General Catalog

BIRD®
TECHNOLOGIES GROUP

BIRD Electronic Corporation

TX RX SYSTEMS, INC.

RF Measurement and Management in Your World

RF Measurement and Management in Your World

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Bird® Electronic Corporation maintains an aggressive program of testing products for conformity applicable electromagnetic and safety standards, including European Union Directives. We are proud to announce that, where applicable, Bird products carry the "CE" Mark. A CE marked product complies with the relevant EU Directives and is approved for sale in the European Union. The specific standards that were used to evaluate the product compliance are listed on the Declaration of Conformity (DOC).

Bird® Electronic Corporation provides solutions to the following markets. For your convenience, each product represented in the catalog includes the market icon(s) for your reference. For more application information, please visit our website www.bird-technologies.com.

Public Safety

Integrated Antenna Analysis
Reliable, Rugged, Power Measurement
Rugged, Versatile Load and Attenuator Kits Available

Government/Military

Integrated Antenna Analysis
Field Testing of Tactical Radio Systems
Power Measurement, Resistive Components and Subassemblies
Rugged, Versatile Load and Attenuator Kits Available

Semiconductor

Precision Power Measurement Solutions and Calorimetric Systems
Highly Stable, Reliable, Terminations, Loads, and Attenuators
Integrated Power Measurement and Load Systems
RF Accessories, Mismatches, Adapters, Subassemblies

Broadcast Market Solutions

Analog and Digital Universal Power Measurement
High Power Digital Load Solutions
Broadcast Accessories

Wireless Market Solutions

Integrated Antenna Analysis
Analog and Digital Universal Power Measurement
Lightweight, Portable Resistive Products
Spread Spectrum

Special Markets

Solutions for Medical, Avionics, Transportation and Other Markets

Bird® Service Center

Service and Calibration of Bird® Products

SignalHawk™

MODEL SH-36S Spectrum Analyzer with Power Meter Option

Bird Technologies SignalHawk™ Analyzes radio frequency spectrum. Measures intended and interfering signals. Allows setup of parameters such as frequency, amplitude, and markers. Graphically displays signal amplitude vs. frequency and saves traces.

Model
SH-36S
SignalHawk™

KEY FEATURES

- Fast, Accurate, and Sensitive: -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 Battery
- Rugged: Drop Tested per Military and European Standards
- USB Connectivity: USB Drive Stores 40,000 Traces

WORLDWIDE APPLICATIONS

Cellular, PCS, DCS, 2 G, 3 G, CDMA, cdmaOne, CDMA 2000, 1x, 1x EV-DO, GSM, GPRS, EDGE, UMTS, HSDPA, W-CDMA, TDMA, AMPS as well as 802.11, Bluetooth, Broadcast, Emergency, Fire, GPS, HDTV, IBOC, Microwave, NPSPAC, Paging, Police, Private, Project 25, Public Safety, Tactical Military, Telematics, Tetra, Trunking, Utilities, WLAN and WLL.

SPECTRUM ANALYZER

- 100 kHz to 3.6 GHz
- Low Displayed Average Noise Level
- Interference Identification
- Measurements: Occupied Band Width, Channel Power, Adjacent Channel Power Ratio, Field Strength, AM/FM Demod, C/I, and more.

GENERAL SPECIFICATIONS

CE Compliance	YES
Military Specifications	MIL-PRF-28800F, Drop & Drip Test
Operating Temperature	0 to 50 °C
Storage Temperature	-20 to +80 °C
Humidity, Max	95% non-condensing
Altitude, Max	4600m above sea level
Dimensions	11.5" x 10.5" x 3.8"
Weight, with battery, Max	7.8 lbs
Operating Time	5.5 Hours continuous
Environmental Testing	Drop Test, Transit Drop Test, Bench Handling, Vibration, Shock, Functional, Drip Proof, Salt Exposure, Fungus Resistance
Win CE Viewers	Word, Excel, PPT, PDF, Image

INPUT

Test Port	N (F)
Impedance, Nominal	50 ohms
VSWR, Nominal	1.8
RF Input, Max.	+20 dBm, 30 dBm for 30 sec.
Attenuator	0, 10, 20, or 30 dB; internal
Pre-Amplifier	+24 dB gain, internal

FREQUENCY

Range	100 kHz to 3.6 GHz
Resolution	1 Hz
Uncertainty	± 1ppm
Temperature Drift	± 1ppm/°C
Reference Aging	± 1ppm/year

SPECTRAL PURITY

30 kHz from carrier	-85 dBc / (RBW Hz)$^{1/2}$
100 kHz from carrier	-100 dBc / (RBW Hz)$^{1/2}$
100 kHz from carrier	-124 dBc / (RBW Hz)$^{1/2}$

BANDWIDTH

Resolution	100 Hz - 1 MHz in 1,3,10 steps
Video	10 Hz - 1 MHz in 1,3,10 steps

AMPLITUDE

Measurement Range	-135 dBm to +20 dBm
Dynamic Range	66 dB, intermod-free
Noise Floor	-135 dBm DANL
Inherernt Spurious	-80 dBm
Input Related Spurious	-70 dBc
Amplitude Accuracy	±1.0 dB typ, ±1.5 dB max

DISPLAY

Screen	8.4", SVGA, indoor/outdoor
Reference Level	-140 dBm to +30 dBm, User selectable or autoscale
Resolution	800 x 600 pixels
Units	dBm, µW, mW, W, dBµV, dBmV, dBV, µV, mV, V, db/m2, µV/m2
Offset Range	-99 to 99 dB
Data Points	705 displayed
Sweep Time	2 s, full span; 1 ms, zero span

TRIGGER

Sources	Internal, external TTL, internal video
Connector	BNC(F)

SignalHawk™

POWER METER OPTION

- Data Logging
- Optional Power Sensors: 5012, 5010B, 5011
- Wideband 5012: 350 MHz to 4 GHz, 150 mW to 150 W average, 400 W peak, Forward
- Directional 5010B: 450 kHz to 2.7 GHz, 100 mW to 10 kW, Forward and Reflected
- Terminating 5011: 40 MHz to 4 GHz, 10 uW to 10 mW, 50 W Attenuator Option

Model 5010B
Directional Power Sensor

Model 5012
Wideband Power Sensor

Model 5011
Terminating Power Sensor

STANDARD ACCESSORIES

Soft Carrying Case, Quick Start Manual, PC Tool Software CD, Serial Cable, USB Cable, USB Drive, AC Power Supply, AutomotivePower Adapter, Headphones, Connector Cover

Standard Accessories

OPTIONAL ACCESSORIES

MODEL	DESCRIPTION
5012	Wideband Power Sensor
5010B	Directional Power Sensor
5011	Terminating Power Sensor
5A2720-2	Replacement Battery
5A2745-1	Replacement USB Drive-WinCE compatible
50-A-MFN-30	Attenuator, 50 W, 30 dB, N(M)/N(F)
10-A-MFN-30	Attenuator, 10 W, 30 dB, N(M)/N(F)
2-A-MFN-20	Attenuator, 2 W, 20 dB, N(M)/N(F)
100-SA-MFN-40	Attenuator, 100 W, 40 dB, N(M)/N(F)
25-A-MFN-30	Attenuator, 25 W, 30 dB, N(M)/N(F)
5-A-MFN-20	Attenuator, 5 W, 20 dB, N(M)/N(F)
TC-MNFN-1.5	Test Cable, 1.5 m, N(M)/N(F)
TC-MNFN-3.0	Test Cable, 3.0 m, N(M)/N(F)
TC-MNMN-1.5	Test Cable, 1.5 m, N(M)/N(M)
TC-MNMN-3.0	Test Cable, 3.0 m, N(M)/N(M)
TC-MNFE-1.5	Test Cable, 1.5 m, N(M)/DIN(F)
TC-MNFE-3.0	Test Cable, 3.0 m, N(M)/DIN(F)
TC-MNME-1.5	Test Cable, 1.5 m, N(M)/DIN(M)
TC-MNME-3.0	Test Cable, 3.0 m, N(M)/DIN(M)
PA-MNME	Adapter, N(M)/DIN(M)
PA-FNME	Adapter, N(F)/DIN(M)
PA-MNFE	Adapter, N(M)/DIN(F)
PA-FNFE	Adapter, N(F)/DIN(F)
4240-550	Adapter Kit, 7/16 DIN
4240-500-1	Adapter, N(F)/N(F)
4240-500-2	Adapter, N(M)/N(M)
4240-500-10	Adapter, N(M)/SMA(F)
ANT-100*	Field Strength Antenna, 136 to 221MHz, SMA(M)
ANT-400*	Field Strength Antenna, 400 to 512MHz, SMA(M)
ANT-800*	Field Strength Antenna, 824 to 894MHz, SMA(M)
ANT-900*	Field Strength Antenna, 890 to 960MHz, SMA(M)
ANT-1800*	Field Strength Antenna, 1710 to 1880MHz, SMA(M)
ANT-1900*	Field Strength Antenna, 1850 to 1990MHz, SMA(M)
ANT-2400*	Field Strength Antenna, 2400 to 2500MHz, SMA(M)
7002C870	Hard Transit Case
USB-Mouse	USB Mouse, Portable, Optical
USB-HUB	USB HUB, 4 Port, Ultra Mini

* Note: Adapter 4240-500-10 required for field strength antenna.

WIDEBAND POWER SENSOR (MODEL 5012) (See page 13)
Wideband Power Sensor, 350 MHz to 4 GHz, 150 mW to 150 W Avg, 400 W Peak. Measures forward and reflected average, VSWR, return loss (dB), peak, burst average, crest factor and CCDF. Forward average power accuracy is 4% (0.2 dB).

DIRECTIONAL POWER SENSOR (MODEL 5010B) (See page 16)
Directional Power Sensor, 2 to 2700 MHz, 100 mW to 10 kW, requires elements. Measures forward and reflected average, VSWR, return loss (dB), and peak. Forward average power accuracy is 5% (0.2 dB).

TERMINATING POWER SENSOR (MODEL 5011) (See page 14)
Terminating Power Sensor, 40 MHz to 4 GHz, 10µW to 10 mW (-20 dBm to +10 dBm). Measures forward average power. Accuracy is 5% (0.2 dB).

TERMINATING POWER SENSOR (MODEL 5011-EF) (See page 14)
Terminating Power Sensor, 40 MHz to 12 GHz, 10µW to 10 mW (-20 to +10 dBm) Measures forward average power. Accuracy is 5% (0.2 dB).

Model SA-6000EX, Model SA-2500EX, Model SA-1700EX & Model SA-1700EXP

SITE ANALYZER® SERIES

MODEL SA-6000EX (25 - 6000 MHz), MODEL SA-2500EX (780 - 2500 MHz), MODEL SA-1700EX (25 - 1700 MHz), MODEL SA-1700EXP (25 - 1700 MHz)

- ONE UNIT covers the entire 25-6000 MHz range!
- Easy to operate and field ready for first-time, occasional and experienced users.
- Suitable for use in Worldwide Cellular and PCS/DCS; supporting measurement of CDMA, GSM,TDMA and AMPS modulation schemes.
- Other applications include 3G, Broadcast, Government, Tactical Military, Microwave, Paging, Public Safety, Trunking, WLAN and WLL, and TETRA (see model matrix).
- Color display is clearly visible in direct sunlight
- WIth a single download you can view as Distance to Fault or Measurement Match-**no need to store two traces.**
- FDR (Frequency Domain Relectrometry) measurement method results in a highly reliable assessment of the health of critical components in your system; ultimately providing a “heads-up” before a failure occurs.
- 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.

Model SA-6000EX Site Analyzer®

Model SA-1700EX Site Analyzer®

Bird's® Site Analyzer® is the user-friendly test solution for installing, maintaining, and troubleshooting your antenna and cable systems. Field engineers and technicians rely on this rugged handheld tool to get the job done. Wireless equipment manufacturers, service providers, contractors, tower erectors, and military field personnel world wide approve of the analyzer's precision VSWR and Return Loss results.

This versatile unit also includes a Digital Power Meter option to accurately measure the output power of your base station. Wideband Power Sensors are available from Bird up to 4 GHz for use with this option, and are listed with the Accessories.

Model #	SA-6000EX	SA-2500EX	SA-1700EXP	SA-1700EX
Frequency Range	25 - 6000 MHz	780 - 2500 MHz	25 - 1700 MHz	25 - 1700 MHz
Frequency Resolution	25 kHz from 25-800 MHz 50 kHz from 800-2500 MHz 150 kHz from 2500-6000 MHz	50 kHz	25 kHz from 25-800 MHz 50 kHz from 800-1700 MHz	25 kHz from 25-800 MHz 50 kHz from 800-1700 MHz
Power Measurement	Yes	Yes	Yes	No
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/(500) 238 point traces			
Immunity to Interfering Signals	Rejects on-frequency signals up to +13 dBm			
Maximum Input Signal	+22 dBm			
Data Transfer	9-pin RS-232 (DB9), compatible with serial port			
Internal	Rechargeable Lithium-Ion batteries. 3-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)			
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	No	Yes, SA-6000EX	Yes SA-6000EX	Yes, SA-6000EX

SITE ANALYZER®

DIGITAL POWER METER OPTION

Digital Power Meter option allows accurate power readings for digital or analog systems including those with CDMA, GSM, TDMA or AMPS modulation. Operators of analog and digital two-way radio systems, including tactical military users, will benefit as well.

- Compatible with the Model 5010B Directional Power Sensor to display forward and reflected power as well as VSWR and Return Loss, DPM elements range from 2 MHz - 2700 MHz.
- Compatible with the Model 5011 Terminating Power Sensor to measure power directly or via a coupled test port from 40 MHz - 4000 MHz.
- Compatible with the Model 5012 Wideband Power Sensor to display forward and reflected power 350 MHz - 4000 MHz. Digital Power Meter option included with SA-6000EX, SA-2500EX and SA-1700EXP.

*Model **SA-2500EX** Site Analyzer® with Digital Power Option*

STANDARD ACCESSORIES

The Site Analyzer® includes Carrying Case, Instruction Manual, Serial Cable, PC Tool Software for Windows, AC Power Supply and Automotive Power Adapter.

Standard Accessories

Calibration Combos

ACCESSORIES

Model	Description
CAL-MN-C	Calibration combo, (M) N
CAL-FN-C	Calibration combo, (F) N
CAL-ME-C	Calibration combo, (M) 7/16 DIN
CAL-FE-C	Calibration combo, (F) 7/16 DIN
5012	Wideband Power Sensor 350 - 4000MHz
5011	Terminating Power Sensor 40 - 4000MHz
5010B	Directional Power Sensor 2 - 2700MHz
TC-MNMN-1.5	Test cable, 1.5 m., N (M) conn.
TC-MNMN-3.0	Test cable, 3 m., N (M) conn.
TC-MNFN-1.5	Test cable, 1.5 m., N (M)/N (F) conn.
TC-MNFN-3.0	Test cable, 3 m., N (M)/N (F) conn.
TC-MNME-1.5	Test Cable, 1.5m, N(M) - 7/16 DIN (M)
TC-MNME-3.0	Test Cable, 3.0m, N(M) - 7/16 DIN (M)
TC-MNFE-1.5	Test cable, 1.5 m., N (M)/7/16 DIN (F) conn.
TC-MNFE-3.0	Test cable, 3 m., N (M)/7/16 DIN (F) conn.
PA-MNME	Adapter, N (M) to 7/16 DIN (M)
PA-FNME	Adapter, N (F) to 7/16 DIN (M)
PA-MNFE	Adapter, N (M) to 7/16 DIN (F)
PA-FNFE	Adapter, N (F) to 7/16 DIN (F)
4240-550	Precision Connector Adapter Kit, 7/16 DIN, SA-Series
7002C870	Hard shell transit case
SA-BATPAK	External battery pack
DC-DB9 USB	Serial-USB Adapter

WIDEBAND POWER SENSOR (MODEL 5012) (See page 13)
The Model 5012 provides customers a TOTAL RF POWER MEASUREMENT SOLUTION for Directional Power Measurement with Accuracy of ±5% of readings.

DIRECTIONAL POWER SENSOR (MODEL 5010B) (See page 16)
The Model 5010B provides customers a TOTAL RF POWER MEASUREMENT SOLUTION for Thruline® (In-line) Power Measurements with Accuracy of ±5% of readings.

NEW TERMINATING POWER SENSOR (MODEL 5011) (See page 14)
The Model 5011 provides customers a TOTAL RF POWER MEASUREMENT SOLUTION to measure Base Station Power and/or Broadcast Transmitter Power with Accuracy of ±5% of readings.

Model 5010B Directional Power Sensor

Model 5011 Terminating Power Sensor

Model 5012 Wideband Power Sensor

Minimize Downtime
Keep Your Critical Antenna Sites Up & Running

BIRD® ANTENNA & CABLE MONITOR

Accurately detects antenna system degradation and failures

- Compatible with analog or digital cellular and two-way radio systems
- Worldwide applications include Tetra, Cellular, PCS and many others
- Monitors VSWR and power levels and provides alarm outputs
- Sensitive to antenna faults that internal transmitter VSWR monitors may not detect
- Local or remote operation via PC software
- Ideal for multi-carrier applications

Antenna & Cable Monitor

PC Software Tool 7005A970 (Optional Accessory)

FORWARD POWER MEASUREMENT

Frequency Range*	136* - 225 MHz 225 - 520 MHz 470 - 960 MHz 960 - 2400 MHz
Measurement Range	2.5 - 100 W, contact factory to inquire about other power measurement ranges
Power Accuracy	±5% of reading, ±1 count
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

REFLECTED POWER MEASUREMENT

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

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 Ports - 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.

*Other frequencies & power ranges available - contact factory.

PHYSICAL AND ENVIRONMENTAL SPECIFICATIONS

General	Thruline® 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 male "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)
EMC	European Standard EN 61326-1:1997+ Addendums A1: 1998 and A2: 2001- Electrical equipment for measurement, control and laboratory use
Safety	European Standard EN 61010-1:2001- Safety Requirements - Electrical equipment for measurement, control and laboratory use- ECM reqirements

ACCESSORIES

Model	Description
7005A970	PC software, displays Antenna & Cable Monitor readings and alarms, controls alarm set points
ACM-RACK	19" rack shelf, mounts up to two Antenna & Cable Monitors
ACM-RACKU	19" rack shelf with universal power supply (100 to 240 VAC, 50 - 60 Hz), mounts up to two +12 to +26 VDC Antenna & Cable Monitors
SUBCON-15/M-SH	DB 15-pin connector

(Contact factory to inquire about other optional accessories. Specifications are subject to change.)

MODEL NUMBER DEFINITION

ACM – ____ – ____ ____ ____ ____

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

Options
Any combination of male or female N or 7/16 DIN input/output connector, female N or TNC coupler connector,or +11 VDC to +25 VDC or ±36 VDC to ±72 VDC power supply.

AT100, AT400, AT800

	AT-100	AT-400	AT-800
Frequency Range	2 - 136 MHz	65 - 520 MHz	806 - 960 MHz
Frequency Resolution	20 kHz	30 kHz	30 kHz
Frequency Accuracy	±50 kHz	±100 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:		
	8 v/m @ 100 MHz	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)		

BIRD® CALIBRATION CART

Turnkey RF Measurements at Your Fingertips

- Stainless steel mobile cart with locking wheels
- 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

The SCC7 Series provides quality turnkey calibration for fab houses and equipment suppliers. The system consists of (1) 4421 Power Meter, (1) Power Sensor, (1) Oil Load, (1) Mobile Cart, and Minor Accessories.

4020 Series Power Sensor

Model	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 Power Sensor

Model	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 Filtered Power Sensor

Model	Frequency Range	Power Input
4027F2M	1.8-2.2 MHz	100 W to 10 kW
4027F10M	12-15 MHz	100 W to 10 kW

High Power Loads

Model	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	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

Ultra-Stable SC13 Loads

Model	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 V
8931-230SC13	DC to 28 MHz at 1.1 max. (VSWR less than 1.05:1)	10 kW, 230 V

Power Levels	1, 2.5, 5, 10 kW
Meter	4421
Sensor Options	4020 Series or 4027A 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
Accuracy 4020 Series	±3% (1σ) across power and frequency range
Accuracy 4027A Series	±1% (1σ) at calibration frequency and power levels; ±2% (1σ) over remainder of power range, and at other than calibration frequencies
Accuracy 4027F Series	±1% (2σ) across power and freqency range; ±2% (2σ) 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
Applicable Standards	CE pending

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

Multi-Sensor Calibration Cart &
High Power Calibration Cart

BIRD® MULTI-SENSOR CALIBRATION CART

Turnkey RF Measurements at Your Fingertips

- Stainless steel mobile cart with locking wheels
- 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

The MSCC7 Series provides quality turnkey calibration for fab houses and equipment suppliers. The system consists of (1) 4421 Power Meter, (2) Power Sensors, (1) Oil Load, (1) Mobile Cart, and Minor Accessories.

4020 Series Power Sensor

Model	Frequency Range	Power Input
4021	1.8-30 MHz	300 mW to 1 kW (1.2 kW max.)
4024	1.5-30 MHz	3 W to 10 kW (12 kW max.)
4025	100-2500 kHz	3 W to 10 kW (12 kW max.)

4027A Series Power Sensor

Model	Frequency Range	Power Input
4027A250K	250-400 kHz	3 W to 10kW
4027A400K	400-550 kHz	3 W to 10kW
4027A800K	800-950 kHz	3 W to 10kW
4027A2M	1.5-2.5 MHz	3 W to 10kW
4027A4M	3-5 MHz	3 W to 10kW
4027A10M	10-15 MHz	3 W to 10kW
4027A12M	10-15 MHz	300 mW to 1kW
4027A25M	25-30 MHz	3 W to 9 kW

4027F Series Filtered Power Sensor

Model	Frequency Range	Power Input
4027F2M	1.8-2.2 MHz	100 W to 10 kW
4027F10M	12-15 MHz	100 W to 10 kW

High Power Loads for Semiconductor

Model	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

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% (1σ)
Accuracy 4027A Series	±1% (1σ)
Accuracy 4027F Series	±1% (2σ)
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
Applicable Standards	CE

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

BIRD® HIGH POWER CALIBRATION CART

- Stainless steel mobile cart with locking wheels
- High return loss ensures minimal power measurement error contribution
- Available in international and domestic versions
- Service plans available with Bird® Service Center

The SCC8 Series provides quality turnkey calibration for fab houses and equipment suppliers. The system consists of (1) 4421 Power Meter, (1) 4028 A or B Series Power Sensor, (1) Moduload, (1) Mobile Cart, and Minor Accessories.

4028 Series Power Sensor

Model	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

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)
Humidity	85% maximum, non-condensing
Altitude	Load derated above 5,000 ft (1,524 m)
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
Applicable Standards	CE pending

SEMICONDUCTOR

4020 SERIES — Power Sensor

	4021	4022	4024	4025
Power Input	300 mW to 1 kW (1.2 kW max.)	300 mW to 1 kW (1.2 kW max.)	3 W to 10 kW (12 kW max.)	3 W to 10 kW (12 kW max.)
Frequency Range	1.8-32 MHz	25-1000 MHz	1.5-32 MHz	100-2500 kHz
Insertion Loss	<0.05 dB	<0.05 dB	<0.05 dB	<0.05 dB
Accuracy	±3% of reading from rated max. to rated min.			

BIRD® MODEL 4421

Precision Power Meter for Semiconductor Processing Applications

- ±1% Accuracy - Accomplished through the use of sensors with an automatic frequency compensation scheme, where the error contributions due to directional coupler frequency response characteristics are eliminated.
- 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

Model 4421

The Bird® Model 4421 is a precision RF power meter that, while originally intended for general purpose laboratory applications where high accuracy is required, has found wide acceptance in semiconductor processing applications. The product is configured as a system, consisting of the Model 4421 digital display and a precision power sensor selected for the application based upon maximum power and operating frequency.

MODEL 4421 MULTIFUNCTION POWER METER

Power Range	100 mW to 25 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 (page 43) 19" Panel Mount Kit 4421-250 Latch & Lock Case 4421-038

MODEL 4421A530 CALIBRATION KIT

Calibration Key

Weight	3 oz. (85 g.)
Cable Length	Approx. 3 ft. (1 m)
Required Products	4421 power meter, 4020 Series power sensor, RF power source, RF low-pass filter, RF terminating power standard (Bird® Model 6091 calorimeter recommended) and IBM compatible computer fitted with a GPIB card-specify standard.
Performance Measurement Cycle	1 Year
Limitation	Not compatible with 4027 Series Sensor

BIRD® Model 4027A

Precision Power Sensors for Precision Process Applications

Achieves tighter, more consistent RF power measurements for improved yield.

- ±1% accuracy at specified calibration frequencies and power levels.
- Direct, plug-in operation with the industry standard Bird® Model 4421 RF Power Meter.
- Multiple sensors provide for measurement of 0.3 W - 10 kW over a 250 kHz - 170 MHz frequency range.

Bird's® new 4027A Series Power Sensors represent a family of sensors for use in semiconductor processing and other precision process applications. Intended for use with the industry standard Bird® Precision Laboratory Power Meter Model 4421, these products provide a threefold improvement in long-term unit-to-unit accuracy.

4027A Series ±1% ACCURACY

POWER MEASUREMENT

Accuracy	±1% (1σ) at calibration frequencies and power levels; ±2% at other frequencies and power levels. Add 2% to uncertainty outside 25 ± 10°C
Calibration Power Level	1000 W units: 700 watts. 10 kW units: 1700 watts.
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

Customer specified

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	13 oz. (0.8 kg)

ENVIRONMENTAL SPECIFICATIONS

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
Calibration Cycle	6 month. Performance before and performance after data to be supplied for units.

4027A SERIES — Power Sensor

	4027A12M	4027A250K	4027A400K	4027A800K	4027A2M	4027A4M	4027A10M	4027A25M	4027A35M	4027A60M	4027A100M	4027A150M	4027F2M	4027F10M
Power Range	300 mW-1 kW	3 W-10 kW						3 W-9 kW	3 W-7.5 kW	3 W-6 kW	3 W-4 kW	3.75 W-3.75 kW	100 W-10 kW	
Frequency	10-15 MHz	250-400 kHz	400-550 kHz	800-950 kHz	1.5-2.5 MHz	3-5 MHz	10-15 MHz	25-30 MHz	35-45 MHz	45-65 MHz	95-105 MHz	150-170 MHz	1.8-2.2 MHz	12-15 MHz
Accuracy	±1% at calibration frequencies and power levels; ±2% at other frequencies & power levels within sensor range.												±1%within 15°C to 35°C (59°F to 95°F) operating temp. ±3%within 0°C-15°C or within 35°C-50°C operating temp.	
VSWR Range	1.0 to 2.0 (40.0 to 9.5 dB return loss)													
Directivity	28 dB													
Insertion Loss	< 0.05 dB													
Calibration Power Level	1000 W units: 700 watts. 10 kW units: 1700 watts.													
Uniformity	2% maximum unit to unit, at calibration frequency and power levels													
Speed	2 readings per second.													
Maximum Power	1.2 kW (on 1 kW units)													
Connectors	Must be specified at time of order													
Sensor Interface	Latch-n-Lock													
External DC	12 VDC, supplied from Multifunction Power Meter													
Dimensions	5 7/32" L x 2 1/2" W x 3 1/4" H												5.128"L x 2.506"W x 3.280"H	
Weight	1 lb. 11 oz. (0.76 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)													
Calibration Cycle	6 month. Performance before and performance after data to be supplied for units.													

BIRD® Model 4028

High Power, Precision Power Sensors for Precision Process Applications

Achieves tighter, more consistent RF power measurements for improved yields.

- ± 2% at calibration frequencies and power levels. ± 4% at other frequencies and power levels. Add 2% to uncertainty outside 25 ± 10 °C.
- Direct, plug-in operation with the industry standard Bird® Model 4421 RF Power Meter.
- Multiple sensors provide for measurement over a 250 kHz to 30 MHz frequency range
- Capable of power measurements up to 50kW.

With the expanding surface areas in the LCD and Solar panel industry, higher power levels are necessary for the industries processes. The Bird 4028 series sensor is designed to meet the growing RF power measurement challenge with accuracy, repeatability and versatility to meet current and future applications. Bird continues to innovate useful sensor technology to meet these fast paced markets.

POWER MEASUREMENT

Accuracy	±2% (1σ) at calibration frequencies and power levels; ±4% at other frequencies and power levels. Add 2% to uncertainty outside 25 ± 10°C
Calibration Power Level	250 and 400kHz units: 1.7kW all other units: 3.5kW
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

POWER REQUIREMENTS

External DC	12 VDC, supplied from Bird 4421 Power Meter

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

4028 SERIES — Power Sensor

	4028A250K	4028400K	4028A2M	4028A3M	4028A4M	4028A10M	4028A25M	4028B3M	4028B10M	4028C10M
Power Range	1 kW - 20 kW		1 kW - 25 kW							500 W-50 kW
Frequency	250 - 400 kHz	400 - 550 kHz	1.5 - 2.5 MHz	2.5 - 3.5 MHz	3.5 - 4.5 MHz	10 - 15 MHz	25 - 30 MHz	2.5 - 4 MHz	10 - 15 MHz	10 - 15 MHz
Accuracy	±2% (1σ) at calibration frequencies and power levels; ±4% at other frequencies and power levels. Add 2% to uncertainty outside 25 ± 10°C									
VSWR Range	1.0 to 2.0 (40.0 to 9.5 dB return loss)									
Directivity	28 dB									
Insertion Loss	< 0.05 dB									
Calibration Power Level	250 and 400kHz units: 1.7kW; all other units: 3.5kW									
Uniformity	2% maximum unit to unit, at calibration frequency and power levels									
Speed	2 readings per second.									
Connectors	Must be specified at time of order							1-5/8 EIA Flanged		3-1/8 EIA Flanged
Sensor Interface	Latch-n-Lock									
External DC	12 VDC, supplied from Power Meter									
Dimensions	4.7" L x 3.2" W x 4.0" H							6.8" L x 3.5" W x 4.8" H		8.0" L x 5.2" W x 6.4" H
Weight	1.7 lbs.		3.3 lbs.					5.2 lbs.		7.3 lbs.
Operating Temperature	0°C to 50°C (32°F to 122°F)									
Storage Temperature	-20°C to 70°C (-4°F to 158°F)									
Calibration Cycle	6 months. Performance before and performance after data to be supplied for units.									

Model 5012 Wideband Sensor and vDPM Software

BIRD® Model 5012

Bird's® Site Management Solutions for Power Measurement

- Easy to use & competitive price
- Wide frequency range (350 MHz - 4000 MHz)
- Direct connection to PC, Digital Power Meter or Site Analyzer® - NO BLACK BOX !!!!
- 30 dB Directivity-Up to 3 GHz; 28 dB up to 4 GHz
- Directional-Forward and Reflected Power
- No elements required!

When combined with a Digital Power Meter, Site Analyzer® Family of line and antenna analysis products, or a Personal Computer, the Wideband Power Sensor becomes an integral part of a very robust and sophisticated power measurement solution.

Sensor Characteristics - General

Frequency Range	350 MHz - 4 GHz
Power Measurement Range	0.15 W - 150 W average, 400 W peak
Impedance	50 ohm (nominal)
Insertion Loss	<0.05 dB up to 1 GHz, <0.1 dB from 1 GHz to 4.0 GHz
Insertion VSWR	<1.05 up to 2.5 GHz, <1.10 from 2.5 to 4.0 GHz
Input Connector	N Female
Output Connector	N Female
Directivity	30 dB up to 3.0 GHz, 28 dB up to 4.0 GHz

Reflection Measurement Characteristics

Measurement Range	Return Loss, 0.0 to 23 dB VSWR, 1.15 to 99.9 Rho, 0.07 to 1.0
Minimum Forward Power	0.5 W
Weight	1.2 lb. max.

Interface Specifications:

DPM Interface	EIA-232, 9600 Baud, no parity, 8 data bits, 1 stop bit
PC Interface(1)	EIA-232, 9600 Baud, no parity, 8 data bits, 1 stop bit
PC Interface(2)	USB 1.1 compliant interface

Power Requirements

USB port	Less than one low-power USB load
DC input connector	7-18 VDC at less than 0.1A

Data Logging (requires VPM Kit)

Data Capture	Time, forward average or peak power, reflected power
Sampling Interval	1 to 1000 seconds

Physical and Environmental Specifications

General	Thruline® power measurement
Operating Temperature	-10°C to +50°C (+14°F to +122°F)
Storage Temperature	-40°C to +80°C (-40°F to +176°F)
Mechanical Shock	IAW MIL-PRF-28800F class 3
Vibration	IAW MIL-PRF-28800F class 3
Humidity	95% maximum (non-condensing)
Altitude	15,000 ft operating
Size	3.78"(4.74) W X 4.56" H X 1.28" D without connector 4.74" W X 4.56" H X 1.28" D including connectors
Weight	1.2 lb. maximum

Model 5012 Accessories

VPM-KIT-NA	Virtual Power Meter Kit 115V
VPM-KIT-E	Virtual Power Meter Kit 230V
PTA-MNMN	Precision Test Adapter Male N to Male N
PTA-MNME	Male N to Male 7/16 (DIN)
PTA-MNFE	Male N to Female 7/16 (DIN)

Comtatible Devices

5000-EX	Digital Power Meter
SA-6000EX	Site Analyzer®, Antenna, & Cable Tester
SA-2500EX	Site Analyzer®, Antenna, & Cable Tester
SA-1700EXP	Site Analyzer®, Antenna, & Cable Tester
SH-36S	SignalHawk®, Spectrum Analyzer

Power Measurement Characteristics

	Average Power	Burst Average Power	Crest Factor Peak-to-Average	Peak Envelope Power	Complementary Cumulative Distribution Function (CCDF)
Power Measurement Range	2.0 W - 150 W	10 W - 150 W average	4.0 W - 150 W average	4.0 W - 400 W	0.1 - 100%
Peak/Average Ratio	12 dB max.	–	–	–	–
Burst Width	–	1 us to 50 ms Duty Cycle Measured	–	–	–
Repetition Rate	–	15 Hz min.	–	–	–
Duty Cycle	–	D=Burst Width/Period, 0.001 to 1	–	–	–
Threshold Level Range	–	–	–	–	4 W to 400 W
Level Set Accuracy	–	–	–	–	±5% of level ±0.5 W
Measurement Uncertainty	±4% of reading, (+15°C to +35°C) ±7% of reading, (-10°C to +50°C)	± 6% of reading ± 0.05/D W, Duty Cycle Entered, (+15°C to +35°C) ± 9% of reading ± 0.05/D W, Duty Cycle Entered, (-10°C to +50°C)	Sum of peak and average power uncertainty	±7% of reading ± 0.2 W from 200 µs (+15°C to +35°C) ±10% of reading ± 0.4 W from 1 µs (+15°C to +35°C) add ±3% of reading if temperature -10°C to +15°C or +35°C to +50°C add ±1.5% of reading + 0.15 W for period > 0.1 seconds add ±0.1 W for D from 0.001 to 0.1 add ±5% or reading for burst widths less than 1 µs add ±10% of reading for burst widths less than 0.5 µs	±0.2%

BIRD® Model 5011 & 5011-EF Terminating Power Sensor

Designed to make Terminating Power Measurements with the full flexibility of a portable precision instrument (Requires Bird® MODEL 5000EX, SA-6000EX, SA-2500EX or SA-1700EXP)

- Significant cost and time savings, easy to use and field ready
- No calibration and no elements required
- Both digital as well as analog modulations including (CDMA, GSM, TDMA, 8-VSB and COFDM)
- Broadcast Transmitter Power with accuracy of ±5% of readings
- Measure power directly or via coupled test port

Model 5011
Terminating Power Sensor

SPECIFICATIONS

Sensor Type	Terminating Power Sensor. Terminated average power measurement.
Frequency Range	**5011** - 40 MHz - 4 GHz **5011EF** - 40 MHz to 12 GHz
Power Range	-20.000 to +10.000 dBm (10.000 µW to 10.000 mW)
Peak/Average Ratio	12 dB max.
Accuracy	±5% of reading ±1mW RSS (excluding mismatch uncertainty)*
Warm Up Time	5 Minutes
Input Impedance	50 ohm (nominal)
Input VSWR	**5011** -Typical 1.03 (36.6 dB return loss); maximum 1.20 (20.8 dB return loss) **5011-EF** -Typical 1.05 (32.3 dB return loss); maximum 1.25 (19.1 dB return loss)
Input Connector	Precision N Male
Output Connector	Male DB-9 to interface to Digital Power Meter or Site Analyzer®
Power Supply	From host instrument via cable connection
Operating Temp.	-10°C to 50°C (14°F to 122°F)
Storage Temp.	-40°C to 80°C (40°F to 176°F)
Humidity	95% maximum (non-condensing)
Altitude	15,000 ft operating
Size	6" long (including connectors); 1.5" diameter
Weight	3/4 lb. max.

** When operating below 100 MHz and above 40°C, add 1%.*
NOTE: The Bird® Model 5000-EX or the Bird® Site Analyzer® Series (SA-6000EX, SA-2500EX, or SA-1700EXP) is required.

ACCESSORIES

Model	Description
8353A040-50**	Attenuator, 50 W, 40 dB, N (F) to N (M) 100 mW to 50 W with TPS 5011
8353A030-10	Attenuator, 10 W, 30 dB, N (F) to N (M) 10 mW to 10 W with TPS 5011
5011-CALDATA	Calibration Data for TPS 5011 Attenuators and Accessories.
4240-500-1	Adapter, N (F) to N (F)
4240-500-3	Adapter, right angle, N (F) to N (M)
4240-500-4	Adapter, N (F) to SMA (F)
4240-500-5	Adapter, N (F) to SMA (M)
PA-FNME	Adapter, N (F) to 7/16 DIN (M)
PA-FNFE	Adapter, N (F) to 7/16 DIN (F)
TC-MNFN-1.5-G	Test cable, 1.5 m., N (M)/N (F) conn.
TC-MNFN-1.5	Test cable, armored, PS, 1.5 m., N (F) to N (M)
TC-MNFN-3.0	Test cable, armored, PS, 3.0 m., N (F) to N (M)
5011A035-1	DC Block, N (F) to N (M)

**Optional 40 dB attenuator provides 100 mW to 50 W capability, other ranges also available.

COMPATIBLE DEVICES

5000-EX	Digital Power Meter
SA-6000EX	Site Analyzer®, Antenna, & Cable Tester
SA-2500EX	Site Analyzer®, Antenna, & Cable Tester
SA-1700EXP	Site Analyzer®, Antenna, & Cable Tester
SH-36S	SignalHawk®, Spectrum Analyzer

BIRD® Wideband Coupler

- Cost effective
- Portable
- Easy-to-use

SPECIFICATIONS

Frequency Range	45 MHz - 230 MHz (VHF Models) 450 MHz - 890 MHz (UHF Models) 450 MHz - 800 MHz (6" UHF Models)
Maximum Power	Transmission line and frequency dependent
Nominal Coupling	Transmission line dependent (See Table 1)
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
Weight	Transmission Line Dependent (See Table 2)
Dimensions	Transmission Line Dependent (See Table 2)

TABLE 1

Line Size	VHF	UHF
1-5/8"	62 dB ±2 dB	59 dB ±2 dB
3-1/8"	69 dB ±2 dB	64 dB ±2 dB
4-1/16"	70 dB ±2 dB	67 dB ±2 dB
6-1/8"	75 dB ±2 dB	75 dB ±2 dB

TABLE 2

Model Number	Line Size	Frquency Range	Length (in.)	Weight (lbs.)
WBC1-45	1-5/8 Flanged	VHF	6.75	3.65
WBC1U-45	1-5/8 Unflanged	VHF	6.38	1.8
WBC1-400	1-5/8 Flanged	UHF	6.75	3.65
WBC1U-400	1-5/8 Unflanged	UHF	6.38	1.8
WBC3-45	3-1/8 Flanged	VHF	7.03	6
WBC3U-45	3-1/8 Unflanged (Recessed)	VHF	6.5	2.75
WBC3UF-45	3-1/8 Unflanged (Flush)	VHF	6.5	2.75
WBC3-400	3-1/8 Flanged	UHF	7.03	6
WBC3U-400	3-1/8 Unflanged (Recessed)	UHF	6.5	2.75
WBC3UF-400	3-1/8 Unflanged (Flush)	UHF	6.5	2.75
WBC4-45	4-1/16 Flanged (Dielectric)	VHF	8.38	8.88
WBC4M-45	4-1/16 Flanged (MYAT)	VHF	8.38	8.88
WBC4U-45	4-1/16 Unflanged (Dielectric)	VHF	7.5	2.88
WBC4-400	4-1/16 Flanged (Dielectric)	UHF	8.38	8.88
WBC4M-400	4-1/16 Flanged (MYAT)	UHF	8.38	8.88
WBC4U-400	4-1/16 Unflanged (Dielectric)	UHF	7.5	2.88
WBC6-45	6-1/8 Flanged	VHF	10.22	13.2
WBC6U-45	6-1/8 Unflanged	VHF	9.63	7.2
WBC6-400	6-1/8 Flanged	UHF	10.22	13.2
WBC6U-400	6-1/8 Unflanged	UHF	9.63	7.2

BIRD® Model 5010B Dual-Socket Thruline® Directional Power Sensor

Bird's® Most Sophisticated Thruline® Sensor System is the Heart of the MODEL 5000-EX (Requires Bird® MODEL 5000-EX, SA-6000EX, SA-2500EX or SA-1700EXP)

- Dual-element THRULINE® design for simultaneous forward and reflected power readings.
- Measures true average power.
- Peak power measurement (using 43 elements**)
- ±5% of reading accuracy rivals thermal wattmeters in actual field use.
- Small, easily-remoted sensor facilitates convenient hand-held operation.

Model 5010B Thruline® Directional Power Sensor

The ***Model 5010B Dual-Socket THRULINE® Power Sensor*** is a precision 50-ohm 7/8-inch "Smart" Line Section which accepts Bird® digital-ready Plug-in DPM Elements. The ***Model 5010B Sensor*** provides true average and peak power readings for digital as well as traditional analog RF systems.

The ***Model 5010B Power Sensor*** is compatible with many existing Bird® accessories for 7/8" line, including signal samplers, and over 20 types of QC connectors. QC Connectors can be changed rapidly and conveniently in the field by removing four screws from the connector.

*DPM Element Guide

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

* Note: 5010B supercedes 5010

**Note: For average power readings, use the elements listed above in the DPM Element Guide. For peak power readings, use elements from Tables 1-6 pages 42 & 43.

SPECIFICATIONS

Sensor Type	Bird® THRULINE® directional dual-element line section
Frequency Range	Element limited. Please view element guide for current listing.
Power Range	Element limited. Please view element guide for current listing. 1 W to 1000 W*
Pulse width Parameters	>100 MHz 800 ns min. 26-99 MHz 1.5 µs min. 2-25 MHz 15 µs min.
Pulse Rep. Rate Peak	15 pps min.
Pulse Duty Factor	1 x 10^{-4} min.
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
Dynamic Range	40:1 (E.G. 50 W element measure 1.25 W to 50 W).
Peak/Average Power Ratio	10 dB maximum with DPM elements
Settling Time	< 2 seconds
Connectors	QC Type. Female N normally supplied.
Insertion VSWR	1.05:1 from 0.45 to 1000 MHz (with N connectors)
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)
Operating Temp.	-10°C to +50°C
Storage Temp.	-40°C to +75°C
Humidity	95% max. (non-condensing)

COMPATIBLE DEVICES

5000-EX	Digital Power Meter
SA-6000EX	Site Analyzer®, Antenna, & Cable Tester
SA-2500EX	Site Analyzer®, Antenna, & Cable Tester
SA-1700EXP	Site Analyzer®, Antenna, & Cable Tester
SH-36S	SignalHawk®, Spectrum Analyzer

BIRD® Model 5000-EX RF Digital Power Meter

Requires Bird® Model 5010B, Model 5011 or Model 5012 Sensor

The "NEW" Industry Standard Hand-Held RF Power Meter
Easy-To-Operate & Field Ready

- Hand-Held and Field Ready
- Easy-to-Use Digital Display
- Compatible with Digital and Analog Signals
- Must be used with a Bird® Power Sensor - Directional Power Sensor (see page 16), Terminating Power Sensor (see page 14), and the New Bird® Wideband Power Sensor (see page 13)

The "NEW" Industry Standard Hand-Held RF Power Meter Easy-To-Operate & Field Ready. The Model 5000-EX must be coupled with Model 5010B Thruline® Power Sensor, Model 5011 Terminating Power Sensor or Model 5012 Wideband Power Sensor. Model 5000-EX handles Cellular, PCS, AMPS, CDMA, GSM, TDMA, ISM, UMTS, 3G Wireless, WLL, Paging, Conventional/Trunked Radio, Aviation, Military, and Analog or Digital and Television Broadcast.

Model 5000-EX is also compatible with pulse modulation systems, such as radar & avionics applications (TACAN, DME), where peak power measurements are required.

Model 5000-EX
RF Digital Power Meter

SPECIFICATIONS

Display	Back-lit liquid crystal technology, 2.25" x 3.0" (57 x 76 mm). Three-way display consisting of major and minor digital display elements, analog bar graph element, annunciators, battery indicator and speed-key legends.
Measurement Mode	TRUE AVERAGE POWER, for measurement of conventional or digitally-modulated RF. PEAK POWER, for pulse, SSB, AM & avionics applications
Sensor Interface	9-pin D-shell RS-232 serial connector. Sensor is powered from meter. Sensor is compatible with Bird® VSWR Alarm products and Broadcast Power Monitor (BPME) product family.
PC Interface	9-pin RS-232 serial port for connection to a PC.
Dimensions	8.0" H x 4.63" W x 1.75" D (203 mm x 117.6 mm x 44.5 mm)
Weight	1.5 lbs., nominal (0.68 kg)
Power Supply	Rechargeable Nickel-Metal Hydride (NiMH) battery. Meter may be operated from AC mains using supplied adapter.
Battery Life	100 hours min. per charge.
Operating Temp.	-10°C to +50°C
Storage Temp.	-40°C to +75°C
Humidity	95% max. (non-condensing)
Standard	Instruction manual, serial communications cable (5010B), AC charger/adapter

* Note: 5010B supercedes 5010

ACCESSORIES

Model	Description
5012	Wideband Power Sensor (See page 13)
5010B*	Directional Power Sensor (DPS) (See page 16) Requires pair of DPM Elements
DPM-XX	DPM Elements, 2 MHz to 2.7 GHz (See Element guide page 16)
5011	Terminating Power Sensor (TPS), (See page 14) 40 MHz to 4 GHz
5A2238-1	Cigarette Lighter Adapter
5000-030	Soft Carrying Case
5000-035	Hard Carrying Case

Digital Power Meter Option

Directional Power Sensor (Model 5010B*) (See page 16)

NEW Terminating Power Sensor (Model 5011) (See page 14)

Wideband Power Sensor (Model 5012) (See page 13)

*Model 5010B**
Directional
Power Sensor

Model 5012
Wideband
Power Sensor

Model 5011
Terminating
Power Sensor

BIRD® BPME Series

Broadcast Power Monitors for Your Digital and Analog Applications

- Frequency/Channel Field Configurable - Provides channel flexibility when needed
- Integral RF Test Port - Enables mask compliance testing
- Ethernet & RS-232 Enabled - Future-ready remote monitoring, control & instant alarm alert
- Data Logging Capabilities-System trends and anomalies before failures
- Accurately measures power in digitally modulated and multi-carrier systems - Provides measurements you can trust to ensure regulatory requirements are met
- VSWR, Return Loss and Match Efficiency calculations using hardware or PC-based software tools -Provides essential feedback on the health of your system
- Handles peak to average ratio of greater than 10 dB - This is a must have for digital systems or antenna problems.

BPME

Model 3129

BPME OPERATING CHARACTERISTICS

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
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

MODEL 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 and line section, and serial interface cable

LINE SECTION

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	**Maximum Forward Power**	**Power Designator**	**Maximum Forward Power**	**Power Designator**
7/8"	50 – 500 W	Low	25 – 250 W	Low
	500 W – 2 kW	Medium	250 W – 1 kW	Medium
	2 – 5 kW	High	1 – 2.5 kW	High
1 5/8"	200 W – 2 kW	Low	50 – 500 W	Low
	2 – 8 kW	Medium	500 W – 2 kW	Medium
	8 – 20 kW	High	2 – 5 kW	High
3 1/8"	500 W – 5 kW	Low	250 W – 2.5 kW	Low
	5 – 20 kW	Medium	2.5 – 10 kW	Medium
	20 – 50 kW	High	10 – 25 kW	High
4 1/16"	1 – 10 kW	Low	400 W – 4 kW	Low
	10 – 40 kW	Medium	4 – 15 kW	Medium
	40 – 100 kW	High	15 – 40 kW	High
6 1/8"	2 – 20 kW	Low	800 W – 8 kW	Low
	20 – 80 kW	Medium	8 – 30 kW	Medium
	80 – 200 kW	High	30 – 75 kW	High

Portable Wattmeters

BIRD'S Famous ANALOG METER

MODEL 43 — Portable Wattmeter

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 (pages 40-43)

MODEL 43P — Portable Wattmeter
PEAK POWER RETROFIT KIT 4300-400 — Portable Wattmeter

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)
Battery Life	48 hours typical
Weight	Adds 1 lb. to Model 43

VARIABLE RF TAP 4431 — Portable Wattmeter

Power and Frequency Range	5 kW max. 2 - 30 MHz, 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 (pages 40-43) (within power/frequency range limits stated above)
Accessories	Case (page 46)

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

WATTMETER 4314B — Portable Wattmeter

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 (pages 40-43)
Accessories	Case (page 46), spare batteries (page 45), extra QC connectors (page 44).

HIGH-POWER WATTMETER 4305A — Portable Wattmeter

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 (page 42)
Accessories	Case (page 46)

4305A Elements — Frequency (MHz)

Power	.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	—	—	—	—	—

MODEL 4304A FIXED 25-1000 MHz 5-500 WATT ELEMENT — Portable Wattmeter

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 (page 46)

MODEL 4308 CELLULAR SPECIALIST WATTMETER — Portable Wattmeter

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)
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 (page 46)

MULTIPOWER, ±5% READING ACCURACY 4410 SERIES— Portable Wattmeters

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. Any Bird® Series 4410-Element may be used.
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 Temperature 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 (page 46), spare battery (page 45)

4410 Elements

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

MHz	30-50	50-88	88-108	–	150-250	225-400	400-800	800-900	900-1000
Model	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

MHz	25-80	50-125	100-250	200-500	400-1000	1000-1800	1800-2300
Model	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

MHz	2–30	25-80	50-200	144-520	200-1000
Model	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

MHz	0.2-0.535	0.45-2.5	2-30
Model	4410-1	4410-2	4410-4

**Accuracy is ±8% of reading*

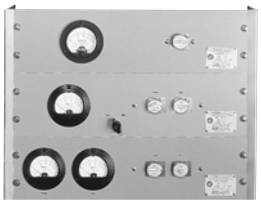
MODEL APM-16 AVERAGE-READING POWER METER — Portable Wattmeters

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 (page 46)

APM-16 Elements

Frequency Bands (MHz)

Power Range	2-30	25-60	50-125	100-250	200-500	400-1000	950-1260	1100-1800	1700-1990	1990-2200	2200-2300
1W	—	—	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	—	—	—	—	—
1000 W	APM-1000H	—	APM-1000B	APM-1000C	—	APM-1000E	—	—	—	—	—



0.45 - 2700 MHz, Model 4521, 4522, and 4526 — Panel-Mount Wattmeters

Models	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)
Elements	Tables 1, 2, 3, 3A, 4, 6 (pages 40-43)

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

2-512 MHz with Sampler Port
MODEL 4527 — Panel-Mount Wattmeters

Power Range	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	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 (pages 40-43)

High Speed, FWD/RFL Alarm Wattcher®
MODEL 3170A — Wattcher® Single Carrier RF Monitoring System

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 (pages 40-43)
Calibration Cycle	1 Year for element

Note: Elements calibrated to a 7/8" line section (standard) can be interchanged. Wattcher® Model 3170A is at interim 7/8" line section.

100 mW - 10 kW Wattcher®
MODEL 3128A — Wattcher® Single Carrier RF Monitoring System

Power Range	100 mW to 10 kW using Bird® Plug-in Elements*
Frequency Range	450 kHz - 2.7 GHz
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 (page 24) QC connectors: Two (page 44) Elements: Two from Tables 1, 2, 3, 3A, 4, or 6 (pages 40-43)

Rugged, RF Power Analyst®
MODEL 4391A — Portable Wattmeter

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 Frequency	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 (pages 40-43)
Accessories	Case (page 46)

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

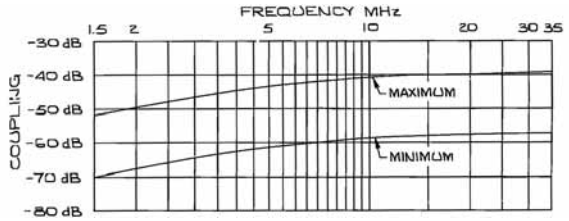
RF Signal Samplers

The Model 4273 (1.5 to 35 MHz, 5 kW max.) and Model 4275 (20 to 1000 MHz, 1 kW max.) are "stand-alone," wide-range THRULINE® RF coupling probes for spectrum analysis, RF signal observation on a scope, or frequency counting and control. They feature very low VSWR throughout a broad frequency and attenuation range. Insertion loss is a negligible 0.1 dB. Both Models produce an unrectified sample at the BNC port that is adjustable. Once adjusted, the setting can be locked in place. The main power connectors are Bird® QC type.

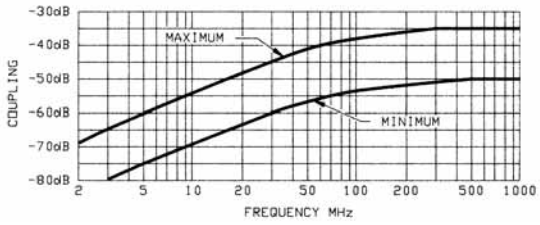
VARIABLE RF SIGNAL SAMPLERS, MODEL 4273, 4275

	4273	4275
Power Rating	5 kW max	1 kW max
Frequency Range	1.5 - 35 MHz	20 - 1000 MHz
Impedance	50 ohm nominal	50 ohm nominal
Insertion VSWR	with N Connectors 1.07 max	with N Connectors 1.1 max. 2 to 512 MHz, 1.25 max. 512 to 1000 MHz
Insertion Loss	0.1 dB max.	0.1 dB max. 2 to 512 MHz, 0.2 dB max. 512 to 1000 MHz
Coupling	Adjustable as shown within ±3 dB	—
Ambient Temperature Range	-40°C to +45°C	
Connectors	QC Type (Choose any two connectors from page 44)	
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)	

MODEL 4273



MODEL 4275



Model 4041

FIELD-STRENGTH METER MODEL 4041

	4041
Frequency Range	1 to 1000 MHz
Dynamic Range	30 dB min.
Typical Sensitivity	Full Scale deflection at 8 ft. (2 1/2 m) from a 1 W source broadcasting at 150 MHz through a quarter wave antenna
Battery Life	200 hours min.
Battery Type	One, 9V alkaline, "Transistor" battery (NEDA No. 1604A)
Ambient Temp Range	0°C to +50°C
Nominal Size	(w/o antenna) 4 3/8" L x 2 1/4" W x 1 15/16" D, (111 mm x 57 mm x 49 mm)
Weight	(includes batteries) 10 oz. (283 g)

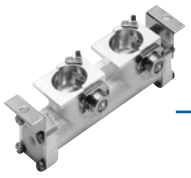
RPK 43-4

FIELD REPLACEMENT METERS

THRULINE® WATTMETER METER MOVEMENT 30µA KIT

4210A100

	RPK 43-4	4210A100
Type	3 1/2" Round Kit w/ Cable	3 1/4" Square Meter in Housing
Current	30 µA/1400 Ω	30 µA/1400 Ω
Scales	25/50/100 W	25/50/100 W
Use with Element Tables	1, 2, 3, 3A, 4, 6 (pages 40-43)	1, 2, 3, 3A, 4, 6 (pages 40-43)



THRULINE® WATTMETER COMPONENTS— Line Sections Cable 7/8" Rigid Line

Model	4230-018	4230-006-1	4230-059	4522-002-5
Line Type	Cable	Cable	Cable	Cable
Connector Type	QC-N (F)	QC (not incld.)	QC (not incld.)	QC (not incld.)
Element Sockets	1	1	1 w/bracket	2 panel mt.
Length (Inches)	5 1/2	4	4	6 7/32
Weight (lbs.)	1 1/3	1	1 1/4	1 1/4
Use with Wattmeters	—	—	—	3128A, 4201A501, 4201A502, 4201A100, RPK 43-4

Wattcher® RF Monitoring System

HIGH SPEED, FWD/RFL ALARM WATTCHER® MODEL 3171A — Single Carrier RF Monitoring System

Models	3171A	3171A020
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" from page 26	
Elements	(pages 42-43): Two from Tables 1 5/8 AA, 3 1/8 AA, 4 1/16 AA, or 6 1/8 AA.	(pages 42-43): 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 from page 45	

100 W — 250 kW WATTCHER® MODELS 3126A, 3127A — Single Carrier RF Monitoring System

Models	3126A	3127A
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" from page 26	
Elements	(pages 42-43): Two from Tables 1 5/8 B, 3 1/8 B, 4 1/16 B, or 6 1/8 B.	(pages 42-43): 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 from page 45	

Rigid Line Sections & Meters for Rigid Line Use

THRULINE® WATTMETER COMPONENTS— Rigid Line Sections

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

4610-000	3 1/8"	EIA Flg.	2	7.03	7.25
4801-100	3 1/8"	UnFlg. (Rec. 0.688")	2	6.5	4.25
4802-000	3 1/8"	UnFlg. (Flush)	2	6.5	4.25

4642-000*	4 1/16"	Flg. (Dielectric)	2	8.13	8.88
4642-010	4 1/16"	Flg. (MYAT)	2	8.13	8.88
4844-000	4 1/16"	UnFlg. (Rec. 0.531")	2	7.5	2.88

4905-000	6 1/8"	EIA Flg.	2	10.22	17
4909-000	6 1/8"	UnFlg. (Rec. 0.968")	2	9.63	12.75

THRULINE® WATTMETER COMPONENTS METERS — Rigid Line Use

Model 3127-040

Model	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

Model 6810 Series

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

Termaline® RF Coaxial Termination

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

*** Termination Model Number Definition:** **100 – T – FN**

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

2-T SERIES (2 Watt) and 5-T SERIES (5 Watt)

Connectors	BNC, N, TNC
Frequency Range and VSWR	DC to 1 GHz at 1.10:1 max., 1 GHz to 6 GHz at 1.25:1 max. (N type), 1 GHz to 4 GHz at 1.25:1 max. (BNC and TNC)
Ambient Temp.	-40°C to +40°C
Operating Position	Any
Coolant	Dry (Convection cooled)
Finish	Silver or Tri-alloy plated
Nominal Size	(with Male N-type connector): 1.6" L x 0.8" Dia., (40.7 mm x 20.4 mm)
Weight	1.9 oz. (55 g)

Also available, 0.5 Watt, SMA Male
0.5-T-MA-A (DC to 12 GHz, 1.25:1 max.)
0.5-T-MA-B (DC to 18 GHz, 1.25:1 max.)

25-T SERIES (25 Watt)

Connectors	BNC, N, TNC, IEC 7/16"
Frequency Range and VSWR	DC to 1 GHz at 1.10:1 max., 1 GHz to 4 GHz at 1.25:1 max.
Ambient Temp.	-40°C to +40°C
Operating Position	Any
Coolant	Dry (Convection cooled)
Finish	Black anodized. Silver or Tri-alloy plated connector
Nominal Size	(with N-type connector): 4.7" L x 2.3" Dia., (119.4 mm x 58.5 mm)
Weight	10.7 oz. (305 g)

50-T Series (50 Watt)

Connectors	BNC, N, TNC, IEC 7/16"
Frequency Range and VSWR	DC to 1 GHz at 1.10:1 max., 1 GHz to 4 GHz at 1.25:1 max.
Ambient Temp.	-40°C to +40°C
Operating Position	Any
Coolant	Dry (Convection cooled)
Finish	Black anodized. Silver or Tri-alloy plated connector
Nominal Size	(with N-type connector): 4.7" L x 2.3" Dia., (119.4 mm x 58.5 mm)
Weight	1.13 lbs. (0.52 kg)

** Also available in 20-T-MN (not listed)*
*** When mounted to a suitable heatsink capable of maintaining a 100°C or lower flange temperature.*

10-T SERIES * (10 Watt) & 10-T-MN

Connectors	BNC, N, TNC
Frequency Range and VSWR	DC to 1 GHz at 1.10:1 max., **10-T:** 1 GHz to 4 GHz at 1.25:1 max. **10-T-MN:** DC-2.4 GHz ≤ 1.10: 2.4-6 GHz ≤ 1.15: 6-10 GHz ≤ 1.25
Ambient Temp.	-40°C to +40°C
Operating Position	Any
Coolant	Dry (Convection cooled)
Finish	Black anodized. Silver or Tri-alloy plated connector
Nominal Size	(with N-type connector): 2" L x 2.3" Dia., (50.8 mm x 58.5 mm)
Weight	5.1 oz. (146 g)

25-CT-FA, 25 CT-MA (25 Watt)**

Power Rating	25 W max. @ 100°C flange temperature, derated to 0 W @ 150°C
Connectors	SMA
Frequency Range and VSWR	DC to 1 GHz at 1.15:1 max., 1 GHz to 3 GHz at 1.25:1 max.
Operating Position	Any
Coolant	Dry (Conduction cooled)
Finish	Silver or Tri-alloy plated
Nominal Size (includes connector)	0.9" L x 1.0" W x 0.5" H, (22.9 mm x 25.4 mm x 12.7 mm)
Base to Connector Center Mounting Centers	0.25" (6.4 mm) 0.614" (15.6 mm)
Weight	0.4 oz. (11.4 g)

50-CT-FA, 50-CT-MA (50 WATT)**

Power Rating	50 W max. @ 100°C flange temperature, derated to 0 W @ 150°C
Connectors	SMA
Frequency Range and VSWR	DC to 3 GHz at 1.15:1 max., 3 GHz to 6 GHz at 1.25:1 max.
Operating Position	Any
Coolant	Dry (Conduction cooled)
Finish	Silver or Tri-alloy plated
Nominal Size (includes connector)	0.86" L x 0.75" W x 0.39" H, (21.9 mm x 19.2 mm x 10.0 mm)
Base to Connector Center Mounting Centers	0.162" (4.12 mm) 0.52" (13.3 mm)
Weight	1.1 oz. (31.2 g)

75-T SERIES (75 WATT)

Connectors	BNC, N, TNC, IEC 7/16
Frequency Range and VSWR	DC to 1 GHz at 1.10:1 max., 1 GHz to 4 GHz at 1.25:1 max.
Ambient Temp.	-40°C to +40°C
Operating Position	Any
Coolant	Dry (Convection cooled)
Finish	Black anodized. Silver or Tri-alloy plated connector
Nominal Size	(with N-type connector): 6.7" L x 2.3" Dia., (170.2 mm x 58.5 mm)
Weight	1.32 lbs. (0.6 kg)

100-ST SERIES (100 WATT)

Connectors	BNC, N, TNC, IEC 7/16
Frequency Range	DC to 1 GHz at 1.10:1 max., 1 GHz to 4 GHz at 1.25:1 max.
Ambient Temp.	-40°C to +40°C
Operating Position	Any
Coolant	Dry (Convection cooled)
Finish	Black anodized fins. Silver or Tri-alloy plated connector
Nominal Size	(with N-type connector): 6.95" H x 2.75" W x 2.75" D, (174 mm x 69.9 mm x 69.9 mm)
Weight	2.62 lbs. (1.20 kg)

150-T SERIES (150 WATT)*

Connectors	BNC, N, TNC, IEC 7/16
Frequency Range and VSWR	DC to 1 GHz at 1.10:1 max., 1 GHz to 2.4 GHz at 1.25:1 max.
Ambient Temp.	-40°C to +40°C
Operating Position	Vertical
Coolant	Dry (Convection cooled)
Finish	Black semigloss paint per Federal Standard 595. Silver or Tri-alloy plated connector
Nominal Size	(with N-type connector): 10.87" H x 2.6" W x 6.8" D, (276.1 mm x 66.1 mm x 172.8 mm)
Weight	6.0 lbs. (2.73 kg)

100-T SERIES (100 WATT)

Connectors	BNC, N, TNC, IEC 7/16
Frequency Range and VSWR	DC to 1 GHz at 1.10:1 max., 1 GHz to 2.4 GHz at 1.25:1 max.
Ambient Temp.	-40°C to +40°C
Operating Position	Vertical
Coolant	Dry (Convection cooled)
Finish	Black anodized fins. Silver or Tri-alloy plated connector
Nominal Size	(with N-type connector): 6.4" L x 2.6" W x 7.0" D, (162.6 mm x 66.1 mm x 172.8 mm)
Weight	3.6 lbs. (1.64 kg)

100-CT-FA, 100-CT-MA (100 WATT)**

Power Rating	100 W max. @ 100°C flange temperature derated to O W at 150°C
Connectors	SMA
Frequency Range and VSWR	DC to 2 GHz at 1.15:1 max., 2 GHz to 3 GHz at 1.25:1 max.
Operating Position	Any
Coolant	Dry (Conduction cooled)
Finish	Silver or Tri-alloy plated
Nominal Size (includes connector)	1.34" L x 1.375" W x 0.56" H, (34.1 mm x 35 mm x 14.3 mm)
Base to Connector Center Mounting Centers	0.26" (6.6 mm) 0.625" x 1.125" (15.9 mm x 28.6 mm)
Weight	1.0 oz. (28.4 g)

150-ST SERIES (150 WATT)

Connectors	BNC, N, TNC, IEC 7/16
Frequency Range and VSWR	DC to 1 GHz at 1.10:1 max., 1 GHz to 2.4 GHz at 1.25:1 max.
Ambient Temp.	-40°C to +40°C
Operating Position	Vertical
Coolant	Dry (Convection cooled)
Finish	Black anodized fins. Silver or Tri-alloy plated connector
Nominal Size	(with N-type connector): 7.54" H x 4.0" W x 4.0" H, (189 mm x 100 mm x 100 mm)
Weight	5.0 lbs. (2.30 kg)

* *WT SERIES also available*
** *When mounted to a suitable heatsink capable of maintaining a 100°C or lower flange temperature.*

Termaline® RF Coaxial Termination

150-CT SERIES (150 WATT)**

Power Rating	150 W max. @ 100°C flange temperature, derated to 0 W @ 150°C
Connectors	BNC, N, TNC, SMA
Frequency Range and VSWR	DC to 1 GHz at 1.15:1 max., 1 GHz to 2.4 GHz at 1.25:1 max.
Operating Position	Any
Coolant	Dry (Conduction cooled)
Finish	Silver or Tri-alloy plated
Nominal Size	(with N connector): 1.86" L x 1.25" W x 1.062" H, (47.3 mm x 31.8 mm x 27.0 mm)
Base to Connector Center	0.531" (13.5 mm)
Mounting Centers	0.575" x 0.825" (14.6 mm x 21.0 mm)
Weight	(with N connector): 2.2 oz. (62.5 g)

250 CT-SERIES (250 WATT)**

Power Rating	250 W max. @ 100°C flange temperature, derated to 0 W @ 150°C
Connectors	BNC, N, TNC, SMA
Frequency Range and VSWR	**SMA:** DC to 2 GHz at 1.15:1 max., 2 GHz to 3 GHz at 1.25:1 max.; **All Others:** DC to 1 GHz at 1.15:1 max., 1 GHz to 2.4 GHz at 1.25:1 max.
Operating Position	Any
Coolant	Dry (Conduction cooled)
Finish	Silver or Tri-alloy plated
Nominal Size (includes connector)	2.36" L x 2.00" W x 1.062" H, (60.0 mm x 50.8 mm x 27.0 mm)
Base to Connector Center	SMA: 0.26" (6.6 mm), N: 0.515 (13.1 mm)
Mounting Centers	0.875" x 1.625" (22.3 mm x 41.3 mm)
Weight	(with N connector) 5.2 oz. (147.6 g)

300-T SERIES (300 WATT) (WT SERIES also available)

Connectors	BNC, N, TNC, IEC 7/16
Frequency Range and VSWR	DC to 1 GHz at 1.10:1 max., 1 GHz to 2.4 GHz at 1.25:1 max.
Ambient Temp.	-40°C to +40°C
Operating Position	Vertical
Coolant	Dry (Convection cooled)
Finish	Black semigloss paint per Federal Standard 595. Silver or Tri-alloy plated connector
Nominal Size	(with N-type connector): 10.9" H x 5.4" W x 16.8" D, (276.9 mm x 137.2 mm x 172.8 mm)
Weight	11.5 lbs. (5.23 kg)

MODEL 8135 (150 WATT)

Power Rating	150 W continuous
Frequency Range and VSWR	DC to 1 GHz at 1.1 max., 1 to 2.5 GHz at 1.2 max. 2.5 to 4 GHz at 1.3 max.
Ambient Temp.	-40°C to +45°C
Connector	QC type (Female N normally supplied)
Operating Position	Horizontal only
Load Coolant	0.1 gal. (380 ml) refined mineral oil
Finish	Gray powder coat
Nominal Size (includes connector)	9 1/2" L x 6 11/32" H x 3 15/16" W, (241 mm x 161 mm x 100 mm)
Weight	6.0 lbs. (2.7 kg)

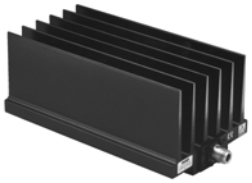
MODEL 8141 (250 WATT)

Power Rating	250 W continuous
Frequency Range and VSWR	DC to 1 GHz at 1.1 max., 1 GHz to 1.8 GHz at 1.2 max., 1.8 to 2.5 GHz at 1.3 max.
Ambient Temp.	-40°C to +45°C
Connector	QC type (Female N normally supplied)
Operating Position	Horizontal only
Load Coolant	0.35 gal. (1.3 liters) silicone oil
Finish	Gray powder coat
Nominal Size (includes connector)	9 9/16" L x 8 1/2" H x 5 15/16" W, (243 mm x 216 mm x 151 mm)
Weight	10 lbs. (4.5 kg)

MODEL 8072A-1 (300 WATT)**

Power Rating	300 W continuous @ 100°C case temperature
Connectors	N female
Frequency Range and VSWR	DC to 1 GHz at 1.10:1 max., 1 to 2.5 GHz at 1.20:1 max.
Ambient Temp.	-40°C to +45°C
Operating Position	Any
Coolant	Dry (Conduction cooled)
Finish	Silver or Tri-alloy, Silver plated or Tri-alloy connectors
Nominal Size	(with N-type connector): 4.4" L x 2" W x 1.3" H, (110 mm x 51 mm x 26 mm)
Weight	12 oz. (340 g)

*** When mounted to a suitable heatsink capable of maintaining a 100°C or lower flange temperature.*



500-WT SERIES (500 WATT)

Connectors	N, TNC, IEC 7/16
Frequency Range and VSWR	DC to 1 GHz at 1.10:1 max., 2.5 GHz at 1.25:1 max.
Operating Position	Any, except mounting surface up
Coolant	Dry (Convection cooled)
Finish	Black anodized fins, tri-alloy plated connectors
Nominal Size	(with female N-type connector; excludes removable feet): 10.59" L x 5.4" W x 4.3" H, (266.7 mm x 137.2 mm x 109.3 mm)
4 Mounting Holes, Center and Size	1.812" x 7.687", typical 10-32 thread x 0.5" D
Weight	7.8 lbs. (3.6 kg)

MODEL 8201 (500 WATT)

Power Rating	500 W continuous
Frequency Range and VSWR	DC to 1 GHz at 1.1 max., 1 GHz to 2.5 GHz at 1.25 max.
Ambient Temp.	-40°C to +45°C
Connector	QC type (Female N normally supplied)
Operating Position	Horizontal only
Load Coolant	0.9 gal. (3.42 liters) refined mineral oil
Finish	Gray powder coat
Nominal Size (includes connector)	16 13/16" L x 5 15/16" W x 8 1/2" H (427 mm x 151 mm x 216 mm)
Weight	21 lbs. (9.5 kg)

MODEL 8401 (600 WATT)

Power Rating	600 W continuous
Frequency Range and VSWR	DC to 1 GHz at 1.1 max., 1 GHz to 2.8 GHz at 1.2 max., 2.8 GHz to 3 at 1.3 max.
Ambient Temp.	-40°C to +45°C
Connector	QC type (Female N normally supplied)
Operating Position	Horizontal only
Load Coolant	0.7 gal. (2.65 liters) refined mineral oil
Finish	Gray powder coat
Nominal Size includes connector)	(16 13/16" H x 8 1/2" W x 5 15/16" D, (427 mm x 216 mm x 151 mm)
Weight	20 lbs. (9.1 kg)

*** When mounted to a suitable heatsink capable of maintaining a 100°C or lower flange temperature.*

500-CT SERIES (500 WATT)**

Power Rating	500 W max. @ 100°C flange temperature, derated to 0 W @ 150°C
Connectors	BNC, N, TNC, SMA, IEC 7/16
Frequency Range and VSWR	DC to 1 GHz at 1.10:1 max.
Operating Position	Any
Coolant	Dry (Conduction cooled)
Finish	Silver or Tri-alloy plated
Nominal Size (includes connector)	**N:** 2.36" L x 2.00" W x 1.062" H, (60.0 mm x 50.8 mm x 27.0 mm); **IEC 7/16:** 2.80" L x 2.00" W x 1.20" H, (71.2 mm x 50.8 mm x 30.5 mm)
Base to Connector Center Mounting Centers	**N:** 0.515 (13.1 mm) **IEC 7/16:** 0.675" (17.2 mm) 0.875" x 1.625" (22.3 mm x 41.3 mm)
Weight	**N:** 8.2 oz. (232.9 g), **IEC 7/16:** 6.0 oz. (170.3 g)

600-T-QFN (600 WATT)

Frequency Range and VSWR	DC to 1 GHz at 1.10:1 max., 1 GHz to 2.4 GHz at 1.25:1 max.
Ambient Temp.	-40°C to +40°C
Connector	QC type (Female N supplied)
Coolant	Dry (Convection cooled)
Finish	Black anodized fins, tri-alloy plated connector
Nominal Size	12.25" L x 9.65" W x 8.875" H
Weight	21.5 lbs.
Accessories	QC Connector (page 44)

1000-WT (1000 WATT)

Connectors	N, TNC, IEC 7/16
Frequency Range and VSWR	DC to 1 GHz at 1.10:1 max., 1 GHz to 2.4 GHz at 1.25:1 max.
Operating Position	Any, except mounting surface up
Coolant	Dry (Convection cooled)
Finish	Black anodized fins, tri-alloy plated connectors
Nominal Size	(with female N-type connector; excludes removable feet): 17.98" L x 8.95" W x 4.3" H
4 Mounting Holes, Center and Size	1.885" x 14.65", typical 1/4 - 20 thread x 0.5" D
Weight	26.5 lbs. (12.1 kg)

Termaline® RF Coaxial Termination

8251 SERIES
Model 8251, 8251N & 8251D (1 kW)

Power Rating	1000 W continuous
Frequency Range and VSWR	DC to 1 GHz at 1.1 max., 1 GHz to 2 GHz at 1.25 max., 2 GHz to 2.4 at 1.3 max. (1.065 max., 470-860 MHz for "D" Model)
Ambient Temperature Range	-40°C to +45°C
Connector	QC type (Female LC normally supplied, and Female N normally supplied unmounted)
Operating Position	Horizontal only
Load Coolant	1.1 gal. (4.1 liters) silicone oil
Finish	Gray powder coat
Nominal Size	17 29/32" L x 5 15/16" W X 8 1/2" H (includes connector) (455 mm x 151 mm x 216 mm)
Weight	25 lbs., 8 oz. (11.5 kg)

8890-300 SERIES (2.5 kW)

Models	8890-300	8892-300 & 8892D300	8895-300	8891D-300 & 8891-300
Power Rating	2500 W continuous			
Frequency Range and VSWR	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.			
Impedance	50 ohm nominal	50 ohm nominal	50 ohm nominal	50 ohm nominal
Ambient Temperature Range	-40°C to +45°C			
Connector	QC-LC (F)	1 5/8" EIA flg.	1 5/8" Unflg.	3 1/8" EIA flg.
Recess (In.)	—	0.625	0.438	0.922
Operating Position	Horizontal only			
Load Coolant	2.9 gal. (11 liters) silicone oil			
Finish	Gray powder coat			
Nominal Size	23 1/8" L x 7" W x 17 3/16" H, (587 mm x 178 mm x 437 mm)	23 1/8" L x 7" W x 17 3/16" H, (587 mm x 178 mm x 437 mm)	22 3/16" L x 7" W x 17 3/16" H, (564 mm x 178 mm x 437 mm)	25 1/8" L x 7" W x 17 3/16" H, (638 mm x 178 mm x 437 mm)
Weight	57 lbs. (26 kg)	58 lbs. (26 kg)	58 lbs. (26 kg)	59 lbs. (27 kg)

NOTE: Overload thermoswitch P/N 8890-008 is optional. Free assembly when ordered as a package.

8860 SERIES (1.5 kW)

Models	8860	8861	8862 & 8862 D	8863	8864 & 8864D
Power Rating	1500 W continuous				
Frequency Range and VSWR	DC to 1 GHz at 1.1 max., (1.065 max., 470-860 MHz for "D" Model) 1 GHz to 2 GHz at 1.25 max.				
Ambient Temperature Range	-40°C to +45°C				
Connector	QC-LC (F)	1 5/8" Unflg.	1 5/8" EIA flg.	3 1/8" Unflg.	3 1/8" EIA flg.
Operating Position	Horizontal only				
Load Coolant	1.5 gal. (5.68 liters) silicone oil				
Finish	Gray powder coat				
Nominal Size	17 1/8" L x 7 1/2" W x 13 1/8" H, (445 mm x 184 mm x 333 mm)	17 7/8" L x 7 1/2" W x 13 1/8" H, (454 mm x 184 mm x 333 mm)	17 1/8" L x 7 1/2" W x 13 1/8" H, (445 mm x 184 mm x 333 mm)	18 5/8" L x 7 1/2" W x 13 1/8" H, (473 mm x 184 mm x 333 mm)	19 1/2" L x 7 1/2" W x 13 1/8" H, (495 mm x 184 mm x 333 mm)
Weight	30 lbs. (13.6 kg)	31 lbs. (14.1 kg)	31 lbs. (14.1 kg)	32 lbs. (14.5 kg)	32 lbs. (14.5 kg)

8890-300 SERIES with BA 300-115, -230 (5 kW)

Models with BA-300-***	8890 -315 -320	8892 -315 -320	8895 -315 -320	8891 -315 -320	8897 -315 -320
Power Rating	5000 W continuous with blower on, 1250 W with blower off				
Frequency Range and VSWR	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.				
Impedance	50 ohm nominal	50 ohm nominal	50 ohm nominal	50 ohm nominal	50 ohm nominal
Ambient Temperature Range	-40°C to +45°C				
Connector	QC-LC (F)	1 5/8" EIA flg.	1 5/8" Unflg.	3 1/8" EIA flg.	3 1/8" Unflg.
Recess (In.)	—	0.625	0.438	0.922	0.0
Operating Position	Horizontal only				
Load Coolant	2.9 gal. (11 liters) silicone oil				
Finish	Gray powder coat				
Nominal Size	23 1/8" L x 7 3/8" W x 22 11/16" H, (587 mm x 187 mm x 560 mm)	23 1/8" L x 7 3/8" W x 22 11/16" H, (587 mm x 187 mm x 560 mm)	22 3/16" L x 7 3/8" W x 22 11/16" H, (564 mm x 187 mm x 560 mm)	25 1/8" L x 7 3/8" W x 22 11/16" H, (638 mm x 187 mm x 560 mm)	24 5/32" L x 7 3/8" W x 22 11/16" H, (614 mm x 187 mm x 560 mm)
Weight	70 lbs. (32 kg)	72 lbs. (33 kg)	72 lbs. (33 kg)	73 lbs. (33 kg)	73 lbs. (33 kg)

NOTE: Overload thermoswitch P/N 8890-008 is optional. Free assembly when ordered as a package. Available in special 8892-300 D model for Digital Broadcast. VSWR = 1.065 max., 470 – 860 MHz.*

Specify -115 for 115 VAC Blower or -230 for 230 VAC Blower

8921 SERIES (5 kW OIL DIELECTRIC)

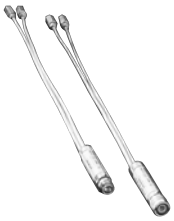
Models	8921	8922 & 8922D	8926 & 8926D	8927 & 8927D
Power Rating	5000 W continuous			
Frequency Range and VSWR	DC to 1 GHz at 1.1 max., (1.065 max., 470-860 MHz for "D" Model)			
Ambient Temperature Range	-40°C to +45°C			
Connector	QC-LC (F)	1 5/8" EIA flg.	3 1/8" EIA flg.	3 1/8" Unflg.
Operating Position	Horizontal only			
Load Coolant	6 2/3 gal. (25.3 liters) silicone oil			
Finish	Gray powder coat			
Nominal Size	30 27/32" L x 9 1/2" W x 25 13/16" H, (783 mm x 241 mm x 656 mm)	30 27/32" L x 9 1/2" W x 25 13/16" H, (783 mm x 241 mm x 656 mm)	32 3/4" L x 9 1/2" W x 25 13/16" H, (832 mm x 241 mm x 656 mm)	31 7/8" L x 9 1/2" W x 25 13/16" H, (809 mm x 241 mm x 656 mm)
Weight	119 lbs. (54 kg)	121 lbs. (55 kg)	126.5 lbs. (57 kg)	126 lbs. (57 kg)

NOTE: An 8890-008 over-temperature interlock safety switch is optional.
** Available in special 8922 D model for Digital Broadcast. VSWR = 1.065 max., 470-860 MHz*

8931-115, -230 SERIES (10 kW OIL DIELECTRIC)

Models	8931-**	8932-**	8936-**	8937-**
Power Rating	10 kW continuous with blower on, 2.5 kW with blower off			
Frequency Range and VSWR	DC to 400 MHz at 1.15 max., 400 MHz to 1 GHz at 1.20 max.			
Ambient Temperature Range	-40°C to +45°C			
Connector	QC-LC (F)	1 5/8" EIA flg.	3 1/8" EIA flg.	3 1/8" Unflg.
Operating Position	Horizontal only			
Load Coolant	6 2/3 gal. (25.3 liters) silicone oil			
Finish	Gray powder coat			
Nominal Size	30 7/32" L x 9 1/2" W x 33 5/16" H, (768 mm x 241 mm x 847 mm)	30 7/32" L x 9 1/2" W x 33 5/16" H, (768 mm x 241 mm x 847 mm)	32 1/8" L x 9 1/2" W x 33 5/16" H, (816 mm x 241 mm x 847 mm)	31 1/4" L x 9 1/2" W x 33 5/16" H, (793 mm x 241 mm x 847 mm)
Weight	135 lbs. (61 kg)	137 lbs. (62 kg)	142 lbs. (64.8 kg)	142 lbs. (64.5 kg)

NOTE: The 8892-333 blower control switch is included. The 8890-017 over-temperature interlock safety switch is optional.
*** AC power 115 or 230 VAC, 50/60 Hz (add suffix –115 or –230 to Model number)*



8710 SERIES (1 kW DIRECT WATER COOLED)

Models	8710F	8710M	8713
Power Rating	1000 W continuous		
Frequency Range and VSWR	DC to 1 GHz at 1.1 max., 1 GHz to 3 GHz at 1.3 max., 3 GHz to 3.5 GHz at 1.35 max.		
Water Temp Range	+8°C to +80°C		
Water Flow Rate	1 quart/minute @ 8°C to 3 qpm @ 80°C (.95 liters/minute @ 8°C to 2.84 lpm @ 80°C)		
Waterlines	1/8" FPT		
Connectors	N Female	N Male	7/8" EIA Fig.
Operating Position	Any		
Load Coolant	Potable water		
Finish	Silver plated		
Nominal Size	(excl. 18" waterlines) 3 21/32" L x 11/16" Dia., (93 mm x 17 mm)		
Weight	5 oz. (142 g)	5 oz. (142 g)	14 oz. (397 g)

8720, 8726 (5 kW DIRECT WATER COOLED)

Models	8720	8726
Power Rating	5 kW continuous	
Frequency Range and VSWR	DC to 500 MHz at 1.1 max., 500 MHz to 900 MHz at 1.15 max., 900 MHz to 2000 MHz at 1.25 max.	DC to 500 MHz at 1.1 max., 500 MHz to 2000 MHz at 1.25 max.
Water Temp Range	+5°C to +80°C	
Water Flow Rate	1 gal./minute @ 5°C to 4 gpm @ 80°C (3.8 liters/minute @ 5°C to 15.21 lpm @ 80°C)	
Waterlines	1/4" FPT	3/4" hose
Connectors	1 5/8" EIA Flg.	QC type (Female LC normally supplied)
Operating Position	Any	
Load Coolant	Potable water	
Finish	Bright nickel plated	
Nominal Size	(excl. 8" waterlines) 8 1/32" L x 1 5/8" Dia., (204 mm x 41 mm)	10 7/16" L x 1 5/8" Dia., (225 mm x 41 mm)
Input Flange	3 1/2" Dia.	—
Weight	2 lbs. (900 g)	2 1/2 lbs. (1.1 kg)

8730A, 8731, 8738A (10 kW Econoload®)

Models	8730A*	8731	8738A*
Power Rating	10 kW continuous		
Frequency Range and VSWR	1.1 max. DC to 1 GHz	1.1 max. 1 kHz to 1 GHz (DC for continuity checks)	1.1 max. DC to 1 GHz
Water Temp Range	+5°C to +60°C		
Water Flow Rate	4 gals./minute @ 5°C to 6 gpm @ 60°C (15.2 liters/minute @ 5°C to 22.8 lpm @ 60°C)		
Waterlines	1/2" FPT or 3/4" hose		
Connectors	1 5/8" EIA Flg.	3 1/8" EIA Flg.	3 1/8" Unflg. (Flush)
Operating Position	Any		
Load Coolant	Distilled water (<1KHz). Distilled or potable water (>1KHz).		
Finish	Black powder coat		
Nominal Size	14 3/4" L x 2 3/4" Dia., (375 mm x 70 mm)	14 3/4" L x 2 3/4" Dia., (375 mm x 70 mm)	14 3/4" L x 2 3/4" Dia., (375 mm x 70 mm)
Input Flange	3 1/2" Dia. (89 mm)	5 3/16" Dia. (132 mm)	—
Weight	7 lbs. 14 oz. (3.6 kg)	6 lbs. 10 oz. (3 kg)	6 lbs. (2.8 kg)

**Recommended for areas with water quality conditions*

Termaline® RF Coaxial Termination

8745, 8746 (20 kW Econoload®)

Models	8745	8746
Power Rating	20 kW continuous	
Frequency Range and VSWR	1.1 max. 1 kHz - 900 MHz (DC for continuity checks)	
Water Temperature Range	+5°C to +60°C	
Water Flow Rate	6 gal./minute @ 5°C to 8 gpm @ 60°C (22.8 liters/minute @ 5°C to 30.4 lpm @ 60°C)	
Waterlines	1/2" FPT or 3/4" hose	
Connectors	3 1/8" EIA Flg.	3 1/8" Unflg. (Flush)
Operating Position	Any	
Load Coolant	Potable water	
Finish	Black powder coat	
Nominal Size	19 1/2" L x 3 1/2" Dia., (495 mm x 90 mm)	
Input Flange	5 3/16" Dia. (132 mm)	
Weight	15 lbs. 13 oz. (7.2 kg)	15 lbs. 5 oz. (7 kg)

8755, 8756 (30 kW Econoload®)

Models	8755	8756
Power Rating	30 kW continuous	
Frequency Range and VSWR	1.1 max. 1 kHz - 900 MHz (DC for continuity checks)	
Water Temperature Range	+5°C to +60°C	
Water Flow Rate	7 gal./minute @ 5°C to 9 gpm @ 60°C (26.6 liters/minute @ 5°C to 34.2 lpm @ 60°C)	
Waterlines	1/2" FPT or 3/4" hose	
Connectors	3 1/8" EIA Flg.	3 1/8" Unflg. (Flush)
Operating Position	Any	
Load Coolant	Potable water	
Finish	Black powder coat	
Nominal Size	19 1/2" L x 3 1/2" Dia., (495 mm x 90 mm)	
Input Flange	5 3/16" Dia. (132 mm)	
Weight	15 lbs. 13 oz. (7.2 kg)	15 lbs. 5 oz. (7 kg)

8765 (40 kW Econoload®)

Model	8765
Power Rating	40 kW continuous
Frequency Range and VSWR	1.1 max. 1 kHz - 900 MHz (DC for continuity checks)
Water Temperature Range	+5°C to +60°C
Water Flow Rate	8 gal./minute @ 5°C to 10 gpm @ 60°C (30.4 liters/minute @ 5°C to 37.9 lpm @ 60°C)
Waterlines	1/2" FPT or 3/4" hose
Connectors	3 1/8" EIA Flg.
Operating Position	Any
Load Coolant	Potable water
Finish	Black powder coat
Nominal Size	19 1/2" L x 3 1/2" Dia., (495 mm x 90 mm)
Input Flange	5 3/16" Dia. (132 mm)
Weight	15 lbs. 13 oz. (7.2 kg)

8775, 8776 (50 kW Econoload®)

Models	8775	8776
Power Rating	50 kW continuous	
Frequency Range and VSWR	1.1 max. 1 kHz - 900 MHz (DC for continuity checks)	
Water Temperature Range	+5°C to +60°C	
Water Flow Rate	9 gal./minute @ 5°C to 11 gpm @ 60°C (34.2 liters/minute @ 5°C to 41.8 lpm @ 60°C)	
Waterlines	1/2" FPT or 3/4" hose	
Connectors	3 1/8" EIA Flg.	3 1/8" Unflg. (Flush)
Operating Position	Any	
Load Coolant	Potable water	
Finish	Black powder coat	
Nominal Size	19 1/2" L x 3 1/2" Dia., (495 mm x 90 mm)	
Input Flange	5 3/16" Dia. (132 mm)	
Weight	15 lbs. 13 oz. (7.2 kg)	15 lbs. 5 oz. (7 kg)

8792 (80 kW Econoload®)

Model	8792
Power Rating	80 kW continuous
Frequency Range and VSWR	1.15 max. 1 kHz - 800 MHz (DC for continuity checks)
Water Temperature Range	+5°C to +60°C
Water Flow Rate	9 gal./minute @ 5°C to 12 gpm @ 60°C (34.2 liters/minute @ 5°C to 45.6 lpm @ 60°C)
Waterlines	1/2" FPT or 3/4" hose
Connectors	6 1/8" EIA Flg.
Operating Position	Any
Load Coolant	Potable water
Finish	Black powder coat
Nominal Size	34" L x 5" Dia., (864 mm x 127 mm)
Input Flange	8 1/8" Dia. (206 mm) add approximately 1 1/4" (32 mm) to length for rear water fitting
Weight	30 lbs. 10 oz. (14 kg)

8631B, 8635B, 8638B (10 kW Moduload®)

Models	8631B	8635B	8638B
Power Rating	10 kW continuous		
Frequency Range and VSWR	1.1 max. 1 kHz - 1000 MHz (DC for continuity checks)		
Ambient Temperature Range	(per power level and coolant mix) ≤10 kW: (100% Water) +5°C to +45°C; ≤10 kW: (35% Ethylene Glycol/65% Water) -20°C to +35°C		
Connector	3 1/8" EIA Flg.	1 5/8" EIA Flg.	3 1/8" Unflg.
Operating Position	Horizontal only		
Load Coolant	10 pts (4.75 liters) 100% water or 65% water/35% industrial Ethylene Glycol. With forced-air cooling		
Finish	Gray powder coat		
Nominal Size	22 1/8" L x 15 15/16" W x 15 13/16" D, (562 mm x 405 mm x 402 mm)		
Weight	110 lbs. (50 kg)		
AC power	115 V models: 9 1/2 A nominal @ 115 V ± 10% 60 Hz; 230 V models: 4 3/4 A nominal @ 230 V ± 10% 50 Hz		
Optional Dolly	P/N 6771-011 (page 46)		

Power	Add Suffix to Model
115 V 60 Hz	–115
230 V 50 Hz	–230

8645B, 8646B (25 kW Moduload®)

Models	8645B	8646B
Power Rating	25 kW continuous	
Frequency Range and VSWR	1.1 max. 1 kHz - 900 MHz (DC for continuity checks)	
Ambient Temperature Range	(per power level and coolant mix) ≤25 kW: (100% Water) +5°C to +30°C; <20 kW: (100% Water) +5°C to +45°C; ≤25 kW: (35% Ethylene Glycol/65% Water) -20°C to +25°C; <20 kW: (35% Ethylene Glycol/65% Water) -20°C to +35°C	
Connector	3 1/8" EIA Flg.	3 1/8" Unflg.
Operating Position	Horizontal only	
Load Coolant	9 qts. (8.5 liters) 100% water or 65% water/35% industrial Ethylene Glycol. With forced-air cooling	
Finish	Gray powder coat	
Nominal Size	25 15/16" L x 19 5/32" W x 19 9/16" D, (659 mm x 487 mm x 497 mm)	
Weight	155 lbs. (70 kg)	
AC power	115 V models: 11 A nominal @ 115 V ± 10% 60 Hz;	
	230 V models: 5 1/2 A nominal @ 230 V ± 10% 50 Hz	
Optional Dolly	P/N 6771-011 (page 46)	

Power	Add Suffix to Model
115 V 60 Hz	–115
230 V 50 Hz	–230
230 V 60 Hz	–230–6

8655B, 8656B (50 kW Moduload®)

Models	8655B	8656B
Power Rating	50 kW continuous	
Frequency Range and VSWR	1.1 max. 1 kHz - 900 MHz (DC for continuity checks)	
Ambient Temperature Range	(per power level and coolant mix) ≥40 kW: (100% Water) +5°C to +30°C; <40 kW: (100% Water) +5°C to +45°C; ≥40 kW: (35% Ethylene Glycol/65% Water) -20°C to +25°C; <40 kW: (35% Ethylene Glycol/65% Water) -20°C to +35°C	
Connector	3 1/8" EIA Flg.	3 1/8" Unflg. (Flush)
Operating Position	Horizontal only	
Load Coolant	17 qts. (16.1 liters) 100% water or 65% water/35% industrial Ethylene Glycol. With forced-air cooling	
Finish	Gray powder coat	
Nominal Size	50 1/2" L x 19 5/32" W x 19 9/16" D, (1283 mm x 487 mm x 497 mm)	
Weight	275 lbs. (125 kg)	
AC power	115 V models: 14 A nominal @ 115 V ± 10% 60 Hz;	
	230 V models: 7 A nominal @ 230 V ± 10% 50 Hz	
Optional Dolly	P/N 6772-011 (page 46)	

Power	Add Suffix to Model
115 V 60 Hz	–115–6
230 V 50 Hz	–230–5
230 V 60 Hz	–230–6

8578A100, 8578A150 (10 kW, 15 kW, Dry, Forced Air Load)

Models	8578A100	8578A100-1	8578A150	8578A150-1
Power Rating	10 kW continuous	10 kW continuous	15 kW continuous	15 kW continuous
Frequency Range and VSWR	1.15:1, 87.5 - 108 MHz			
Ambient Temp.	-40°C to +40°C			
Connector	1 5/8" EIA Flanged (Swivel)	3 1/8" Unflg. option	1 5/8" EIA Flanged (Swivel)	3 1/8" Unflg. option
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	70 lbs. (31.8 kg)			
AC power	115/230 ± 10% VAC, 50/60 Hz 8.6 amps max. @ 115 VAC			

DIGITAL AIR® LOAD

Bird® High-Power Forced Air Loads for Broadcast Applications

- Low maintenance and high reliability.
- Handles > 10 dB Peak to Average power ratio.
  < 1.05:1 typical VSWR (1.1:1 max.) across rated frequency range.
- Ductable exhaust and cool-to-the-touch exterior surfaces.
- Flanged and unflanged EIA & IEC industry standard connectors.
- Fully shielded against the production of extraneous radiation.
- Manual/automatic fan modes, plus interlock for overload protection.

Digital Air® Load

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	100 V/115 V/230 V 50/60 Hz

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	100 V/115 V/230 V 50/60 Hz

**DA40 Peak to Average is 14 dB*

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

Other models available, please consult factory.

Oil Dielectric

SC 13 Series

Ultra-Stable, Oil-Dielectric RF Termination Loads For Semiconductor Processing Advantages

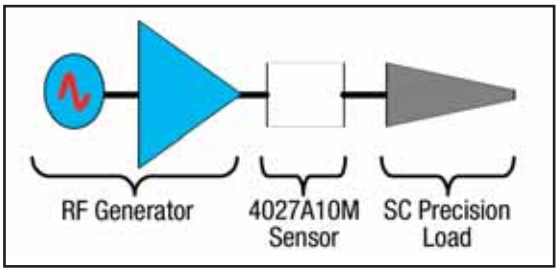
- No warm-up time
- Ultra-stable: 0.1 dB total change in VSWR from 0 to 100% rating power at 13.56 MHz
- Passive design
- Ultra-low VSWR – typically 1.05:1 at process critical frequencies
- Homogeneous RF design provides long-term repeatability

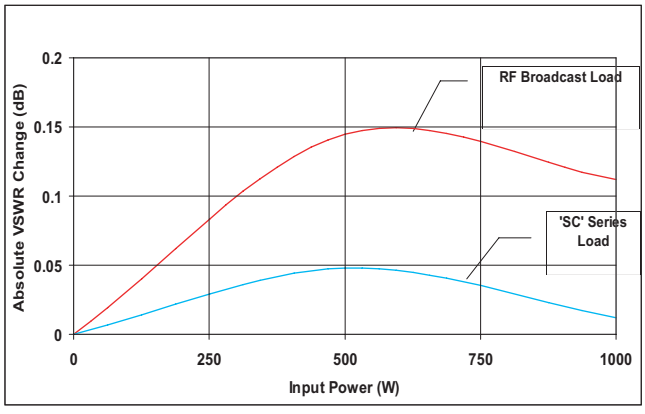
For maximum process repeatability and consistency, modern plasma applications require precise RF power regulation and control. A key component in ensuring accurate and repeatable RF power delivery to the chamber is calibration, regulation, and monitoring of the RF generator.

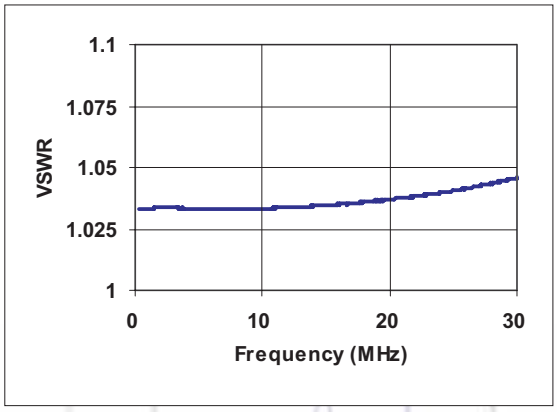
Bird® now offers ultra-stable, low VSWR loads for quick and precise measurement of generator power output when used with precision power sensors such as the Bird® 4020 & 4027A Series.

Bird® models 8865SC13, 8890-300SC13, 8921SC13 & 8931-115SC13/-230SC13 not only provide low VSWR but also less than 0.1 dB total change in VSWR at process critical frequencies. There is no need for load warm-up or risk of repeatability due to calibration for different lengths of time. This can minimize the errors associated with this calibration and control one of the more critical process variables in the etch process.

Model	Frequency Range & VSWR	Power Rating
8865SC13	DC to 28 MHz at 1.1 max. (less than 1.05 typical)	1 kW
8890-300SC13	DC to 28 MHz at 1.1 max. (less than 1.05 typical)	2.5 kW
8921SC13	DC to 28 MHz at 1.1 max. (less than 1.05 typical)	5 kW
8931-115SC13	DC to 28 MHz at 1.1 max. (less than 1.05 typical)	10 kW, 115 V
8931-230SC13	DC to 28 MHz at 1.1 max. (less than 1.05 typical)	10 kW, 230 V







Tenuline® RF Coaxial Attenuators

*** Attenuator Model Number Definition:** **100 – A – QQC – XX**

Power Rating (watts)

Product Type
A, SA, WA - Attenuator

Connector Gender
MF - Male/Female
FF - Female/Female

Connectors+
A - SMA
B - BNC
N - N
T - TNC
E - Iec 7/16

Attenuation Value in dB
01 – 1 dB
02 – 2 dB
03 – 3 dB
06 – 6 dB
10 – 10 dB
20 – 20 dB
30 – 30 dB

+ Call for other connector options.

Model 2-18A

Model 5-18A

Model 10-18A

High Frequency Components

Models	2-6A	5-6A	10-6A
Power Rating	2 Watt	5 Watt	10 Watt
Connector	N (Female) SMA (Male/Female)		
Frequency Range	DC to 6 GHz		
Operating Temperature	-65°C to +125°C		
Body	Passivated Stainless Steel		
Dimensions	1.76" L x .83 Dia.	2.25" L x .83 Dia.	2.5" L x .83 Dia.
Weight	2.5 oz.	3.0 oz.	3.5 oz.

Models	2-18A	5-18A	10-18A
Power Rating	2 Watt	5 Watt	10 Watt
	N (Female) SMA (Male/Female)		
Frequency Range	DC to 18 GHz		
Operating Temperature	-65°C to +125°C		
Body	Passivated Stainless Steel		
Dimensions	2.25" L x .83 Dia.	2.25" L x .83 Dia.	2.5" L x .83 Dia.
Weight	2.5 oz.	3.0 oz.	3.5 oz.

All Attenuators 100 W or lower (as well as 150-A & 300-A) are Bi-Directional

Models	2-A-MFA Series (2 WATT)	2-A SERIES (2 WATT)*	3-A-MFB-K1 AND 3-A MFB-XX	5-A (5 WATT)*	10-A (10 WATT)*	25-A (25 WATT)*
	SMA (Male or Female)	N, BNC (Male or Female)	BNC (Male or Female)	N, BNC, TNC (Male or Female)	SMA, N, BNC, TNC (Male or Female)	N, BNC, TNC IEC 7/16
Frequency Range and VSWR	DC to 1 GHz at 1.10:1 max., 1 GHz to 4 GHz at 1.25:1 max.					
Ambient Temp.	-40°C to +40°C					
Finish	Nickel Plated	Silver or Tri-alloy plated, except Nickel plate for BNC			Black anodized. Silver or Tri-alloy plated connectors	
Nominal Size	1.32" L x 0.42" Dia., (33.6 mm x 10.7 mm)	(with N-type connectors): 2.2" L x 0.8" Dia., (55.9 mm x 20.4 mm)	1.4" L x .50 Dia.	(with N-type connectors): 2.2" L x 0.8" Dia., (55.9 mm x 20.4 mm)	(with N-type connectors): 2.2" L x 2.3" Dia., (66.1 mm x 58.5 mm)	(with N-type connectors): 5.3" L x 2.3" Dia., (134.7 mm x 58.5 mm)
Weight	0.4 oz. (11.4 g)	3.1 oz. (88 g)	—	3.1 oz. (88 g)	4 oz. (176.7 g)	9 oz. (373.4 g)

Models	50-A (50 WATT)	75-A (75 WATT)	100-A* (100 WATT)	100-SA (100 WATT)	150-A, SA (150 WATT)	300-A, WA*** (300 WATT)	500-WA (500 WATT)**
Connectors	N, BNC, TNC, IEC 7/16						N, TNC, or IEC 7/16
Frequency Range and VSWR	DC to 1 GHz at 1.10:1 max., 1 GHz to 2.4 GHz at 1.25:1 max.						
Ambient Temperature Range	-40°C to +40°C						
Operating Position	Any	Any	Vertical	Fin Vertical	Vertical	Vertical	Any, except mounting surface up
Finish	Black anodized. Silver or Tri-alloy plated connectors						
Nominal Size (with N-type Connectors)	5.3" L x 2.3" Dia., (134.7 mm x 58.5 mm)	7.3" L x 2.3" Dia., (185.5 mm x 58.5 mm)	6.4" H x 2.6" W x 6.8" D, (162.6 mm x 66 mm x 172.8 mm)	7.30" H x 2.75" W x 2.75" D, (192.8 mm x 69.9 mm x 69.9 mm)	11.9" H x 2.6" W x 6.8" D, (302 mm x 66 mm x 173 mm)	10.9" H x 5.3" W x 6.8" D, (277 mm x 137 mm x 173 mm)	11.31" L x 5.4" W x 4.3" H (285.3 mm x 137.2 mm x 109.3 mm)
Weight	1.0 lb. (0.57 kg)	1.6 lbs. (0.73 kg)	4.3 lbs. (1.95 kg)	2.82 lbs. (1.29 kg)	6.5 lbs. (2.95 kg)	12 lbs. (5.45 kg)	7.9 lbs. (3.6 kg)

** Also available in -40 dB*
*** 4 Mounting Holes, Centers and Size: 1.812" x 7.687", typical 10-32 thread x 0.5" D*
**** WA SERIES Compact Size*

600-A-QFFN-XX (600 WATT UNI-DIRECTIONAL)
(See table p. 30)

Connectors	QC N-type Female
Frequency Range and VSWR	DC to 1 GHz at 1.10:1 max., 1 GHz to 2.4 GHz at 1.25:1 max.
Operating Position	Vertical
Coolant	Dry (Convection cooled)
Finish	Black anodized. Silver or Tri-alloy plated connectors
Nominal Size	13.15" L x 9.65" W x 8.875" H
Weight	21.5 lbs. (9.75 kg)
Accessories	Quick disconnect options (page 44)

1000-WA-QQC-XX SERIES (1000 WATT)
(See p. 30 for QQC #)

Connectors	N, TNC, or IEC 7/16
Coolant	Dry (Convection cooled)
Operating Position	Any, except mounting surface up
Frequency Range and VSWR	DC to 1 GHz at 1.10:1 max., 1 GHz to 2.4 GHz at 1.25:1 max.
Attenuator Operation	Unidirectional. Standard attenuation values 3, 6, 10, 20 and 30 dB; others available on request
Finish	Black anodized. Silver or Tri-alloy plated connectors
Nominal Size	(with female N connector; excludes removable feet), 18.65" L x 10.53" W x 4.9" H (587.6 mm x 229.4 mm x 137.2 mm)
4 Mounting Holes, Centers and Size	1.885" x 14.40", typical 1/4-20 thread x 0.5" D
Weight	Approximately 26.5 lbs. (12.1 kg)

XX VALUE

dB Atten.	Accuracy ± dB DC–1 GHz	Accuracy ± dB 1–2.4 GHz	"XX" Value
3	0.3	0.5	03
6	0.4	0.6	06
10	0.4	0.8	10
20	0.5	1.0	20
30	0.8	1.3	30

ACCURACY 1000-WA

dB Atten.	Accuracy ± dB DC–1 GHz	Accuracy ± dB 1–2.4 GHz	"XX" Value
3	0.5	+1.0 dB/-0.5 dB	03
6	0.6	+1.2 dB/-0.5 dB	06
10	0.6	+1.5 dB/-0.5 dB	10
20	0.6	+1.5 dB/-0.5 dB	20
30	1.0	+1.5 dB/-0.5 dB	30

Models	8325 (500 WATT)	8327-300 (1 kW)	8329-300 (2 kW)	8329-300 with BA-300-115 (4 kW)	8329-300 with BA-300-230 (4 kW)
Power Rating	500 W continuous	1000 W continuous	2000 W continuous	4000 W continuous with blower on, 1000 W with blower off	
Frequency Range and VSWR	Input 1.1 max. DC to 500 MHz				
Attenuation	30 dB				
Accuracy	±0.5 dB (Calibration Data supplied for 30, 100, 200, 300, 400, and 500 MHz which is accurate to ±0.2 dB)				
Ambient Temperature Range	-40°C to +45°C				
Connectors	QC type N(F)	QC type LC(F) input, N(F) output			
Coolant	0.9 gal. (3.4 liters) refined mineral oil	2.9 gal. (11 liters) refined mineral oil	2.9 gal. (11 liters) silicone oil	2.9 gal. (11 liters) silicone oil with forced-air cooling	
Operating Position	Horizontal only				
Finish	Gray powder coat				
Nominal Size	17 1/2" L x 5 15/16" W, x 8 1/2" H (445 mm x 151 mm x 216 mm)	23 15/16" L x 7 1/8" W x 17 3/16" H , (596 mm x 181 mm x 437 mm)		23 15/32" L x 7 1/8" W x 22 1/16" H , 596 mm x 181 mm x 560 mm)	
Weight	25 lbs. (11 kg)	57 lbs. (26 kg)		70 1/2 lbs. (32 kg)	
Note	—	Overload thermoswitch P/N 8329-028 is optional		Overload thermoswitch P/N 8329-028 is optional. When ordered as a package, attenuator and blower are factory assembled at no additional charge.	

50-OHM COAXIAL SELECTOR SWITCHES — 71, 72 R, 74 SERIES

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

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

MINIATURE COAXIAL COUPLER

Models	50-AC-FFA-XX	100-CC-FFN-XX
Frequency Range	0.5 GHz - 1.0 GHz	800 - 3500 MHz
Coupling Factor	10, 20, 30 dB	20, 30 dB
Directivity	25 dB, minimum	18 dB, minimum
Frequency Sensitivity	±0.75 dB, maximum	±1.0 dB, maximum
VSWR	1.15:1, maximum (primary and secondary line)	1.20:1, maximum (primary and secondary line)
Insertion Loss	0.2 dB, excluding coupled power, 0.8 dB true	0.25 dB (excluding coupled power)
Maximum Operating Temp.	+105°C (221°F)	+105°C (221°F)
Dimensions	3.6" L x 0.86" W x 0.42" H	5.2" L x 1.85" W x 0.812" H
Weight	1.3 oz (37 g)	8 oz. *Depends on external load

COMBINER / DIVIDER

Models	2-AD-FFN-X	30-AD-FFN-2	100-AD-FFN-02*	350-BD-FFN-2*
Power Rating	2 watts	30 watts into 1.15:1; 10 watts into 1.50:1; 1 watt into open *	100 watts cw *	350 watts into matched loads; 150 watts into mismatched loads *
Frequency	2.0 GHz - 2.5 GHz	800 MHz - 2.4 GHz	806 MHz - 906 MHz	460 MHz - 970 MHz
Insertion Loss	0.6 dB (above 3 dB split)	0.5 dB max (above 3 dB split)	3.25 dB max (above 3 dB split)	0.4 dB
Isolation	20 dB min. (J2 to J3)	25 dB min. (J2 to J3)	20 dB min. (J2 to J3)	20 dB min.
VSWR	1.17:1 max.	1.2:1 max.	1.2:1 max. (all ports) 1.15:1 max.	Input: (J1) 1.3:1 max.; Output: (J2, J3)
Matching	1.5 degree phase dB amplitude (typically 0.3 dB)	2 degree phase (typically 0.5) 0.5 dB amplitude	1 degree phase (typically 0.2) (0.1 dB amplitude) (typically 0.05 dB)	2 degree max.
Housing	Aluminum	Aluminum	Aluminum	Aluminum
Finish	Tri-alloy	Clear Iridite	Tri-Alloy	Tri-Alloy per Fed. Std. 26492
Nominal Size	2.75" L x 2.75" W x 1.062" H	2.20" L x 2.72" W x 1.04" H	1.15" H x 3.00" W x 3.00" D	3.27" L x 2.50" W x 0.80" H
Connectors	Female (N)	N-Type (F)	Female (N)	Female (N)

** Weatherproof*

ELEMENT SELECTION GUIDE

Wattmeter Model	Select Element from Table(s)
3128A	1, 2, 3, 3A, 4, 6, 14*
3170A	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 (page 19), 1 5/8AA (page 42)
4314B	1, 2, 3, 3A, 4, 5, 6, 14*
4391A	1, 2, 3, 3A, 4, 5, 6, 14*
4410A, 4412A	(see page 20)
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. PWR (WATTS F.S.)	MAX. PWR (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
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

	Frequency Bands (MHz)					
Power Range	**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 W	500H	500A	500B	500C	500D	500E
1000 W	1000H	1000A	1000B	1000C	1000D	1000E
2500 W	2500H	—	—	—	—	—
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 Number	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 Number	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

	Frequency Bands (MHz)								
Power Range	**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 W	100J	—	—	—	—	—	—	—	—
250 W	250J	—	—	—	—	—	—	—	—

TABLE 3A - HIGH FREQUENCY MILLIWATT ELEMENTS

	Frequency Bands (MHz)						
Power Range	**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-FREQUENCY ELEMENTS

	Frequency Band
Power Range	**.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

	Frequency Bands (MHz)					
Power Range	**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	—

Elements 500 - 1000 Watts, 950 - 1260 MHz, are rated at 100 Watts avg.
Elements 2500 Watts and higher, 25-1000 MHz, are rated at 1000 Watts avg.
Elements are capable of reading peak and average power.

TABLE 6 — MILLIWATT ELEMENTS

100 mW													
Frequency (MHz)	45-50	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	Model
25-1000	-50 dB ± 2 dB (-66 dB @ 2 MHz)	500 W	4274-025
100-400	-35 to -48 dB (±1 dB) Adjustable	500 W	4274-050

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

Frequency Band (MHz)	Nominal Coupling	Max. Main Line Power	Model
50-100	-40 dB	1 kW	400-50
75-150	-40 dB	1 kW	400-75
125-250	-40 dB	1 kW	400-125
225-450	-40 dB	1 kW	400-225
400-800	-40 dB	1 kW	400-400
750-1250	-40 dB	1 kW	400-750

TABLE 15 — DIRECTIONAL COUPLER ELEMENTS FOR 1 5/8" EIA LINES

Frequency Band (MHz)	Nominal Coupling	Max. Main Line Power	Model
50-100	-50 dB	10 kW	501-50
75-150	-50 dB	10 kW	501-75
125-250	-50 dB	10 kW	501-125
225-450	-50 dB	10 kW	501-225
400-800	-50 dB	5 kW	501-400

NOTE: For use in any line section including BPME

TABLE 16 — DIRECTIONAL COUPLER ELEMENTS FOR 3 1/8" EIA LINES

Frequency Band (MHz)	Nominal Coupling	Max. Main Line Power	Model
25-40	-55 dB	25 kW	553-25
50-100	-55 dB	25 kW	553-50
75-150	-55 dB	25 kW	553-75
125-250	-55 dB	25 kW	553-125
225-450	-55 dB	25 kW	553-225
400-800	-55 dB	15 kW	553-401
750-1250	-55 dB	10 kW	553-750

TABLE 17— DIRECTIONAL COUPLER ELEMENTS FOR 6 1/8" EIA LINES

Frequency Band (MHz)	Nominal Coupling	Max. Main Line Power	Model
50-100	-60 dB	60 kW	606-50
75-150	-60 dB	60 kW	606-75
125-250	-60 dB	60 kW	606-125
400-870	-60 dB	60 kW	606-400

ELEMENT SELECTION GUIDE

Wattmeter 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
3171A	1 5/8 AA, 3 1/8 AA, 4 1/16 AA, 6 1/8 AA
3171-020	1 5/8 BB, 3 1/8 BB, 4 1/16 BB, 6 1/8 BB
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
6810-307	1 5/8 B, 3 1/8 B, 4 1/16 B, 6 1/8 B
6810-265	1 5/8 B, 3 1/8 B, 4 1/16 B, 6 1/8 B

TABLE 1 5/8A — STANDARD ELEMENTS 100 µA

	Frequency Bands (MHz)			
Power Range	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 5/8AA — STANDARD ELEMENTS 30 µA

	Frequency Bands (MHz)			
Power Range	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 5/8B — STANDARD ELEMENTS 100 µA

	Frequency Bands (MHz)			
Power Range	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 5/8BB — STANDARD ELEMENTS 30 µA

	Frequency Bands (MHz)			
Power Range	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 5/8C — STANDARD ELEMENTS 100 µA

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

TABLE 3 1/8A — STANDARD ELEMENTS 100 µA

	Frequency Bands (MHz)			
Power Range	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 1/8AA — STANDARD ELEMENTS 30 µA

	Frequency Bands (MHz)			
Power Range	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 1/8B — STANDARD ELEMENTS 100 µA

	Frequency Bands (MHz)		
Power Range	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

TABLE 3 1/8BB — STANDARD ELEMENTS 30 µA

	Frequency Bands (MHz)		
Power Range	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 1/8C — STANDARD ELEMENTS 100 µA

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

TABLE 4 1/16A — 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 1/16AA — STANDARD ELEMENTS 30 µA

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

TABLE 4 1/16B — 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 1/16BB — 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 1/16C — 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 1/8A — 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	100KH6	100KB6	100KC6	—
250 kW	250KH6	—	—	—

TABLE 6 1/8AA — 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 1/8B — 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 1/8BB — 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 1/8C — 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

Many TERMALINE® load resistors, attenuators and absorption wattmeters, as well as THRULINE® wattmeters, employ our patented QC-type "Quick-Change" RF Connectors. These products may be ordered with the connector(s) most convenient for use with your equipment. Many customers order additional connectors to avoid using performance robbing adapters. QC Connectors are easily changed in the field by removing and replacing four screws. Because of the wide variety of connectors and possible applications, electrical specifications for QC-equipped products are quoted with the standard connectors normally supplied with the equipment.

SQC Connectors, (used with the 4110 Series, 4304 Wattmeter, 8072-1, 8431 Load Resistors, etc.) are shown below.

Description	Part Number
Female N	4100-014
Male N	4100-015
Female UHF	4100-017
Female TNC	4100-055
Female BNC	4110-014

QC Connectors

BNC (F)
4240-125

BNC (M)
4240-132

C (F)
4240-100

HN (F)
4240-268

HN (M)
4240-278

LC (F)
4240-031

LC (M)
4240-025

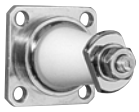
LT (F)
4240-018

LT (M)
4240-012

Mini-UHF (F)
4240-346

N (F)
4240-062

N (M)
4240-063



Open Term.
#10-32 Nut
4240-080

SC (F)
4240-090

SMA (F)
4240-336

SMA (M)
4240-334

TNC (F)
4240-156

TNC (M)
4240-160

UHF (F)
4240-050
(SO239)

UHF (M)
4240-179
(PL259)

7/8" EIA
4240-002

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

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

DIN (F)
IEC 7/16 (F) - Jack
Type 169-4
4240-344

DIN (M)
IEC 7/16 (M) - Plug
Type 169-4
4240-363

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)	•	•	•	•	•	•	•

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 ADAPTERS

Model	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

DC CABLE ASSEMBLIES

Model	Connector	Length	Use With Group*
3170-058-1	BNC (M)	14"	I
3170-058-3	BNC (M)	25'	I
3170-058-5	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

QC ADAPTERS, CONNECTORS

Model	Description
4240-165	QC (F) to QC (F)
4240-180	Copl. (M) to QC (F)
4240-187	3 1/8" Unflg. 51.5 ohm 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)
7500-076	DC conn. plug

WATTMETER BATTERIES

Model	Use With	Volts	Type	Notes
5-1230	4391A	1.25	NiCd	6 Required
5-1587	4412A	9	NiCd	—
5-1375	4314B, 4410A, 4041, 4410, APM-16	9	Alkaline	—

CASES

Model	Case Holders
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®

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

MISCELLANEOUS

Model	Use With	Description
3610-031	All Element Sockets	Dummy Plug
5-1864	4314B	Power Supply 115 V
5-1940	4314B	Power Supply 230 V
5A2229	AT Series	Power Supply 120 V
5A2226	AT Series	Power Supply 230 V

DOLLIES

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

REPLACEMENT RESISTORS

Model	For	Power
8731-031-1	8731 ECONOLOADS	10 kW
8738A072	8730A/8738A ECONOLOADS	10 kW
8755-027-2	8745/8746 ECONOLOADS	20 kW
8755-027-3	8755/8756 ECONOLOADS	30 kW
8755-027-4	8765/8766 ECONOLOADS	40 kW
8755-027-5	8775/8776 ECONOLOADS	50 kW
8792-010-2 one reqd.	8796 ECONOLOADS	60 kW
8792-010-1 one reqd.	8792 ECONOLOADS	80 kW
5A2388	8578A100 Forced-Air Load	10 kW
5A2393	8578A150 Forced-Air Load	15 kW

COUPLING KITS

Model	Line Type	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

COOLANTS

Model	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

FLANGE-TO-FLANGE ADAPTERS

Model	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
7500-076	DC Connector Plug

WATER-COOLED ACCESSORIES

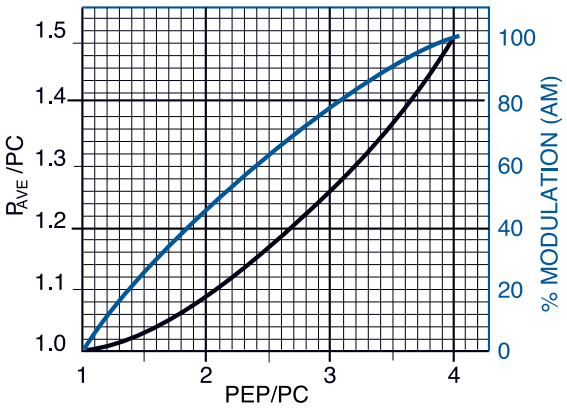
Model	Product	Power
6770-120	Wall Mounting Bracket	10 kW
6770-130	Wall Mounting Bracket	80 kW
6770-125	Wall Mounting Bracket	20 kW, 30 kW 40 kW, 50 kW
5-898-6	Water Flow Switch	10 kW
5-898-2	Water Flow Switch	20 kW
5-898-3	Water Flow Switch	30 kW
5-898-4	Water Flow Switch	40 kW
5-898-7	Water Flow Switch	50 kW, 80 kW
8750-115	Control Box Assembly	115 VAC, 50/60 Hz
8750-230	Control Box Assembly	230 VAC, 50/60 Hz

THERMOSWITCHES FOR AIR-COOLED LOADS

Model	Function	Temp. Set Point	Use With
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

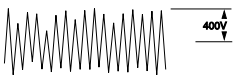
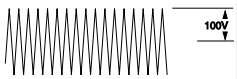
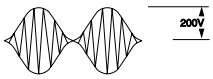
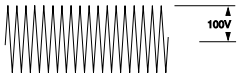
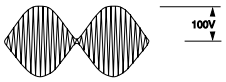
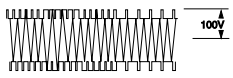
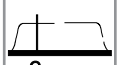
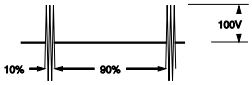
Interpreting readings on peak Wattmeters with Multicarrier, CW, AM, SSB, and pulsed signals

Figure 1



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			$\frac{400}{\sqrt{2}}$ V	1600W	400W	—	1600W	—	—	400W
Table B CW			$\frac{100}{\sqrt{2}}$ V	100W	100W	100W	100W	0%	100W	100W
Table C AM 100% Mod.			$\frac{200}{\sqrt{2}}$ V	400W	150W	100W	400W	100%	100W	150W
Table D AM 75% Mod.			$\frac{173}{\sqrt{2}}$ V	300W	127W	100W	300W	73%	100W	127W
Table E SSB 1 Tone			$\frac{100}{\sqrt{2}}$ V	100W	100W	100W	100W	0%	100W	100W
Table F SSB 2 Tones			$\frac{100}{\sqrt{2}}$ V	100W	50W	25W	100W	100%	40.5W	50W
Table G SSB Voice			$\frac{100}{\sqrt{2}}$ V	100W	—	—	100W	—	—	—
Table H TV Black Level			$\frac{100}{\sqrt{2}}$ V	100W	60.1W	Models 4314B, 4391A only			59.6W	60.1W
						—	100W	—		
Table I Pulse			$\frac{100}{\sqrt{2}}$ V	100W	10W	—	100W	100%	—	10W
Table J Pulse			$\sqrt{400Z_o}$	400W	100W	130W	400W	—	130W	100W

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

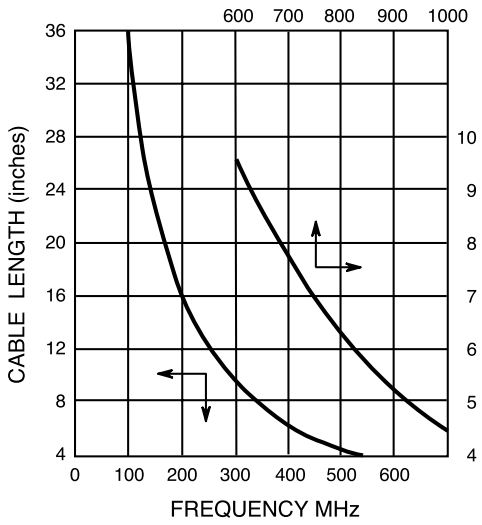
When a Model APM-16, 43, 4431, 4314B or 4391A is used to match a load to a transmitter and a good match is obtained, removing the instrument will not cause any change in the conditions, since a good 50 ohm load can be placed at the end of a 50 ohm transmission line of any length without altering conditions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

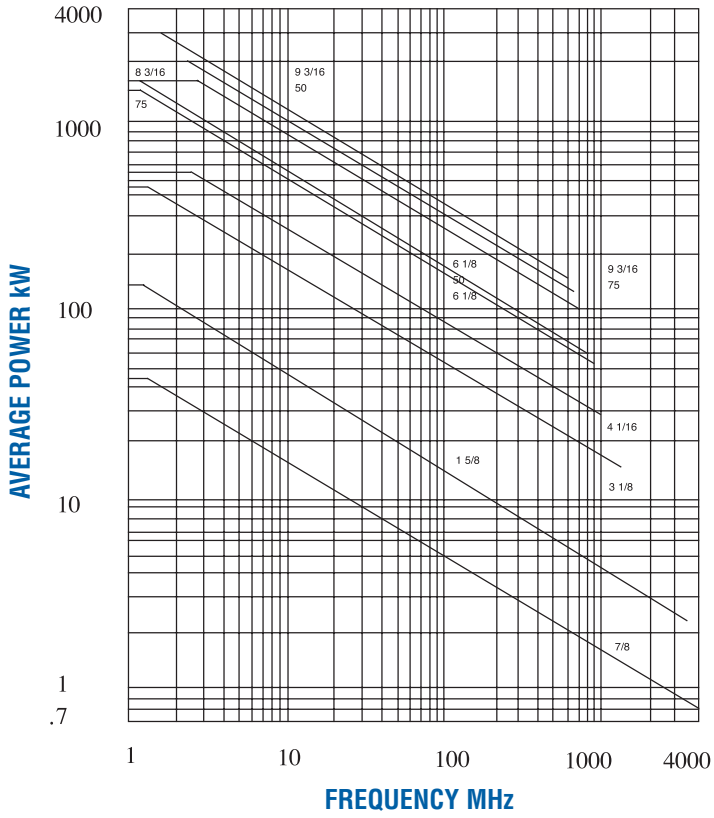


TYPICAL PEAK POWER RATINGS

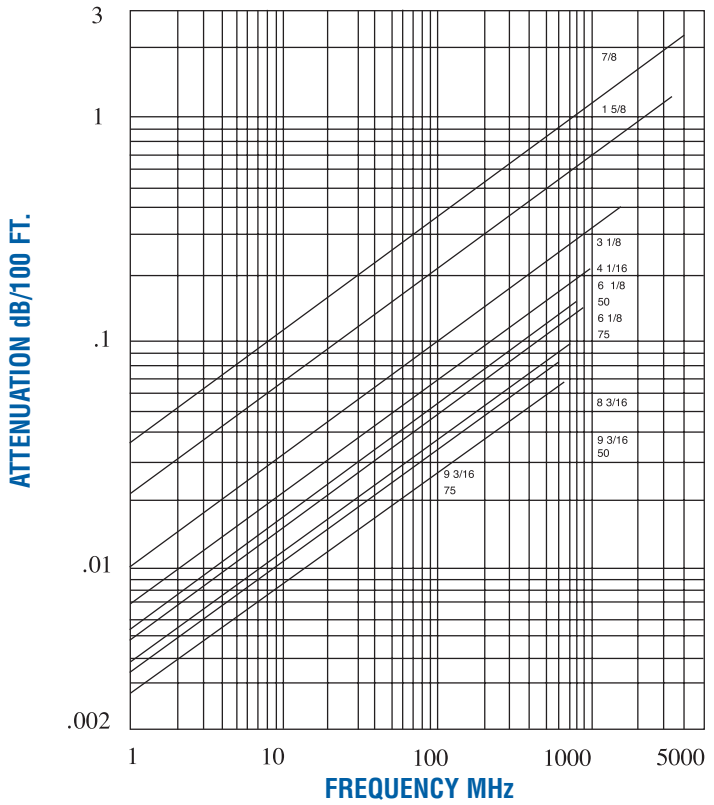
Models	Avg. Power	Pulse Width (µs) 1	10	100	1000	5000
Oil Dielectric Loads						
8135	150 W	10 kW	8.0 kW	5.75 kW	3.5 kW	2.0 kW
8201	500 W	200 kW	150 kW	105 kW	57 kW	25 kW
8251	1000 W	200 kW	150 kW	105 kW	57 kW	25 kW
8890 Series	2.5 kW	150 kW	115 kW	80 kW	54 kW	22 kW
8920 Series	5 kW	150 kW	115 kW	80 kW	54 kW	22 kW
8930 Series	10 kW	150 kW	120 kW	85 kW	55 kW	30 kW
Direct Water-Cooled Loads						
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	40 kW	250 kW	197 kW	145 kW	90 kW	55 kW
8770 Series	50 kW	250 kW	197 kW	145 kW	97 kW	65 kW
8790 Series	80 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.

Transmission Line Power Rating



Transmission Line Attenuation



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NOTES

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