

# *FREEDOM* Communications System Analyzer **R8000C**



**DATA SHEET**

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

### Power

DC Power Requirements:	24 VDC @ 5.0 A max
AC Adapter Specs:	100-240 VAC, 2.5 A max, 50-60 Hz
Battery Power:	Optional External Battery
Battery Operation:	1 hour minimum

### MECHANICAL/ENVIRONMENTAL

Weight:	<14 lbs (6.4 kg)
Dimensions:	9.4" (23.9 cm) H, 12.7" (32.3 cm) W, 7.5" (19.1 cm) D
Operating Altitude:	Up to 10,000 ft (3048 m)
Humidity:	80% maximum relative humidity
Operating Temperature:	0° to 50° C
Storage Temperature:	-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):	1 MHz to 3GHz (250 kHz to 3 GHz typical)
Frequency Resolution:	1 Hz

### OUTPUT LEVEL GENERATE PORT

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

### OUTPUT LEVEL RF I/O PORT

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

### SPECTRAL PURITY

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

### FM MODULATION

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

### AM MODULATION

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

# Receiver (Transmitter Test)

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

## SENSITIVITY

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

## RF I/O PORT

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

## ANTENNA PORT

Maximum Power:	0 dBm
Alarm:	+10 dBm

## 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 HARDWARE CHARACTERISTICS

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

## AUDIO WEIGHTING FILTERS

Filters:	none, C-message, CCITT
De-emphasis:	750 μs (selectable)

## 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, 3kHz, 20kHz 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), 1dB point @ 20kHz
Output Impedance:	100 ohms nominal

### RECEIVE SIGNAL STRENGTH LEVEL METER

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

### BROADBAND POWER METER (RF In/Out Port)

Frequency Range:	1MHz to 1GHz (250kHz to 1GHz typical); Optional to 3GHz
Measurement Range:	0.1Wto150W
Input Impedance:	50 Ohms
Accuracy:	±10% (2 kHz – 1 GHz); ±10% (1 GHz – 3 GHz < 2.5W)
Protection:	Over temperature alarms

### FREQUENCY COUNTER

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

### SINAD METER

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

### DISTORTION METER

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

### OPTIONAL MODES

DMR (MOTOTRBO™), NXDN Type - C Trunk, P25 Phase I Trunk, P25 Phase II, TETRA, PTC (ITCR)

## Spectrum Analyzer

### SWEEP

Frequency Range:	1MHz to 1GHz (250kHz to 1GHz typical); Optional to 3GHz
Frequency Resolution:	1 Hz
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 -70 dB
T/R Port Dynamic Range:	80 dB
Typical Noise Floor Performance:	-140 dBm
SSB Phase Noise (20 kHz Offset):	-95 dBc/Hz max below 1 GHz (15° to 35° C) -93 dBc/Hz max all frequencies (0° to 50° C)

## Resolution Bandwidth

Auto Selected

## Harmonic Spurious (Antenna Port, No Attenuation):

-20 dBc max

## Non-Harmonic Spurious (Antenna Port, No Attenuation):

-60 dBc max

## Residual Spurious (Input Terminated):

-70 dBm

## Markers:

Delta, Absolute, and Frequency

## Modes:

Standard, Average, Freeze, Max Hold, and Peak Hold

# Oscilloscope

## VERTICAL INPUT

Input Impedance: 1 Meg Ohm / 600 Ohm (Selectable)

Range:  $\pm 100$  VDC,  $\pm 70$  Vrms AC

Accuracy: 5% of full scale

Bandwidth: 0 to 50 kHz

## HORIZONTAL SWEEP

Range: 20 uSec to 1 Sec / div. (Selectable)

## TRIGGER SELECTION

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

## SPECIAL FUNCTIONS

Markers: Absolute Voltage, Delta Voltage, Delta Frequency and Delta Period

# 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  $\pm 8$  V peak

Amplitude Flatness:  $\pm 0.2$  dB (300 Hz to 3 kHz), 1 dB point @ 20 kHz

1 kHz Tone Distortion: Not to exceed 1% THD

Impedance: 100 Ohms

External Modulation Input Level:  $\pm 1$  V peak reference

Amplitude Flatness:  $\pm 0.2$  dB (300 Hz to 3 kHz), 1 dB point @ 20 kHz

Impedance: 600 Ohms

External Microphone Input Amplitude Flatness:  $\pm 0.2$  dB (300 Hz to 3 kHz), 1 dB point @ 20 kHz

## Tracking Generator

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

## Digital Voltmeter (DVM)

Input Impedance: 1 Meg Ohm / 600 Ohm (Selectable)

Voltage Range: 1V, 10V, 70V full scale

Frequency Range: 50 Hz to 20 kHz

DC Accuracy: 1% full scale  $\pm 1$  LSB

AC Accuracy: 5% full scale  $\pm 1$  LSB

## Timebase

Output Frequency: 10 MHz

Stability: Aging:  $\pm 0.1$  ppm / year

Temp.:  $\pm 0.01$  ppm

Output Level: Minimum 0 dBm into 50 Ohms

Warm Up: 3 minutes: within  $\pm 0.1$  ppm

## Display

### FRONT PANEL DISPLAY

Resolution: 800 x 600

Size: Size: 8.4" (21.3 cm) Full Color LCD

### EXTERNAL DISPLAY

External Display: VGA

## Remote Interface (Optional Feature)

### Remote Front Panel

Available over Ethernet

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