2650A Series
Handheld Spectrum Analyzers

Portable
Quick
Precise

Spectrum Analysis

BK PRECISION
ELECTRONIC TEST INSTRUMENTS

2650A Series Handheld Spectrum Analyzers

The 2650A Series spectrum analyzers are ideal for quick, precise and cost effective signal investigations. At a weight of only 4 pounds (1.8 kg), they are by far the lightest and most compact full-featured spectrum analyzers available.

With their ease of use, measurement flexibility and unmatched portability, the 2650A series can handle numerous applications ranging from the installation, maintenance, and troubleshooting of wireless communication systems to frequency response measurements of cables and electric field strength measurements.

Handheld Spectrum Analyzers, 3.3 GHz & 8.5 GHz

Models 2650A, 2652A, 2658A

Truely portable solution for quick and precise spectrum analysis

B&K Precision's 2650A series handheld spectrum analyzers are compact, light weight, and cost-effective spectrum analyzers for quick and precise signal investigations, especially away from the bench. At a weight of only 1.8 kg (4 pounds), the 2650A series are by far the lightest full-featured spectrum analyzer available, yet they deliver performance and features comparable to full-size bench spectrum analyzers and can operate up to 4 hours on a single battery.

With their ease of use, measurement flexibility, and unmatched portability, the 2650A series analyzers are indispensible tools for engineers and technicians who conduct field measurements in the 50 kHz to 8.5 GHz range.

Model	Frequency Range
2650A	50 kHz – 3.3 GHz
2652A	50 kHz – 3.3 GHz with Tracking Generator
2658A	50 kHz – 8.5 GHz

Applications

- Installation, maintenance, and troubleshooting of wireless communication systems such as W-CDMA/CDMA, GSM, WLAN, WiMAX and Bluetooth
- Frequency response measurements of passive components such as RF cables, filters, and attenuators (model 2652A)
- Detection of signal interference and undesired emissions
- TV and broadcasting
- Antenna alignment
- Electric field strength measurement with dipole antennas optimized for typical frequencies used in wireless systems (order M401-M406)
- Magnetic field strength measurement with magnetic field probe (PR 26m)

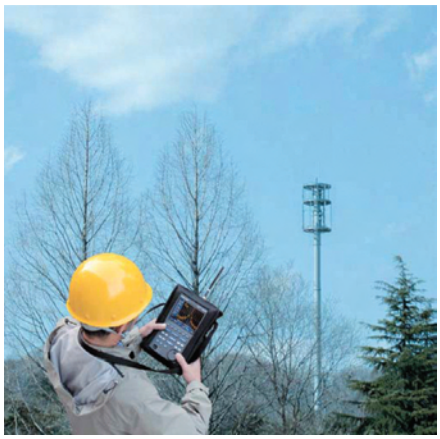
Superb performance improves your productivity

Advanced synthesizer-based design enables the 2650A series to provide you with an accurate and detailed picture of the spectrum you are investigating.

- Fast sweep speed, minimum 10 ms, to help locate and identify elusive, transient interference signals
- DANL (displayed average noise level) of -127 dBm
- Single sideband phase noise – 90 dBc @ 100 kHz offset

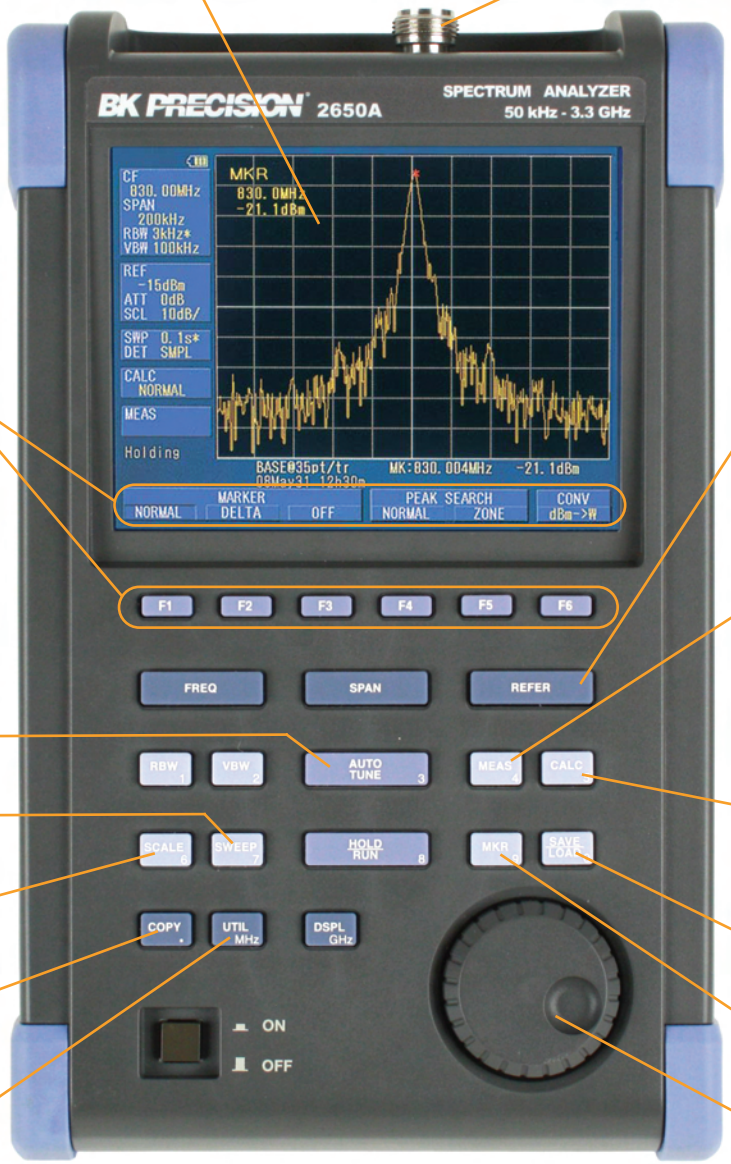
Key features and benefits

- Frequency range from 50 kHz – 3.3 GHz or 8.5 GHz
- A truly portable spectrum analyzer weighing only 1.8 kg including the battery
- Impressive 4 hour battery life; easy-to-replace rechargeable Lithium-Ion battery
- Built-in tracking generator to rapidly determine transmission characteristics of 2 port devices (model 2652A)
- USB interface for PC connectivity
- Intuitive PC Software for remote control and documentation of measurement results
- Conveniently store measurement results and screen shots in bitmap format to USB flash drive (USB host interface)
- Large easy-to-read color display (TFT LCD), 640 x 480 resolution
- Measurement functions: channel/adjacent channel power, occupied bandwidth, electric and magnetic field strength
- Convenient Auto Tune function automatically sets center frequency to the maximum signal within full span and optimum settings for RBW, VWB and sweep time
- External trigger for zero span measurements
- SCPI-like remote control commands



2650A Series Handheld Spectrum Analyzers

▲ Front panel



Large color screen (640 x 480 pixels) can be switched to high contrast monochrome display in extreme sunlight

RF Input (N-connector), able to withstand 27 dBm (CW average power)/25V DC max

Simple menu-based operation via soft keys

Set reference level from +1 dBm to -60 dBm in 1 dB steps

Measurement functions:
- Channel power
- Adjacent channel power
- Occupied bandwidth
- Electric field strength
- Magnetic field strength

Automatically tune to maximum level with full span

Set sweep time and detection mode

Calculation functions:
- Max hold
- Min hold
- Averaging
- Overwrite

2, 5 and 10 dB/div

Save/Load trace data and setups to/from internal memory or USB flash drive

Store screen images in bitmap format to flash drive or hard copy to USB printer

Marker measurement and peak search

Enter custom labels for filenames, set the time and date

Rotary knob for parameter selection

▲ Interface

External trigger input (SMA)

PC interface - USB device (A plug)

USB host adapter for USB flash drives

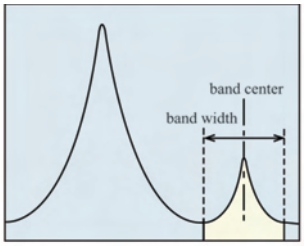
Charge status indicator

DC power input

▲ Versatile measurement functions

Channel power measurement

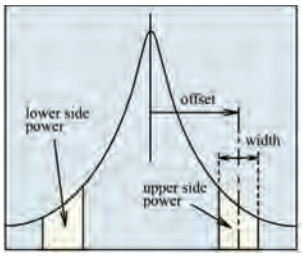
Allows you to measure the total power or noise power in a user-specified bandwidth.



Adjacent channel power

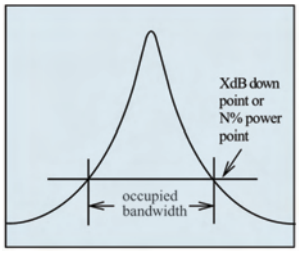
Measure the ratio of power leakage (from the wanted signal) into adjacent channels. Center frequency, adjacent channel bandwidth, and offset between main carrier and adjacent channels can be set.

Users can select from any of the following three measurement methods based on the reference carrier definition: total power (of displayed spectrum), peak power (reference level) and in-band power (user-specified band width).



Occupied Bandwidth

This measurement calculates the bandwidth containing the total integrated power occupied in a given signal bandwidth. Two measurement methods are available: The user can specify N% of total power or the X dB down point relative to the carrier peak level.

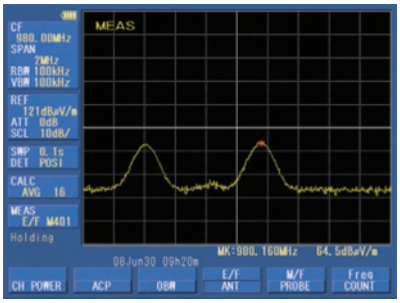


Electric field strength measurement

A dipole antenna (options M401 – M406) connected to the RF input enables the measurement of electric field strength. Users can choose from 6 antennas based on the frequency range under investigation. Each antenna's resonance point is optimized for the frequency spectrum of a specific wireless standard:

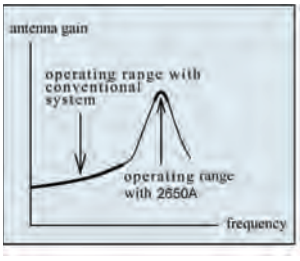
- M401 is suitable for GSM 850/900
- M403 for W-CDMA and GSM 1800/1900
- M404 for 2.4 GHz wireless LAN and Bluetooth
- M406 for 5 GHz wireless LAN

Combined with the MAX HOLD function and a 10 ms sweep time, the M404 dipole antenna is capable of measuring the electric field strength of



Bluetooth systems and systems using direct sequence spread spectrum/frequency hopping modulation techniques.

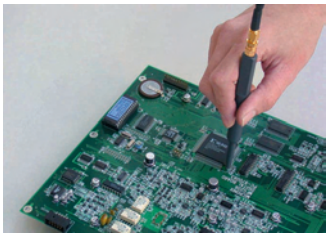
Using multiple dedicated dipole antennas leads to better measurement results compared to the conventional method of using only a single wide band antenna in which case the frequency range under investigation is typically located far away form the antenna's resonance point, resulting in poor dynamic range. Measuring at or near the resonance point where the antenna gain is at a maximum translates into high dynamic measurement range.



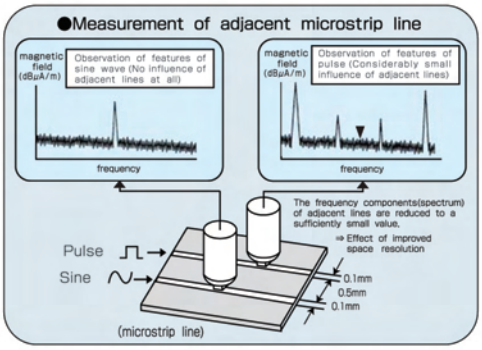
Since the antenna gain factor compensation data is preloaded into the analyzer, the field strength is displayed directly in dBuV/m. The analyzers also support downloading of user-defined gain factor tables for custom antennas.

Magnetic field strength measurement

Using a magnetic field probe (option PR 26M), the 2650A series is capable of accurately measuring the magnetic field distribution on a PCB (printed circuit board) or IC (integrated circuit). The magnetic field strength detector inside the probe consists of a shielded loop structure using a glass ceramic multi-layer board technology with high frequency characteristics. This enables the detection of magnetic field components only. The probe can measure over a wide frequency range of 10 MHz to 3 GHz. Since the probe's compensation data is already preloaded into the analyzer, the magnetic field strength is displayed directly in dBuA/m.



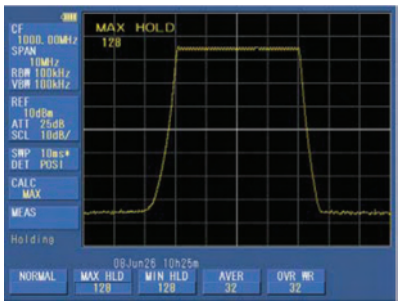
Typical applications of this magnetic field probe are evaluation of the effectiveness of a bypass capacitor located near the power supply terminal of an IC or evaluation of the microstrip layout on a PCB. Due to the probe's high spatial resolution (approximately 0.25 mm), it is not affected by adjacent patterns.



▲ Calculation and Marker functions

Max and Min Hold

Max Hold: At each displayed frequency, the currently-measured value is compared to the previously-measured value and the larger one is retained and displayed. This feature is useful for observing a bursted or intermittent signal or for measuring the electric field strength of systems using direct sequence spread spectrum/frequency hopping modulation techniques.

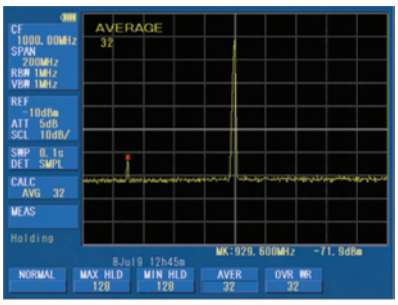


Min hold: At each displayed frequency, the currently-measured value is compared to the previously-measured value and the smaller one is retained and displayed.

In both cases, the number of sweeps can be set to 2^N, where N is from 1 to 10 or infinite.

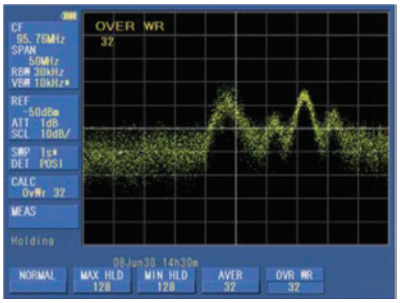
Averaging

The analyzer continuously sweeps, then calculates and displays the average value over the total number of sweeps. The number of sweeps can be set to 2^N, where N is from 1 to 10. Averaging is useful for detecting signals buried in the noise floor because random noise is averaged out.



Overwrite

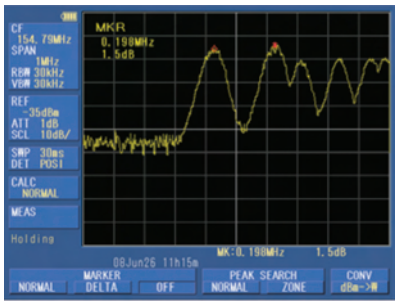
The results of each consecutive sweep are displayed and the screen is not cleared after each sweep. This lets you observe the long term variations of a signal.



Marker Function

Two different modes are available for marker measurements:

- Normal marker mode measures the frequency and level of the marked point
- Delta marker mode measures the frequency and level differences between the two markers (see image)

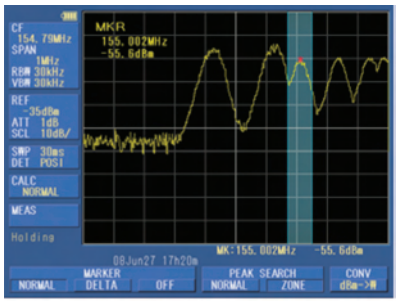


Delta marker measurement

Peak Function

Two different modes are available for peak search:

- Normal peak search mode searches for the highest level on the screen. In this mode, you can also use the NEXT button to locate the marker on the next smaller peak.
- In-zone peak search mode searches for the peak level in the range specified by the center value and width.



The picture shown demonstrates in-zone peak search.

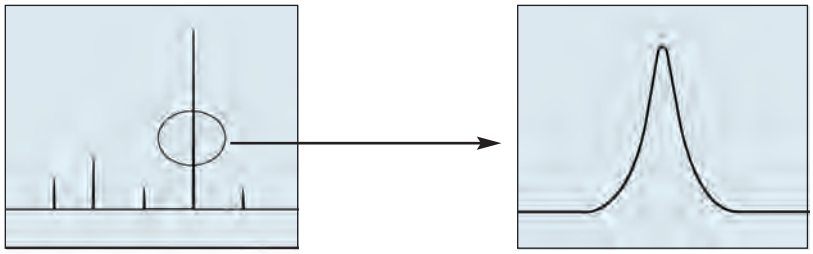
▲ Easy operation

The 2650 series handheld spectrum analyzers are straightforward to operate and provide many functions to facilitate quick and easy measurements:

- Smart one button "Auto Tune" function which automatically scans the full frequency range, detects and centers the maximum signal, and configures optimum values for RBW, VBW, sweep time and reference level
- Input attenuator and internal preamp are set automatically to optimal values based on the reference level
- Easy configuration of frequency, span, and amplitude
- Marker and peak search functions enabling rapid measurements
- 200 setups and reference spectrum measurements can be stored and recalled from either internal memory or USB flash drive
- Filenames can be customized and include a date and time stamp.
- Large easy-to-read display. The backlight is adjustable and monochrome mode can be used for extreme lighting conditions

Long battery life

The 2650A provides a battery operating time of up to 4 hours (approximatly 3 ½ hours with back light set to typical settings). Battery replacement is simple and doesn't require any hand tools. To fully charge the lithium-ion battery takes only approximately 4 hours (analyzer must be turned off). A two color LED indicates the charging status "charging", "charge completed", "no battery detected" and "charging error".

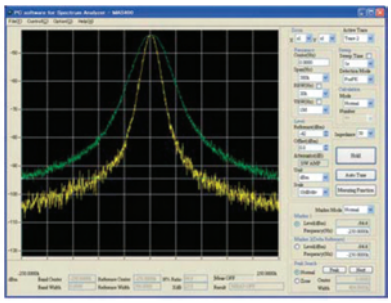


Detect the maximum level within full span.

Center the maximum signal, configure optimum parameters

▲ Simple and flexible documentation of your measurements

PC software



The 2650A series includes easy-to-use software for documentation and further analysis of your measurements. Connect the analyzer via USB cable to your PC, configure the analyzer remotely, then download measurement data and instrument settings for storage and further analysis.

- Continuously sweep and transfer trace data to the PC.
- Capture 1001 trace data points (twice the number of display dots) and store the data in CSV (comma separated values) format for detailed analysis (e.g., import into a spread sheet)
- Save the screen to a bitmap file or to the clipboard
- Control all instrument settings from the PC
- Download custom antenna gain factor compensation data to the instrument

Hardcopy to USB printer

Generate a hard copy of the display by directly connecting the optional USB printer model PT2650A to the 2650A series analyzer.

Conveniently save measurement data to USB flash drive

Easily save and recall measurement data and settings in CSV format directly to and from the USB flash drive. Filenames can be customized and have a time and date stamp. Users can choose to store measurement data and setups in separate files or combined in one file.
Using the Copy function, a screen image in bitmap format (BMP) can be directly stored to the USB drive. CSV data residing in internal memory can be stored to the USB drive in a lump sum.

▲ Spectrum Analyzer with Tracking Generator, 50 kHz – 3.3 GHz Model 2652A

Built-in transmission measurement
The 2652A is a 2650A with a tracking generator added. The 2652A can be used to rapidly determine transmission characteristics of two-port RF devices.

Tracking generator specifications	
Frequency range	5 MHz to 3.3 GHz
Output Level	-10 dBm ± 1 dB @ 1 GHz (output level is fixed)
Output flatness	±1.5dB
Output impedance	50 Ω
Output connectors	N (J)

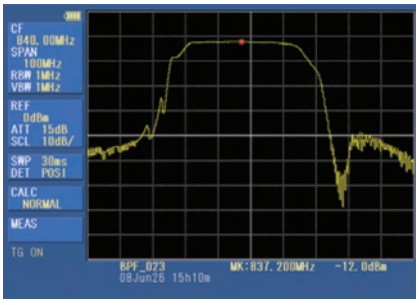
Tracking generators are ideal for tuning filters, determining the usable frequency range of amplifiers and attenuators and aligning receiver IF stages.

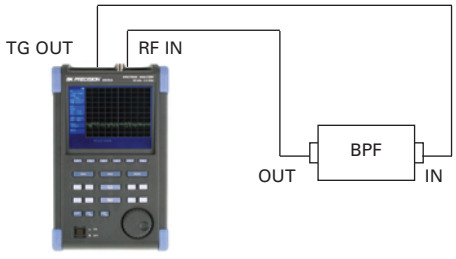
The tracking generator's output frequency is the same as the frequency the spectrum analyzer is tuned to. This lets you see the amplitude response of a circuit on the spectrum analyzer screen.

The analyzer's normalize function can be used to remove the effects of the cable(s) connecting the device. This allows you to differentially measure a device's response without worrying about cable effects.

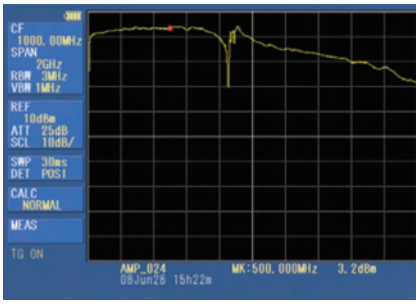
APPLICATIONS

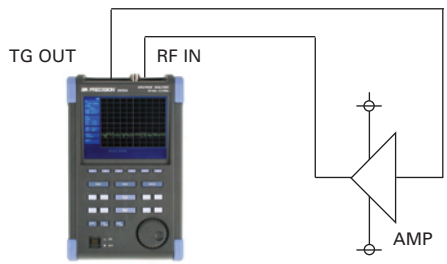
Characterize the frequency response of a filter
Measure the frequency response of a passive component, e.g a filter, over the 2652A's full range of 5 MHz to 3.3 GHz.



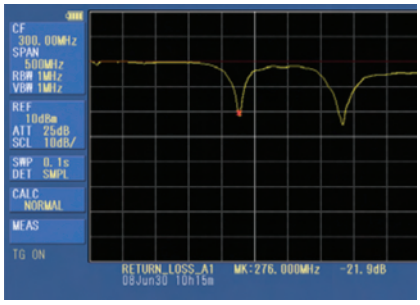


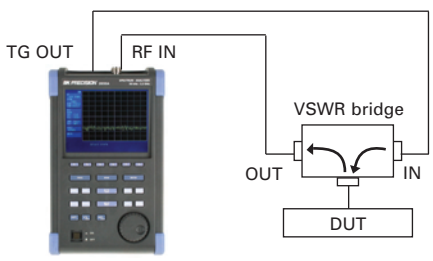
Determine the gain characteristics of an amplifier
Characterize the frequency response of an active circuit such as an amplifier.





Return loss measurement
Measure the return loss of an electric component or circuit with a VSWR bridge





Specifications

models

	2650A, 2652A	2658A
Frequency section		
Frequency range	50 kHz to 3.3 GHz	50 kHz to 8.5 GHz
Center frequency		
Setting resolution	20 kHz Settable with rotary encoder, numeric or function key	
Accuracy	within ± (30+20T) kHz±1 dot @frequency span: 200 kHz to 10 MHz, RBW 3 kHz, 23±5°C within ± (60+300T) kHz±1dot @frequency span: 20 MHz to max. frequency (3.3 GHz or 8.5 GHz), RBW 100 kHz, 23±5 °C T: sweep time (s)	
RBW frequency error	within ±4 kHz @ 3 kHz, 10 kHz, 30 kHz within 20% of RBW @ RBW: 100 kHz, 300 kHz within 10% of RBW @ RBW: 1 MHz, 3 MHz	
Frequency span		
Range	0 Hz (zero span), 200 kHz to 2 GHz (1-2-5 step) and 3.3 GHz (full span)	0 Hz (zero span), 200 kHz to 5 GHz (1-2-5 step) and 8.5 GHz (Full span)
Accuracy	within ±3% ±1dot @ sweep time of 0.3s, 23±5 °C	
Display resolution # of points per trace	501dots on LCD screen, 1001dots readout via PC (501 dots are visible on the display, 1001 dots of trace data are captured internally and can be transferred to a PC via USB device interface.)	
Resolution bandwidth	3 dB bandwidth (6 dB for 2651 @ 9 kHz, 120 kHz)	
Range	3 kHz to 3 MHz (1-3 sequence) and AUTO (2651: 3 kHz, 9 kHz, 30 kHz, 120 kHz, 300 kHz, 1 MHz, 3 MHz)	
Accuracy	±20%	
Shape Factor	1:12 (typical, 3 dB : 60 dB)	
Video bandwidth	100 Hz to 1 MHz (1-3 step) and AUTO	
SSB phase noise	-90 dBc/Hz (typical) @100 kHz offset, RBW : 3 kHz, VBW : 100 Hz, sweep time: 1 s	
Spurious response	less than -60 dBc	
Harmonics	less than -40 dBc @ ≥ 100 MHz	
Amplitude section		
Reference level		
Range	+10 to -60 dBm (1dB step)	
Accuracy	within ± 0.8 dB ± 1 dot @ center frequency : 100 MHz, RBW : 3 MHz, VBW : 1 MHz, REF : -15 dBm, 23±5 °C	
Unit	dBm, dBV, dBmV, dBµV, dBµV/m, dBµA/m (dBµV/m and dBµA/m are used for measurement functions)	
Average noise level	-127 dBm (typical) @ CF : 1 GHz, RBW : 3 kHz, VBW : 100 Hz, Ref. level < - 40 dBm (preamp automatically ON)	
Frequency response	within ±2.0 dB ± 1 dot @50 kHz to 100 MHz within ±1.0 dB ± 1 dot @100 MHz to max. frequency (3.3 GHz or 8.5 GHz)	
Input impedance	50 Ω	
Input VSWR	< 2.0	
Input attenuator		
Operating range	0 to 25 dB (1 dB step), coupled with reference level	
Switching error	±0.6 dB @100 MHz	
RBW switching error	±0.6 dB	
Display resolution (vertical)	381 dots/10 div	
Display scale		
Scale	10 dB/div, 5 dB/div, 2 dB/div	
Accuracy	±(0.2 dB+1dot)/2 dB ±(0.4 dB+1dot)/5 dB ±(0.8 dB+1dot)/10 dB ±(1.8 dB+1dot)/83 dB	
Input damage level	+27 dBm (CW average power), 25 VDC	
Sweep section		
Sweep time		
Range (1-3 step)	10 ms to 30 s and AUTO @frequency span : 0 to 2 GHz 30 ms to 30 s and AUTO @frequency span : full span	10 ms to 30 s and AUTO @frequency span : 0 to 2 GHz 30 ms to 30 s and AUTO @frequency span : 5 GHz, full span

Accuracy	Within ±0.1 %±1dot @frequency span : 0 to 2GHz within ±1.5 %±1dot @ full span	Within ±0.1 %±1dot @frequency span : 0 to 5GHz within ±2.5 %±1dot @ full span
Trigger		
Trigger mode	AUTO (Available only for zero span)	
Trigger source	Internal and External	
External trigger		
Input voltage range	1 to 10 Vp-p	
Frequency range	DC to 5 MHz	
Input coupling	DC coupling	
Trigger level	approx. 0.56 V(fix)	
Input RC	approx. 10 kΩ / less than 15 pF	
Input damage level	±50 V(DC+AC peak)	
Input connector	SMA(J)	
Detection mode	Positive peak, Negative peak, Sample (QP and AV for model 2651 only.)	
Function		
Marker measurement	NORM : displays frequency (8 digits max) and level (4 digits max) at marker point. DELTA : displays frequency difference and level difference between two markers.	
Peak search	NORM: searches peak point within 10div (full freq. range). This mode also supports NEXT peak (up to 10). ZONE: searches peak point within a zone designated by center and width	
Calculations	NORM, MAX HOLD, MIN HOLD, AVERAGE, OVER WRITE MAX/MIN HOLD: 2 to 1024 AVERAGE: 2 to 256	
Measurements	Measure Channel power, Adjacent channel leakage power, Occupied frequency bandwidth, Electric field strength (requires antenna), Magnetic field strength (requires magnetic field probe).	
Auto tuning	Automatically scans the full bandwidth, sets center frequency to the maximum signal within full span and centers it onscreen. Automatically adjusts reference level, RBW, VBW and sweep time to optimum values	
Save/Load		
Save	Saves 200 reference spectrum measurements and 200 setups	
Load	Loads one reference spectrum measurement and one setup	
General		
RF Input connector	N(J) connector	
USB Communication		
Protocol	USB version 1.1 (will also work with USB 2.0 devices)	
Device Connector	B plug	
Transfer rate	12 Mbps	
Hard copy	USB printer (option) connected to A plug (host) enables hard copy of screen.	
Host connector	A plug	
Display		
Display	5.7 inch color TFT LCD	
Backlight	LED backlight	
Number of dots	640(H) x 480(V) dots	
Power supply		
Dedicated	Input : 100 to 240 VAC	
AC adaptor	Output : 9 VDC/2.6 A	
Lithium-ion battery	7.4 V/5000 mAh Li-Ion battery (MB400)	
Charge function	Capable of charging during power-off. Indicates 4 conditions with two color LED	
Charge indicator	5 level indicator of remaining battery charge	
Environmental and Size		
Operating temperature	0 to 50° C (guaranteed at 23±10 °C, without soft carrying case)	
Operating humidity	less than 40 °C/80 %RH (guaranteed at less than 33 °C/70 %RH, without soft carrying case)	
Storage temperature	-20 to 60 °C, less than 60 °C/70 %RH	
Dimensions	6.38 (W) x 2.80 (H) x 10.43 (D) inch, 162(W) x 71(H) x 265(D) mm (excluding projections, protection bumper and stand)	
Weight	approx. 1.8 kg or 4 lbs (including battery)	
	Two Year Warranty	
Accessories Included	User manual, AC adaptor MA400, soft carrying case LC2650A, accessory pouch, PC software and USB cable, Lithium-Ion battery MB400	
Optional	Dipole antennas M401 – M406, magnetic field probe PR 26M, printer PT2650A and extra roll paper PX2650A	

2650A Series Handheld Spectrum Analyzers

Next generation spectrum analyzers

Expanding on the success of its "2008 Product of the Year" Award winning 2652 spectrum analyzer, B&K Precision has incorporated many customer suggestions in developing this new, enhanced family of products. The EN-genius network (www.en-genius.net), a popular engineering site, granted the award and recognized the analyzer for "Best Price versus Performance Factor in Handheld Instrumentation".

The new 2650A series look and feel just like their predecessors, the popular 2650 series, yet offer many new features and performance enhancements in response to customer requirements:

Comparison between the 2650A series and its predecessor

Features/Specifications	2650 series	2650A series	Benefits
LCD	monochrome, 4.7 inch	color, 5.7 inch	Improved readability,
	320 x 240 dots	640 x 480 dots	better resolution
Battery operation (display off)	100 min, Ni-MH	4 hours, Li-Ion	Much improved battery life
charging indicator	No	Yes, 5 levels	Indicates amount of charge left
charge status LED	No	Yes	Informs user when battery is fully charged
Computer interface	RS-232C	USB 1.1	Connectivity to laptops, which typically offers a USB interface only
USB host interface (for USB flash drive)	No	Yes	Conveniently save CSV data or screen shots in BMP format directly to USB flash drive
Display dynamic range	80 dB/8div	100 dB/10 div	View complete signals with a large dynamic range
Display data resolution (# of onscreen data points)	251(H) x 201(V)	501(H) x 381(V)	Better amplitude and frequency resolution, improved measurement accuracy
Input damage level	+ 20 dBm (CW average power)	+ 27 dBm (CW average power)	Improved protection of the RF input against excessive RF signals
Display scale	2, 10 dB/div	2, 5, 10 dB/div	More flexibility displaying a great variety of signals
Average noise level	-117 dBm	-127 dBm	Increased ability to detect small signals
Frequency setting resolution	100 kHz	20 kHz	Set center frequency more accurately
External trigger	No	Yes	Perform zero span measurements
RF input connector	SMA (J)	N (J)	Added convenience and robustness
User configurable file names	No	Yes, 16 characters	More convenient file management
Protection bumper	No	Yes	More rugged
Battery replacement	Requires hand tool	by hand	Easier and quicker battery exchange
PC Software and communication cable included	No	Yes	More cost effective

About B&K Precision

For more than 50 years, B&K Precision Corporation has been building a reputation for excellence in the design and manufacture of reliable and cost-effective general purpose test and measurement instruments. The company's products are used in a wide range of applications including design, research and development, production line testing, industrial maintenance, and electronic field service. B&K Precision test and measurement instruments are standard test equipment in a large number of universities and technical schools which train future engineers and technicians. B&K Precision was founded in 1951 and is headquartered in Yorba Linda, California.

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