Hardware Error • Application Error • Communications Error If there is an application error, it is likely that the GPS receiver configuration in the **Hardware Editor** of the configuration is different than the actual settings of the Trimble GPS receiver. A common error is **"**Application Error: Failed to read serial device. Please make sure the hardware configuration is correct and the hardware is connected and turned on. Device = COM 1".

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Do This	Additional Information
4 (Continued) Verify the GPS configuration.	• Verify that the Hardware Type (for example, GPS Placer 450, 455: TAIP) is selected. If not, select the correct model and protocol in the Hardware Type field. • Review the settings specific to the GPS receiver used. If the settings are wrong, correct them. • For port selection, if the GPS receiver is connected to the Agilent E645x receiver through the GPS RS-232 port, select Multiplexed Serial. If the GPS receiver is connected directly to the computer (and the Agilent E645x receiver is not used) select Serial. • COM 1 is the default serial port, but if a different serial port is used with the Agilent E645x receiver, select the correct COM port. • For port settings, if the protocol of your GPS receiver is known and the default settings are used, nothing needs to change. But if the GPS receiver has been configured to work with Qualcomm's Mobile Diagnostic Monitor (MDM), it is very likely that it is set as: TAIP and 4800 bps. Change the bps to the correct speed (usually, other parameters will not need to change, but be sure to verify them against the known hardware settings). • When all port selections and port settings have been configured to the settings of the GPS receiver, click **OK** in the Hardware Editor. The Agilent Wireless Solutions Software should be ready to successfully communicate with the GPS receiver. Select Collection mode and repeat step 3.

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Updating the Software

Software updates are available to download from the web. Your computer must be web-enabled to perform this process: you must have a modem or LAN access to the web, a service provider, and a web browser. If you are set up to access the web, go to the following web site for information about software updates:

`http://agilent.com/find/software`

Then click on the **Wireless Software Updates and Firmware Upgrades** link.

NOTE If you are unable to access the web, contact your Agilent Technologies representative for information about updating the software.

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Updating the Firmware

Sometimes a software update (see “Updating the Software” on page 5-11) also requires a firmware update. With the software update installed, when you run the updated software and select Collection mode, you will be notified if a firmware update is required. A series of messages will walk you through the firmware update process. Before you update the firmware, you must first insert a firmware write enable key (E6450-60007) into the RX LOOP OUT connector, as shown in Figure 5-1, then follow the instructions on the screen. Remember to remove and safely store the firmware write enable key when you are prompted to do so by the software.

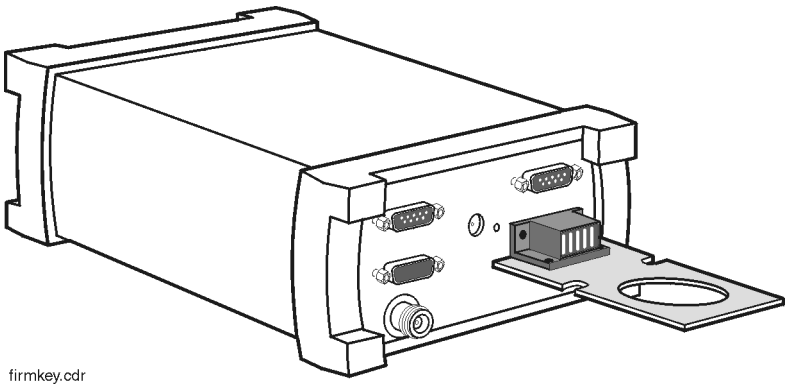


Figure 5-1 Firmware Write Enable Key

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Replacement Firmware Security Key

If you have misplaced your firmware write enable key, you can order a new one (order from your Agilent Technologies representative, E6450-60007), or you can substitute a piece of wire that shorts pins 8 to 10 on the RX LOOP OUT connector (see Figure 5-2). Remember to follow on screen instructions, and remove the wire when you are prompted by the software.

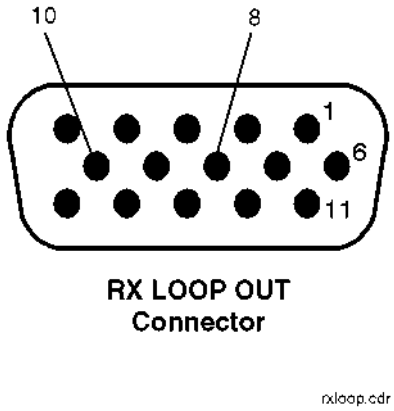


Figure 5-2 Short These Pins to Update the Firmware

Details on this process can be found on the product web site:

http://agilent.com/find/software

Then click on the **Wireless Software Updates and Firmware Upgrades** link.

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Calling for Assistance

Your Agilent Wireless Solutions are designed to provide dependable service. It is unlikely that you will experience a problem. However, Agilent Technologies sales and service organization is ready to provide the support you need.

The Agilent Technologies web site provides very detailed lists of frequently asked questions, which address the most commonly encountered problems. It is highly recommended that you search these questions before contacting Agilent Technologies.

If You Have a Problem

If you have a problem, refer to the following for possible help:

- This guide
- Online help
- Online tutorial

If you are unable to resolve your problem, refer to the information in the following section.

NOTE For continued protection against fire hazard, replace the line fuse (cigarette lighter/2 amp 32 V FB fuse, Agilent part number 2110-0002) only with the same type of rating (type nA/nV). The use of other fuses or materials is prohibited.

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Frequently Asked Questions

If you need installation or application assistance, refer to the web site at

http://agilent.com/find/drive_test.

To access the frequently asked questions section, use the following procedure:

1. Click on the **Technical Support** link.
2. Select the **Frequently Asked Questions - Search**
3. For the Search key, type the keyword "drive test"

If you do not have access to the web, contact your local Agilent Technologies representative for information.

Technical Telephone Assistance

Your Agilent Wireless Solutions come with 12 months of technical telephone assistance and a 12 month hardware warranty period. To use the telephone assistance:

1. Install the software.
2. The Customer Business Center will provide you with a packet of information, which includes your system handle number. Please refer to that number when calling for support.

   To establish a Support Contact, please call the Customer Business Center.
3. Ask the Agilent Technologies engineer your question.

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Numbers to call

For a more detailed list of contact numbers, please refer to the Agilent web site, or contact your local Agilent Technologies Sales and Service Office.

Before calling, ensure you have all the information described in step 2, above.

Region	Phone Number
Americas	+1-800-698-0061, press 3
Asia, Australasia	+65 271 0915
Europe, Africa, Middle East	+31 20 547 9900

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Returning the Instrument for Service

The instructions in this section show you how to properly package the instrument for return to Agilent Technologies.

Warranty

If the instrument is still under warranty or is covered by an Agilent Technologies maintenance contract, it will be repaired under the terms of the warranty or contract (the warranty is at the front of this manual). If the instrument is no longer under warranty or is not covered by an Agilent Technologies maintenance plan, Agilent Technologies will notify you of the cost of the repair after examining the unit.

When an instrument is returned to Agilent Technologies for servicing, it must be adequately packaged (see "Preparing the Instrument for Shipping" on page 5-18) and have a complete description of the failure symptoms attached.

When describing the failure, please be as specific as possible about the nature of the problem. Include copies of additional failure information (such as instrument failure settings, data related to instrument failure, and error messages) along with the instrument being returned.

Please notify Agilent Technologies before returning your instrument for service. Any special arrangements for the instrument can be discussed at this time. This will help Agilent Technologies repair and return your instrument as quickly as possible.

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Preparing the Instrument for Shipping

Do This	Additional Information

1 Write a complete description of the failure and attach it to the instrument.	Include any specific performance details related to the problem. The following information should be returned with the instrument:
	• Type of service required
	• Date instrument was returned for repair
	• Description of the problem:
	  • Whether problem is constant or intermittent
	  • Whether instrument is temperature-sensitive
	  • Whether instrument is vibration sensitive
	  • Instrument settings required to reproduce the problem
	  • Error Code
	  • Performance data
	• Company name and return address
	• Name and phone number of technical contact person
	• Model number of returned instrument
	• Full serial number of returned instrument
	• List of any accessories returned with the instrument

2 Cover all front and rear panel connectors that were originally covered when you first received the instrument.	
3 Pack the instrument in the original shipping containers. Original materials are available through Agilent Technologies office. See step 4 for more information.	

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Do This	Additional Information
4 Wrap the instrument in antistatic plastic to reduce the possibility of damage caused by electrostatic discharge.	• For instruments weighing less than 54 kg (120 lbs), use a double-walled, corrugated cardboard carton of 159 kg (350 lbs) test strength. • The carton must be large enough to allow 3 to 4 inches on all sides of the instrument for packing material, and strong enough to accommodate the weight of the instrument. • Surround the equipment with 3 to 4 inches of packing material, to protect the instrument and prevent it from moving in the carton. If packing foam is not available, the best alternative is S.D-240 Air Cap™ from Sealed Air Corporation (Commerce, California 90001). Air Cap looks like a plastic sheet filled with air bubbles. Use the pink (antistatic) Air Cap to reduce static electrical damage. Wrapping the instrument several times in this material will protect the instrument and prevent it from moving in the carton.
5 Seal the carton with strong nylon adhesive tape and mark it “FRAGILE, HANDLE WITH CARE”.	
6 Retain copies of all shipping papers.	

CAUTION

- Cover electrical connectors to protect sensitive components from electrostatic damage.
- Instrument damage can result from using packaging materials other than the original materials. Never use styrene pellets as packaging material. They do not adequately cushion the instrument or prevent it from shifting in the carton. They may also cause instrument damage by generating static electricity.

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6

Hardware and Software Specifications

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What You'll Find in This Chapter

To Review	Go To
General Software Specifications and Functionality	"General System Software Specifications and Functionality" on page 6-4
CDMA	
Agilent E7473A Cellular and PCS CDMA Wireless Solutions Software Measurement Specifications	"Software Measurement Specifications" on page 6-14
Agilent E7490A Over Air Maintenance Test Software Measurement Specifications	"Software Measurement Specifications" on page 6-25
Agilent E7473A and Agilent E7490A Cellular and PCS CDMA Wireless Solutions Hardware Specifications	"Hardware Specifications" on page 6-30
TDMA	
Agilent E7474A Cellular and PCS TDMA Wireless Solutions Software Measurement Specifications	"Software Measurement Specifications" on page 6-34
Agilent E7474A Cellular and PCS TDMA Wireless Solutions Hardware Specifications	"Hardware Specifications" on page 6-45
GSM	
Agilent E7475A GSM900, DCS1800, GSM1900 Software Measurement Specifications	"Software Measurement Specifications" on page 6-49
Agilent E7475A GSM900, DCS1800, GSM1900 Hardware Specifications	"Hardware Specifications" on page 6-64
General Hardware Specifications and Minimum System Requirements	"General Hardware Specifications and Minimum System Requirements" on page 6-68

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Specifications and Hardware Information

This chapter lists specifications and characteristics of the systems. Specifications apply over the temperature range 0°C to +55°C (unless otherwise noted) after the temperature of the Receiver has been stabilized by 30 minutes of continuous operation.

Specifications Describe warranted performance over the temperature range of 0°C to +55°C and include a 30 minute warm-up from ambient conditions.

Typical Provides useful information by giving non-warranted performance parameters. Typical refers to test data at the fiftieth percentile for a 25°C room temperature.

Characteristics Provide useful information by giving non-warranted performance parameters. Characteristics information describes product information for parameters that are either not subject to variation, non-measurable, verifiable through functional pass/fail tests, or as a matter of routine, not measured. *Characteristics are printed in italics.*

Calibration Cycle Agilent Technologies warrants instrument specifications over the recommended calibration interval. To maintain specifications, periodic recalibrations are necessary. We recommend that the Receiver be calibrated at an Agilent Technologies service facility every 12 months.

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General System Software Specifications and Functionality

Some of the functionality of the system is common across all platforms. The following sections describe the specifications and functionality of these cross-platform features.

- "Data Export" on page 6-4
- "Alerts and Alarms" on page 6-8
- "Link Editor" on page 6-10
- "Real-time Mapping (Option 160)" on page 6-11
- "Report Generation" on page 6-11
- "Virtual Front Panel Printing" on page 6-12
- "Indoor Measurements (Option 180)" on page 6-13

Data Export

Data can be exported from the Wireless Solutions database for display and post-processing. Any measurement data can be exported. The export function provides flexible filtering capability to define the specific data to be exported. Multiple data types can be exported to a single output file.

You can save export plans, and once saved, those plans can be quickly accessed for easy data export. An export plan is made up of:

Export Plan Element	Description
Data types	Defines which data will be exported. Column order is user-definable.
Alarms	Defines which alarms will be exported.
Notes	Exports any user note or auto-note entered while recording data

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Export Plan Element	Description
Processing functions	Defines the functions that will be applied to the data during export.
Exclusion rules	Defines a set of conditions that, if true, the associated data will be excluded from the export.
Geographic binning	Data-reduction process in which the data is averaged based on geographic area or distance

Several different operations can be executed in order to provide the desired data in the desired format.

Processing functions

- All values
- Count - counts number of values above or below a specified threshold
- Maximum
- Minimum
- Value(x)

Conditionals

- Greater than (>) a threshold
- Less than (<) a threshold
- All values
- Qualified against another measurement

Sorting

- Ascending
- Descending
- None

Geographic binning methods

- **Bin size**

  User defines the size of bin to be used in meters.

- **Percentage of low and high values to discard**

  User defines the percentage of values to ignore from new raw data before calculating the bin.

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- **Bin by location (grid binning)**

  Define the reference bin to be used, choices are:

  - Southwest extent of drive data
  - Southeast extent of drive data
  - Northwest extent of drive data
  - Northeast extent of drive data
  - User-defined reference coordinates

- **Bin by distance travelled (linear binning)**

  Data is averaged based on the distance traveled.

Data Output Formats

The output formats supported by the Wireless Solutions are listed below. The system is designed to work with MapInfo®[1] in an integrated manner via an OLE (object link embedded) link to the MapInfo application (MapInfo via COM). This exports the data, launches MapInfo, creates the necessary MapInfo table, and creates a thematic map display in MapInfo. This functionality does require MapInfo be present.

- Arcview®[2] compatible file
- MapInfo via COM (optional - run MapBasic program after export)
- MapInfo compatible file
- PlaNET ®[3] compatible file
- Text file

Export Column Data Delimiters

- Tab
- Comma

1. MapInfo® is a registered trademark of MapInfo Corp.
2. ArcView ® is a registered trademark of Environmental Systems Research Institute, Inc.
3. PlaNET ® is a registered trademark of Mobile Systems International.

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Optional Data parameters

- Position
- Altitude
- Time
- Date
- Fill column data
- Column headings

Position Formats

- Decimal degrees with direction
- Deg: Min: Sec with direction
- Signed decimal degrees
- Signed Deg: Min: Sec with direction
- UTM (Universal Transverse Mercator)

Coordinate Datums

It is possible to change to the coordinate datum being applied by the application. It can be changed either during the configuration or export stages.

The following datums are available:

- AGD66
- AGD84
- European
- Hu-Tzu-Shan
- NAD27 (default) (North American)
- NAD83 (North American)
- OS36 (GB)
- SAD69 (Brazil)
- SAD69 (Mean)
- Tokyo (J6)
- Tokyo-Korea
- WGS72 (World Geodetic System)
- WGS84 (World Geodetic System)

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Integrated Mapping Software

MapInfo can be run from within the system software. The system can also export data in ASCII format. The data can then be imported into other applications.

The system can also run with Agilent E7480A (CDMA only) Post-processing software. The Agilent E7480A is an optimization and performance-monitoring tool designed to process large amounts of collected data to simplify the task of optimization. The Agilent E7480A provides the ability to analyze one or multiple drives at a time through either separate maps, or together in a merged format.

Alerts and Alarms

The Wireless Solutions Software has sophisticated alert and alarm capabilities. An alert is defined as a single condition on a single measurement. An alarm is a boolean expression made up of single or multiple conditions on single or multiple measurements. When an alert or alarm condition occurs, any, or all, of the actions listed below can be executed. If the alert or alarm condition occurs, while data is being logged, each data record includes the alert/alarm information.

Alarm Wizard

The alarm wizard can be used to simplify setting up some of the more common alarms.

Features of the Alarm Wizard Set up

- Specify type of alarm required
- Notification of new or changed measurements
- Notification of resources required
- Customize settings, actions and other user-definable aspects
- Set of default Male and Female voice alarm messages

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Actions (Alarms and Alerts)

- Play a .WAV audio file
- Display a text message
- Pause or stop measurements

Alert Conditions

- Greater than (>)
- Greater than or equal to (≥)
- Less than (<)
- Less than or equal to (≤)
- Equal to (=)
- Not equal to (≠)

Alert Operators

- Value
- Maximum
- Minimum

Alarm Conditions

- Greater than (>)
- Greater than or equal to (≥)
- Less than (<)
- Less than or equal to (≤)
- Equal to (=)
- Not equal to (≠)
- Is a subset
- Is not a subset
- Sets intersect
- Sets do not intersect

Alarm Operators

- Value
- Maximum
- Minimum

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- Subset
- OR
- AND
- XOR (exclusive OR)

Any measurement can be an operand in an alert or alarm. Below are some examples (Agilent E7473A CDMA system example shown) to illustrate alerts and alarms. In example number four, the alarm triggers when the receiver measures a pilot signal above -18 dB Ec/Io that the handset does not measure. This provides very quick identification of neighbor list problems.

- **Alerts**

  1.Value(FER) > 2.0%

  2. Maximum(TopN Eo/Io) < -10 dB

- **Alarms**

  3. (Value(FER) > 2.0%) AND (Maximum(TopN Ec/Io)< -10 dB)

  4. Subset(Pilot Multipath Top N) NOT Subset (Value PNList)

System status parameters can also be used as operands in alerts and alarms. For example, an alert can be defined to trigger when the available disk space on the PC drops below 10 MB or when the GPS position fix is lost.

Link Editor

The Link Editor is available from the Tools menu and enables you to link controls in one virtual front panel (the source) with parameters in another virtual front panel (the destination). Links can be configured from either Configuration mode or Collection mode. You can:

- Link simple measurement results to parameters for other measurements.
- Link measurement parameters to parameters for other measurements.
- Invoke an action (such as a button click) on all virtual front panels of the same type.
- Invoke an action (such as a button click) on a select set of virtual front panels of the same type.

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Real-time Mapping (Option 160)

Using the GPS virtual front panel, you can display vector and raster-based maps against a real-time, plotted measurement result. The following features are available:

- Load and control map layers (TAB format).
- Add raster maps (GIF, TIF, and PNG format).
- Zoom in and Zoom out of map detail.
- Pan automatically and manually.
- Scale automatically.
- Add labels and identify points.
- Display alarms on map. Click on alarm symbol to display the message associated with the alarm.
- Link a measurement result, via the link editor for display on the map.
- Map result values controlled via the Legend button in color. Pre-defined Legends exist for most common measurement results.
- Specify base stations in StationInfo.txt are displayed on the map.
- Link the active server for a phone to the map and draw a line from the current position to the appropriate base station.

Report Generation

The report generator is accessed using the **Tools > New Report** (Ctrl+R) menu option, or by clicking the report generator button in Collection mode. The reports generated are in HTML format with referenced images, which are captured in PNG format. The reports and images are stored in the report folder (C:\Program Files\Agilent Technologies\E74xx\Reports\reportname\). The following details can be entered by the user:

- Title (also used for the report folder name)

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- User name
- Company name
- Time report generated. By default, this is the PC system time.
- Date. By default, this is the PC system date.
- Location. By default, these are the GPS coordinates identified at the time the report was generated.
- Comments. This is optional text, entered by the user.
- A report can include all opened Virtual Front Panels, or just those maximized.
- A report may also contain textual and/or table information for specific measurements like the CDMA Code Domain Power, Base Station Spectrum Analyzer, and MOST.

Once the report has been generated, it is displayed on the screen, using your default browser. A report can include multiple virtual front panels. Reports can be viewed by selecting the Reports tab while in Configuration mode. Reports can be imported and exported.

Virtual Front Panel Printing

It is possible to print virtual front panels. This feature is accessed from the File menu. There are two print commands:

- Print (Ctrl+P) prints the active and all other virtual front panels.
- Print VFP prints just the active virtual front panel.

The active virtual front panel is the window with the blue title bar (if default windows colors are used).

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Indoor Measurements (Option 180)

The Agilent Wireless Solutions Software can be used for testing and measuring indoor coverage areas. These measurements are taken without reference to GPS or dead-reckoning position information.

An indoor system supports the following hardware:

- Phones
- Receivers (no PN correlation for CDMA)
- Pen tablet computer
- Computer pen input devices.
- Full set of backpack accessories.
- Portable power supply for computer and receiver.

The measurement control virtual front panel has the following features:

- Selection of data points, such as user features like CW sources
- Automatic interpolation of data between waypoints, during recording.
- Imported maps converted to layer map files. Supports GIF, TIF, and PNG formats.
- Way point information for specifying when measurements are to be taken.
- Zoom in and zoom out of map area.
- Automatic and manual pan.
- Automatic scaling.
- Display alarms on map. Click on alarm symbol to display the message associated with the alarm.
- Link measurements to display.
- Map result values controlled via the Legend button in color. Pre-defined Legends exist for most common measurement results.

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Agilent E7473A CDMA System Specifications

Software Measurement Specifications

The Agilent E7473A measurement software has the following measurement capabilities and functionality:

- "CDMA Pilot Channel Analysis" on page 6-14
- "CW Power Measurements" on page 6-17
- "Channel Power Measurements" on page 6-18
- "Spectrum Measurements" on page 6-19
- "CDMA Phone Call Control" on page 6-21
- "CDMA Phone Measurement Data" on page 6-23
- "CDMA Phone Messaging" on page 6-24
- "CDMA Code Domain Power (CDP) Analysis" on page 6-25
- "CDMA Base Station Spectrum Analysis" on page 6-27
- "CDMA Mobile Station Test Measurement (MOST)" on page 6-28

CDMA Pilot Channel Analysis

Part of Agilent E7473A Option 110, 120.

The Agilent E7473A system is capable of measuring IS-95 and J-STD-008 CDMA pilot channels using the Agilent digital receiver. These measurements are independent of network parameter settings. The system executes four different types of CDMA pilot channel measurements (listed below). Any or all of them can be executed simultaneously.

Measurement Types

- **All pilots**

  The System measures the power, both Ec and Ec/Io for all 512 pilot channels. The results are displayed as a trace with one point for each of the 512 PN offsets.

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- **Top N**

  The system measures all of the pilots in the network and returns the ‘N’ Strongest pilot channels received, where ‘N’ is a user definable integer from 1 to 20. The results are displayed in bar graph format.

- **Zoomed pilots**

  The user sets the center and span in terms of chips (or PN offsets). The results are displayed as a trace.

- **User list**

  The user manually inputs a list of up to 20 PN offsets to be measured. The measurements are displayed in a bar graph format. The user list frequencies can be imported from a text file. This allows regularly used sets of frequencies or channels to be stored for quick loading into the application.

Measurement Controls

- Carrier frequency
  - Frequency
  - Channel
- Measurement types
  - All pilots
  - TopN pilots
  - Zoomed pilots
  - User list of pilots
- PN increment

Markers (Trace Displays only)

- Multiple markers
- Delta markers
- To Max function
- Drag and drop
- Marker to center

Display Controls

- Power display (Y-axis parameter)

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  - Ec/Io
  - Ec
- Show value (bar graphs only)
  - Peak Ec/Io
  - Peak Ec
  - Aggregate Ec/Io
  - Aggregate Ec
  - Aggregate - Peak
  - Delay Spread(Chips)
  - Pilot delay (Chips)

Measurement Results

- Peak Ec/Io
- Peak Ec
- Io
- Aggregate Ec/Io
- Aggregate Ec
- Aggregate - Peak
- Delay spread
- Pilot delay
- Carrier frequency error

Peak pilot power (both Ec and Ec/Io) are computed by selecting the strongest peak of the correlation for each pilot. **Io** is the total received power integrated across the entire 1.2288 MHz signal bandwidth.

Aggregate pilot power (both Ec and Ec/Io) are computed for a given pilot by integrating the power received over the time dispersion of that pilot. **Delay spread** is the duration of time over which this power is dispersed. Both aggregate pilot power and delay spread are determined with respect to an Ec/Io threshold of -17 dB. The system also reports the difference between the aggregate and peak pilot power (**Aggregate-Peak**). This difference along with the delay spread provides a characterization of the multipath effect on that pilot.

Pilot delay is defined as the difference in time between when a pilot signal is received and when it should have been transmitted, as defined by GPS timing. For example, a base station transmitting PN offset 0 is expected to start a new

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short-code pattern synchronous with the GPS even second clock. If the signal is received 3 chips after the GPS even second clock, then the pilot delay is said to be 3 chips (1 chip = 0.8 microseconds). Timing offsets can be due to both propagation delay and base station timing problems.

Carrier Frequency Error is defined as the difference between the measured carrier frequency and the user specified carrier frequency. The measured carrier frequency is of the dominant pilot signal. Carrier frequency error can be due to both base station carrier error and doppler shift (if moving).

CW Power Measurements

Part of Agilent E7473A Option 110, 120.

The Agilent E7473A can measure the peak power (CW Power) at user defined frequencies within a user-defined resolution bandwidth. The user can define the frequencies to be measured in two different ways.

Frequency Entry Methods

- **List**: Enter an arbitrary list of frequencies. The user list frequencies can be imported from a text file. This allows regularly used sets of frequencies or channels to be stored for quick loading into the application.
- **Trace**: Enter a start frequency, step size, and count. The system measures at the start frequency, at the (start + step) frequency, (start + (count - 1)*step frequency. For example, if the start frequency is set to 1900 MHz, the step size is set to 1 MHz, and the count is set to 4; then measurements are made at 1900 MHz, 1901 MHz, 1902 MHz, and 1903 MHz. Frequencies can be specified in terms of frequency units or channel number.

Measurement Controls

- Frequency
  - Arbitrary list (list)
  - Start/step/count (trace)
- IF Bandwidth
  - Wideband mode - 1.25 MHz
  - Narrowband mode - 30 kHz or 200 kHz (options 390 and 391 only)

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- Resolution Bandwidth (CW power, all other options)
  - 8.36 kHz to 1 MHz in wideband mode
  - 246 Hz to 28 kHz in narrowband mode
- Resolution bandwidth (CW power, Option 390 and 391 only)
  - 8.36 kHz to 950 kHz in wideband mode
  - 1.68 kHz to 190 kHz in narrowband mode

Channel Power Measurements

Part of Agilent E7473A Option 110, 120.

The Agilent E7473A system can measure the total power (Channel Power) within a user-defined bandwidth at a user-defined set of frequencies. This differs from the CW power measurement in that the total power is integrated across the specified channel width. The user can define frequencies to be measured in two different ways.

Frequency Entry Methods

- **List**: Enter an arbitrary list of frequencies. The user list frequencies can be imported from a text file. This allows regularly used sets of frequencies or channels to be stored for quick loading into the application.
- **Trace**: The power virtual front panel can be used to quickly diagnose RF problems. The system operates in both the downlink and uplink PCS bands. Enter a start frequency, step, size and count. The system measures at the start frequency, at the (start + step) frequency,..., (start + (count - 1*step) frequency. For example, if the start frequency is set to 1900 MHz, the step size is set to 1 MHz, and the count is set to 4; the measurements are made at 1900 MHz, 1901 MHz, 1902 MHz and 1903 MHz.

Frequencies can be specified in terms of frequency units or channel number.

Measurement Controls

- Frequency
  - Arbitrary list (list)
  - Start/step/count (trace)

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- IF Bandwidth
  - Wideband mode - 1.25 MHz
  - Narrowband mode - 30 kHz or 200 kHz (options 390 and 391 only)
- Resolution bandwidth (CW power only)
  - 8.36 kHz to 1 MHz in wideband mode
  - 246 Hz to 28 kHz in narrowband mode
- Channel width (channel power only)
  - Agilent E7473A Option 320/330
    - 8.36 kHz to 60 MHz in wideband mode
    - 246 Hz to 60 MHz in narrowband mode
  - Agilent E7473A Option 300/310. 380/381
    - 8.36 kHz to 25 MHz in wideband mode
    - 246 Hz to 25 MHz in narrowband mode
  - Agilent E7473A Option 390/391
    - 30 kHz to 75 MHz in wideband mode
    - 5 kHz to 75 MHz in narrowband mode

Spectrum Measurements

Part of Agilent E7473A Option 110, 120.

The spectrum virtual front panel can be used to quickly diagnose RF problems. The system operates in both the downlink and uplink bands. The spectrum display provides the controls listed below. Frequencies can be specified in terms of frequency units or channel number.

Measurement Controls

- Frequency, tunable range[1]
  - Agilent E7473A Option 320/330
    - 1850 - 1910 MHz [1845 - 1915 MHz]
    - 1930 - 1990 MHz [1925 - 1995 MHz]

1. Spectrum measurement allows some out of band tuning above and below specified frequency ranges. These extended ranges are shown in brackets - []. The performance is not specified in these ranges. Characteristic noise floor increase is 2 dB with respect to specified range. Characteristic amplitude accuracy is unchanged with respect to specified range.

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  - Agilent E7473A Option 300/310
    - 824 - 849 MHz [819 - 854 MHz]
    - 869 - 894 MHz [864 - 899 MHz]
  - Agilent E7473A Option 380/381
    - 832 - 870 MHz [827 - 875 MHz]
    - 887 - 925 MHz [882 - 930 MHz]
  - Agilent E7473A Option 390/391
    - 1710 - 1785 MHz [1705 - 1790 MHz]
    - 1805 - 1880 MHz [1800 - 1885 MHz]
- Frequency, maximum span
  - Agilent E7473A Option 320/330
    - 70 MHz
  - Agilent E7473A Option 300/310
    - 35 MHz
  - Agilent E7473A Option 380/381
    - 48 MHz
  - Agilent E7473A Option 390/391
    - 85 MHz
- IF Bandwidth
  - Wideband mode - 1.25 MHz
  - Narrowband mode - 30 kHz or 200 kHz (options 390 and 391 only)
- Resolution bandwidth
  - 8.36 kHz to 1 MHz in wideband mode
  - 246 Hz to 28 kHz in narrowband mode
- Resolution bandwidth (Options 390/391 only)
  - 8.36 kHz to 950 kHz in wideband mode
  - 1.68 kHz to 190 kHz in narrowband mode

Markers

- Multiple markers
- Delta markers
- To Max function
- Drag and drop
- Marker to center

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CDMA Phone functionality

Part of Agilent E7473A Option 100, 120, 150.

The phone component of the Agilent E7473A system includes three main functions. Each one is associated with a control/display window called a virtual front panel.

- Phone control (see page 6-21)
- Measurement data (see page 6-23)
- Messaging display (see page 6-24)

CDMA Phone Call Control

This functionality provides automated control of the handset from the PC. The phone control virtual front panel provides the control functions listed below.

Call controls

- Call initiation mode
  - Sequence
  - Single (long) call
  - Termination
- Call initiation control
  - Start/continue
  - Pause
  - Stop
- Automatic call sequencing
  - Access time (duration of call)
  - Redial wait (duration between calls)
  - Total calls (number of calls to be executed)
- Automatic Redial
  - On a dropped call
  - On a blocked call (failed origination)
  - Redial interval (wait duration after drop or block)
  - Maximum redial attempts
- Phone number pick list
- Call type pick list
  - Voice (8 or 13 kbps)

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- Markov (set 1 or set 2)
- Loopback (8 or 13 kbps)
- Enhanced Variable Rate Codec (EVRC)

State Controls

- No analog (forces dual mode phone to stay in digital mode)
- Log to file (creates binary file)
- Channel
  - Channel number
  - Frequency units

Statistics logging controls

- Attempted calls
- Dropped calls
- Blocked calls (failed originations)
- Markov data

In addition to control functionality, the phone control virtual front panel displays the information listed below.

Display fields (text)

- Channel
- Call information
  - Access time counter
  - Redial time counter
  - Calls remaining
- Statistics
  - Dropped call rate
  - Blocked call rate
  - Total attempts
  - Total drops
  - Total blocks

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CDMA Phone Measurement Data

The Agilent E7473A system extracts various measurement data from the mobile handset. You control extraction of the specific measurement types with a set of check boxes. The data types are listed below.

Display fields (text)

- State
- Status (mode)
- SAT
- PN increment
- Tx Adj (Tx gain adjacent)
- RSSI (mobile received power)
- Tx Power (mobile transmit power)
- FER (frame erasure rate)
- Ec/Io
  - Aggregate
  - Dominant

Tabular displays

- PN list

Bar graph displays

- Finger data (TA fingers)
- Pilot data
  - Active
  - Candidate
  - Neighbor

Line graph displays

- Rx / Tx level
- Temporal analyzer (TA searcher)

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CDMA Phone Messaging

The Agilent E7473A system extracts and decodes the over-the-air messaging from the handset. The user can select any or all of the channel types listed below from which to extract and decode messaging.

Message logging controls

- Log to display
- Snapshot

Message type selection controls

- Access
- Paging
- Sync
- Forward traffic
- Reverse traffic

In the messaging display, the user can double-click on any message to expand it to the next level of detail. A snapshot function captures the last 50 messages to a separate display while the main display continues to update.

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Agilent E7490A and Agilent E7473A CDMA System Specifications

Software Measurement Specifications

The Agilent E7490A and Agilent E7473A measurement software has the following measurement capabilities and functionality:

- "CDMA Code Domain Power (CDP) Analysis" on page 6-25
- "CDMA Base Station Spectrum Analysis" on page 6-27
- "CDMA Mobile Station Test Measurement (MOST)" on page 6-28

CDMA Code Domain Power (CDP) Analysis

Part of Agilent E7490A or Agilent E7473A option 111.

Measurement Types

- **Top N**

  The system measures all signals in the network and returns the 'N'strongest power pilot signals received, where 'N' is a user definable integer from 1 to 2 for Agilent E7490A and 'N' is from 1 to 20 for Agilent E7473A. The results are displayed in bar graph format.

- **CDP Trace**

  The system shows the power of each Walsh code and their relative status.

- **CDP Stats**

  The system reports the statistics from one or more predefined lists selected from the display controls. These lists are:

  - Modulation Stats
  - Channel Stats

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- All (both)

Measurement Controls

- Carrier frequency
  - Frequency
  - Channel
- Measurement types
  - Top N
  - CDP trace
  - CDP stats and CDP reset
  - PN increment
- Band
  - Uplink
  - Downlink

Display Controls

- Power display (Y-axis parameter)
  - Ec/Io
  - Ec
- Show value (bar graphs only)
  - None
  - Delay (chips)
  - Ec (dBm)
  - Ec/Io (dB)
  - Aggregate - Ec (dBm)
  - Aggregate - Ec/Io (dB)
  - Delay spread(chips)
  - Aggregate - Peak (dB)
  - Aggregate - Peak (dBm)
- CDP stats display list
  - Modulation statistics
    - PN
    - Delay
    - Estimated rho
    - Delta paging
    - Delta Sync

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        - Noise floor
        - Carrier feedthrough
        - Multiplath power
        - Pilot dominance
        - Pilot power, Ec
        - Channel power, Io
        - Channel, carrier
    - Channel Statistics
        - Multipath power
        - Pilot dominance
        - Percentage amplitude
        - Relative power of traffic channel
        - Average relative power of active traffic channel
        - Number of active traffic channels
        - Peak held across all active traffic channels
        - Average across all active channels
    - All lists

CDMA Base Station Spectrum Analysis

Part of Agilent E7490A and Agilent E7473A option 111.

The spectral mask measurement enables you to visually determine whether the signals in your band meet the IS-97C specifications.

Measurement Types

- Spectral mask
    - Frequency segments against which the spectrum is measured.
    - Pass or fail of transmit power within each frequency segment.
    - Frequency difference between center and spur of worst spurious signal.
    - Amplitude difference from spur to limit line for worst spurious signal.

Measurement Controls

- Frequency units
    - Frequency
    - Channel

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- Carrier
- Band
- Span
- Averages

Display Controls - Markers

- Multiple markers
- Delta markers
- To Max function
- Drag and drop
- Marker to center

CDMA Mobile Station Test Measurement (MOST)

Part of Agilent E7490A and Agilent E7473A option 101.

The Mobile station test measurement (MOST) measures quality, automates the measurement actions, and records the results of the measurement. You enter the call number, the length of the call, and the code key sequence. The MOST test forces the phone to hand the call to the next channel element. It records data for the phone on the forward link, including notes, date, and time. FER and Walsh codes are recorded for every channel element tested.

Call Status Fields

- Channel
- Site
- Face
- Cluster control
- Channel unit
- Channel element
- FER
- Sequence number
- Walsh code

Automatic Redial

- On a dropped call
- On a blocked call (failed origination)

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- Redial interval (wait duration after drop or block)
- Maximum redial attempts

Call Test Setup Fields

- Directory number
- Function code
- Test interval
- Number of iterations

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Hardware Specifications

For full details on receiver types and options, refer to the online *Agilent System Options and Accessories Guide*. For more information on viewing and printing this guide, refer to "Viewing and Printing Online Documents" on page 3-15

Agilent E7473A and Agilent E7490A Option 300/310, 380/381 Cellular Receiver Specifications

Model		E6452A Receiver Options 300, 310	E6452A-H02 Options 380, 381
Frequency	Frequency range	824 to 849 MHz 869 to 894 MHz	832 to 870 MHz 887 to 925 MHz
	Frequency accuracy *With GPS time synchronization*	±1 ppm *±0.05 ppm, characteristic*	
	IF bandwidth	1.25 MHz, characteristic 30 kHz, characteristic	1.25 MHz, characteristic 30 kHz, characteristic
	Aging of TCXO	±1 ppm/year	
Amplitude	Accuracy, 1.25 MHz IF	±1 dB from –40 dBm to –100 dBm (20° to 30°C) ±2 dB from –40 dBm to –100 dBm (0° to 55°C)	±1 dB from –40 dBm to –100 dBm (20° to 30°C) ±2 dB from –50 dBm to –100 dBm (0° to 55°C) ±3 dB from –40 dBm to –50 dBm (0° to 55°C)
	Accuracy, 30 kHz IF	±1.5 dB from –40 dBm to –100 dBm (20° to 30°C) ±2.5 dB from –40 dBm to –100 dBm (0° to 55°C)	
	Noise figure	8.0 dB typical	
	Maximum safe input level	+10 dBm, 20V DC, characteristic	
	1 dB compression point [a]	–15 dBm, characteristic	

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Model		E6452A Receiver Options 300, 310	E6452A-H02 Options 380, 381
	Adjacent channel desensitization [b]	–25 dBm typical	
	Adjacent channel rejection[c]	45 dB typical	
	Internally generated spurious, input referred	–120 dBm	
Input/Output	RF input	50Ω Type-N	
Connectors	Computer	RS-232 (DB9) Male	
	GPS	RS-232 (DB9) Male	
	Power	DC power jack 100 mils, positive center	
Miscellaneous	Operating temperature range	0°C to 55°C	
	Maximum relative humidity	80% for temperatures up to 31°C, decreasing linearly to 50% relative humidity at 40°C	
	Storage temperature range	–40°C to +70°C	
	Dimensions	6 in × 3-5/8 in × 8 in 15.24 cm x 9.21 cm x 20.32 cm	
	Weight	4.6 lbs (2.1 kg)	
	Power (option 300)	9 to 34 V DC, 9W	
	Power (internal GPS, option 310)	9 to 34 V DC, 10W	
Internal GPS[d] (Option 310)	GPS Receiver	8 Channel internal GPS receiver	
	Connector type	SMA	
	Differential compatible without dead reckoning		

a. It is recommended the input signal level not exceed –40 dBm.
b. Adjacent channel desensitization: 1 dB compression of tuned signal with interfering signal 1.25 MHz from tuned signal.
c. Adjacent channel rejection applies to the narrowband mode (30 kHz IF filter) and is defined as: Suppression of interfering signal ± 30 kHz from tuned signal for 30 kHz.
d. Systems fitted with an internal GPS do not support connection to external GPS receivers.

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Agilent E7473A and Agilent E7490A Option 320/330, 390/391 PCS Receiver Specifications

Model		E6450B Receiver Options 320, 330	E6453A Receiver Options 390, 391
Frequency	Frequency range	1850 to 1910 MHz 1930 to 1990 MHz	1710 to 1785 MHz 1805 to 1880 MHz
	Frequency accuracy *With GPS time synchronization*	±1 ppm *±0.05 ppm, characteristic*	
	IF bandwidth (wideband mode)	1.25 MHz, characteristic	1.25 MHz characteristic
	IF bandwidth (narrowband mode)	30 kHz, characteristic	200 kHz, characteristic
	Aging of TCXO	±1 ppm/year	
Amplitude	Accuracy 1.25 MHz IF	±1 dB from –40 dBm to –100 dBm (20° to 30°C) ±2 dB from –40 dBm to –100 dBm (0° to 55°C)	± 0.5 typical (-25 dBm to -100 dBm)
	Accuracy, 30 kHz IF	±1.5 dB from –40 dBm to –100 dBm (20° to 30°C) ± 2.5 dB from –40 dBm to -100 dBm (0° to 55°C)	
	Accuracy, 200 kHz IF		± 0.5 typical (-25 dBm to -100 dBm)
	Noise figure	8.0 dB typical	
	Maximum safe input level	+10 dBm, 20V DC, characteristic	
	1 dB compression point [a]	–15 dBm, characteristic	
	Adjacent channel desensitization [b]	–25 dBm typical	
	Adjacent channel rejection[c]	45 dB typical	
	Internally generated spurious, input referred	–120 dBm	

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Model		E6450B Receiver Options 320, 330	E6453A Receiver Options 390, 391
Input/Output	RF input	50Ω Type-N	
Connectors	Computer	RS-232 (DB9) Male	
	GPS	RS-232 (DB9) Male	
	Power	DC power jack 100 mils, positive center	
Miscellaneous	Operating temperature range	0°C to 55°C	
	Maximum relative humidity	80% for temperatures up to 31°C, decreasing linearly to 50% relative humidity at 40°C	
	Storage temperature range	–40°C to +70°C	
	Dimensions	6 in x 3-5/8 in x 8 in 15.24 cm x 9.21 cm x 20.32 cm	
	Weight	4.6 lbs (2.1 kg)	
	Power (option 320)	9 to 34 V DC, 9W	
	Power (internal GPS option 330)	9 to 34 V DC, 10W	
Internal GPS[d] (Option 330)	GPS Receiver	8 Channel internal GPS receiver	
	Connector type	SMA	
	Differential compatible without dead reckoning		

a. It is recommended the input signal level not exceed –40 dBm.
b. Adjacent channel desensitization applies to wideband mode (1.25 MHz IF filter) and is defined as: 1 dB compression of tuned signal with interfering signal 1.25 MHz from tuned signal.
c. Adjacent channel rejection applies to the narrowband mode (30 kHz and 200 kHz IF filter) and is defined as: Suppression of interfering signal ± 30 kHz from tuned signal and ± 200 kHz from tuned signal for 200 kHz.
d. Systems fitted with an internal GPS do not support connection to external GPS receivers.

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Agilent E7474A TDMA System Specifications

Software Measurement Specifications

The Agilent E7474A measurement software has the following measurement capabilities and functionality:

- "TDMA Channel Analyzer" on page 6-34
- "TDMA Interference Analysis" on page 6-35
- "CW Power Measurements" on page 6-36
- "Channel Power Measurements" on page 6-37
- "Spectrum Measurements" on page 6-38
- "TDMA Phone call control" on page 6-40
- "TDMA Phone Measurement Data" on page 6-41
  - "Large Display Virtual Front Panel (Big Font Mode)" on page 6-42
  - "Handoff/Reselection History" on page 6-43
- "TDMA Phone Messaging" on page 6-44

TDMA Channel Analyzer

Part of Agilent E7474A Option 110, 120.

The Agilent E7475A system channel analyzer virtual front panel provides channel power measurements with controls designed specifically for TDMA and AMPS channels. The channel width is fixed at 30 kHz.

Measurement Types

- All Channels — The system measures the power, of all of the channels in a user specified range. The results are displayed as a trace with one point for each channel.
- Top N — The system measures all of the channels in a user specified range and returns the 'N' channels with the highest power. 'N' is a user definable integer from 1 to 20. Results are displayed in bar graph format.

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- User list — The user manually inputs a list of up to 40 channels to be measured. The measurements are displayed in bar graph format with up to 20 bars. If more than 20 channels are in the list, all channels are measured and recorded, but only 20 are displayed. The user list frequencies can be imported from a text file. This allows regularly used sets of frequencies or channels to be stored for quick loading into the application.

Measurement Controls

- Frequency units
  - Frequency
  - Channel
  - Channelization selection
- Measurement types
  - All channels
  - Top N
  - User list
- Channel/frequency
  - Start, start of range
  - Stop, end of range

Markers (Trace Displays only)

- Multiple markers
- Delta markers
- To Max function
- Drag and drop

TDMA Interference Analysis

Part of Agilent E7474A Option 110, 120.

The adjacent channel power virtual front panel measures the power of a serving channel and the upper and lower adjacent channels. This function is primarily intended for use in systems with Agilent E7474A option 120. Typically, the carrier frequency of the adjacent channel interference measurement is linked to the serving channel of the phone. When the phone is

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handed-off to a new channel, the adjacent channel interference measurement tunes to the new channel.

The adjacent channel interference measurement can also be used independently from the phone. A user can define a specific channel to measure along with the associated upper and lower adjacent channels.

Two independent adjacent channel interference measurements are provided in a single virtual front panel. This is intended for two-phone configurations (option 150). Each adjacent channel interference measurement can be linked to one of the phones.

Measurement Controls

- Carrier frequency
  - Frequency
  - Channel

Display Controls

- Display mode
  - Amplitude versus channel (frequency)
  - Amplitude versus time

Measurement Results

- Adjacent carrier (A)
  - Ratio of power C/N+1 (dB) (server to upper adjacent)
  - Ratio of power C/N-1 (dB) (server to lower adjacent)
- Adjacent carrier (B)
  - Ratio of power C/N+1 (dB)
  - Ratio of power C/N-1 (dB)

CW Power Measurements

Part of Agilent E7474A Option 110, 120.

The Agilent E7474A can measure the peak power (CW Power) at user-defined frequencies within a user-defined resolution bandwidth. The user can define the frequencies to be measured in two different ways.

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Frequency Entry Methods

- **List** Enter an arbitrary list of frequencies.
- **Trace** Enter a start frequency, step size, and count. The system measures at the start frequency, at the (start + step) frequency, (start + (count - 1)*step frequency. For example, if the start frequency is set to 1900 MHz, the step size is set to 1 MHz, and the count is set to 4; then measurements are made at 1900 MHz, 1901 MHz, 1902 MHz, and 1903 MHz. Frequencies can be specified in terms of frequency units or channel number.

Measurement Controls

- Frequency
  - Arbitrary list (list)
  - Start/step/count (trace)
- IF bandwidth
  - 1.25 MHz (wideband mode)
  - 30 kHz (narrowband mode)
- Resolution bandwidth (CW power only)
  - 8.36 kHz to 1 MHz in wideband mode
  - 246 Hz to 28 kHz in narrowband mode

Channel Power Measurements

Part of Agilent E7474A Option 110, 120.

The Agilent E7474A system can measure the total power (Channel Power) within a user-defined bandwidth at a user-defined set of frequencies. This differs from the CW power measurement in that the total power is integrated across the specified channel width. The user can define frequencies to be measured in two different ways.

Frequency Entry Methods

- **List** Enter an arbitrary list of frequencies.
- **Trace** The power virtual front panel can be used to quickly diagnose RF problems. The system operates in both the downlink and uplink PCS bands. Enter a start frequency, step size and count. The system measures

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at the start frequency, at the (start + step) frequency,..., (start + (count - 1*step) frequency. For example, if the start frequency is set to 1900 MHz, the step size is set to 1 MHz, and the count is set to 4; the measurements are made at 1900 MHz, 1901 MHz, 1902 MHz and 1903 MHz.

Frequencies can be specified in terms of frequency units or channel number.

Measurement Controls

- Frequency
  - Arbitrary list (list)
  - Start/step/count (trace)
- IF bandwidth
  - 1.25 MHz (wideband mode)
  - 30 kHz (narrowband mode)
- Resolution bandwidth (CW power only)
  - 8.36 kHz to 1 MHz in wideband mode
  - 246 Hz to 28 kHz in narrowband mode
- Channel width (Channel power only)
  - Cellular band receiver, Options 300, 310
    - 8.36 kHz to 25 MHz in wideband mode
    - 246 Hz to 25 MHz in narrowband mode
- Channel width (channel power only)
  - PCS band receiver, Options 320, 330
    - 8.36 kHz to 60 MHz in wideband mode
    - 246 Hz to 60 MHz in narrowband mode

Spectrum Measurements

Part of Agilent E7474A Option 110, 120.

The spectrum virtual front panel can be used to quickly diagnose RF problems.The system operates in both the downlink and uplink bands. The spectrum display provides the controls listed below. Frequencies can be specified in terms of frequency units or channel number.

Measurement Controls

- Frequency, tunable range[1]
  - Cellular band receiver, Options 300, 310

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        - 824 - 849 MHz [819 - 854 MHz]
        - 869 - 894 MHz [864 - 899 MHz]
- Frequency, tunable range
    - PCS band receiver, Options 320, 330
        - 1850 - 1910 MHz [1845 - 1915 MHz]
        - 1930 - 1990 MHz [1925 - 1995 MHz]
- Frequency, maximum span
    - Cellular band receiver, Options 300, 310
        - 35 MHz
    - PCS band receiver, Options 320, 330
        - 70 MHz
- IF bandwidth
    - 1.25 MHz (wideband mode)
    - 30 kHz (narrowband mode)
- Resolution bandwidth
    - 8.36 kHz to 1 MHz in wideband mode
    - 246 Hz to 28 kHz in narrowband mode

Markers

- Multiple markers
- Delta markers
- To Max function
- Drag and drop
- Marker to center

TDMA Phone functionality

Part of Agilent E7474A Option 100, 120, 150.

The TDMA/AMPS phone component of the Agilent E7474A system includes three main functions. Each one is associated with a control/display window

1. Spectrum measurement allows some out of band tuning above and below specified frequency ranges. These extended ranges are shown in brackets - []. The performance is not specified in these ranges. Characteristic noise floor increase is 2 dB with respect to specified range. Characteristic amplitude accuracy is unchanged with respect to specified range.

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called a virtual front panel. For the phone measurement data, there are two additional displays for data in different formats.

- Phone control (see page 6-40)
- Phone measurement data (see page 6-41)
  - Large display virtual front panel (see page 6-42)
  - Handoff/reselection history (see page 6-43)
- Phone messaging display (see page 6-44)

TDMA Phone call control

This functionality provides automated control of the handset from the PC. The phone control virtual front panel provides the control functions listed below.

Call controls

- Call initiation mode
  - Sequence
  - Single (long) call
- Call mode preference
  - Digital preferred
  - Force digital
  - Force analog
- Call initiation control
  - Start/continue
  - Pause
  - Stop
- Automatic call sequencing
  - Access time (duration of call)
  - Redial wait (duration between calls)
  - Total calls (number of calls to be executed)
- Automatic redial
  - On a dropped call
  - On a blocked call (failed origination)
  - Redial interval (wait duration after drop or block)
  - Maximum redial attempts
- Phone number pick list

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Statistics logging controls

- Attempted calls
- Dropped calls
- Blocked calls (failed originations)

In addition to control functionality, the phone control virtual front panel displays the information listed below.

Display fields (text)

- Channel
- State (conversation, idle and other phone states)
- Access time counter
- Redial time counter
- Calls remaining counter
- Total attempts
- Total drops
- Total blocks
- Dropped call rate
- Blocked call rate

TDMA Phone Measurement Data

The Agilent E7474A system extracts various measurement data from the mobile handset. You control extraction of the specific measurement types with a set of check boxes. The data types are listed below.

Display fields (text)

- Server Data
  - Channel
  - Channel set
  - Time slot
  - RSSI
  - MAC
  - Timing advance
  - BER
  - Color code
  - Site

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- Mobile data
  - State
  - Mode (TDMA, analog)
  - MIN
- Best MAHO
  - Channel
  - RSSI
- System data
  - System identification (SID)
  - Home or roam
  - Provider

Bar graph displays

- Serving channel
- MAHO channels

Line graph displays

- RSSI
- MAC
- BER
- Timing advance
- Best MAHO RSSI
- Handoff
- Reselection

Large Display Virtual Front Panel (Big Font Mode)

The large font display allows the user to select a specific set of parameters to look at in a text display that is easily viewed.

Display Options

- Serving channel
- Channel set
- Time slot
- RSSI
- MAC
- Timing advance

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- BER
- Color code
- Site
- State (conversation, idle, etc.)
- Status (TDMA, Analog, etc.)
- MIN
- SID
- Best MAHO channel
- Best MAHO RSSI
- Home or roam
- Provider

Handoff/Reselection History

The hand-off history virtual front panel displays a tabular list of hand-offs and reselections. Each hand-off or reselection is listed as two lines:

- The before line displays the values of the key parameters immediately prior to the hand-off or reselection.
- The after line displays the same parameters immediately following the hand-off or reselection.

Tabular display of hand-offs and reselections (text)

- Hand-off or reselection indicator (home or roam)
- Time
- Delta RSSI (RSSI after - RSSI before)
- Key parameters before and after
- Serving channel
- RSSI
- BER
- Mode (TDMA, Analog,)
- Site
- Channel set
- Color code
- Timing advance
- Time slot
- MAC

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TDMA Phone Messaging

The Agilent E7474A system extracts and decodes the layer 3 over-the-air messaging from the handset. The user can select any or all of the message types listed below from which to extract and decode messaging.

Message type selection controls

- Digital Channel
  - RACH
  - F-BCCH
  - E-BCCH
  - SMSCH
  - PCH
  - ARCH
  - RDTC, FACCH
  - RDTC, SACCH
  - FDTC, FACCH
  - FDTC, SACCH
- Analog Channel
  - RECC
  - FOCC
  - RVC
  - FVC

In the messaging display, the user can double-click on any message to expand it to the next level of detail. A snapshot function captures the last 50 messages to a separate display while the main display continues to update.

Message logging controls

- Log to display
- Snapshot

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Hardware Specifications

For full details on receiver types and options, refer to the online *Agilent System Options and Accessories Guide*. For more information on view and printing this guide, refer to "Viewing and Printing Online Documents" on page 3-15

Agilent E7474A Option 300, 310 Cellular Receiver Specifications

Model		**E6452A Receiver, Options 300, 310**
Frequency	Frequency range	824 to 849 MHz 869 to 894 MHz
	Frequency accuracy *With GPS time synchronization*	±1 ppm *±0.05 ppm, characteristic*
	IF bandwidth	1.25 MHz, characteristic 30 KHz, characteristic
	Aging of TCXO	±1 ppm/year
Amplitude	Accuracy 1.25 MHz IF	±1 dB from –40 dBm to –100 dBm (20° to 30°C) ±2 dB from –40 dBm to –100 dBm (0° to 55°C)
	Accuracy, 30 kHz IF	±1.5 dB from –40 dBm to –100 dBm (20° to 30°C) ± 2.5 dB from –40 dBm to -100 dBm (0° to 55°C)
	Noise figure	8.0 dB typical
	Maximum safe input level	+10 dBm, 20V DC, characteristic
	1 dB compression point [a]	–15 dBm, characteristic

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Model		E6452A Receiver, Options 300, 310
	Adjacent channel desensitization [b]	–25 dBm typical
	Adjacent channel rejection[c]	45 dB typical
	Internally generated spurious, input referred	–120 dBm
Input/Output	RF input	50Ω Type-N
Connectors	Computer	RS-232 (DB9) Male
	GPS	RS-232 (DB9) Male
	Power	DC power jack 100 mils, positive center
Miscellaneous	Operating temperature range	0°C to 55°C
	Maximum relative humidity	80% for temperatures up to 31°C, decreasing linearly to 50% relative humidity at 40°C
	Storage temperature range	–40°C to +70°C
	Dimensions	6 in x 3-5/8 in x 8 in 15.24 cm x 9.21 cm x 20.32 cm
	Weight	4.6 lbs (2.1 kg)
	Power (option 300)	9 to 34 V DC, 9W
	Power (option 310, internal GPS)	9 to 34 V DC, 10W
Internal GPS[d] (Option 310)	GPS Receiver	8 Channel internal GPS receiver
	Connector type	SMA
	Differential compatible without dead reckoning	

a. It is recommended the input signal level not exceed –40 dBm.
b. Adjacent channel desensitization applies to wideband mode (1.25 MHz IF filter) and is defined as: 1 dB compression of tuned signal with interfering signal 1.25 MHz from tuned signal.
c. Adjacent channel rejection applies to the narrowband mode (30 kHz IF filter) and is defined as: Suppression of interfering signal ± 30 kHz from tuned signal.
d. Systems fitted with an internal GPS do not support connection to external GPS receivers.

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Agilent E7474A Option 320, 330 PCS Receiver Specifications

Model		E6450B Receiver Options 320, 330
Frequency	Frequency range	1850 to 1910 MHz 1930 to 1990 MHz
	Frequency accuracy *With GPS time synchronization*	±1 ppm *±0.05 ppm, characteristic*
	IF bandwidth	1.25 MHz, characteristic 30 KHz, characteristic
	Aging of TCXO	±1 ppm/year
Amplitude	Accuracy 1.25 MHz IF	±1 dB from –40 dBm to –100 dBm (20° to 30°C) ±2 dB from –40 dBm to –100 dBm (0° to 55°C)
	Accuracy, 30 kHz IF	±1.5 dB from –40 dBm to –100 dBm (20° to 30°C) ± 2.5 dB from –40 dBm to -100 dBm (0° to 55°C)
	Noise figure	8.0 dB typical
	Maximum safe input level	+10 dBm, 20V DC, characteristic
	1 dB compression point [a]	–15 dBm, characteristic
	Adjacent channel desensitization [b]	–25 dBm typical
	Adjacent channel rejection[c]	45 dB typical
	Internally generated spurious, input referred	–120 dBm
Input/Output	RF input	50Ω Type-N

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Model		E6450B Receiver Options 320, 330
Connectors	Computer	RS-232 (DB9) Male
	GPS	RS-232 (DB9) Male
	Power	DC power jack 100 mils, positive center
Miscellaneous	Operating temperature range	0°C to 55°C
	Maximum relative humidity	80% for temperatures up to 31°C, decreasing linearly to 50% relative humidity at 40°C
	Storage temperature range	–40°C to +70°C
	Dimensions	6 in x 3-5/8 in x 8 in 15.24 cm x 9.21 cm x 20.32 cm
	Weight	4.6 lbs (2.1 kg)
	Power (option 320)	9 to 34 V DC, 9W
	Power (option 330, internal GPS)	9 to 34 V DC, 10W
Internal GPS[d] (Option 330)	GPS Receiver	8 Channel internal GPS receiver
	Connector type	SMA
	Differential compatible without dead reckoning	

a. It is recommended the input signal level not exceed –40 dBm.
b. Adjacent channel desensitization applies to wideband mode (1.25 MHz IF filter) and is defined as: 1 dB compression of tuned signal with interfering signal 1.25 MHz from tuned signal.
c. Adjacent channel rejection applies to the narrowband mode (30 kHz IF filter) and is defined as: Suppression of interfering signal ± 30 kHz from tuned signal.
d. Systems fitted with an internal GPS do not support connection to external GPS receivers.

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Agilent E7475A GSM900, DCS1800 and GSM1900 System Specifications

Software Measurement Specifications

The Agilent E7475A measurement software has the following measurement capabilities and functionality:

- "GSM Broadcast Channel Analysis" on page 6-49
- "GSM Interference Analysis" on page 6-51
- "CW Power Measurements" on page 6-53
- "Channel Power Measurements" on page 6-54
- "Spectrum Measurements" on page 6-55
- "GSM Phone Call Control" on page 6-58
- "GSM Phone Measurement Data" on page 6-60
- "GSM Phone Messaging" on page 6-61
- "GSM Phone Scan Measurements" on page 6-62

GSM Broadcast Channel Analysis

Part of Agilent E7475A Option 110, 120.

The Agilent E7475A system is capable of collecting comprehensive RF measurement data. These measurements are independent of network parameter settings. The systems execute three different types of broadcast channel measurements (listed below). Any or all of them can be executed simultaneously.

Measurement Types

- All BCH — The system measures the power of all GSM channels in the user selected range. The results are displayed as a trace with one point for each channel. If 20 or less channels are found in the range, they are displayed as a bar graph with amplitude versus frequency.

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- Top N — The system measures all of the GSM channels in the user selected range and returns the N strongest GSM channels received. N is a user-defined variable from 1 to 20. The results are displayed in a bar graph of amplitude versus frequency or a line graph of amplitude versus time. If a measured channel is a broadcast channel, the BSIC can be decoded and a BER measurement can be returned[1].
- User list: — Returns power measurements from a user-defined list of frequencies or channels. There can be up to 40 ARFCN defined in the list. The user inputs a list of up to 40 GSM channels to be measured. The measurements are displayed in a bar graph of amplitude versus frequency or a line graph of amplitude versus time. If a measured channel is a broadcast channel, the BSIC can be decoded. It is also possible to display the highest powers of the top N ARFCNs from this list.The user list frequencies can be imported from a text file. This allows regularly-used sets of frequencies or channels to be stored for quick loading into the application.

Measurement Controls

- Frequency Units
  - Frequency
  - Channel
- Measurement types
  - All BCH
  - Top N
  - User list
- ARFCN (Absolute Radio Frequency Channel Number)
  - Start ARFCN, start of range
  - Stop ARFCN, end of range

1. An estimated BER is calculated based on the number of the bit errors in the mid-amble of the synchronization burst.

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Markers (Trace Displays only)

- Multiple markers
- Delta Markers
- To Max function
- Drag and drop

Display Controls

- Power Display (Y-axis parameter)
  - dBm
  - RxLev
- Display Mode
  - Amplitude versus Frequency
  - Amplitude versus Time
- Show Value (bar graphs only)
  - Power (dBm)
  - Power in RxLev
  - BSIC (if BSIC decode selected)
  - BER (if BSIC decode selected)
  - Name of cell site (if BSIC decode selected)

Measurement Results

- GSM Carrier Power
- BSIC
- BER

GSM Interference Analysis

Part of Agilent E7475A Option 110, 120.

The Agilent E7475A can make adjacent channel and co-channel interference measurements. The measurement returns the ratios of the power at the user-defined carrier frequencies and power of channels either adjacent or on the same channel.

Measurement controls

- Adjacent Channel measurement:
  The system can make adjacent channel interference measurements. For

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two, user-selectable channels, it can return the ratio in dB of the power in each channel to that in the immediately adjacent channels.

- Co-Channel measurement:
  For a single-user, selectable channel, the system can return:
  - Total power in the channel
  - Carrier to interferer ratio
  - Fading
  - Bar graph of symbol delay spread (± 6 symbols).
  - Decoded BSIC of the primary signal in the channel.

Measurement Controls

- Frequency Units
  - Frequency
  - Channel
- Measurement types
  - Adjacent channel analysis
  - Co-channel analysis

Display Controls

- Show Value (bar graphs only)
  - Power in dBm

Measurement Results

- Adjacent carrier (A)
  - Ratio of power C/N+1 (dB)
  - Ratio of power C/N-1 (dB)
- Adjacent carrier (B)
  - Ratio of power C/N+1 (dB)
  - Ratio of power C/N-1 (dB)
- Average power over 8 timeslots (default) - adjacent channel
- Peak power measurement - adjacent channel
- Co-Channel
  - Total power received in channel (dBm)
  - Primary power of strongest signal path (dBm)
  - Peak deviation Fading from primary power (dB)
  - Ratio of primary power / interferer (dB)

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  - Primary BSIC and cellsite name
  - Secondary BSIC and cellsite name
  - Status of measurement
- Symbol Delay Spread (multi-path) graph
- Power at ± 6 symbol offsets

CW Power Measurements

Part of Agilent E7475A Option 110, 120.

The Agilent E7475A system can measure the peak power (CW Power) at user-defined frequencies within a user-defined resolution bandwidth. The user can define the frequencies to be measured in two different ways.

Frequency Entry Methods

- **List**: Enter an arbitrary list of frequencies. The user list frequencies can be imported from a text file. This allows regularly-used sets of frequencies or channels to be stored for quick loading into the application.
- **Trace**: Enter a start frequency, step size, and count. The system measures at the start frequency, at the (start + step) frequency,..., (start + (count - 1*step) frequency. For example, if the start frequency is set to 900 MHz, the step size is set to 1 MHz, and the count is set to 4; the measurements are made at 900 MHz, 901 MHz, 902 MHz and 903 MHz. Frequencies can be specified in terms of frequency units or channel number.

Measurement Controls

- Frequency
  - Arbitrary list (List)
  - Start/Step/Count (Trace)
- IF Bandwidth
  - 1.25 MHz (wideband mode)
  - 200 kHz (narrowband mode)
- Resolution Bandwidth (CW Power only)
  - 8.36 kHz to 950 kHz in wideband mode
  - 1.68 kHz to 190 kHz in narrowband mode

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Channel Power Measurements

Part of Agilent E7475A Option 110, 120.

The Agilent E7475A system can measure the total power (Channel Power) within a user-defined bandwidth at a user-defined set of frequencies. This differs from the CW power measurement in that the total power is integrated across the specified channel width. The user can define frequencies to be measured in two different ways.

Frequency Entry Methods

- **List** Enter an arbitrary list of frequencies. The user list frequencies can be imported from a text file. This allows regularly used sets of frequencies or channels to be stored for quick loading into the application.
- **Trace** The spectrum virtual front panel can be used to quickly diagnose RF problems. The system operates in both the downlink and uplink GSM bands.Enter a start frequency, step, size and count. The system measures at the start frequency, at the (start + step) frequency,..., (start + (count - 1*step) frequency. For example, if the start frequency is set to 900 MHz, the step size is set to 1 MHz, and the count is set to 4; the measurements are made at 900 MHz, 901 MHz, 902 MHz and 903 MHz.

Frequencies can be specified in terms of frequency units or channel number.

Measurement Controls

- Frequency
  - Arbitrary list (List)
  - Start/Step/Count (Trace)
- IF Bandwidth
  - 1.25 MHz (wideband mode)
  - 200 kHz (narrowband mode)
- Channel Width (Channel Power only)
  - GSM900 (option 300, 305, 310)
    - 30 kHz to 35 MHz in wideband mode
    - 5 kHz to 35 MHz in narrowband mode
  - DCS1800 (option 320, 330)
    - 30 kHz to 75 MHz in wideband mode

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        - 5 kHz to 75 MHz in narrowband mode
    - GSM1900 (option 340, 350)
        - 30 kHz to 60 MHz in wideband mode
        - 5 kHz to 60 MHz in narrowband mode

Spectrum Measurements

Part of Agilent E7475A Option 110, 120.

The spectrum virtual front panel can be used to quickly diagnose RF problems. The spectrum display provides the controls listed below. Frequencies can be specified in terms of frequency units or channel number.

Measurement Controls

- Frequency, tunable range[1]
    - GSM900 (option 300, 310)
        - 880 - 915 MHz [876 - 917 MHz]
        - 925 - 960 MHz [921 - 962 MHz]
    - GSM-R (option 305)
        - 876 - 915 MHz [876 - 917 MHz]
        - 921 - 960 MHz [921 - 962 MHz]
    - DCS1800 (option 320, 330)
        - 1710 - 1785 MHz [1705 - 1790 MHz]
        - 1805 - 1880 MHz [1800 - 1885 MHz]
    - GSM1900 (option 340, 350)
        - 1850 - 1910 MHz [1845 - 1915 MHz]
        - 1930 - 1990 MHz [1925 - 1995 MHz]
- Frequency, maximum span
    - GSM900 (option 300, 310) - 41 MHz
    - GSM-R (option 305) - 41 MHz
    - DCS1800 (option 320, 330) - 85 MHz

1. Spectrum measurement allows some out of band tuning above and below specified frequency ranges. These extended ranges are shown in brackets - []. The performance is not specified in these ranges. Characteristic noise floor increase is 2 dB with respect to specified range. Characteristic amplitude accuracy is unchanged with respect to specified range.

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  - GSM1900 (option 340, 350) - 70 MHz
- IF Bandwidth
  - 1.25 MHz (wideband mode)
  - 200 kHz (narrowband mode)
- Resolution Bandwidth
  - 8.36 kHz to 950 kHz in wideband mode
  - 1.68 kHz to 190 kHz in narrowband mode

Markers

- Multiple markers
- Delta Markers
- To Max function
- Drag and drop

Spectrum noise floor

- Narrowband mode, 300 kHz span
  - -139 dBm average
  - -138 dBm peak
- Wideband mode, 300 kHz span
  - -131 dBm average
  - -130 dBm peak
- Narrowband mode, 25 MHz span
  - -130 dBm average
  - -129 dBm peak
- Wideband mode, 25 MHz span
  - -125 dBm average
  - -123 dBm peak

GSM Power Measurements

The Agilent E7475A system is capable of measuring power using various methods. The following list describes how the techniques are used, calculated, and displayed.

- Spectrum and CW analyzer
  - Peak power measurement.
- Channel analyzer

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  - Total channel power.
- Broadcast channel and adjacent channel analyzer
  - Power averaged over 8 timeslots.
  - Peak power measurement.
- Broadcast channel with BSIC decoding
  - Power is measured over 1 timeslot.
- Co-channel analyzer
  - Power of the dominant component over 1 timeslot.
- Adjacent Channel Analyzer
  - Power averaged over 8 timeslots.
  - Peak power averaged over 8 timeslots.

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GSM Phone functionality

Part of Agilent E7475A Option 100, 120, 150.

The phone component of the Agilent E7475A system includes four main functions.

- Phone Call Control (see page 6-58)
- Phone Measurement data (see page 6-60)
- Phone Messaging display (see page 6-61)
- Phone Scan Measurement data (see page 6-62)

GSM Phone Call Control

This functionality provides automated control of the handset from the PC. The phone control virtual front panel provides the control functions listed below.

Call controls

- Call initiation mode
  - Sequence
  - Single (long) call
  - Termination
- Call initiation control
  - Start/continue
  - Pause
  - Stop
- Automatic call sequencing
  - Access time (duration of call)
  - Redial wait (duration between calls)
  - Total calls (number of calls to be executed)
- Automatic redial
  - On a dropped call
  - On a blocked call (failed origination)
  - Redial interval (wait duration after drop or block)
  - Maximum redial attempts
- Phone number pick list
- Call option
  - Full rate of speech

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  - Enhanced full rate of speech (if supported by network)
- Select channel
  - Force handover to an ARFCN
  - Prevent handover from an ARFCN
  - Force broadcast channel (BCH)
- Mobile behavior
  - Restrict timeslot to be used by the mobile (0-7)
  - Ignore cell barring

Statistics logging controls

- Attempted calls
- Dropped calls
- Blocked calls (failed originations)
- Handover data

In addition to control functionality, the phone control virtual front panel displays the information listed below.

Display fields (text)

- Call information
  - Access time counter
  - Redial time counter
  - Calls remaining
- Statistics
  - Dropped call rate
  - Blocked call rate
  - Total attempts
  - Total drops
  - Total blocks
- Handover Information
  - Successful handovers
  - Failed handovers
  - Attempted handovers
- Serving cell ARFCN

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GSM Phone Measurement Data

The Agilent E7475A system extracts various measurement data from the mobile handset. You control extraction of the specific measurement types with a set of check boxes. The data types are listed below.

Display fields (text)

- State (No service, idle or dedicated)
- Serving cell information
  - BCH
  - BSIC (base station identity code)
  - Cell identity
  - Cell name
  - LAC (Location area code)
  - MNC (mobile network code)
  - MCC (mobile country code)
- Mobile measurement information
  - TCH (traffic) ARFCN
  - RxLev (full or sub)
  - RxQual (full or sub)
  - Mobile transmit power
  - Timing advance
  - Timeslot
  - Radio link timeout counter (RLTC)
  - Frame erasure rate (FER)

Tabular displays

- Frequency hopping sequence
- Neighbor cell list
- C1 and C2 path loss and re-selection parameters (not for Sagem OT-35G/D phones)

Graph displays

- Serving cell and neighbor cells amplitude versus frequency
- Serving cell and neighbor cells amplitude versus time
- Mobile measurements
  - RxQual versus time (displayed as RxQual-sub or RxQual-full)

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- RxLev versus time (Can be displayed as RxLev-sub or RxLev-full.)
- Tx power versus time
- Timing advance versus time

GSM Phone Messaging

The Agilent E7475A system extracts and decodes the Layer 3 over-the-air messaging from the handset. The user can select any or all of the channel types listed below from which to extract and decode messaging.

Message type selection controls

- Layer 3 messages
  - Call control
  - Radio resource
  - Mobility management
- Layer 2 messages
  - Sub-set of layer 2 messages[1].

In the messaging display, the user can double-click on any message to expand it to the next level of detail. A snapshot function captures the last 50 messages to a separate display while the main display continues to update.

Message logging controls

- Log to display
- Layer 2 messages
- Layer 3 messages
- Snapshot

1. The Layer 2 protocol decodes are dependent on the test mobile phone hardware used. Currently the Sagem OT35x, OT55x and OT75x provide only the Information (I) messages and the SABM messages. The Sagem OT95x and the Orbitel 907 test mobiles provide the full Layer 2 commands covered in GSM 04.06 version 5.2.1 table 4.

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GSM Phone Scan Measurements

Part of Agilent E7475A Option 130

The Agilent E7475A system enables the phone to switch into a scanning mode and to pass these measurements for display and recording. The mobile scans all broadcast channels[1].

Measurement Types

- All BCH The system will scan through and measure the power in all the frequency channels in its operating range. The results are displayed as a trace with one point for each of the channels.
- Top N The system will scan through and measure the power in all the frequency channels is its operating range. The Top N channels, where N is an integer between 1 and 20, are then displayed in either a bar graph of amplitude versus frequency or a line graph of amplitude versus time.
- User list The user inputs a list of up to 20 GSM channels to be measured. The results are displayed in a bar graph of amplitude versus frequency or a line graph of amplitude versus time.

Measurement Controls

- Frequency units
  - Frequency
  - Channel
- Measurement types
  - All BCH
  - Top N
  - User list

Markers (Trace Displays only)

- Multiple markers
- Delta markers
- To Max function

1. When a test mobile is being used as a frequency scanner, it cannot be used to set up calls and log other data at the same time.

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- Drag and drop

Display Controls

- Power display (Y-axis parameter)
  - dBm
  - RxLev
- Display mode
  - Amplitude versus frequency
  - Amplitude versus Time
- Show value (bar graphs only)
  - Power (dBm)
  - Power in RxLev

Measurement Results

- GSM carrier power

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Hardware Specifications

For full details on receiver types and options, refer to the online *Agilent System Options and Accessories Guide*. For more information on view and printing this guide, refer to "Viewing and Printing Online Documents" on page 3-15

Agilent E7475A Options 300, 310, 320, 330, 340, and 350 Receiver Specifications

Model		Agilent E7475A Option 300, 310 (E6451A)	Agilent E7475A Option 320, 330 (E6453A)	Agilent E7475A Option 340, 350 (E6454A)
Frequency	Frequency range	880 to 915 MHz 925 to 960 MHz	1710 to 1785 MHz 1805 to 1880 MHz	1850 to 1910 MHz 1930 to 1990 MHz
	Frequency accuracy	±1 ppm		
	IF bandwidth	1.25 MHz, characteristic (wideband mode) 200 kHz, characteristic (narrowband mode)		
	Aging of TCXO	±1 ppm/year		
Amplitude	Accuracy, 1.25 MHz IF bandwidth	± 0.5 typical (-25 dBm to -100 dBm)		
	Accuracy, 200 kHz IF bandwidth	± 0.5 typical (-25 dBm to -100 dBm)		
	Noise figure	8 dB typical		
	Maximum safe input level	+10 dBm, 20V DC, characteristic		
	1 dB compression point [a]	–15 dBm, characteristic		
	Adjacent channel desensitization [b]	–25 dBm typical		
	Adjacent channel rejection[c]	45 dB typical		
	Internally generated spurious, input referred	–120 dBm		
Input/Output	RF input	50Ω Type-N		

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Agilent E7475A GSM900, DCS1800 and GSM1900 System Specifications

Model		Agilent E7475A Option 300, 310 (E6451A)	Agilent E7475A Option 320, 330 (E6453A)	Agilent E7475A Option 340, 350 (E6454A)
Connectors	Computer	RS-232 (DB9) Male		
	GPS	RS-232 (DB9) Male		
	Power	DC power jack 100 mils, positive center		
Miscellaneous	Operating temperature range	0°C to 55°C		
	Maximum relative humidity	80% for temperatures up to 31°C, decreasing linearly to 50% relative humidity at 40°C		
	Storage temperature range	–40°C to +70°C		
	Dimensions	6 in x 3-5/8 in x 8 in 15.24 cm x 9.21 cm x 20.32 cm		
	Weight	2.1 kg (4.6 lbs)		
	Power (options 300, 320, 340)	9 to 34 V DC, 9W		
	Power (internal GPS, Option 310, 330, 350)	9 to 34 V DC, 10W		
Internal GPS[d] (Option 310, 330, 350)	GPS Receiver	8 Channel internal GPS receiver		
	Connector type	SMA		
	Differential compatible without dead reckoning			

a. It is recommended the input signal level not exceed –25 dBm.
b. Adjacent channel desensitization applies to the wideband mode (1.25 MHz IF Filter) and is defined as: 1 dB compression of tuned signal with interfering signal ±1.25 MHz from tuned signal.
c. Adjacent channel rejection applies to the narrowband mode (200 kHz IF filter) and is defined as: Suppression of interfering signal ± 200 kHz from tuned signal.
d. Systems fitted with an internal GPS do not support connection to external GPS receivers.

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HP E7475A Options 305 Receiver Specifications

Model		Agilent E7475A Option 305 (E6451A-E03)
Frequency	Frequency range	876 to 915 MHz 921 to 960 MHz
	Frequency accuracy	±1 ppm
	IF bandwidth	1.25 MHz, characteristic (wideband mode) 200 kHz, characteristic (narrowband mode)
	Aging of TCXO	±1 ppm/year
Amplitude	880 to 915 MHz and 925 to 960 MHz range:	
	Accuracy, 1.25 MHz IF bandwidth	± 0.5 dB typical (-25 dBm to -100 dBm)
	Accuracy, 200 kHz IF bandwidth	± 0.5 dB typical (-25 dBm to -100 dBm)
	Noise figure	8 dB typical
	876 to 880 MHz and 921 to 925 MHz range:	
	Accuracy, 1.25 MHz IF bandwidth	± 1 dB typical (-25 dBm to -100 dBm)
	Accuracy, 200 kHz IF bandwidth	± 1 dB typical (-25 dBm to -100 dBm)
	Noise figure	11 dB typical
	Maximum safe input level	+10 dBm, 20V DC, characteristic
	1 dB compression point [a]	–15 dBm, characteristic
	Adjacent channel desensitization [b]	–25 dBm typical
	Adjacent channel rejection[c]	45 dB typical
	Internally generated spurious, input referred	–120 dBm
Input/Output	RF input	50Ω Type-N

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Agilent E7475A GSM900, DCS1800 and GSM1900 System Specifications

Model		Agilent E7475A Option 305 (E6451A-E03)
Connectors	Computer	RS-232 (DB9) Male
	GPS	RS-232 (DB9) Male
	Power	DC power jack 100 mils, positive center
Miscellaneous	Operating temperature range	0°C to 55°C
	Maximum relative humidity	80% for temperatures up to 31°C, decreasing linearly to 50% relative humidity at 40°C
	Storage temperature range	–40°C to +70°C
	Dimensions	6 in x 3-5/8 in x 8 in 15.24 cm x 9.21 cm x 20.32 cm
	Weight	2.1 kg (4.6 lbs)
	Power (option 305)	9 to 34 V DC, 9W
Internal GPS (Option 305)	Not supplied	

a. It is recommended the input signal level not exceed –25 dBm.
b. Adjacent channel desensitization applies to the wideband mode (1.25 MHz IF Filter) and is defined as: 1 dB compression of tuned signal with interfering signal ±1.25 MHz from tuned signal.
c. Adjacent channel rejection applies to the narrowband mode (200 kHz IF filter) and is defined as: Suppression of interfering signal ± 200 kHz from tuned signal.

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General Hardware Specifications and Minimum System Requirements

Personal Computer Recommendations, Minimum

The PC requirements differ depending on the operating system, and on whether you wish to collect data from a single phone or multiple phones.

Single phone

- Windows 95/98
  - Minimum: 233 MHz Pentium, 64 Mbytes RAM
  - Recommended: 266 MHz Pentium II or III, 64 Mbytes RAM
- Windows NT
  - Minimum: 233 MHz Pentium, 64 Mbytes RAM
  - Recommended: 266 MHz Pentium II or III, 128 Mbytes RAM

Multiple phone

- Windows 95/98
  - Minimum: 266 MHz Pentium, 64 Mbytes RAM
  - Recommended: 366 MHz Pentium II or III, 64 Mbytes RAM
- Windows NT
  - Minimum: 266 MHz Pentium, 64 Mbytes RAM
  - Recommended: 366 MHz Pentium II or III, 128 Mbytes RAM

Common Requirements

- RS-232 DB9 Serial Port
- Parallel port: 25-pin bidirectional
- 90 Mbytes disk space for software installation
- 200 Mbytes disk space for data (recommended)
- CD-ROM drive recommended
- 800 x 600 display resolution minimum
- For multiple phone capability, two PCMCIA slots

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Supported Phones

Agilent E7473A CDMA systems:

- Qualcomm QCP-800, QCP-820, QCP-860, QCP-1900, QCP-1920, QCP-1960, QCP-2700, QCP-2760
- Sony CM-D500, CM-D600, CM-M1300, CM-B1201SPR, CM-S1101SPR
- Samsung SCH-1000
- Lucky Goldstar LG1300 Korean PCS
- Toshiba CM10 for Cellular J-CDMA

Agilent E7474A TDMA systems:

- Motorola StarTAC ST7790 TDMA/AMPS - 800 MHz
- Motorola StarTAC ST7797 TDMA/AMPS - 800 MHz and TDMA 1900 MHz

Agilent E7475A GSM systems:

- Sagem OT-35G GSM900
- Sagem OT-35D DCS1800
- Sagem OT-55G GSM900
- Sagem OT-55D DCS1800
- Sagem OT-55P GSM1900
- Sagem OT-55R GSM-R
- Sagem OT-75M Dual Band
- Sagem OT-95
- Orbitel ST-907

External GPS Receiver Requirements

- TSIP, TAIP, or NMEA communication protocol
- RS-232 (DB9) interface
- Any external GPS will have to output a GPS 1 pulse/second signal for Pilot correlation for Agilent E7473A options 110, 111, or 120 and Agilent E7490A option 111.

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GPS Systems Supported[1]

- Bosch Travel Pilot RGS08 Professional
- Magneti Marelli RP Nav200
- GARMIN GPSII/III
- Trimble DR
- Trimble 455/DR and 450
- Trimble SVeeSix
- Trimble 400

Differential GPS Receiver Requirements

- DCI RDS-3000

Antennas

- Receiver RF input specifications:
  - Input impedance: 50Ω
  - Connector type: Type-N

1. Not all these systems can provide 1 pulse/second signal for Pilot correlation.

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Safety and Regulatory Information

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Warning and Caution Notices

Review this product and related documentation to familiarize yourself with safety markings and instructions before you operate the system. This product has been designed and tested in accordance with appropriate international standards.

WARNING

The WARNING notice denotes a hazard. It calls attention to a procedure, practice, or the like, that, if not correctly performed or adhered to, could result in personal injury. Do not proceed beyond a WARNING notice until the indicated conditions are fully understood and met.

CAUTION

The **CAUTION** notice denotes a hazard. It calls attention to an operating procedure, practice, or the like, which, if not correctly performed or adhered to, could result in damage to the product or loss of important data. Do not proceed beyond a **CAUTION** notice until the indicated conditions are fully understood and met.

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Instrument Markings

	When you see this symbol on your instrument, you should refer to the instrument's instruction manual for important information.
	This symbol indicates hazardous voltages.
	The laser radiation symbol is marked on products that have a laser output.
	This symbol indicates that the instrument requires alternating current (ac) input.
	This symbol indicates that the instrument requires direct current (dc) input.
	The CE mark is a registered trademark of the European Community. If it is accompanied by a year, it indicates the year the design was proven.
	The CSA mark is a registered trademark of the Canadian Standards Association.
ISM 1-A	This text indicates that the instrument is an Industrial Scientific and Medical Group 1 Class A product (CISPER 11, Clause 4).
	This symbol indicates that the power line switch is ON.
	This symbol indicates that the power line switch is in STANDBY position.
 N279	The C-Tick mark is a registered trademark of the Spectrum Management Agency of Australia. This signifies compliance with the Australian EMC Framework Regulations under the terms of the Radio communications Act of 1992
	This symbol indicates that the power line switch is in OFF position.

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General Safety Considerations

The Agilent digital receiver has been designed and tested in accordance with IEC Publication 1010, Safety Requirements for Electronic Measuring Apparatus, and has been supplied in a safe condition. The documentation contains information and warnings which must be followed by the user to ensure safe operation and to maintain the product in a safe condition.

WARNING

- **If this product is not used as specified, the protection provided by the equipment could be impaired. This product must be used in a normal condition (in which all means for protection are intact) only.**
- **No operator serviceable parts are inside this system. Refer servicing to a qualified Agilent Technologies, Inc. service center. To prevent electrical shock, do not remove the covers.**
- **To prevent electrical shock, disconnect the Agilent receiver from mains before cleaning. Use a dry cloth or one slightly dampened with water to clean the external case parts. Do not attempt to clean the receiver internally.**

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Product Installation, Use, and Storage

CAUTIONS

- This Agilent digital receiver is designed for use in INSTALLATION CATEGORY II and POLLUTION DEGREE 2, per IEC 1010 and 664 respectively.
- Enclosure protection IP40 according to IEC 529.
- Install the system according to the enclosure protection provided. This system does not protect against the ingress of water. This instrument protects against entry of solid foreign objects greater than, or equal to, one millimeter.

Product Power

CAUTIONS

- The input power to the Agilent digital receiver should not exceed –15 dBm. Power levels greater than +10 dBm will damage the instrument.
- For continued protection against fire hazard, replace the line fuse (cigarette lighter/2 amp 32 V FB fuse) only with the same type of rating (type nA/nV). The use of other fuses or materials is prohibited.
- If you use external power, install the instrument so the detachable power cord is readily identifiable and is easily reached by the operator. The detachable power cord is the instrument disconnecting device. It disconnects the mains circuit from the mains supply before other parts of the instrument.
- If you do not use external power, position the product so you can easily operate the disconnecting device.

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Declarations of Conformity

DECLARATION OF CONFORMITY

According to ISO/IEC Guide 22 and EN 45014

Manufacturer's Name:	Hewlett-Packard Co.
Manufacturer's Address:	1400 Fountaingrove Parkway Santa Rosa, CA 95403-1799 USA

Declares that the product:

Product Name:	Digital Receiver RF Coverage Measurement System Integrated Air Interface Measurement System
Model Number:	HP E6450A, HP E6450B, HP E6451A, HP E6452A HP E7450A, HP E7450B, HP E7452A HP E7470A, HP E7472A
Product Options:	This declaration covers all options of the above products.

Conforms to the following product specifications:

Safety: IEC 61010-1:1990 / EN 61010-1:1993
CAN/CSA-C22.2 No. 1010.1-92

EMC: CISPR 11:1990/EN 55011:1991 Group 1, Class A
IEC 801-2:1984/EN 50082-1:1992 4 kV CD, 8 kV AD
IEC 801-3:1984/EN 50082-1:1992 3 V/m, 27-500 MHz
IEC 801-4:1988/EN 50082-1:1992 0.5 kV sig. lines, 1 kV power lines

Supplementary Information:

The product herewith complies with the requirements of the Low Voltage Directive 73/23/EEC and the EMC Directive 89/336/EEC and carries the CE-marking accordingly.

Santa Rosa, CA, USA October 27, 1998

Greg Pfeiffer/Quality Engineering Manager

European Contact: Your local Hewlett-Packard Sales and Service Office or Hewlett-Packard GmbH Department HQ-TRE, Herreneberger Strasse 130, D71034 Boblingen, Germany (FAX +49-7031-14-3143)

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DECLARATION OF CONFORMITY

according to ISO/IEC Guide 22 and EN 45014

Manufacturer's Name:	**Hewlett-Packard Ltd.**
Manufacturer's Address:	Queensferry Microwave Division, South Queensferry, West Lothian, EH30 9TG Scotland, United Kingdom

Declares that the product

Product Name :	GSM Drive Test System
Model Numbers:	HP E7475A
Product Options:	This declaration covers all options of the above products as detailed in TCF No. A-5951-9852-09.

Conforms with the protection requirements of European Council Directive 89/336/EEC on the approximation of the laws of the member states relating to electromagnetic compatibility.

Against EMC test specifications EN 55011: 1991 (Group 1, Class A) and EN 50082-1:1992

As Detailed in:	Electromagnetic Compatibility (EMC) Technical Construction File (TCF) No. A-5951-9852-09
Assessed by:	Dti Appointed Competent Body EMC Test Centre, GEC-Marconi Avionics Ltd., Maxwell Building, Donibristle Industrial Park, KY11 5LB Scotland, United Kingdom
Technical Report Number:	Report No. 605/CBR, dated 09 April 1999

Supplementary Information:

The individual components of the product meet relevant international safety standards.

The product herewith complies with the requirements of the Low Voltage Directive 73/23/EEC.

South Queensferry, Scotland	April 13, 1999	R. Evans / Quality Manager
Location	**Date**	

European Contact:
Your local Hewlett-Packard Sales and Service Office or Hewlett-Packard GmbH, Department ZQ/Standards Europe
Herrenberger Strasse 130, D-7030 Böblingen (FAX: +49-7031-143143)

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