will'tek

Willtek
9101
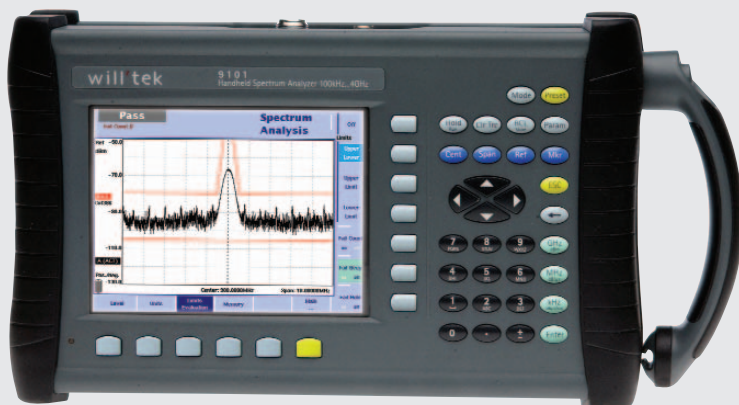## Handheld Spectrum Analyzer

20 BEST IN TEST 04
TEST & MEASUREMENT WORLD
TEST PRODUCT OF THE YEAR

Covers 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 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.

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.

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.

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).

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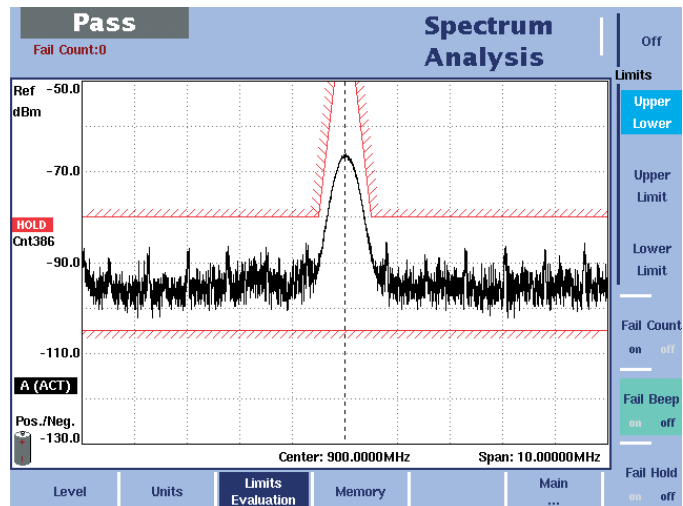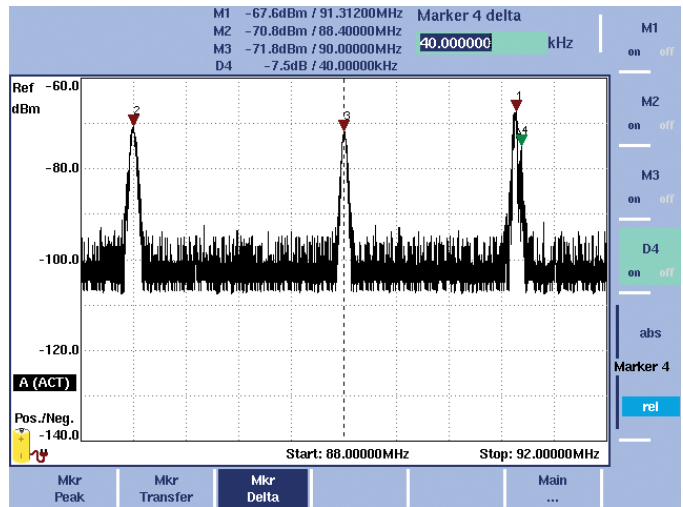
Get more out of digitally modulated signals through RMS channel power measurement functions

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 predefined 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 "91xx 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 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.
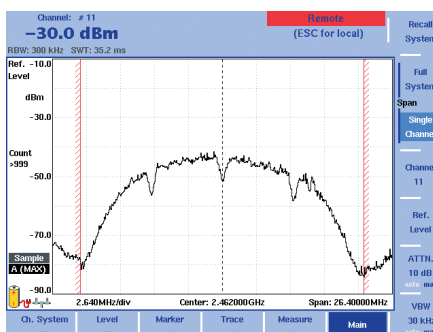
Specifications

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	2×10^{-6}
(Sweep time $\leq$ 1s)	

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	2×10^{-6}

Sweep time

Span $\geq$ 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 1 MHz
Steps	1, 3, 10

SSB noise

f = 2 GHz, Df = 100 kHz	< –80 dBc/Hz

Amplitude

Maximum safe DC Voltage at RF in	$\pm$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, attenuation = 0 dB)

10 to 3600 MHz	< –98 dBm
> 3600 MHz	< –94 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	> 65 dB
Max. measurable input level	20 dBm
(attenuation = 50 dB)	
Min. measurable input level	–105 dBm

Level accuracy

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

10 to 3600 MHz	$\pm$1 dB

VSWR RF input

(input attenuation = 10 dB)

1 to 3600 MHz	< 1.8

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	< –86 dBm
(attenuation = 0 dB)	
LO breakthrough	< –80 dBm
(attenuation = 10 dB)	
Intermodulation-free range	> 75 dB
(input level –26 dBm, f_1 = 990 MHz, f_2 = 992 MHz)	

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	2×500[1]
Trace functions	A, B, copy a>b, copy b>a
A-Curve	colour selectable (default is black)
B-Curve	colour 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 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, WLAN, Bluetooth

Demodulation

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

Keyboard

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

[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 |
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

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

Weight

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

Environmental conditions | MIL-PRF28800F
(unless otherwise specified) | 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

Ext. Trigger

Connector | BNC (female)
Input level | LVTTL/LVCMOS, 0 to 3 V

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 | M 100 401
incl. 91xx Data Exchange Software,
standard battery and AC power supply
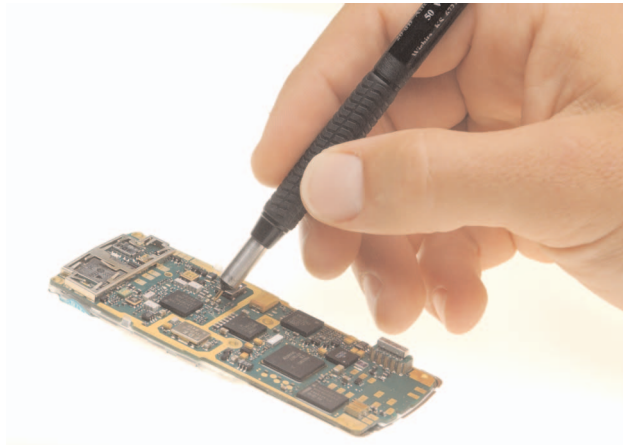(100 to 240 V/50 to 60 Hz)

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
9190 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

will'tek