Willtek

Data Sheet

2801
Multilock
Communications System Analyzer

Boosting wireless efficiency

A real multi-talented instrument – the Willtek 2801 Multilock

The Willtek 2801 Multilock is a test instrument for multiple analogue and digital communications standards, integrating a wide range of instruments with just those functions that you really need for service and repair. This makes the 2801 a comparatively cheap and easy-to-use test solution for Private Mobile Radio (PMR) terminals.

Get more space on your working table

One 2801 Multilock substitutes many instruments such as power meter, signal generator, signal analyzer, oscilloscope, spectrum analyzer and many more.

Modern testing of conventional analogue two-way radio systems

The new 2801 Multilock is different from all other communication testers on the market. Its state-of-the-art design enables an unseen performance for measurements on radio communication systems. Its powerful graphical measurement menus help service engineers to easily identify potential problems. Operation is easy and fast thanks to its direct access keys (shortkeys). The ultra-sensitive measurement receiver and the low-spurious RF generator allow high quality testing of RF components at frequencies up to 3 GHz (optional)!

Go on the road without ballast

The 2801 Multilock can do more than you would expect from a communication test set, yet in a compact and lightweight box. Thanks to the optional battery pack, the Multilock is the optimal companion for technicians who need to work on RF installations in the field.

Highlights

- Integrated communication test set for analogue and digital standards
- Future-proof with ETSI DMR and TIA APCO 25 support
- Broadband RF power measurement, up to 150 W
- Fast and sensitive spectrum analyzer and oscilloscope, comparable with standalone instruments

Instruments included in the Multilock

- Spectrum analyzer
- Signal generator
- Sensitive measurement receiver
- Tracking generator (optional)
- SINAD meter
- Distortion meter
- Modulation scope
- Oscilloscope
- Frequency error meter
- Cable fault locator (optional)
- FM deviation meter, AM modulation meter
- RSSI meter
- Broadband and narrowband power meters
- Audio generator and analyzer
- AC/DC voltmeter

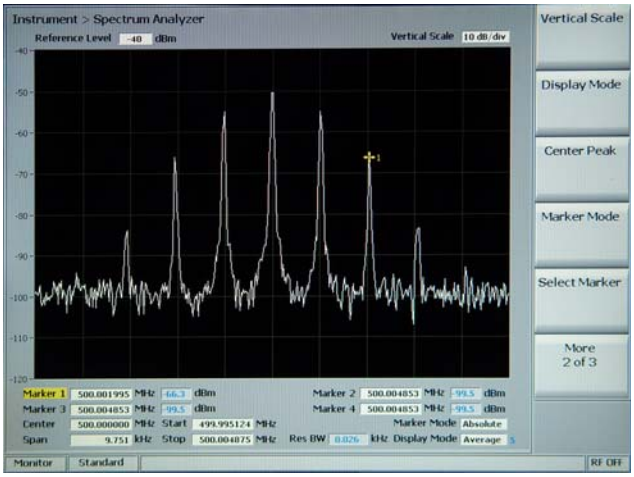
Feature-rich test set covering your PMR testing needs

Widest frequency range

Where usual communication analyzers stop at 1 GHz or at a maximum of 2.7 GHz, the 2801 provides more bandwidth with a range of up to 3 GHz (optional). This is the widest frequency range supported by an instrument of this category!

Superior spectrum analyzer

The 2801 Multilock comes with a fast spectrum analyzer, featuring a screen update rate of up to 10 per second. With its low noise floor, fast signal acquisition and flexible scales and markers, the Multilock is the ideal tool for tracking and measuring elusive interfering signals.



Upgradeable and expandable

The software-based architecture of the 2801 Multilock lets you add options in the field. So if your instrument needs change during its lifetime, simply order the feature or protocol you need and enable the function in your unit with a USB-based upgrade.

Clear and large display, easy to use

The user interface is one of the most important parts of an instrument. The Multilock is made for best visibility, thanks to an 8.4 inch (21 centimeter) wide TFT display with 800x600 resolution, high contrast and wide viewing angle for outdoor use. This is the largest and highest resolution screen available for this instrument class!

The 2801 Multilock has been designed for easiest operation. Its shortcut keys and its well-arranged front panel allow test engineers to operate it immediately, without the need to read manuals for hours. Just start it up!

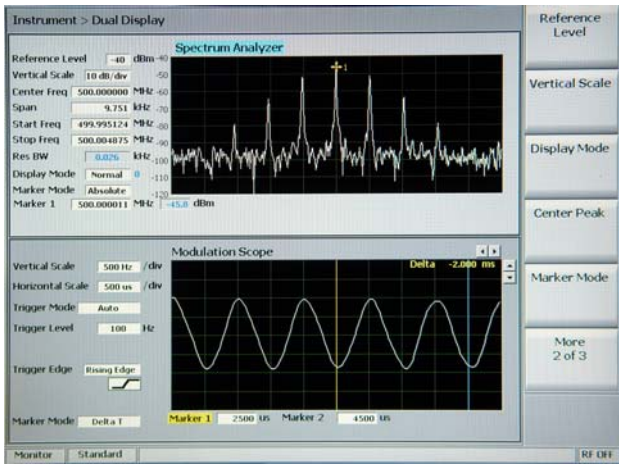
Connectivity

By default, the Multilock features a vast number of interfaces for remote control and data exchange. Four USB connectors and an Ethernet interface provide for flexible connectivity of the instrument. Plus, the 2801 Multilock provides a standard SVGA plug to connect with external displays. Last but not least, a key loader for encryption key modules supports testing of terminals designed for public safety and security use.

Options extend the capabilities where needed

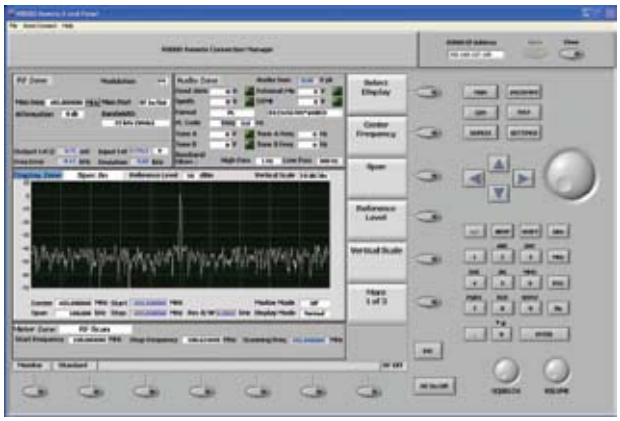
"DualScope" display shows carrier signal and demodulated audio simultaneously

The 2801 Multilock supports the new DualScope, which displays the RF spectrum and the modulation scope simultaneously, giving the user the ability to analyze the RF characteristics of the carrier signal and recovered audio from the same screen. The complete functionality of both instruments is available in DualScope mode, and all associated measurements are displayed. DualScope together with the 1 dB vertical scale and 4 markers is included in both the 2862 Enhanced Spectrum Analyzer/Oscilloscope Option and the 2801 Multilock Advantage Package.



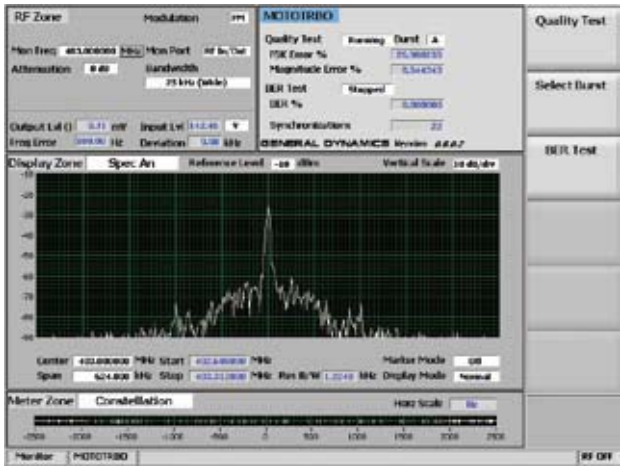
2830 Remote Control Software

The virtual instrument keyboard on a standard PC equipped with the optional 2830 Remote Control Software includes every key on the Multilock itself. Just assign an IP address to the unit and operate every function of the instrument from the remote PC; you can e.g. monitor any channel activity, measure interference or track the site performance.



2831 ETSI DMR Test Option

With the Multilock users can now test the quality of any ETSI DMR radio including Motorola's MOTOTRBO product line. Simply put the instrument in DMR mode to test bit error rate, FSK and magnitude error, and receive audio quality. The Multilock's constellation display provides a quick overview of the FSK signal by comparing measured signal points with ideal IQ points of maximum effect.



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.

The published accuracies are determined in accordance with GUM (Guide to the Expression of Uncertainty in Measurement) and EA (European Co-operation for Accreditation) application document EA4/02: "Expressions of the Uncertainty of Measurements in Calibration".

Basic RF data

Frequency range	250 kHz to 1 GHz (optional 3 GHz)
Reference frequency uncertainty	< 0.01 x 10^{-6}
Reference frequency aging	< 0.1 x 10^{-6}/year
RF ports	RF I/O port Antenna port Generator port

RF I/O port

Type	input and output
Connector	N-type
Input impedance	50 Ω
VSWR	< 1.20
Max. input power	150 W (30 s)

Antenna port

Type	input
Connector	BNC
Input impedance	50 Ω
Max. input power	0 dBm

RF Generator port

Type	output
Connector	BNC
Output impedance	50 Ω
Max. input power	50 W (30 s)

RF generator

Output level	
RF I/O port	–130 dBm to –30 dBm
RF Generator port	–95 dBm to +5 dBm
Level resolution	0.1 dB
Level accuracy	
150 kHz to 1 GHz	±1 dB
1 GHz to 3 GHz	±2 dB
FM deviation accuracy	5 % of setting
FM deviation range	0 to 75 kHz
FM deviation resolution	10 Hz
FM modulation frequency	5 Hz to 20 kHz
AM depth range	0 to 90%
AM depth resolution	1%
AM modulation frequency	100 Hz to 10 kHz
AM accuracy	5% of setting
Modulation sources	Modulation generator External input
Harmonic spurious signals	< –20 dBc
Non-harmonic spurious signals	< –35 dBc
Residual FM (300 Hz to 3 kHz)	< 20 kHz
Residual AM (300 Hz to 3 kHz)	< 1.0%
SSB phase noise	< –75 dBc/Hz @ 20 kHz offset

RF analyzer

Sensitivity	
Narrowband FM	2.0 µV for 10 dB EIA SINAD
Wideband FM	10 µV for 10 dB EIA SINAD
AM	10 µV for 10 dB EIA SINAD
FM demodulation range	
Narrowband	< +-5 kHz
Wideband	< ±75 kHz
FM demodulation accuracy	±5%
AM demodulation range	0 to 100%
AM demodulation accuracy	±5% up to 80% depth
IF filters	6.25 kHz, 12.5 kHz, 25 kHz, 60 kHz, 200 kHz
Modulation filters	
Lowpass	300 Hz, 3 kHz, 20 kHz
Highpass	5 Hz, 300 Hz, 3 kHz

Demod Out port

Impedance	100 Ω
Level	
1 kHz deviation in Narrowb. FM	0.8 V peak
10 kHz deviation in Wideb. FM	0.8 V peak
10% AM modulation depth	0.8 V peak
RF frequency error measurement resolution	
1 Hz (autoranging)	

Receive signal strength meter

Accuracy	±2 dB
Sensitivity	–120 dBm

Broadband power measurement	
Range	0.1 to 150 W
Accuracy	±10%

SINAD measurement	
Accuracy	±1 dB @ 12 dB SINAD
Input level	> 0.1 V RMS

AF frequency counter	
Range	5 Hz to 100 kHz
Input level	> 0.1 V RMS

Distortion measurement	
Range	1% to 20 %
Accuracy	±10% of reading
Input level	> 0.1 V RMS

Spectrum analyzer

Level accuracy	±2 dB
Display resolution	1, 2, 5, 10 dB/div.
Linearity accuracy	< 0.1 dB
Reference level resolution	1dB
Reference level range	–70 to +60 dB
Dynamic range	80 dB
Displayed averaged noise level	–120 dBm (typ.)
Residual phase noise	–75 dBc/Hz @ 10 kHz offset
Resolution bandwidth (RBW)	40 Hz, 80 Hz, 160 Hz, 320 Hz, 640 Hz, 1280 Hz (auto-selected depending on span)
Harmonic spurious	< –20 dBc (antenna port, no attenuation)
Non-harmonic spurious	< –60 dBc (antenna port, no attenuation)
Residual spurious	< –70 dBm (input terminated)
Markers	Absolute level Absolute frequency Delta
Number of markers	2 (4 optional)
Trace modes	Standard Average Freeze Max Hold Peak Hold

2861 Tracking Generator (option)

Frequency range	250 kHz to 1 GHz
Level range	–95 to +5 dBm

Oscilloscope

Input impedance	1 MΩ, 600 Ω (selectable)
Bandwidth	50 kHz
Vertical range	±100 V DC, ±70 V RMS AC
Vertical accuracy	5 % of full scale
Horizontal sweep time	20 µs to 1 s
Trigger selection	Normal, auto, single sweep
Markers	Delta voltage, delta frequency, delta period

Audio modulation generator

Modulation types	1 kHz tone Digital private line Private line Single tone DTMF Two-tone paging 5/6-tone paging International select v 20-tone general sequence Tone remote control External
Modulation amplitude flatness	±1 dB @ 5 Hz to 20 kHz
Modulation output level	< ±8 V peak
1 kHz tone distortion	< 1%
External modulation input impedance	600 Ω

Digital voltmeter

Input impedance	1 MΩ
Voltage ranges	1 V, 10 V, 70 V full scale
Frequency range	50 Hz to 20 kHz
DC measurement uncertainty	1% of full scale ±1 digit
AC measurement uncertainty	5% of full scale ±1 digit

General data

Power supply	24 V DC
	100 - 240 V AC
Power consumption	5 A DC
Operating temperature range	0°C to 50°C
Dimensions	
Width	32.3 cm (12.7″)
Height	23.9 cm (9.4″)
Depth	19,1 cm (7.5″)
Weight	6.4 kg (14 lb)
Screen size	21 cm (8.4″)
Screen resolution	800 x 600
External display connector	VGA

Scope of delivery

Instrument
Antenna
Microphone
Oscilloscope probe
Power cord
User's manual on CD

Ordering information

2801 Multilock Communications System Analyzer	M 896 125
2801 Multilock Advantage Package	M 896 126

Includes 2801 Multilock Communications System Analyzer, 2860 3GHz Frequency Extension, 2861 Tracking Generator, 2862 Enhanced Spectrum Analyzer/Oscilloscope, 2863 Cable Fault Locator, 2830 Remote Control Software, soft carrying case

Options

2830 Remote Control Software	M 860 592
2831 ETSI DMR Software Option	M 860 598
2860 3GHz Frequency Extension	M 860 591
2861 Tracking Generator	M 860 593
2862 Enhanced Spectrum Analyzer/Oscilloscope	M 860 594
2863 Cable Fault Locator	M 860 595

Accessories

Soft carrying case	M 860 596
Hard transit case	M 860 597

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