

Specifications, Power Sensors



CAUTION

Changing the sensor's connectors will invalidate calibration data, and may reduce the maximum power rating of the unit.

Specifications Common to all Sensors

Impedance, Nominal	50 ohms
Max. Allowable Terminating VSWR	2.00:1
Calibration Technique	Frequency-specific calibration factors stored in nonvolatile memory in each sensor. Sensor output corrected for frequency and temperature within specified ranges.
Calibration Cycle, Nominal	6 months
Accuracy, Reflected	Calculated from FWD accuracy and FWD power $\text{RFL Accuracy} = \text{FWD Accuracy} + \frac{\text{FWD Power}}{10 \text{ Directivity}/10}$
Accuracy, VSWR	Calculated from FWD and RFL power $\text{VSWR} = \left(1 + \sqrt{\frac{P_R}{P_F}} \right) / \left(1 - \sqrt{\frac{P_R}{P_F}} \right)$
Sampling Rate, Nominal	2 readings/second
Operating Power	Supplied by power meter via sensor cable
Connectors	
4028B10M	1-5/8" EIA Flanged
4028C10M	3-1/8" EIA Flanged
4028A Series	7-16 DIN, LC, HN, or 7/8"
All other models	Customer specified from QC list, appropriate for frequency and power.
CE	CE Compliant. Refer to Declaration of Conformity for specific standards.
Humidity, Max.	95% (noncondensing)
Altitude, Max.	10,000 feet (3,000 m)
Temperature Range	
Operating	0 to 50 °C (32 to 122 °F)
Storage	-20 to +70 °C (-4 to +158 °F)
Dimensions	
4028B10M	6.75"L x 3.5"W x 4.75"H (175 x 89 x 121 mm)
4028A Series	4.7"L x 3.2"W x 3.8"H (120 x 82 x 97mm)
All other models	5.2"L x 2.5"W x 3.25"H (137 x 64 x 83 mm)
Weight, Nominal	
4028B10M, 4028C10M	5 lb. 2 oz. (2.33 kg)
4028A2M, 3M, 4M, 10M, and 25M	3 lb. 5 oz. (1.5 kg)
All other models	1 lb. 13 oz. (0.8 kg)

Bird 4020 Series RF Power Sensors

RF Power Range	
4021, 4022	300 mW – 1 kW
4024, 4025	3 W – 10 kW
Frequency Range	
4021	1.8 – 32 MHz
4022	25 MHz – 1 GHz
4024	1.5 – 32 MHz
4025	100 kHz – 2.5 MHz
Accuracy, Fwd, Best Case*	
	± 3% (1σ)
VSWR, Max.	
4021, 4024, 4025	1.05:1
4022	1.05:1, 25 – 512 MHz 1.10:1, 512 MHz – 1 GHz
Insertion Loss, Max.	
4021, 4024, 4025	0.05 dB
4022	0.05 dB, 25 – 512 MHz 0.13 dB, 512 MHz – 1 GHz
Directivity, Min.	
4021, 4022	30 dB
4024	28 dB, 1.5 – 2.5 and 25 – 32 MHz 30 dB, 2.5 – 25 MHz
4025	28 dB, 100 – 125 kHz 30 dB, 125 – 2500 kHz

* For rated accuracy, no more than 1% AM; Harmonics –50 dBc or less
Derate accuracy by 3.0% (1σ) below 15 °C and above 35 °C



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Bird 4027A Series RF Power Sensors

Frequency Range			
4027A250K	250 – 400 kHz	4027A12M	10 – 15 MHz
4027A400K	400 – 550 kHz	4027A25M	25 – 30 MHz
4027A800K	800 – 950 kHz	4027A35M	35 – 45 MHz
4027A2M	1.5 – 2.5 MHz	4027A60M	45 – 65 MHz
4027A4M	3 – 5 MHz	4027A100M	95 – 105 MHz
4027A10M	10 – 15 MHz	4027A150M	150 – 170 MHz
RF Power Range			
4027A12M	300 mW – 1 kW	4027A100M	3 W – 5 kW
4027A25M	3 W – 9 kW	4027A150M	3 W – 4 kW
4027A35M	3 W – 7.5 kW	All other models	3 W – 10 kW
4027A60M	3 W – 6 kW		
Accuracy, Fwd, Best Case*		$\pm 1.0\%$ (1σ)	
Calibration Frequencies, Typical (MHz)[†]			
4027A250K	0.25, 0.40	4027A12M	10.0, 13.56, 15.0
4027A400K	0.40	4027A25M	25.76, 27.12, 28.48
4027A800K	0.90	4027A35M	40.68
4027A2M	1.8, 2.0, 2.17	4027A60M	55.0, 60.0
4027A4M	4.0, 5.0	4027A100M	95.0, 100.0
4027A10M	10.0, 13.56, 15.0	4027A150M	162.0
Calibration Power, Typical			
4027A12M	700 W		
All other models	1.7 kW		
VSWR, Max.		1.05:1	
Insertion Loss, Max.		0.05 dB (with female “N” connectors)	
Directivity, Min.			
4027A12M	30 dB		
All other models	28 dB		

* For rated accuracy, no more than 1% AM; Harmonics –50 dBc or less
 Derate accuracy by 1% (1σ) outside cal. power or cal. frequency
 Derate accuracy by 1% (1σ) below 15 °C and above 35 °C

† Other calibration frequencies available upon request

Bird 4027F Series RF Power Sensors

Frequency Range	
4027F2M	1.8 – 2.2 MHz
4027F10M	12 – 15 MHz
4027F60M	57 – 63 MHz
RF Power Range	
4027F2M, 4027F10M	0.1 – 10 kW
4027F60M	0.1 – 3 kW
Accuracy, Fwd, Best Case	± 1.0% (2σ)
Calibration Frequencies, Typical*	
4027F2M	1.8, 2.0, 2.17 MHz
4027F10M	12.0, 12.5, 13.56, 14.0, 15.0 MHz
4027F60M	57.0, 58.5, 60.0, 61.5, 63.0 MHz
Calibration Power, Typical	1.7 kW
Harmonic Rejection, Min.	
4027F2M	26 dB @ 3.6 – 3.8 MHz, 30 dB @ > 3.8 MHz
4027F10M	30 dB @ > 25 MHz
4027F60M	30 dB @ > 114 MHz
Low Frequency Rejection, Min.	
4027F10M	30 dB @ < 1 MHz
4027F60M	30 dB @ < 15 MHz
Max Error Induced by 10% AM	
4027F2M, 4027F10M	0.2% @ < 5 kW, 1.0% @ 5 – 10 kW
4027F60M	0.2% @ < 1.5 kW, 1.0% @ 1.5 – 3 kW
VSWR, Max.	1.05:1
Insertion Loss, Max.	0.05 dB (with female “N” connectors)
Directivity, Min.	28 dB

* Other calibration frequencies available upon request

Uncertainty Budget, 4027F Series*		4027F2M	4027F10M	4027F60M
Frequency	at cal freq	± 0.1%	± 0.1%	± 0.1%
Error...	not at cal freq	± 0.5%	± 1.5%	± 0.5%
Power	at cal power	± 0.1%	± 0.1%	± 0.1%
Linearity...	not at cal power	± 1.0%	± 0.5%	± 1.0%
Temperature	within 20 to 30°C	± 0.65%	± 0.6%	± 0.5%
Uncert...	outside 20 to 30°C	± 3.2%	-3.0, +0.75%	± 2.9%
Calibration Uncertainty		± 0.6%	± 0.6%	± 0.6%
Resolution	at cal power	± 0.06%	± 0.06%	± 0.06%
Uncert...	not at cal power†	± 0.34%	± 0.34%	± 0.34%
Other sources of error		± 0.4%	± 0.5%	± 0.6%
Best Case RSS Uncertainty		± 1.0%	± 1.0%	± 1.0%

* All values 2σ

† Resolution uncertainty is error due to limited display digits. Actual uncertainty can be calculated as

$$\pm (1 \text{ in least significant digit}) / \text{Reading}$$

For a 3.5-digit display, worst case is at 300W. Least significant digit is one watt, uncertainty is ± 1W out of 300 or 0.34%. For a 4.5-digit display, least significant digit is 0.1W, so the uncertainty is 0.034%

Bird 4028A and 4028B Series RF Power Sensors

Frequency Range	
4028A250K	250 – 400 kHz
4028A400K	400 – 550 kHz
4028A2M	1.5 – 2.5 MHz
4028A3M	2.5 – 3.5 MHz
4028A4M	3.5 – 4.5 MHz
4028A10M, 4028B10M, 4028C10M	10 – 15 MHz
4028A25M	25 – 30 MHz
RF Power Range	
4028A250K, 4028A400K	1 kW – 20 kW
4028C10M	500W – 50 kW
All other models	1 kW – 25 kW
Accuracy, Fwd, Best Case*	± 2.0% (2 σ)
Calibration Frequencies, Typical (MHz)[†]	
4028A250K	0.25, 0.40
4028A400K	0.40
4028A2M	1.8, 2.0, 2.17
4028A3M	2.5, 3.2, 3.5
4028A4M	3.5, 4.0
4028A10M, 4028B10M, 4028C10M	10.0, 13.56, 15.0
4028A25M	25.76, 27.12, 28.48
Calibration Power, Typical	3.5 kW
VSWR, Max.	1.05:1
Insertion Loss, Max.	0.05 dB (with female 7-16 DIN connectors)
Directivity, Min.	28 dB

* For rated accuracy, no more than 1% AM; Harmonics –50 dBc or less
 Derate accuracy by 2% (2 σ) outside cal. power or cal. frequency
 Derate accuracy by 2% (2 σ) below 15 °C and above 35 °C

† Other calibration frequencies available upon request

Specifications, RS-232 Interface

RS-232 Interface Module

Logic Levels	Meets all EIA Standard RS-232-C specifications
Modes of Operation	Switch and bus selectable
Talk Always	Allows the 4421 to send to the bus keyboard-initiated measurements only
Addressable	Allows the 4421 to be commanded by an RS-232 interface controller
Connector	RS-232 Interface Type
Humidity, Max	95% (non-condensing)
Altitude, Max	10,000 feet (3,000 m)
Temperature Range	
Operating	0 to 50° C (32 to 122° F)
Storage	–20 to +50° C (–4 to +122° F)
Dimensions	6.5" L x 4.5" W (165 x 115 mm)

Weight	0.5 lbs (0.23 kg) nominal
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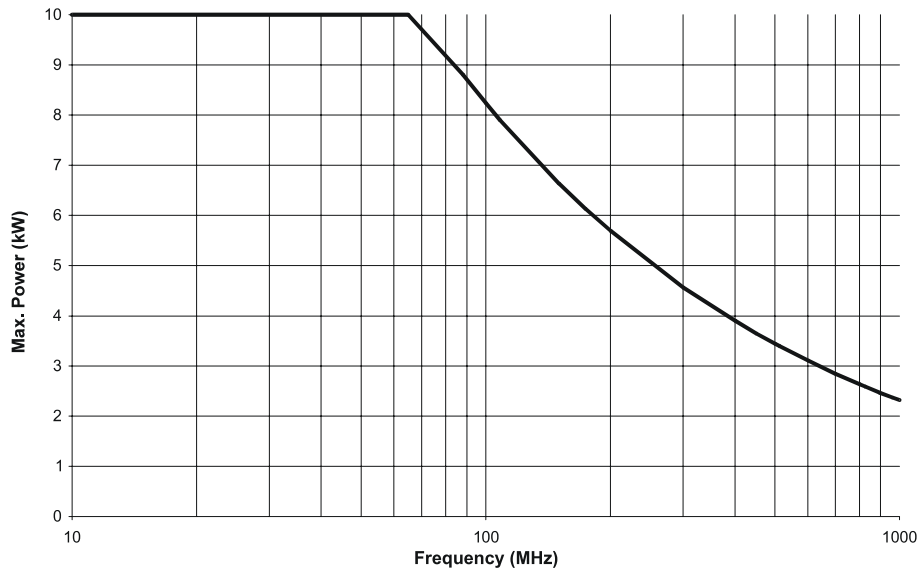
Specifications, IEEE-488 GPIB Interface

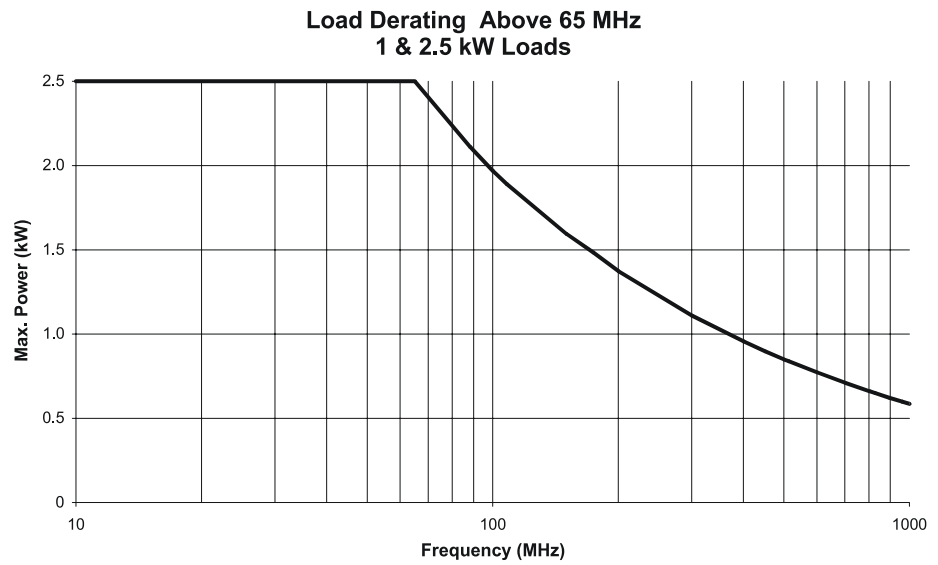
IEEE-488 Interface

Logic Levels	Meets all IEEE Standard 488-1978 specifications
Modes of Operation	Switch and bus selectable
Talk Only	Allows the 4421 to send to the bus keyboard-initiated measurements only
Addressable	Allows the 4422 to be addressed as talker or listener under the command of an IEEE-488 bus controller
Connector	Standard IEEE-488 bus type
Humidity, Max	95% (non-condensing)
Altitude, Max	10,000 feet (3,000 m)
Temperature Range	
Operating	0 to 50° C (32 to 122° F)
Storage	-20 to +50° C (-4 to +122° F)
Dimensions	6.5" L x 4.5" W (165 x 115 mm)
Weight, Nominal	0.5 lbs (0.23 kg)

High Frequency Derating

**Load Derating Above 65 MHz
5 & 10 kW Loads**





Replacement Parts

Description	Qty	Part Number
Fuse, IEC (5 x 20 mm) Time Lag Type T 115 Vac, T630 mA 230 Vac, T315 mA	1	5A2257-10 5A2257-7
Cord, AC Power 115 Vac 230 Vac Harmonized	1	5-1286 5A2416
Plug, 115 Vac	1	5A2626
Cable, Sensor	1	4421-038
Grommet	1	4421A372
Cordreel	1	4421A383
Casters	4	4421A384
Handle	1	4421A385
IEEE-488 Bus Interface Module	1	4421-489-2
Cable, IEEE-488 2 m 1 m	1	5-1317-2 5-1317-1
RS-232 Bus Interface Module	1	4421-233-1
Cable, RS-232 10 ft. 5 ft.	1	5-1662-2 5-1662-1
Null Modem Kit (RS-232 only)	1	4380-250
Panel Mount Kit	1	4421-250
Battery, C size, NiMH	8	5A1230

Available Connectors



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Connector	Part Number	Connector	Part Number	Connector	Part Number
HN (F)	4240-268	N (F)	4240-062	TRU 6934 (F)	4240-371
LC (F)	4240-031	7/16 Jack, IEC Type 169-4	4240-344	TRU 7958 (F)	4240-372

Connector	P/N	Connector	P/N	Connector	P/N
BNC-Female	4240-125	LT-Female	4240-018	Mini UHF-Female	4240-346
BNC-Male	4240-132	LT-Male	4240-012	UHF-Female	4240-050
C-Female	4240-100	N-Female	4240-062	UHF-Male	4240-179
C-Male	4240-110	N-Male	4240-063	1-5/8" EIA Fixed	4240-096
HN-Female	4240-268	SC-Female	4240-090	1-5/8" EIA Swivel	4240-208
HN-Male	4240-278	SMA-Female	4240-336	7/8" EIA	4240-002
LC-Female	4240-031	SMA-Male	4240-334	TNC-Female	4240-156
LC-Male	4240-025	7/16 Jack, IEC Type 169-4	4240-344	TNC-Male	4240-160
Open Term. # 10-32 Nut	4240-080	7/16 Plug, IEC Type 169-4	4240-363		

Customer Service

If you need to return the unit for any reason, contact the Bird Service Center for a return authorization. All instruments returned must be shipped prepaid and to the attention of Bird Service Center.

Bird Service Center
30303 Aurora Road
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For the location of the sales office nearest you, give us a call or visit our Web site at:

<http://www.bird-electronic.com>