Bird Technologies®

www.birdrf.com

General Catalog

Table of Contents

SignalHawk™

VNA | Spectrum Analyzers

SignalHawk™	
Display	8.4”, TFT, 800 x 600 pixel
Battery	5.5 hour, field replaceable
Environmental	Per MIL-PRF-28800F, Class 2
CE	EMC EN 61326-1:2006 and Safety EN 61010-1:2001
RF Input, N(F)	+20 dBm (100 mW) max
USB Connectivity	PC; USB drive and accessories
Size and Weight	11.5” x 10.5” x 3.8”, 7.8 lbs
Saved Trace Storage	300 internal; 90,000 USB drive
Win CE Viewers	Word, Excel, PPT, PDF, Image
Power Meter	5012B, 5010B, 5010T, 5011, 5011-EF, 5016B, 5017B, 5018B, 5019B External Sensors, Optional

		SH-36S	SH-361S	SH-362S	SH-362
VNA	**Ports**	N/A	1-Port VNA	2-Port VNA	
	Frequency Range		1.6 MHz to 3.6 GHz		
	Frequency Resolution		± 2 ppm uncertainty, 40kHz res		
	Data Points		705 default,12 to 11265 selectable		
	Sweep Time		0 .6 s with 705 data points		
	RF Output, N(F)		-40 dBm to +10 dBm, 1 dB steps		
	Interference Immunity		+13 dBm		
	Directivity		-42 dB calibrated		
	Measurements		Match (VSWR & Return Loss dB), Distance-to-Fault,- Cable Loss	Gain & Loss (Amplifier Gain, Insertion Loss, Antenna Isolation)	
	Loss/Gain		N/A	-90 to +50 dB, 12/24 V Int Bias Tee	
Spectrum Analyzer	**Frequency Range**	100 kHz to 3.6 GHz			N/A
	Frequency Resolution	1 Hz			
	Frequency Uncertainty	± 1 ppm			
	Reference Aging	± 1 ppm / year			
	Temperature Drift	± 1 ppm / °C			
	Data Points	705 displayed			
	Spectral Purity	-85 dBc @ 30 kHz			
	Sweep Time	2.2 s, full span; 1 ms, zero span			
	Resolution Bandwidth	100 Hz to 1 MHz RBW			
	Video Bandwidth	10 Hz to 300 kHz VBW			
	Amplitude Accuracy	± 1.0 dB typ, ± 1.5 dB max			
	Dynamic Range	66 dB, intermod-free			
	Noise Floor	-135 dBm DANL			
	Attenuator	0, 10, 20, or 30 dB; internal			
	Pre-Amplifier	+24 dB gain, internal			
	Single-Button Measurements	Occ BW, Channel Power, ACPR, Field Strength, AM/FM Demod, C/I			

SignalHawk™

VNA | Spectrum Analyzers

- Fast, Accurate, and Sensitive: -42 dB Directivity and -135 dBm Noise Floor
- Large High-Resolution Display: Full Color, Indoor/Outdoor Viewable
- Easy-to-Use: Intuitive Menus, One-Button Setup, and On-Board Help
- Long Battery Life: 5.5 Hours per Charge, Field Replaceable
- Rugged: Drop Tested per Military and European Standards
- USB Connectivity: USB Drive Stores 90,000 Traces

STANDARD ACCESSORIES

Soft Carry Case	7002A220-1
Operators Manual	920-SH36-OPS
Start-Up Instructions	920-SH36-REF
USB Cable, 10 ft, USB A (M) to USB B (M)	5A2653-10
AC Adapter/Charger	5A2743-1
Car Adapter/Charger	5A2238-3
Internal Li-Ion Battery, Field Replaceable	5A2720-2
PC Tool Software and Manual CD's	7002A210
USB Drive, Win CE Compatible	5A2745-1

NOTE: Spare standard accessories are available as optional accessories. Manuals and soft/firmware updates available at www.bird-electronic.com.

VNA ACCESSORIES

Calibration Combo, Open/Short/Load, N(M)	CAL-MN-C
Calibration Combo, Open/Short/Load, N(F)	CAL-FN-C
Calibration Combo, Open/Short/Load, 7/16 DIN(M)	CAL-ME-C
Calibration Combo, Open/Short/Load, 7/16 DIN(F)	CAL-FE-C
Load, 2W, N(M)	2-T-MN
Load, 2W, N(F)	2-T-FN

SPECTRUM ANALYZER ACCESSORIES

Field Strength Antenna Adapter, N(M) to SMA(F)	4240-500-10
Field Strength Antenna, 136 to 221 MHz, SMA(M)*	ANT-100
Field Strength Antenna, 400 to 512 MHz, SMA(M)*	ANT-400
Field Strength Antenna, 824 to 894 MHz, SMA(M)*	ANT-800
Field Strength Antenna, 890 to 960 MHz, SMA(M)*	ANT-900
Field Strength Antenna, 1710 to 1880 MHz, SMA(M)*	ANT-1800
Field Strength Antenna, 1850 to 1990 MHz, SMA(M)*	ANT-1900
Field Strength Antenna, 2400 to 2500 MHz, SMA(M)*	ANT-2400
Attenuator, 100 W, 40 dB, N(M) to N(F), 2.4 GHz	100-SA-MFN-40
Attenuator, 50 W, 30 dB, N(M) to N(F).4 GHz	50-A-MFN-30
Attenuator, 25 W, 30 dB, N(M) to N(F), 4 GHz	25-A-MFN-30
Attenuator, 10 W, 30 dB, N(M) to N(F), 4 GHz	10-A-MFN-30
Attenuator, 5 W, 20 dB, N(M) to N(F), 4 GHz	5-A-MFN-20
Attenuator, 2 W, 20 dB, N(M) to N(F), 4 GHz	2-A-MFN-20
Kit, GPS Sensor, RS232	7002A222-1

*Recommended for field strength antennas.

PC SignalHawk™

Model SH-36S-PC

- Transform your Laptop into a Spectrum Analyzer
- Fast, Accurate, and Sensitive: -135 dBm Noise Floor
- Same “Spectrum Analyzer” functionality as our hand held and rack mount units but in a convenient model
- Built in FCC Compliance Masks
- Waterfall display
- Sophisticated Spectrum Analysis software package included with the product
- Ideal solution for field techs who already carry a laptop with them as standard equipment

SignalHawk™
VNA | Spectrum Analyzer

Frequency Range	100 kHz to 3.6 GHz
Frequency Resolution	1 Hz
Frequency Uncertainty	± 1 ppm
Reference Aging	± 1 ppm / year
Temperature Drift	± 1 ppm / °C
Spectral Purity	-85 dBc @ 30 kHz
Sweep Time	2 s, full span; 1 ms, zero span
Resolution Bandwidth	100 Hz to 1 MHz RBW
Video Bandwidth	10 Hz to 300 kHz VBW
Amplitude Accuracy	± 1.0 dB typ, ± 1.5 dB max
Dynamic Range	66 dB, intermod-free
Noise Floor	-135 dBm DANL

Attenuator	0, 10, 20, or 30 dB; internal
Pre-Amplifier	+24 dB gain, internal
Data Points	705 displayed (settable)
Single-Button Measurements	Occ BW, Channel Power, ACPR, Field Strength, AM/FM Demod, C/I
Environmental	Per MIL-PRF-28800F, Class 2
CE	EMC EN 61326-1:2006 and Safety EN 61010-1:2001
RF Input, N(F)	+20 dBm (100 mW) max
Connectivity	USB 2.0
Operating & Store Temperature	0° to +50°C oper; -20° to +80°C store
Humidity & Altitude	95% humidity; 4600 m altitude
Size and Weight	7.5” x 7.0” x 3.0”, 3.5 lbs
Emissions Mask	IBOC, Analog FM, DTV and many others

STANDARD ACCESSORIES

Operators Manual 920-SHPC-OPS
Start-Up Instructions 920-SHPC-REF
USB Cable, 10 ft, USB A (M) to USB B (M) 5A2653-10
AC Adapter/Charger 5A2436
Car Adapter/Charger 5A2238-2
Internal Li-Ion Battery, Field Replaceable. RPK5B2431
PC Tool Software and Manual CD’s 7002A148

Rack Mount SignalHawk™

Model SH-36S-RM

- Over an Ethernet network, remotely analyze the performance of your system
- Diagnose problems from any computer on your network, whether in the same room or across the country
- High Performance in a Rack-Mount Spectrum Analyzer
- Fast, Accurate, and Sensitive: 66 dB Dynamic Range and -135 dBm Noise Floor
- Minimal Rack Space Required: Only 2 RU
- Eliminates trips to difficult remote locations
- Multiple sites can be monitored from one centralized location

SignalHawk™
VNA | Spectrum Analyzer

Frequency Range	100 kHz to 3.6 GHz
Frequency Resolution	1 Hz
Frequency Uncertainty	± 1 ppm
Reference Aging	± 1 ppm / year
Temperature Drift	± 1 ppm / °C
Spectral Purity	-85 dBc @ 30 kHz
Sweep Time	2 s, full span; 1 ms, zero span
Resolution Bandwidth	100 Hz to 1 MHz RBW
Video Bandwidth	10 Hz to 300 kHz VBW
Amplitude Accuracy	± 1.0 dB typ, ± 1.5 dB max
Dynamic Range	66 dB, intermod-free
Noise Floor	-135 dBm DANL

Attenuator	0, 10, 20, or 30 dB; internal
Pre-Amplifier	+24 dB gain, internal
Data Points	705 displayed (settable)
Single-Button Measurements	Occ BW, Channel Power, ACPR, Field Strength, AM/FM Demod, C/I
CE Compliant	Yes
RF Input, N(F)	+20 dBm (100 mW) max
Connectivity	Ethernet and USB 2.0
Operating & Store Temperature	0° to +50°C oper; -20° to +80°C store
Humidity & Altitude	95% humidity; 4600 m altitude
Size and Weight	19" x 10" x 3.5", 10 lbs.
Emissions Mask	IBOC, Analog FM, DTV and many others

OPTIONAL ACCESSORIES

Operators Manual	920-SHPC-OPS
Start-Up Instructions	920-SHPC-REF
USB Cable, 10 ft, USB A (M) to USB B (M)	5A2653-10
Attenuator, 100 W, 40 dB, N(M) to N(F), 2.4 GHz	100-SA-MFN-40
Attenuator, 50 W, 30 dB, N(M) to N(F).4 GHz	50-A-MFN-30
Attenuator, 25 W, 30 dB, N(M) to N(F), 4 GHz	25-A-MFN-30
Attenuator, 10 W, 30 dB, N(M) to N(F), 4 GHz	10-A-MFN-30
Attenuator, 5 W, 20 dB, N(M) to N(F), 4 GHz	5-A-MFN-20
Attenuator, 2 W, 20 dB, N(M) to N(F), 4 GHz	2-A-MFN-20
Adapter, N(M) to 7/16 DIN(M)	PA-MNME
Adapter, N(F) to 7/16 DIN(M)	PA-FNME
Adapter, N(M) to 7/16 DIN(F)	PA-MNFE
Adapter, N(F) to 7/16 DIN(F)	PA-FNFE
Adapter Kit, 7/16 DIN	4240-550
Adapter, N(F) to N(F)	4240-500-1
Adapter, N(M) to N(M)	4240-500-6
Adapter, N(M) to SMA(F)	4240-500-10

NOTE: Spare standard accessories are available as optional accessories. Manuals and soft/firmware updates available at www.bird-electronic.com.

Site Analyzer® Series

SA-XT Series

- One unit covers the entire 25-6000 MHz range!
- Frequency Domain Reflectometry (FDR) method results in a highly reliable assessment of the health of your system
- Easy to operate and field ready for first-time, occasional and experienced users
- Color display is clearly visible in direct sunlight
- With a single download you can view data as Distance to Fault or Measurement Match-no need to store two traces
- Fault location or DTF mode indicates VSWR or Return Loss levels at each point along the cable and antenna system length
- Cable Loss function measures insertion loss of the cable system over a given frequency range
- USB communication ports for connection to PC, field sensors and storage devices

	SA-3600XT	SA-6000XT
Frequency Range	25 - 3600 MHz	25 - 6000 MHz
Frequency Resolution	25 kHz; 25-800 MHz 50 kHz; 800-2500 MHz 150 kHz; 2500-3600 MHz	25 kHz; 25-800 MHz 50 kHz; 800-2500 MHz 150 kHz; 2500-6000 MHz
Power Measurement	Yes	Yes
Return Loss	0 to -60 dB	
Test Port	N-type female connector	
Impedance	50	
Speed	1 multi-frequency scan - (238 points)/2 seconds; (475 points)/3.5 seconds; (949 points)/6 seconds	
Trace Resolution	238 (default), 475, or 949 per trace data points	
Storage Capacity	15 Set-Ups/(300) 238 point traces	
Immunity to Interfering Signals	Rejects on-frequency signals up to +13 dBm	
Maximum Input Signal	+22 dBm	
Data Transfer	Sensor: USB 2.0 Type A PC: USB 2.0 Type B	
Internal	Rechargeable Lithium-Ion batteries. 5-hour minimum operating time. Auto shut-off conserves battery life.	
External DC	9 to 16 VDC fused, <3A	
External AC	90 to 264 VAC @ 45-66 Hz; AC/DC adapter required	
Operating Temperature	-10°C to 50°C (14°F to 122°F)	
Storage Temperature	-40°C to 80°C (-40°F to 176°F	
Battery Charging Temperature	0°C to 35°C (32°F to 95°F	
Humidity	95% ±5% max., (non-condensing)	
Altitude	Up to 15,000 feet (4572 m)	
Dimensions	10.5" x 8.4" x 3.3" (265 mm x 212 mm x 83 mm)	
Weight	5.5 lbs. (2.5 kg)	
Upgradeable	May be upgraded to SA-6000XT	No
CE	EMC EN 61326-1:2006 and Safety EN 61010-1:2001	
Compatible Devices	5012B, 5014, 5015, 5016B, 5017B, 5018B, 5019B, 7020	

STANDARD ACCESSORIES

AC Adapter (15 Vdc Output) 5B2229-1224G-1
Automobile Cigarette Lighter Adapter 5A2238-2
Soft Carrying Case 7002A850
USB Interface Cable 5A2653-10
PC Interface Software Kit 7002A840
Instruction Manual 920-SA-XT
Internal Battery Pack, with 4-pin Connector 5C2431-2

Antenna Testers

AT Series

- Cost-effective, fast, graphical way of determining the quality of mobile and base station antennas
- Rugged, easy-to-use, hand-held design with extended battery life makes it ideal for use in the field
- Tests the system in VSWR, Return Loss, Match Efficiency, or Reflection Coefficient (Rho)
- Single frequency readings and frequency sweeps allow for everything from pin-point tests to system optimization and tuning
- Can save up to 12 traces for comparison and tracking over time
- RS232 Interface allows communication

	AT-500	AT-800
Frequency Range	2 - 520 MHz	806 - 960 MHz
Frequency Resolution	20 kHz	30 kHz
Frequency Accuracy	±50 kHz	±100 kHz
Measurement Range	**VSWR:** 1.00 - 99.99, **Match Efficiency:** 00 to 100.0%, **Return Loss:** 0.0 to -32.0 dB	
Measurement Speed (Typical)	**Single Frequency:** 5 readings/second, **Swept Frequency:** 1 sweep/second	
Preprogrammed Bands	—	AMPS, NADC, GSM, PDC, CT2
Field Strength	0 to 100% (relative) Sensitivity for Full-scale deflection:	
	0.22 v/m @ 400 MHz	3m @ 12.6 W ERP
Test Port	Impedance: 50 ohm, nominal. Connector (others available)	
	N (F)	TNC (F)
Interface	Serial (female DB-9 connector)	
Power Requirements	Batteries: 6 rechargeable AA (KR-15/51) External DC: 11-16 VDC, External AC Adapter: 108-132 VAC @ 57-63 Hz, or 207-253 VAC @ 48-52 Hz	
Operating Temperature	0°C to 50°C (32°F to 122°F)	
Storage Temperature	-41°C to 71°C (-40°F to 160°F)	
Size (including connector)	8" H x 4 5/8" W x 1 3/4" D, (205 mm x 118mm x 42 mm)	
Weight	1 3/4 lbs. (0.8 kg)	
CE	EMC EN 61326-1:2006 and Safety EN 61010-1:2001	

STANDARD ACCESSORIES

Battery, NiMH, 1.2V AA 5B2230
Connector, N(f) 4240-403
Antenna - UHF N(m) 5A2228-3
Book, Instruction 920-AT500
Fuse RP5-1976-11

OPTIONAL ACCESSORIES

N/m Adapter 4240-402
BNC/m Adapter 4240-404
BNC/f Adapter 4240-405
TNC/m Adapter 4240-406
TNC/f Adapter 4240-407
UHF/m Adapter 4240-408
UHF/f Adapter 4240-409
SMA/m Adapter 4240-410
SMA/f Adapter 4240-411
Cigarette Lighter Adapter 5A2238-1
Verification Kit 7000A545
Carrying Case 5000-030

VIP System

- System of matched components calibrated for superior accuracy
- Measures voltage, current and the phase angle in complex applications
- Up to 3 fundamental frequencies can be measured simultaneously
- Proprietary architecture maintains correct phase angle information between the fundamental and harmonics
- Harmonic Levels up to 150 MHz are available for analysis

Frequency Range	300 kHz - 150 MHz (Sensor Dependent)
Frequency Resolution	100 Hz
Frequency Accuracy	± 1 kHz
Harmonics	10 maximum, up to 150 MHz (Sensor Dependent)
Number of fundamentals (F0)	Maximum of 3 simultaneously
Digital	> Voltage, current, phase, frequency, impedance, power at frequencies selected by user
Analog	5 Outputs, 0-10Vdc, 1000Ω-source
Update Rates	60 Hz typical for 1 fundamental (Note 1)
Network Protocol	DeviceNet, Ethernet

RF Power, Max	10 kW or maximum power limit of RF connector (Note 2)
RF Connector	Custom or QC
Receiver Operating Temp.	+20 to +40 °C (68 to 104 °F)
Receiver Storage Temp.	-20 to +80 °C (-4 to +176 °F)
Cable Operating Temp.	0 to +100 °C (32 to 212 °F)
Cable Storage Temp.	-20 to +100 °C (-4 to 212 °F)
Sensor Operating/ Storage Temp.	Refer to Sensor Specification
Humidity, Max;	85% Non-condensing
Air Pressure, Min.	745 mbar (equivalent to 2,500 m/ 8,200 ft. max altitude)
Operating Power	11-24 Vdc, 1.4-3A input to receiver

Parameter	Voltage	Current	Phase Angle
Measurement	RF: 1 to 3000 V_{rms} (Note 2)	0.1 to100 A_{rms} (Note 2)	-180° to + 180°
Resolution	IEEE 754 Single Precision Floating Point		
Uncertainty 300 kHz-1 MHz (Note 3)	for F_o, ± 0.5 V or 1% of reading whichever is greater for F_n , ± 1.0 V or 2% of reading, whichever is greater (95% confidence interval)	for F_o, ± 0.05 A or 1% of reading whichever is greater for F_n , ± 0.10 A or 2% of reading, whichever is greater (95% confidence interval)	Absolute Angle: for F_o > 10 V, 1 A: ±1° for F_o < 10 V, 1 A: ±4° for F_n > 10 V, 1 A: ±2° for F_n <10 V, 1 A: ±6° (95% confidence interval)
Uncertainty 1-100 MHz (Note 3)	for F_o, ± 0.1 V or 1% of reading whichever is greater for F_n , ± 0.2 V or 2% of reading, whichever is greater (95% confidence interval)	for F_o, ± 0.01 A or 1% of reading whichever is greater for F_n , ± 0.02 A or 2% of reading, whichever is greater (95% confidence interval)	Absolute Angle: for F_o > 10 V, 1 A: ±1° for F_o < 10 V, 1 A: ±4° for F_n > 10 V, 1 A: ±2° for F_n <10 V, 1 A: ±6° (95% confidence interval)
Uncertainty 100-150 MHz (Note 3)	for F_o, ± 0.2 V or 2% of reading whichever is greater for F_n , ± 0.4 V or 4% of reading, whichever is greater (95% confidence interval)	for F_o, ± 0.02 A or 2% of reading whichever is greater for F_n , ± 0.04 A or 4% of reading, whichever is great (95% confidence interval)	Absolute Angle: for F_o > 10 V, 1 A: ±2° for F_o < 10 V, 1 A: ±8° for F_n > 10 V, 1 A: ±4° for F_n <10 V, 1 A: ±12° (95% confidence interval)
Receiver Temperature Derating - from 25 °C	± 0.05% / °C	± 0.05% / °C	± 0.1 / °C

Note 1: Typical data rate for 1 fundamental, 10 harmonics, auto-ADC mode, and no averaging is 60 Hz. Data rate can vary significantly depending on configuration, network traffic, and host performance.

Note 2: Maximum power is limited by the size of the sensor line section and connectors. See sensor specification document.

Note 3: At customer specified frequencies.

Diagnostic System

BDS Series

bds
Bird Diagnostic System

- Measure multiple fundamental, harmonic and intermodulation frequencies
- Measures voltage and current in complex applications
- Operates while maintaining the phase angle of each measurement
- Enables users to identify small process discrepancies
- Works in environments with variable impedance
- An incredible tool for researching new RF technologies and repeating high precision processes

Frequency Range	1 MHz - 500 MHz (Sensor Dependent)
Frequency Resolution	100 Hz
Frequency Accuracy	± 1 kHz
Harmonics	15 maximum, up to 500 MHz (Sensor Dependent)
Number of fundamentals (F0)	Maximum of 5 simultaneously
Digital	> Voltage, current, phase, frequency, impedance, power at frequencies selected by user
Analog	5 Outputs, 0-10Vdc, 1000Ω-source
Update Rates	60 Hz typical for 1 fundamental (Note 1)
Network Protocol	DeviceNet, Ethernet
RF Power, Max	10 kW or maximum power limit of RF connector (Note 2)
RF Connector	Custom or QC

Receiver Operating Temp.	+20 to +40 °C (68 to 104 °F)
Receiver Storage Temp.	-20 to +80 °C (-4 to +176 °F)
Cable Operating Temp.	0 to +100 °C (32 to 212 °F)
Cable Storage Temp.	-20 to +100 °C (-4 to 212 °F)
Sensor Operating/ Storage Temp.	Refer to Sensor Specification
Humidity, Max;	85% Non-condensing
Air Pressure, Min.	745 mbar (equivalent to 2,500 m/ 8,200 ft. max altitude)
Operating Power	Sensor: Provide by receiver; Receiver: 11-24 Vdc, 1.4-3A
Environmental	MIL-PRF-28800F Class 3
CE	EMC EN 61326-1:2006 and Safety EN 61010-1:2001
FCC	CFR 47 Part 18 C:2005 Radiated Emissions

Parameter	Voltage	Current	Phase Angle
Range	RF: 1 - 3000 V_{rms} DC Bias: 3500 V dc Breakdown: > 10kV @ 745 mbar, 100 °C (Note 2)	0.1 - 100 A_{rms} (Note 2)	-180° to + 180° Resolution: 0.1°
Uncertainty 1-100 MHz (Note 3)	± 0.2V or 2% of reading whichever is greater (95% confidence interval)	± 0.2V or 2% of reading whichever is greater (95% confidence interval)	Absolute Angle: for F_o < 10V, 1A: ±1° for F^o < 10V, 1A: ±4° for F^o < 10V, 1A: ±2° for F^n < 10V, 1A: ±6° (95% confidence interval)
Uncertainty 100-500 MHz (Note 3)	± 0.3V or 3% of reading whichever is greater 25 W to 1 kW	± 0.3V or 3% of reading whichever is greater 25 W to 1 kW	Absolute Angle: for F_o < 10V, 1A: ±2° for F^o < 10V, 1A: ±8° for F^o < 10V, 1A: ±4° for F^n < 10V, 1A: ±12° (95% confidence interval)
Receiver Temperature Derating - from 25 °C	± 0.05% / °C	± 0.05% / °C	± 0.1 / °C

Note 1: Typical data rate for 1 fundamental, 10 harmonics, auto-ADC mode, and no averaging is 60 Hz. Data rate can vary significantly depending on configuration, network traffic, and host performance.

Note 2: Maximum power is limited by the size of the sensor line section and connectors. See sensor specification document.

Note 3: At customer specified frequencies.

Power Sensors

4020 Series

- Cost-effective solution for maintaining critical RF systems
- Only 4 models are required to cover the frequency range of 100 KHz to 1 GHz and power range from 300 mW - 10 kW
- Full-Scale Accuracy ±3% for applications requiring accurate forward and reflected power measurement
- Direct plug-in operation with industry-standard Bird® 4421 Multifunction Power Meter
- Low insertion loss (<0.05 dB)

	4021	4022	4024	4025
Frequency Range	1.8-32 MHz	25 MHz-1 GHz	1.5-32 MHz	100 kHz-2.5 MHz
Power Input	300 mW to 1 kW (1.2 kW max.)		3 W to 10 kW (12 kW max.)	
Accuracy, Forward	± 3% of reading from rated Max to rated Min. VSWR Measurement Range			
VSWR Measurement Range	1.00 to 2.00 (40.0 to 9.5 dB Return Loss)			
Directivity, Min.	30 dB		28 dB, 1.5-2.5 and 25-32 MHz 30 dB, 2.5-25 MHz	28 dB, 100-125 kHz 30 dB, 125-2500 kHz
Insertion Loss Max. (with female "N" connectors)	0.05 dB	0.05 dB, 25-512 MHz 0.13 dB, 512 MHz-1 GHz	0.05 dB	
VSWR, Max.	1.05:1	1.05:1, 25-512 MHz 1.10:1, 512 MHz-1 GHz	1.05:1	
Sampling Rate	Nominal 2 readings per second			

POWER REQUIREMENTS

External DC	12 VDC, supplied from Bird 4421 Power Meter

PHYSICAL SPECIFICATIONS

Dimensions	5.2" L x 2.5" W x 3.25" H (137 x 64 x 83 mm)
Weight	1lb., 11oz. (0.8 kg)
Connectors	N (F) standard, other customer specified from QC list appropriate for frequency and power.

ENVIRONMENTAL SPECIFICATIONS

Operating Temperature	0 to 50°C (32 to 122 °F)
Storage Temperature	-20 to 70°C (–4 to +158 °F)
Humidity	95% maximum (non-condensing)
Altitude	Up to 10,000 feet (3,048 m)
General EMC	Designed to carry CE mark (with immunity exception noted below)
Emissions	EN-55011, 1991, Class B
Immunity	EN-50082-1, 1995
Safety	EN-61010, 1993 in accordance with Council Directives 73/23/EEC and 93/68/EEC
CE	EMC EN 61326-1:2006
Calibration Cycle	Nominal 1 year

Power Sensors

4027A Series

- Bird's® Precision power sensors for precision laboratory applications
- Designed to bring superb accuracy and ease of use together for the laboratory engineer
- Capable of 1% accuracy at the calibrated frequency and power levels
- Calibration traceable to the National Institute of Standards and Technology
- Plug and Play with 4421 Meter
- No field calibration required
- Dozens of connector options available
- Automatic frequency compensation scheme, eliminating the error due to directional coupler frequency response

POWER MEASUREMENT

Accuracy	±1% (1s) at calibration frequencies and power levels; ±2% at other frequencies and power levels.
Calibration Power Level	1000 W units: 700 watts. 10 kW units: 1700 watts.
VSWR Range	1.0 to 2.0 (40.00 to 9.5 dB return loss)
Directivity	28 dB
Insertion Loss	< 0.05dB
Uniformity	2% maximum unit to unit, at calibration frequency and power levels.
Speed	2 readings per second.
Maximum Power	10 kW units - 12 kW max. 1 kW units - 1.2 kW max.

CONNECTORS

Type	Customer specified
Sensor Interface	Latch-n-Lock

POWER REQUIREMENTS

External DC	12 VDC, supplied from Bird 4421 Power Meter

PHYSICAL SPECIFICATIONS

Dimensions	5.2" L x 2.5" W x 3.25" H
Weight	1 lb. 13 oz. (0.8 kg)
Operating Temperature	15°C to 35°C (59°F to 95°F)
Storage Temperature	-40°C to 80°C (-40°F to 176°F)
Humidity	95% maximum (non-condensing)
Altitude	Up to 10,000 feet (3,048 m)
General EMC	Designed to carry CE mark (with immunity exception noted below)
Emissions	EN-55011, 1991, Class B
Immunity	EN-50082-1, 1995
Safety	EN-61010, 1993 in accordance with Council Directives 73/23/EEC and 93/68/EEC
CE	EMC EN 61326-1:2006
Calibration Cycle	6 month

POWER SENSOR SELECTION GUIDE

4027A Series	Power Range	Frequency
4027A12M	300mW to 1kW	10-15 MHz
4027A250K	3 W to 10kW	250-400 kHz
4027A400K	3 W to 10kW	400-550 kHz
4027A800K	3 W to 10kW	800-950 kHz
4027A2M	3 W to 10kW	1.5-2.5 MHz
4027A4M	3 W to 10kW	3-5 MHz
4027A10M	3 W to 10kW	10-15 MHz
4027A25M	3 W to 9kW	25-30 MHz
4027A35M	3 W to 7.5kW	35-45 MHz
4027A60M	3 W to 6kW	45-65 MHz
4027A100M	3 W to 5kW	95-105 MHz
4027A150M	3.75 W to 4kW	150-170 MHz

*For applications with harmonic content greater than -50 dBc, contact the factory for versions of the 4027A sensors with filtering included.

Power Sensors

4027F Series

- Filtered Design eliminates the effects of amplitude modulation and harmonics from the measurement
- Capable of 1% accuracy at the calibrated frequency and power levels
- Calibration traceable to the National Institute of Standards and Technology
- Plug and Play with 4421 Meter
- No field calibration required
- Dozens of connector options available

VSWR, Max	1.05:1
Insertion Loss, Max	0.05 dB (with female "N" connectors)
Directivity, Min.	28 dB
Connectors	Customer specifies from QC list, appropriate for frequency and power.
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, RFL	= Forward Accuracy + [FWD Power/10^(Directivity/10)]
Accuracy, VSWR	Calculated from FWD and RFL Power VSWR = [1 + sqrt (PR/PF)] / [1 - sqrt (PR/PF)]

Sampling Rate, Nominal	2 Readings/Seconds
Operating Power	Supplied by power meter via sensor cable
Operating Temp	0°C to 50°C (32°F to 122°F) (Derate accuracy outside 25°C ± 5°C)
Storage Temp	-20°C to 70°C (-4°F to 158°F)
Humidity Max.	95% (non-condensing)
Altitude, Max	10,000 Ft. (3,000m)
Applicable Standards	CE
Repeatability, Multiple Measurements Single Sensor	± 0.3% (95% c.l.) With female "N" connectors)
Dimensions, Nominal	5.2"L x 2.5"W x 3.25"H (137 x 64 x 83 mm) (With female "N" connectors)
Weight	1 lb. 13 oz. (0.8kg) (With female "N" connectors)

	4027F2M	4027F10M	4027F60M
Frequency Range	1.8 MHz - 2.2 MHz	12 MHz - 15 MHz	57-63 MHz
RF Power Range	100 W-10 kW		100 W-6 kW
Calibration Frequencies, Typical	1.8, 2.0, 2.17 MHz	12.0, 12.5, 13.56, 14.0, 15.0 MHz	57.0, 58.5, 60.0, 61.5, 63 MHz
	other calibration frequencies available upon request		
Calibration Power, Typical	1.7 kW		
Harmonic Rejection, Min.	26 dB @ 3.6-3.8 MHz, 30 dB @ >3.8 MHz	30 dB @ >25 MHz	30 dB @ >114.0 MHz
LF Rejection	Not Specified	30 dB @ <1 MHz	30 dB @ < 15.0 MHz
Max. Error Induced By 10% AM	0.2% @ <5 kW, 1% @ 5-10 kW		0.2% @ <1.5 kW, 1% @ 1.5- 3 kW
Accuracy, FWD, Best Case	±1.0% of Reading (2σ)		
	Uncertainty Budget (All values 2σ)		
Frequency Error–at cal freq	± 0.1%	± 0.1%	± 0.1%
–not at cal freq	± 0.5%	± 1.5%	± 0.5%
Power Linearity–at cal freq	± 0.1%	± 0.1%	± 0.1%
–not at cal freq	± 1.0%	± 0.5%	± 1.0%
Temp. Uncertainty–within 20 to 30°C	± 0.65%	± 0.6%	± 0.5%
–outside 20 to 30°C	± 3.2%	-3.0%, +0.75%	± 2.9%
Calibration Uncertainty	± 0.6%	± 0.6%	± 0.6%
Resolution Uncertainty–at cal freq	± 0.6%	± 0.6%	± 0.6%
–not at cal freq	± 0.34%	± 0.34%	± 0.34%
Other	± 0.4%	± 0.5%	± 0.6%
Best Case RSS Uncertainty	± 1.0%	± 1.0%	± 1.0%

*For connector options, please refer to our catalog or contact sales at 866.695.4569 or sales@bird-technologies.com

Power Sensors

4028 Series

- Family of high accuracy sensors for use in high power LCD, TFT, Solar, and Semiconductor processes
- Achieve tighter, more consistent RF power measurements for improved yield
- ±2% accuracy at specified calibration frequencies and power levels
- Direct, plug-in operation with the Bird Model 4421 RF Power Meter
- Measures power levels up to 50kW
- 4028A Series sensor can be configured with a wide range of connectors

POWER MEASUREMENT

Accuracy	±2% at calibration frequencies and power levels; ±3% at other frequencies and power levels. Add 2% to uncertainty outside 25± 10°C
Calibration Power Level	1.7kW
VSWR Range	1.0 to 2.0 (40.00 to 9.5 dB return loss)
Directivity	28 dB
Insertion Loss	< 0.05dB
Uniformity	2% maximum unit to unit, at calibration frequency and power levels.
Speed	2 readings per second.
Maximum Power	4028AxxK: 20kW 4028AxxM: 25kW 4028B: 25kW 4028C: 50kW

CONNECTORS

4028A Series	Customer specified
4028B Series	1-5/8 EIA Flanged
4028C Series	3-1/8 EIA Flanged
Sensor Interface	Latch-n-Lock

POWER REQUIREMENTS

External DC	12 VDC, supplied from Bird 4421 Power Meter

PHYSICAL SPECIFICATIONS

Dimensions	4.7" L x 3.2" W x 4.0" H (4028A Series) 6.8" L x 3.5" W x 4.8" H (4028B Series) 8.0" L x 5.2" W x 6.4" H (4028C Series)
Weight	3.3 lbs. (4028A Series) 5.2 lbs. (4028B Series) 7.3 lbs. (4028C Series)

ENVIRONMENTAL SPECIFICATIONS

Operating Temperature	0°C to 50°C (32°F to 122°F) (derate accuracy outside 25 ± 10°C)
Storage Temperature	-20°C to 70°C (-4°F to 158°F)
Humidity	95% non-condensing
Altitude	10,000 feet (3,000 m)
General EMC	Designed to carry CE mark (with immunity exception noted below)
Emissions	EN-55011, 1991, Class B
Immunity	EN-50082-1, 1995
Safety	EN-61010, 1993 in accordance with Council Directives 73/23/EEC and 93/68/EEC
Calibration Cycle	6 months

POWER SENSOR SELECTION GUIDE

4028 Series	Power Range	Frequency
4028A250K	1.0 kW-20 kW	250-400 kHz
4028A400K	1.0 kW-20 kW	400-550 kHz
4028A2M	1.0 kW-25 kW	1.5-2.5 MHz
4028A3M	1.0 kW-25 kW	2.5-3.5 MHz
4028A4M	1.0 kW-25 kW	3.5-4.5 MHz
4028A10M	1.0 kW-25 kW	10-15 MHz
4028A25M	1.0 kW-25 kW	25-30 MHz
4028B3M	1.0 kW-25 kW	2.5-4 MHz
4028B10M	1.0 kW-25 kW	10-15 MHz
4028C10M	500 W-50 kW	10-15 MHz

Multifunction Power Meter

4421

- Precision Power Meter for Semiconductor Processing Applications
- ±1% Accuracy when used with the Bird 4027 Series Sensors
- Wide Dynamic Range - The instrument will meet the full accuracy specification over a 35 dB dynamic range
- Excellent Measurement Repeatability - Typically <0.1%
- Digital Display - Along with automatic VSWR calculation
- Computer Interface - RS-232 and IEEE-488 standard

	4421
Power Range	100 mW to 50 kW FS
Frequency Range	100 kHz - 1 GHz
VSWR Range	1.0 - 199.9
Functions	Forward and reflected power in W or dBm, VSWR, return loss in dB and min./max. values
Overrange	Audible warning when RF power input exceeds 120% of sensor's maximum power range
Indication Display	3 1/2 digit-liquid crystal display with indicator for mode, measurement units, battery condition, programming status, and trend arrows. Switchable backlight.
Operating Power	115/230 VAC, 50/60 Hz or 8 nickel metal hydride 1.2 V cells (NEDA type 10014)
Nominal Size	12 9/32" L x 12 5/32" W x 4 1/4" H (312 mm x 309 mm x 108 mm) with handle extended 15 7/16" L (392 mm)
Weight	11 lbs. (5 kg.)
Interconnects	1 meter latch-n-lock coiled cable
Interfaces	IEEE-488 and RS-232 standard
Dimensions	4 1/2" x 6 1/2" (114 x 165 mm)
Required Product	RF Power Sensor
Accessories	Case 4300A215 19" Panel Mount Kit 4421-250 Latch & Lock Cable 4421-038
CE	EMC EN 61326-1:2006

	4421A530 (Calibration Key)
Weight	3 oz. (85 g.)
Cable Length	Approx. 3 ft. (1 m)w
Required Products	4421 power meter, 4020 Series power sensor, RF power source, RF low-pass filter, RF terminating power standard and IBM compatible computer fitted with a GPIB card-specify standard.
Measurement Cycle	1 Year
Limitation	Not compatible with 4027 or 4028 Series Sensor

Calibration Cart

SCC7 Series

- Turnkey RF Measurements
- Designed for easy transportation and effortless use
- Suitable for use in a clean room environment
- Stainless Steel Mobile Cart with Locking Wheels
- Available in International and Domestic Versions
- High Return Loss Ensures Minimal Power Measurement Error Contribution
- Frequency and Power Upgrades Available (Contact factory for more details)
- Service Plans Available with Bird® Service Center

Power Levels	1, 2.5, 5, 10 kW
Meter	4421
Sensor Options	4020 Series,4027A Series or 4027F Series
Load Options	8251, 8890-300, 8921, 8931-115, 8931-230
Impedance	50 ohm
Frequency Range 4020 Sensor	100 kHz - 1000 MHz
Frequency Range 4027A Sensor	250 kHz - 65 MHz
Frequency Range 4027F Sensor	1.8 MHz - 65 MHz
Accuracy 4020 Series	±3% (1s) across power and frequency range
Accuracy 4027A Series	±1% (1s) at calibration frequency and power levels; ±2% (1s) over remainder of power range, and at other than calibration frequencies
Accuracy 4027F Series	±1% (2s) across power and freqency range; ±2% (2s) over remainder

Casters	4 locking swivel
Connector Type	*Customer Specified
Operating Position	Vertical only
Power Requirements	115/230 VAC, ±10%, 50/60 Hz
Ambient Temp Range	0ºC to 45ºC (For 10 kW 0°C to +40°C)
Storage Temperature	-20ºC to +70ºC
Humidity	85% Max., Non condensing
Altitude	Load derated above 5,000 feet
5 kW & 10 kW Size/Weight	52" L x 20" W x 42" H / 250 lbs. Fully assembled
1 kW & 2.5 kW Size/Weight	42" L x 20" W x 42" H / 175 lbs. Fully assembled
Material of Construction	Stainless steel cart
CE	EMC EN 61326-1:2006 and Safety EN 61010-1:2001

*For connector options, please refer to our catalog or contact sales at 866.695.4569 or sales@bird-technologies.com

POWER SENSOR SELECTION GUIDE

4020 Series	Frequency Range	Power Input
4021	1.8-32 MHz	300 mW to 1 kW (1.2 kW max.)
4022	25-1000 MHz	300 mW to 1 kW (1.2 kW max.)
4024	1.5-32 MHz	3 W to 10 kW (12 kW max.)
4025	100-2500 kHz	3 W to 10 kW (12 kW max.)
4027A Series	**Frequency Range**	**Power Input**
4027A250K	250-400 kHz	3 W to 10 kW
4027A400K	400-550 kHz	3 W to 10 kW
4027A800K	800-950 kHz	3 W to 10 kW
4027A2M	1.5-2.5 MHz	3 W to 10 kW
4027A4M	3-5 MHz	3 W to 10 kW
4027A10M	10-15 MHz	3 W to 10 kW
4027A12M	10-15 MHz	300 mW to 1kW
4027A25M	25-30 MHz	3 W to 9 kW
4027A35M	35-45 MHz	3 W to 7.5 kW
4027A60M	45-65 MHz	3 W to 6 kW
4027A100M	95-105 MHz	3 W to 4 kW
4027A150M	150-170 MHz	3.75 W to 3.75 kW
4027F Series	**Frequency Range**	**Power Input**
4027F2M	1.8-2.2 MHz	100 W to 10 kW
4027F10M	12-15 MHz	100 W to 10 kW

LOADS GUIDE

High Power	Frequency Range & VSWR	Power Rating
8251	DC to 1 GHz at 1.1 max.	1000 W continuous
8890-300	DC to 1 GHz at 1.1 max. 1 GHz to 2 GHz at 1.25 max. 2 GHz to 2.4 GHz at 1.3 max.	2500 W continuous
8921	DC to 1 GHz at 1.1 max.	5000 W continuous
8931-115	DC to 400 MHz at 1.15 max. 400 MHz to 1 GHz at 1.20 max.	10 kW continuous w/ blower on 2.5 kW continuous w/ blower off
8931-230		
Ultra-Stable	**Frequency Range & VSWR**	**Power Rating**
8865SC13	DC to 28 MHz at 1.1 max. (VSWR less than 1.05:1)	1 kW
8890-300SC13	DC to 28 MHz at 1.1 max. (VSWR less than 1.05:1)	2.5 kW
8921SC13	DC to 28 MHz at 1.1 max. (VSWR less than 1.05:1)	5 kW
8931-115SC13	DC to 28 MHz at 1.1 max. (VSWR less than 1.05:1)	10 kW, 115 Volt
8931-230SC13	DC to 28 MHz at 1.1 max. (VSWR less than 1.05:1)	10 kW, 230 Volt

Multi-Sensor Calibration Cart

MSCC7 Series

- Turnkey RF measurements
- Designed for easy transportation and effortless use
- Integrates two switchable precision power sensors
- Suitable for use in a clean room environment
- Stainless steel mobile cart with locking wheels
- Available in International and Domestic versions
- Frequency and power upgrades available (Contact factory for more details)
- Service plans available with Bird® Service Center

Power Levels	5 kW or 10 kW for either sensor
Meter	4421
Sensor Options	4020, 4027A, or 4027F Series
Load Options	8921A100, 8931A400-115, 8931A400-230
Impedance	50 ohm
Frequency Range	100 kHz - 30 MHz (depending on sensor)
Accuracy 4020 Series	±3% (1s)
Accuracy 4027A Series	±1% (1s)
Accuracy 4027F Series	±1% (2s)
Casters	4 locking swivel

Connector Type	*Customer Specified
Operating Position	Vertical only
Power Requirements	115/230 VAC, ±10%, 50/60 Hz
Ambient Temp Range	0ºC to 35ºC (For 10 kW 0°C to +40°C)
Storage Temperature	-20ºC to +70ºC
Humidity	85% Max., Non condensing
Altitude	Load derated above 5,000 feet
5 kW & 10 kW Size/ Weight	52" L x 20" W x 42" H /290 lbs. Fully assembled
Material of Construction	Stainless steel cart
CE	EMC EN 61326-1:2006 and Safety EN 61010-1:2001

*For connector options, please refer to our catalog or contact sales at 866.695.4569 or sales@bird-technologies.com

POWER SENSOR SELECTION GUIDE

4020 Series	Frequency Range	Power Input
4021	1.8-32 MHz	300 mW to 1 kW (1.2 kW max.)
4024	1.5-32 MHz	3 W to 10 kW (12 kW max.)
4025	100-2500 kHz	3 W to 10 kW (12 kW max.)
4027A Series	**Frequency Range**	**Power Input**
4027A250K	250-400 kHz	3 W to 10 kW
4027A400K	400-550 kHz	3 W to 10 kW
4027A800K	800-950 kHz	3 W to 10 kW
4027A2M	1.5-2.5 MHz	3 W to 10 kW
4027A4M	3-5 MHz	3 W to 10 kW
4027A10M	10-15 MHz	3 W to 10 kW
4027A12M	10-15 MHz	300 mW to 1kW
4027A25M	25-30 MHz	3 W to 9 kW
4027F Series	**Frequency Range**	**Power Input**
4027F2M	1.8-2.2 MHz	100 W to 10 kW
4027F10M	12-15 MHz	100 W to 10 kW

LOADS FOR SEMICONDUCTOR GUIDE

High Power	Frequency Range & VSWR	Power Rating
8921A100	DC to 30 MHz at 1.1 max. (less than 1.05 typical)	5 kW
8931A400-115		10 kW
8931A400-230		10 kW

High Power Calibration Cart

SCC8 Series

- Capable of measuring and terminating 25kW of RF power
- Designed for easy transportation and effortless use
- Suitable for use in a clean room environment
- High return loss ensures minimal power measurement error contribution
- Available in International and Domestic versions
- Frequency and power upgrades available (Contact factory for more details)
- Service plans available with Bird® Service Center

Frequency Range	250 kHz - 30 MHz, depending on sensor (see chart)
Power Range	1 kW - 25 kW
Accuracy	±1% of reading at calibration frequency and power levels, ±2% of reading at other power levels and frequencies within sensor range.
Connector	Customer specified, appropriate for power level.
Impedance	50 ohm nominal
Sensor VSWR	1.05 max. (32.2 dB return loss)
Load VSWR	1.1 max. (26.4 dB return loss)
Coolant	100% water or 35% industrial ethylene glycol/65% water, 9 quarts (8.5 liters), forced air cooling
Particle Generation	156 per cfm (0.5 µm), 29 per cfm (1 µm), 0 per cfm (3 µm)

Power Requirements	115/230 VAC, ±10%, 50/60 Hz
Humidity	85% maximum, non-condensing
Altitude	Load derated above 5000 feet
Operating Temperature	+5°C to +30°C, < 25 kW, 100% water, +5°C to +45°C, < 20 kW, 100% water, 0°C to +25°C, < 25 kW, 35% ethylene glycol/65% water, 0°C to +35°C, < 20 kW, 35% ethylene glycol/65% water
Storage Temperature	+5°C to +50°C, 100% water, - 20°C to +50°C, 35% ethylene glycol/65% water
Size	39.5" L x 21.5" W x 39.5" H (1003.3mm x 546.1mm x 876.3mm)
Weight	240 lbs (109 kg)
Material of Construction	Stainless steel cart
CE	EMC EN 61326-1:2006 and Safety EN 61010-1:2001

*For connector options, please refer to our catalog or contact sales at 866.695.4569 or sales@bird-technologies.com

POWER SENSOR SELECTION GUIDE

4028 Series	Frequency Range	Power Range
4028A10M	10-15 MHz	1kW-25kW
4028A250k	250-400 kHz	1kW-20kW
4028A25M	25-30 MHz	1kW-25kW
4028A2M	1.5-2.5 MHz	1kW-25kW
4028A3M	2.5-3.5 MHz	1kW-25kW
4028A400K	400-550 kHz	1kW-20kW
4028A4M	3.5-4.5 MHz	1kW-25kW
4028B10M	10-15 MHz	1kW-25kW
4028B3M	3-4 MHz	1kW-25kW

Digital Power Meter

DPM Series

- Rugged field meter tested to military standards
- Works with all Bird field sensors
- Up to 60 hours of continuous battery life
- Automatically detects sensor and displays appropriate screen
- Data logging capable with up to 7 days of onboard memory

MODEL 5000-XT	
Display	Indoor/Outdoor Viewable Monochrome VGA Display with Backlight
Functions	VSWR, Peak Power, True Average Power, Crest Factor CCDF, Burst Power, Data Logging
Sensor Detection	Automatic
Battery	Rechargeable, Field Replaceable, Lithium Ion Batteries
AC Adapter/Charger	115/230 VAC, 50/60 Hz
Battery Life	20 Hours Continuous Usage with WPS Series Sensors 60 Hours Continuous Usage with All Other Sensors
Calibration Interval	No calibration required
Languages	English, Mandarin, Spanish
Dimensions	6.6” H x 4.0” W x 1.95” D (168 mm x 102 mm x 50 mm)
Sensor Interface	DB9, USB 2.0 SeaLatch Type A
PC Interface	USB 2.0 SeaLatch Type B
Weight w/ Battery	1.4 lbs.
Operating Temp.	0°C to +50°C
Storage Temp.	-20°C to +50°C
Environmental	MIL-PRF-28800F, Class 2*
International Certs.	CE, RoHS
CE	EMC EN 61326-1:2006
Compatible Devices	All Bird Field Sensors

*contact Bird Applications Engineering for specific tests conducted

STANDARD ACCESSORIES

Battery, Installed 5A5001-1
Power Supply, Includes Brick, cord, 3 Intl Adaptors 5A5002-1
Cigarette adaptor 5A2238-4
USB SeaLatch Cable, 6’ 5A2653-6L2
DB9 Cable, 10’ 5A2264-09-MF-10
Operations Manual , Multilanguage 920-5000-XT
Soft Case 5A5000-1

Power Sensor

7020 Series

- Economical, broad band sensor
- Modulation independent measurements
- Inline device - no directional coupler required
- Every unit ships with a free Virtual Power Meter
- NIST traceable calibration

Frequency Range	350 MHz - 4.0 GHz
Power Range	0.15 W to 150 W
Accuracy	+/- (4% of reading + 0.05 W) (above 35 °C or below 15 °C add 3%)
Min, Forward Power for Reflected Measurement	5.0 W
Peak/Average Ratio, Max	12 dB
Insertion Loss, Max.	0.1 dB
Insertion VSWR	1.10 max
Impedance, Nominal	50 ohms
Response Time	3 seconds
VSWR Range	1.15 to 99.9
RF Connector	From host instrument via cable
Directivity, Min:	28 dB
Recommended Calibration Interval	Annually
Compatible Devices	SA-3600XT, SA-6000XT, 5000-XT, VPM2

POWER SUPPLY

Source	5Vdc from USB host
Current Draw	35 mA

INTERFACE

Protocol	USB 2.0
Connector	USB Type 'B' with SeaLatch locking USB connector
Data Logging	with VPM2 Software

STANDARDS COMPLIANCE

CE	EMC EN 61326-1:2006
RoHS	Compliant
Upgradability	Firmware field-upgradable via the USB port

MECHANICAL SPECIFICATIONS

Dimensions, Nominal	4.8" x 2.2" x 1.3" (122mm x 54mm x 32mm)
Weight, nominal	0.8 lbs (0.36 kg)
Environmental	MIL-PRF-28800F Class 3
Operating Temperature	-10 to +50 °C (+14 to +122 °F)
Storage Temperature	-40°C to 80°C (-40°F to 176°F)
Humidity, Max	95% maximum (non-condensing)
Altitude, Max	4,572 m (15,000ft)

STANDARD ACCESSORIES

SeaLatch USB Cable, 6' 5A2653-6L2
Virtual Power Meter. VPM2
Instruction Manual (Sensor) 920-7020S
Instruction Manual (VPM2) 920-VPM2

Wideband Power Sensor

WPS Series

- Measures True Average Power, Peak Power, and Duty Cycle directly with exceptional accuracy
- Calculates VSWR, Return Loss, Reflection Coefficient, Crest Factor, Average Burst Power, and CCDF
- Works with any Modulation scheme
- Compatible with all analog, digital, and multi-carrier signals
- Sensor plugs and plays with 5000-XT meter
- Virtual Power Meter software is also included for free
- No field calibration required
- NIST traceable calibration

Connectors	N Female (Both)
Power Supply	USB Port: Less than one low-power USB load DC Input Connector: 7-18 VDC at less than 0.1A
Impedance	50 Ohms (nominal)

INTERFACES

DPM	DB9 proprietary interface
PC Interface (1)	RS -232, 9600 Baud, no parity, 8 data bits, 1 stop bit, DB9
PC Interface (2)	USB 2.0 Type B
Data Logging	Requires 5000-XT or VPM2

ENVIRONMENTAL SPECIFICATIONS

Weight	1.2 lb. maximum
Dimensions HxWxD [inches (mm)]	4.8" x 4.6" x 1.3" (122 mm x 117 mm x 33 mm)
Operating Temps [°C(°F)]	-10° to +50°C (+14° to +122°F)
Storage Temps [°C(°F)]	-40 ° to +80°C (-40° to +176°F)
Mechanical Shock & Vibration	IAQ MIL-PRF-28800F Class 3
CE	EMC EN 61326-1:2006
Compatible Devices	SH-36S, SH-361S, SH-362, SH-362S, SA-3600XT, SA-6000XT, 5000-XT, VPM2

OPTIONAL ACCESSORIES

Precision Test Adapter Male N to Male N . . . . . PTA-MNMN
Male N to Male 7/16 (DIN) . . . . . PTA-MNME
Male N to Female 7/16 (DIN) . . . . . PTA-MNFE
Power Supply, Intl 5A2226
Power Supply, US 5A2229
USB Cable, 10' 5A2653-10
DB9 Cable, 10' 5A2264-09-MF-10

Wideband Power Sensor

WPS Series

	5012B	5016B	5017B	5018B	5019B
Frequency Range	350 MHz - 4.0 GHz	350 MHz - 4.0 GHz	25MHz - 1.0 GHz	150MHz - 4.0 GHz	25MHz - 1.0 GHz
Power Range	150mW - 150 W Avg. 400 W Peak	25mW - 25 W Avg. 60 W Peak	500mW - 500 W Avg. 1300 W Peak	100mW - 25 W Avg 60 W Peak	100mW - 100 W Avg. 260 W Peak
Insertion VSWR	<1.05 from 0.35 to 2.5 GHz, <1.10 from 2.5 to 4 GHz	<1.05 from 0.35 to 2.5 <1.10 from 2.5 to 4 GHz	<1.05	<1.05 from 0.35 to 2.5 <1.10 from 2.5 to 4 GHz	<1.05
Insertion Loss	<0.05 dB from 0.35 to 1.0 <0.1 dB from 1 to 4 GHz	<0.05 dB from 0.35 to 1.0 <0.1 dB from 1 to 4 GHz	<0.05 dB	<0.05 dB from 0.35 to 1.0 <0.1 dB from 1 to 4 GHz	<0.05 dB
Directivity	30 dB up to 3.0 GHz, 28dB up to 4.0 GHz	30 dB up to 3.0 GHz, 28dB up to 4.0 GHz	28dB up to 100 MHz, 30dB from 100-1000 MHz	30 dB up to 3.0 GHz, 28dB up to 4.0 GHz	28dB up to 100 MHz, 30dB from 100-1000 MHz
	Average Power				
Average Forward Power Range	150 mW - 150 W Avg, 400 W Peak	25 mW - 25 W Avg, 60 W Peak	500 mW - 500 W Avg, 1300 W Peak	Peak 100 mW - 25 W Avg, 60 W Peak	100 mW - 100 W, 260 W Peak
***Accuracy, Average Forward Power**	± 4% of reading, + 0.05 W	± 4% of reading, + 0.008 W	± 4% of reading, + 0.17 W	± 4% of reading, + 0.008 W	± 4% of reading, + 0.04 W
Minimum Forward Power for Reflected Measurement	0.5 W	0.1 W	0.5 W	0.1 W	0.3 W
Return Loss	0.0 to 23 dB				
VSWR	1.15 to 99.9				
Rho	1.2 lb. maximum				
	Burst Average Power				
Burst Average Power Range	4 W - 150 W Avg	.7 W - 25 W Avg	13.5 W - 500 W Avg	.7 W - 25 W Avg	2.7 W - 100 W Avg
Burst Width	1 µs to 50 ms	1 µs to 50 ms			
Repetition Rate	200 Hz, Min	200 Min	200 Hz, Min	200 Min	200 Min
Duty Cycle (D)	.001 to 1.0				
***Accuracy, Burst Average Power**	± 4% of reading, + 0.05/D W	± 4% of reading, + 0.008/D W	± 4% of reading, + 0.17/D W	± 4% of reading, + 0.008/D W	± 4% of reading, + 0.04/D W
	Peak Envelope Power				
Peak Envelope Power Range	4.0 - 400 W	0.7 - 60 W	13.5 - 1300 W	0.7 - 60 W	2.7 - 260 W
	*Accuracy, Peak Envelope Power				
Burst Width > 200 µs	± 7% of reading, + 0.20 W	± 7% of reading, + 0.05 W	± 7% of reading, + 0.70 W	± 7% of reading, + 0.05 W	± 7% of reading, + 0.13 W
1 µs < Burst Width < 200 µs	± 10% of reading, + 0.40 W	± 10% of reading, + 0.10 W	± 10% of reading, + 1.40 W	± 10% of reading, + 0.10 W	± 10% of reading, + 0.26 W
0.5 µs < Burst Width < 1 µs	± 15% of reading, + 0.40 W	± 15% of reading, + 0.10 W	± 15% of reading, + 1.40 W	± 15% of reading, + 0.10 W	± 15% of reading, + 0.26 W
Burst Width < 0.5 µs	± 20% of reading, + 0.40 W	± 20% of reading, + 0.10 W	± 20% of reading, + 1.40 W	± 20% of reading, + 0.10 W	± 20% of reading, + 0.26 W
	Crest Factor				
Crest Factor Measurement Range	150 mW - 150 W Avg	25 mW - 25 W Avg	500 mW - 500 W Avg	25 mW - 25 W Avg	100 mW - 100 W
***Accuracy, Crest Factor**	Linear Sum of Peak and Average Power Accuracies				
	Complementary Cumulative Distribution Function (CCDF)				
CCDF Measurement Range	0.1 to 100%				
Threshold Measurement Range	4.0 - 400 W	0.7 - 25 W	13.5 - 500 W	0.7 - 25 W	2.7 - 100 W
Measurement Uncertainty	± 0.2%				
Threshold Measurement Range	As Peak Envelope Power Accuracy + 2.0%				

* for temperatures above 35°C or below 15°C add 3.0% to stated accuracies

Directional Power Sensors

DPS Series

- Can measure True Average Power or Peak Power
- Available with a wide range of Bird Elements
- Every unit ships with a free Virtual Power Meter
- No field calibration required
- NIST traceable calibration

	5010B	5014
Frequency Range	Element dependent, 2 MHz to 2.7 GHz	
Power Range	Element dependent, 500 mW to 1 kW full scale	
Impedance	50 Ohm	
Peak/Average Ratio	10 dB maximum with DPM elements	
Accuracy	True Average Power, ±5% of reading (15°C to 35°C), ±7% of reading (-10°C to 50°C) PEAK POWER, ±8% of full scale	
Insertion VSWR	1.05:1 from 0.45 to 1000 MHz (with N connectors)	
Settling Time	< 2 seconds	
Connectors	QC Type. Female N normally supplied.	
Power Suppply	From host instrument via cable	
Interface	DB9 (proprietary configuration)	USB 2.0 (Type B)
Dimensions	1.875" H x 1.875" W x 3.5" D 47.7 mm x 47.7 mm x 88.9 mm) excluding connectors	
Weight	1.12 lbs. (0.51 kg)	
Directivity	30 dB typical (exact value depends on element selected)	
Humidity	95% max. (non-condensing)	
Pulse Width	>100 MHz	800 ns min.
Parameters	26-99 MHz 2-25 MHz	1.5 µs min. 15 µs min.
Pulse Rep. Rate Peak	15 pps min.	
Pulse Duty Factor	1 x 10-4 min.	
Dynamic Range	16 dB	
Operating Temp.	-10°C to +50°C	
Storage Temp.	-40°C to +75°C	
Environmental	MIL PRM-2880F Class 2	
CE	EMC EN 61326-1:2006 and Safety EN 61010-1:2001	
Compatible Devices	SH-36S, SH-361S, SH-362, SH-362S, 5000-XT	SA-3600XT, SA-6000XT, 5000-XT, VPM2

AVERAGE POWER ELEMENT SELECTION GUIDE*

Frequency Range (MHz)	Forward Power Range	Reflected Power Range	Forward Element	Reflected Element
2 - 30	1.25 W to 50 W 12.5 W to 500 W	125 mW to 5 W 1.25 W to 50 W	DPM-50H DPM-500H	DPM-5H DPM-50H
25 - 60	1.25 W to 50 W 12.5 W to 500 W	125 mW to 5 W 1.25 W to 50 W	DPM-50A DPM-500A	DPM-5A DPM-50A
50 - 125	1.25 W to 50 W 12.5 W to 500 W 25 W to 1 kW	125 mW to 5 W 1.25 W to 50 W 2.5 W to 100 W	DPM-50B DPM-500B DPM-1000B	DPM-5B DPM-50B DPM-100B
100 - 250	1.25 W to 50 W 12.5 W to 500 W 62.5 W to 2.5 kW	125 mW to 5 W 1.25 W to 50 W 6.25 W to 250 W	DPM-50C DPM-500C DPM-2500C	DPM-5C DPM-50C DPM-250C
200 - 500	125 mW to 5 W 1.25 W to 50 W 12.5 W to 500 W	12.5 mW to 500 mW 125 mW to 5 W 1.25 W to 50 W	DPM-5D DPM-50D DPM-500D	DPM-.5D DPM-5D DPM-50D
400 - 960	125 mW to 5 W 1.25 W to 50 W 2.5 W to 100 W 12.5 W to 500 W 25 W to 1 kW	12.5 mW to 500 mW 125 mW to 5 W 250 mW to 10 W 1.25 W to 50 W 2.5 W to 100 W	DPM-5E DPM-50E DPM-100E DPM-500E DPM-1000E	DPM-.5E DPM-5E DPM-10E DPM-50E DPM-100E
950 - 1260	125 mW to 5 W 1.25 W to 50 W	12.5 mW to 500 mW 125 mW to 5 W	DPM-5J DPM-50J	DPM-.5J DPM-5J
1100 - 1800	125 mW to 5 W 1.25 W to 50 W	12.5 mW to 500 mW 125 mW to 5 W	DPM-5K DPM-50K	DPM-.5K DPM-5K
1700 - 1990	125 mW to 5 W 1.25 W to 50 W 12.5 W to 500 W	12.5 mW to 500 mW 125 mW to 5 W 1.25 W to 50 W	DPM-5L1 DPM-50L1 DPM-500L1	DPM-.5L1 DPM-5L1 DPM-50L1
1900 - 2200	125 mW to 5 W 1.25 W to 50 W	12.5 mW to 500 mW 125 mW to 5 W	DPM-5L2 DPM-50L2	DPM-.5L2 DPM-5L2
2200 - 2300	125 mW to 5 W 625 mW to 25 W	12.5 mW to 500 mW 62.5 mW to 2.5 W	DPM-5M DPM-25M	DPM-.5M DPM-2.5M
2300 - 2500	125 mW to 5 W	12.5 mW to 500 mW	DPM-5N	DPM-.5N
2500 - 2700	125 mW to 5 W	12.5 mW to 500 mW	DPM-5R	DPM-.5R

* Note: For Peak Power Readings, use elements from Tables 1-6 on pages 44-45

Terminating Power Sensor

TPS Series

- One port measurement device provides True Average Power
- Complimentary Virtual Power Meter (VPM2) software
- Sensor plugs and plays with 5000-XT meter
- No front panel calibration required at any time
- NIST traceable calibration
- Now available in a USB compatible version

	5011	5011-EF	5015	5015-EF
Frequency Range	40 MHz - 4.0 GHz	40 MHz - 12 GHz	40 MHz - 4.0 GHz	40 MHz - 12 GHz
Power Range	-20 to +10 dBm (10 µW to 10 mW)			
Impedance	50 Ohms (nominal)			
Peak/Average Ratio	12 dB max.			
Accuracy	± 5% of Reading. When operating below 100 MHz and above 40 °C, add 1 %			
Insertion VSWR	Typical 1.03 (36.6 dB return loss) Maximum 1.20 (20.8 dB return loss)	Typical 1.05 (32.3 dB return loss) Maximum 1.25 (19.1 dB return loss)	Typical 1.03 (36.6 dB return loss) Maximum 1.20 (20.8 dB return loss)	Typical 1.05 (32.3 dB return loss) Maximum 1.25 (19.1 dB return loss)
Warm Up Time	5 Minutes			
Connector(s)	Precision N Male			
Power Supply	From host instrument via cable connection			
Interface(s)	DB9 proprietary interface	DB9 proprietary interface	USB 2.0 Type B	USB 2.0 Type B
Weight	.75 lb. maximum			
Dimensions [inches mm)]	6" (152 mm) long (including connector); 1.5" (38 mm) diameter			
Altitude	15,000 ft. operating			
Humidity, Max.	95% maximum (non-condensing)			
Safety	Complies with EN 61326-1:1997 IAW EMC Directive (89/336/EEC)			
Operating Temps [°C(°F)]	-10° to +50°C (+14° to +122°F)			
Storage Temps [°C(°F)]	-40° to +80°C (-40° to +176°F)			
Mechanical Shock & Vibration	IAQ MIL-PRF-2880F Class 3			
CE	EMC EN 61326-1:2006			
Compatible Devices (5011)	SH-36S, SH-361S, SH-362, SH-362S, 5000-XT			
Compatible Devices (5015)	SA-3600XT, SA-6000XT, 5000-XT, VPM2			

OPTIONAL ACCESSORIES

40 dB Attenuator, 50 W, 4 GHz. 8353A040-50
30 dB Attenuator, 10 W, 4 GHz. 8353A030-10
40 dB Attenuator, 50 W,18 GHz 8353A040-50-18
30 dB Attenuator, 10 W,18 GHz 8353A030-10-18
Adapter, N (F) to N (F) 4240-500-1
Adapter, right angle, N (F) to N (M) 4240-500-3
Adapter, N (F) to SMA (F). 4240-500-4
Adapter, N (F) to SMA (M) 4240-500-5
Adapter, N (F) to 7/16 DIN (M) . . . . . PA-FNME
Adapter, N (F) to 7/16 DIN (F) . . . . . PA-FNFE
DC Block, N (F) to N (M). 5011A035-1
USB SeaLatch Cable, 6' 5A2653-6L2
USB Cable, 10' 5A2653-10
DB9 Cable, 10' 5A2264-09-MF-10

Wideband Coupler

WBC Series

- Line section includes two directional couplers
- Designed to work with the Bird Terminating Power Sensor
- Available for either UHF or VHF operation
- Wide variety of line sizes and power ratings
- Measured across frequency band for highly accurate coupling factors

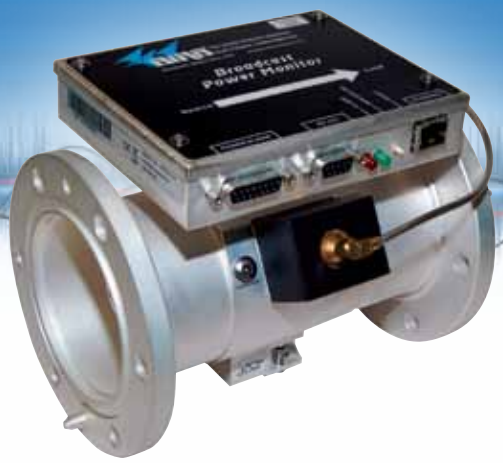
Frequency Range	45 MHz - 230 MHz (VHF Models)
	450 MHz - 890 MHz (UHF Models)
	450 MHz - 800 MHz (6" UHF Models)
Directivity	28 dB Min.
Coupler Output Connector	Type "N" Female

Coupler Output VSWR	1.2 Max.
Main Line VSWR	1.1 Max.
Coupling Uncertainty (after correction)	±0.05 dB
Operating Temp.	-10°C to 40°C
Storage Temp.	-20°C to 85°C

	Line Size	Frequency Range	Nominal Coupling	Length (in.)	Weight (lbs.)
WBC1-45	1-5/8 Flanged	VHF	62 dB ±2 dB	6.75	3.65
WBC1U-45	1-5/8 Unflanged	VHF	62 dB ±2 dB	6.38	1.8
WBC1-400	1-5/8 Flanged	UHF	59 dB ±2 dB	6.75	3.65
WBC1U-400	1-5/8 Unflanged	UHF	59 dB ±2 dB	6.38	1.8
WBC3-45	3-1/8 Flanged	VHF	69 dB ±2 dB	7.03	6
WBC3U-45	3-1/8 Unflanged (Recessed)	VHF	69 dB ±2 dB	6.5	2.75
WBC3UF-45	3-1/8 Unflanged (Flush)	VHF	69 dB ±2 dB	6.5	2.75
WBC3-400	3-1/8 Flanged	UHF	64 dB ±2 dB	7.03	6
WBC3U-400	3-1/8 Unflanged (Recessed)	UHF	64 dB ±2 dB	6.5	2.75
WBC3UF-400	3-1/8 Unflanged (Flush)	UHF	64 dB ±2 dB	6.5	2.75
WBC4-45	4-1/16 Flanged (Dielectric)	VHF	70 dB ±2 dB	8.38	8.88
WBC4M-45	4-1/16 Flanged (MYAT)	VHF	70 dB ±2 dB	8.38	8.88
WBC4U-45	4-1/16 Unflanged (Dielectric)	VHF	70 dB ±2 dB	7.5	2.88
WBC4-400	4-1/16 Flanged (Dielectric)	UHF	67 dB ±2 dB	8.38	8.88
WBC4M-400	4-1/16 Flanged (MYAT)	UHF	67 dB ±2 dB	8.38	8.88
WBC4U-400	4-1/16 Unflanged (Dielectric)	UHF	67 dB ±2 dB	7.5	2.88
WBC6-45	6-1/8 Flanged	VHF	75 dB ±2 dB	10.22	13.2
WBC6U-45	6-1/8 Unflanged	VHF	75 dB ±2 dB	9.63	7.2
WBC6-400	6-1/8 Flanged	UHF	75 dB ±2 dB	10.22	13.2
WBC6U-400	6-1/8 Unflanged	UHF	75 dB ±2 dB	9.63	7.2

Broadcast Power Monitor

BPME Series



- Continuously monitor key system measurements
- ±5% of reading accuracy for power
- Operates in digital, analog and multi-carrier systems
- Hard Contact alarms
- Remote access with IP Enabled Ethernet connectivity

	BPME
Frequency Range*	See chart below
Forward/Reflected Power Range*	See chart below
Measurement Type	In-line, True Average Power
Peak/Average Ratio	10 dB
Coupler Directivity	26 dB minimum, 30 dB typical
Accuracy	±5% of reading
Dynamic Power Range	20 dB
Alarms	VSWR, No/Low Forward Power High Forward Power
Outputs	SPDT relay contact
Display Options	BPME PC Software, 3129
Remote Interface	Ethernet 10BASE-T or 100BASE-TX (auto-sensing); Ethernet Version 2.0/IEEE 802.3 Protocols: ARP, UDP/IP, TCP/IP, Telnet, ICMP, SNMP, DHCP, BOOTP, TFTP, Auto IP, and HTTP Security: 256-bit encryption; Serial RS-232, 9600 baud, no parity, 8 data bits, 1 stop bit, no handshake
CE	EMC EN 61326-1:2006 and Safety EN 61010-1:2001
Operating Temperature	-10°C to +50°C (14°F to 122°F)
Storage Temperature	-40°C to + 80°C (-40°F to 176°F)
Humidity	95% ±5% max. (noncondensing)
Altitude	up to 10,000 feet (3,048 m)
Calibration Cycle	Annual

* Frequency and power level depend on line section, sensor element, and selected display option. While designed for digital broadcast, the Broadcast Power Monitor can be used for a wide range of frequencies, power levels, and applications. Please contact the factory to discuss your application and requirements.

SELECTION GUIDE

		VHF (45-230 MHz)	UHF (470-890 MHz)
Line Size	**Power Designator**	**Forward Power Range**	**Forward Power Range**
7/8”	Low Medium High	5W – 500 W 20 W – 2000 W 50 W – 5000 W	2.5 W – 250 W 10 W – 1000 W 25 W – 2500 W
1 5/8”	Low Medium High	20 W – 2000 W 80 W – 8 kW 200W – 20 kW	5 W – 500 W 20 W – 2000 W 50 W – 5000 W
3 1/8”	Low Medium High	50 W – 5000 W 200 W – 20 kW 500 W – 50 kW	25 W – 2500 W 100 W– 10 kW 250 W – 25 kW
4 1/16” & 4 1/2”	Low Medium High	100 W – 10 kW 400 W – 40 kW 1000 W – 100 kW	40 W – 4 kW 150 W – 15 kW 400 W – 40 kW
6 1/8”	Low Medium High	200 W – 20 kW 800 W – 80 kW 2000 W – 200 kW	80 W – 8 kW 300 W – 30 kW 750 W – 75 kW

Transmitter Power Monitor

TPM Series

- Low Cost in-situ power measurement solution
- Capable of In-line calibration
- Integrated precision directional & non-directional couplers
- ±5% Accuracy with both analog and digitally modulated systems

Frequency Ranges	L = 54-88 MHz F = 88-108 MHz H = 174-216 MHz U = 470-806 MHz
Forward Power Range	See chart below
Reflected Power Range	10% of Forward Power Range
Measurement Type	In-Line, True Average Power
Peak Average Ratio	10dB Maximum
Directivity Rfl	30 typical, 26 dB minimum
Accuracy	±5% of reading
Dynamic Power Range	16 dB
Outputs	DB 9 Voltage I/O
Displays Offered	3140-A4 (4 Channel) 3140-A8 (8 Channel)

LINE SECTION

Operating Temperature	0° to +50° C (32° to 122° F)
Storage Temperature	-20° to +80° C (-4° to 176° F)
Humidity	95% ±5% max. (noncondensing)
Altitude	up to 10,000 feet (3048 m)
Weights	TPM7 = 3.5 lbs TPM1 = 5.5 lbs TPM3 = 8.0 lbs 3140 = 2.5 lbs
Calibration Cycle	Annual*
CE	EMC EN 61326-1:2006 and Safety EN 61010-1:2001

* Standard calibration cycle of 1 year for reverification, but can be recalibratedby the customer with an accurate power reference. See the Application note on TPM calibration at www.bird-electronic.com

SELECTION GUIDE

	VHF (54-216 MHZ)		UHF (470-806 MHZ)	
Line Size	**Forward Power Range**	**Power Designator**	**Forward Power Range**	**Power Designator**
7/8”	15 W – 500 W 30 W – 1.0 kW 80 W – 2.5 kW 150 W – 5 kW	Low Medium High Very High	15 W – 500 W 30 W – 1 kW 80 W – 2.5 kW	Low Medium High
1 5/8”	30 W – 1.0 kW 80 W – 2.5 kW 150 W – 5 kW 300 W – 10 kW	Low Medium High Very High	30 W – 1.0 kW 80 W – 2.5 kW 150 W – 5.0 kW	Low Medium High
3 1/8”	150 W – 5 kW 300 W – 10 kW 800 W – 25 kW 1.5 kW – 50 kW	Low Medium High Very High	150 W – 5.0 kW 300 W – 10 kW 800 W – 25 kW	Low Medium High

Note: For best accuracy, pick the lowest power range that includes your maximum average operating power.

MODEL NOMENCLATURE 7/8” LINE SECTIONS

TPM7 _____ _____ – _____ _____

Line Section	Input Connector	Output Connector	Frequency Band	POWER**	Connector Options	
7 = 7/8”			L = 54-88 MHz F = 88-108 MHz H = 174-216 MHz U = 470-806 MHz	L = Low M = Medium H = High S = Very High	A= N (F) B = N (M) C =LC (F) D = 7/8 EIA	H = DIN (F) J = DIN (M) K =UHF (F) L = UHF (M)

MODEL NOMENCLATURE 1 5/8” OR 3 1/8” LINE SECTIONS

TPM _____ _____ – _____ _____

Line Section	Line Interface****	Frequency Band	POWER**
1 = 1 5/8” 3 = 3 1/8”	U = Unflanged, Recessed Center Conductor UF = UUnflanged, Flush Center Conductor	L = 54-88 MHz F = 88-108 MHz H = 174-216 MHz U = 470-806 MHz	L = Low M = Medium H = High S = Very High

* Patent Pending
** see Chart for power ranges
*** Other sizes and power ranges available upon request
****For Flanged, leave blank.

Antenna & Cable Monitor

ACM Series

- Accurately monitors your antenna and cable system VSWR levels
- Also provides accurate in-line power measurement functionality
- Provides alarms if an antenna or cable failure should occur
- Monitors transmitter output power and includes low and high power alarms
- Measures true average power of signals with high peak-to-average characteristics - works with any modulation!
- Included as standard Push-To-Talk (PTT) input to avoid false alarm triggering when the transmitter (radio) is not keyed

FORWARD POWER MEASUREMENT

Frequency Range*	136 - 225 MHz 225 - 520 MHz 470 - 960 MHz 960 - 2400 MHz
Measurement Range	ACM: 2.5 W to 100 W ACM 500: 12.5 W to 500 W
Power Accuracy	136 - 225 MHz, ±10% 225 - 520 MHz, ±8% 470 - 960 MHz, ±5% 960 - 2400 MHz, ±5%
Insertion Loss	0.1 dB, 136 - 960 MHz 0.15 dB, 960 - 2400 MHz
VSWR	1.07, 136 - 960 MHz 1.1, 960 - 2400 MHz, N Connectors 1.1, 960 - 2000 MHz, 7/16 Connectors 1.2, 2000 - 2400 MHz, 7/16 Connectors

*Other frequencies & power ranges available - contact factory.

VSWR ALARM CHARACTERISTICS

Alarm Set Point	1.3, 1.4, 1.5, 1.6, 1.7, 1.8 to 1
Relay Contact Type	Dry, Form C, relay contacts, common, normally open, normally closed.
Contact Rating	100 VDC @ 0.5 A
Visual Alarm	Red LED will illuminate to indicate alarm
Stimulus	VSWR set point exceeded, response time proportional to overload.
Reset	Local Mechanical reset switch. Remote input (Reset if VDC is 0 to +0.8 volts).
Monitor Port Connectors	Female N, TNC or BNC
Coupling	-63 dB approx., Subject to changes in full-scale power
Interface Port Connector	Female DB-9, compatible with IBM PC AT serial port.
Protocol	Serial RS-232, 9600 baud, no parity, 8 data bits, 1 stop bit, no handshake.

REFLECTED POWER MEASUREMENT

Directivity	30 dB, 136 - 960 MHz 26 dB, 960 - 2400 MHz

PHYSICAL AND ENVIRONMENTAL SPECIFICATIONS

General	1Thruline® sensor for direct insertion in 50-ohm line
RF Connectors	N or 7/16 DIN
Maximum Line Section Power	Dependent on frequency and connector
Alarm/Power Connector	15-pin female “D” connector
Operating Temperature	0°C to 50°C
Storage Temperature	-20°C to 80°C
Humidity	0 to 95% maximum (non-condensing)
Altitude	Up to 3000 meters above sea level
Passive Intermodulation Products	Less than -130 dBc
Power Requirements	+11 to +26 VDC or ±36 to ±72 VDC
Dimensions	4.75” (121 mm) wide (7.55” (192 mm) with connectors) 4.2” (107 mm) high, 1.06“(27 mm) deep
Weight	less than 2 lbs. (0.9 kg)
CE	EMC EN 61326-1:2006 and Safety EN 61010-1:2001

MODEL NOMENCLATURE

ACM _____ – _____ – _____ _____ _____ _____

ACM = 2.5 - 100 W ACM 500 = 12.5 - 500 W	Frequency Band L1 = 136* - 225 MHz L2 = 225 - 520 MHz M = 470 - 960 MHz H** = 960 - 2400 MHz	RF Input Connector NM = N Male NF = 136 - 225 MHz DM = 7/16 DIN Male DF = 7/16 DIN Female	RF Output Connector NM = N Male NF = 136 - 225 MHz DM = 7/16 DIN Male DF = 7/16 DIN Female	Monitor Port Connector N = N Female T = TNC Female B = BNC Female	Input Voltage L = + (11 to 26) VDC H = ± (36 to 72) VDC

** “H” Frequency band unavailable with the ACM 500 version.

Displays

3129 Digital & 3140 Meter

	3129 Digital Display
Operating Voltage	115/230 VAC @ 50/60 Hz
Operating Power	Less than 10 watts
Dimensions	5.25" X 19" X 1.75" (133.35 mm X 483 mm X 44.5 mm)
Weight	Approximately 2 lbs. (0.85 kg)
Supplied with	50 feet of cable to connect RS-232 and serial ports between 3129 and50 feet of line section, and serial interface cable

	3140A4 (4 Channels)	3140A8 (8 Channels)
Operating Voltage	115/230 VAC 50/60Hz	
Operating Power	Less than 10 watts	
Dimensions	3.5" X 19" X 3.5" (2 RU) (89mm X 483mm X 89mm)	
Weight	Approximately 2.5 lbs (0.85kg)	
Operating Temp	-10 to + 50 degrees C (-14 to 122 degrees F)	
Storage Temp	-40 to + 80 degrees C (-40 to 176 degrees F)	
Humidity	95% +/-5% (Noncondensing)	
Altitude	up to 10,000 feet (3048 m)	

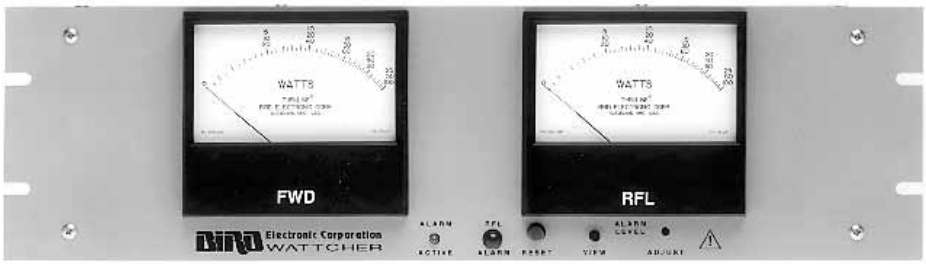
RF Monitor/Alarms

Wattcher® Series

	3126A (Single Carrier)	3127A (Single Carrier)
Power Range	300 W to 60 kW using Bird® Plug-in Elements	100 W to 250 kW using Bird® Plug-in Elements
Frequency Range	2 MHz - 1 GHz	
Accuracy	±5% of full scale	
Meter Scales FWD	15, 30, 60 kW	5, 10, 25 kW
Meter Scales RFL	1.5, 3, 6 kW	1, 2.5, 5 kW
Meter Sensitivity	100 µA/3000 Ω	
Alarms	Front panel buzzer and red LED	
Front Panel Controls	Reset push-button, reflected power limit display button, adjust alarm level recessed screw	
Rear Panel Features	FWD/RFL DC signal inputs (BNC), DC power/remote reset connector, DPDT interlock relay connector, fail-safe/nonfail-safe selector, alarm buzzer disable, AC line voltage selector, safety fuses and IEC 320 AC receptacle.	
Cable	Includes two 25 ft. DC cables	
AC Power	115/230 V, 50/60 Hz @ 0.125 A max.	
DC Power	9 to 16 V @ 1 A max.	
Finish	Gray powder coat	
Nominal Size	19" W x 5 7/32" H x 3 3/4" D (483 mm x 133 mm x 95 mm)	
Weight	5 lbs. (2.28 kg)	
Required Products	Line Section: 1 5/8", 3 1/8", 4 1/16", 6 1/8"	
Elements	Two from Tables 1 5/8 B, 3 1/8 B, 4 1/16 B, or 6 1/8 B.	Two from Tables 1 5/8 A, 3 1/8 A, 4 1/16 A, or 6 1/8 A.
Accessories	Cable: If length other than 25 ft. is desired, order two BNC (M) cables.	

RF Monitor/Alarms

Wattcher® Series



	3128A (Single Carrier)
Power Range	100 mW to 10 kW using Bird® Plug-in Elements*
Frequency Range	450 kHz - 2.7 GHz
Insertion VSWR	with N connectors 1.05 max. to 1000 MHz, 1.1 max. to 2700 MHz
Accuracy	±5% of full scale
Meter Scales	FWD and RFL 25, 50, 100 W
Meter Sensitivity	30 µA/1400 Ω
Alarms	Front Panel Buzzer and red LED
Front Panel Controls	Reset push-button, reflected power limit display button, adjust alarm level recessed screw
Rear Panel Features	FWD/RFL DC signal inputs (BNC), DC power/remote reset connector, DPDT interlock relay connector, fail-safe/nonfail-safe selector, alarm buzzer disable, AC line voltage selector, safety fuses and IEC 320 AC receptacle.
Cable	Includes two 25 ft. DC cables
AC Power	115/230 VAC, 50/60 Hz @ 0.125A
DC Power	9 - 16 VDC @ 1A
Finish	Gray powder coat
Nominal Size	19” W x 5 7/32” H x 3 3/4” D (483 mm x 133 mm x 95 mm)
Weight	5 lbs. (2.28 kg)
Required Products	Line Section: 4522-002-5 QC connectors: Two Elements: Two from Tables 1, 2, 3, 3A, 4, or 6

RF Monitor/Alarms

High-Speed Wattcher® Series

	3170B (Dual Meter - Dual Element - Single Carrier)
Power Range	100 mW to 10 kW using Bird® Plug-in Elements*
Frequency Range	450 kHz - 2.7 GHz
Insertion VSWR	with N connectors 1.05 max. to 1000 MHz, 1.1 max. to 2700 MHz
Accuracy	±5% of full scale
Meter Scales	FWD and RFL 25, 50, 100 W
Alarms	Front Panel Buzzer, “Active” and “Trip” LEDs for forward/reflected
Response Time	25 µs max.
Activate Forward	73 µs to 50 ms nominal (adjustable) monitor delay
Front Panel Controls	Reset push-button, adjust FWD/RFL alarm levels screw, element sockets
Rear Panel Features	DC FWD/RFL signal inputs, main and remote meter drive outputs, external 12-16 VDC supply input, alarm in/out, reset in/out, AC line voltage selector, fuse, IEC 320 AC receptacle.
Inputs/Outputs	TTL compatible +5 V logic. Outputs for remote meter
AC Power	115/230 VAC, 50/60 Hz @ 56 mA
DC Power	12.7 to 16.0 VDC @ 400 mA max.
Connectors	QC Type (Female N normally supplied)
Finish	Gray powder coat
Nominal Size	19” W x 5 7/32” H x 9 5/16” D (483 mm x 133 mm x 237 mm)
Weight	7 lbs. (3.2 kg)
Required Products	Elements: Two from Tables 1, 2, 3, 3A, 4, or 6
Calibration Cycle	1 Year for element

RF Monitor/Alarms

High-Speed Wattcher® Series

	3171B (Dual Meter - Single Carrier)	3171B020 (Dual Meter - Single Carrier)
Power Range	100 W to 250 kW using Bird® Plug-in Elements	
Frequency Range	2 MHz - 1 GHz	
Accuracy	±5% of full scale	
Meter Scales	FWD and RFL 5, 10, 25 kW	FWD and RFL 15, 30, 60 kW
Alarms	Front Panel Buzzer, “Active” and “Trip” LEDs for forward/reflected	
Response Time	25 µs max.	
Activate Forward	73 µs to 50 ms nominal (adjustable) Monitor Delay	
Front Panel Controls	Reset push-button, adjust FWD/RFL alarm levels screw	
Rear Panel Features	DC FWD/RFL signal inputs, main and remote meter drive outputs, external 12-16 VDC supply input, alarm in/out, reset in/out, AC line voltage selector, fuse, IEC 320 AC receptacle.	
Inputs/Outputs	TTL compatible +5 V logic. Outputs for remote meter	
Cable	Includes two 25 ft. DC cables	
AC Power	115/230 V, 50/60 Hz @ 56 mA max.	
DC Power	12.7 to 16.0 VDC @ 400 mA max.	
Finish	Gray powder coat	
Nominal Size	19” W x 5 7/32” H x 9 21/64” D (483 mm x 133 mm x 237 mm)	
Weight	5 1/2 lbs. (2.5 kg)	
Required Products	Line Section: 1 5/8”, 3 1/8”, 4 1/16”, 6 1/8”	
Elements	Two from Tables 1 5/8 AA, 3 1/8 AA, 4 1/16 AA, or 6 1/8 AA.	Two from Tables 1 5/8 BB, 3 1/8 BB, 4 1/16 BB, or 6 1/8 BB.
Accessories	Cable: If length other than 25 ft. is desired, order two BNC (M) cables.	

Portable Wattmeters

Thruline® RF Directional

43

Power Range	100 mW - 10 kW using Bird® Plug-in Elements.*
Frequency Range	450 kHz - 2.7 GHz (depending on element)
Insertion VSWR	with N Connectors 1.05 max. to 1000 MHz
Accuracy	±5% of full scale
Connectors	QC Type (Female N normally supplied)
Finish	Light Gray powder coat
Nominal Size includes connectors	6 7/8" H x 5 1/8" W x 3 5/8" D, (175 mm x 130 mm x 92 mm)
Weight	3 lbs. (1.4 kg)
Elements	Tables 1, 2, 3, 3A, 4, 6

43P (with Peak Power Retrofit Kit 4300-400)

Power Range	100 mW - 10 kW using Bird® Plug-in Elements.*
Frequency Range	450 kHz - 2.7 GHz (depending on element)
Accuracy	CW Mode: ±5% full scale, Peak mode: ±8% full scale
Modulation	Normal voice audio; or (Peak Mode) Rectangular Pulses; Duty cycle: 2% (min); Repetition rate: 100 pps (min); Pulse width: 200 µs (min)
Connectors	QC Type (Female N normally supplied)
Battery (Life)	48 hours typical
Weight	Adds 1 lb. to Model 43

4431 (Variable RF TAP)

Power Range	5 kW max. 2 - 30 MHz
Frequency Range	1 kW max. 30 - 1000 MHz** using Bird® Plug-in Elements*
Insertion VSWR	with N Connectors 1.07 max.** to 1000 MHz
Accuracy	±5% of full scale
Insertion Loss	0.1 dB max. (2-512 MHz), 0.2 dB max. (512-1000 MHz)*
RF Sample Output	Variable -15 to -70 dB from BNC (Female) port
Connectors	QC Type (Female N normally supplied)
Finish	Gray powder coat
Nominal Size includes connectors	6 7/8" H x 5 1/8" W x 3 5/8" D, (175 mm x 130 mm x 92 mm)
Weight	3 1/2 lbs. (1.6 kg)
Elements	Tables 1, 2, 3, 3A, 4, 6 (within power/frequency range limits stated above)
Accessories	Case

*Quoted accuracy only when used with other Bird® Products
**Applies only when coupling is less than 30 dB

Portable Wattmeters

Thruline® RF Directional

4314C (P EP, Single Element)

Power Range	100 mW - 10 kW using Bird® Plug-in Elements.*
Frequency Range	450 kHz - 2.7 GHz (depending on element)
Insertion VSWR	with N Connectors 1.05 max. to 1000 MHz
Accuracy	±5% of full scale CW, ±8% PEP
Pulse Parameters	(min.) Pulse width 0.4 µs (100-2300 MHz), 1.5 µs (26-99 MHz) and 15 µs (2-25 MHz); repetition rate 30 pps and duty factor 1 x 10^{-4} min.
Battery	Two 9-Volt alkaline transistor batteries
AC Power	120 VAC, 60 Hz or 220 VAC, 60 Hz (using Bird® adapter)
Connectors	QC Type (Female N normally supplied)
Finish	Light Gray powder coat
Nominal Size includes connectors	6 7/8" H x 5 1/8" W x 3 5/8" D, (175 mm x 130 mm x 92 mm)
Weight	3 lbs. (1.4 kg)
Elements	Tables 1, 2, 3, 3A, 4, 5, 6
Accessories	Case, spare batteries, extra QC connectors.

4305A (High-Power)

Power Range	50 W - 25 kW using Bird® Plug-in Elements.*
Frequency Range	450 kHz - 2.3 GHz (depending on element)
Insertion VSWR	with N Connectors 1.05 max.
Accuracy	±5% of full scale
Connectors	QC Type (Female N normally supplied)
Finish	Gray powder coat
Nominal Size- includes connectors	6 5/16" H x 5 1/8" W x 4 1/4" D, (161 mm x 131 mm x 108 mm)
Weight	3 1/4 lbs. (1.5 kg)
Elements	4305A element table below and 1 5/8AA table
Accessories	Case

4305A ELEMENT SELECTION GUIDE

Power Range	Frequency Bands (MHz)					
	.45-2.5	2–30	50-125	100-250	400-1000	1100-1800
50 W	—	—	—	—	—	50K7
2500 W	—	—	2500B7	2500C7	2500E7	—
5000 W	—	—	5000B7	—	—	—
10 kW	—	10KH7	—	—	—	—
25 kW	25KP7	—	—	—	—	—

Portable Wattmeters

Thruline® RF Directional

4304A (Fixed 25-1000 MHz 5-500 Watt Element)	
Power Ranges	5, 15, 50, 150, 500 W, with no scale limitations except power limited to 150 W from 800-1000 MHz
Frequency Range	25 MHz - 1.0 GHz
Insertion VSWR	25-521 MHz, 1.05 max. (with UHF female conn.), 512-1000 MHz, 1.07 max.
Insertion Loss	25-512 MHz, 0.10 dB max. with UHF female conn., 512-1000 MHz range, 0.13 dB max.
Accuracy	25-100 MHz, ±7% of full scale, using correction charts. 100-512 MHz, ±6 of full scale, no correction needed. 512-1000 MHz, ±7% of full scale, no correction needed.
Connectors	QC Type (Female N normally supplied)
Finish	Light Gray powder coat
Nominal Size includes connectors	6 7/8" H x 5 1/8" W x 3 5/8" D, (175 mm x 130 mm x 92 mm)
Weight	3 lbs. (1.36 kg)
Accessories	Case

4308 (Cellular Specialist)	
Power Ranges	1.5, 5, 15, 50 W, with no scale limitations
Frequency Range	440 MHz - 960 MHz
Insertion VSWR	1.05 with TNC connectors (QC Type)
Accuracy	±5% of full scale
Connectors	QC Type (Female TNC normally supplied)
RF Sample Output	Variable -15 to -70 dB from BNC (Female) port
Connectors	QC Type (Female N normally supplied)
Finish	Gray powder coat
Nominal Size includes connectors	6 7/8" H x 5 1/8" W x 3 5/8" D, (175 mm x 130 mm x 92 mm)
Weight	3 lbs. (1.36 kg)
Accessories	Case

Portable Wattmeters

Thruline® RF Directional

	4410 Series (Multipower)
Battery	4410A - 9V Alkaline Battery 4412A-Rechargeable Battery
Power Range	2 mW to 10 W, 20 mW to 100 W, 200 mW to 1 kW or 2 W to 10 kW full scale in one single Plug-in Element.
Frequency Range	200 kHz - 2.3 GHz CW or FM
Insertion VSWR	with N Connectors 1.25 max. to 2300 MHz
Accuracy	±5% of reading for any reading above 20% of the Power Range selected for FM or CW signals without AM. This accuracy is maintained for a full 37 dB dynamic range with each 4410 Element (except No. 4410-1 200 kHz-535 kHz which is accurate to ±10% of reading, and 4410-15 1.0-1.8 GHz and 4410-16 1.8-2.3 GHz which are accurate to ±8% of reading.)
Ambient Temp. Range	Elements 4410-1 through -8 and -10 through -16 are temperature compensated for rated accuracy from 0°C to 50°C (32°F to 122°F) and 4410-20 through -27 from 20°C to 30°C (68°F to 86°F)
Over-Range Protection	To 120% of nominal full scale (i.e. 12 W, 120 W, 1200 W, or 12,000 W). No damage or degradation to the unit will result, regardless of the Range Selector Switch position.
Connectors	QC Type (Female N normally supplied)
Finish	Gray powder coat
Nominal Size includes connectors	6 7/8" H x 5 1/8" W x 3 5/8" D, (175 mm x 130 mm x 92 mm)
Weight	4410A: 3 lbs. (1.4 kg), 4412A: 3 1/3 lbs. (1.5 kg)
Elements	Tables 9, 10, 11, 12 (below)
Accessories	Case, spare battery

4410 ELEMENT SELECTION GUIDE

Table 9 — Full-Scale Power and Frequency Ranges 0-10, 30, 100, 300 Milliwatts, 1, 3, 10 Watts

Frequency Bands (MHz)							
30-50	50-88	88-108	150-250	225-400	400-800	800-900	900-1000
4410-20	4410-21	4410-27	4410-23	4410-24	4410-25	4410-26	4410-28

Table 10 — Full-Scale Power and Frequency Ranges 0-100, 300 Milliwatts, 1, 3, 10, 30, 100 Watts

Frequency Bands (MHz)						
25-80	50-125	100-250	200-500	400-1000	1000-1800	1800-2300
4410-10	4410-11	4410-12	4410-13	4410-14	4410-15*	4410-16*

Table 11 — Full-Scale Power and Frequency Ranges 0-1, 3, 10, 30, 100, 300, 1000 Watts

Frequency Bands (MHz)				
2–30	25-80	50-200	144-520	200-1000
4410-3	4410-5	4410-6	4410-7	4410-8

Table 12 — Full-Scale Power and Frequency Ranges 0-10, 30, 100, 300, 1000, 3000, 10,000 Watts

Frequency Bands (MHz)		
0.2-0.535	0.45-2.5	2-30
4410-1	4410-2	4410-4

*Accuracy is ±8% of reading

Portable Wattmeters

Thruline® RF Directional

APM-16 (Average Reading Power Meter)	
Power Range	1 W - 1000 W
Frequency Range	2 MHz - 2.3 GHz
Accuracy	10°C to 35°C ±4% reading, ±1% full scale, -20°C to 50°C ±6% reading, ±2% full scale
Peak/Avg. Ratio	In excess of 10 dB
Insertion VSWR	(with N connector) 1.05 max. to 1000 MHz
Setting Time	< 1 second
Meter	Shock mounted, linear scale with expanded scales of 25, 50 and 100 for full scale 1 to 1000 W readings. Mirrored scale includes 5% overrange.
Temp. Ranges	-20°C to 50°C operating; -25°C to 65°C storage
Humidity	95% ±5% max. (noncondensing)
Battery	Internal 9 volt
Connectors	QC type (Female N normally supplied)
Nominal Size	6 7/8" H x 5 1/8" W x 3 5/8" D, (175 mm x 130 mm x 92 mm)
Weight	3 lbs. (1.4 kg)
Elements	Special APM Series (below)
Recommended Accessories	Case

ELEMENT SELECTION GUIDE

Power Range	Frequency Bands (MHz)										
	2-30	25-60	50-125	100-250	200-500	400-1000	950-1260	1100-1800	1700-1990	1990-2200	2200-2300
1 W	—	—	APM-1B	APM-1C	—	APM-1E	APM-1J	—	APM-1L1	APM-1L2	APM-1M
2.5 W	—	—	APM-2.5B	—	APM-2.5D	APM-2.5E	APM-2.5J	APM-2.5K	APM-2.5L1	APM-2.5L2	—
5 W	APM-5H	APM-5A	APM-5B	APM-5C	APM-5D	APM-5E	APM-5J	APM-5K	APM-5L1	APM-5L2	—
10 W	APM-10H	APM-10A	APM-10B	APM-10C	APM-10D	APM-10E	APM-10J	APM-10K	APM-10L1	APM-10L2	—
25 W	—	—	APM-25B	APM-25C	APM-25D	APM-25E	—	APM-25K	APM-25L1	APM-25L2	—
50 W	—	—	—	APM-50C	APM-50D	APM-50E	APM-50J	APM-50K	APM-50L1	APM-50L2	—
100 W	APM-100H	APM-100A	APM-100B	APM-100C	APM-100D	APM-100E	APM-100J	—	APM-100L1	—	—
250 W	APM-250H	APM-250A	APM-250B	APM-250C	APM-250D	APM-250E	—	—	—	—	—
500 W	APM-500H	—	APM-500B	APM-500C	APM-500D	APM-500E	—	—	—	—	—
100 W	APM-1000H	—	APM-1000B	APM-1000C	—	APM-1000E	—	—	—	—	—

Portable Wattmeters

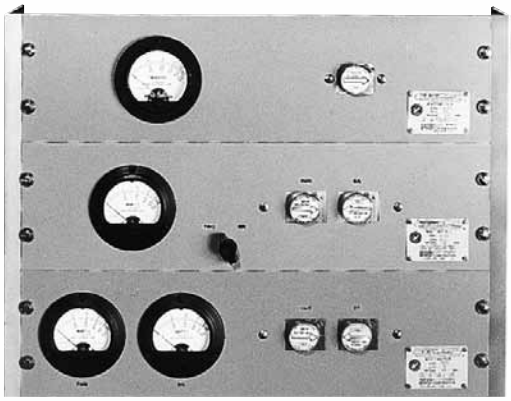
Thruline® RF Directional

	4391A (Rugged, RF Power Analyst®)
Power Range	100 mW to 10 kW using Bird® Plug-in Elements*
Frequency Range	450 kHz - 2.7 GHz
Insertion VSWR	with N connectors 1.05 max. to 1000 MHz
Accuracy	Power Readings: ±5% of full scale CW, ±8% PEP VSWR: ±10% of reading % Modulation: (CW power 1/3 or more of full scale) ±5% (0-90%), ±10% (90-100%)
Usable Over-range	to 120% of scale (CW, PEP, SWR and Return Loss)
Sampling Rate	2 to 3 readings per second
Display	3 1/2 digit, 0.3" LED strobed
Modulation	25 to 10,000 Hz (Audio)
Pulse Parameters	(min.) Pulse width 0.8 µs (100-2700 MHz), 1.5 µs (26-99 MHz) and 15 µs (2-25 MHz) Repetition Rate 25 PPS, and Duty Factor 1 x 10^{-4}
Return Loss	±0.3 dB to corresponding SWR value
Battery Life	8 hours (rechargeable)
AC Power	100-130/200-260 V, 50/60 Hz, 6 W
Connectors	QC Type (Female N normally supplied)
Finish	Blue vinyl with silver anodized side panels
Nominal Size includes connectors	9 9/16" L x 5 7/32" W x 4 5/16" H (243 mm x 158 mm x 110 mm)
Weight	5 3/4 lbs. (2.6 kg)
Elements	Select two elements in a 10:1 power ratio from Tables 1, 2, 3, 3A, 4, 5, 6 and 14
Accessories	Case

*Quoted accuracy only when used with other Bird® products.

Panel Mount Wattmeters

Thruline® RF Directional



4521, 4522 & 4526	
Power Range	100 mW - 10 kW using Bird® Plug-in Elements
Frequency Range	450 kHz - 2.7 GHz (depending on element)
Insertion VSWR	with N Connectors 1.05 max. to 1000 MHz
Accuracy	±5% of full scale
Connectors	QC Type (Female N normally supplied)
Finish	Gray powder coat
Nominal Size	19" W x 5 7/32" H x 1 11/16" D (483 mm x 133 mm x 43 mm)
Weight	3 1/2 lbs. (1.6 kg)
Weight	3 lbs. (1.36 kg)
Elements	Tables 1, 2, 3, 3A, 4, 6

*Applies only when coupling is less than 30 dB
**Quoted accuracy only when used with other Bird® Products

4527 (2-512 MHz with Sampler Port)	
Power Ranges	100 mW to 10 kW using Bird® Plug-in Elements*
Frequency Range	2 - 512 MHz (depending on element)
Insertion VSWR	with N Connectors 1.05 max. to 512 MHz
Accuracy	±5% of full scale
RF Sample Output	Fixed at -53 dB from 512 to 10 MHz, decreasing to -70 dB at 2 MHz BNC (Female) port
Connectors	QC Type (Female N normally supplied)
Finish	Gray powder coat
Nominal Size includes connectors	19" W x 5 7/32" H x 1 11/16" D (483 mm x 133 mm x 43 mm)
Weight	3 1/2 lbs. (1.6 kg)
Elements	2 to 512 MHz models within Tables 1, 2, 6

Field Replacement Meter

Thruline® Wattmeter Movement Kit

RPK 43-4	
Type	3 1/2” Round Kit w/ Cable
Current	30 µA/1400 Ω
Scales	25/50/100 W
Use with Element Tables	1, 2, 3, 3A, 4, 6

4210A100	
Type	3 1/4” Square Meter in Housing
Current	30 µA/1400 Ω
Scales	25/50/100 W
Use with Element Tables	1, 2, 3, 3A, 4, 6

Rigid Line Sections

Thruline® Wattmeter Components

1 5/8" LINE SECTIONS

	Connector Type	Line Size (Inches)	Element Sockets	Length (Inches)	Weight
4715-000	EIA Flg.	1 5/8"	2	6.75	3.25
4723-000	UnFlg. (Rec. 0.438")	1 5/8"	2	6.38	1.5
4723-020	UnFlg. (Flush)	1 5/8"	2	6.38	1.5

3 1/8" LINE SECTIONS

	Connector Type	Line Size (Inches)	Element Sockets	Length (Inches)	Weight
4610-000	EIA Flg.	3 1/8"	2	7.03	7.25
4801-100	UnFlg. (Rec. 0.438")	3 1/8"	2	6.5	4.25
4802-000	UnFlg. (Flush)	3 1/8"	2	6.5	4.25

4 1/16" LINE SECTIONS

	Connector Type	Line Size (Inches)	Element Sockets	Length (Inches)	Weight
4642-000	Flg. (Dielectric)	4 1/16"	2	8.13	8.88
4642-010	Flg. (MYAT)	4 1/16"	2	8.13	8.88
4844-000	UnFlg. (Rec. 0.531")	4 1/16"	2	7.5	2.88

6 1/8" LINE SECTIONS

	0.0556 in	Line Size (Inches)	Element Sockets	Length (Inches)	Weight
4905-000	EIA Flg.	6-1/8"	2	10.22	17
4909-000	UnFlg. (Rec. 0.438")	6-1/8"	2	9.63	12.75

7/8" LINE SECTIONS

	Connector Type	Line Size (Inches)	Element Sockets	Length (Inches)	Weight
4230-018	N-Type (F)	7/8"	1	5 1/2	1 1/3
4230-006-1	QC (not included)	7/8"	1	4	1
4230-059	QC (not included)	7/8"	1 w/bracket	6 7/32	1 1/4
4522-002-5	QC (not included)	7/8"	2 panel mt.	6.38	1 1/4

Rigid Line Wattmeters

3127 Series

3127 Series **SELECTION GUIDE**

	Type	Scales	DC Cable (Ft.)	Uses Line Section
3127-035	Single 4-1/2” rectangular on panel	5/10/25 kW	25	Double Socket
3127-055	Single 4-1/2” rectangular on panel w/fwd. and rfl. switch	5/10/25 kW	25	Double Socket
3127-040	Dual 4-1/2” rectangular on panel	5/10/25 kW	25	Double Socket
3127-080	Single 4-1/2” rectangular on panel w/fwd. and rfl. switch	15/30/60 kW	25	Double Socket
3127-075	Dual 4-1/2” rectangular on panel	15/30/60 kW	25	Double Socket

Rigid Line Wattmeters

6810 Series

6810 Series **SELECTION GUIDE**

	Type	Scales	DC Cable (Ft.)	Uses Line Section
6810-220	4-1/2" rectangular in housing w/fwd. and rfl. switch	5/10/25 kW	10	Double Socket
6810-230	4-1/2" rectangular in housing w/fwd. and rfl. switch	15/30/60 kW	10	Double Socket
6810-250	4-1/2" rectangular in housing w/fwd. and rfl. switch	8/80 kW	10	Double Socket
6810-265	4-1/2" rectangular in housing	8/80 kW	10	Single Socket
6810-307	4-1/2" rectangular in housing	15/30/60 kW	10	Single Socket
6810-309-7	4-1/2" rectangular in housing	5/10/25 kW	10	Single Socket

Plug-In Elements

Selection Guide

Model	Select Element From Table(s)
3128A	1, 2, 3, 3A, 4, 6, 14*
3170B	1, 2, 3, 3A, 4, 6, 14*
43	1, 2, 3, 3A, 4, 6, 14*
43P	1, 2, 3, 3A, 4, 5, 6
4305A	4305A Elements, 1 5/8AA
4314C	1, 2, 3, 3A, 4, 5, 6, 14*

Model	Select Element From Table(s)
4391A	1, 2, 3, 3A, 4, 5, 6, 14*
4410A, 4412A	(see page 24)
4431	1, 2, 3, 3A, 4, 6, 14*
4521, 4522	1, 2, 3, 3A, 4, 6, 14*
4526	1, 2, 3, 3A, 4, 6, 14*
4527	2 MHz to 512 MHz elements in 1,2, 6,14*

*Table 14 describes coupler elements used for RF sampling.The instrument meter does not read when these elements are installed, but simply serves as a line section.

ELEMENT TABLE FREQUENCY & POWER LIMITS

Element Table	Min. Power (Watts F.S.)	Max. Power (Watts F.S.)	Min. Freq (MHz)	Max. Freq (MHz)
APM	1	1000	2	2300
1	5	5000	2	1000
2	1	2.5	25	1000
3	1	250	950	2700
3A	0.1	0.5	950	2600
4	1000	10,000	0.45	2.5
5	500	10,000	2	1260
6	0.1	0.5	45	1000

ELEMENT TABLE FREQUENCY & POWER LIMITS

Element Table	Min. Power (Watts F.S.)	Max. Power (Watts F.S.)	Min. Freq (MHz)	Max. Freq (MHz)
8	50	25,000	0.45	2300
9	0.01	10	30	1000
9A	0.001	1	864	970
10	0.1	100	25	2300
11	1	1000	2	1000
12	10	10,000	0.2	30
14	1000	1000	50	1250

TABLE 1 STANDARD ELEMENTS

Power Range	Frequency Bands (MHz) 2-30	25-60	50-125	100-250	200-500	400-1000
5 W	—	5A	5B	5C	5D	5E
10 W	—	10A	10B	10C	10D	10E
25 W	—	25A	25B	25C	25D	25E
50 W	50H	50A	50B	50C	50D	50E
100 W	100H	100A	100B	100C	100D	100E
250 W	250H	250A	250B	250C	250D	250E
500 kW	500H	500A	500B	500C	500D	500E
1000 W	1000H	1000A	1000B	1000C	1000D	1000E
2500 W	2500H	—	—	—	2500D	—
5000 W	5000H	—	—	—	—	—

TABLE 2 LOW POWER ELEMENTS

	1 Watt Frequency (MHz) 40-50	50-60	60-80	80-90	95-125	110-160	150-250	200-300	275-450	425-850	800-1000
Part No.	040-1	050-1	060-1	080-1	095-1	110-1	150-1	200-1	275-1	425-1	801-1
	2.5 Watt Frequency (MHz) 25-30	30-40	40-50	50-60	60-80	80-95	95-150	150-250	200-300	250-450	400-850	800-1000
Part No.	025-2	030-2	040-2	050-2	060-2	080-2	095-2	150-2	200-2	250-2	400-2	801-2

Table 3 HIGH-FREQUENCY ELEMENTS, ENTIRE TABLE ±8% FS

Power Range	Frequency Bands (MHz) 950-1260	1100-1800	1700-1990	1990-2200	2200-2300	2300-2400	2400-2500	2500-2600	2600-2700
1 W	1J	1K	1L1	1L2	1M	431-17	431-20	431-23	431-120
2.5 W	2.5J	2.5K	2.5L1	2.5L2	2.5M	431-110	431-107	431-108	431-117
5 W	5J	5K	5L1	5L2	5M	432-15	432-28	432-2	432-12
10 W	10J	10K	10L1	10L2	10M	432-125	432-141	432-102	432-104
25 W	25J	25K	25L1	25L2	25M	433-19	433-20	433-35	433-36
50 W	50J	50K	50L1	50L2	50M	433-37	433-38	433-163	433-164
100 kW	100J	—	—	—	—	—	—	—	—
250 W	250J	—	—	—	—	—	—	—	—

Plug-In Elements

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Table 3A HIGH-FREQUENCY MILLIWATT ELEMENTS

Power Range	Frequency Bands (MHz)						
	950-1260	1250-1500	1500-1700	1700-2200	2300-2400	2400-2500	2500-2600
100 mW	430-82	430-209	430-210	430-178	430-211	430-182	—
250 mW	—	—	—	430-1	430-239	430-240	430-241
500 mW	—	430-259	—	430-95	—	430-159	—

Table 4 LOW-FREQUENCYELEMENTS

Power Range	Frequency Band (MHz)
	.45 - 2.5 MHz
1000 W	1000P
2500 W	2500P
5000 W	5000P
10000 W	10000P

Table 5 PULSE-POWER ELEMENTS, ENTIRE TABLE ±8% OF FULL SCALE

Power Range	Frequency Bands (MHz)					
	2-30	25-60	50-125	100-250	400-1000	950-1260
500 W	—	—	—	—	—	500J
1000 W	—	—	—	—	—	1000J
2500 W	—	2500A	2500B	2500C	2500E	2500J
5000 W	—	5000A	5000B	5000C	5000E	5000J
10000 W	10000H	—	10000B	—	10000E	—

Refer to "Transmission Power Rating Chart" for max. power ratings.
Elements are capable of reading peak and average power.

Table 6 MILLIWATT ELEMENTS

	100 mW Frequency (MHz)										
	40-50	72-76	108-136	135-175	320-340	328-336	400-420	420-450	450-470	600-800	800-1000
Cat. No.	430-266	430-2	430-57	430-86	430-205	430-3	430-7	430-208	430-8	430-169	430-263

	250 mW Frequency (MHz)							
	72-76	88-108	105-120	116-126	130-150	190-210	450-470	800-1000
Cat. No.	430-22	430-217	430-20	430-48	430-13	430-65	430-61	430-264

	500 mW Frequency (MHz)												
	72-76	88-108	105-120	120-136	136-150	240-290	290-340	340-360	350-400	400-450	450-500	600-800	800-1000
Cat. No.	430-33	430-247	430-26	430-248	430-249	430-27	430-253	430-157	430-254	430-255	430-256	430-258	430-265

NONDIRECTIONAL SAMPLER ELEMENTS FOR QC-TYPE OR 7/8" EIA LINE

	Frequency Band (MHz)	Nominal Coupling	Max. Main Line Power
4274-025	25-1000	-50 dB ± 2 dB (-66 dB @ 2 MHz)	500 W
4274-050	100-400	-35 to -48 dB (±1 dB) Adjustable)	500 W

Table 14 DIRECTIONAL COUPLER ELEMENTS FOR QC-TYPE OR 7/8" EIA LINE

Model No.	Frequency Bands (MHz)		
	Freq Band (MHz)	Nominal Coupling	Max. Main Line Power
400-50	50-100	-40 dB	1 kW
400-75	75-150	-40 dB	1 kW
400-125	125-250	-40 dB	1 kW
400-225	225-450	-40 dB	1 kW
400-400	400-800	-40 dB	1 kW
400-750	750-1250	-40 dB	1 kW

Table 15 DIRECTIONAL COUPLER ELEMENTS FOR 1 5/8" EIA LINE

Model No.	Frequency Bands (MHz)		
	Freq Band (MHz)	Nominal Coupling	Max. Main Line Power
501-50	50-100	-50 dB	10 kW
501-75	75-150	-50 dB	10 kW
501-125	125-250	-50 dB	10 kW
501-225	225-450	-50 dB	10 kW
501-400	400-800	-50 dB	5 kW

NOTE: For use in any line section including BPME

Table 16 DIRECTIONAL COUPLER ELEMENTS FOR 3 1/8" EIA LINE

Model No.	Frequency Bands (MHz)		
	Freq Band (MHz)	Nominal Coupling	Max. Main Line Power
553-25	25-40	-55 dB	25 kW
553-50	50-100	-55 dB	25 kW
553-75	75-150	-55 dB	25 kW
553-125	125-250	-55 dB	25 kW
553-225	225-450	-55 dB	25 kW
553-401	400-800	-55 dB	15 kW
553-750	750-1250	-55 dB	10 kW

Table 17 DIRECTIONAL COUPLER ELEMENTS FOR 6 1/8" EIA LINE

Model No.	Frequency Bands (MHz)		
	Freq Band (MHz)	Nominal Coupling	Max. Main Line Power
606-50	50-100	-60 dB	60 kW
606-75	75-150	-60 dB	60 kW
606-125	125-250	-60 dB	60 kW
606-225	125-250	-60 dB	60 kW
606-400	400-870	-60 dB	60 kW

Plug-In Elements

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Model	Select Element From Table(s)
3126A	1 5/8 B, 3 1/8 B, 4 1/16 B, 6 1/8 B
3127A	1 5/8 A, 3 1/8 A, 6 1/8 A
3127-035	1 5/8 A, 3 1/8 A, 4 1/16 A, 6 1/8 A
3127-040	1 5/8 A, 3 1/8 A, 4 1/16 A, 6 1/8 A
3127-055	1 5/8 A, 3 1/8 A, 4 1/16 A, 6 1/8 A
3127-075	1 5/8 B, 3 1/8 B, 4 1/16 B, 6 1/8 B
3127-080	1 5/8 B, 3 1/8 B, 4 1/16 B, 6 1/8 B

Model	Select Element From Table(s)
3171B020	1 5/8 BB, 3 1/8 BB, 4 1/16 BB, 6 1/8 BB
3171B	1 5/8 AA, 3 1/8 AA, 4 1/16 AA, 6 1/8 AA
6810-220	1 5/8 A, 3 1/8 A, 4 1/16 A, 6 1/8 A
6810-309-7	1 5/8 A, 3 1/8 A, 4 1/16 A, 6 1/8 A
6810-230	1 5/8 B, 3 1/8 B, 4 1/16 B, 6 1/8 B
6810-250	4 1/16 C, 6 1/8 C
6810-307	1 5/8 B, 3 1/8 B, 4 1/16 B, 6 1/8 B
6810-265	4 1/16 C, 6 1/8 C

Table 1 5/8 A — STANDARD ELEMENTS 100 µA

Power Range	Frequency Bands (MHz)			
	2-30	50-125	100-250	400-1000
100 W	—	100B1	100C1	100E1
250 W	—	250B1	250C1	250E1
500 W	—	500B1	500C1	500E1
1000 W	1000H1	1000B1	1000C1	1000E1
2500 W	2500H1	2500B1	2500C1	2500E1
5000 W	5000H1	5000B1	5000C1	5000E1
10 kW	10KH1	10KB1	10KC1	—
25 kW	25KH1	25KB1	—	—

Table 1 5/8 AA — STANDARD ELEMENTS 30 µA

Power Range	Frequency Bands (MHz)			
	2-30	50-125	100-250	400-1000
100 W	—	100B12	100C12	100E12
250 W	—	250B12	250C12	250E12
500 W	500H12	500B12	500C12	500E12
1000 W	1000H12	1000B12	1000C12	1000E12
2500 W	2500H12	2500B12	2500C12	2500E12
5000 W	5000H12	5000B12	5000C12	5000E12
10 kW	10KH12	10KB12	—	—
25 kW	25KH12	25KB12	—	—

Table 1 5/8 B — STANDARD ELEMENTS 100 µA

Power Range	Frequency Bands (MHz)			
	2-30	50-125	100-250	400-1000
300 W	—	300B1	300C1	300E1
600 W	—	600B1	600C1	600E1
1500 W	1500H1	1500B1	1500C1	1500E1
3000 W	3000H1	3000B1	3000C1	3000E1
6000 W	6000H1	6000B1	6000C1	6000E1
15 kW	15KH1	15KB1	—	—

Table 1 5/8 BB — STANDARD ELEMENTS 30 µA

Power Range	Frequency Bands (MHz)			
	2-30	50-125	100-250	400-1000
300 W	300H12	300B12	300C12	300E12
600 W	600H12	600B12	600C12	600E12
1500 W	1500H12	1500B12	1500C12	1500E12
3000 W	3000H12	3000B12	3000C12	3000E12
6000 W	6000H12	6000B12	6000C12	6000E12
15 kW	15KH12	15KB12	—	—

Table 1 5/8 C — STANDARD ELEMENTS 100 µA

Power Range	Frequency Bands (MHz)	
	50-125	100-250
8000 W	8000B1	8000C1

Table 3 1/8 A — STANDARD ELEMENTS 100 µA

Power Range	Frequency Bands (MHz)			
	2-30	50-125	100-250	400-1000
100 W	—	100B3	100C3	100E3
250 W	—	250B3	250C3	250E3
500 W	—	500B3	500C3	500E3
1000 W	—	1000B3	1000C3	1000E3
2500 W	2500H3	2500B3	2500C3	2500E3
5000 W	5000H3	5000B3	5000C3	5000E3
10 kW	10KH3	10KB3	10KC3	10KE3
25 kW	25KH3	25KB3	25KC3	25KE3
50 kW	50KH3	50KB3	50KC3	—
100 kW	100KH3	—	—	—

Table 3 1/8 AA — STANDARD ELEMENTS 30 µA

Power Range	Frequency Bands (MHz)			
	2-30	50-125	100-250	400-1000
100 W	—	100B32	100C32	100E32
250 W	—	250B32	250C32	250E32
500 W	500H32	500B32	500C32	500E32
1000 W	1000H32	1000B32	1000C32	1000E32
2500 W	2500H32	2500B32	2500C32	2500E32
5000 W	5000H32	5000B32	5000C32	5000E32
10 kW	10KH32	10KB32	10KC32	10KE32
25 kW	25KH32	25KB32	25KC32	25KE32
50 kW	50KH32	50KB32	50KC32	—
100 kW	100KH32	—	—	—

Table 3 1/8 B — STANDARD ELEMENTS 100 µA

Power Range	Frequency Bands (MHz)		
	50-125	100-250	400-1000
600 W	600B3	600C3	600E3
1500 W	1500B3	1500C3	1500E3
3000 W	3000B3	3000C3	3000E3
6000 W	6000B3	6000C3	6000E3
15 kW	15KB3	15KC3	15KE3
30 kW	30KB3	30KC3	30KE3

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Table 3 1/8 BB — STANDARD ELEMENTS 30 µA

Power Range	Frequency Bands (MHz)		
	50-125	100-250	400-1000
600 W	600B32	600C32	600E32
1500 W	1500B32	1500C32	1500E32
3000 W	3000B32	3000C32	3000E32
6000 W	6000B32	6000C32	6000E32
15 kW	15KB32	15KC32	15KE32
30 kW	30KB32	30KC32	30KE32

Table 3 1/8 C — STANDARD ELEMENTS 100 µA

Power Range	Frequency Bands (MHz)
	100-250
8000 W	8000C3

Table 4 1/16 A — STANDARD ELEMENTS 100 µA

Power Range	Frequency Bands (MHz)		
	50-125	100-250	400-1000
2500 W	2500B5	2500C5	2500E5
5000 W	5000B5	5000C5	5000E5
10 kW	10KB5	10KC5	10KE5
25 kW	25KB5	25KC5	25KE5
50 kW	50KB5	50KC5	—

Table 4 1/16 AA — STANDARD ELEMENTS 30 µA

Power Range	Frequency Bands (MHz)		
	50-125	100-250	400-1000
2500 W	2500B5	2500C52	2500E52
5000 W	5000B52	5000C52	5000E52
10 kW	10KB52	10KC52	10KE52
25 kW	25KB52	25KC52	25KE52

Table 4 1/16 B — STANDARD ELEMENTS 100 µA

Power Range	Frequency Bands (MHz)		
	50-125	100-250	400-1000
1500 W	1500B5	1500C5	1500E5
3000 W	3000B5	3000C5	3000E5
6000 W	6000B5	6000C5	6000E5
15 kW	15KB5	15KC5	15KE5
30 kW	30KB5	30KC5	30KE5
60 kW	60KB5	60KC5	—

Table 4 1/16 BB — STANDARD ELEMENTS 30 µA

Power Range	Frequency Bands (MHz)		
	50-125	100-250	400-1000
1500 W	1500B52	1500C52	1500E52
3000 W	3000B52	3000C52	3000E52
6000 W	6000B52	6000C52	6000E52
15 kW	15KB52	15KC52	15KE52
30 kW	30KB52	30KC52	30KE52
60 kW	60KB52	60KC52	—

Table 4 1/16 C — STANDARD ELEMENTS 100 µA

Power Range	Frequency Bands (MHz)		
	50-125	100-250	400-1000
8000 W	8000B5	8000C5	8000E5
80 kW	80KB5	80KC5	—

Table 6 1/8 A — STANDARD ELEMENTS 100 µA

Power Range	Frequency Bands (MHz)			
	2-30	50-125	100-250	400-1000
1000 W	—	1000B6	1000C6	1000E6
2500 W	—	2500B6	2500C6	2500E6
5000 W	—	—	5000C6	5000E6
10 kW	10KH6	10KB6	10KC6	10KE6
25 kW	25KH6	25KB6	25KC6	25KE6
50 kW	50KH6	50KB6	50KC6	50KE6
100 kW	10KH6	100KB6	100KC6	—
250 kW	250KH6	—	—	—

Table 6 1/8 AA — STANDARD ELEMENTS 30 µA

Power Range	Frequency Bands (MHz)			
	2-30	50-125	100-250	400-1000
250 W	—	—	250C62	250E62
500 W	—	500B62	500C62	500E62
1000 W	1000H62	1000B62	1000C62	1000E62
2500 W	2500H62	2500B62	2500C62	2500E62
5000 W	—	5000B62	5000C62	5000E62
10 kW	10KH62	10KB62	10KC62	10KE62
25 kW	—	25KB62	25KC62	25KE62
50 kW	50KH62	50KB62	50KC62	50KE62
100 kW	100KH62	100KB62	100KC62	—

Table 6 1/8 B — STANDARD ELEMENTS 100 µA

Power Range	Frequency Bands (MHz)		
	50-125	100-250	400-1000
3000 W	3000B6	3000C6	3000E6
6000 W	6000B6	6000C6	6000E6
15 kW	15KB6	15KC6	15KE6
30 kW	30KB6	30KC6	30KE6
60 kW	60KB6	60KC6	60KE6

Table 6 1/8 BB — STANDARD ELEMENTS 30 µA

Power Range	Frequency Bands (MHz)		
	50-125	100-250	400-1000
3000 W	3000B62	3000C62	3000E62
6000 W	6000B62	6000C62	6000E62
15 kW	15KB62	15KC62	15KE62
30 kW	30KB62	30KC62	30KE62
60 kW	60KB62	60KC62	60KE62

Table 6 1/8 C — STANDARD ELEMENTS 100 µA

Power Range	Frequency Bands (MHz)		
	50-125	100-250	400-1000
8000 W	8000B6	8000C6	8000E6
80 kW	80KB6	80KC6	80KE6

Convection Cooled Loads

- Self cooling design, needs no cooling plate
- Frequencies up to 18 GHz
- Fully shielded against production of extraneous radiation
- Load requires no AC power
- Rugged Construction
- Broadband Operation

Coolant Method	Dry, Convection Cooled	**Ambient Temperature**	-40°C to 40°C
Impedance	50 Ohm	**AC Power**	None**
Operating Position	Any	**Humidity**	95% non-condensing
PIM	-110 dBc Min.		

	Power Rating	Connector	VSWR & Frequency Range	Dimensions (LxWxH)	Weight	FInish
2-T	2 W	SMA, BNC, 7/16 DIN, N, TNC	1.10:1 from DC to 1 GHz 1.25:1 from 1 to 4 GHz	2.9 " x 1.4" Dia 74 x 36 Dia. mm	4.6 oz. 131 g	Tri-alloy
2-NT	2 W	BNC, 7/16 DIN, N, TNC	1.10:1 from DC to 1 GHz 1.15:1 from 1 to 3 GHz	2.9 " x 1.4" Dia 74 x 36 Dia. mm	4.6 oz. 131 g	
2-18T	2 W	SMA, N	1.20:1 from DC to 12.4 GHz 1.25:1 from 12.4 to 18 GHz	1.0" x 0.9" Dia. 26 x 23 Dia. mm	2.0 oz. 57 g	Stainless Steel
5-T	5 W	BNC, 7/16 DIN, N, TNC	1.10:1 from DC to 1 GHz 1.25:1 from 1 to 4 GHz	2.9 " x 1.4" Dia 74 x 36 Dia. mm	4.6 oz. 131 g	Tri-alloy
5-NT	5 W	BNC, 7/16 DIN, N, TNC	1.10:1 from DC to 1 GHz 1.25:1 from 1 to 3 GHz	2.9 " x 1.4" Dia 74 x 36 Dia. mm	4.6 oz. 131 g	
5-18T	5 W	SMA, N	1.15:1 from DC to 4 GHz 1.25:1 from 4 to 12.4 GHz	1.4" x 0.9" Dia. 36 x 23 Dia. mm	2.0 oz. 57 g	Stainless Steel
10-T	10 W	SMA, BNC, 7/16 DIN, N, TNC	1.10:1 from DC to 1 GHz 1.25:1 from 1 to 4 GHz	2.6" x 2.3" Dia. 67 x 59 Dia. mm	3 oz. 86 g	Black Anodized Aluminum
10-NT	10 W	BNC, 7/16 DIN, N, TNC	1.10:1 from DC to 1 GHz 1.15:1 from 1 to 3 GHz	2.2" x 2.3" Dia. 56 x 59 Dia. mm	5.9oz. 168 g	
10-18T	10 W	SMA, N	1.20:1 from DC to 12.4 GHz 1.25:1 from 12.4 to 18 GHz 1.35:1 from 12.4 to 18 GHz	1.7" x 1.0" Dia. 44 x 26 Dia. mm	2.0 oz. 57 g	
25-T	25 W	SMA, BNC, 7/16 DIN, N, TNC	1.10:1 from DC to 1 GHz 1.25:1 from 1 to 4 GHz	5.3" x 2.3" Dia. 135 x 59 Dia. mm	7 oz. 199 g	
25-NT	25 W	BNC, 7/16 DIN, N, TNC	1.10:1 from DC to 1 GHz 1.25:1 from 1 to 3 GHz	4.9" x 2.3" Dia. 125 x 59 Dia. mm	7 oz. 199 g	
25-6T	25 W	SMA, N	1.20:1 from DC to 6 GHz	3.5" x 2.3" x 2.3" 89 x 59 x 59 mm	14.0 oz. 397 g	
25-18T	25 W	SMA, N	1.20:1 from DC to 6 GHz 1.30:1 from 6 to 12.4 GHz 1.40:1 from 12.4 to 18 GHz	3.5" x 2.3" x 2.3" 89 x 59 x 59 mm	14.0 oz. 397 g	

**1500 W models require 115/230V AC power

MODEL NOMENCLATURE

Use this Model Number Definition to specify part numbers when ordering T, ST, WT, and CT Series dry loads.

_____ – _____ – _____ _____

Power Rating (Watts)

Product Type
T, WT – Convection-cooled
CT – Conduction-cooled
ST – Square Convection Cooled

Connector Gender
F –Female
M –Male

Connectors*
A – SMA
B – BNC
E – IEC 7/16
N – N
T – TNC

*Call for custom connector options not shown in this catalog

	Power Rating	Connector	VSWR & Frequency Range	Dimensions (LxWxH)	Weight	FInish
50-T	50 W	SMA, BNC, 7/16 DIN, N, TNC	1.10:1 from DC to 1 GHz 1.25:1 from 1 to 4 GHz	5.3" x 2.3" Dia. 135 x 59 Dia. mm	1.3 lbs. 590 g	Black Anodized Aluminum
50-NT	50 W	BNC, 7/16 DIN, N, TNC	1.10:1 from DC to 1 GHz 1.15:1 from 1 to 3 GHz	5.3" x 2.3" Dia. 135 x 59 Dia. mm	1.2 lbs. 545 g	
50-6T	50 W	N	1.20:1 from DC to 6 GHz	4.0" x 3.0" x 3.0" 102 x 77 x 77 mm	1.6 lbs. 726 g	
50-18T	50 W	N	1.25:1 from DC to 6 GHz 1.35:1 from 6 to 12.4 GHz 1.45:1 from 12.4 to 18 GHz	4.0" x 3.0" x 3.0" 102 x 77 x 77 mm	1.6 lbs. 726 g	
100-ST	100 W	BNC, 7/16 DIN, N, TNC	1.10:1 from DC to 1 GHz 1.25:1 from 1 to 4 GHz	7.4" x 2.8" x 2.8" 188 x 72 x 72 mm	2.7 lbs. 1.2 kg	
100-NST	100 W	BNC, 7/16 DIN, N, TNC	1.10:1 from DC to 1 GHz 1.20:1 from 1 to 3 GHz	7.3" x 2.8" x 2.8" 186 x 72 x 72 mm	2.7 lbs. 1.2 kg	
100-6T	100 W	N	1.20:1 from DC to 2 GHz 1.30:1 from 2 to 4 GHz 1.40:1 from 4 to 6 GHz	5.5" x 3.5" x 3.8" 140 x 89 x 97 mm	2.2 lbs 1.0 kg	
150-T	150 W	BNC, 7/16 DIN, N, TNC	1.10:1 from DC to 1 GHz 1.25:1 from 1 to 2.4 GHz	6.8" x 11.5" x 2.6" 173 x 293 x 67 mm	6.0 lbs. 2.8 kg	
150-ST	150 W	BNC, 7/16 DIN, N, TNC	1.10:1 from DC to 1 GHz 1.25:1 from 1 to 2.4 GHz	8.1" x 4.0" x 4.0" 206 x 102 x 102 mm	5.0 lbs. 2.3 kg	
150-WT	150 W	BNC, 7/16 DIN, N, TNC	1.10:1 from DC to 1 GHz 1.25:1 from 1 to 2.4 GHz	4.9" x 5.4" x 4.8" 125 x 138 x 122 mm	2.5 lbs. 1.2 kg	
300-T	300 W	BNC, 7/16 DIN, N, TNC	1.10:1 from DC to 1 GHz 1.25:1 from 1 to 2.4 GHz	7.4" x 5.4" x 10.9" 188 x 138 x 277 mm	11.5 lbs. 5.3 kg	
300-WT	300 W	BNC, 7/16 DIN, N, TNC	1.10:1 from DC to 1 GHz 1.25:1 from 1 to 2.4 GHz	8.2" x 5.4" x 4.8" 209 x 138 x 122 mm	4.7 lbs. 2.2 kg	
500-WT	500 W	7/16 DIN, N	1.10:1 from DC to 1 GHz 1.25:1 from 1 to 2.5 GHz	11.0" x 5.4" x 4.8" 280 x 138 x 122 mm	7.8 lbs. 3.6 kg	
600-T	600 W	7/16 DIN, N	1.10:1 from DC to 1 GHz 1.25:1 from 1 to 2.4 GHz	12.4" x 9.6" x 7.4" 315 x 244 x 188 mm	21.5 lbs. 9.8 kg	
1000-T	1000 W	7/16 DIN, N	1.10:1 from DC to 1 GHz 1.25:1 from 1 to 2.4 GHz	12.3" x 9.6" x 12.8" 313 x 244 x 326 mm	26.5 lbs. 12.0 kg	
1000-WT	1000 W	7/16 DIN, N	1.10:1 from DC to 1 GHz 1.25:1 from 1 to 2.4 GHz	18.5" x 10.6" x 4.8" 470 x 270 x 122 mm	26.5 lbs. 12.0 kg	
1500-WT**	1500 W	7/16 DIN, N	1.10:1 from DC to 1 GHz 1.25:1 from 1 to 2.4 GHz	20" x 10.6" x 6.0" 508 x 270 x 152 mm	30.0 lbs. 13.6 kg	

Conduction Cooled Loads

- Ultra compact, lightweight design
- Economical design
- Fully shielded against production of extraneous radiation
- Load requires no AC power
- 750, 1500, and 2500 W models rated for 13dB Peak Power

Coolant Method	Dry, Conduction Cooled
Impedance	50 Ohm
Operating Position	Any
PIM	-110 dBc Min.

Max Flange Temp for Full Rated Power	-40°C to 40°C
AC Power	None
Humidity	95% non-condensing

	Power Rating	Connector	VSWR & Frequency Range	Dimensions (LxWxH)	Weight	Finish
25-CT	25 W	SMA	1.15:1 from DC to 1 GHz 1.25:1 from 1 to 3 GHz	0.9" x 1.0" x 0.5" (23 x 26 x 13 mm)	0.4 oz 12 g	Tri-alloy
50-CT	50 W	SMA	1.15:1 from DC to 3 GHz 1.25:1 from 3 to 6 GHz	0.8" x 0.9" x 0.4" (21 x 23 x 11 mm)	1.1 oz 32 g	
100-CT	100 W	SMA	1.15:1 from DC to 2 GHz 1.25:1 from 2 to 3 GHz	1.4" x 1.4" x 0.6" (36 x 36 x 16 mm)	1.0 oz 30 g	
150-CT	150 W	N, TNC	1.10:1 from DC to 1 GHz 1.25:1 from 1 to 2.4 GHz	1.9" x 1.2" x 1.1" (49 x 31 x 28 mm)	2.2 oz 63 g	
		SMA	1.15:1 from DC to 2 GHz 1.25:1 from 2 to 3 GHz	2.1" x 2.1" x 0.6" (54 x 54 x 16 mm)		
151-CT	150 W	N	1.10:1 from DC to 1 GHz 1.25:1 from 1 to 4 GHz	2.0" x 2.0" x 1.1" (51 x 51 x 28 mm)	2.2 oz. 63 g	
250-CT	250 W	BNC, N, TNC	1.10:1 from DC to 1 GHz 1.25:1 from 1 to 2.4 GHz	2.5" x 2.2" x 1.1" (64 x 56 x 28 mm)	5.2 oz. 148 g	
		SMA	1.15:1 from DC to 2 GHz 1.25:1 from 2 to 3 GHz	2.1" x 2.1" x 0.6" (54 x 54 x 16 mm)		
300-CT	300 W	BNC, N, TNC, 7/16 DIN	1.10:1 from DC to 1 GHz 1.25:1 from 1 to 2.5 GHz	4.8" x 2.0" x 1.2" (122 x 51 x 31 mm)	12 oz. 340 g	
500-CT	500 W	SMA, BNC, N, TNC, 7/16 DIN	1.10:1 from DC to 1 GHz 1.30:1 from 1 to 3 GHz	2.7" x 2.0" x 1.2" (69 x 51 x 31 mm)	8.2 oz. 233 g	
750-CT	750 W	7/16 DIN	1.25:1 from 460 - 890 MHz	5.4" x 3.0" x 1.5" (138 x 78 x 38 mm)	2.3 lbs 1.1 kg	Al / Cu
1500-CT	1500 W	7/16 DIN	1.25:1 from 460 - 890 MHz	8.1" x 3.0" x 1.5" (208 x 78 x 38 mm)	3.5 lbs 1.6 kg	
2500-CT	2500 W	7/16 DIN	1.25:1 from 460 - 890 MHz	9.4" x 3.0" x 1.5" (240 x 78 x 38 mm)	4.2 lbs 2.0 kg	

Oil Loads

- Wide range of available RF input connectors
- Compact design
- Capable of up to 10 dB peak to average power ratios
- Broadband operation
- Self-contained cooling system that includes cooling fans for higher power models

Altitude	1520 m (5000 ft.)
Humidity	95% noncondensing max
Impedence	50 Ohms Nominal
Ambient Temperature Range	-40°C to +45°C
Operating Position	Vertical Only

Finish	Gray Powder Coat
Load Coolant	8135, 8201, 8251: Refined Mineral Oil All Others: Silicone Oil
CE	EMC EN 61326-1:2006 (units w/blowers) and Safety EN 61010-1:2001 (all units)

	Power Rating	Frequency Range/VSWR	Cooling Method	Connector	Dimensions	Weight
8135	150 W	DC to 1 GHz at 1.1:1 max 1 to 2 GHz at 1.2:1 max 2.5 to 4 GHz at 1.3:1 max	Convection	QC - N(f)	9.6" x 6.5" x 4" 242mm x 164mm x 102mm	6.0 lbs. 2.7 kg
8141	250 W	DC to 1 GHz at 1.1:1 max 1 to 1.8 GHz at 1.2:1 max 1.8 to 2.5 GHz at 1.3:1 max	Convection	QC - N(f)	9.6" x 8.5" x 6" 243mm x 216mm x 151mm	10 lbs. 4.5 kg
8201	500 W	DC to 1 GHz at 1.1:1 max 1 to 2.5 GHz at 1.25:1 max	Convection	QC - N(f)	16.2" x 8.5" x 6" 427mm x 216mm x 151mm	20 lbs. 9.1 kg
8401	600 W	DC to 1 GHz at 1.1:1 max 1 to 2.8 GHz at 1.2:1 max 2.8 to 3 GHz at 1.3:1 max	Convection	QC - N(f)	16.8" x 8.5" x 6" 427mm x 216mm x 151mm	20 lbs. 9.1 kg
8251	1000 W	DC to 1 GHz at 1.1:1 max 1 to 2 GHz at 1.25:1 max 2 to 2.4 GHz at 1.3:1 max	Convection	QC - LC(f)	17.9" x 8.5" x 6" 455mm x 216mm x 151mm	25 lbs. 11.5 kg
8860	1500 W	DC to 1 GHz at 1.1:1 max 1 to 2 GHz at 1.25:1 max 2 to 2.4 GHz at 1.3 max	Convection	QC - LC(f)	19.5" x 7.5" x 13.2" 496mm x 184mm x 334mm	32 lbs. 14.5 kg
8861				1-5/8 EIA Unflg		
8862				1-5/8 EIA Flg		
8863				3-1/8 EIA Unflg		
8864				3-1/8 EIA Flg		
8890-300	2500 W	DC to 1 GHz at 1.1:1 max 1 to 2 GHz at 1.25:1 max 2 to 2.4 GHz at 1.3 max	Convection	QC - LC(f)	25.2" x 7" x 17.2" 638mm x 178mm x 437mm	59 lbs. 27 kg
8891-300				3-1/8 EIA Flg		
8892-300				1-5/8 EIA Flg		
8895-300				1-5/8 EIA Unflg		
8890-315	5000 W		115 VAC Fan	QC - LC(f)	25.2" x 7.4" x 22.7" 638mm x 187mm x 560mm	73 lbs. 33 kg
8890-320			230 VAC Fan	QC - LC(f)		
8891-315			115 VAC Fan	3-1/8 EIA Flg		
8891-320			230 VAC Fan			
8892-315			115 VAC Fan	1-5/8 EIA Flg		
8892-320			230 VAC Fan			
8895-315			115 VAC Fan	1-5/8 EIA Unflg		
8895-320			230 VAC Fan			
8897-315			115 VAC Fan	3-1/8 EIA Unflg		
8897-320			230 VAC Fan			
8921	5000 W	DC to 1 GHz at 1.1:1 max	Convection	QC - LC(f)	32.8" x 9.5" x 26.9" 832mm x 241mm x 681mm	126 lbs. 57 kg
8922				1-5/8 EIA Flg		
8926				3-1/8 EIA Flg		
8927				3-1/8 EIA Unflg		
8931-115	10000 W	DC to 400 MHz at 1.15:1 max, 400 MHz to 1 GHz at 1.2:1 max	115 VAC Fan	QC - LC(f)	32.8" x 9.5" x 33.4" 832mm x 241mm x 847mm	142 lbs. 65 kg
8931-230			230 VAC Fan	QC - LC(f)		
8932-115			115 VAC Fan	1-5/8 EIA Flg		
8932-230			230 VAC Fan	1-5/8 EIA Flg		
8936-115			115 VAC Fan	3-1/8 EIA Flg		
8936-230			230 VAC Fan	3-1/8 EIA Flg		
8937-115			115 VAC Fan	3-1/8 EIA Unflg		
8937-230			230 VAC Fan	3-1/8 EIA Unflg		

Econoloads

- Econoloads are the smallest load design for the power dissipated
- Utilizing an external water supply, the Econoloads have no input power requirements
- Surface cool to the touch
- May be mounted in any orientation
- Standard EIA RF connections and NPT Water connections

Impedance	50 Ohm
Finish	1 kW - Silver Plated
	5 kW - Bright Nickel Plated
	10, 20, 30, 40, 50, 80 kW - Black Powder Coat
Load Coolant	Potable Water
Operating Position	Any

Waterlines	1 kW - 1/8" FPT
	5 kW, 8720 - 1/4" FPT
	5 kW , 8726 - 3/4" Hose
	10, 20, 30, 40, 50, 80 kW - 3/4" Hose
Water Inlet Temp.	1 kW, 8720 - 8°C to 80°C
	5 kW, 8720 - 5°C to 80°C
	10, 20, 30, 40, 50, 80 kW - 5°C to 60°C

	Power Rating	Frequency Range/VSWR	Connector	Flow Rate	Dimensions	Weight
8710F	1 kW	DC to 1 GHz at 1.1:1 max 1 to 3 GHz at 1.3:1 max 3 to 3.5 GHz at 1.35:1 max	N(f)	1 QPM (1LPM) @ 8°C to 3 QPM (3 LPM) @ 80°C	3.7" x 0.7 " Dia. 93 mm x 18 mm Dia.	5 oz. 142 g
8710M	1 kW		N(m)			5 oz. 142 g
8713	1 kW		7/8" EIA Flg		4.9" x 2.3 " Dia. 123 mm x 57 mm Dia.	14 oz. 397 g
8720	5 kW	DC to 500 MHz at 1.1:1 max 500 to 900 MHz at 1.15:1 max 900 to 2000 MHz at 1.25:1 max	1-5/8" EIA Flg	1 GPM (4 LPM) @ 5°C to 4 GPM (15 LPM) @ 80°C	8.1" x 3.5 " Dia. 204 mm x 89 mm Dia.	2 lbs. 2 oz. 964 g
8726	5 kW	DC to 500 MHz at 1.1:1 max 500 to 2000 MHz at 1.25:1 max	QC - LC(f)		10.5" x 1.7 " Dia. 265 mm x 43 mm Dia.	2 lbs. 8 oz. 1.1 kg
8730A	10 kW	DC to 1 GHz at 1.1:1 max	1-5/8" EIA Flg	4 GPM (15 LPM) @ 5°C to 6 GPM (23 LPM) @ 60°C	16.0" x 4.4 " Dia. 406 mm x 111 mm Dia.	8 lbs. 3.6 kg
8731	10 kW	1 kHz to 1 GHz at 1.1:1 max	3-1/8" EIA Flg		14.7" x 5.2 " Dia. 372 mm x 132 mm Dia.	6 lbs. 4 oz. 2.9 kg
8738A	10 kW	1 kHz to 1 GHz at 1.1:1 max	3-1/8" EIA Unflg		16.0" x 4.4 " Dia. 406 mm x 111 mm Dia.	6 lbs. 2.8 kg
8745	20 kW	1 kHz to 900 MHz at 1.1:1 max	3-1/8" EIA Flg	6 GPM (23 LPM) @ 5°C to 8 GPM (30 LPM) @ 60°C	19.5" x 5.2 " Dia. 495 mm x 132 mm Dia.	15 lbs. 13 oz. 7.2 kg
8746	20 kW		3-1/8" EIA Unflg			15 lbs. 5 oz. 7.0 kg
8755	30 kW		3-1/8" EIA Flg	7 GPM (26 LPM) @ 5°C to 9 GPM (34 LPM) @ 60°C		15 lbs. 13 oz. 7.2 kg
8756	30 kW		3-1/8" EIA Unflg			15 lbs. 5 oz. 7.0 kg
8765	40 kW		3-1/8" EIA Flg	8 GPM (30 LPM) @ 5°C to 10 GPM (38 LPM) @ 60°C		15 lbs. 13 oz. 7.2 kg
8775	50 kW		3-1/8" EIA Flg	9 GPM (34 LPM) @ 5°C to 11 GPM (42 LPM) @ 60°C		15 lbs. 13 oz. 7.2 kg
8776	50 kW		3-1/8" EIA Unflg			15 lbs. 5 oz. 7.0 kg
8792	80kW	1 kHz to 800 MHz at 1.15:1 max	6-1/8" EIA Flg	9 GPM (34 LPM) @ 5°C to 12 GPM (46 LPM) @ 60°C	35.2" x 8.2 " Dia. 891 mm x 206 mm Dia.	25 lbs. 11.3 kg

Moduloads

- Forced-air heat exchanger cooled load for high-power applications up to 1 GHz
- High power RF dissipation with 10, 25 and 50 kW versions are available
- Available in models to work with 115 or 230 volts at 50 or 60 Hz
- Compact, low-profile design saves space in crowded transmitter sites
- Interlock control circuit provides fail-safe protection of the transmitter

Frequency Range	10kW - 1 kHz to 1000 MHz at 1.1:1 max
	25 kW & 50 kW - 1 kHz to 900 MHz at 1.1:1 max
Finish	Gray Powder Coat
Load Coolant	100 % Water 35% Ethylene Glycol / 65% Water
Operating Position	Horizontal Only
CE	EMC EN 61326-1:2006 and Safety EN 61010-1:2001

	Input Power	[Power Rating] Operating Temperature	Connector	Dimensions (Lx-WxH)	Weight
8631B115	9.5 A @ 115V, 60Hz	[10 kW] 100% Water: +5°C to +45°C, 35% Ethylene Glycol / 65% Water: -20°C to +35°C	3-1/8" EIA Flg	24.6" x 15.9" x 17.5" 623 mm x 402 mm x 443 mm	113 lbs. 50.9 kg
8631B230	4.75A @ 230V, 50Hz				
8631B230-6	4.75A @ 230V, 60Hz				
8635B115	9.5 A @ 115V, 60Hz		1-5/8" EIA Flg		
8635B230	4.75A @ 230V, 50Hz				
8638B115	9.5 A @ 115V, 60Hz		3-1/8" EIA Unflg		
8638B230	4.75A @ 230V, 50Hz				
8638B230-6	4.75A @ 230V, 60Hz				
8645B115	11 A @ 115V, 60Hz	[25 kW] 100% Water: +5°C to +30°C, 35% Ethylene Glycol / 65% Water: -20°C to +25°C	3-1/8" EIA Flg	28.5" x 19.6" x 20.9" 723 mm x 497 mm x 528 mm	155 lbs. 70 kg
8645B230	5.5 A @ 230V, 50Hz				
8645B230-6	5.5 A @ 230V, 60Hz				
8646B115	11 A @ 115V, 60Hz	[20 kW] 100% Water: +5°C to +45°C, 35% Ethylene Glycol / 65% Water: -20°C to +35°C	3-1/8" EIA Unflg		
8646B230	5.5 A @ 230V, 50Hz				
8646B230-6	5.5 A @ 230V, 60Hz				
8655B115-6	15 A @ 115V, 60Hz	[50kW] 100% Water: +5°C to +35°C, 35% Ethylene Glycol / 65% Water: -20°C to +25°C	3-1/8" EIA Flg	53" x 19.6" x 20.9" 1347 mm x 497 mm x 528 mm	275 lbs. 125 kg
8655B230-5	8 A @ 230V, 50Hz				
8655B230-6	8 A @ 230V, 60Hz				
8656B115-6	15 A @ 115V, 60Hz	[40kW] 100% Water: +5°C to +45°C, 35% Ethylene Glycol / 65% Water: -20°C to +35°C	3-1/8" EIA Unflg		
8656B230-5	8 A @ 230V, 50Hz				
8656B230-6	8 A @ 230V, 60Hz				

Dry Forced Air FM Loads

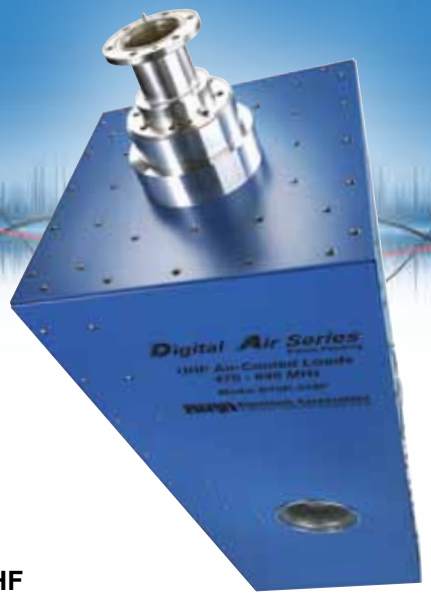
8578B Series

- Forced-air cooled, high-power RF Loads designed to be quiet, rugged and trouble free
- Capable of dissipating RF line power of up to 15 kW at low VSWR from 87.5 to 108 MHz
- A.C. power input for blower operation is switch selectable 115 V or 230 V
- Interlock control circuit provides fail-safe protection of the transmitter and load resistor in the event of an AC power failure to the blower
- Virtually maintenance free and simple to operate, the unit will provide years of trouble free operation

	8578B100	8578B100-1	8578B150	8578B150-1
Power Rating	10 kW continuous		15 kW continuous	
Frequency Range and VSWR	1.15:1, DC - 108 MHz		1.15:1, 87.5 - 108 MHz	
Impedence	50 Ohm			
Ambient Temp	-40°C to +40°C			
Humidity	95%, non-condensing			
Connector	1 5/8" EIA Flanged (Swivel)	3 1/8" Unflg.	5/8" EIA Flanged (Swivel)	3 1/8" Unflg.
Operating Position	Any (except blockage of air inlets and exhaust)			
Load Coolant	Dry (forced air)			
Resistors	Tubular type, parallel connection, 50 ohm nominal			
Finish	Gray powder coat			
Nominal Size	39 7/32" H x 16 15/32" W x 13 7/16" D, (996 mm x 418 mm x 341 mm)			
Weight	58 lbs. (26.1 kg)		60 lbs. (27.2 kg.)	
AC Power	115/230 ± 10% VAC, 50/60 Hz 8.6 amps max. @ 115 VAC			
CE	Safety EN 61010-1:2001			

Digital Air Loads

DA Series



- Self-contained and convenient means of dissipating large amounts analog, digital, and combined signals
- Excellent VSWR performance with <1.05:1 typical VSWR (1.1:1 max) across rated frequency range
- Handles >13 dB Peak to Average power ratio
- Ductable exhaust and cool-to-the-touch exterior surfaces
- Double shielded against the production of extraneous radiation

VHF

Impedance	50 ohm nominal
VSWR (DC-240 MHz)	1.05:1 typical, 1.10:1 maximum
Cooling Method	Forced air-cooled
Peak to Average Power	>10 dB
Ambient Temperature	-40°C to +45°C (-40°F to +113°F)
Interlock Contact Rating	10 A @ 120 VAC, 5 A @ 250 VAC
Finish	Blue Powder Coat
AC Power Required	115 V/230 V 50/60 Hz
CE	EMC EN 61326-1:2006 and Safety EN 61010-1:2001

UHF

Impedance	50 ohm nominal
VSWR (470-890 MHz)	1.05:1 typical, 1.10:1 maximum
Cooling Method	Forced air-cooled
Peak to Average Power	>10 dB*
Ambient Temperature	-40°C to +45°C (-40°F to +113°F)
Interlock Contact Rating	10 A @ 120 VAC, 5 A @ 250 VAC
Finish	Blue Powder Coat
AC Power Required	115 V/230 V 50/60 Hz
CE	EMC EN 61326-1:2006 and Safety EN 61010-1:2001

*DA40 Peak to Average is 14 dB

	Connector	AC Power	Power Rating	Frequency Range	Dimensions (L x W x H)	Weight
DA10V1F15	1 5/8" Flanged	115 VAC	10 kW	0-240 MHz-AM, FM, VHF	23.5" x 23.5" x 59" 597 mm x 597 mm x 1499 mm	130 lbs. 58.97 kg
DA10V1U15	1 5/8" Unflanged					
DA10V1F30	1 5/8" Flanged	230 VAC				
DA10V1U30	1 5/8" Unflanged					
DA10V3F15	3 1/8" Flanged	115 VAC	10 kW	0-240 MHz-AM, FM, VHF	23.5" x 23.5" x 59" 597 mm x 597 mm x 1499 mm	130 lbs. 58.97 kg
DA10V3U15	3 1/8" Unflanged					
DA10V3F30	3 1/8" Flanged	230 VAC				
DA10V3U30	3 1/8" Unflanged					
DA25V3F15	3 1/8" Flanged	115 VAC	25 kW	0-240 MHz-AM, FM, VHF	27" x 27" x 61" 686 mm x 686 mm x 1549 mm	160 lbs. 72.57 kg
DA25V3U15	3 1/8" Unflanged					
DA25V3F30	3 1/8" Flanged	230 VAC				
DA25V3U30	3 1/8" Unflanged					
DA25V4U15	4 1/2" Unflanged	115 VAC	25 kW	0-240 MHz-AM, FM, VHF	27" x 27" x 61" 686 mm x 686 mm x 1549 mm	160 lbs. 72.57 kg
DA25V4U30	4 1/2" Unflanged	230 VAC				
DA5F15	3 1/8" Flanged	115 VAC	5 kW	470-890 MHz UHF	17" x 17" x 64" 495 mm x 495 mm x 1740 mm	100 lbs. 45.5 kg
DA5U15	3 1/8" Unflanged					
DA5F30	3 1/8" Flanged	230 VAC				
DA5U30	3 1/8" Unflanged					
DA10F15	3 1/8" Flanged	115 VAC	10 kW	470-890 MHz UHF	19.5" x 19.5" x 68.5" 432 mm x 432 mm x 1608 mm	130 lbs. 58.97 kg
DA10U15	3 1/8" Unflanged					
DA10F30	3 1/8" Flanged	230 VAC				
DA10U30	3 1/8" Unflanged					
DA15F15	3 1/8" Flanged	115 VAC	15 kW	470-890 MHz UHF	25" x 25" x 76.5" 635 mm x 635 mm x 1943 mm	192 lbs. 87.09 kg
DA15U15	3 1/8" Unflanged					
DA15F30	3 1/8" Flanged	230 VAC				
DA15U30	3 1/8" Unflanged					
DA25F15	4 1/16" Myat Flanged	115 VAC	25 kW	470-890 MHz UHF	27" x 27" x 76.5" 686 mm x 686 mm x 1943 mm	245 lbs. 111.13 kg
DA25U15	4 1/16" Myat Unflanged					
DA25F30	4 1/16" Myat Flanged	230 VAC				
DA25U30	4 1/16" Myat Unflanged					
DA25-4U15	4 1/2" IEC Unflanged	115 VAC				
DA25-4U30	4 1/2" IEC Unflanged	230 VAC				
DA40-5U15	4 7/8" IEC Unflanged	115 VAC	40 kW	470-890 MHz UHF	27.5" x 27.5" x 84" 701 mm x 701 mm x 2134 mm	310 lbs. 140.6 kg
DA40-5U30	4 7/8" IEC Unflanged	230 VAC				
DA40F15	6 1/8" IEC Flanged	115 VAC				
DA40F30	6 1/8" IEC Flanged	230 VAC				
DA40U30	6 1/8" IEC Unflanged	230 VAC				

Other models available, please consult factory.

Convection Cooled Attenuators

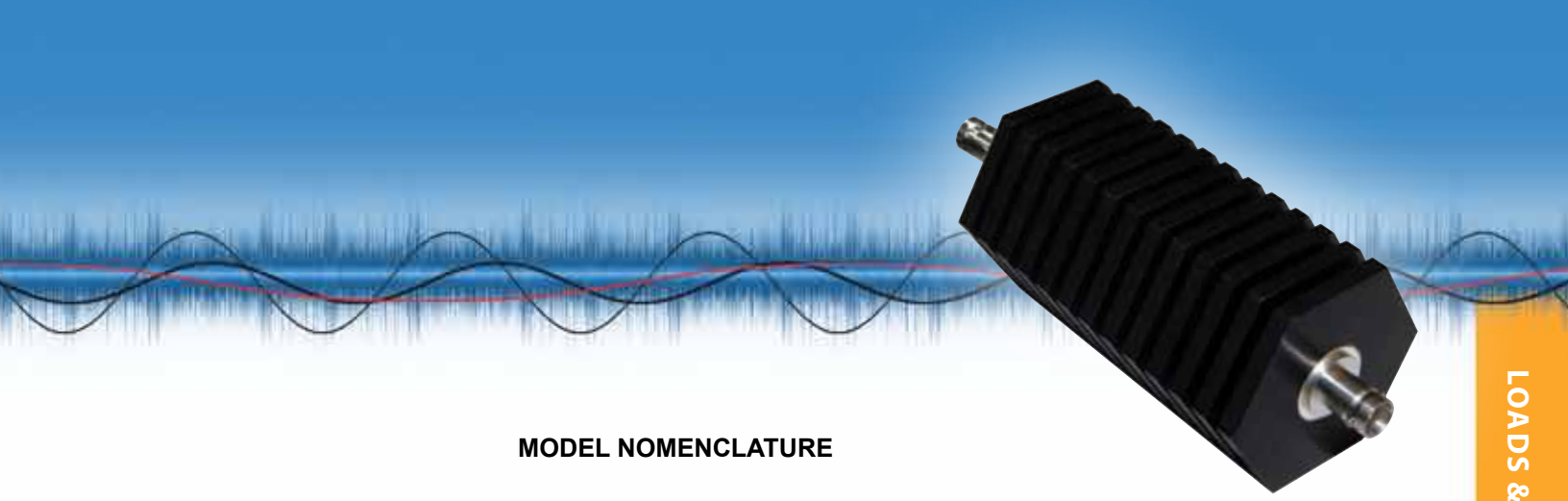
- Self cooling design, needs no cooling plate
- Frequencies up to 18 GHz
- Fully shielded against production of extraneous radiation
- Attenuator requires no AC power
- Rugged construction
- Broadband operation
- Other attenuation values available upon request
- Models to cover all LTE frequencies

Coolant Method	Dry, Convection Cooled
Impedance	50 Ohm
Operating Position	Any
Ambient Temperature	-40°C to 40°C
PIM	-110 dBc Min.

AC Power	None**
Humidity	95% non-condensing
Standard Attenuation Values	3, 6, 10, 20, 30 dB

	Power Rating	Connector	VSWR & Frequency Range	Dimensions (LxWxH)	Weight	FInish
2-A	2 W	BNC, N	1.10:1 from DC to 1 GHz 1.25:1 from 1 to 4 GHz	2.4" x 0.8" Dia. 61 x 21 Dia. mm	3.1 oz. 88 g	Tri-Alloy
2-A	2 W	SMA	1.15:1 from DC to 2.5 GHz 1.30:1 from 2.5 to 6 GHz	0.9" x 0.4" Dia. 23 x 11 Dia. mm	1.2 oz. 34 g	Stainless Steel
2-6A	2 W	N	1.25:1 from DC to 6 GHz	1.8" x 0.9" Dia. 46 x 23 Dia. mm	2.5 oz. 71 g	
2-18A	2 W	SMA, N	1.15:1 from DC to 4 GHz 1.20:1 from 4 to 8 GHz 1.25:1 from 8 to 12.4 GHz 1.35:1 from 12.44 to 18 GHz	1.8" x 0.9" Dia. 46 x 23 Dia. mm	2.5 oz. 71 g	
3-A	3 W	BNC, TNC	1.10:1 from DC to 1 GHz 1.25:1 from 1 to 4 GHz	1.5" x 0.6" Dia. 39 x 16 Dia. mm	3.1 oz. 88 g	Tri-Alloy
5-A	5 W	BNC, N, TNC	1.10:1 from DC to 1 GHz 1.25:1 from 1 to 4 GHz	2.6" x 0.8" Dia. 67 x 21 Dia. mm	3.1 oz. 88 g	
5-6A	5 W	N	1.25:1 from DC to 6 GHz	2.4" x 0.9" Dia. 61 x 23 Dia. mm	3.0 oz. 86 g	Stainless Steel
5-18A	5 W	SMA, N	1.15:1 from DC to 4 GHz 1.25:1 from 4 to 12.4 GHz 1.35:1 from 12.4 to 18 GHz	2.5" x 0.9" Dia. 64 x 23 Dia. mm	3.5 oz. 100 g	
10-A	10 W	SMA, BNC, N, TNC	1.10:1 from DC to 1 GHz 1.25:1 from 1 to 4 GHz	2.8" x 2.3" Dia. 72 x 59 Dia. mm	5.0 oz. 142 g	Black Anodized Aluminum
10-6A	10 W	SMA, N	1.20:1 from DC to 4 GHz 1.30:1 from 4 to 6 GHz	2.5" x 1.1" Dia. 64 x 28 Dia. mm	3.5 oz. 100 g	Stainless Steel
10-18A	10 W	N	1.20:1 from DC to 4 GHz 1.30:1 from 4 to 12.4 GHz 1.45:1 from 12.4 to 18 GHz	2.5" x 0.9" Dia. 64 x 23 Dia. mm	3.5 oz. 100 g	
25-A	25 W	SMA, BNC, 7/16 DIN, N, TNC	1.10:1 from DC to 1 GHz 1.25:1 from 1 to 4 GHz	5.3" x 2.3" Dia. 135 x 59 Dia. mm	9.0 oz. 256 g	Black Anodized Aluminum
25-6A	25 W	N	1.20:1 from DC to 6 GHz	4.2" x 2.3" x 2.3" 107 x 59 x 59 mm	13.5 oz. 383 g	Stainless Steel
25-18A	25 W	N	1.20:1 from DC to 4 GHz 1.30:1 from 4 to 12.4 GHz 1.40:1 from 12.4 to 18 GHz	4.2" x 2.3" x 2.3" 107 x 59 x 59 mm	13.5 oz. 383 g	

**1500 W models require 115/230V AC power



MODEL NOMENCLATURE

_____ – _____ – _____ – _____ _____

Power Rating (Watts)	Product Type	Connector Gender	Connectors*	Attenuation Value in dB
	A, SA, WA – Attenuator	M/F – Male/Female F/F – Female/ Female	A - SMA B - BNC N - N T - TNC E - IEC 7/16	03 – 3 dB 06 – 6 dB 10 – 10 dB 20 – 20 dB 30 – 30 dB

*Call for custom connector options not shown in this catalog

	Power Rating	Connector	VSWR & Frequency Range	Dimensions (LxWxH)	Weight	FInish
50-A	50 W	SMA, BNC, 7/16 DIN, N, TNC	1.10:1 from DC to 1 GHz 1.25:1 from 1 to 3.0 GHz	6.4" x 2.3" Dia. 163 x 59 Dia. mm	1.0 lbs. 454 g	Black Anodized Aluminum
50-6A	50 W	N	1.20:1 from DC to 6 GHz	4.7" x 3.0" x 3.0" 120 x 77 x 77 mm	1.7 lbs. 772 g	Stainless Steel
50-18A	50 W	N	1.25:1 from DC to 6 GHz 1.35:1 from 6 to 12.4 GHz 1.45:1 from 12.4 to 18 GHz	4.7" x 3.0" x 3.0" 120 x 77 x 77 mm	1.7 lbs. 772 g	Stainless Steel
75-A	75 W	SMA, BNC, 7/16 DIN, N, TNC	1.10:1 from DC to 1 GHz 1.25:1 from 1 to 3.0 GHz	7.3" x 2.3" Dia. 186 x 59 Dia. mm	1.6 lbs. 726 g	Black Anodized Aluminum
100-A	100 W	SMA, BNC, 7/16 DIN, N, TNC	1.10:1 from DC to 1 GHz 1.25:1 from 1 to 2.4 GHz	7.3" x 2.6" x 6.4" 186 x 67 x 163 mm	3.6 lbs.	Black Anodized Aluminum
100-6A	100 W	N	1.20:1 from DC to 2 GHz 1.35:1 from 2 to 4 GHz 1.40:1 from 4 to 6 GHz	6.4" x 2.7" x 3.8" 163 x 69 x 97 mm	2.4 lbs. 1.7 kg	Stainless Steel
100-SA	100 W	BNC, 7/16 DIN, N, TNC	1.10:1 from DC to 1 GHz 1.25:1 from 1 to 3.0 GHz	8.4" x 2.8" x 2.8" 214 x 72 x 72 mm	3.0 lbs. 1.4 kg	Black Anodized Aluminum
150-A	150 W	BNC, 7/16 DIN, N, TNC	1.10:1 from DC to 1 GHz 1.25:1 from 1 to 2.4 GHz	6.7" x 2.6" x 11.9" 171 x 67 x 303 mm	6.6 lbs. 3.0 kg	
150-SA	150 W	SMA, BNC, 7/16 DIN, N	1.10:1 from DC to 1 GHz 1.25:1 from 1 to 2.4 GHz	9.1" x 4.0" x 5.0" 232 x 102 x 127 mm	5.5 lbs. 2.5 kg	
150-WA	150 W	BNC, 7/16 DIN, N, TNC	1.10:1 from DC to 1 GHz 1.25:1 from 1 to 2.4 GHz	5.6" x 5.4" x 4.3" 143 x 138 x 110 mm	2.5 lbs. 1.2 kg	
300-A	300 W	BNC, 7/16 DIN, N, TNC	1.10:1 from DC to 1 GHz 1.25:1 from 1 to 2.4 GHz	7.3" x 5.4" x 10.9" 186 x 138 x 277 mm	12.0 lbs. 5.5 kg	
300-WA	300 W	BNC, 7/16 DIN, N, TNC	1.10:1 from DC to 1 GHz 1.25:1 from 1 to 2.4 GHz	9.0" x 5.4" x 4.8" 229 x 138 x 122 mm	4.6 lbs. 2.1 kg	
500-WA	500 W	7/16 DIN, N	1.10:1 from DC to 1 GHz 1.25:1 from 1 to 2.4 GHz	12.4" x 5.4" x 4.8" 315 x 138 x 122 mm	7.9 lbs. 3.6 kg	
600-A	600 W	7/16 DIN, N	1.10:1 from DC to 1 GHz 1.25:1 from 1 to 2.4 GHz	12.7" x 9.4" x 9.6" 323 x 239 x 244 mm	21.5 lbs. 9.8 kg	
1000-A*	1000 W	7/16 DIN, N	1.10:1 from DC to 1 GHz 1.25:1 from 1 to 2.4 GHz	13.6" x 12.8" x 9.6" 346 x 326 x 244 mm	26.5 lbs. 12.0 kg	
1000-WA*	1000 W	7/16 DIN, N	1.10:1 from DC to 1 GHz 1.25:1 from 1 to 2.4 GHz	19.6" x 10.6" x 4.8" 498 x 270 x 122 mm	26.5 lbs. 12.0 kg	
1500-WA*	1500 W	7/16 DIN, N	1.10:1 from DC to 1 GHz 1.25:1 from 1 to 2.4 GHz	20.4" x 10.7" x 5.9" 519 x 272 x 150 mm	30.0 lbs. 13.6 kg	

*Note: attenuators 1000 W and above are not available in attenuation values less than 10 dB

Oil Convection Cooled Attenuators

- Self cooling design
- Broadband operation
- Rugged construction
- Fully shielded against production of extraneous radiation
- Other Attenuation values available upon request

Coolant Method	Oil, Convection Cooled	**Ambient Temperature**	-40°C to 45°C
Impedance	50 Ohm	**Humidity**	95% non-condensing
Operating Position	Horizontal Only	**Standard Attenuation Value**	30 dB

	Power Rating	Connector	VSWR & Frequency Range	Cooling Method	Dimensions (LxWxH)	Weight
8325	500 W	QC - N(f) Input; QC - N(f) Output	DC to 500 MHz at 1.1:1 max	Convection	17.5" x 6.0" x 8.5" 445mm x 151mm x 216mm	25 lbs. 11.0 kg
8327-300	1000 W	QC - LC(f) Input; QC - N(f) Output			24.0" x 7.2" x 17.2" 596mm x 181mm x 437mm	57 lbs. 26.0 kg
8329-300	2000W	QC - LC(f) Input; QC - N(f) Output			24.0" x 7.2" x 17.2" 596mm x 181mm x 437mm	
8329-300 w/ BA-300-115	4000 W	QC - LC(f) Input; QC - N(f) Output		Forced Convection, 115 VAC Fan	23.5" x 7.2" x 22.1" 596mm x 181mm x 560mm	70.5 lbs. 32 kg
8329-300 w/ BA-300-230	4000 W			Forced Convection, 230 VAC Fan		

OPTIONAL ACCESSORIES

Interlock Thermoswitch . . . . . 2450-056 (8327 Models only)
Interlock Thermoswitch . . . . . 8329-028 (8329 Models only)

Variable RF Signal Samplers

4273 & 4275 Series

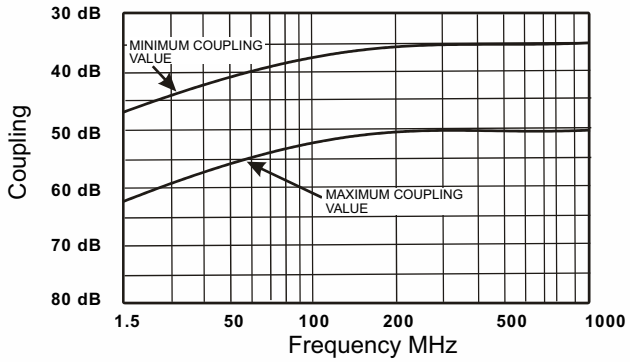
- Very low insertion VSWR across the operating frequency range with an insertion loss is less than 0.2 dB
- Available with a wide variety of Quick Change (QC) connectors
- Passive device requiring no external source of power or utility service
- Includes locking devices on the attenuation control knob

	4273	4275
Power Rating	5 kW max	1 kW max
Frequency Range	1.5 - 35 MHz	20 - 1000 MHz
Impedance	50 Ohms (nominal)	
Insertion Loss	with N Connectors 1.07 max	with N Connectors 1.1 max. 2 to 512 MHz, 1.25 max. 512 to 1000 MHz
Coupling	Adjustable as shown within ±3 d	—
Ambient Temp. Range	-40°C to +45°C	
Connectors	QC Type (Input and Output Ports)	
Finish	Bright silver plate	
Nominal Size	2 51/64" L x 2 7/8" W x 1 1/4" D, (71 mm x 73 mm x 32 mm)	
Weight	10 oz. (280 g)	

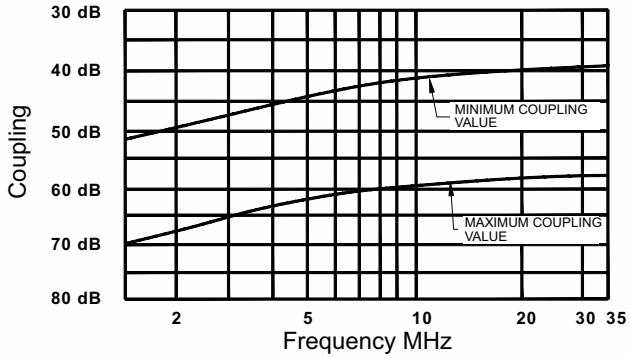
POWER CONNECTORS

	"QC" CONNECTOR
4273	None
4273-020	N (Male/Female)
4275	None
4275-020	N (Male/Female)
4275-025	N (Female/Female)
4275-100	Special QC (Male/Female)

Model 4273



Model 4275



Coaxial Selector Switches

71, 72 R, 74 Series

- Rugged and reliable design which permits positive contact
- Low insertion VSWR and negligible cross talk between channels
- Can't be operated accidentally - must be operated by intentional sequential movement
- Switches may be panel-mounted

Frequency Range	DC to 10 GHz
Maximum RF Voltage	500 volts rms
Attenuation to Unused Channel	75 dB (cross talk)
Ambient Temp.	-60°C to +65°C (-76°F to +149°F)
Weight	Varies by model, approx. 2 1/2 lbs. (1.1 kg)

TYPICAL OPERATING VALUES

Frequency	VSWR	Insertion Loss	Max Rf Power Rating @ 65°C
100 MHz	Negligible	0.02 dB	850 W
1000 MHz	1.06 max.	0.09 dB	200 W
4000 MHz	1.30 max.	0.22 dB	75 W

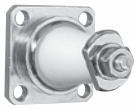
	7422	7441	7431	74	718	7181	72-2	72R
Positions	2	3	4	6	8	10	2	Reversing
Coaxial Circuits	1	1	1	1	1	1	2	2

QC Connectors

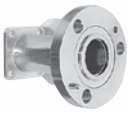
SMA (F)
4240-336S

TNC (M)
4240-160

OPEN TERM. #10-32 NUT
4240-080



7/8" EIA
4240-002

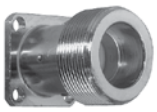


SMA (M)
4240-334

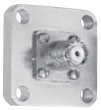
HN (F)
4240-268

SC (F)
4240-090

LT (F)
4240-018



MINI-UHF (F)
4240-346



HN (M)
4240-278

N (F)
4240-062

LT (M)
4240-012

BNC (F)
4240-125

UHF (F)
4240-050
(SO239)

N (M)
4240-063

LC (F)
4240-031

BNC (M)
4240-132

UHF (M)
4240-179
(PL259)

DIN (F) IEC 7/16 (F)-JACK TYPE 169-4
4240-344

LC (M)
4240-025

TNC (F)
4240-156

C (F)
4240-100

DIN (M) IEC 7/16 (M) - PLUG TYPE 169-4
4240-363

1 5/8" EIA SWIVEL (M)
4240-208

1 5/8" EIA FIXED (M)
4240-096

Adapters & Connectors

INTERSERIES ADAPTER KITS MODEL 4240-401

	N (F)	N (M)	BNC (F)	BNC (M)	TNC (F)	TNC (M)	SMA (F)	SMA (M)	UHF (F)
N (F)									
N (M)	•								
BNC (F)	•	•							
BNC (M)	•	•	•						
TNC (F)	•	•	•	•					
TNC (M)	•	•	•	•	•				
SMA (F)	•	•	•	•	•	•			
SMA (M)	•	•	•	•	•	•	•		
UHF (F)	•	•	•	•	•	•	•	•	
UHF (M)	•	•	•	•	•	•	•	•	•

INTERSERIES ADAPTER KITS MODEL 4240-400

	N (F)	N (M)	UHF (F)	UHF (M)	BNC (F)	BNC (M)	TNC (F)
N (F)	•						
N (M)	•	•					
UHF (F)	•	•					
UHF (M)	•	•	•				
BNC (F)	•	•	•	•			
BNC (M)	•	•	•	•	•		
TNC (F)	•	•	•	•	•	•	
TNC (M)	•	•	•	•	•	•	•

INTERSERIES ADAPTERS

	Description
4240-402	Precision Connector Adapter, AT-Series, N Male
4240-403	Precision Connector Adapter, AT-Series, N Female
4240-404	Precision Connector Adapter, AT-Series, BNC Male
4240-405	Precision Connector Adapter, AT-Series, BNC Female
4240-406	Precision Connector Adapter, AT-Series, TNC Male
4240-407	Precision Connector Adapter, AT-Series, TNC Female
4240-408	Precision Connector Adapter, AT-Series, UHF Male
4240-409	Precision Connector Adapter, AT-Series, UHF Female
4240-410	Precision Connector Adapter, AT-Series, SMA Male
4240-411	Precision Connector Adapter, AT-Series, SMA Female

COUPLING KITS

	Description	ohm
4240-220	7/8" Flg.	50
4712-020	1 5/8" Flg.	50
4600-020	3 1/8" Flg.	50
5-726	3 1/8" Unflg.	50
4902-020	6 1/8" Flg.	50

QC ADAPTERS, CONNECTORS

	Description
4240-165	QC (F) to QC (F)
4240-180	Copl. (M) to QC (F)
4240-194	3 1/8" Flg. to QC (F)
4240-201	7/8" Flg. to QC (F)
4240-244	Rt. Angle QC
4240-260	1 5/8" Flg. to QC (F)

FLANGE-TO-FLANGE ADAPTERS

	Description
4600-025	3 1/8" Flg. To 1 5/8" EIA Flg. 50 ohm
4712-015	1 5/8" Flg. To 7/8" EIA Flg. 50 ohm

Miscellaneous Accessories

DC CABLE ASSEMBLIES

	Connector	Length	Use With Group
3170-058-1	BNC (M)	14”	I
3170-058-5	BNC (M)	25’	I
3170-058-7	BNC (M)	50’	I
3170-058-9	BNC (M)	100’	I
4220-097-1	Spade Lug	12”	II
4220-097-7	Spade Lug	10’	II
4220-097-10	Spade Lug	25’	II
4220-097-17	Spade Lug	50’	II
4220-097-13	Spade Lug	75’	II
4220-097-16	Spade Lug	100’	II
7500-072-1	DC Plug	39 1/2’	III
7500-072-4	DC Plug	10’	III
7500-072-2	DC Plug	25’	III

WATTMETER GROUPS

Group I	3171-020, 3171, 3171A020, 3171A, 3127-055, 3127-080
Group II	3127-035, 3127-075, 3127-040
Group III	4305A, 4909, 4715, 4610, 4723, 4802

WATTMETER BATTERIES

	Use With	Volts	Type	Notes
5A1230	4391A	1.25	NiMH	6 req.
5A1587	4412A	9	NiMH	-
5-1375	4314B, 4410A, 4041, 4410, APM-16	9	Alkaline	-

MISCELLANEOUS

	Use With	Description
3610-031	All Element Sockets	Dummy Plug
5A2229	AT Series	Power Supply 120 V
5A2226	AT Series	Power Supply 230 V
5B2229-156E	4314C	Power Supply 115 V /230 V
500-076	-	DC Connector

CASES

	Description
CC-6	Portable THRULINE® Wattmeter*, 5 elements, and 1 small load
EC-1	12 elements
4300-061	Model 43 or 43P Wattmeter, load, signal sampler, QC connectors, and 4 elements
4300-070	Portable THRULINE® Wattmeter*, test cable, screw driver, QC connectors, and 15 elements
4300-085	4391 POWER ANALYST®, signal sampler, and other accessories
4300-055	4410 Wattmeter, load, elements, and other accessories
4300A215	4421 Wattmeter and power sensors
5000-030	Soft Case - AT-100, AT-400, AT-800 Antenna Testers, 5000-EX
5000-035	Hard Transit Case - 5000-EX and Sensors
7002C870	Site Analyzer®
7002A225-1	SignalHawk™

*For use with THRULINE® Wattmeter Models: APM-16, 43, 43P, 4304A, 4308, 4314B, 4410A, 4430 and 4431.

Load and Cooling Accessories

THERMOSWITCHES FOR AIR-COOLED LOADS

	Connector	Temp. Set Point	Use With Group
8630-013	Over Temp. Interlock	Opens @ 86°C	8630 Series
8640-066	Over Temp. Interlock	Opens @ 77°C	8640/8650 Series
8890-008	Over Temp. Interlock	Opens @ 236°C	8890/8920 Series
8890-017	Over Temp. Interlock	Opens @ 226°C	8930 Series
8892-333	Blower	Closes @ 60°C	8930 Series

WATER-COOLED ACCESSORIES

	Product	Power
RPK6770-120	Wall Mounting Bracket	10 kW
RPK5-898-6	Water Flow Switch	10 kW
RPK5-898-2	Water Flow Switch	20 kW
RPK5-898-3	Water Flow Switch	30 kW
RPK5-898-4	Water Flow Switch	40 kW
RPK5-898-7	Water Flow Switch	50 kW, 80 kW

REPLACEMENT RESISTORS

	For	Power
8731-031-1	8731 ECONOLOADS	10 kW
RPK8738A072	8730A/8738A ECONOLOADS	10 kW
RPK8755-027-2	8745/8746 ECONOLOADS	20 kW
RPK8755-027-3	8755/8756 ECONOLOADS	30 kW
RPK8755-027-4	8765/8766 ECONOLOADS	40 kW
RPK8755-027-5	8775/8776 ECONOLOADS	50 kW
RPK8792-010-1 one reqd.	8792 ECONOLOADS	80 kW
RPK5A2388	8578A100 Forced-Air Load	10 kW
RPK5A2393	8578A150 Forced-Air Load	15 kW

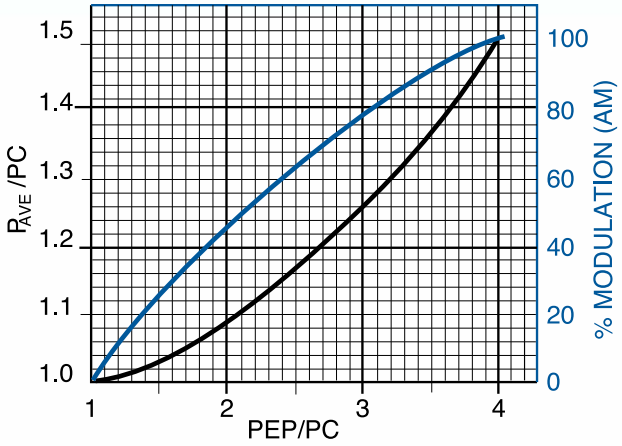
COOLANTS

	Description	Volume / Pkg.
5-030-3	Refined Mineral Oil	1 Gallon Can
5-1070-2	DC-200 Silicone	1 Gallon Can
5-1134-3	Ethylene Glycol, Industrial Grade	1 Gallon Can

DOLLIES

	Description
6771-011	For 10 and 25 kW MODULOAD
6772B011	For 50 kW MODULOAD

Technical Data



Interpreting readings on peak Wattmeters with Multicarrier, CW, AM, SSB, and pulsed signals.

In the table below, Z° = 50 ohm, PEP is peak envelope power, and PEV is peak envelope voltage. The PEV of the carrier (or suppressed carrier) C was arbitrarily chosen at 100 volts in all examples, $PEV_{RMS} = \frac{PEV}{1.414}$.

The graph at left shows correlation of peak-envelope-power (PEP), average heating power (P_{AVE}) and % modulation of AM signals for Tables B, C, and D below.

Transmission Type and Scope Pattern	Frequency Spectrum C=Carrier	PEV_{RMS} (arbitrary)	$PEP = \frac{PEV^2_{RMS}}{Z_0}$	P_{AVE} (Average Heating)	Models 4314B, 4391A			Model 43, 4304A, 4308	Model APM-16, 5010B, 5011, ACM, BPME
					CW Mode Power	PEP% Mode	MOD Mode		
Table A Multiple Carriers	C C C C	$\frac{400}{\sqrt{2}}$ V	1600 W	400 W	-	1600 W	-	-	400W
Table B CW	C	$\frac{100}{\sqrt{2}}$ V	100 W	100 W	100 W	100 W	0%	100 W	100W
TableC AM 100% Mod.	C	$\frac{200}{\sqrt{2}}$ V	400 W	150 W	100 W	400 W	100%	100 W	150 W
Table D AM 75% Mod.	C	$\frac{173}{\sqrt{2}}$ V	300 W	127 W	100 W	300 W	73%	100 W	127 W
Table E SSB 1 Tone	(C)	$\frac{100}{\sqrt{2}}$ V	100 W	100 W	100 W	100 W	0%	100 W	100 W
Table F SSB 2 Tones	(C)	$\frac{100}{\sqrt{2}}$ V	100 W	50 W	25 W	100 W	100%	40.5 W	50 W
Table G SSB Voice	(C)	$\frac{100}{\sqrt{2}}$ V	100 W	-	-	100 W	-	-	-
Table H TV Black Level	C	$\frac{100}{\sqrt{2}}$ V	100 W	60.1 W	Models 4314B and 4391A only -	100 W	-	59.6 W	60.1 W
Table I Pulse	C	$\frac{100}{\sqrt{2}}$ V	100 W	10 W	-	100 W	100%	-	10 W
Table J Pulse	(C)	$\sqrt{400Z_0}$	400 W	100 W	130 W	400 W	-	130 W	100 W

Required length of cable to equal 1⁄2 or 1 wavelength when added to a THRULINE® Wattmeter

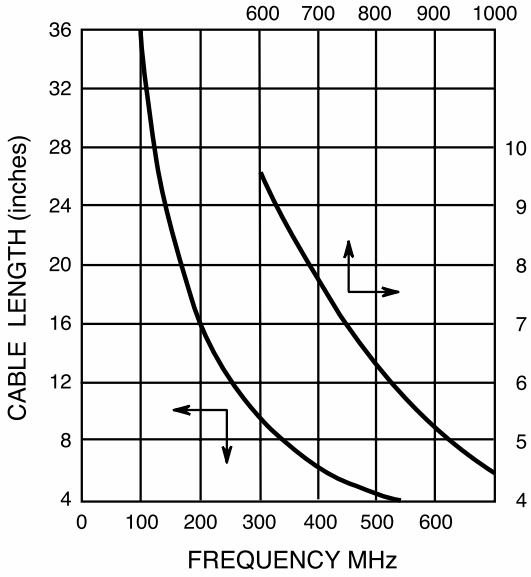
When a Model APM-16, 43, 4431, 4314B or 4391A is used to match a load to a transmitter and a good match is obtained, removing the instrument will not cause any change in the conditions, since a good 50 ohm load can be placed at the end of a 50 ohm transmission line of any length without altering conditions at the transmitter.

What happens when the load is not well matched, as with an antenna with a VSWR of 1.5 or 2.0? Since the length of line between a mismatched load and the source transforms the impedance of the load as seen at the source, line length now becomes critical. If the adjustments for maximum power transfer were made with the Model 43 in place, removing it shortens the line by four inches, plus two connectors. This still is no cause for concern at low frequencies where four to five inches is a small fraction of a wavelength. At higher frequencies; e.g., above 100 MHz, power output and frequency of the source may be affected.

It is a principle of transmission line theory that the impedance is identical on either side of 1⁄2 wavelengths. In order to duplicate the conditions in your transmission line with the above Model wattmeters either in or out of the line, it is only necessary to insert or remove one or more 1⁄2 wavelengths. This is easily done by making up a length of cable which, when added to the THRULINE®, equals one or more 1⁄2 wavelengths at the frequency of measurement. If more than one frequency is involved, one cable is needed for each frequency.

1) Physical cable length shown in inches is measured from end to end of outer conductor of connectors (TNC and N Male connectors), except for cables with UHF or Mini-UHF plugs where the cable length is measured from tip to tip of the center pins.

2) Dimensions shown are for solid polyethylene cable (e.g., RG-58C/U, RG-8/U) which has 66% the velocity of propagation relative to air. If so-called "RG-58 type" or "RG-8 type" cables (which often contain foam polyethylene) are used, the dimensions in the graph must be multiplied by that cable's relative velocity (eg. 79%) divided by 66% (i.e., by a factor of 79% ÷ 66% = 1.2).



TYPICAL PEAK POWER RATINGS - OIL DIELECTRIC LOADS

		Pulse Width (µs)				
	Avg. Power	1	10	100	1000	5000
8135	150 W	10 kW	8.0 kW	5.75 kW	3.5 kW	2.0 kW
8201	500 W	200 kW	150 kW	105 kW	57 kW	25 kW
8251	1000 W	200 kW	150 kW	105 kW	57 kW	25 kW
8890 Series	2.5 W	150 kW	115 kW	80 kW	54 kW	22 kW
8920 Series	25KP7	150 kW	115 kW	80 kW	54 kW	22 kW
8930 Series	10 kW	150 kW	120 kW	85 kW	55 kW	30 kW

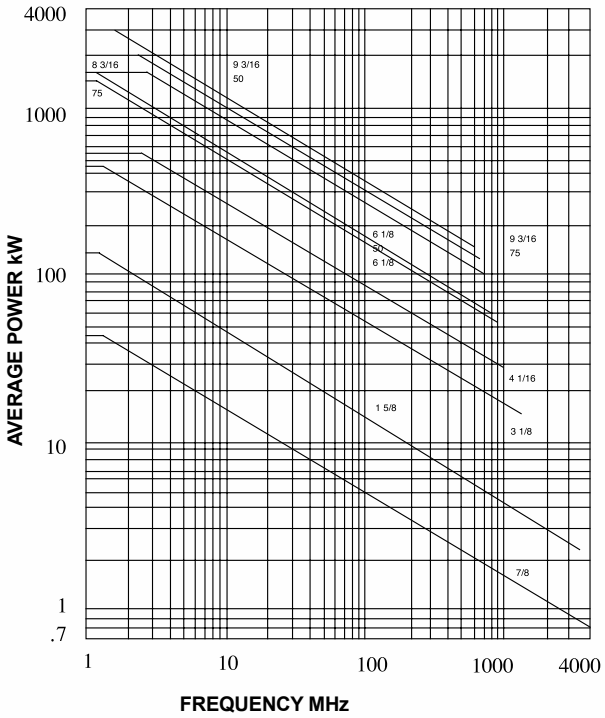
TYPICAL PEAK POWER RATINGS - DIRECT WATER COOLED LOADS

		Pulse Width (µs)				
	Avg. Power	1	10	100	1000	5000
8730 Series	10 kW	100 kW	77 kW	56 kW	32 kW	16 kW
8740 Series	20 kW	250 kW	190 kW	135 kW	75 kW	35 kW
8750 Series	30 kW	250 kW	190 kW	135 kW	75 kW	40 kW
8760 Series	2.5 W	250 kW	190 kW	145 kW	90 kW	55 kW
8770 Series	25KP7	250 kW	190 kW	145 kW	97 kW	65 kW
8790 Series	10 kW	250 kW	210 kW	170 kW	130 kW	100 kW

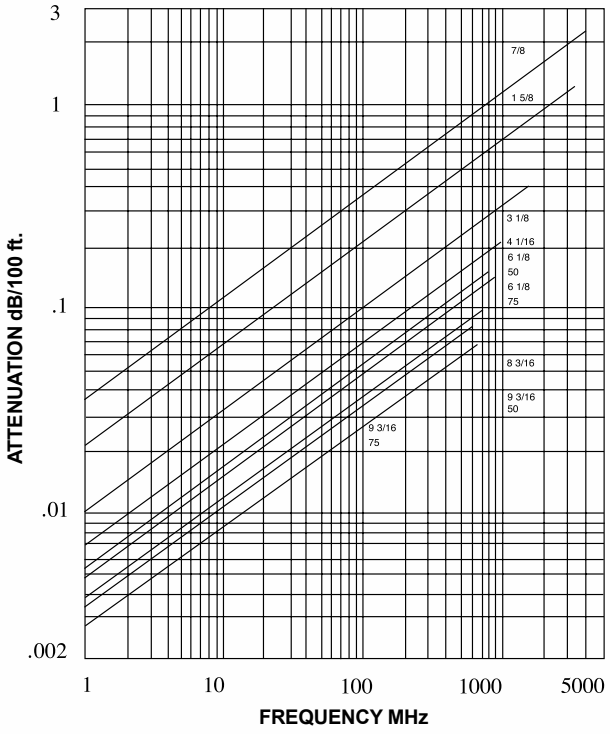
Note: The duty factor should be such that the average power rating of the load is never exceeded.

Technical Data

Transmission Line Power Rating



Transmission Line Attenuation



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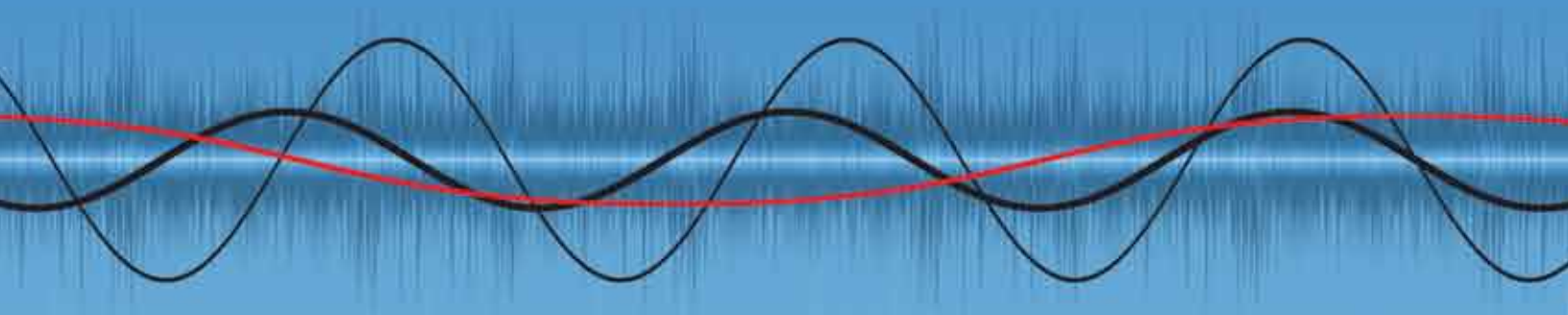

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