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 @ 100kHz 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





www.bkprecision.com Tel.: 714.921.9095

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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



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

<u>Max Hold:</u> 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.



<u>Min hold:</u> 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 2N, 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".



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 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 5MHz to 3.3GHz.





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





Specification	S	models		
	2650A, 2652A	2658A		
Frequency section				
Frequency range	50 kHz to 3.3 GHz 50 kHz to 8.5 GHz			
Center frequency				
Setting	20 kHz			
resolution	Settable with rotary encoder, numeric or funct	ion key		
Accuracy	within \pm (30+20T) kHz \pm 1 dot			
	@frequency span: 200 kHz to 10 MHz, RBW 3 kHz, 23±5°C			
	within \pm (60+300T) kHz \pm 1dot			
	@frequency span: 20 MHz to max. frequency (3.3 GHz or 8.5 GHz), RBW 100 kHz,			
	$23\pm5^{\circ}$ 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			
Frequency span	within 10% of RBW @ RBW: 1 MHz, 3 MHz			
	0 Hz (zero span),	0 Hz (zero span),		
Range	200 kHz to 2 GHz (1-2-5 step) and	200 kHz to 5 GHz (1-2-5 step) and		
	3.3 GHz (full span)	8.5 GHz (Full span)		
Accuracy	within $\pm 3\% \pm 1$ dot @ sweep time of 0.3s,	23±5 °C		
Display resolution	501dots on LCD screen, 1001dots readout via PC			
# of points per trace	(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	,		
0	(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 @ \geq 100 MHz			
Amplitude section				
Reference level				
Range	+10 to -60 dBm (1dB step)			
Accuracy	within \pm 0.8 dB \pm 1 dot @ center frequency	/: 100 MHz, RBW : 3 MHz,		
	VBW : 1 MHz, REF : -15 dBm, 23±5 °C			
Unit	dBm, dBV, dBmV, dBµV/m, dBµA/m			
	$(dB\mu V/m and dB\mu A/m are used for measurement functions)$			
Average noise level	-127 dBm (typical) @ CF : 1 GHz, RBW : 3 kHz, VBW : 100 Hz,			
r	Ref. level < - 40dBm (preamp automatically ON)			
Frequency response	within $\pm 2.0 \text{ dB} \pm 1 \text{ dot } @50 \text{ kHz}$ to 100 MHz within $\pm 1.0 \text{ dB} \pm 1 \text{ dot } @100 \text{ MHz}$ to max. frequency (3.3 GHz or 8.5 GHz)			
Innut impodonce		. Trequency (3.3 GHz or 8.5 GHz)		
	50 Ω			
Input VSWR	< 2.0			
Input attenuator Operating range	0 to 25 dB (1 dB step), coupled with reference level			
Switching error	$\pm 0.6 \text{ dB} (1 \text{ dB step})$, coupled with reference level $\pm 0.6 \text{ dB} (0 \text{ MHz})$			
RBW switching error	±0.6 dB @100 MHz ±0.6 dB			
Display resolution (vertical)	±0.6 dB 381 dots/10 div			
Display scale				
Scale	10 dB/div, 5 dB/div, 2 dB/div			
Accuracy	$\pm (0.2 \text{ dB} + 1 \text{ dot})/2 \text{ dB} \pm (0.4 \text{ dB} + 1 \text{ dot})/5 \text{ dB}$			
	$\pm (0.8 \text{ dB} + 1 \text{ dot})/10 \text{ dB} \pm (1.8 \text{ dB} + 1 \text{ dot})/10$			
Input damage level	+27 dBm (CW average power), 25 VDC			
Sweep section				
Sweep time				
Range	10 ms to 30 s and AUTO	10 ms to 30 s and AUTO		
(1-3 step)	@frequency span : 0 to 2 GHz	@frequency span : 0 to 2 GHz		
. ·	30 ms to 30 s and AUTO	30 ms to 30 s and AUTO		
	@frequency span : full span	@frequency span : 5 GHz, full span		

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Accuracy	Within ±0.1 %±1dot	Within ±0.1 %±1dot		
	@frequency span : 0 to 2GHz	@frequency span : 0 to 5GHz		
	within $\pm 1.5 \% \pm 1$ dot @ full span	within $\pm 2.5 \% \pm 1 \text{ dot } @$ full span		
Trigger				
Trigger mode	AUTO (Available only for zero span)			
Trigger source	Internal and External			
External trigger				
Input voltage range	I to IO Vp-p			
Frequency range	DC to 5 MHz			
Input coupling	DC coupling			
Trigger level		approx. 0.56 V(fix)		
Input RC	approx. 10 k Ω / less than 15 pF			
Input damage level	\pm 50 V(DC+AC peak)			
Input connector	SMA(J)			
Detection mode	Positive peak, Negative peak, Sample (Q	Positive peak, Negative peak, Sample (QP and AV for model 2651 only.)		
Function				
Marker measurement	NORM : displays frequency (8digits max) and level (4digits max) at marker point. DELTA : displays frequency difference and level difference between two markers.			
Peak search	NORM: searches peak point within 10div (up to 10).	NORM: searches peak point within 10div (full freq. range). This mode also supports NEXT peak		
	ZONE: searches peak point within a zon	e designated by center and width		
Calculations				
earealations	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			
Auto tuning	Automatically scans the full bandwidth, sets center frequency to the maximum signal within full			
0	span and centers it onscreen. Automatically adjusts reference level, RBW, VBW and sweep time			
	to optimum values			
Save/Load				
Save	Saves 200 reference spectrum measurem	ents and 200 setups		
Load	Loads one reference spectrum measurem	ent and one setup		
General		L.		
RF Input connector	N(J) connector			
USB Communication				
Protocol	USB version 1.1 (will also work with USE	3 2.0 devices)		
Device Connector	B plug			
Transfer rate	12 Mbps			
Hard copy	USB printer (option) connected to A plug	g (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 LEI			
Charge indicator	5 level indicator of remaining battery cha	rge		
Environmental and Size				
Operating temperature	0 to 50° C (guaranteed at 23 \pm 10 °C, w	thout soft carrying case)		
Operating humidity	less than 40 °C/80 %RH (guaranteed at l	ess than 33 °C/70 %RH, without soft carrying case)		
Storage temperature	less than 40 °C/80 %RH (guaranteed at l -20 to 60 °C, less than 60 °C/70 %RH	ess than 33 °C/70 %RH, without soft carrying case)		
	less than 40 °C/80 %RH (guaranteed at l -20 to 60 °C, less than 60 °C/70 %RH 6.38 (W) x 2.80 (H) x 10.43 (D) inch,	ess than 33 °C/70 %RH, without soft carrying case) 162(W) x 71(H) x 265(D) mm		
Storage temperature Dimensions	less than 40 °C/80 %RH (guaranteed at l -20 to 60 °C, less than 60 °C/70 %RH 6.38 (W) x 2.80 (H) x 10.43 (D) inch, (excluding projections, protection bumpe	ess than 33 °C/70 %RH, without soft carrying case) 162(W) x 71(H) x 265(D) mm r and stand)		
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