

FREEDOM Communications System Analyzer *R9000*



DATA SHEET

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Operating/Display Modes

AM/FM Duplex Monitor and Generator
Audio Synthesizer
Vector Network Analyzer
Cable Fault Locator
Spectrum Analyzer
Frequency Error Meter
Power Meter
Audio Analyzer
Signal Strength Meter
SINAD/Distortion Meter



General

Displayed Average Noise:

Level (DANL):	-140 dBm (50 Ω input termination)
Dynamic Range:	80 dB
Input Related Spurious:	-60 dBc

Power

DC Power Requirements:	15-19 Vdc @ 8.0 A max
AC Adapter Specs:	100-240 Vac, 2.5 A max, 50-60 Hz
Battery Power:	Dual Internal Battery, Individually swappable
Battery Operation:	4 hour typical with two individually swappable batteries

MECHANICAL/ENVIRONMENTAL

Weight:	16.5 lb (7.5 kg) with no batteries, 18.5 lb (8.4 kg) with batteries
Dimensions:	12" (30.5 cm) H x 16.5" (41.9 cm) W x 5.75" (14.6 cm) D
Operating Altitude:	Up to 15,000 ft (4572 m)
Humidity	80 % maximum relative humidity
Operating Temperature:	-20 $^{\circ}$ C to 50 $^{\circ}$ C with external DC; 0 $^{\circ}$ C to 50 $^{\circ}$ C using supplied AC adapter
Storage Temperature:	Without battery: -30 $^{\circ}$ C to +80 $^{\circ}$ C; With battery: -20 $^{\circ}$ C to +50 $^{\circ}$ C
Battery Charging Temperature:	0 $^{\circ}$ C to +45 $^{\circ}$ C
Shock and Vibration Rating:	MIL-PRF-28800F, Class 3

WARRANTY

Standard Warranty:	Two years
Three Year Service Plan:	Optional

Generator (Receiver Test)

Frequency Range:	10 MHz to 6 GHz
Frequency Resolution:	1 Hz

OUTPUT LEVEL GENERATE PORT

Range FM:	+0 dBm to -130 dBm
Range AM:	-7 dBm to -130 dBm
Resolution:	0.1 dB
Accuracy:	± 1 dB

OUTPUT LEVEL RF I/O PORT

Range FM:	-30 dBm to -130 dBm
Range AM:	-36 dBm to -130 dBm
Resolution:	0.1 dB
Accuracy:	± 1 dB

SPECTRAL PURITY

Harmonic Spurious:	-20 dBc max
Non-Harmonic Spurious:	-35 dBc max
SSB Phase Noise (10 kHz Offset):	-105 dBc/Hz max @ 500 MHz (15 °C to 35 °C)

FM MODULATION

Deviation Accuracy:	5 % of setting
Deviation Range:	0 to 75 kHz
Deviation Resolution:	1 Hz
Pre-emphasis (selectable):	750 μ s (selectable)
Modulation Bandwidth:	0 Hz to 20 kHz

AM MODULATION

Depth Range:	0 to 99 % (AM Depth)
Deviation Resolution:	1 %
Depth Accuracy:	1 % of setting
Modulation Bandwidth:	100 Hz to 10 kHz
Deviation Accuracy:	1 % of setting

SSB-AM (USB or LSB) Modulation

AM Depth Range:	0 to 99 %
Depth Resolution:	1 %
Modulation Bandwidth:	300 Hz to 20 kHz

Receiver (Transmitter Test)

Frequency Range:	10 MHz – 6 GHz
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SENSITIVITY

Narrowband FM:	2.0 μ V for 10 dB EIA SINAD
Wideband FM:	10 μ V for 10 dB EIA SINAD
AM:	10 μ V for 10 dB EIA SINAD

RF I/O PORT

VSWR:	< 1.5
Max Power:	50 W continuous 150 W for 30 seconds (30 seconds on, 5 minutes off)

ANTENNA PORT

Maximum Power:	0 dBm
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IF FILTERS:

6.25 kHz, 12.5 kHz, 25 kHz, 50 kHz, 100 kHz, 200 kHz

FREQUENCY ERROR MEASUREMENT

Type of Display:	Autoranging
Resolution:	1 Hz

FM DEVIATION MEASUREMENT

Demodulation Range:	Up to ± 75 kHz
Accuracy:	± 5 % plus residual FM
Frequency Response:	Selectable per the following: Low Pass Filters: 300 Hz, 3 kHz, 20 kHz High Pass Filters: 1 Hz, 300 Hz, 3 kHz

DEMOD HARWARE CHARACTERISTICS

Demodulation Output Level:	6.25 kHz B/W: 2.56 V / 1 kHz 12.5 kHz B/W: 1.28 V / 1 kHz 25 kHz B/W: 0.64 V / 1 kHz 50 kHz B/W: 0.32 V / 1 kHz 100 kHz B/W: 1.6 V / 10 kHz 200 kHz B/W: 0.8 V / 10 kHz
Demodulation Output Amplitude Flatness:	± 0.2 dB (300 Hz to 3 kHz), 1 dB point @ 20 kHz
Demodulation Output Impedance:	100 Ω nominal

AUDIO WEIGHTING FILTERS

Filters: none, C-Message, CCITT	none, C-Message, CCITT
De-emphasis (selectable):	750 μ s

AM MODULATION MEASUREMENTS

Demodulation Range:	0 to 100 %
Accuracy:	± 5 % for levels below 80 %
Frequency Response:	Selectable per the following: Low Pass Filters: 300 Hz, 3 kHz, 20 kHz / High Pass Filters: 1 Hz, 300 Hz, 3 kHz
Demodulation Output Level:	0.8 V peak per 10 % AM Modulation
Demodulation Output Amplitude Flatness:	± 0.2 dB (300 Hz to 3 kHz), 1 dB point @ 20 kHz
Output Impedance:	100 Ω nominal
SSB Sideband Suppression:	> 70 dB

RECEIVE SIGNAL STRENGTH LEVEL METER

Frequency Range:	10 MHz to 6 GHz
Accuracy:	± 1 dB
Sensitivity:	-120 dBm (Antenna Port; 6.25 kHz IF B/W)

BROADBAND POWER METER (RF In/Out Port)

Frequency Range:	10 MHz to 6 GHz
Measurement Range:	0.1 W to 150 W
Input Impedance:	50 Ω
Accuracy:	± 10 %

SINAD METER

Accuracy:	± 1 dB @ 12 dB SINAD
Input Level:	0.1 V _{RMS} min
Frequency Range:	300 Hz to 10 kHz
Reading Range:	0 to > 60 dB
Resolution:	0.01 dB

DISTORTION METER

Reading Range:	0.00 % to 100 %
Distortion Accuracy:	The greater of: ± 0.5 % of distortion or ± 10 % of reading
Input Level:	0.1 V _{RMS} min
Frequency Range:	300 Hz to 10 kHz
Resolution:	0.01 %

Spectrum Analyzer

SWEEP

Frequency Range:	10 MHz to 6 GHz
Frequency Resolution:	1 Hz
Span Accuracy:	5 %
Update Rate:	~10 times per second (depending on span)

AMPLITUDE

Level Accuracy:	± 1 dB
Reference Level Resolution:	1 dB
Reference Level Range:	+60 to -70 dB
T/R Port Dynamic Range:	80 dB
Typical Noise Floor Performance:	-140 dBm
SSB Phase Noise (20 kHz Offset):	-105 dBc / Hz max @ 500 MHz (15 °C to 35 °C)
Harmonic Spurious (Antenna Port, No Attenuation):	-30 dBc max
Non-Harmonic Spurious (Antenna Port, No Attenuation):	-60 dBc max
Residual Spurious (Input Terminated):	-70 dBm
Markers:	Delta, Absolute, and Frequency
Number of Markers:	8
Modes:	Standard, Average, Freeze, Max Hold, and Peak Hold

Modulation Input

Input Impedance:	> 100 k Ω
Range:	± 8 Vpk
Accuracy:	5 % of full scale
Bandwidth:	0 to 20 kHz

Audio Modulation Synthesizer

Modulation Output Level:	Tone, Standard formats (Private Line, Digital Private Line, DPL Invert), DTMF, and external inputs from both a supplied microphone and BNC connector.
Modulation Output Level:	± 8 V peak (± 16 / BW V / kHz FM, ± 0.08 V / % AM)
Amplitude Flatness:	± 0.2 dB (300 Hz to 3 kHz), 1 dB point @ 20 kHz
1 kHz Tone Distortion:	Not to exceed 1 % THD
Output Impedance:	100 Ω
Microphone Input Amplitude Flatness:	± 0.2 dB (300 Hz to 3 kHz), 1 dB point @ 20 kHz

Vector Network Analyzer

Frequency Range:	10 MHz to 6 GHz
Parameters:	S11, S21

Timebase

Type:	GPS Disciplined OCXO
Frequency Accuracy:	25 ppb (not locked to GPS), 5 ppb (locked to GPS)

Display

FRONT PANEL DISPLAY

Resolution:	1280 x 800
Size:	Size: 12.1" Full Color PCAP Multi-Touch Touchscreen

EXTERNAL DISPLAY

External Display:	DisplayPort
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REMOTE DISPLAY

Available over Ethernet via HTML 5 capable web browser



ООО «4TECT»

Телефон: +7 (499) 685-4444

info@4test.ru

www.4test.ru