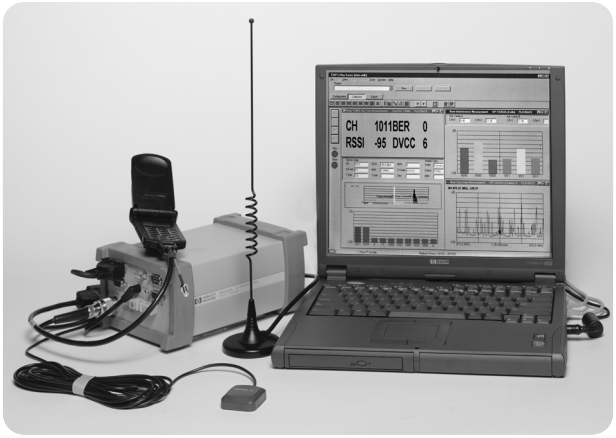
Agilent Technologies
E7474A TDMA Drive-Test System

Data Sheet



The Agilent Technologies E7474A TDMA drive-test system is used to obtain RF coverage and service performance measurements for wireless communications networks using IS-136, IS-54 and AMPS technologies. A PC interfaces with an Agilent digital RF receiver and/or a TDMA mobile phone. The system can control up to four receivers and four phones simultaneously.

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System software

The system software can control Agilent digital RF receivers and TDMA/AMPS mobile phones. Multiple measurements can be made simultaneously. All measurements can be displayed in real-time and logged to a database. Six system software options are available:

- Option 100: TDMA phone-based software license
- Option 110: TDMA receiver-based software license
- Option 120: TDMA receiver and phone-based software license
- Option 150: TDMA multiple phone capability software license
- Option 160: Real-time mapping software license
- Option 180: Indoor measurement capability software license

Option 120 combines all of the function of Options 100 and 110 into a single integrated package. Options 100 and 120 have the capability to control a single TDMA/AMPS mobile phone. Option 150 adds multiple phone control capability to Options 100 and 120.

Phone-based software

The E7474A options 100 and 120 provide the functionality described below for a single TDMA/AMPS mobile phone option. Option 150, when combined with option 100 or 120, extends the phone-based software to include up to four mobiles. The E7474A TDMA Drive Test System supports the following TDMA phones: Motorola StarTAC TDMA phone and the Nokia 6160 TDMA phone.[1] Each phone option requires a connection to a PC.

To connect the Motorola StarTAC TDMA mobile phone to the PC, a cable is required. Agilent offers a choice of cables for the StarTAC TDMA handsets:

- 86154A Option 730 – Cable for Motorola StarTAC TDMA phone. This cable provides communication between the phone and the PC.
- 86154A Option 731 – Powered cable for the Motorola StarTAC TDMA phone. This cable provides communication between the phone and the PC and also provides DC power to the phone using the auto cigarette lighter adapter.

To connect the Nokia 6160 TDMA mobile phone to the PC, a Nokia 616x phone kit is required.

- 86154A Option 900 – Nokia 616x Phone Kit. This phone kit provides the communication between the PC and the Nokia 6160 TDMA mobile phone. The Nokia 6160 phone kit also provides the necessary cabling to power the Nokia 6160 phone using the auto cigarette lighter adapter.

The phone-based function of the Agilent E7474A system is comprised of five primary elements:

- Phone control
- Phone measurements
- Messaging
- Hand-off history
- Large font display

Each element has an associated control and display window called a virtual front panel (VFP).

Phone control

The PC software provides automated control of the phone. The phone control VFP 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

State controls

- Channel display units
  - Channel number
  - Frequency units

1. The Indoor Measurement Capability Software License does not support the Nokia 6160 phone at this time.

Statistics logging controls

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

In addition to the control function, the phone control VFP displays the information listed below in a tabular format.

Tabular display (text)

- Channel
- Status (conversation, idle, etc.)
- Access time counter
- Redial time counter
- Calls remaining counter
- Total attempts
- Total drops
- Total blocks
- Dropped call rate = total drops / total attempts
- Blocked call rate = total blocks / total attempts

	New TDMA ...
Channel	1019
Access Time	0 s
Redial In	0 s
Dropped Calls	0
Blocked Calls	3
Attempted Calls	4
Remaining Calls	0
Drop Rate	0.
Block Rate	0.75

Figure 1. Phone control

Phone measurements

The E7474A system extracts measurement data from the mobile handset. Extraction of the specific measurement types is controlled by 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
- Mobile data
  - State
  - Status
    (TDMA, analog, etc.)
  - MIN
- Best MAHO
  - Channel
  - RSSI
- System data
  - System identification
    (SID)
  - Home or Roam
  - Provider (A,B, etc.)

Bar graph display

- Serving channel
- MAHO channels
- Cell site name

Strip-chart display

- RSSI
- MAC
- BER
- Timing advance
- Best MAHO RSSI
- Hand-off
- Reselection

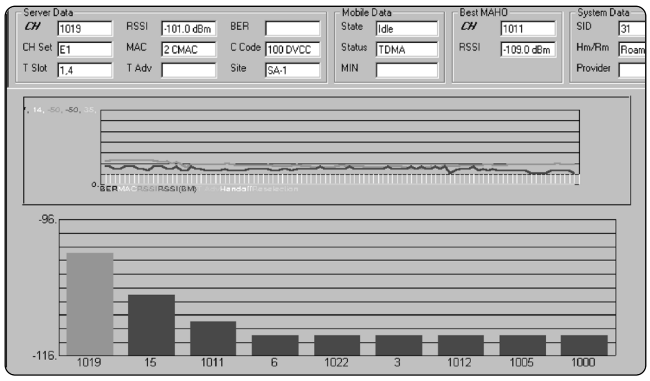


Figure 2. Phone measurements

Messaging

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

Message type selection controls

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

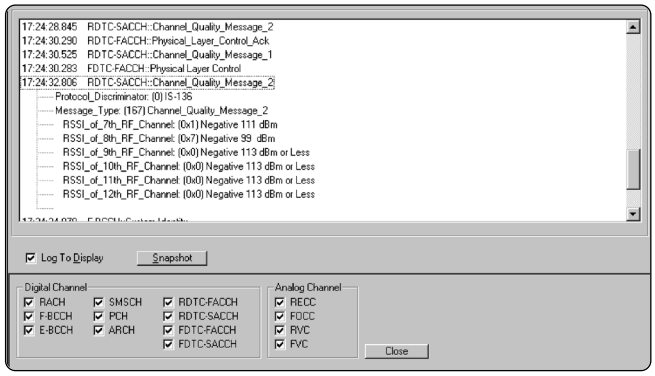


Figure 3. Messaging

In the messaging display the user can double-click on any message to show the next level of detail. A snapshot function captures the last 50 messages in a separate window while the main display continues to update and record new messages.

Message logging controls

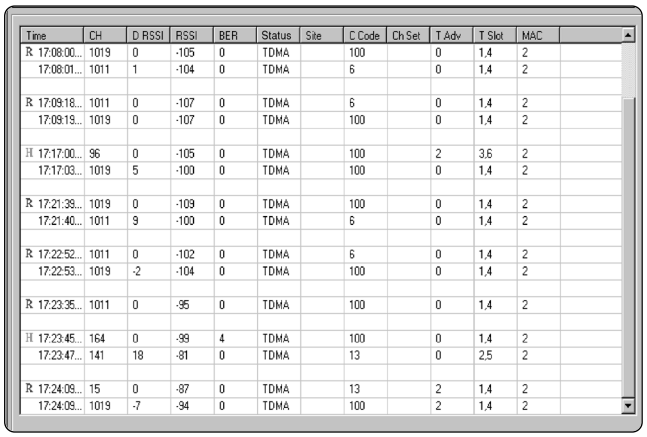
- Log to display
- Snapshot

Hand-off history

The hand-off history VFP displays a tabular list of hand-offs and reselections. Each hand-off or reselection is displayed as two lines. The top line displays the values of the key parameters immediately prior to the hand-off or reselection. The bottom 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 (H or R)
- Time
- Delta RSSI (RSSI after – RSSI before)
- Key parameters before and after
    - Serving channel
    - RSSI
    - BER
    - Status (TDMA, analog, etc.)
    - Site
    - Channel set
    - Color code
    - Timing advance
    - Time slot
    - MAC



	Time	CH	D RSSI	RSSI	BER	Status	Site	C Code	Ch Set	T Adv	T Slot	MAC
R	17:08:00...	1019	0	-105	0	TDMA		100		0	1,4	2
	17:08:01...	1011	1	-104	0	TDMA		6		0	1,4	2
R	17:09:18...	1011	0	-107	0	TDMA		6		0	1,4	2
	17:09:19...	1019	0	-107	0	TDMA		100		0	1,4	2
H	17:17:00...	96	0	-105	0	TDMA		100		2	3,6	2
	17:17:03...	1019	5	-100	0	TDMA		100		0	1,4	2
R	17:21:39...	1019	0	-109	0	TDMA		100		0	1,4	2
	17:21:40...	1011	9	-100	0	TDMA		6		0	1,4	2
R	17:22:52...	1011	0	-102	0	TDMA		6		0	1,4	2
	17:22:53...	1019	-2	-104	0	TDMA		100		0	1,4	2
R	17:23:35...	1011	0	-95	0	TDMA		100		0	1,4	2
H	17:23:45...	164	0	-99	4	TDMA		100		0	1,4	2
	17:23:47...	141	18	-81	0	TDMA		13		0	2,5	2
R	17:24:09...	15	0	-87	0	TDMA		13		2	1,4	2
	17:24:09...	1019	-7	-94	0	TDMA		100		2	1,4	2

Figure 4. Hand-off history

Large font display

The large font display allows the user to select a specific set of parameters. The selected parameters are displayed in large, easily viewable text. The parameters that can be selected are:

- Serving channel
- Channel set
- Time slot
- RSSI
- MAC
- Timing advance
- BER
- Color code
- Site
- State (conversation, idle, etc.)
- Status (TDMA, analog, etc.)
- MIN
- SID
- Best MAHO channel
- Best MAHO RSSI
- Home or roam
- Provider

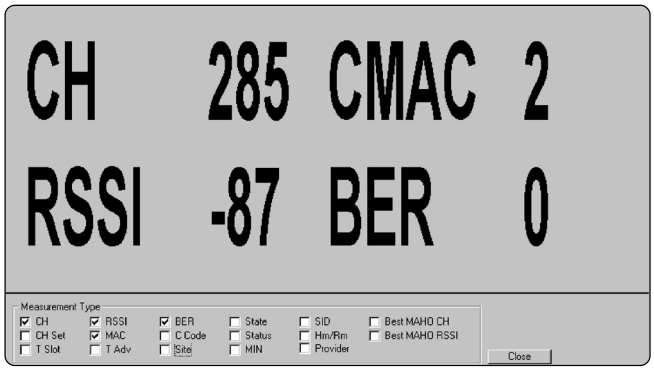


Figure 5. Large font display

Multiple phone capability

The Agilent E7474A Option 150, when combined with Option 100 or 120, extends the phone-based software function to include up to four mobile phones.Multiple phones are connected to the PC using dual Socket I/O cards which provide two serial ports each. These cards are included with Options 100, 120, and 150. The *All Phones* window pane in the call control VFP allows the user to control dialing functions of any or all of the phones from a single window.

Use of multiple phones can significantly improve optimization efficiency. Some applications of multiple phone configurations:

- Simultaneously evaluate hand-offs and reselections
- Execute origination and dropped call testing simultaneously
- Execute measurements on your network and a competitive network simultaneously

In multiple phone configurations, each phone communicates with the PC using a dedicated serial port. Each phone requires a connection to the PC.

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Receiver-based software

The E7474A software Options #110 and #120 provide the function described below. The software can control up to four Agilent digital RF receivers.

The receiver-based function of the E7474A system is comprised of five primary elements:

- Spectrum analysis
- CW power
- Channel power
- Adjacent channel interference
- Channel analyzer

Each element has an associated control and display window called a VFP.

The controls listed below are available for the receiver measurements:

- Measurement interval
  - Time
  - Distance
- Averaging
  - Running
  - Group
  - Max Hold
  - At Least (CW and channel power only)

The measurement interval defines the duration between measurements. This can be specified in terms of time (e.g., execute a measurement every 200 milliseconds), or distance (e.g., execute a measurement every 10 meters). If the user defines an interval that the system can not achieve, a *busy light* indicates this condition.

Spectrum analysis

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 (Option 300 or 310)
    - 824 to 849 MHz [819 to 854]
    - 869 to 894 MHz [864 to 899]
  - PCS band receiver (Option 320 or 330)
    - 1850 to 1910 MHz [1845 to 1915]
    - 1930 to 1990 MHz [1925 to 1995]
- Frequency, maximum span[1]
  - Cellular band receiver (Option 300 or 310)
    - 25 MHz [35]
  - PCS band receiver (Option 320 or 330)
    - 60 MHz [70]
- 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

1. Spectrum measurement allows tuning 5 MHz above and below 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.

Markers

- Multiple markers
- Delta markers
- Marker to max
- Marker value to center frequency
- Drag and drop

Spectrum noise floor (characteristic):[1]

	Average	Peak
Narrowband mode / 300 kHz span	-139 dBm	-131 dBm
Wideband mode / 300 kHz span	-128 dBm	-119 dBm
Narrowband mode / 25 MHz span	-132 dBm	-129 dBm
Wideband mode / 25 MHz span	-123 dBm	-117 dBm

Minimum sweep speed (characteristic):[1]

Narrowband mode	1 MHz / sec
Wideband mode	70 MHz / sec

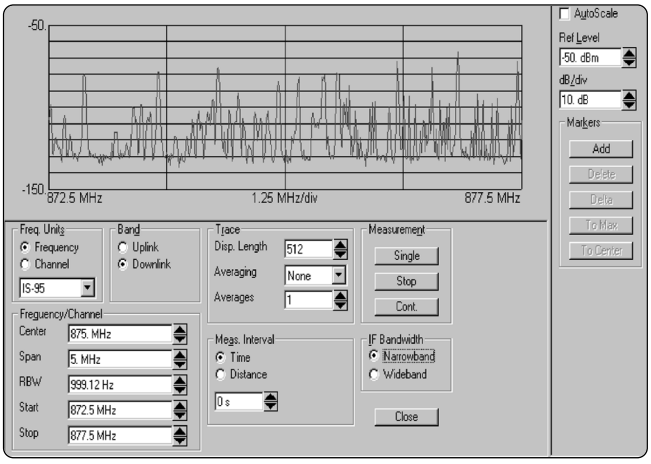

Figure 6. Spectrum

CW power and channel power

The Agilent E7474A can measure the peak power, CW power, at user-defined frequencies within a user-defined resolution bandwidth. The systems can also measure the total power, channel power, within a user-defined bandwidth at a user-defined set of frequencies. Channel power differs from the CW power measurement in that the total power is integrated across the specified channel width. The user can define the frequencies measured in two different ways, indicated below.

Frequency entry methods

- List: enter an arbitrary list of frequencies. A user list can also be imported from a text file.

- 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 1903MHz.

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 (Option 300 or 310)
    - 8.36 kHz to 25 MHz in wideband mode
    - 246 Hz to 25 MHz in narrowband mode
  - PCS band receiver (Option 320 or 330)
    - 8.36 kHz to 60 MHz in wideband mode
    - 246 Hz to 60 MHz in narrowband mode

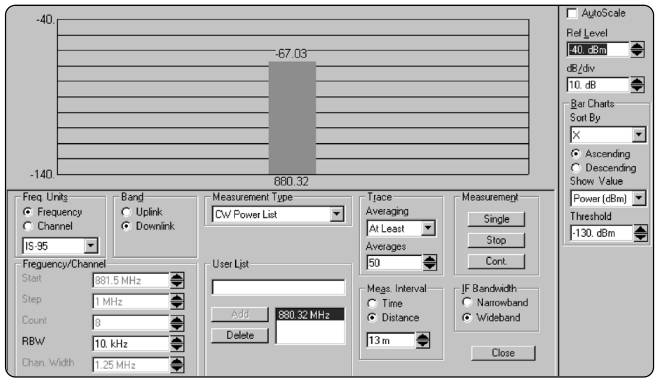

Figure 7. CW/channel power

1. Does not imply warranted performance, but rather characteristic performance.
Tested with minimum resolution bandwidth; 246 Hz in narrowband mode, 8.46 kHz in wideband mode.

Adjacent channel interference

The adjacent channel power VFP measures the power of a serving channel and the upper and lower adjacent channels. This function is primarily intended for use in systems with Option 120. Typically, the center channel frequency of the adjacent channel interference measurement is linked to the serving channel of the phone. When the phone is handed off to a new channel, the adjacent channel interference measurement tunes to the new channel.

The receiver can decode the DVCC of each of the six channels displayed in the VFP. The decoded DVCC can be displayed above the bar for each channel. When performing DVCC decode, the color of the bars in the VFP indicate their channel type. Green bars are digital control channels (DCCH), blue bars are TDMA traffic channels, and red bars are unrecognized channels. The user can enable the cell site naming feature. Location and control information is correlated to a cell site name using the cell site information file.

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 VFP. This is intended for two phone configurations. Each adjacent channel interference measurement can be linked to one of the phones.

Measurement controls

- Frequency units
  - Frequency
  - Channel

Display controls

- Display mode
  - Amplitude vs. channel (frequency)
  - Amplitude vs. time
- Displayed measurement
  - Channel power
  - DVCC

Display fields (text)

- Server to adjacent channel deltas
  - C/(N-1)
    – server to lower adjacent
  - C/(N+1)
    – server to upper adjacent
- Cell Site Name

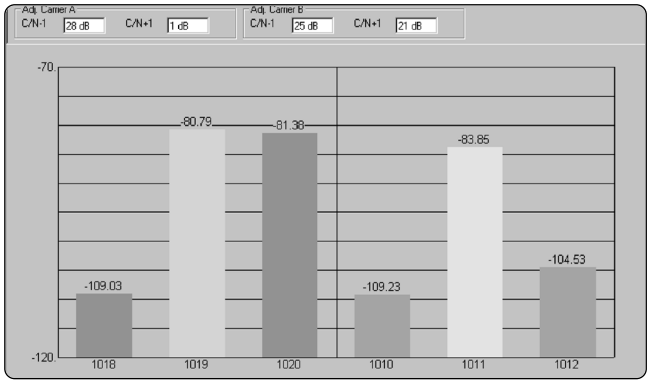

Figure 8. Adjacent channel power

Channel analyzer

The channel analyzer VFP 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. The user can enable the cell site naming feature. Location and control information is correlated to a cell site name using the cell site information file.

- User list:
  The user manually inputs a list of up to 250 channels to be measured. The measurements are displayed in bar graph format—up to 20 bars. The user can enable the cell site naming feature. Location and control information is correlated to a cell site name using the cell site information file. If more than 20 channels are in the user list, all channels are measured and recorded, but only 20 channels will be displayed. A user list can also be imported from a text file.

- DVCC decode:
  The receiver can decode the DVCC of each channel displayed in the VFP. The decoded DVCC can be displayed above the bar for each channel. When performing DVCC decode, the color of the bars in the VFP indicate their channel type. Green bars are digital control channels (DCCH), blue bars are TDMA traffic channels, and red bars are unrecognized channels.

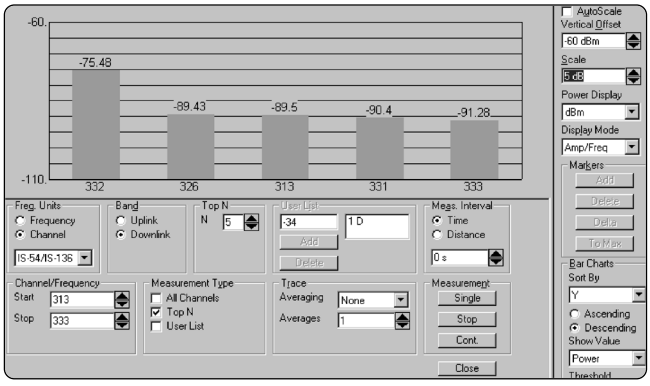

Figure 9. Channel analyzer

Indoor measurement software (E7474A Option 180)

The indoor measurement VFP provides the ability to make phone-based or receiver-based TDMA wireless measurements inside of buildings. While walking through a building, waypoints are recorded on a floor plan of the building. Measurements are interpolated between waypoints. Indoor measurements require a floor plan or sketch of the building to be measured. This floor plan can be in .gif, .tif, or .png format.

An essential part of the indoor measurement system is a pen tablet computer which allows the user to correlate measurements with positions on a floor plan. Additional accessories are available which provide a simple, ergonomic way of making indoor measurements (see *E7474A TDMA Drive-Test System Configuration Guide*, literature number 5968-5861E).

Indoor measurement features

- Autoscale
- Autopan
- Auto legend
- Ability to link and plot phone or receiver measurements
- Ability to save plot as .tab file (Mapinfo)
- Waypoints with interpolation
- Moveable waypoints

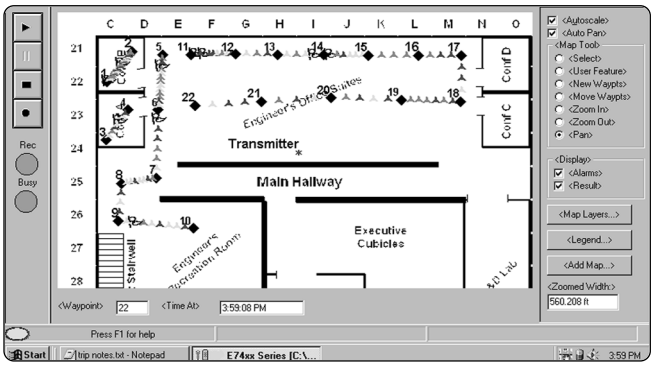

Figure 10. Indoor measurement VFP

Alerts and alarms

The E7474A drive-test system has sophisticated alarm capabilities. An alert is defined as a single condition on a single measurement. An alarm is a Boolean expression made up of multiple conditions on multiple measurements. If the alert or alarm condition occurs while data is being logged, each data record includes the alert and alarm information.

The alarm wizard provides fast, easy setup of commonly used alarms. The alarms available for TDMA via the wizard are listed below.

- Dropped call
- High BER
- Low RSSI
- Hand-off
- Hand-off (From–To)
  - Analog to analog
  - Digital PCS to analog
  - Digital Cellular to analog
  - Analog to Digital PCS
  - Analog to Digital Cellular
  - Digital PCS to Digital Cellular
  - Digital Cellular to Digital PCS
  - Digital Cellular to Digital Cellular
  - Digital PCS to Digital PCS
- Reselection
- Reselection (From–To)
  - Analog to analog
  - Digital PCS to analog
  - Digital Cellular to analog
  - Analog to Digital PCS
  - Analog to Digital Cellular
  - Digital PCS to Digital Cellular
  - Digital Cellular to Digital PCS
  - Digital Cellular to Digital Cellular
  - Digital PCS to Digital PCS
- Low delta RSSI on hand-off
- No GPS fix
- No location fix
- Low disk space
- Low battery
- No AC power
- High CPU usage

When an alert or alarm condition occurs, any or all of the actions listed below can be executed.

Actions

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

Alert operators
- Value
- Maximum
- Minimum

Alarm operators
- Value
- Maximum
- Minimum
- Sub-set
- OR
- AND
- XOR (exclusive OR)

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

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

Any measurement can be an operand in an alert or alarm. Below are some examples to illustrate alerts and alarms.

Alerts:
- Value(BER) > 2.0%
- Maximum(Channel Analyzer power) < -90 dB

Alarms:
- (Value(BER) > 2.0%) AND (RSSI > -80 dB)

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.

System status parameters
- Available disk space
- GPS fix
- Location
- Velocity
- Percent CPU usage
- PC battery level
- PC AC power
- Time of day

Real-time mapping

The E7474A Option 160 software license provides real-time data mapping. A single measurement parameter is plotted on the map, in color-coded thematic format, as the data is collected base stations are plotted on the map with site names, sector orientations and channel sets. Alarms are plotted on the map. Double- clicking on the alarm symbol displays the corresponding alarm text message.

Measurement parmeters that can be plotted on a map
- Phone measurements
  - RSSI
  - Serving channel
  - Best MAHO channel
  - BER
  - Best MAHO RSSI
  - MAC
  - Timing advance
- Large font
  - RSSI
  - Serving channel
  - Best MAHO channel
  - BER
  - Best MAHO RSSI
  - MAC
  - Timing advance
- Handoff history
  - Serving channel
- Call control
  - Serving channel
- Adjacent channel power measurement
  - Adjacent channel A frequency
  - Adjacent channel B frequency
- CW and channel power
  - Max CW power list
  - Max CW power trace
  - Max power channel list
  - Max power channel list

An indicator line is drawn from the current location to the serving sector.

Measurement parmeters that can represent serving sector

- Phone measurements
  - Serving channel
  - Best MAHO channel
- Large font
  - Serving channel
  - Best MAHO channel
- Handoff history
  - Serving channel
- Call control
  - Serving channel
- Adjacent channel power measurement
  - Adjacent channel A frequency
  - Adjacent channel B frequency

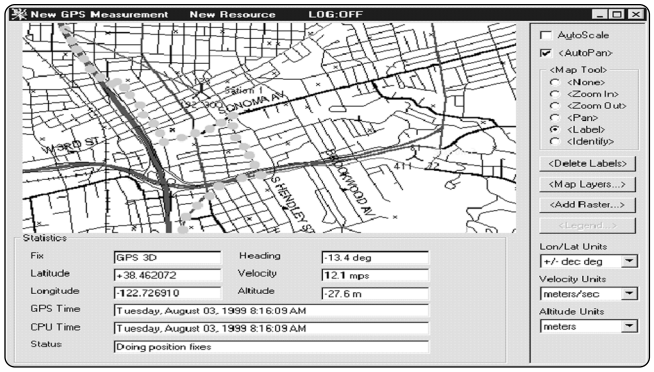

Figure 11. Real-time mapping display. The underlying map is in MapInfo .tab format. The software can convert a rastor image (.gif or .tif) to .tab format, so the user can use any map that is in .tab, .gif, or .tif format.

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 requiring minimum interaction with the keyboard. A summary of record and playback features are listed below.

Record features

- User note
- Automatically numbered note
- Display on/off
- Pause/resume
- User-defined data set name

Playback features

- Play forward
- Play reverse
- Step forward
- Step reverse
- Variable speed
- Advance to alert/alarm
- Advance to user note/auto-numbered note

Data export

Data can be exported from the E7474A database for display and post-processing. All measurement data can be exported. The export function provides flexible filtering capability that defines which data is exported. Multiple data types can be exported to a single output file.

The user can save export plans. Once an export plan has been saved it can be retrieved to quickly and easily export the desired data. An export plan is made up of:

- Data type(s):
  Defines which data will be exported. Column order is user definable.

- Alarms:
  Defines which alarms will be exported.

- 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 over 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
- Count with summary – same as count with a text file summarizing the results
- 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
- Grid–drive area is overlaid by a grid of user-definable size. The average of the data over each square is reported.
- Linear distance–user defines a drive distance over which to average. The average of the data over each segment of that distance is reported.
- None

The system is designed to work with MapInfo in an integrated manner via an object link embedded (OLE) link to the MapInfo application. This exports the data, launches MapInfo, creates the necessary MapInfo tables, and creates a thematic map display in MapInfo. This function requires that MapInfo be present. MapInfo is not included with the E7474A system. The supported output formats are listed below.

Data output formats
- ArcView-compatible file
- MapInfo via com
- MapInfo-compatible file
- PlaNET-compatible file
- Text file

Report generator and display printing
The E7474A provides fast and easy report generation. All of the current displays (VFP) 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 VFP can be printed by selecting the print command from the file menu.

Mapping software

MapInfo can be launched from within the Agilent E7474A, providing transparent integration between mapping information and measurement data. In addition, the E7474A can output data in ASCII format, allowing the user to import data into other applications (see data export section).

RF receiver hardware

There are four digital RF receiver options for the Agilent E7474A system:

- Option 300: Cellular band receiver
- Option 310: Cellular band receiver with internal GPS receiver
- Option 320: PCS band receiver
- Option 330: PCS band receiver with internal GPS receiver

E7474A drive-test systems with Options 110 or 120 have software functions for controlling the receivers. The system supports any combination of receivers, up to a total of four. Using multiple receiver configurations can greatly improve drive-test efficiency for applications such as measuring at 850/1900 MHz borders, simultaneously measuring 850 and 1900 in overlay areas, simultaneously monitoring both forward and reverse links, and monitoring competitive networks.

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 (Options 310 and 330 only)

Agilent digital RF receiver specifications (E7474A Options 300, 310, 320 and 330)

Frequency

Range[1]	
Options 300, 310	824-849 MHz [819-854] 869-894 MHz [864-899]
Options 320, 330	1850-1910 MHz [1945-1915] 1930-1990 MHz [1925-1995]
Frequency accuracy	± 1 ppm
With GPS time synchronization	± .05 ppm characteristic
IF bandwidth	1.25 MHz characteristic 30 kHz characteristic
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 characteristic
1 dB compression point	-15 dBm characteristic
Adjacent channel desensitization[2]	-25 dBm typical
Adjacent channel rejection[3]	45 dB typical

Input/output

RF input	50 Ω type-N

1. Spectrum measurement allows tuning 5 MHz above and below 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. 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.
3. 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.

Note:
Specifications describe warranted performance over the temperature range of 0 to 55 °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 °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.

Connectors

Computer	RS-232 (DB9) male
GPS	RS-232 (DB9) male
Power	DC power jack 100 mils, positive center

Misc

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	9-34 V DC, 9W
with Internal GPS (Options 310, 330)	9-34 V DC, 10W

GPS

The Agilent E7474A 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 from Agilent for our drive-test systems. E7474A receiver Options 310 and 330 include GPS receivers mounted inside the receiver enclosure. This configuration provides excellent portability and convenience.

86154A Option 210 adds a Trimble Placer GPS 455 receiver with dead reckoning for external connection to the system.

GPS receiver with Option 310, 330

- 8 channel GPS receiver
- Mounted inside Agilent RF receiver enclosure
- SMA antenna connector
- Bulkhead mount antenna with cable
- Magnetic mount antenna with cable
- Differential compatible
- Not dead reckoning compatible

* Option 310 and 330 receivers do not support connection to external GPS receivers.

Agilent 86154A Option 210

- Trimble Placer GPS 455 with dead reckoning
- Heading sensor
- Interconnect adapter (to connect to the Agilent RF receiver)
- Interconnect cables
- Bulkhead mount antenna with cable
- Magnetic mount antenna with cable
- Differential compatible

* DOES NOT PROVIDE mechanical or electrical devices for connection to odometer pulse.

The Agilent E7474A software includes a VFP for the GPS receiver. This window displays a bar graph with the individual satellite signal strengths (TSIP protocol only), a text display of the GPS statistics and a map of location history. This map also displays the base station locations and names.

External GPS receivers communicate with the E7474A via an RS-232 serial connection. The table below lists several GPS receiver models and the associated requirements for connection to an E7474A system.

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

When a GPS receiver is purchased from Agilent, all necessary interconnect parts are provided. For other models of external GPS receivers, consult an Agilent representative for interconnect requirements.

Differential GPS can be used with the E7474A drive-test systems, provided the GPS receiver being used is differential compatible. Agilent 86514A Option 230 adds a differential GPS receiver to the system.

86154A Option 230: differential GPS receiver

- Differential corrections, incorporated RDS-3000
- Magnetic mount antenna
- Interconnect cables

Handset compatibility

The E7474A can interface with the handsets listed below. This list is complete as of the time of this printing. The TDMA handsets are not available from Agilent. Contact your Agilent representative regarding handset compatibility and availability plans.

Compatible Handsets
- Motorola StarTAC ST7790 TDMA/AMPS – 800 MHz
- Motorola StarTAC ST7797 TDMA/AMPS – 800/1900MHz
- Nokia 6160 TDMA Dual Band TDMA/AMPS Mobile Phone[1]

To connect a Nokia 6160 TDMA mobile phone to the PC, order 86154A Option 900, the Nokia 616x Phone Kit. A separate phone kit is needed for each phone connected to the E7474A TDMA Drive Test System. The Nokia Phone Kit provides all the necessary cabling needed to connect the Nokia 6160 phone to the PC. The kit includes the following items:
- Nokia 616x Phone Interface Controller
- Nokia 616x Phone Interface Controller Mounting kit that includes a mounting plate, mounting bracket, and screws.
- Nokia 616x Phone Interface Controller to PC interface Cable.
- Nokia 616x Phone Interface Controller Power Cable that provides DC power from the auto cigarette lighter adapter.
- Nokia 6160 Phone Interface Cable
- Powered Nokia 6160 Phone Powered Interface Cable that provides DC power from the auto cigarette lighter adapter.
- Auto Power 3 to 1 Adapter

To connect a Motorola StarTAC TDMA mobile phone to the PC, an interface cable is required. Agilent offers a choice of cables for the StarTAC TDMA handsets:
- 86154A Option 730 – Cable for Motorola StarTAC TDMA phone. This cable provides communication between the phone and the PC.
- 86154A Option 731 – Powered cable for the Motorola StarTAC TDMA phone. This cable provides communication between the phone and the PC and also provides DC power to the phone using the auto cigarette lighter adapter.

Computer hardware

The Agilent E7474A 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 (233 MHz)
- Windows® 95, 98 or Windows NT® (4.0 or greater)
- RS-232 (DB9) serial port
- PCMCIA slot (two if using more than two phones)
- 32 MB RAM if using Windows 95 or 98
- 64 MB RAM if using Windows NT
- 50 MB disk space for software installation
- 400 MB disk space recommended for data
- CD-ROM drive recommended
- 800 x 600 display resolution

Agilent 86154A Option 010 PC specifications
- HP OmniBook 4150
- PentiumII processor (300 MHz)
- Windows 98
- 64 MB RAM
- 6.4 GB hard disk
- 24X CD-ROM 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**.

1. The Indoor Measurement Capability software license does not support the Nokia 6160 phone at this time.

Portability accessories

The Agilent E7474A TDMA Drive Test System is a lightweight, portable system. The accessories option, 86154A option 531, adds a carrying case.

86154A Option 531 – Briefcase carrier
The carrying case is intended for transporting the E7474A TDMA Drive Test System. The case measures 17in. x 14in. x 5in and accommodates one Agilent digital receiver, one test mobile, a laptop PC, and the necessary cabling.

The drive test system was not intended for operating from within the carrying case.

Vehicle Mounted Display System Accessories Options

The Vehicle Mounted Display System (VMDS), accessories option 86154A option 520, improves safety, boosts efficiency, and allows real-time troubleshooting while using the E7474A TDMA Drive Test System.

86154A Option 520 – Vehicle Mounted Display System
The Vehicle Mounted Display System consists of a bright, rugged, and adjustable pedestal mounting, and a custom keypad. The permanently mounted display system allows users to monitor network impairments as they happen without taking their eyes off the road.

Training

One day of on-site start-up assistance is provided with Options 110 and 120.

Technical support

One year of on-line technical support is provided with Options 100, 110 and 120.

Warranty

One-year warranty on hardware components is included with the E7474A system. Extended warranties and calibrations services are also available:

E7474A Option W30
Two years additional (three years total) warranty on hardware components

E7474A Option W32
Three years return calibration service

E7474A Option W50
Four years additional (five years total) warranty on hardware components

E7474A Option W52
Five years return calibration service

Additional literature

E7474A TDMA Drive-Test System Configuration Guide 5968-5861E

E7474A TDMA Drive-Test System Product Overview 5968-8689E

Indoor Wireless Measurement System Product Overview 5968-8691E

Vehicle Mounted Display System Product Overview 5980-0721E

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Printed in USA 11/00
5968-5556E

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