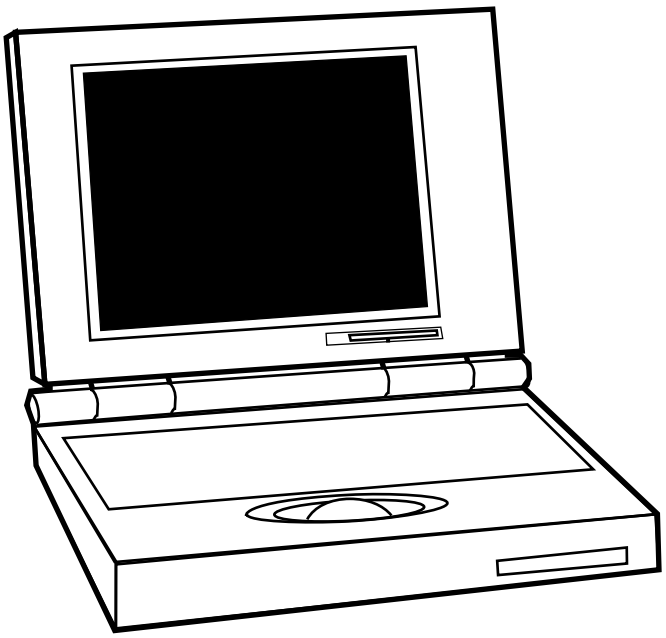
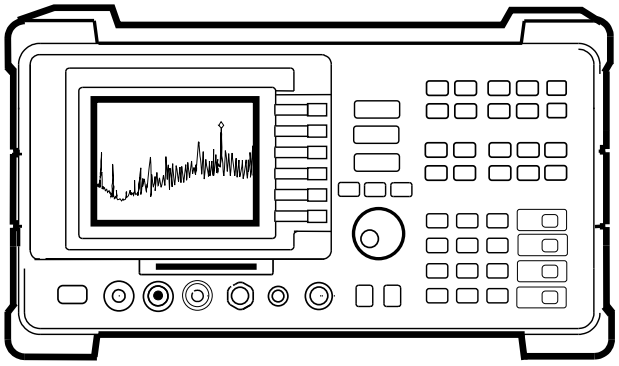
# HP E4900 Series Spectrum Monitoring Systems

Technical Specifications





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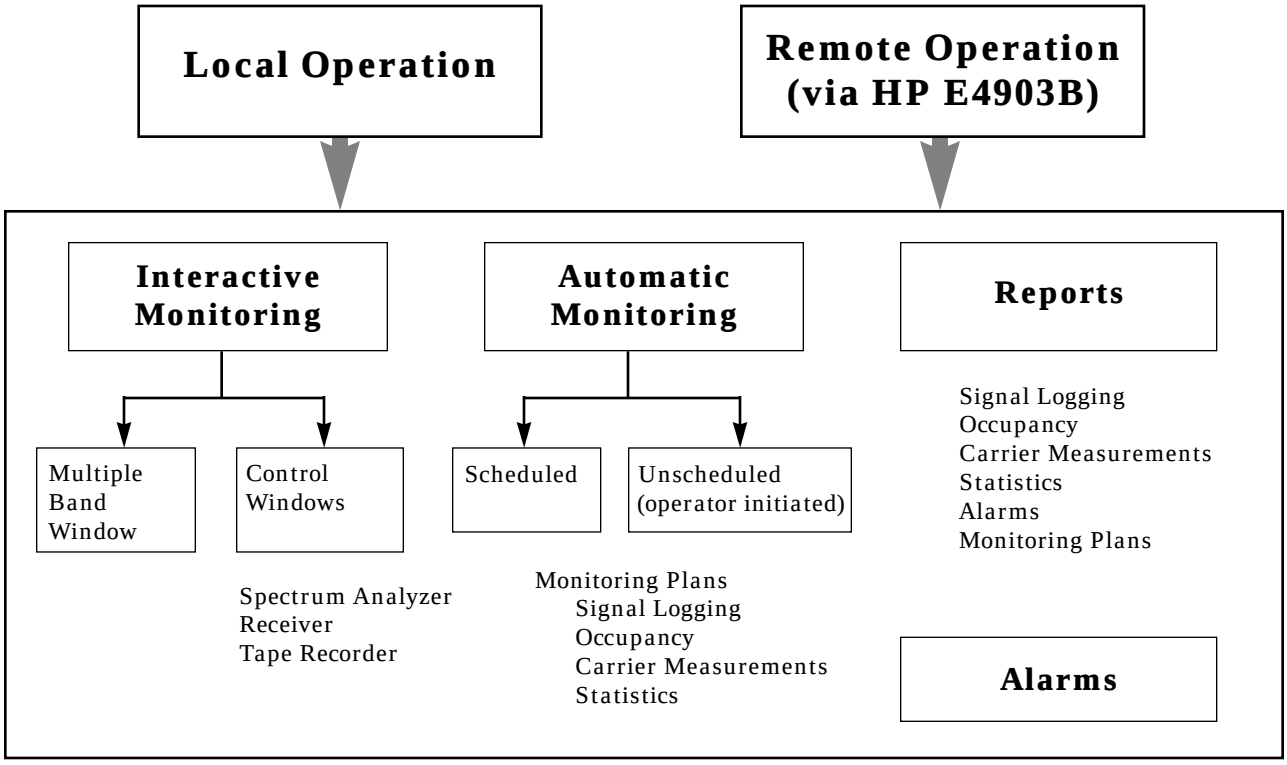
# Introduction

HP E4900 systems are the first commercial off-the-shelf spectrum monitoring systems to deliver economical and efficient signal monitoring and interference resolution to wireless operators, government regulatory agencies, hospitals and civil and military aviation. Sophisticated and user-friendly MS-Windows®-based software makes HP E4900 systems powerful yet easy to use. HP E4900 systems deliver high operator productivity with task scheduling to allow unattended monitoring, profile compliance and alarms to detect new signals, automatic spectral occupancy statistics to survey spectrum usage and a wide variety of reports to save analysis time.

This document contains two main sections: system capabilities and system specifications. System specifications describe the system's warranted performance. The system capabilities section explains the functionality of the system and contains numerous supplemental characteristics. Supplemental characteristics are typical but nonwarranted performance parameters.




**HP E4900 Operational Overview**

# System Capabilities

## Measurement

HP E4900 systems can perform both interactive and automated measurements. Interactive measurements allow the operator to investigate signals rapidly. Interactive measurements include observation of multiple bands in multiple formats, handoff of signals to carrier measurements, control of the spectrum analyzer, optional receiver and optional tape recorder. Automated measurements may be commanded to happen under operator control or scheduled to occur without an operator present. Powerful capabilities such as task scheduling and alarms can be used to coordinate signal logging, carrier measurements, spectral occupancy and statistical measurements. RF path management, including amplitude correction, applies to all measurements made by the system.

### Band Definition

All measurements in HP E4900 systems are performed in user-selected bands. Systems are shipped with several predefined bands containing recommended settings for common communications bands. Users may also create and name custom bands up to a maximum of 50 total bands defined.

Band definitions include all appropriate spectrum analyzer settings: start and stop frequency or center frequency and span, resolution bandwidth, video bandwidth, sweep time, attenuation, reference level and detection mode. Information about the use of these parameters is contained in the HP E4900 User's Guide. The HP E4900B and E4901B have analog resolution bandwidths from 1 kHz to 3 MHz in a 1, 3, 10 sequence for general purpose monitoring. The E4902B improves sensitivity and selectivity by adding 1 Hz to 300 Hz resolution bandwidths. Resolution bandwidths of 1 Hz to 100 Hz are implemented digitally in order to minimize measurement time. Sweep times can be set between 50 ms and 60 s.

Frequency span is unlimited from zero to the entire frequency range of the system. Frequency span is typically set to the width of a band to observe band activity or set to the channel spacing for carrier measurements. Normally, bands should be defined to be no more than 25 channel widths in order to assure legible displays and reports and accurate channelization and signal handoff.

### RF Path Management

HP E4900 systems include two important system capabilities: amplitude correction and path control.

Amplitude correction is accomplished with a user-defined table of electrical loss/gain factors and antenna factors versus frequency. This allows measurements to be calibrated for the effects of cable losses, filter attenuation and preamplifier gain as well as the actual performance of the monitoring antenna. Amplitude correction is applied to all measurements and displays. Amplitude values can be displayed in dBm or dBµV/m.

HP E4900A Option 003 systems add path control. Each RF path has a separate table of amplitude correction factors. Bands can be associated with paths so that the preamplifier is switched by band and the appropriate amplitude correction factors are applied.

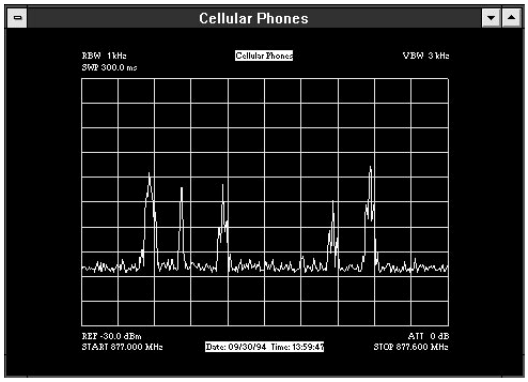
### Multiple Band Window

The multiple-band window is a tool for interactive spectrum observation. The multiple-band window can display up to eight bands at once by time sharing the spectrum analyzer. Windows features such as cascading, tiling, scaling, minimization, and maximization allow the display to be customized for most convenient presentation. Approximate trace update times are shown in the table below. Sweep times can be set between 50 ms and 60 s.

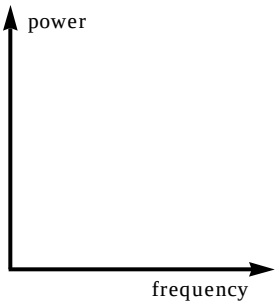
| Model Number | Trace Update Time | |
|---|---|---|
| | Single Band | Multiple Band (per band) |
| **HP E4900B** | 300 ms + sweep time | 1 s + sweep time |
| **HP E4901B** | 300 ms + sweep time | 1 s + sweep time |
| **HP E4902B** | 500 ms + sweep time | 600 ms + sweep time |

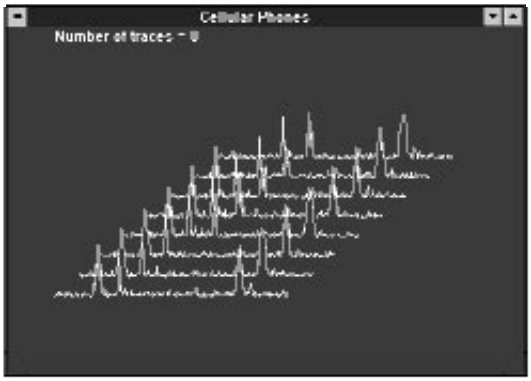
Bands can be displayed in three different formats: trace, waterfall and spectrogram. The trace format is a good choice for seeing the power of time-invariant signals like broadcast signals. The trace display is an amplitude-corrected spectrum analyzer display. Waterfall and spectrogram displays are useful for viewing time-variant signals such as paging signals or two-way radios. The spectrogram display is an excellent visual tool to observe time durations of transmissions.

Markers can be placed on a signal to read out power and frequency. Option 003 systems can also automatically tune the receiver to the marker frequency.

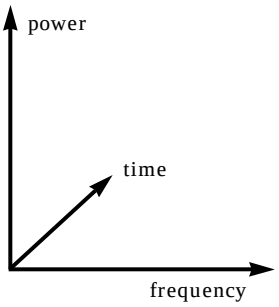


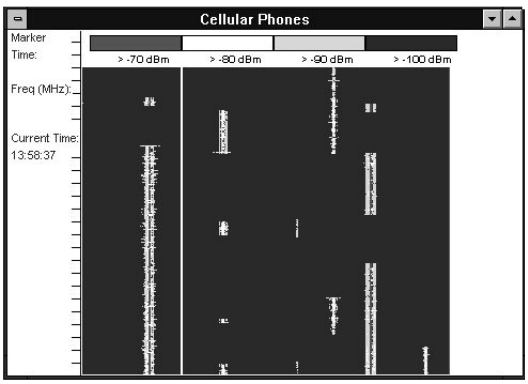

**Trace Display**



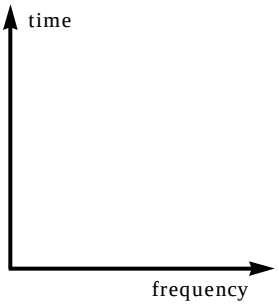




**Waterfall Display**




**Spectrogram Display**



**Spectrum Analyzer Control**

A spectrum analyzer window allows direct control of spectrum analyzer functions. Measurements in a single band can be displayed in the same three formats used in the multiple-band window (trace, waterfall and spectrogram). Marker signals can be handed off to carrier measurements and optional demodulation. In addition, the spectrum analyzer window adds capabilities to: interactively recall, edit and save band definitions, graphically define profiles and observe thresholds, both user-defined and automatic noise-riding.

**Demodulation and Recording**

Option 003 systems add a receiver and tape recorder for demodulation and recording of analog voice signals.

The frequency range for demodulation is 25 MHz to 1.8 or 2 GHz. Demodulation modes available include AM, FM (normal and wideband) and SSB (USB and LSB). The receiver can be controlled interactively via the receiver control window or by being tuned by the marker function. Alarms can trigger the receiver and recorder automatically.

The tape recorder has a ±3 dB bandwidth of 300 Hz to 3.4 kHz and records at 1/4 speed (15/32 ips) for a recording capacity of six hours on a standard C-90 cassette. A tape recorder control window automates playback and high-speed transport functions.

## Signal Logging

Signal logging is a tool for automatic monitoring of the spectrum. Signal logging can include trace storage, signal storage with masking and threshold processes, as well as detection of new signals through an alarm process.

Spectrum Analyzer traces can be saved with time and date stamps to the hard disk for future analysis. Saved traces can be viewed in trace, waterfall and spectrogram formats using the archived trace feature of the multiple-band window. The system can store more than 200,000 archived traces.

Signals can also be logged to the hard disk as power and frequency pairs. Signals are defined as any peak above a threshold. The threshold can be defined in three ways:

1. fixed threshold — the user defines a fixed power level for all frequencies,
2. automatic noise-riding threshold — the system sets the threshold based on the measured noise floor and
3. profile threshold — the user defines the threshold as a set of contiguous line segments in the power, frequency plane.

Masking, an aid to the signal logging process, can eliminate signals known not to be of interest. The system will not log signals inside user-defined mask ranges. With automasking, the system builds its own mask based on signals present during the first measurement. The system reports all signals present on the first measurement and reports only new signals in subsequent measurements. To log all signals periodically, the mask may be discarded regularly according to a user-defined time interval.

The signal logging process can be coupled with the alarm process so that intermittent signals can be captured. Signals within user-defined power and frequency limits can trigger alarm actions.

**Carrier Measurements**

Carrier measurements can be performed either manually by placing the marker on the signal in the spectrum analyzer window, or automatically. Carrier measurements can also occur as the result of an alarm condition. Carrier measurements consist of seven measurements: center frequency, maximum and average power, signal-to-noise ratio, occupied bandwidth, amplitude modulation and profile compliance. All measurements except for amplitude modulations are computed based on the accumulated maximum value of several traces. Measurement conditions such as sweep time, span, resolution bandwidth and video bandwidth can be defined uniquely for each band. Measurement results outside of user-defined limits can trigger alarms.

*Center Frequency:* Center frequency is measured using the frequency counter feature of the spectrum analyzer. Frequency accuracy of the E4900B and E4901B is $\pm 7.5\ e^{-6}$ x center frequency ±110 Hz. Frequency accuracy of the E4902B is $\pm 1e^{-7}$ x center frequency ±N x 2 Hz ±1Hz.

(Note: N = 1 for cf < 6.5 GHz,
N = 2 for 6.5 GHz < cf < 13.2 GHz,
N = 4 for cf > 13.2 GHz)

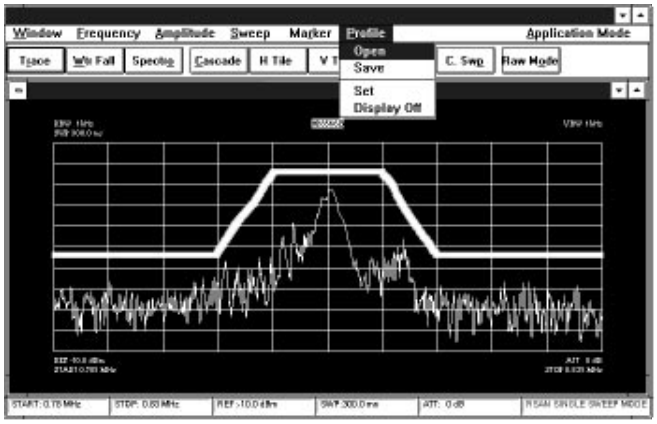
*Maximum and Average Power:* Maximum power is determined by the highest peak on the maximum hold trace. Average power is the mean power over the defined span. Typical power measurement accuracy is ±3 dB.

*Signal-to-Noise Ratio:* Signal-to-noise ratio is determined by comparing the maximum power to the measured noise. The noise level is the minimum value of the maximum hold trace. For signal-to-noise ratios up to 80 dB, typical measurement accuracy is ±2 dB.

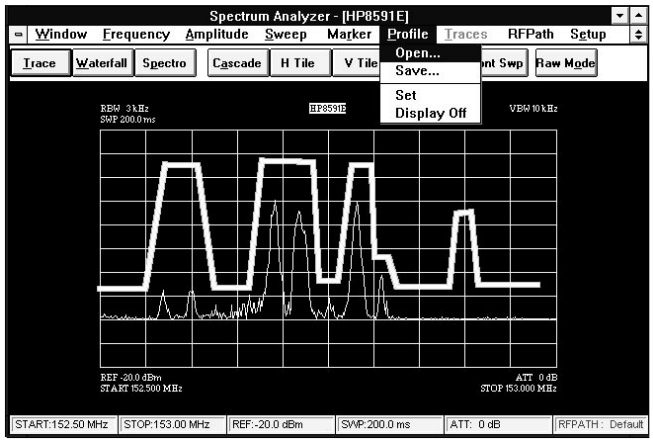
*Occupied Bandwidth:* HP E4900 systems measure occupied bandwidth using the "x dB" technique. The occupied bandwidth is the frequency difference between the frequencies at which the sidebands are x dB below the maximum power. Occupied bandwidth is usually measured at either 6 or 26 dB down; the x dB number is user-defined. For spans less than 2 MHz, typical measurement accuracy is ±5%.

*% Amplitude Modulation:* Amplitude modulation is measured by taking two sweeps in zero span. One sweep uses positive peak detection and determines the maximum modulation by averaging the highest 1% of the trace points. The second sweep uses sample (HP E4900B or E4901B) or negative peak (HP E4902B) detection to determine the minimum modulation by averaging the lowest 1% of the points of the trace. Percentage amplitude modulation is then computed with a typical measurement error of ±6%.

*Profile Compliance:* Profile compliance allows signals to be tested against a user-defined mask. The mask is drawn as a set of connected line segments in the power, frequency plane. Profile compliance reports the percentage of trace points that are below the profile. Profile compliance is especially helpful for testing signals against masks, for example to check a signal for compliance to standards. Go/no go decisions on profile compliance may be performed by coupling profile compliance to alarms. Also, profiles may be used in signal logging to detect new signals in the presence of several known signals.




**Profile defined for testing known signal against mask.**



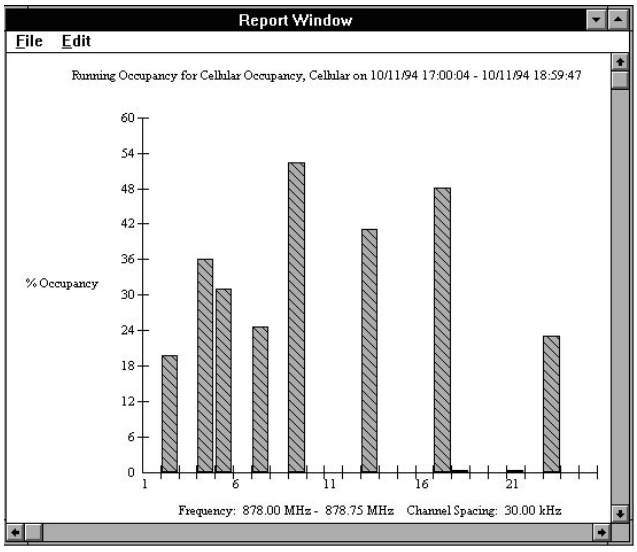

**Profile defined for detecting new signals in signal logging.**

## Spectral Occupancy

Spectral occupancy provides information on long-term usage of the spectrum. These measurements are particularly useful for allocating frequencies for best spectral economy or for verifying that reserved bands are indeed free from interference prior to installing communications systems.

Spectral occupancy is channelized. By dividing the band by a user-defined channel spacing (1 kHz to 10 MHz), continuous frequencies are partitioned into discrete channels. Bands should contain no more than 25 channels due to display resolution in occupancy reports and span accuracy considerations. Bands having more than 25 channels can be divided into sub-bands.

HP E4900 systems provide two types of occupancy measurements: running and interval. Running occupancy provides a single report for the entire time the measurement was running. Interval occupancy can export data with one set of values per user-defined time interval during the total measurement time. For example, if the measurement runs for three weeks, running occupancy would return one report averaging activity over that time period. Interval occupancy would export a spreadsheet of data with multiple entries, for example, every hour on the hour.




There are two results of occupancy measurements: channel occupancy and message length. Channel occupancy is the percentage of time that a given channel was occupied. Message length is the time duration of each transmission. Running occupancy and maximum and average message length are reported in bar graph format. Interval occupancy and maximum and average message length can be exported to a spreadsheet. An example of a running occupancy report is shown below.

The occupancy process can also be linked to masking (see Signal Logging) and alarms. Messages longer than a user-defined message length can be passed on to trace storage and optional demodulation.

## Statistical Measurements

Similar to spectral occupancy, HP E4900 systems can also provide statistical measurements. Bands are divided into channels in the same way as in spectral occupancy.

Channelized power can be used to characterize the noise floor for channelized communications like analog cellular or TDMA and noise-sensitive communications like CDMA. Maximum and average power can be plotted by channel or output to a spreadsheet as a matrix with values for each user-defined time interval.

HP E4900 systems can also plot channel availability, the converse of occupancy. Variable threshold channel availability can be displayed in order to see how channel availability varies with threshold.

## Coordination

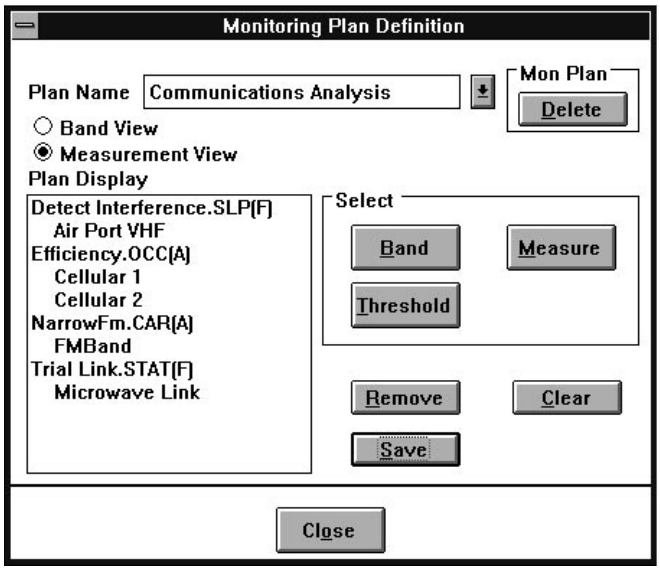
In order to improve productivity of existing operators, HP E4900 systems automate measurements with a powerful suite of coordination capabilities. Task scheduling allows unattended monitoring 24 hours-a-day, 365 days-a-year with minimal operator attention. Multitasking allows the system to time share between multiple tasks in multiple bands, using a single set of equipment for a broad range of needs. Alarms track intermittent signals so they can be measured and recorded even when an operator is not present. Lastly, remote operation allows a single operator in a central site to coordinate monitoring in multiple sites without travelling to each site.

### Task Scheduling

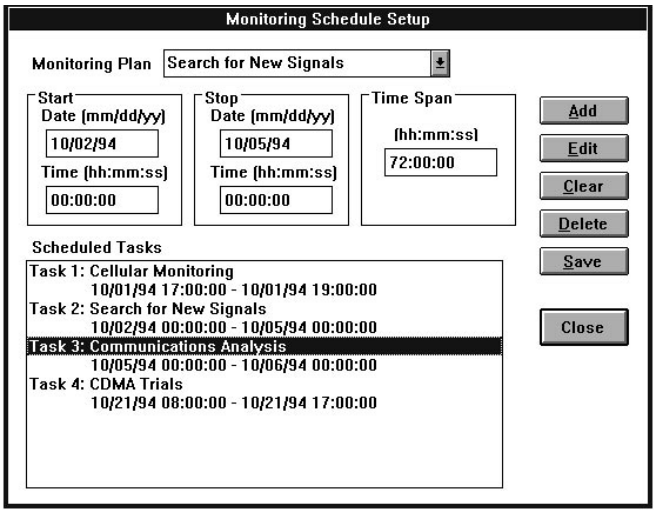
Unattended monitoring can be performed by scheduling measurements to happen at specific times. Measurements are associated with bands and grouped into monitoring plans which can be executed either under operator command or scheduled to occur automatically. This allows measurements to be made at specific times of the day when an operator is not present. The schedule can be created and edited using the user-friendly windows interface. Examples of a monitoring plan and a monitoring schedule are shown at right.

### Multitasking

Because the system is multi-tasking, measurement plans can consist of multiple measurements. For example, the system can timeshare between spectral occupancy in cellular and paging bands signal logging in public safety bands and carrier measurements in the FM broadcast band. Reports can be viewed without interrupting scheduled measurements. Multiple band window can be used to test measurement plans.




**Example of a Monitoring Plan**




**Example of a Monitoring Schedule**

## Alarms

Alarms can be set to capture intermittent events such as interfering or illegal transmissions. Alarms can be triggered by each of the three main measurement processes: signal logging, carrier measurements and spectral occupancy. When an alarm condition is satisfied, the triggering event and results are stored in an alarm log and three different alarm actions can occur:

1. Traces can be saved to disk for later analysis.
2. Carrier measurements can be made and saved to disk.
3. The signal can be demodulated and recorded for later listening. (Option 003 only)

The table below summarizes alarm types, trigger conditions and actions.

| Alarm Type | Trigger Conditions | | | | Alarm Actions | | |
|---|---|---|---|---|---|---|---|
| **Measurement** / Parameter | Below Limit | Above Limit | Between Limits | Outside Limits | Trace Storage | Carrier Meas. | Demod. & Record |
| **Signal Logging** | | | | | | | |
| Frequency | | | • | | • | • | • |
| Power | | | • | | • | • | • |
| **Carrier Measurements** | | | | | | | |
| Center Frequency | | | | • | • | | • |
| Maximum Power | • | • | • | | • | | • |
| Average Power | • | • | • | | • | | • |
| Signal-to-Noise Ratio | • | | | | • | | • |
| Occupied Bandwidth | • | • | • | | • | | • |
| % Amplitude Modulation | • | • | • | | • | | • |
| Profile Compliance | • | | | | • | | • |
| **Spectral Occupancy** | | | | | | | |
| Channel Up Time | | • | | | • | | • |

## Remote Operation

With a modem connection between systems, the HP E4903 central site controller can control HP E4900, E4901 and E4902 systems located at inconvenient or inaccessible sites. All measurements, coordination capabilities and reports can be commanded from the central site. In systems having multiple remote sites, the E4903 central site controller can command all sites by logging into them one at a time.

## Reports

HP E4900 systems can generate reports about every type of measurement as well as the measurement schedule and list of alarms detected. A wide variety of standard reports are available to suit most purposes. For specialized report formats or reports in local languages, HP E4900 systems can export their measurement data to standard PC software tools for writing custom reports.

### Standard Reports

The system can generate a variety of text and graphical reports including reports on signal logging, carrier measurements, spectral occupancy and statistical measurements, monitoring plans and alarm logs. These reports are summarized in the table on page 14.

### Custom Reports

Custom reports can be generated with a variety of standard PC software tools. There are two methods for generating custom reports.

Graphic displays from the system can be copied to the windows clipboard and then saved to a bitmap file using a supplied windows accessory called Paintbrush. These graphics files can then be included in word-processed reports. Displays that can be saved include trace and spectrogram displays, occupancy bar graphs, or any screen display, including menus and measurement definitions.

Measured data, as well as monitoring plans and band definitions, can be exported to files that are compatible with PC software tools such as Microsoft® Excel spreadsheets and numerous word processors. Data can then be manipulated with these tools for inclusion in custom reports. The table on page 14 summarizes standard reports plus exportable data.

| Category | Measurement | Report Type | | | |
|---|---|---|---|---|---|
| | | Text | Bar Graph | Line Graph | Data Export |
| **Signal Logging** | Signal Logging | • | | | • |
| **Carrier Measurement** | Carrier Measurement | • | | | • |
| **Spectral Occupancy** | Running Channel Occupancy | | • | | • |
| | Running Average Message Length | | • | | • |
| | Running Maximum Message Length | | • | | • |
| | Interval Channel Occupancy | | | | • |
| | Interval Message Length | | | | • |
| **Statistical Measurements** | Running Maximum Power | | | • | |
| | Running Average Power | | | • | |
| | Running Maximum vs. Average Power | | | • | |
| | Running Channel Availability | | • | | |
| | Running Variable Threshold Channel Availability | | | • | |
| | Interval Maximum Power | | | | • |
| | Interval Average Power | | | | • |
| | Interval Channel Availability | | | | • |
| | Interval Variable Threshold Channel Availability | | | | • |
| **Monitoring Plan** | Monitoring Plan | • | | | • |
| **Alarm Logs** | Signal Logging Alarms | • | | | |
| | Occupancy Alarms | • | | | |
| | Carrier Measurement Alarms | • | | | |
| **Bands** | Band Definitions | | | | • |

# HP E4900 Series Specifications

## **HP E4900B** 1.8 GHz Spectrum Monitoring System

System includes HP 8591E spectrum analyzer, telescoping whip antenna, HP Omnibook laptop PC and installed and configured spectrum monitoring software running under MS-Windows®.

**Option 002** adds preamplifier and transportable rack: Rack contains spectrum analyzer, preamplifier, laptop PC in a locking tray and a drawer to hold manuals and removable wheels from the rack.
**Option 003** adds preamplifier, switch, transportable rack, receiver, recorder, keyboard and 17" monitor: Preamplifier is switchable. Rack contains spectrum analyzer, laptop PC and keyboard in locking trays, monitor, preamplifier, switch, switch controller, receiver and recorder.
**Option 011** 25 MHz to 1.3 GHz antenna: vertically polarized omnidirectional discone suitable for outdoor, fixed-site applications. Includes 50-foot low-loss cable.
**Option 012** 25 MHz to 2.9 GHz antenna: vertically polarized omnidirectional conical monopole suitable for fixed and mobile applications. Includes 6-foot and 10-meter low loss cables.
**Option 031** adds HP 87405A preamplifier
**Option 220** 220/240-Volt operation
**Option 400** 14.4 kbps FAX/modem - USA
**Option W30** two additional years return-to-HP service

**Frequency Range:**

| | |
|---|---|
| HP E4900B | 9 kHz to 1.8 GHz |
| HP E4900B -002/031 | 10 MHz to 1.8 GHz |
| HP E4900B -003 (preamp off) | 9 kHz to 1.8 GHz |
| HP E4900B -003 (preamp on) | 10 MHz to 1.8 GHz |
| HP E4900B -003 (demodulation) | 25 MHz to 1.8 GHz |

| **Displayed Average Noise Level:** | **frequency** | **rbw** | **DANL (characteristic)** |
|---|---|---|---|
| HP E4900B | 10 MHz to 1.8 GHz | 1 kHz | –112 dBm |
| HP E4900B -002/031 | 10 MHz to 1.8 GHz | 1 kHz | –130 dBm |
| HP E4900B -003 (preamp off) | 10 MHz to 1.8 GHz | 1 kHz | –104 dBm |
| HP E4900B -003 (preamp on) | 10 MHz to 1.8 GHz | 1 kHz | –130 dBm |

**Input:** Type N(f), 50 Ω
VSWR < 2:1

**Maximum Input Power:**
+10 dBm (HP E4900B, input attenuation = 0 dB)
+30 dBm (HP E4900B, input attenuation >= 10 dB)
+30 dBm (HP E4900B -002)
+10 dBm (HP E4900B -031)
+30 dBm (HP E4900B -003, preamp on)
+10 dBm (HP E4900B -003, preamp off, input attenuation = 0 dB)
+30 dBm (HP E4900B -003, preamp off, input attenuation >= 10 dB)

**Size:**

| | |
|---|---|
| Spectrum Analyzer: | 163mm (H) x 325mm (W) x 427mm (D) |
| Laptop PC: | 50mm (H) x 295mm (W) x 226mm (D) |
| Rack (HP E4900B -002): | 24" (H) x 36" (W) x 26" (D) |
| Rack (HP E4900B -003): | 55" (H) x 36" (W) x 26" (D) |

HP E4900B -002 and HP E4900B -003 include 4 removable 5"-diameter wheels which add 6.5" to rack height when mounted.

**Weight:**

| | |
|---|---|
| Spectrum Analyzer: | 20 kg |
| Laptop PC: | 3.5 kg |
| Rack (HP E4900B -002): | 60 kg |
| Rack (HP E4900B -003): | 190 kg |

**Power Consumption:**

| | |
|---|---|
| HP E4900B: | 220 W maximum |
| HP E4900B -003: | 330 W maximum |

**Temperature Range:** 10° C to 40° C

## **HP E4901B** 2.9 GHz Spectrum Monitoring System

System includes HP 8594E spectrum analyzer, telescoping whip antenna, HP Omnibook laptop PC and installed and configured spectrum monitoring software running under MS-Windows®.

**Option 002** adds preamplifier and transportable rack: Rack contains spectrum analyzer, preamplifier, laptop PC in a locking tray and a drawer to hold manuals and removable wheels from the rack.
**Option 003** adds preamplifier, switch, transportable rack, receiver, recorder, keyboard and 17" monitor: Preamplifier is switchable. Rack contains spectrum analyzer, laptop PC and keyboard in locking trays, monitor, preamplifier, switch, switch controller, receiver and recorder.
**Option 011** 25 MHz to 1.3 GHz antenna: vertically polarized omnidirectional discone suitable for outdoor, fixed-site applications. Includes 50-foot low-loss cable.
**Option 012** 25 MHz to 2.9 GHz antenna: vertically polarized omnidirectional conical monopole suitable for fixed and mobile applications. Includes 6-foot and 10-meter low loss cables.
**Option 031** adds HP 87405A preamplifier
**Option 220** 220/240-Volt operation
**Option 400** 14.4 kbps FAX/modem - USA
**Option W30** two additional years return-to-HP service

**Frequency Range:**

| | |
|---|---|
| HP E4901B | 9 kHz to 2.9 GHz |
| HP E4901B -002/031 | 10 MHz to 2.9 GHz |
| HP E4901B -003 (preamp off) | 9 kHz to 2.9 GHz |
| HP E4901B -003 (preamp on) | 10 MHz to 2.9 GHz |
| HP E4901B -003 (demodulation) | 25 MHz to 2 GHz |

| **Displayed Average Noise Level:** | **frequency** | **rbw** | **DANL (characteristic)** |
|---|---|---|---|
| HP E4901B | 10 MHz to 2.9 GHz | 1 kHz | –112 dBm |
| HP E4901B -002/031 | 10 MHz to 2.9 GHz | 1 kHz | –130 dBm |
| HP E4901B -003 (preamp off) | 10 MHz to 2.9 GHz | 1 kHz | –104 dBm |
| HP E4901B -003 (preamp on) | 10 MHz to 2.9 GHz | 1 kHz | –130 dBm |

**Input:** Type N(f), 50 Ω
VSWR < 2:1

**Maximum Input Power:**
+10 dBm (HP E4901B, input attenuation = 0 dB)
+30 dBm (HP E4901B, input attenuation >= 10 dB)
+30 dBm (HP E4901B -002)
+10 dBm (HP E4901B -031)
+30 dBm (HP E4901B -003, preamp on)
+10 dBm (HP E4901B -003, preamp off, input attenuation = 0 dB)
+30 dBm (HP E4901B -003, preamp off, input attenuation >= 10 dB)

**Size:**

| | |
|---|---|
| Spectrum Analyzer: | 163mm (H) x 325mm (W) x 427mm (D) |
| Laptop PC: | 50mm (H) x 295mm (W) x 226mm (D) |
| Rack (HP E4901B -002): | 24" (H) x 36" (W) x 26" (D) |
| Rack (HP E4901B -003): | 55" (H) x 36" (W) x 26" (D) |

HP E4901B -002 and HP E4901B -003 include 4 removable 5"-diameter wheels which add 6.5" to rack height when mounted.

**Weight:**

| | |
|---|---|
| Spectrum Analyzer: | 20 kg |
| Laptop PC: | 3.5 kg |
| Rack (HP E4901B -002): | 60 kg |
| Rack (HP E4901B -003): | 190 kg |

**Power Consumption:**

| | |
|---|---|
| HP E4901B: | 220 W maximum |
| HP E4901B -003: | 330 W maximum |

**Temperature Range:** 10° C to 40° C

## **HP E4902B** 26.5 GHz Spectrum Monitoring System

System includes HP 8563E spectrum analyzer, telescoping whip antenna, HP Omnibook laptop PC, and installed and configured spectrum monitoring software running under MS-Windows®.

**Option 002** adds preamplifier and transportable rack: Rack contains spectrum analyzer, preamplifier, laptop PC in a locking tray, and a drawer to hold manuals and removable wheels from the rack.
**Option 011** 25 MHz to 1.3 GHz antenna: vertically polarized omnidirectional discone suitable for outdoor, fixed-site applications. Includes 50-foot low-loss cable.
**Option 012** 25 MHz to 2.9 GHz antenna: vertically polarized omnidirectional conical monopole suitable for fixed and mobile applications. Includes 6-foot and 10-meter low loss cables.
**Option 013** 2 GHz to 18 GHz antenna: slant-linear polarized omnidirectional biconic suitable for fixed and mobile applications. Includes 6-foot cable.
**Option 220** 220/240-Volt operation
**Option 400** 14.4 kbps FAX/modem - USA
**Option W30** two additional years return-to-HP service

**Frequency Range:**

| | |
|---|---|
| HP E4902B: | 9 kHz to 26.5 GHz |
| HP E4902B -002: | 10 MHz to 26.5 GHz |

**Displayed Average Noise Level: (characteristic)**

| | **frequency** | **1 kHz rbw** | **1 Hz rbw** |
|---|---|---|---|
| HP E4901B | 10 MHz to 2.9 GHz | -114 dBm | -144 dBm |
| | 2.9 GHz to 6.5 GHz | -118 dBm | -148 dBm |
| | 6.5 GHz to 13.2 GHz | -115 dBm | -145 dBm |
| | 13.2 GHz to 22 GHz | -110 dBm | -140 dBm |
| | 22 GHz to 26.5 GHz | -109 dBm | -139 dBm |
| HP E4901B -002 | 10 MHz to 13.2 GHz | -128 dBm | -158 dBm |
| | 13.2 GHz to 22 GHz | -121 dBm | -151 dBm |
| | 22 GHz to 26.5 GHz | -118 dBm | -148 dBm |

**Input:** N(f), 50 Ω
VSWR < 2:1

**Maximum Input Power:**
+10 dBm (HP E4902B, input attenuation = 0 dB)
+30 dBm (HP E4902B, input attenuation >= 10 dB)
+23 dBm (HP E4902B -002)

**Size:**

| | |
|---|---|
| Spectrum Analyzer: | 163mm (H) x 325mm (W) x 427mm (D) |
| Laptop PC: | 50mm (H) x 295mm (W) x 226mm (D) |
| Rack (HP E4902B -002): | 24” (H) x 36” (W) x 26” (D) |

HP E4902B -002 includes 4 removable 5”-diameter wheels which add 6.5” to rack height when mounted.

**Weight:**

| | |
|---|---|
| Spectrum Analyzer: | 20 kg |
| Laptop PC: | 3.5 kg |
| Rack (HP E4901B -002): | 60 kg |

**Power Consumption:** 220 W maximum

**Temperature Range:** 10° C to 40° C

## **HP E4903B** Central Site Controller

System includes HP Omnibook laptop PC and installed and configured remote control software running under MS-Windows®.

**Option 220** 220/240-Volt operation
**Option 400** 14.4 kbps FAX/modem - USA
**Option W30** two additional years return-to-HP service

| | |
|---|---|
| **Size:** | 50mm (H) x 295mm (W) x 226mm (D) |
| **Weight:** | 3.5 kg |
| **Power Consumption:** | 30 W maximum |
| **Temperature Range:** | 10° C to 40° C |

The HP E4903B central site controller provides remote control of E4900, E4901 and E4902 spectrum monitoring systems using public switched telephone lines. An operator at the central site controller can initiate all interactive and automatic measurements possible at the remote spectrum monitoring system and can see all reports and screens shown on the monitoring system. The central site operator can also copy files to create custom reports locally.

A modem is required at the central site controller and at each spectrum monitoring system. US customers should purchase Option 400 for both the central site controller and the monitoring system. Non-US customers should purchase modems locally.

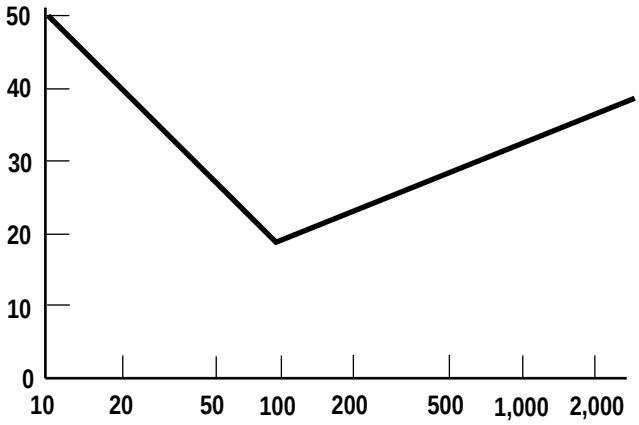
## Antenna Characteristics

**Option 011**

| | |
|---|---|
| Frequency Range: | 25 MHz to 1.3 GHz |
| Type: | discone |
| Directionality: | omnidirectional |
| Antenna Gain: | 0 dBi, nominal |
| Polarization: | vertical |
| Size: | 1.7 m high x 0.85 m diameter |
| Weight: | 1 kg |
| Recommended Use: | fixed site, outdoors |

**Option 012**

| | |
|---|---|
| Frequency Range: | 25 MHz to 2.9 GHz |
| Type: | conical monopole enclosed in radome (protective enclosure) |
| Directionality: | omnidirectional |
| Antenna Factor: | see curve |
| Polarization: | vertical |
| Size: | 13.12” high x 20” diameter |
| Weight: | 16 lbs. |
| Recommended Use: | fixed or mobile |




**Option 013**

| | |
|---|---|
| Frequency Range: | 2 GHz to 18 GHz |
| Type: | biconic enclosed in radome (protective enclosure) |
| Directionality: | omnidirectional |
| Antenna Gain: | 0 dBi, copolarized |
| Polarization: | slant linear (receives V, H, RHCP and LHCP) |
| Size: | 5.25” high x 7” diameter |
| Weight: | 3 lbs. |
| Recommended Use: | fixed or mobile |

Useful antenna equations:

1. to convert antenna gain to antenna factor: AFE(dB/m) = 20 log f (Hz) - 149.8 dB - G (dBi)
2. to convert field strength to electrical power: P(dBm) = E(dBµV/m) - 107.2 dB - AFE (dB/m)

# Post Sales Service

To ensure your complete success, Hewlett-Packard offers extensive system support. Our global service organization keeps you up and running with local equipment service and our factory experts help you use your system efficiently. Our commitment to your success continues long after the sale is completed.

## Hardware Warranty

HP E4900 systems include a standard one-year return-to-HP system warranty. Option W30 extends the warranty to three years.

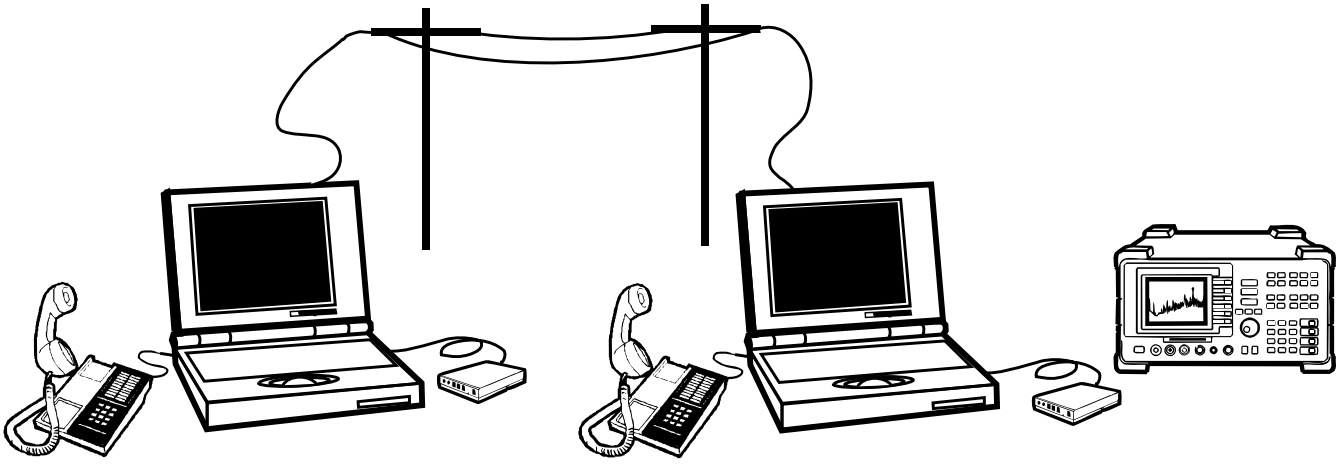
## Application Support

### FAX Support

Our wealth of application knowledge is yours with direct access to our factory experts. FAX support is standard on every system. Typical response time is three working days.

### Remote Support

To help our support team follow up on your application questions, you can demonstrate your problems using a modem and supplied remote control software. Our spectrum monitoring experts can then recommend solutions based on your specific monitoring situation.



HP Support Team

Your HP E4900 System

**For more information on Hewlett-Packard Test and Measurement products, applications, or services, please call your local Hewlett-Packard sales office. A current listing is available via the World-wide Web through AccessHP at http://www.hp.com. If you do not have access to the internet, please contact one of the HP centers listed below and they will direct you to your nearest HP representative.**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1 800 452 4844

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