

# JD746A

## RF Analyzer



**Spectrum Analyzer: 100 kHz to 4 GHz**

**Cable and Antenna Analyzer: 5 MHz to 4 GHz**

**Power Meter: 10 MHz to 4 GHz**

### Conditions of Specifications

The JD746A specifications apply under the following conditions.

- After 30 minute warm-up and then two hours of operation temperature.
- The instrument is operating within a valid calibration period.
- Data with no tolerance is considered as typical values.
- The 'typical' or 'nominal' values are defined as follows:
  - Typical: Expected performance of the instrument operating under 20 °C to 30 °C after being at this temperature for two hours.
  - Nominal: A general, descriptive term or parameter..

### Spectrum Analyzer (Standard)

Supplemental Information

#### Frequency

Frequency range	100 kHz to 4 GHz
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#### Internal 10 MHz Frequency Reference

Accuracy	$\pm 0.05$ ppm (25°C $\pm$ 25°C) + aging
Aging	$\pm 0.5$ ppm/year

#### Frequency Span

Range	0 Hz (Zero Span) 10 Hz to 4 GHz
Resolution	1 Hz

#### Resolution Bandwidth (RBW)

-3 dB bandwidth	1 Hz to 3 MHz	1-3-10 sequence
Accuracy		$\pm 10\%$ (nominal)

#### Video Bandwidth (VBW)

-3 dB bandwidth	1 Hz to 3 MHz	1-3-10 sequence
Accuracy		$\pm 10\%$ (nominal)

#### Single sideband (SSB) Phase Noise

RBW 10 kHz, VBW 1 kHz, RMS Detector

Carrier offset:		
30 kHz	$< -90$ dBc/Hz	Typical
100 kHz	$< -95$ dBc/Hz	
1 MHz	$< -102$ dBc/Hz	

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**Measurement Range**

DANL to +30 dBm	
Input attenuator range	0 to 50 dB, 5 dB steps

**Maximum Input Level**

Average continuous power	+ 20 dBm
DC voltage	± 50 VDC

**Displayed Average Noise Level (DANL)**

1 Hz RBW, 1 Hz VBW, 50 Ω Termination, 0 dB Attenuation, RMS Detector

Preamplifier Off:

10 MHz to 2.3 GHz	-140 dBm
>2.3 to 3.0 GHz	-138 dBm
>3.0 to 4.0 GHz	-135 dBm

Preamplifier On:

10 MHz to 2.3 GHz	-155 dBm
>2.3 to 3.0 GHz	-153 dBm
>3.0 to 4.0 GHz	-150 dBm

**Display Range**

Log scale and units	1 to 20 dB/division in 1 dB steps 10 divisions displayed dBm, dBV, dBmV, dBμV
Linear scale and units	10 divisions displayed V, mV, mW, W
Detectors	Normal, Positive Peak, Sample, Negative Peak, RMS
Number of traces	6
Trace functions	Clear/Write, Maximum Hold Minimum Hold, Capture, Load View On/Off

**Total Absolute Amplitude Accuracy**

Preamplifier off, power level > -50 dBm, auto coupled (25°C ± 5°C)

5 MHz to 4 GHz	±1.25 dB, ±0.5 dB (typical)	Attenuation < 40 dB
	±1.55 dB, ±1.0 dB (typical)	Attenuation ≥ 40 dB

**Reference Level**

Setting range	-120 dBm to +100 dBm
Setting resolution	
Log scale	0.1 dB
Linear scale	1% of reference level

**Markers**

Marker types	Normal, Delta, Delta Pair Noise, Frequency count marker
Number of markers	6
Marker functions	Peak, Next Peak, Peak Left, Peak Right, Minimum Search Marker to Center/Start/Stop

**RF Input VSWR**

1.5:1	Typical
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20 MHz to 4.0 GHz

**Second Harmonic Distortion (Second Harmonic Intercept: SHI)**

Mixer level = -25 dBm

10 MHz to 1.3 GHz	< -65 dBc	Typical
1.3 to 4.0 GHz	< -70 dBc	Typical

**Third Order Inter-modulation (Third Order Intercept: TOI)**

200 MHz to 2 GHz	+10 dBm	Typical
2 to 4 GHz	+12 dBm	Typical

**Spurious**

Inherent residual response

Input terminated, 0 dB attenuation, preamplifier off, RBW @10 kHz

20 MHz to 3 GHz	-90 dBm	Nominal
3 to 4 GHz	-85 dBm	Nominal
Exceptions	< -85 dBm @ 2497.8 MHz	
Input related spurious	< -70 dBc	

**Dynamic Range**

> 95 dB	2/3 (TOI-DANL) in 1Hz RBW
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**Sweep Time**

Range	80 ms to 1000 s	
	24 μs to 200 s	Span = 0 Hz (zero span)
Sweep mode	Continuous, single	

**Gated Sweep**

Trigger source	External
Gate length	1 μs to 100 ms
Gate delay	0 to 100 ms

**Trigger**

Trigger source	Free run, video, external
Trigger delay	
Range	0 to 200 s
Resolution	6 μs

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#### Measurements

Channel Power
Occupied BW
Spectrum Emission Mask
Adjacent Channel Power
Spurious Emissions
Field Strength
AM/FM Audio Demodulation
Can be set up CW signal generator simultaneously

#### Cable and Antenna Analyzer (Standard)

Supplemental Information

#### Frequency

Range	5 MHz to 4 GHz
Resolution	10 kHz
Accuracy	± 25 ppm

#### Data Points

126, 251, 501, 1001		
Measurement speed	1.65 ms/point	Nominal

#### Measurement Accuracy

Corrected directivity	40 dB (typical)	
Reflection uncertainty	$0.3 +  20\log(1+10^{-EP/20}) $	EP is calibration return loss value minus measured return loss value.

#### Output Power

High	+ 0 dBm	Typical
Low	-30 dBm	Typical

#### Dynamic Range

Reflection	60 dB
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#### Maximum Input Level

Average continuous power	+25 dBm	
DC voltage	± 50 VDC	
Interference immunity	+17 dBm on channel	
	0 dBm on frequency	Nominal

#### Measurements

##### Reflection (VSWR):

VSWR range	1 to 65
Return Loss range	0 to 60 dB
Resolution	0.01

##### Distance to Fault (DTF):

Vertical VSWR range	1 to 65	
Vertical return loss range	1 to 60 dB	
Vertical resolution	0.01	
Horizontal range	0 to (# of data points -1) x horizontal resolution	Maximum = 1500 m (4921 ft)
Horizontal resolution	$(1.5 \times 10^8) \times (Vp) / (\Delta) \times 0.95$	Vp=Propagation Velocity Delta= Stop Freq - Start Freq [Hz]

##### Cable Loss (1 port):

Range	0 to 30 dB
Resolution	0.01 dB

##### 1 Port Phase

Range	-180° to +180°
Resolution	0.01°

##### Smith Chart:

Resolution	0.01
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#### Power Meter (Standard)

##### Power Meter

Display range	-100 dBm to +100 dBm	
Offset range	0 to 60 dB	
Resolution	0.01 dB or 0.1xW	x = m, u, p

##### Internal Power Sensor

Display range	10 MHz to 4 GHz
Span	100 kHz to 100 MHz
Dynamic range	-120 dBm to +20 dBm
Maximum power	+20 dBm
Accuracy	Same as Spectrum Analyzer

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**External Power Sensor**

<b>Directional Power Sensors</b>	<b>JD731A</b>	<b>JD733A</b>		
Frequency range	300 MHz to 3800 MHz	150 MHz to 3800 MHz		
Dynamic range	Average	0.15 W to 150 W	Average	0.1 W to 50 W
	Peak	4 W to 400 W	Peak	0.1 W to 50 W
Connector type	Type N (f) on both ends			
Measurement type	Forward/reverse average power, forward peak power, VSWR			
Accuracy	$\pm 4\% + 0.05\text{ W}^1$			
<b>Terminating power sensors</b>	<b>JD732A</b>	<b>JD734A</b>	<b>JD736A</b>	
Frequency range	20 to 3800 MHz	20 to 3800 MHz	20 to 3800 MHz	
Dynamic range	-30 to 20 dBm	-30 to 20 dBm	-30 to 20 dBm	
Connector type	Type N (m)	Type N (m)	Type N (m)	
Measurement type	Average	Peak	Average and peak	
Accuracy	$\pm 7\% ^1$	$\pm 7\% ^1$	$\pm 7\% ^1$	

<sup>1</sup>CW condition at 25°C  $\pm$  10°C**2 Port Transmission Measurements (Option 001)****Frequency**

		Supplemental Information
Frequency range	5 MHz to 4 GHz	
Frequency resolution	10 kHz	

**Output Power**

High	0 dBm	Typical
Low	-30 dBm	Typical

**Measurement Speed**

2.2 ms/point	Nominal
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**Dynamic Range**

5 MHz to 3 GHz	80 dB
3 GHz to 4 GHz	75 dB

**Measurements****Insertion Loss/Gain**

Range	-120 to 100 dB
Resolution	0.01 dB

**2 port Phase**

Range	-180° to +180°
Resolution	0.01°

**Bias Tee (Option 002)****Voltage**

		Supplemental Information
Voltage range	+12 to +32 V	
Voltage resolution	0.1 V	

**Power**

8 W Max
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**CW Signal Generator (Option 003)****Frequency**

		Supplemental Information
Frequency range	25 MHz to 4 GHz	
Frequency reference	< $\pm 25$ ppm	
Frequency resolution	10 kHz	

**Output Power**

Range	0 dBm, -30 dBm to -80 dBm
Step	1 dB
Accuracy	$\pm 1.5$ dB

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**GPS Receiver and antenna (Option 010)**

**GPS Indicator**

	Supplemental Information
Latitude, Longitude, Altitude	

**High Frequency Accuracy**

		Spectrum, Interference, and Signal Analyzer
GPS lock	± 25 ppb	
Hold over	± 50 ppb	3 minutes after satellite locking
Connector	SMA, Female	

**Interference Analyzer (Option 011)**

**Measurements**

		Supplemental Information
Spectrum analyzer	Sound Indication, AM/FM audio demodulation, interference ID	
Spectrogram	Collect data up to 72 hours	
RSSI	Collect data up to 72 hours	Received signal strength indicator

**Channel Scanner (Option 012)**

**Frequency Range**

	Supplemental Information
100 kHz to 4 GHz	

**Measurement Range**

-110 dBm to +20 dBm
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**Measurements**

Channel scanner	1 to 20 channels
Frequency scanner	1 to 20 frequencies
Custom scanner	1 to 20 channels or frequencies

**General Information**

**Inputs and Outputs**

		Supplemental Information
RF in		Spectrum analyzer
Connector	Type-N, female	
Impedance	50 Ω (nominal)	
Damage level	> +40 dBm, >± 50 VDC	Nominal (3 minutes maximum)
Reflection/RF Out		Cable and antenna analyzer
Connector	Type-N, female	
Impedance	50 Ω (nominal)	
Damage level	>+37 dBm, >± 50 VDC	Nominal (3 minutes maximum)
RF in		Cable and antenna analyzer
Connector	Type-N, female	
Impedance	50 Ω (nominal)	
Maximum level	>+25 dBm, >±50 VDC	
External Trigger, GPS		
Connector	SMA, female	
Impedance	50 Ω (nominal)	
External Ref		
Connector	SMA, female	
Impedance	50 Ω (nominal)	
Input frequency	10 MHz, 13 MHz, 15 MHz	
Input range	-5 dBm to +5 dBm	
USB		
USB host	Type A, 1 port	Connects flash drive and power sensor
USB client	Type B, 1 port	Connects to PC for data transfer
LAN	RJ45, 10/100 Base-T	Connects to PC for data transfer
GPIO	RJ48C	
Audio jack	3.5 mm headphone jack	
External power	5.5 mm barrel connector	
Speaker	Built-in speaker	
<b>Display</b>		
Size	8 inch, LED backlight	
Resolution	800 x 600	

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**Power**

External DC input	12 VDC to 19 VDC	
Power Consumption	32.5 W	45 W maximum when battery charging
External AC/DC Adapter Input	100 to 240 VAC 50 to 60 Hz, 1.5 A	
Output	19 VDC, 4.74 A	

**Battery**

	10.8 V, 7200 mA-h	Lithium Ion
Operating time	> 3 hours	Typical
Charge time	A fully discharged battery takes about 2.5 hours to recharge to 80 %, 3.5 hours to 100 %	
Storage temperature	-20 to 50 °C, ≤ 85 % RH -4 to 122 °F, ≤ 85 % RH	The battery pack should be stored in an environment with low humidity. Extended exposure to temperature above 45 °C could degrade battery performance and life

**Data Storage**

Internal	Minimum 20 MB	Up to 200 instrument states and trace
External		Supports USB 2.0 compatible memory devices

**Environmental**

Operating temperature	-10 to 55°C (14 to 131°F)	
Maximum humidity	85 %	
Shock and vibration	MIL-PRF-28800F Class 2	
Storage temperature	-55 to 71°C (-67 to 160°F)	With the battery pack removed

**EMC**

EN 61326-2-1	Complies with European EMC
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**Safety**

EN 61010-1 2nd
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**Size and Weight**

Weight	< 4 kg (8.8 lbs) with battery	With standard configuration
Size	295 x 195 x 82 (mm) (11.6 x 7.7 x 3.2 (Inch))	Approximately (W x H x D)

**Warranty**

2 years
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**Calibration Cycle**

1 year
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**Order information****JD746A RF Analyzer**

100 kHz to 4 GHz	Spectrum Analyzer
5 MHz to 4 GHz	Cable and Antenna Analyzer <sup>1</sup>
10 MHz to 4 GHz	RF Power Meter Internal mode

**Options**

NOTE: Upgrade options for the JD746A use the designation JD746AU before the respective last three digit option number.

JD746A001	2 Port Transmission Measurement <sup>2</sup>
JD746A002	Bias Tee (Requires option 01)
JD746A003	CW Signal Generator
JD746A010	GPS Receiver and Antenna
JD746A011	Interference Analyzer <sup>3,4</sup>
JD746A012	Channel Scanner

<sup>1</sup>Requires Calibration Kit

<sup>2</sup>Requires Dual port Calibration kit

<sup>3</sup>Highly recommends adding JD746A010

<sup>4</sup>Highly recommends adding G70005035x and/or G70005036x

**Standard Accessories**

G710550322	AC/DC Power Adapter <sup>5</sup>
G710550335	Cross LAN Cable (1.5 m) <sup>5</sup>
GC73050515	USB A to B Cable (1.8 m) <sup>5</sup>
GC72450518	> 1 G Byte USB Memory <sup>5</sup>
G710550325	Rechargeable Lithium Ion Battery <sup>5</sup>
G710550323	Automotive Cigarette Lighter 12 VDC Adapter <sup>5</sup>
JD746A361	JD746A User's Manual and Application Software – CD

<sup>5</sup>Standard accessories can be purchased separately.

**Optional Power Sensors**

JD731A	Directional Power Sensor (peak and average power) Frequency: 300 MHz to 3.8 GHz Power: Average 0.15 to 150 W, Peak 4 to 400 W
JD733A	Directional Power Sensor (peak and average power) Frequency: 150 MHz to 3.5 GHz Power: Average/Peak 0.1 to 50 W
JD732A	Terminating Power Sensor (average power) Frequency: 20 MHz to 3.8 GHz Power: -30 to 20 dBm
JD734A	Terminating Power Sensor (peak power) Frequency: 20 MHz to 3.8 GHz Power: -30 to 20 dBm
JD736A	Terminating Power Sensor (peak and average power) Frequency: 20 MHz to 3.8 GHz Power: -30 to 20 dBm

**Order information****Optional Calibration Kits**

JD72450509	One Port N Type Calibration Kit Open/Short/Load N(m), 40 dB, 4 GHz, 50 Ω
JD72450510	One Port DIN Type Calibration Kit Open/Short/Load DIN(m), 40 dB, 4 GHz, 50 Ω
JD71050507	Dual Port N Type Calibration Kit, 50 Ω <ul style="list-style-type: none"> <li>– Open/Short/Load N(m), 40 dB, 4 GHz, 50 Ω</li> <li>– Two Adapters N(f) to N(f), DC to 4 GHz, 50 Ω</li> <li>– Two 1 m (3.28 ft) RF Test Cables, N(m) to N(m), DC to 18 GHz, 50 Ω</li> </ul>
JD71050508	Dual Port DIN Type Calibration Kit, 50 Ω <ul style="list-style-type: none"> <li>– Open/Short/Load DIN(m), 40 dB, 4 GHz, 50 Ω</li> <li>– Two 1 m (3.28 ft) RF Test Cables, N(m) to N(m), DC to 18 GHz, 50 Ω</li> <li>– Adapter N(f) to DIN(f), DC to 4 GHz, 50 Ω</li> <li>– Adapter N(f) to DIN(m), DC to 4 GHz, 50 Ω</li> <li>– Adapter DIN(f) to DIN(f), DC to 4 GHz, 50 Ω</li> <li>– Adapter DIN(m) to DIN(m), DC to 4 GHz, 50 Ω</li> </ul>

**Optional RF Cables**

G710050531	1.5 m (4.92 ft) RF Cable, DC to 18 GHz, N(m)-N(f), 50 Ω
G710050532	3.0 m (9.84 ft) RF Cable, DC to 18 GHz, N(m)-N(f), 50 Ω

**Optional Omni Antennas**

G700050351	RF Omni Antenna 400 MHz to 450 MHz
G700050352	RF Omni Antenna 450 MHz to 500 MHz
G700050353	RF Omni Antenna 806 MHz to 896 MHz
G700050354	RF Omni Antenna 870 MHz to 960 MHz
G700050355	RF Omni Antenna 1710 MHz to 2170 MHz

**Optional Yaggi Antennas**

G700050364	RF Yaggi Antenna 806 MHz to 896 MHz
G700050365	RF Yaggi Antenna 866 MHz to 960 MHz
G700050363	RF Yaggi Antenna 1750 MHz to 2390 MHz

**Optional Adapters**

G710050571	Adapter N(m) to DIN(f), DC to 4 GHz, 50 Ω
G710050572	Adapter DIN(m) to DIN(m), DC to 4 GHz, 50 Ω
G710050573	Adapter N(m) to SMA(f), DC to 18 GHz, 50 Ω
G710050574	Adapter N(m) to BNC(f), DC to 1.5 GHz, 50 Ω
G710050575	Adapter N(f) to N(f), DC to 4 GHz, 50 Ω
G710050576	Adapter N(m) to DIN(m), DC to 4 GHz, 50 Ω
G710050577	Adapter N(f) to DIN(f), DC to 4 GHz, 50 Ω
G710050578	Adapter N(f) to DIN(m), DC to 4 GHz, 50 Ω
G710050579	Adapter DIN(f) to DIN(f), DC to 4 GHz, 50 Ω



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**Order information**


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**Optional Miscellaneous**


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G710050581 Attenuator 40 dB, 100 W, DC to 4 GHz (Unidirectional)

JD74050341 Soft Carrying Case

JD71050342 Hard Carrying Case

JD71050343 Backpack Carrying Case

G710550324 External Battery Charger

JD746A362 JD746A User's Manual – Printed Version

**Test & Measurement Regional Sales**

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