

# BIRD DIAGNOSTIC SYSTEM

## Inline Voltage & Current Probe

### BDS2 SYSTEM

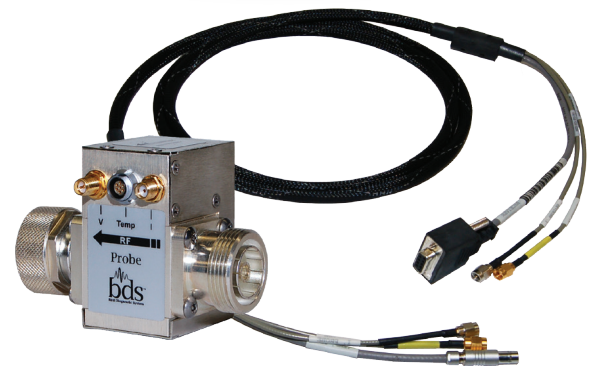


## Identify & Minimize RF Process Variability

Using sophisticated parallel signal processing, the BDS2 simultaneously measures and reports voltage, current, and phase angle at multiple fundamental, harmonic and intermodulation frequencies.

A robust frequency tracking algorithm guarantees accurate measurements under dynamic signal conditions. With this data, power and impedance are calculated at each frequency, giving users the ability to identify small discrepancies that may make the difference between a successful and a failed process.

The optional Time-Domain mode allows exceptional visibility into the shape of pulsed RF waveforms in the non-50 ohm environment. Similar to an oscilloscope, the BDS2 will display a one-shot, triggered view of the pulse envelope. Uniquely, however, the BDS2 will display the waveform in voltage, current, phase, power, or impedance to the fully-specified accuracy of the system.



### PRODUCT FEATURES

- 1% accurate measurement of RF voltage and current with a locked system
- Calculated impedance, RF power
- Multi-level pulse or CW waveforms
- 1-3 fundamental frequencies
- 4 harmonics per fundamental frequency
- 6 intermodulation products per fundamental pair
- Time-domain mode
- Tracking & Spectral search mode
- Ethernet enabled

### APPLICATIONS

- Chamber to chamber matching
- RF process monitoring
- Impedance matching
- Troubleshooting RF delivery system
- Identify process drifts
- Harmonic levels up to 252 MHz are available for analysis
- Voltage, current, phase and delivered power comparison

## SYSTEM COMPONENTS - UNLOCKED SYSTEM

<b>Receiver</b> 7001A900-2	BDS2 Single Ch. Receiver w/Ethernet
<b>Calibrated Data Cable</b> 7001B040-5M	RF/Data Cable Set 5 M straight
<b>Sensor Options*</b> 7001A550-1-xx yy	Sensor, BDS2, QC Connector (Choose xx yy options from chart below)
7001A550-2	Sensor, BDS2, Protruding Dielectric Connection

## SYSTEM KITS - LOCKED SYSTEM

7001A500-1-xxyy	BDS2 Kit (Receiver, Cable and Sensor Kit), QC Connectors (Choose xx yy options from chart below)
7001A500-1-2	BDS2 Kit (Receiver, Cable and Sensor Kit), Protruding Dielectric Connection

## CONNECTION OPTIONS\*\*

Input Connector (xx)	Output Connector (yy)
01 = N(f)	01 = N(f)
02 = N(m)	02 = N(m)
12 = HN(f)	12 = HN(f)
13 = HN(m)	13 = HN(m)
14 = 7/16(f)	14 = 7/16(f)
15 = 7/16(m)	15 = 7/16(m)
34 = LC(f)	34 = LC(f)
35 = LC(m)	35 = LC(m)

## SYSTEM PROFILES

Parameter	Voltage	Current	Phase Angle
<b>Measurement</b>	RF: 1 to 3000V <sub>rms</sub> (Note 1)	0.1 to 100 A <sub>rms</sub> (Note 1)	-180° to + 180°
<b>Resolution</b>	IEEE 754 Single Precision Floating Point		
<b>Uncertainty</b> <b>307 kHz - 1 MHz</b> <b>Locked System</b> (Note 2)	for F <sub>n</sub> , ± 0.5 V or 1% of reading whichever is greater for F <sub>n</sub> , ± 1.0 V or 2% of reading, whichever is greater (95% confidence interval)	for F <sub>n</sub> , ± 0.05 A or 1% of reading whichever is greater for F <sub>n</sub> , ± 0.1 A or 2% of reading, whichever is greater (95% confidence interval)	<b>Absolute Angle:</b> F <sub>n</sub> ≥ 10 V, 1A: ±1° F <sub>n</sub> < 10 V, 1A: ±4° F <sub>n</sub> ≥ 10 V, 1A: ±2° F <sub>n</sub> < 10 V, 1A: ±6° (95% confidence interval)
<b>Uncertainty</b> <b>1-252 MHz</b> <b>Locked System</b> (Note 2)	for F <sub>n</sub> , ± 0.1 V or 1% of reading whichever is greater for F <sub>n</sub> , ± 0.2 V or 2% of reading, whichever is greater (95% confidence interval)	for F <sub>n</sub> , ± 0.01 A or 1% of reading whichever is greater for F <sub>n</sub> , ± 0.02 A or 2% of reading, whichever is greater (95% confidence interval)	
<b>Uncertainty</b> <b>307 kHz - 1 MHz</b> <b>Unlocked System</b> (Note 2)	for F <sub>n</sub> , ± 1.0 V or 2% of reading whichever is greater for F <sub>n</sub> , ± 2.0 V or 4% of reading, whichever is greater (95% confidence interval)	for F <sub>n</sub> , ± 0.1 A or 2% of reading whichever is greater for F <sub>n</sub> , ± 0.2 A or 4% of reading, whichever is greater (95% confidence interval)	<b>Absolute Angle:</b> F <sub>n</sub> ≥ 10 V, 1A: ±1° F <sub>n</sub> < 10 V, 1A: ±4° F <sub>n</sub> ≥ 10 V, 1A: ±2° F <sub>n</sub> < 10 V, 1A: ±6° (95% confidence interval)
<b>Uncertainty</b> <b>1-252 MHz</b> <b>Unlocked System</b> (Note 2)	for F <sub>n</sub> , ± 0.2 V or 2% of reading whichever is greater for F <sub>n</sub> , ± 0.4 V or 4% of reading, whichever is greater (95% confidence interval)	for F <sub>n</sub> , ± 0.02 A or 2% of reading whichever is greater for F <sub>n</sub> , ± 0.04 A or 4% of reading, whichever is greater (95% confidence interval)	

\*Contact factory for a custom designed sensor and custom frequency combinations.

\*\* Contact factory for additional connector options.

Note 1: Maximum power is limited by the size of the RF frequency (25 kW max average power at 13.56 MHz).

Note 2: At customer specified frequencies.

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## TIME DOMAIN MEASUREMENT OPTIONS

7001A993-1	Factory Install License
7001A993F-1	Field Install License

## TIME DOMAIN MEASUREMENT MODE

<b>Time Resolution</b>	500 ns
<b>Configurable Time Scale</b>	0.1 to 10 ms
<b>Average</b>	Trace Average
<b>Trigger</b>	Voltage or current waveform Rising or falling edge External triggering Upper/lower thresholds Holdoff
<b>Pre- and Post- Trigger Buffer</b>	5% to 95%



## MEASUREMENT

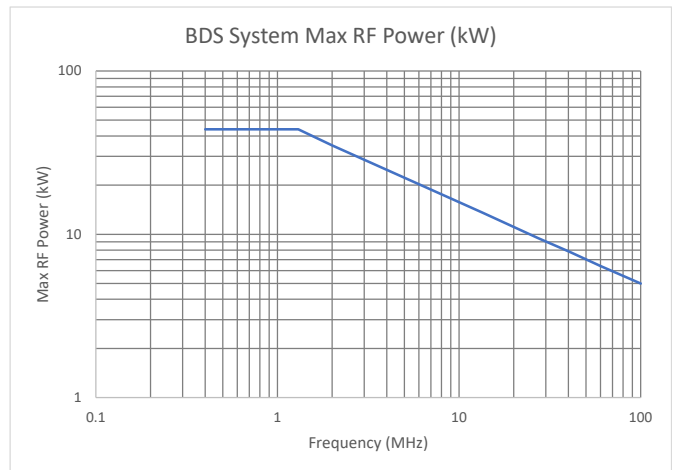
<b>Measurements</b>	Voltage, current, phase, frequency, impedance, power at frequencies selected by user
<b>Frequency Range</b>	307 kHz - 252 MHz (Sensor Dependent)
<b>Frequency Resolution</b>	100 Hz
<b>Frequency Accuracy</b>	± 1 kHz
<b>Number of Fundamentals</b>	Up to 3 simultaneously. For more than 1 fundamental, choose from the following (or contact the factory for custom combinations): - 0.4, 13.56, 160 MHz - 0.4, 60 MHz - 1, 13.56 MHz - 2, 27.12, 60 MHz - 3.2, 40.68 MHz - 3.2, 60 MHz - 12.88, 40.68 MHz - 13.56, 100 MHz
<b>Tracking Frequency Slew Rate</b>	2 GHz/sec
<b>Tracking Minimum Pulse Width</b>	5 µsec
<b>Number of Harmonics</b>	4 harmonics per fundamental, 6 intermodulation products per pair of fundamentals up to 252 MHz  Limited by the maximum number of measurement channels  Tracking & Spectral search mode: 12 harmonics standard mode 6 in time domain mode
<b>Update Rates</b>	100 Hz typical
<b>Network Protocol</b>	Ethernet
<b>RF Power Max</b>	Determined by RF sensor, (Typically 10kW or higher)
<b>RF Connector</b>	Custom or QC
<b>Operating Modes</b>	Tracking mode, Spectral Search mode

## ENVIRONMENTAL

<b>Receiver Operating Temperature</b>	20 °C to 40 °C (68 °F to 104 °F)
<b>Receiver Storage Temperature</b>	-20 °C to 80 °C (-4 °F to 176 °F)
<b>Cable Operating Temperature</b>	0 °C to 100 °C (32 °F to 212 °F)
<b>Cable Storage Temperature</b>	-20 °C to 100 °C (-4 °F to 212 °F)
<b>Sensor Operating/Storage Temperature</b>	Refer to sensor specification
<b>Humidity</b>	85% maximum (non-condensing)
<b>Air Pressure</b>	745 mbar (equivalent to 2,500 m/ 8,200 ft max altitude)

## POWER

<b>Operating Power</b>	15 VDC, 2.5 A nominal
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- The chart above is based on the standard BDS Sensor's line section
- Further reduction in max power may apply depending on the selection of the sensor's RF connectors



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