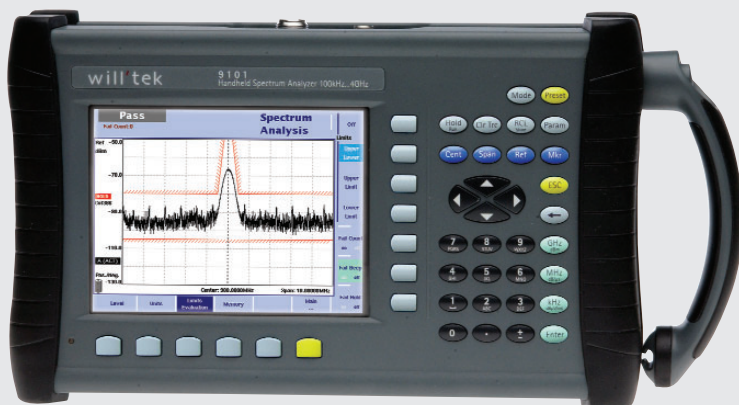


will'tek

# Willtek 9101 Handheld Spectrum Analyzer



TEST & MEASUREMENT WORLD  
TEST PRODUCT OF THE YEAR



Cover all frequencies with a 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 phones parts of 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 be easily 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 lower 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 new 91xx Data Exchange software, which comes with the 9101, supports enhanced manage and transfer functions.

Set-up and maintaining of Channel Systems, Limit Templates, Settings and Correction Tables 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 like BMP and JPG support the needs for quick documentations of measurement data. Likewise, stored traces can be uploaded to set the unit to the previous measurement settings.

### Easy-to-read Screens make the difference in finding signals

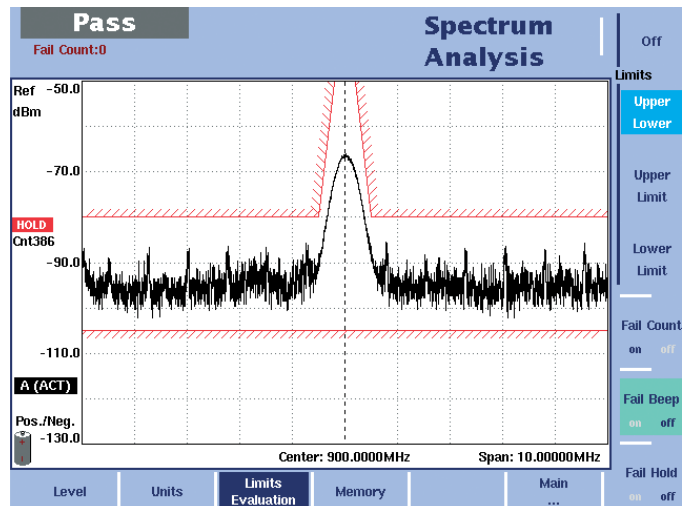
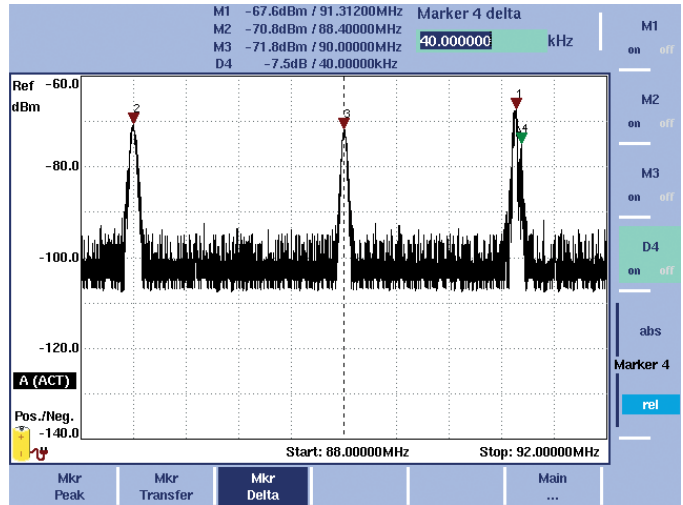
The high-resolution colour VGA display (640 x 480 pixels) is great for finding misleading spurs or aligning modulators. Multiple colours ease the comparison of measurement traces on the screen. The extra bright 6.5" TFT display has a superb 140° viewing angle and provides fast updates.

### Markers make the difference in exactly reading signals

Up to 4 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 4 markers with their flexibility and clear on-screen display. By pressing Delta Marker 2nd and 3rd harmonic levels can easily be checked. Power level and frequency are displayed relatively.

### 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 the signal can be tested onto the exceed of an upper and/or lower limit.



## Get more out of digitally modulated signals by expanded RMS channel power measurement functions

The RMS power measurement capability provides Channel Power, Adjacent Channel Power Ratio (ACPR) and the Occupied Bandwidth (OBW). Adjacent channel power measurements enables measurement 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. In principle, 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 of the behavior 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 in the "Channel Power Mode" an experienced user can set the measuring range, the resolution and the sweep time free according to individual needs. Therewith, besides defined communication systems, measurements are easily set up.

## 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 application software, the built-in amplitude correction is realised. The "External Device Compensation" function takes a list of frequency and amplitude pairs.

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

## Easy adjustment onto different impedance situations

Besides the 50 Ohm world in cable TV environment the 75 Ohm impedance is common. The new application software now supports this standard too. With switching between impedances the suitable correction table will be automatically loaded to assure a correct measurement.

## AM and FM demodulation

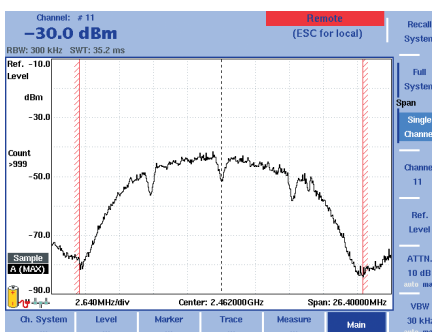
The presence of audio signals can be checked by demodulation of AM or FM signals using Zero Span mode and listening on the built-in loudspeaker.

## Digital signal processing by 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 footprint and portable

On the bench with minimal footprint or in the field, the 9101 has a highly portable 2,5 kg weight including battery. The 9101 can be run and reloaded from the 12 V cigarette lighter adapter.



## Specifications

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
Frequency accuracy (Sweep time ≤ 1s)	$2 \times 10^{-6}$

#### Reference Frequency

Temperature stability	$< 2 \times 10^{-6}$
Aging	$< 2 \times 10^{-6}$ /year

#### Frequency span

Setting range	0 Hz, 100 kHz to 4000 MHz
Frequency accuracy	$2 \times 10^{-6}$

#### Sweep time

Span ≥ 100 kHz	1 ms to 20 s
Span = 0 Hz	1 ms to 100 s

#### Resolution bandwidth (RBW)

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

#### Video bandwidth (VBW)

VBW selection	manual or automatic
VBW range (-3 dB)	10 Hz to 300 kHz
Steps	1, 3, 10

#### SSB noise

f = 2 GHz, Df = 100 kHz	$< -80$ dBc/Hz
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## Amplitude

Maximum safe DC Voltage at RF in	±50 V
Maximum safe input power	27 dBm
Display units	dBm, dBμV, dBmV, dBV

#### Measurement range

averaged noise floor to 27 dBm

#### Displayed average noise level (DANL)

(RBW = 10 kHz, Attenuator = 0 dB)

1 to 3600 MHz	$< -105$ dBm
$> 3600$ MHz	$< -100$ dBm

#### Input Attenuator

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
Attenuator steps	10 dB

#### Dynamic range

Range	$> 65$ dB
Max. measurable input level (attenuation = 50 dB)	20 dBm
Min. measurable input level	-105 dBm

#### Level accuracy

(Input Attenuator = 10 dB, ambient temperature from +20°C to +26°C)

10 to 3600 MHz	±1 dB
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#### VSWR RF input

(input attenuation = 10 dB)

1 to 3600 MHz	$< 1.8$
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#### Reference level

Reference level setting by keyboard entry or step keys

Setting range	-100 to 27 dBm
Resolution	0.1 dB

#### Spurious response

Image rejection (f = 1 GHz)	$> 80$ dB
Spurious level (attenuation = 0 dB)	$< -70$ dBm
LO breakthrough (attenuation = 10 dB)	$< -80$ dBm
Intermodulation-free range (input level -26 dBm, f <sub>1</sub> = 990 MHz, f <sub>2</sub> = 992 MHz)	$> 75$ dB

## Functions

### Detector & Sweep

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

### Trace

Max. displayed traces	2
Trace points	$2 \times 500^1$
Trace functions	A, B, copy a>b, copy b>a
A-Curve selectable	(default is black)
B-Curve selectable	(default is blue)

### Marker

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

### Limit

Limit templates storage	16
Limit function	upper, lower, upper and lower
No. of limit segments	30

### Power Measurement

Max. channel systems	32
Measurement functions	Channel Power, ACPR, OBW

### Keyboard

Key type	silicon click
Parameters shortcut keys	Freq, Span, Level
Quick setting keys	Preset, Rcl

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

## General

<b>Display (TFT)</b>	Size 6,5"
Resolution	640 x 480
Colours	256
Brightness	300 CD
Measurement result points	2 x 500 <sup>1</sup>

### Power supply

DC voltage, external	11 to 15 V / max. 28 W
Internal battery	Li-Ion
Operating time, battery fully charged	
Standard battery (M 205 011)	max. 1.1 h
Extended battery (M 205 012)	max. 2.2 h

### Memory

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

<b>Dimensions (W x H x D)</b>	355 x 190 x 85 [mm]
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### Weight

With standard battery	2.5 kg (5 lbs)
Power supply only	0.32 kg (0.7 lbs)

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

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

## Connectors

<b>RF in</b>	
Connector	type N (female)
Impedance	50 Ω

### Ext. Trigger

Connector	BNC (female)
Input level	TTL

### 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 kbps
Required cable	null modem cable

### LAN (TCP/IP)

For software updates and remote control	
Connector	RJ-45
Speed	10 Mbps

## Standard deliveries

9101 Handheld Spectrum Analyzer incl. 91xx Data Exchange Software, standard battery and AC power supply (100 to 240 V/50 to 60 Hz)	M 100 401
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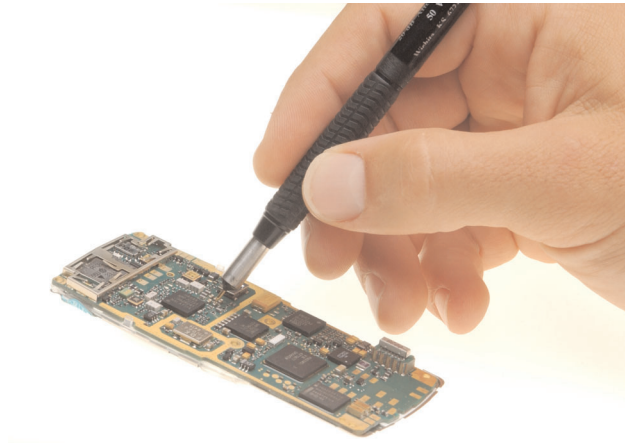
### Accessories

Soft carrying bag for 9101	M 241 013
Standard battery for 9101	M 205 011
High-capacity battery for 9101	M 205 012
12 V car adapter	M 860 389
Null modem cable	M 860 388
Safety lock	M 867 037
9101 Demo Signal Generator	M 248 633

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 1800/1900 MHz band (TNC)	M 860 262
Antenna 2400 MHz band (TNC)	M 860 146
Adapter N (male) to TNC (female)	M 886 098
Adapter N (male) to BNC (female)	M 886 097

### Related Products

4201S Mobile Service Tester	M 101 301
4403 Mobile Phone Tester	M 101 105





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Willtek Communications GmbH  
85737 Ismaning  
Germany  
Tel: +49 (0) 89 996 41-0  
Fax: +49 (0) 89 996 41-440  
info@willtek.com

Willtek Communications Inc.  
Indianapolis  
USA  
Tel: +1 317 595 2021  
Tel: +1 866 willtek  
Fax: +1 317 595 2023  
willtek.us@willtek.com

Willtek Communications Ltd.  
Cheshington  
United Kingdom  
Tel: +44 (0) 20 8408 5720  
Fax: +44 (0) 20 8397 6286  
willtek.uk@willtek.com

Willtek Communications SARL  
Paris  
France  
Tel: +33 (0) 1 74 37 26 35  
Fax: +33 (0) 1 74 37 25 88  
willtek.fr@willtek.com



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