

FREEDOM

Communications System Analyzer

R8600



DATA SHEET

FREEDOM
Communication Technologies

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Operating/Display Modes

AM/FM Duplex Monitor and Generator
Audio Synthesizer
Tracking Generator (Opt.)
Dual Display (Opt.)
Cable Fault Locator (Opt.)
Spectrum Analyzer
Frequency Counter
Frequency Error Meter
Digital Voltmeter
Power Meter
Oscilloscope
Signal Strength Meter
SINAD/Distortion Meter



General

Displayed Average Noise:

Level (DANL):	-140dBm (50 Ohm input termination)
Dynamic Range:	80dB
Input Related Spurious:	-60dBc max
Residual Spurious (non-input related):	-70dBm

Power

DC Power Requirements:	15-16VDC @ 8.0A max
AC Adapter Specs:	100-240VAC, 2.5A max, 50-60Hz

MECHANICAL/ENVIRONMENTAL

Weight:	15 lbs
Dimensions:	6.34" (16.1cm) H, 8.82" (22.4cm) W, 16.14" (41cm) D
Operating Altitude:	Up to 10,000 ft (3048 m)
Humidity:	80% maximum relative humidity
Operating Temperature:	0° to 50°C
Storage Temperature without Battery:	-30° to +80°C

WARRANTY

Standard Warranty:	Two years
Three Year Service Plan:	Optional
Five Year Service Plan:	Optional

Generator (Receiver Test)

Port Protection Limit	5W for 30 seconds
Frequency Range:	1MHz to 1GHz (250kHz to 1GHz typical); Optional to 3GHz
Extended Frequency Range (Optional):	1MHz to 3GHz (250kHz to 3GHz typical)
Frequency Resolution:	1Hz

OUTPUT LEVEL GENERATE PORT

Range FM:	+5dBm to -95dBm below 2GHz -5dBm to -95dBm above 2GHz
Range AM:	-1dBm to -95dBm below 2GHz -11dBm to -95dBm above 2GHz
Resolution:	0.1dB
Accuracy:	±2dB

OUTPUT LEVEL RF I/O PORT

Range FM:	-30dBm to -130dBm below 2GHz -40dBm to -130dBm above 2GHz
Range AM:	-36dBm to -130dBm below 2GHz -46dBm to -130dBm above 2GHz
Resolution:	0.1dB
Accuracy:	±1dB to 1GHz ; ±2dB > 1GHz

SPECTRAL PURITY

Harmonic Spurious:	-20dBc max
Non-Harmonic Spurious:	-35dBc max; <-30dBc at mixing product frequencies (3227MHZ - Carrier)
Residual FM:	4Hz, 300Hz to 3kHz (<1GHz) 5Hz, 300Hz to 3 kHz (> 1GHz)
Residual AM:	1.0% max, 300Hz to 3kHz
SSB Phase Noise (20 kHz Offset):	-95dBc/Hz max below 1GHz (15° to 35°C) -93dBc/Hz max all frequencies (0° to 50°C)

FM MODULATION

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

AM MODULATION

AM Depth Range:	0 to 90%
Deviation Resolution:	1% of setting
Modulation Bandwidth:	100Hz to 10kHz
Deviation Accuracy:	5% of setting

SSB-AM (USB or LSB) Modulation

AM Depth Range:	0 to 90%
Depth Resolution:	1%
Modulation Bandwidth:	300Hz to 20kHz

Receiver (Transmitter Test)

Frequency Range:	250kHz – 1GHz (3GHz optional)
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SENSITIVITY

Narrowband FM:	2.0uV for 10dB EIA SINAD
Wideband FM:	10uV for 10dB EIA SINAD
AM:	10uV for 10dB EIA SINAD

RF I/O PORT

VSWR:	< 1.2 to 2GHz, ~ 1.5 to 3GHz
Max Power:	50W for 5 minutes 150W for 30 seconds (30 sec. on, 5 min. off)
Absolute Max Power:	150W
Alarm:	Internal temperature alarm

ANTENNA PORT

Maximum Power:	0dBm
Alarm:	+10dBm

IF FILTERS:

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

FREQUENCY ERROR MEASUREMENT

Type of Display:	Autoranging
Resolution:	1Hz

FM DEVIATION MEASUREMENT

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

DEMOD HARWARE CHARACTERISTICS

Demodulation Output Level:	6.25kHz B/W: 2.56V / 1kHz 12.5kHz B/W: 1.28V / 1kHz 25kHz B/W: 0.64V / 1kHz 50kHz B/W: 0.32V / 1kHz 100kHz B/W: 1.6V / 10kHz 200kHz B/W: 0.8V / 10kHz
Demodulation Output Amplitude Flatness:	± 0.2 dB (300Hz to 3kHz), 1dB point @ 20kHz
Demodulation Output Impedance:	100 ohms 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:	$\pm 5\%$ for levels below 80%
Frequency Response:	Selectable per the following:
Demodulation Output Level:	Low Pass Filters: 300Hz, 3kHz, 20kHz High Pass Filters: 1Hz, 300Hz, 3kHz
Demodulation Output Amplitude Flatness:	0.8V peak per 10% AM Modulation
Output Impedance:	± 0.2 dB (300Hz to 3kHz), 1dB point @ 20kHz 100 ohms nominal
SSB Sideband Suppression:	>70 dB

RECEIVE SIGNAL STRENGTH LEVEL METER

Frequency Range:	1MHz to 1GHz (250kHz to 1GHz typical); Optional to 3GHz
Accuracy:	± 2 dB
Sensitivity:	-120dBm (Antenna Port; Preamplifier on; 6.25kHz IF B/W)

BROADBAND POWER METER (RF In/Out Port)

Frequency Range:	1MHz to 1GHz (250kHz to 1GHz typical); Optional to 3GHz
Measurement Range:	0.1W to 150W
Input Impedance:	50 Ohms
Accuracy:	±10%(2 KHz - 1GHz); ±10%(1GHz - 3GHz <2.5W)
Protection:	Over temperature alarms

FREQUENCY COUNTER

Frequency Range:	5Hz to 100kHz
Period Counter Range:	5Hz to 20kHz
Input Level:	0.1V rms min

SINAD METER

Accuracy:	±1dB @ 12dB SINAD
Input Level:	0.1V rms min

DISTORTION METER

Range:	1% to 20%
Distortion Accuracy:	The greater of: ±0.5% of distortion or ±10% of reading
Input Level:	0.1V rms min

OPTIONAL MODES

DMR (MOTOTRBO™), NDXN, NXDN Type C Trunking, P25 Phase 1 (Conventional and Trunked), P25 Phase 2, TETRA, PTC (ITCR)

Spectrum Analyzer

SWEEP

Frequency Range:	1MHz to 1GHz (250kHz to 1GHz typical); Optional to 3GHz
Frequency Resolution:	1Hz
Span Accuracy:	5%
Update Rate:	~10 times per second (depending on span)

AMPLITUDE

Level Accuracy:	±2 dB
Scales (dB/div):	10 (1,2, & 5 w/ESA option)
Log Linearity Accuracy:	<0.1dB
Reference Level Resolution:	1dB
Reference Level Range:	+60 to -70dB
T/R Port Dynamic Range:	80dB
Typical Noise Floor Performance:	-140dBm
SSB Phase Noise (20 kHz Offset):	-95dBc/Hz max below 1GHz (15° to 35° C) -93dBc/Hz max all frequencies (0° to 50° C)

Resolution Bandwidth	Auto Selected
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Harmonic Spurious (Antenna Port, No Attenuation):	-20dBc max
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Non-Harmonic Spurious (Antenna Port, No Attenuation):	-60dBc max
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Residual Spurious (Input Terminated):	-70dBm
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Markers:	Delta, Absolute, and Frequency
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Modes:	Standard, Average, Freeze, Max Hold, and Peak Hold
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Oscilloscope

VERTICAL INPUT

Input Impedance:	1 Meg Ohm / 600 Ohm (Selectable)
Range:	$\pm 100\text{VDC}$, $\pm 70\text{Vrms AC}$
Accuracy:	5% of full scale
Bandwidth:	0 to 50kHz

HORIZONTAL SWEEP

Range:	20 μSec to 1 Sec / div. (Selectable)
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TRIGGER SELECTION

Normal, Auto (Free Running), Single Sweep and Freeze

SPECIAL FUNCTIONS

Markers:	Absolute Voltage, Delta Voltage, Delta Frequency and Delta Period
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Audio Modulation Synthesizer

Modulation Types:	1 kHz tone, Private Line, Digital Private Line (w/ DPL Invert), Single Tone, DTMF, Two-Tone Paging, 5/6 Tone Paging, POCSAG, A&B Independent Synths., EURO Tones, User Defined Tone Sequences, and External inputs from both a supplied micro-phone and BNC input.
Modulation Output Level:	Programmable to $\pm 8\text{V}$ peak
Amplitude Flatness:	$\pm 0.2\text{dB}$ (300Hz to 3kHz), 1dB point @ 20kHz
1 kHz Tone Distortion:	Not to exceed 1% THD
Impedance:	100 Ohms
External Modulation Input Level:	$\pm 1\text{V}$ peak reference
Amplitude Flatness:	$\pm 0.2\text{dB}$ (300Hz to 3kHz), 1dB point @ 20kHz
Impedance:	600 Ohms
External Microphone Input Amplitude Flatness:	$\pm 0.2\text{dB}$ (300Hz to 3kHz), 1dB point @ 20kHz

Tracking Generator

Frequency Range:	1MHz to 1GHz (250kHz to 1GHz typical); Optional to 3GHz
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Digital Voltmeter (DVM)

Input Impedance:	1 Meg Ohm / 600 Ohm (Selectable)
Voltage Range:	1V, 10V, 70V full scale
Frequency Range:	50Hz to 20kHz
DC Accuracy:	1% full scale ± 1 LSB
AC Accuracy:	5% full scale ± 1 LSB

Timebase

Output Frequency:	10MHz
Stability:	Aging: $\pm 0.1\text{ppm}$ / year Temp.: $\pm 0.01\text{ppm}$
Output Level:	Minimum 0dBm into 50 Ohms
Warm Up:	3 minutes: within $\pm 0.1\text{ppm}$

Display

EXTERNAL DISPLAY

External Display:	VGA
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REMOTE FRONT PANEL

Remote Front Panel:	Available over Ethernet
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Supplemental Digital Specifications

DMR

FSK ERROR

Range: 0 to 10%

Accuracy (2% to 10%): <5%

Resolution: 0.01%

MAGNITUDE ERROR

Range: 0-5%

Accuracy: <5% of reading

Resolution: 0.01%

SYMBOL DEVIATION

Range: 1500 to 2350Hz

Accuracy: ± 10 Hz

Resolution: .1Hz

BER

Range: 0 to 20%

Resolution: 0.00001%

NXDN

FSK ERROR

Range: 0 to 10%

Accuracy (2% to 10%): <5%

Resolution: 0.01%

MAGNITUDE ERROR

Range: 0-5%

Accuracy: <5% of reading

Resolution: 0.01%

SYMBOL DEVIATION

Range: 840 to 1260Hz (4800bps)
1920 to 2880Hz (9600bps)

Accuracy: ± 10 Hz

Resolution: .1Hz

BER

Range: 0 to 20%

Resolution: 0.00001%

dPMR

FSK ERROR

Range: 0 to 10%

Accuracy (2% to 10%): <5%

Resolution: 0.01%

MAGNITUDE ERROR

Range: 0-5%

Accuracy: <5% of reading

Resolution: 0.01%

SYMBOL DEVIATION

Range: 1500 to 2350Hz

Accuracy: ± 10 Hz

Resolution: .1Hz

BER

Range: 0 to 20%

Resolution: 0.00001%

TETRA

EVM (RMS)

Range: 0 to 20%

Accuracy (2% to 10%): <10%

Resolution: 0.10%

RESIDUAL CARRIER

Range: 0-10%

Accuracy: ± 0.1 %

Resolution: 0.10%

FREQUENCY ERROR

Accuracy: ± 500 Hz

Resolution: 1 Hz

P25 MEASUREMENT MODULATION FIDELITY

Range: 0 to 10%

Resolution: 0.01%

Accuracy: <5.0% of reading
for 2.0 % and higher

Remote Interface (Optional Feature)

REMOTE FRONT PANEL

Available over Ethernet
Distribution by:

rfe-global

radio frequency equipment

rfe-global GmbH
Marie-Curie-Str. 1
26129 Oldenburg (Oldb)
Germany

FREEDOM

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