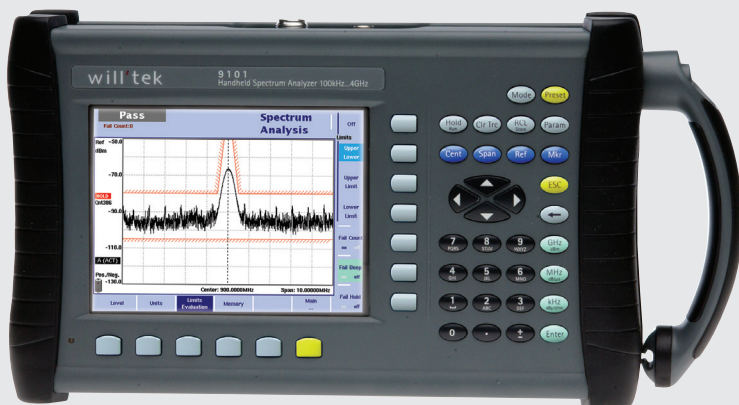


will'tek

Willtek 9101 Handheld Spectrum Analyzer



TEST & MEASUREMENT WORLD
TEST PRODUCT OF THE YEAR



Covering all applications in a frequency range up to 4 GHz

Ideal for mobile phone repair, basic testing in R&D labs, alignment testing for manufacturing, and measurement of base station emissions in the field

Willtek 9101

Handheld Spectrum Analyzer

The 9101 Handheld Spectrum Analyzer provides RF engineers with the excellent performance of a workbench analyzer in a handheld form, at a competitive price.

One instrument for all your needs

- Used in mobile phone repair to detect and locate faulty mobile phone parts and components.
- Used in R&D labs to assess the electromagnetic radiation and to verify measures against EMI.
- Used in manufacturing to check and align the output of RF modules or units.
- Used in the field to measure and verify base station emissions.
- Used for installation troubleshooting, repair and maintenance e.g. in wireless local loop and modern 2.4 GHz Wi-Fi systems.

Typical measurements include transmitter testing, alignment of modulators and measuring switch breakthrough.

The analyzer is fully controllable via front panel or by remote control from a PC.

Measurement results and instrument settings can easily be transferred to a PC for presentation or post-processing.

This rugged portable instrument is suitable for indoor and outdoor usage and with its excellent technical data and extensive feature set, meets many application needs.





Comprehensive feature set in one-button measurement

With its clear and easy-to-use operation, the 9101 Handheld Spectrum Analyzer presents all the measurement functions required to quickly and precisely resolve measurement tasks. The user-friendly interface with logical softkeys enhances operation.

Frequencies are increasing ... needn't break the budget

The wide frequency range from 100 kHz to 4 GHz enables testing in RF systems and modules such as modern wireless local oscillators.

This frequency coverage also captures the higher harmonics from amplifier or oscillator modules, plus any spurious signals that can mix and break through into the pass-band. Its complete coverage of carrier, IF stages and audio frequencies gives the performance needed when other analyzers run out of bandwidth.

Manual or automatic control made simple

Controlling the 9101 from a PC is easy and convenient with the built-in RS-232 interface and Ethernet port. All functions of the spectrum analyzer can be controlled via the industrial standard remote control SCPI command set.

Convenience

No time is wasted in setting up the instrument or copying settings from one instrument to the other by hand. The 9100 Data Exchange Software, which comes with the 9101, supports enhanced manage and transfer functions.

Channel systems, limit templates, settings and correction tables can easily be set up and maintained on a PC. The act of building new limit templates and correction tables is child's play, using the PC's mouse.

A live trace can be downloaded from the instrument at all times. An easy export to standard graphic formats such as BMP and JPG supports the need for quick documentation of measurement data. Likewise, stored traces can be uploaded to set the unit to the previous measurement settings.

Easy-to-read screens make all the difference in finding signals

The high-resolution colour VGA display (640 x 480 pixels) is great for finding misleading spurs or aligning modulators. Multiple colours facilitate the comparison of measurement traces on the screen. The extra bright 6.5" TFT display has a superb 140° viewing angle and provides fast updates.

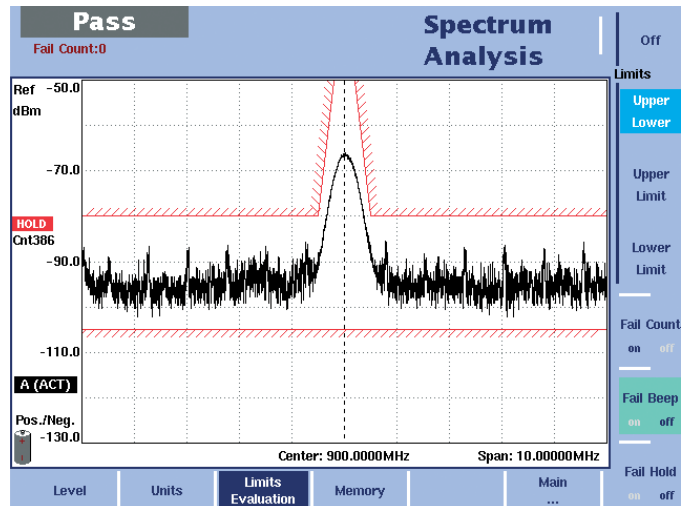
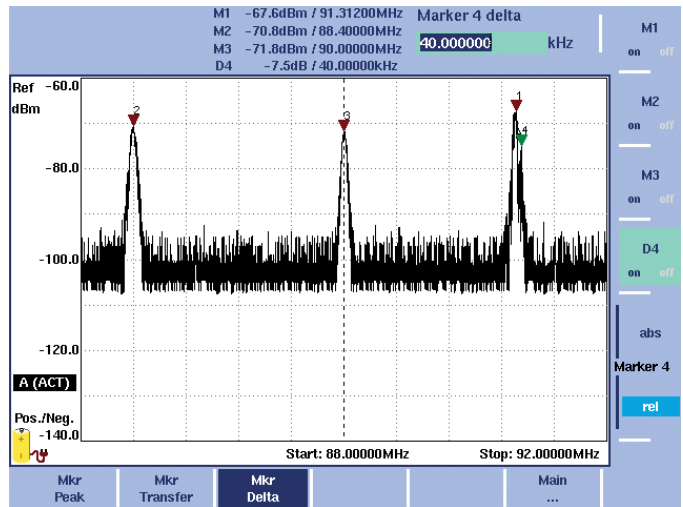
Markers help in exactly reading signals

Up to four markers allow for exact reading of complex signals. The transmitter performance can be checked, spurious signals can be detected and sideband levels can be established using the four markers with their flexibility and clear on-screen display.

By pressing Delta Marker second and third harmonic levels can easily be checked. Power level and frequency are displayed in relation to a reference point.

Pass/fail verdict with limit templates

Limit lines simplify assessment of complex displayed signals, give users the ability to decide whether the signal passes or fails. These limit templates can be set up with 30 segments. At the same time it can be tested whether the signal exceeds an upper and/or lower limit.



Get more out of digitally modulated signals through RMS channel power measurement functions

The RMS power measurement capability offers Channel Power, Adjacent Channel Power Ratio (ACPR) and the Occupied Bandwidth (OBW). ACPR enables measurements of the leakage power from a modulated communication channel into an adjacent channel.

The occupied bandwidth measurement represents the part of the transmitted power that lies in a specified bandwidth. This measurement function can give useful qualitative information about the used bandwidth, e.g. give useful insight into transmitter operation.

This one-button functions allow rapid measurement and information about the behaviour of the specified communication channel. All significant values are displayed at a glance.

Additionally, the channel power measurement, ACPR and OBW are implemented into the "Spectrum Analyzer Mode". In contrast to the one-key operation an experienced user can set the measuring range, the resolution and the sweep time freely according to individual needs. This way, besides defined communication systems, measurements are easily set up when pre-defined communication systems cannot be used.

Accurate measurements in different RF environments

When making accurate amplitude measurements with a spectrum analyzer, it is required that any effects that alter the signal of interest between the device under test (DUT) and the analyzer be corrected while measuring. External devices like cables, amplifier, antenna and additional attenuator can influence the signal level. In the instrument software, the built-in amplitude correction is realised. The "External Device Compensation" function takes a list of frequency and amplitude pairs.

Connected linearly, these points offset the input signal accordingly. This correction table can be set up easily with the new "9100 Data Exchange Software".

Easy adjustment onto different impedance situations

Besides the 50 ohm world, the 75 ohm impedance is common in cable TV. The new instrument software now supports this standard too. When switching between impedances the suitable correction table will automatically loaded to assure correct measurement.

AM and FM demodulation

The presence of audio signals can be checked by demodulation of AM or FM signals using Zero Span mode and listening via the built-in loudspeaker.

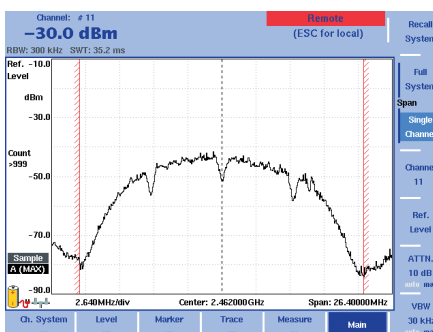
Digital signal processing with reloadable digital IF

RF signals are digitally processed by microprocessor and field-programmable gate arrays (FPGA) to ensure both superb accuracy and repeatability as well as flexibility for future requirements.

Small and portable

With its minimal footprint, the 9101 is suitable for usage both on the bench and in the field. The low weight makes it a highly portable instrument in the lab and supports mobile applications in the field that seemed impossible before.

With the Willtek 1500 Battery Charger, additional battery modules can be recharged outside of the 9101. The batteries are easy to exchange, preparing the instrument for many hours of independent operation in the field.



Specifications

Specifications valid for 9101 from serial number LX 5004001.

Specifications valid after 30 minutes warm-up time at ambient temperature, specified environmental conditions and typical measurement range, within a period of one year after calibration.

Frequency

Frequency range

Measurement range	100 kHz to 4 GHz
Resolution	1 kHz

Reference frequency

Temperature stability	$< 2 \times 10^{-6}$
Aging	$< 2 \times 10^{-6}/\text{year}$
Frequency uncertainty (Sweep time $\leq 1\text{s}$)	$< 2 \times 10^{-6}$

Frequency span

Setting range	0 Hz, 100 kHz to 4 GHz
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Sweep time

Span ≥ 100 kHz	1 ms to 100 s
Span = 0 Hz	1 ms to 100 s

Resolution bandwidth (RBW)

RBW selection	manual or automatic
RBW (-3 dB) range	1 kHz to 1 MHz
Steps	1, 3, 10

Video bandwidth (VBW)

VBW selection	manual or automatic
VBW range (-3 dB)	10 Hz to 1 MHz
Steps	1, 3, 10

SSB noise

$f = 2$ GHz, $\Delta f = 100$ kHz	< -78 dBc/Hz
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Amplitude

Maximum safe DC voltage at RF-in	± 50 V
Maximum safe input power	30 dBm
Display units	dBm, dB μ V, dBmV, dBV, dB

Measurement range

in automatic mode	average noise floor to 20 dBm
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Displayed average noise level (DANL)

(RBW = 1 kHz, attenuation = 0 dB)	
10 MHz to 1 GHz	< -113 dBm typ. -116 dBm
1 GHz - 4 GHz	< -117 dBm typ. -120 dBm

Input attenuation

User-defined by direct entry or step keys. 0 dB only selectable by direct entry to protect the first mixer.	
Setting range	(0) 10 to 50 dB
Attenuation steps	10 dB

Dynamic range

Range	> 70 dB
Max. measurable input level (attenuation = 40 dB)	20 dBm
Min. measurable input level	-115 dBm

Level accuracy

(Input attenuation = 10 dB, ambient temperature from $+20^\circ\text{C}$ to $+26^\circ\text{C}$)	
10 MHz to 3.6 GHz	± 1 dB

RF input match

(input attenuation = 10 dB, 10 MHz to 4 GHz)	
VSWR	< 1.6 typ. < 1.5
Return loss	> 14 dB typ. > 15 dB

Reference level

Reference level setting by keyboard entry or step keys	
Setting range	-100 to $+30$ dBm
Resolution	0.1 dB

Spurious response

Image rejection ($f = 1$ GHz)	> 80 dB
Spurious level (attenuation = 0 dB)	< -90 dBm
LO breakthrough (attenuation = 10 dB)	< -77 dBm
Intermodulation-free range (input level -30 dBm, $f_1 = 990$ MHz, $f_2 = 992$ MHz)	> 63 dB

Functions

Detector & sweep

Detector types	pos./neg. peak, pos. peak, neg. peak, sample
Sweep processing	actual, average, max. hold, min. hold

Trace

Max. displayed traces	2
Trace points	2×500^1
Trace functions	A + B \rightarrow A, A - B \rightarrow A, trace offset, copy a>b, copy b>a
Trace A	colour selectable (default is black)
Trace B	colour selectable (default is blue)

Marker

Max. markers	4
Delta markers	3
Marker functions	max. peak, next peak
Transfer functions	M \rightarrow centre frequency M \rightarrow ref. level M \rightarrow f step

Limit check

Max. no. of limit templates	99
Limit functions	upper, lower, upper and lower
Max. no. of limit segments	30

Power measurement

Max. no. of channel systems	99
Measurement functions	Channel Power, ACPR, OBW
Default systems	GSM, WCDMA, DECT

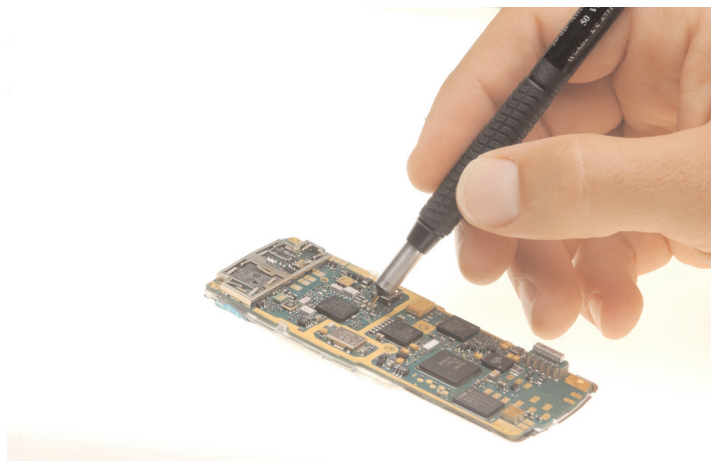
Demodulation

Min. input level	-50 dBm
AM/FM	on marker/permanent/on multi marker

Keyboard

Key type	silicon click
Parameters shortcut keys	Cent, Span, Ref
Quick setting keys	Preset, Hold/Run, Clr Trc, RCL/Store

¹ Two independent traces are available (min. hold, max. hold at the same time)



General

Display (TFT)	Size 6.5"
Resolution	640 x 480
Colours	256
Brightness	300 cd
Measurement result points	2 x 500 ¹

Power supply

DC voltage, external	11 to 15 V / max. 28 W
Internal battery	Li-Ion
Operating time, battery fully charged	max. 2.2 h

Memory

Type	Flash disk
Capacity (set-ups and traces)	100

Dimensions (W x H x D)	355 x 190 x 85 [mm]
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Weight

With battery	2.9 kg (6.4 lbs)
Power supply only	0.32 kg (0.7 lbs)

Environmental conditions (unless otherwise specified)	MIL-PRF28800F class 2
Operating temperature	0 to +45°C
Storage temperature	-10 to +50°C
Rel. humidity (non-condensing)	80%

¹ Two independent traces are available
(min. hold, max. hold at the same time)

Connectors

RF in	
Connector	type N (female)
Impedance	50 Ω

DC in

Connector	2.1 mm dia. barrel jack socket
Max. current	3 A

Serial interface

For software updates and remote control	
Connector	DB-9 (male)
Speed	57.6 kbit/s
Required cable	null modem cable

LAN (TCP/IP)

For software updates and remote control	
Connector	RJ-45
Speed	10 Mbit/s

Standard delivery

Power supply (90 to 240 V, 50 to 60 Hz)
User's guide
9100 Data Exchange Software (1 license)
Serial communication cable

Ordering information

Product Packages

9101 Handheld Spectrum Analyzer Bench Edition	M 100 411
9101 Handheld Spectrum Analyzer Field Edition	M 248 800

Accessories

9100 Battery module, 7.2 Ah	M 205 012
9100 Outdoor backpack	M 241 015
9100 Soft carrying bag	M 241 013
1500 Battery charger	M 204 097
9100 Power supply	M 248 328
9100 12 V car adapter	M 860 389
9100 Safety lock	M 867 037
9100 Data Exchange Software	M 897 137
9100 Serial communication cable	M 860 388

1205 RF Probe 20 dB	M 248 640
Frequency range 100 kHz to 4 GHz RF attenuation (nominal at 50 Ω) 20 dB including adapter N (male), BNC (female)	
Antenna 900 MHz band (TNC)	M 860 261
Antenna 1800 MHz band (TNC)	M 860 262
Antenna 1880 MHz band (BNC)	M 860 260
Antenna 2400 MHz band (TNC)	M 860 146
Adapter N – TNC	M 886 098
Adapter N – BNC	M 886 097
Matching pad N 50 Ω to N 75 Ω	M 886 205
Matching pad N 50 Ω to F 75 Ω	M 886 204
Attenuator 18 GHz, 6 dB	M 874 061

Related products

9102 Handheld Spectrum Analyzer Bench Edition	M 100 412
9102 Handheld Spectrum Analyzer Field Edition	M 248 806
9102 Handheld Spectrum Analyzer Tracking Edition	M 248 801



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