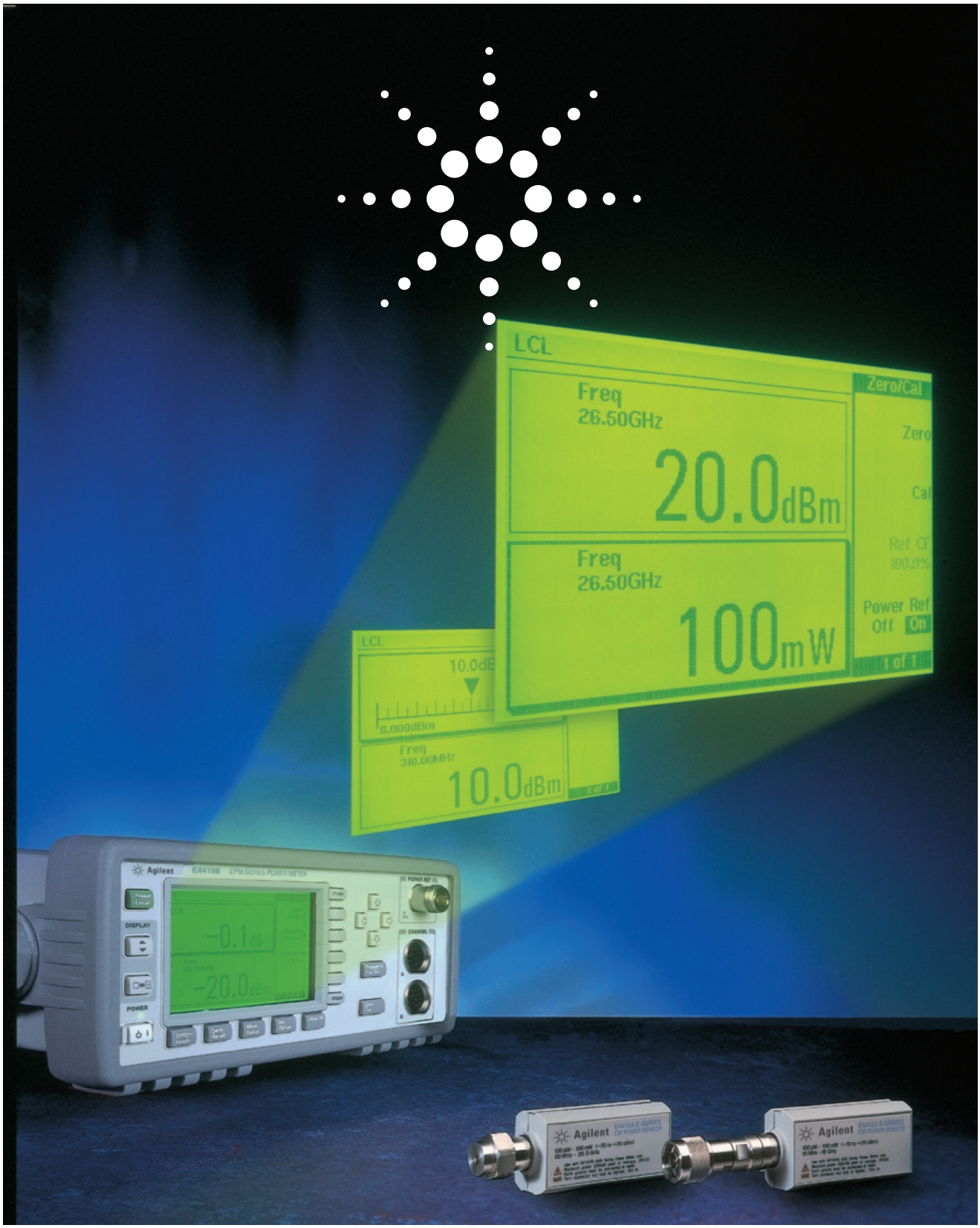
Agilent EPM Series
Power Meters



Agilent Technologies

E4418B single-channel power meter

E4419B dual-channel power meter

E4412A power sensor and E4413A power sensor.

E-Series Power Sensors, CW Family

Model	Frequency Range	Power Range
E4412A	10 MHz to 18 GHz	-70 to +20 dBm
E4413A	50 MHz to 26.5 GHz	-70 to +20 dBm

E-Series Power Sensors, Average Power Family

Model	Frequency Range	Power Range
E9300A	10 MHz to 18 GHz	-60 to +20 dBm
E9301A	10 MHz to 6 GHz	-60 to +20 dBm
E9304A	9 kHz to 6 GHz	-60 to +20 dBm
E9300B	10 MHz to 18 GHz	-30 to +44 dBm
E9301B	10 MHz to 6 GHz	-30 to +44 dBm
E9300H	10 MHz to 18 GHz	-50 to +30 dBm
E9301H	10 MHz to 6 GHz	-50 to +30 dBm

The standard just got better!

What's new?

- Fast measurement speeds (up to 200 readings per second)
- Wide dynamic range sensors (-70 dBm to +44 dBm), sensor dependent
- Calibration factors stored in EEPROM
- Rechargeable battery option

Agilent Technologies power meters have long been recognized as the industry standard for RF and microwave power measurements. Now, with our latest generation of power meters and sensors, Agilent provides totally updated and exciting choices.

The EPM series of power meters is comprised of:

- E4418B single-channel power meter
- E4419B dual-channel power meter

and the E-series of power sensors (see table at left).

The E-series power sensors are characterized by having their calibration factors, linearity, and temperature compensation data all stored in EEPROM and have a wide dynamic range. This series of power sensors only operate with the EPM power meters. For more information on the E9300 power sensors, refer to the Product Overview, 5968-4960E.

Compatibility– Agilent protects your investment

Operates with 8480 series power sensors!

Because Agilent understands the need to protect your investment in power sensors, the EPM series power meters have been designed to be fully compatible with the 8480 series power sensors.

Works with 436A, 437B, and 438A code[1]!

The development of automatic test procedures, software generation, and verification are expensive tasks. To help protect your investment, we've designed the new E4418B power meter to be code-compatible with the 436A and 437B, and the E4419B to be code-compatible with the 438A. It's therefore a quick and simple task to make many power measurements in an automatic test equipment (ATE) system using existing 436A, 437B and 438A code. This is achieved by softkey selection.

[1] The Agilent EPM series provides a high degree of compatibility with 436A/437B/438A code. However, backwards compatibility can never be 100% guaranteed. For an application note on EPM series compatibility, visit our Web site at www.tm.agilent.com or ask your sales representative for literature number 5968-4519E.

Designed for manufacturing

Fast speed means increased productivity
Fast measurement speed is essential in the high volume manufacturing of RF and microwave components and systems. Faster test time improves your productivity—letting you test more devices in less time. E-series sensors along with the E4418B power meter provide a FAST measurement mode that lets you make up to 200 readings per second. There's also a x2 mode with the EPM series power meters and 8480 series sensor combination—doubling your speed compared to the 437B and 8480 series combination.

No more slow range switch delays!
A common problem with most power meters is the time delay that occurs when the power being measured crosses a range switch point. Range switching delays are either significantly reduced or eliminated when an EPM series power meter is used with an E-series sensor. This power measurement combination has only one fast range switch point across the entire dynamic range of the sensor.

Height and width compatibility allows easy replacement in rackmount systems
The EPM series power meters are the same height and width as the 437B and 438A—making them easy to substitute in rackmount systems. The following options are available[2]:

E441xB-002 - rear panel sensor input(s) with the Power Reference Calibrator on the front panel.

E441xB-003 - rear panel sensor input(s) with the Power Reference Calibrator on the rear panel.

E441xB-908 - rackmount kit for one instrument.

E441xB-909 - rackmount kit for two instruments.

[2] These options are available for an extra cost.

... yet more useful functions ...
SCPI compatible - EPM power meters conform to the Standard Commands for Programmable Instruments (SCPI).

RS232/422 interface - both RS232 and RS422 serial interfaces can be used to remotely control the EPM series power meters.

Limit testing - EPM series power meters can be configured to verify the power being measured against an upper and / or lower limit. Limit failures are indicated on the power meter's display and over the GPIB.

Zero/cal lockout - can be enabled to prevent the EPM series power meter from making measurements until the connected sensor is zeroed and calibrated.

Channel offset - EPM series power meters can be configured to compensate for signal loss or gain in your test setup.

Rigorous environmental testing and high-reliability qualifies the EPM power meters for your most demanding measurement applications.

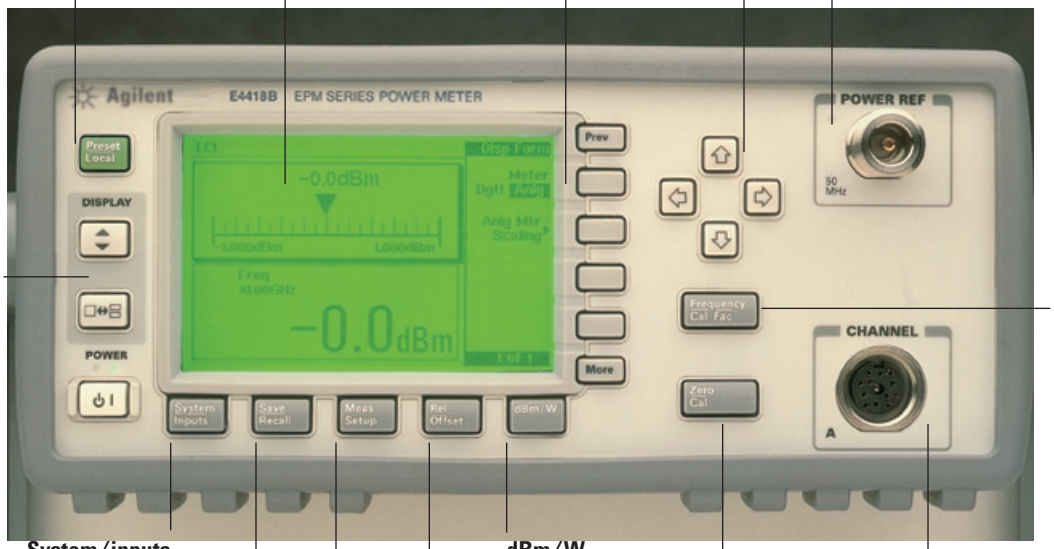
Preset/local
Returns the power meter to local control. If already in local, returns the power meter to the default condition.

Large LCD display
High resolution display with back lighting provides a wide viewing angle for all the displayed data.

Arrowkeys
Allow positioning of the cursor for editing purposes and for character selection.

Power ref
1.00 mW, 50 MHz source used for power sensor calibration (traceable to NIST).

Softkeys
Provide user menu selection.



Display keys
Select the active display window. Selectable single and split screen formats.

Frequency/cal fac
Frequency: Direct entry of the test signal frequency.
Cal factor: For sensor frequency response correction (settable from 1% to 200% with 0.1% resolution).

System/inputs
Accesses the menus associated with the general power meter setup (for example, the GPIB address, sensor cal tables). Also accesses input offsets, averages, and other input data.

dBm/W
Selectable units of either Watts or dBm in absolute power, or percent, or dB for relative measurements.

Save/recall:
Save and recall up to 10 instrument states.

Zero/cal
Zero: Fully automatic digital zero corrects for residual offsets.
Cal: Fully automatic sensor calibration.

Rel: Relative mode uses displayed value as reference (when active).
Offset: Display offset values from -99.99 dB to +99.99 dB can be set up.

Meas setup
Accesses the menus associated with the Measurement Setup (for example, selection of the digital or analog meter). Also accesses ratio measurements on the dual-channel power meter.

Sensor connector(s)
Sensor input operates with Agilent 8480 series and E-series power sensors. This is the E4418B single-channel power meter. The E4419B has A and B channel inputs.

Easy to learn ... easy to use

Increase your productivity with an easy-to-learn, easy-to-use power meter. The EPM series has been designed with the user in mind. Hardkeys such as ZERO/CAL allow access to the most frequently used power meter functions. Softkeys provide measurement control through user selection. The high resolution LCD display (with backlighting), large characters, and split screens provide easy viewing of information.

Rear panel features

• DC recorder output, 0 to 1 Volt. The Agilent E4419B has two DC recorder outputs.

• E441xB-002 provides rear panel sensor inputs with the power reference oscillator on the front panel.

• E441xB-003 provides parallel rear panel sensor inputs and moves the power reference oscillator to the rear panel.

• GPIB connector for remote control of all functions.

• RS232/422 connector for remote control.

• Line power - universal input voltage range with NO range selection switches.

• Ground connector - for those applications where you need a hard-wired connection between the power meter's ground and a common ground.

• Power meter conforms to CE and CSA standards.

• Remote input / output - TTL logic level is output when a measurement exceeds a predetermined limit. TTL inputs are provided to initiate zero and calibration cycles.

Designed for installation and maintenance

Wide dynamic range allows high and low power measurements with a single sensor

One E-series CW sensor covers the range -70 to +20 dBm, while the E9300 sensors operate from -60 to +44 dBm (25W), depending on the sensor. This wide dynamic range capability saves you time and money as you can measure both high (transmitter monitor points) and low (receiver) power levels using a single sensor. Often using just one sensor reduces the requirement for multiple sensor reconnections and the associated mandatory zero and calibration procedures.

Stored sensor calibration factors for best accuracy and ease of use

Now you no longer have to key in the sensor calibration factors to achieve optimum measurement accuracy. The E-series sensor calibration factors (computed at our factory or Agilent Technologies Service Center) are programmed into measurement points across the frequency range of the sensor and stored in EEPROM.

At power-on, or when the sensor is connected, the calibration factors are automatically downloaded into the EPM series power meter. This eliminates measurement errors caused by wrongly keyed-in calibration factor data.

Not all installation and maintenance environments are temperature controlled. Therefore, it is important to have confidence in your power measurements over a wide temperature range. E-series sensors provide temperature correction information. This ensures that the best power measurement accuracy is maintained over the full 0 to 55˚C temperature range.

Rugged and portable makes it ideal for field use

The optional rechargeable battery (option 001), which provides up to 5.5 hours of continuous operation, means you can use the EPM series power meters in a mains-free environment. The battery charges in less than three hours, during which time the meter can be used, and the charge level indicators keep you informed of the battery status at all times. The soft carry / operating case (34141A) makes it easy to use the EPM series power meter in installation and maintenance environments. Front and rear-panel bumpers protect the power meter from everyday knocks. A bail handle makes it easy to carry. The EPM series power meters are lightweight—weighing approximately 4kg (9 lb).

The accessories available for the EPM series power meters are ideal for installation and maintenance situations.

The battery option and operating case bring Agilent's power accuracy and ease-of-use to field applications.

In subdued lighting conditions, you can easily read the high resolution display.

In this setup, the top half of the split display shows the analog peaking meter while the bottom display shows the same measurement with a larger character size.

Versatile display is suitable for your measurement needs

In the installation and maintenance environment, it is important to be able to see the power meter's display from a distance and in a variety of lighting conditions. The EPM series power meter has been designed to meet this need. Contrast adjustment lets you set the brightness of the display.

With the internal battery Option E441xB-001[3] installed, the LED backlight can be switched off to conserve battery charge levels. The backlight "timed" mode switches the backlight off after 10 minutes of inactivity, again, to maximize battery operation.

The display's wide viewing angle lets you read the large characters and digits, or the analog peaking meter, from a distance. You can display both the digital and analog types of readout using the meter's split screen facility.

The analog peaking meter helps you make accurate adjustments. User-defined upper and lower scale limits, either in dBm or Watts, allow you to control the sensitivity of the displayed adjustment.

The E-series and 8480 series sensors can operate with long sensor cables. Cable lengths up to 61 meters (200 feet) can be used in conjunction with the 8480 series sensors. So, when you are inside a radio station or up a radio mast, those awkward transmitter and receiver adjustments are made easy using long sensor cables.

[3] Available for an extra cost.

Designed for R&D

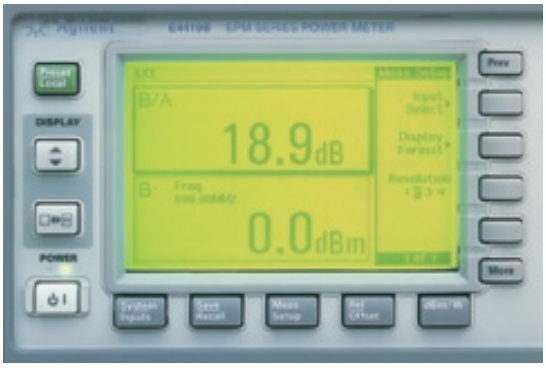
Optimum measurement accuracy and repeatability means confidence in your power measurements

The EPM series power meters maintain the high accuracy standard set by the Agilent 437B and 438A—being designed to have excellent linearity. Instrumentation absolute accuracy, due to the meter electronics, is specified to be +0.02 dB in logarithmic mode and +0.5% in linear mode—making this source of error a negligible part of the overall measurement uncertainty.

In RF and microwave power measurements, the largest errors are caused by:

- Sensor and source mismatch, and
- Sensor frequency response, non-linearity, and temperature characteristics.

To minimize the mismatch error, the E-series sensors have a low VSWR specification. To provide comprehensive error correction, the calibration factors, linearity and temperature error correction information are stored in EEPROM. Error correction is performed within the power meter. Frequency data is entered by the user. Taking account of the signal level, the frequency being measured, and the temperature, appropriate correction values are applied to the measurement. This error correction process ensures optimum measurement accuracy and repeatability over the full 0 to 55˚C temperature range.



With the E4419B, ratio and difference measurements can be made. Here the upper half of the display shows the gain of a GSM amplifier while the lower half of the display shows the B Channel absolute power measurement in dBm.

User friendly interface for quick setup times

The power meter has an intuitive user interface. Hardkeys for the most frequently used functions and softkey menus simplify configuring the power meter for your particular measurement needs. To reduce repeated setup sequences, the SAVE/RECALL menu allows you to save up to 10 instrument configurations.

Designed for R&D

More choice means the correct sensor for your application

The EPM series power meter's compatibility with both the 8480 series and E-series sensors provides R&D engineers with more choice:

- The EPM series power meter and 8480 series sensor combination form a high precision, average power measurement system operating in the frequency range 100 kHz to 110 GHz (depending on the selected sensor) over a 50 dB maximum dynamic range.

- The EPM series power meter and E-series sensor combination is ideal for measuring signals in the frequency range 9 kHz to 26.5 GHz, over a wide dynamic range, from -70 dBm to +44 dBm, (depending on the selected sensor).

EPM power meter options[4]

Power

E441xB-001 Mains power and internal rechargeable battery

Connectors

E441xB-002 Parallel rear panel sensor input connector(s) and front panel reference calibrator connector

E441xB-003 Parallel rear panel sensor input connector(s) and rear panel reference calibrator connector

Calibration documentation

E441xB-A6J ANSI Z540 compliant calibration test data including measurement uncertainties

Documentation

A hard copy and CD version of the English language *User's Guide* and *Programming Guide* is provided with the EPM power meter as standard. A selection can be made to delete the hard copy.

E441xB-0B0 Delete manual set

Additional documentation

Selections can be made for the localization of the *User's Guide* and an English language *Service Manual*.

E441xB-915 English language *Service Manual*

E441xB-916 English language manual set (hard copy *User's Guide* and *Programming Guide*)

E441xB-ABD German localization (hard copy *User's Guide* and *English Programming Guide*)

E441xB-ABE Spanish localization (hard copy *User's Guide* and *English Programming Guide*)

E441xB-ABF French localization (hard copy *User's Guide* and *English Programming Guide*)

E441xB-ABJ Japanese localization (hard copy *User's Guide* and *English Programming Guide*)

Cables

E441xB-004 Delete power sensor cable

Additional cables

11730A	Power sensor and SNS noise source cable, length 5 ft (1.5 m)
11730B	Power sensor and SNS noise source cable, length 10 ft (3 m)
11730C	Power sensor and SNS noise source cable, length 20 ft (6.1 m)
11730D	Power sensor cable, length 50 ft (15.2 m)
11730E	Power sensor cable, length 100 ft (30.5 m)
11730F	Power sensor cable, length 200 ft (61.0 m)

Accessories

E441xB-908	Rackmount kit (one instrument)
E441xB-909	Rackmount kit (two instruments)
34131A	Transit case for half-rack 2U high instruments
34141A	Yellow soft carry / operating case
34161A	Accessory pouch
E9287A[5]	Spare battery pack for the EPM power meter

[4] With the exception of "delete" options, these are available for an extra charge.

[5] Only for EPM series power meter with Option E441xB-001 installed.

Service and support

Traceability to NIST
Agilent's power measurements are traceable to the US National Institute of Standards and Technology (NIST).

Quality and reliability
Agilent's power meters and sensors are manufactured in ISO9002 registered facilities in accordance with Agilent's commitment to quality. The reliability of these instruments is proven through extensive environmental testing.

Warranty and extended warranty
Included with each EPM series power meter[6] is a standard three-year return-to-Agilent service warranty. The E-series sensors have a one-year return-to-Agilent service warranty. Support options to extend warranty or cover periodic calibrations are available. For more information, contact your local Agilent sales office.

Literature reference

EPM Series Power Meters and E-series Power Sensors
Data Sheet
5965-6382E

EPM Series Power Meters and E-series Power Sensors
Configuration Guide
5965-6381E

Fundamentals of RF and Microwave Power Measurements
Application Note 64-1C
5965-6630E

4 Steps for Better Power Measurements
Application Note 64-4C
5965-8167E

E-Series E9300A Power Sensors
Product Overview
5968-4960E

[6] For Option E441xB-001, the 3 year warranty does not apply to the E9287A battery pack.

Agilent Technologies' Test and Measurement Support, Services, and Assistance
Agilent Technologies aims to maximize the value you receive, while minimizing your risk and problems. We strive to ensure that you get the test and measurement capabilities you paid for and obtain the support you need. Our extensive support resources and services can help you choose the right Agilent products for your applications and apply them successfully. Every instrument and system we sell has a global warranty. Support is available for at least five years beyond the production life of the product. Two concepts underlie Agilent's overall support policy: "Our promise" and "Your Advantage."

Our Promise
Our Promise means your Agilent test and measurement equipment will meet its advertised performance and functionality. When you are choosing new equipment, we will help you with product information, including realistic performance specifications and practical recommendations from experienced test engineers. When you use Agilent equipment, we can verify that it works properly, help with product operation, and provide basic measurement assistance for the use of specified capabilities, at no extra cost upon request. Many self-help tools are available.

Your Advantage
Your Advantage means that Agilent offers a wide range of additional expert test and measurement services, which you can purchase according to your unique technical and business needs. Solve problems efficiently and gain a competitive edge by contracting with us for calibration, extra-cost upgrades, out-of-warranty repairs, and on-site education and training, as well as design, system integration, project management, and other professional engineering services. Experienced Agilent engineers and technicians worldwide can help you maximize your productivity, optimize the return on investment of your Agilent instruments and systems, and obtain dependable measurement accuracy for the life of those products.

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Europe:
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(fax) (31 20) 547 2390

Japan:
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(fax) (81) 426 56 7840

Korea:
(tel) (82 2) 2004 5004
(fax) (82 2) 2004 5115

Latin America:
(tel) (305) 269 7500
(fax) (305) 269 7599

Taiwan:
(tel) 0800 047 866
(fax) 0800 286 331

Other Asia Pacific Countries:
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(fax) (65) 6836 0252
Email: tm_asia@agilent.com

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Printed in USA, June 11, 2002
5965-6380E

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