Agilent
CDMA Base Station Over-Air Maintenance Tool

Data Sheet

CDMA Over-Air Maintenance Tool

The Agilent Technologies E6474A CDMA Over-Air Maintenance Tool is used to make diagnostic measurements of cdmaOne, IS-2000 (cdma 2000 1X), and J-STD-008 CDMA base stations over the air. The system software runs on a PC that interfaces with an Agilent digital RF receiver.

Agilent Technologies

System software

The system software controls Agilent digital RF receivers. Multiple measurements can be made simultaneously. All measurements can be displayed in real-time and logged to the database. The system software option currently available:

- Option 150: code domain power and spectrum mask software license

Receiver-based software

The receiver-based function of the Agilent E6474A system, provided by Option 150, is comprised of two primary elements:

- code domain power
- spectrum display with IS-97 mask

Each element has an associated control and display window called a view. The software can control up to four digital receivers.

CDMA code domain power

The Agilent E6474A Option 150 software measures code domain power for cdmaOne, cdma2000 1x and J-STD-008 signals. These measurements provide real-time insight for traffic analysis, capacity management, and base station health. The code domain power view is segmented into three measurement types (listed below). Any or all of them can be executed simultaneously.

Measurement types

- CDP Trace:

The system measures the relative powers of each of the 64 or 128 Walsh codes. Data is displayed in bar graph format with a unique color for each channel type – pilot, paging, quick paging, sync, and traffic.

- CDP Stats:

The system displays important modulation and traffic measurement parameters in large font text format.

- TopN or Top 2 Pilots:

The system measures all of the pilots in the network and returns the 'N' strongest pilot channels received, (when E6474A Options 110, 111, 120, or 121 are included) where 'N' is a user-definable integer from 1 to 20. When E6474A Option 150 is used as a stand-alone measurement, the Top 2 pilots are measured in order to determine pilot dominance. The results are displayed in bar graph format.

Measurement controls

- Carrier frequency
  - frequency
  - channel
- Measurement types
  - code domain power trace
  - code domain power stats
  - topN or Top 2 pilots

Markers

(CDP trace display only)

- multiple markers
- delta markers
- to max function
- drag and drop

Measurement results

- CDP trace
  - relative power for each Walsh code
  - active channel threshold
- CDP stats
  - frequency channel
  - channel power
  - pilot power
  - PN offset number
  - pilot delay (absolute delay with respect to GPS time)
  - pilot-paging amplitude delta
  - pilot-sync amplitude delta
  - pilot-quick paging amplitude delta (cdma2000)
  - estimated Rho
  - code domain noise floor
  - multipath power
  - pilot dominance
  - carrier feedthrough
  - instantaneous number of active traffic channels
  - average number of active traffic channels
  - peak number of active traffic channels
  - average power per active traffic channel
  - peak power per active traffic channel
  - percentage of amplifier capacity
- For cdma2000:
  - peak amplifier power
  - average amplifier power
  - traffic channel utilization
  - peak traffic channel utilization
  - average traffic channel utilization
- TopN or Top 2 pilots
  - see CDMA pilot channel analysis section
  - frequency error

Pilot-paging amplitude delta is the difference, in dB, between the amplitudes of the pilot and paging channels. Similar measurements are made for pilot-sync delta and pilot-quick paging delta (cdma2000).

Multipath power is equivalent to the aggregate-peak power measurement of the pilot channel analyzer. Pilot dominance is the difference, in dB, between the amplitudes of the strongest pilot and the second strongest pilot.

Estimated Rho is a measure of modulation quality. Rho is the formal measure of modulation quality defined in IS-97, but it requires the transmitter be in a pilot-only state. Estimated Rho is measured with the transmitter in service, so there is no impact on traffic.

Code domain noise floor is the averaged power of all of the inactive channels.

Pilot delay is defined as the difference between the time a pilot signal is received and the time 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 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 the frequency of the dominant pilot signal. Carrier frequency error can be due to both base station carrier error and doppler shift (if moving).

The number of active traffic channels is displayed in three different ways:

- instantaneous – number of active traffic channels for that specific code domain measurement
- average – number of active averaged over the duration a specific pilot is dominant
- peak – the maximum number of active traffic channels over the duration a specific pilot is dominant

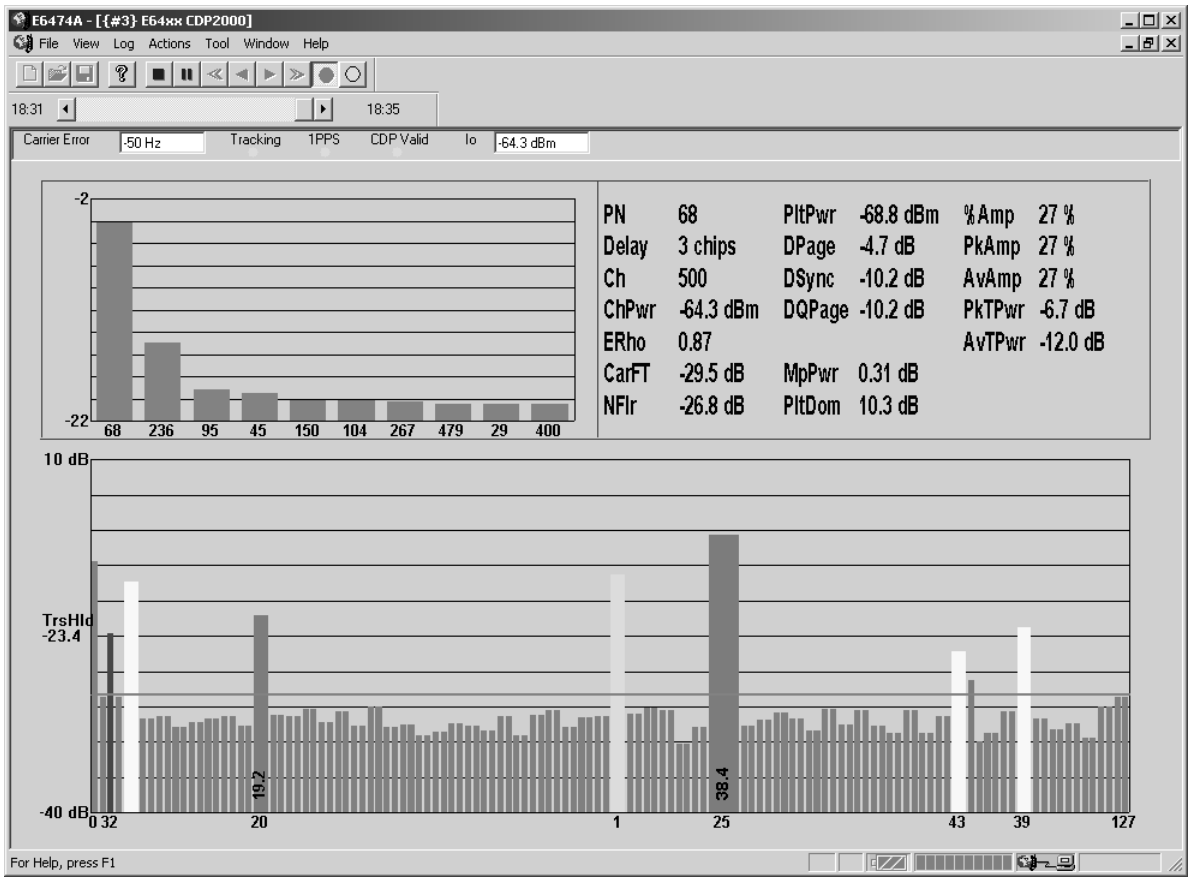

Figure 1. Code domain power

Spectrum with IS-97 mask

The Agilent E6474A Option 150 software provides a spectrum display that includes the spectrum mask as defined in the IS-97 standard. Pass/Fail indicators for the mask are provided at each of the IS-97 frequency offsets. The controls are simple and intended for fast test execution.

Measurement controls

Channel	Frequency span
• channel	• 2 MHz
• frequency	• 7 MHz

The resolution bandwidth is fixed at 30 kHz.

Frequency (tunable range)

- cellular band receiver (E6452C)
  - 824 to 849 MHz [819 to 854]
  - 869 to 894 MHz [864 to 899]
- PCS band receiver (E6450C)
  - 1850 to 1910 MHz [1845 to 1915]
  - 1930 to 1990 MHz [1925 to 1995]
- Japan cellular band receiver (E6457C)
  - 832 to 870 MHz [827 to 875]
  - 887 to 925 MHz [882 to 930]
- Korea PCS band receiver (E6453C)
  - 1710 to 1785 MHz [1705 to 1790]
  - 1805 to 1880 MHz [1800 to 1885]

Markers

- multiple markers
- delta markers
- marker to max
- marker value to center frequency
- drag and drop

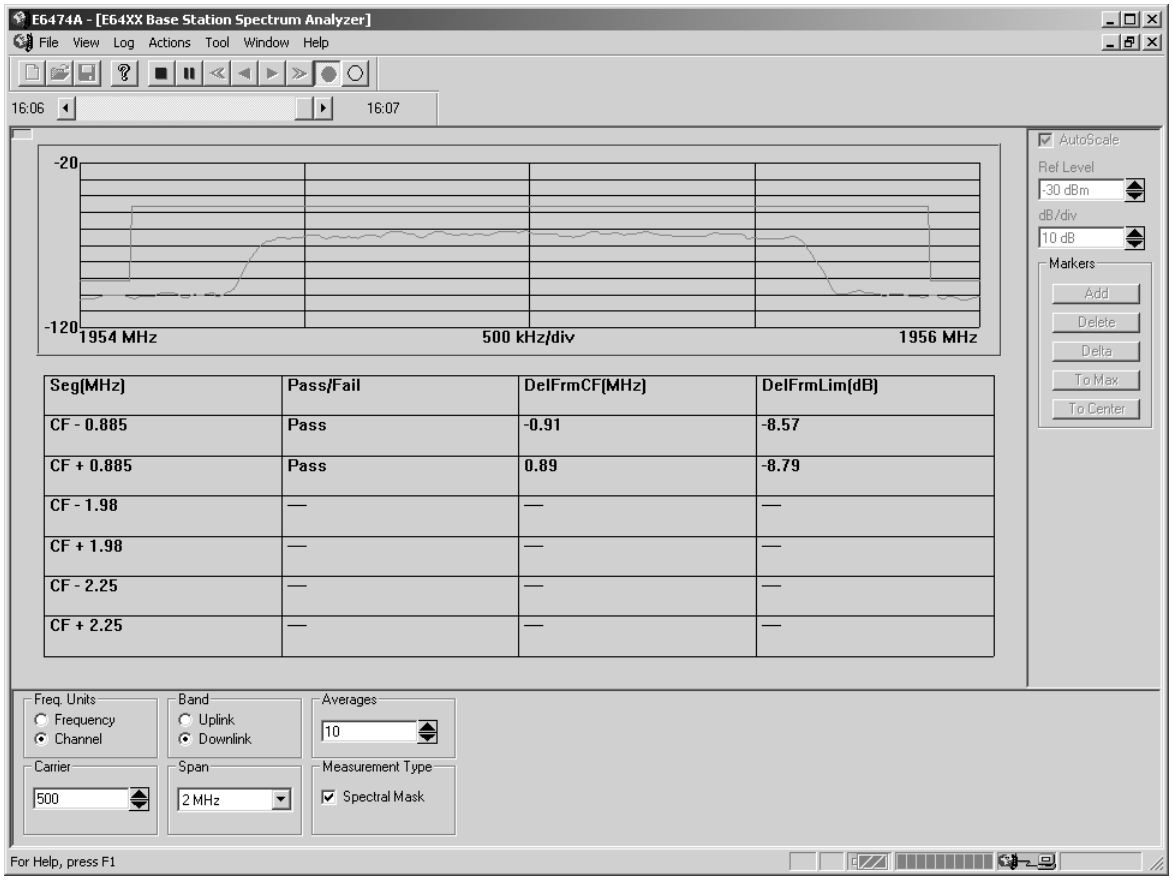

Figure 2. Spectrum with IS-97 mask

1. Spectrum measurement allows tuning 5 MHz 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.

Data recording and playback

Logging and playback of data are controlled by VCR-like buttons. While logging data, the user can enter notes into the data. Two methods of user note entry are provided. One prompts the user to enter a text string; for example, entering a tunnel. The other automatically enters a numbered note into the database, minimizing interaction with the keyboard. A summary of record and playback features are listed below.

Record features

- user note
- pause/resume
- user-defined data set name

Playback features

- play forward
- play reverse
- step forward
- step reverse
- variable speed

Report generator and display printing

The Agilent E6474A provides fast and easy report generation. All of the current views are captured to an HTML file. Each report includes a header section. After selecting generate report, a dialog box prompts the user to enter the header information listed below. Smart defaults and persistent information are used, so minimal text entry is required.

Header elements

- title
- user name
- company
- time
- date
- location – defaults to current GPS fix
- comments – user entered notes

There is no limit to the number of reports that can be generated. Reports can be generated during playback as well as during live data collection.

Any view can be printed by selecting the print command from the file menu.

RF receiver hardware

There are six digital RF receiver options for the Agilent E6474A CDMA Base Station Over-Air Maintenance Tool system:

- E6452C Cellular band receiver
- E6450C PCS band receiver
- E6457C Japan Cellular band receiver
- E6453C Korea PCS band receiver
- E6454C CDMA/GSM PCS band receiver
- E6456C cdma2000/UMTS PCS band receiver

Each receiver has an internal GPS receiver. Alternatively, an external GPS receiver can be used.

The Agilent E6474A system supports any combination of receivers, up to a total of four. In multiple receiver configurations, the receivers communicate with each other via a high-speed serial ring. Communication with the PC is done via a single RS-232 link to one of the receivers in the ring.

Each receiver option includes:

- RF antenna for the corresponding frequency band
- cable to connect to other receivers
- cable to connect to PC*
- kit for mounting receiver in a vehicle
- AC/DC power supply*
- cigarette lighter power cord*
- GPS antenna and cables

* Alternatively, Agilent provides an optional USB hub solution that not only provides PC connectivity, but also provides power for the digital RF receivers. A single USB hub can simultaneously support up to two phones and two receivers.

The USB hub solution is ordered using the E6473A drive test accessory product number:

- E6473A Option 010: Vehicle-mounted USB hub

Digital RF receiver specifications

Frequency

Range[1]	
E6452C	824-849 MHz [819-854]
	869-894 MHz [864-899]
E6450C	1850-1910 MHz [1845-1915]
	1930-1990 MHz [1925-1995]
E6457C	832-870 MHz [827-875]
	887-925 MHz [882-930]
E6453C	1710-1785 MHz [1705-1790]
	1805-1880 MHz [1800-1885]
E6454C	1850-1910 MHZ [1845-1915]
	1930-1990 MHZ [1925-1995]
E6456C	1850-1910 MHZ [1845-1915]
	1930-1990 MHZ [1925-1995]
Frequency accuracy with GPS time	± 1 ppm ± .05 ppm characteristic synchronization
IF bandwidth[2]	1.25 MHz 30 kHz, 200 kHz or 5MHz
Aging of TCXO	± 1 ppm/year

Amplitude

Accuracy

1.25 MHz IF bandwidth

± 1 dB; ± 0.5 dB typical
(20 – 30 °C, -40 to -100 dBm)
± 2 dB (0 – 55 °C, -40 to -100 dBm)

30 kHz IF bandwidth

± 1.5 dB; ± 0.5 dB typical
(20 – 30 °C, -40 to -100 dBm)
± 2.5 dB (0 – 55 °C, -40 to -100 dBm)

Noise figure	8 dB typical
Internally generated spurious	-120 dBm
Maximum safe input level	+10 dBm, 20V DC characteristics
1 dB compression point	-15 dBm characteristic
Adjacent channel desensitization[3]	-25 dBm typical
Adjacent channel rejection[4]	45 dB typical

Input/output

RF input	50 Ω 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 to 55 °C
Storage temperature range	-40 to 70 °C
Dimensions	6 in x 3 5/8 in x 8 ∫ in
Weight	4.5 lbs
Power with Internal GPS	9-34 V DC, 9W

1. Spectrum measurement allows tuning 5 MHz 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.
2. E6450C, E6452C and E6457C have 1.25 MHz and 30 kHz IF bandwidths. E6453C and E6454C have 1.25 and 200 kHz IF bandwidths. E6456C has 1.25 MHz and 5 MHz IF bandwidths.
3. 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.
4. Adjacent channel rejection applies to the narrowband mode (30 kHz IF filter) and is defined as the suppression of an interfering signal +/-30 kHz away from the tuned signal.

Note: Specifications describe warranted performance over the temperature range of 0 to 55 degrees Celsius and include a 30-minute warm-up from ambient conditions. Typical and characteristic information provide useful information by giving non-warranted performance parameters. Typical refers to test data at the fiftieth percentile for a 25 degree Celsius room temperature. Characteristic 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.

GPS

The Agilent E6474A system has the ability to work with several types of GPS interfaces. The system is compatible with the communications protocols listed below. The physical interface is RS-232 with a DB9 connector.

Compatible protocols

- TAIP
- TSIP
- NMEA

Two different GPS receiver configurations are available. The Agilent receivers are listed on the previous page and include GPS receivers mounted inside the receiver enclosure. This configuration provides excellent portability and convenience.

Accessories can be ordered using the Agilent 86154A system accessories model number. Agilent 86154A Option 210 adds a Trimble Placer GPS 455 receiver with dead reckoning for external connection to the system.

Internal GPS receiver

- 8-channel GPS receiver
- mounted inside RF receiver enclosure
- SMA antenna connector
- magnetic mount antenna with cable
- differential compatible
- not dead reckoning compatible

Agilent 86154A Option 210

- Trimble Placer GPS 455 with dead reckoning
- heading sensor
- interconnect adapter (to connect to the RF receiver)
- interconnect cables
- magnetic mount antenna with cable
- differential compatible

External GPS receivers communicate with the Agilent E6474A via an RS-232 serial connection. The table below lists several GPS receiver models and the associated requirements for connection to an Agilent E6474A system. For other models of external GPS receivers, consult an Agilent representative for interconnect requirements.

GPS receiver model	Interconnect requirement
•Trimble Placer GPS/DR	Option 211
•Trimble Placer GPS 455	Option 212
•Trimble SveeSix	Straight-through RS-232 cable
•Trimble Placer GPS 400	Straight-through RS-232 cable

If a GPS receiver is purchased from Agilent, all necessary interconnect parts are provided.

Differential GPS can be used with the Agilent E6474A systems, provided the GPS receiver being used is differential compatible. Agilent 86514A Option 230 adds a differential GPS receiver to the system.

Agilent 86154A Option 230: differential GPS receiver

- differential Corrections, Incorporated RDS-3000
- magnetic mount antenna
- interconnect cables

Computer hardware

The Agilent E6474A system requires a PC. The minimum PC requirements are listed. If you wish to purchase a laptop computer with the system, the Agilent 86154A Option 010 adds a Hewlett-Packard OmniBook*.

Minimum PC requirements

- Pentium® processor (400 MHz)
- Windows® 95, 98, 2000, ME or NT (4.0 or greater)
- RS-232 (DB9) serial port
- PCMCIA slot (2 if using more than 2 phones)
- 64 MB RAM if using Windows 95, 98, or ME
- 128 MB RAM if using Windows NT or 2000
- 80 MB disk space for software installation
- 400 MB disk space recommended for data
- CD-ROM drive recommended
- 800 x 600 display resolution
- HP OmniBook 6100

Agilent 86154A Option 010 PC specifications

- Pentium III processor (1 GHz)
- Windows 2000
- 128 MB RAM
- 18 GB hard disk
- DVD drive
- Enhanced lithium ion battery pack
- 14.1-inch active matrix display
- 1024 x 768 display resolution

*More information on the HP Omnibook can be found at **http://www.hp.com.**

Portability accessories

The Agilent E6474A is a lightweight, portable system. Agilent 86154A Option 531 adds a carrying case.

Agilent 86154A Option 531: briefcase carrier

This carrying case is for transporting an Agilent E6474A system (one Agilent receiver, one mobile phone, laptop PC and connecting cables).

The system is not intended to be operated from within case.

Training

One day of start-up assistance is provided with Option 150 (via Option 800 for no extra charge).

Technical support

One year of on-line technical support is provided with E6474A Option 150 (via the E6474A Option 800 for no extra charge).

Warranty

One-year warranty on hardware components is included with the Agilent E645XC receivers.

Extended warranties and calibrations services are also available.

- Option W30: three years of customer return repair service
- Option W32: three years of customer return calibration service
- Option W50: five years of customer return repair service
- Option W52: five years of customer return calibration service

Additional Agilent literature

Product overviews

CDMA Over-Air Maintenance Tool Product Overview 5968-8697E

E6474A Wireless Network Optimization Platform Product Overview 5988-3558EN

Direct Connect Hub Product Overview 5988-3176EN

Configuration guides

CDMA Over-Air Maintenance Tool Configuration Guide.....5968-8696E

E6474A Wireless Network Optimization Platform Configuration Guide.....5988-2396EN

Data sheets

E7473A CDMA Drive Test System Data Sheet 5968-5555E

Product Notes

CDMA Drive Test Product Note.....5968-5554E

Using Agilent E7473A CDMA Drive Test System Product Note 5988-0896EN

Application Notes

Optimizing your CDMA Wireless Network Today and Tomorrow Using Drive Test Solutions Application Note - 1345 .....5968-9916E

For the latest news, product and support information and application literature, visit our Web site at:

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