Electronic Corporation

A Member of Bird Technologies Group

GENERAL CATALOG AND APPLICATIONS GUIDE

QUALITY INSTRUMENTS FOR RF POWER MEASUREMENTS

BIRD TECHNOLOGIES GROUP

Bird Technologies Group (BTG) is the parent of Bird Electronic Corporation, Bird Component Products, and TX RX Systems Inc. BTG brings the synergy of several companies with proven leadership and expertise in the fields of RF measurement, manufacturing, and communication technology.

Electronic Corporation

30303 Aurora Road
Cleveland, Ohio 44139
Phone: 440-248-1200
Fax: 440-248-5426

- RF Power Meters
- High-Power Line Sections and Components
- Antenna Testers
- High-Power Loads and Attenuators
- VSWR Alarms and Power Monitors

For use in:

- PCS, Cellular and other Wireless Services
- Conventional and Digital Broadcast
- Semiconductor Fabrication
- Traditional and Two-way Paging
- Mobile and Two-way Radio

TX RX Systems Inc.

8625 Industrial Parkway
Angola, New York 14006
Phone: 716-549-4700
Fax: 716-549-4772

- T-Pass® Transmit-Receive Multicouplers
- Signal Booster Systems
- Tower Mount Preamps
- Broadband Base Station Antennas
- Resonant Cavity Filters
- RF System Components

For use in:

- Wireless Infrastructure OEM
- System Integrators
- Wireless Carriers
- PCS
- Specialized Mobile Radio
- Two-way Radio
- Paging

Component Products

30303 Aurora Road
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- Coaxial RF Terminations
- Coaxial RF Attenuators
- Hybrid Coaxial Dividers/Combiners

For use in:

- Wireless Infrastructure OEM
- Wireless System Design
- General Purpose RF Test and Measurement

OUR MISSION...

Bird Technologies Group is committed to meeting its customers' needs for innovative RF and communication products around the globe. With representation in over 45 countries, you can count on us for quality solutions, excellent service, and long-term reliability.

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FOR YOUR CONVENIENCE

Look for these symbols which identify whether an instrument is used with 50-ohm Cable and 7/8" Rigid Line, or High-Power Rigid Line RF Systems.

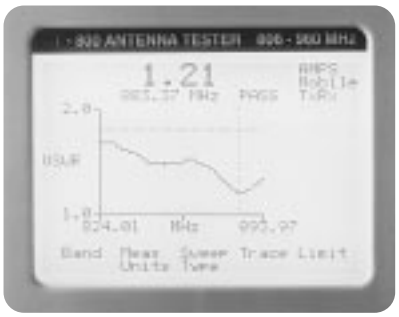
Bird Electronic Corporation maintains an aggressive program of testing products for conformity to applicable electromagnetic and safety standards, including European EEC directives. We are proud to announce that, where applicable, Bird products carry the "CE" mark. A CE-marked product complies with relevant EEC directives and is approved for sale to the European Union.

The continuing phase-in of new EEC directives may periodically affect the status of some products. However, any Bird product offered for sale to the European Union will conform to all EEC directives in effect at the time of shipment. Please consult your local Bird sales office or Bird Electronic Corporation regarding questions about CE compliance of any Bird product.

ANTENNA TESTERS
HF, VHF, and UHF

MODEL AT-800

Single frequency mode for antenna tuning.



Swept frequency mode reveals a comprehensive picture of antenna matching.

MEASURE VSWR, MATCH EFFICIENCY, RETURN LOSS, FIELD STRENGTH

Bird's AT-Series Antenna Testers bring a new dimension to the testing of HF, VHF, and UHF antenna systems. Powerful, yet remarkably easy to use, these instruments can test an entire band in a matter of seconds. And unlike conventional antenna testers, Bird's advanced design provides accurate results regardless of antenna cable length. Menu driven, software-defined keys and digital keypad permit quick selection of operating mode and direct entry of test parameters. A self-contained RF source lets you precisely set the test frequency – no external transmitter is needed. A built-in adaptable antenna jack mates a wide range of standard RF connectors. Plus, compact size and rechargeable batteries provide for truly portable operation.

- **Swept Frequency Measurements** – Fast scans show VSWR, Match Efficiency or Return Loss across the entire band. A moveable cursor can be used to pinpoint scan frequency and digitally display the corresponding measurement value.
- **Single-Frequency Mode** – Can be used to optimize antenna performance and troubleshoot intermittent problems.
- **Limit Testing** – Quick Pass-Fail indicator compares measurements to user selected limits.
- **Audible Indicator** – Pitch varies with match condition. You can keep your eyes and hands on adjustments and simply listen for the best match.
- **Field-Strength Measurements** – Verifies the output of devices such as portable radios and cellular phones.
- **Data Storage** – Saves and recalls up to 12 scans in nonvolatile memory for long-term monitoring of antenna performance or degradation.
- **Serial Communication Link** – Optional software uploads data to a personal computer for analysis or storage.
- **Back-lit Liquid Crystal Display** – More rugged than mechanical movements, more versatile than digital displays, and visible in any light. The LCD also produces high-resolution graphics.
- **Portable** – Lightweight, easy-to-carry, with rechargeable batteries.
- **Rugged** – Designed to meet the harsh environment requirements of MIL-T-28800.

Phone: 440-248-1200 • **Fax:** 440-248-5426

MODELS AT-100, AT-400, AT-800

MODEL:	AT-100	AT-400	AT-800
Frequency Range:	2 – 136 MHz	80 –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	1.00 – 99.99	1.00 – 99.99
Match Efficiency:	0.0 to 100.0%	0.0 to 100.0%	0.0 to 100.0%
Return Loss:	0.0 to –32.0 dB	0.0 to –32.0 dB	0.0 to –32.0 dB
Measurement Speed (Typical):			
Single Frequency:	5 readings/second	5 readings/second	5 readings/second
Swept Frequency:	1 sweep/second	1 sweep/second	1 sweep/second
Preprogrammed Bands:	None	None	AMPS, NADC, GSM, PDC, CT2
Field Strength:			
Range:	0 to 100% (relative)	0 to 100% (relative)	0 to 100% (relative)
Sensitivity:	Full-scale deflection at 8 v/m @ 100 MHz	Full-scale deflection at 0.22 v/m @ 400 MHz	Full-scale deflection at 3m @ 12.6 W ERP
Test Port:			
Impedance:	50-ohm nominal	50-ohm nominal	50-ohm nominal
Connector (Field-changeable):	N (F) included Others available	N (F) included Others available	TNC (F) included Others available
Interface:	Serial (female DB-9 connector)	Serial (female DB-9 connector)	Serial (female DB-9 connector)
Power Requirements:			
Batteries:	Six rechargeable AA (KR-15/51)	Six rechargeable AA (KR-15/51)	Six rechargeable AA (KR-15/51)
External DC:	11 to 16 Vdc	11 to 16 Vdc	11 to 16 Vdc
External AC Adapter:	108 to 132 Vac @ 57 to 63 Hz or 207 to 253 Vac @ 48 to 52 Hz	108 to 132 Vac @ 57 to 63 Hz or 207 to 253 Vac @ 48 to 52 Hz	108 to 132 Vac @ 57 to 63 Hz or 207 to 253 Vac @ 48 to 52 Hz
Operating Temperature:	0° to 50°C (32° to 122°F)	0° to 50°C (32° to 122°F)	0° to 50°C (32° to 122°F)
Storage Temperature:	–41° to 71°C (–40° to 160°F)	–41° to 71°C (–40° to 160°F)	–41° to 71°C (–40° to 160°F)
Size (including connector):	8" H x 4⅝" W × 1¾" D (204 mm × 118 mm × 42 mm)	8" H x 4⅝" W × 1¾" D (204 mm × 118 mm × 42 mm)	8" H x 4⅝" W × 1¾" D (204 mm × 118 mm × 42 mm)
Weight:	1¾ lbs. (0.8 kg)	1¾ lbs. (0.8 kg)	1¾ lbs. (0.8 kg)
Supplied Accessory:	Field-strength antenna	Field-strength antenna	Field-strength antenna
Recommended Accessories:	Carry case (Model 7000A850), Windows® Interface Software (Model 7000A840), Cigarette Lighter Adapter (Model 5A2238-1) Verfication Kit 7000A145	Carry case (7000A850), Windows® Interface Software (7000A840), Cigarette Lighter Adapter (Model 5A2238-1) Verification Kit 7000A145	Carry case (7000A850), Windows® Interface Software (7000A840), Cigarette Lighter Adapter (Model 5A2238-1) Verification Kit 7000A845

Windows® is a registered trademark of Microsoft Corporation.

AT series antenna testers are compact, truly portable and solidly built for go-anywhere service.

E-mail: sales@bird-electronic.com • **Internet:** www.bird-electronic.com

LABORATORY GRADE INSTRUMENTS

THRULINE® High-Accuracy RF Power Meter

Cable Products

MULTIFUNCTION POWER METER — MODEL 4421

Our Model 4421 power meter is an excellent choice for demanding calibration, process control and scientific applications. It directly measures power with an accuracy of ± 3% of reading without calibration charts, couplers, attenuators, or other external equipment which can degrade accuracy.

The backlit 3½-digit LCD displays forward and reflected power in either watts or dBm, VSWR, return loss in dBm and Minimum or Maximum values. Ranging is selectable manual or autoranging. An optional GPIB or RS-232 computer interface can be used with the Model 4421 during AC operation.

Smart Power Sensors (see below) are required for operation. Each covers an extended frequency and power range. The microprocessor based sensors contain nonvolatile memory to store calibration data, and can easily be recalibrated in the field.

Power Range: 100 mW to 10 kW FS
Frequency Range: 100 kHz to 2.5 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
Ranging: Selectable manual or autoranging. Power sensor dependent.
Overrange Indication: Audible warning when RF power input exceeds 120% of sensor's maximum power range.
Display: 3½ digit-liquid crystal display with annunciator for mode, measurement units, battery condition, programming status, and trend arrows. Switchable backlight.
Operating Power: AC mains or batteries. 115/230 Vac, 50/60 Hz or 8 nickel cadmium 1.2 V C cells (NEDA type 10014).
Nominal Size: 12 9/32" L × 12 5/32" W × 4¼" H (312 mm x 309 mm × 108 mm) with handle extended 15 7/16"L (392 mm)
Weight: 11 lbs. (5 kg.)
Interconnects: 1 meter latch-n-lok coiled cable.
Interfaces: Optional field-installable IEEE-488 (PN: 4421-488) or RS-232 serial interface (PN: 4421-232). Dimensions: 4½" × 6½" (114 × 165 mm)
Required Product: Order a Smart RF Power Sensor below
Recommended Accessories: Case (page 7)

SMART POWER SENSORS — 4020 SERIES

MODEL	POWER INPUT	FREQUENCY RANGE	VSWR RANGE	MINIMUM DIRECTIVITY	INSERTION LOSS (DB)
4021	300 mW – 1000 W (1200 W max.)	1.8 MHz – 32 MHz	1.0 – 2.0	28	<0.05
4022	300 mW – 1000 W (1200 W max.)	25 MHz – 1000 MHz	1.0 – 2.0	28	25 – 512 MHz: <0.05 512 – 1000 MHz: <0.13
4023	100mW – 200W (240 W max.)	900 MHz – 2500 MHz	1.0 – 3.0	20	<0.2
4024	3 W – 10 kW (12 kW max.)	1.5 MHz – 32 MHz	1.0 – 2.0	28	<0.05
4025	3 W – 10 kW (12 kW max.)	100 kHz – 2500 kHz	1.0 – 2.0	28	<0.05

Circuitry: Microprocessor-based measurement and conversion.
Frequency/Power Coverage: Single power sensor covers specified power and frequency range.
Bi-directional Operation: Pick up of RF power in precision 50-ohm line.
Accuracy: ±3% of reading from rated maximum range down to 30% of full scale on the most sensitive range.
Signal Purity: For rated accuracy, no more than 1% AM; harmonics –50 dB or less.
Calibration Technique: Calibration vs frequency curve stored in nonvolatile memory within each sensor. Sensor output corrected at frequency of measurement within rated stage.
Sampling Rate: Approximately 2 readings/second.
Ambient Temperature Range: Temperature compensated for rated accuracy from 0˚C to 50˚C (32˚F to 122˚F).
Connectors: QC-type. Female N normally supplied; Other coaxial-type connectors available on page 60.
Nominal Size: (includes connectors) 5 7/32" L × 2½" W × 3¼" H (132.5 mm × 64 mm × 83 mm).
Weight: 1 lb. 11 oz. (0.76 kg).

Phone: 440-248-1200 • **Fax:** 440-248-5426

CALIBRATION KIT — MODEL 4421A500

The 4421A500 calibration kit lets you calibrate and maintain calibration histories of 4020 Series power sensors used with your 4421 power meter. The kit consists of a calibration card (must be installed in your 4421 power meter), calibration key, sensor cable, software for your PC and instruction book. Use the kit with an RF power source, RF low-pass filter, RF terminating power standard like the Bird Model 6091 calorimeter and IBM compatible computer fitted with a GPIB card.

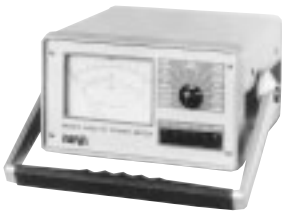
Calibration Software: 3½" and 5¼" diskettes supplied
Plug-in Card Module:
Logic Level: Meets all IEEE standard 488-1978 specs
Operating Modes: (Switch & Bus Selectable)
Talk Only: Keyboard can command meter to output a measurement to the bus
Addressable: IEEE-488 bus controller command can give power meter a talker of listener address
Connector: Standard IEEE-488 bus type
Temperature Range:
Operational: 0° to 50° C (32° to 122° F)
Storage: –20° to +70° C (–4° to 158° F)
Dimensions: 6½"L × 4½"W × 1"H (165 mm × 114 mm × 25 mm)
Weight: ½ lb. (227 g.)

Power Requirements: AC operation of 4421 meter
Calibration Key:
Dimensions: 3"L × 2"W × 1⅝"H (76 mm × 51 mm × 41 mm)
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.

CARRY CASE FOR 4421 — MODEL 4300A215

Protect and easily transport your 4421 power meter and power sensors with this sturdy carrying case. The Model 4300A215 case cradles your wattmeter and up to 4 power sensors in shock-absorbing laminated die-cut foam inserts. Another insert holds power cables and miscellaneous accessories. The case features an internal divider panel, strong rigid aluminum frame and durable charcoal color polyurethane shell. A comfortable fold down handle makes it easy to tote your equipment and quick-release latches keep everything secure.

MULTIFUNCTION POWER METER — MODEL 4420



The Model 4420 analog display power meter offers most of the capabilities of the Model 4421 on the facing page and uses the same power sensors. The major differences are the Model 4420 has only manual ranging, operates only with AC power and cannot be used with the Model 4421A500 calibration kit.

Page 24 contains instrument cases for other Bird wattmeters.

LABORATORY GRADE INSTRUMENTS

High-Accuracy Broadband RF Power Calorimeters

Cable Products

Our microprocessor controlled 6091 and 6085 Absolute Flow RF Calorimeters are calibrated to a precision standard with the calibration profile in nonvolatile memory. Measurements are automatically corrected prior to display and there's no need for calibration curves. A built-in interface lets you connect either calorimeter to any supported GPIB controller for remote or automated testing. Both units support IEEE-488.

SELF-CONTAINED CALORIMETER — MODELS 6091, 6091P

The self-contained Model 6091 measures 10 to 200 watts at DC to 2.5 GHz with ±1.25% of reading accuracy, and reaches 97% of the final reading in under 1 minute. Measurements are made by connecting the power source to the Model 6091. Sensor circuitry and load are inside the calorimeter for convenient, self-contained operation. The power reading is presented on a 4-digit LED display. The Model 6091P is a panel-mount version.

Models: 6091 and 6091P (panel mount)
Power Range: 10 W – 200 W (average power independent of wave shape).
Frequency Range: Broadband; low-reflection load remains precisely matched from DC to 2.5 GHz.
Input VSWR: DC to 1 GHz: 1.10 max. (26.4 dB min. return loss). 1 to 2.5 GHz: 1.25 max. (19.18 dB min. return loss).
Accuracy: 10 W – 25 W: ±3% of reading. 25 W to 200 W: ±1.25% of reading.
Display/Functions: Large 4 digit, 7-segment LED displays RF power directly in W. The rise in coolant temperature (ΔT) is displayed in ˚C. Coolant flow rate is displayed in liters/minute.
Calibration: Precalibrated to precision power standard at factory, with data stored in nonvolatile memory.
Response Time: 1 minute max. to reach 97% of final reading.
Sampling Rate: 1 reading/second.
Remote Operation: General Purpose Interface Bus cable supplied, for connecting the 6091 to a GPIB controller. All front panel features are available through the bus.
GPIB Functions Supported: SH1, AH1, T6, L4, SR1, RL1, PP0, DC1, DT1, C0, E1, TE0, and LE0. (IEEE 488 1978)
EMI: EMI compliance per FCC part 15J, Class A.
Coolant: 10 oz. (525 ml.) water-based coolant (65% H_20 + 35% ethylene glycol).
Load: Specially designed 50-ohm precision load resistor assembly.
Input Connector: Female Type N.
Nominal Input Impedance: 50 ohms.
Power: 104 to 132 Vac / 195 to 264 Vac, 47–63 Hz (single phase).
Power Consumption: 45–70 W
Temperature Range: Storage: 50˚ to 122˚F (10˚ to 50˚C)
Operating: 59˚ to 95˚F (15˚ to 35˚C).
Nominal Size: (includes connector end drain) Model 6091: 16½" L × 20 15/32" W × 8 17/16" H (419 mm × 520 mm × 210 mm) Model 6091P: 16½" L × 20 15/32" W × 8 17/16" H (419 mm × 483 mm × 177 mm)
Weight: Model 6091: 40 lbs. (18.1 kg.) Model 6091P: 25 lbs. (11.3 kg.)
Accessories: 6½ ft. (2 meter) GPIB cable, AC power cord.

HIGH-POWER CALORIMETER — MODEL 6085

The Model 6085 consists of a digital RF power meter and an RF power sensor that must be used with an ECONOLOAD® or other external water-cooled load. The load connects to a sensor box which is digitally linked to the meter. It provides ±3% of reading accuracy and fast stabilization. RS-232 (Model 6085A232) and IEEE-488 (Model 6085A488) Interface Cards are available.

Power/Frequency Range: Function of RF load, flow rate, temperature and coolant
Accuracy: ±3% of reading
Circuitry: Microprocessor based operation with digital display
Display/Functions: 3½-digit LCD displays power in W or dBm, (ΔT) in ˚C, flow in liters/minute, min., max., back light
Over-Range Protection: N/O and N/C interlock on sensor
Ambient Temperature Range: 5˚C to 35˚C
Cable Length: 5 m standard
Water Flow: 4 to 72 liters/min. (actual range determined by RF load)
Stabilization Time: 5 minutes typical
Coolant: Water/glycol
AC Power: 115/230 Vac, 50/60 Hz
Nominal Size: Meter: 12 9/32" L × 12 5/32" W × 4¼" H (312 mm × 309 mm × 108 mm); Power Sensor: 9 27/32" L × 10 3/32" W × 5 3/64" H (250 mm × 256 mm × 128 mm)
Weight: RF Power Meter: 9 lbs. (4 kg); RF Power Sensor: 7 lbs. (3.2 kg)
Required Product: ECONOLOAD® Load Resistor on pages 50–51, or other water cooled external load

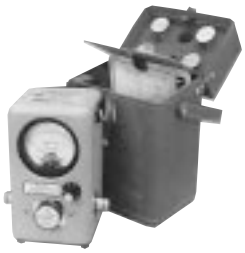
Phone: 440-248-1200 • Fax: 440-248-5426

Cable Products

RF POWER METER SELECTION GUIDE

Power Meters For Use With 50-Ohm Cable

PRECISION INSTRUMENTS
Pages 6–8



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We've organized the power meters in this catalog into three major groups: wattmeters for use with 50-ohm cable and ⅞" line (pages 6-21), wattmeters for 1⅝"– 6⅛" rigid transmission lines (pages 29–33) and absorption wattmeters (pages 39–41).

The tables below should help you identify the Bird 50-ohm cable power meter that's best for your application. Then turn to the referenced page for full product descriptions and specifications. You can also contact Bird or any authorized distributor for further assistance.

Broadcast professionals and those needing power meters for rigid transmission lines should see the selection guide on page 29. The absorption wattmeter selection guide is located on page 39.

50-OHM CABLE WATTMETERS – Portable — For Service and Field Use

MODEL (SEE NOTE 1)	SPECIAL FEATURES	POWER (WATTS)	FREQ. (MHz)	ACCURACY	DISPLAY TYPE	SEE PAGE
43*	General purpose portable for 50-ohm AM, FM, CW, SSB.	0.1–10,000	0.45–2700	± 5% FS	Analog	12
4308*	Model 43-style for analog cellular systems.	1.5–50	440–960	± 5% FS	Analog	15
4304A*	Broadband operation. 5 ranges with single element.	5–500	25–1000	± 7% FS	Analog	15
4431*	Similar to Model 43, but with adjustable output RF tap.	0.1–5000	2–1000	± 5% FS	Analog	14
4314B*	PEP & peak-reading for navcom, radar, TV, telemetry, pulsed RF.	0.1–10,000	0.45–2700	± 5% FS	Analog	13
4410-Series*	High sensitivity, dynamic range and accuracy. Multirange elements.	0.002–10,000	0.2–2300	± 5% of rdg	Analog	16
APM-16*	Average-reading meter for analog and digital services.	1–1000	2–2300	4% rdg + 1% FS	Analog	11
4305A*	High-power version of Model 43 .	50–25,000	0.45–2300	± 5% FS	Analog	14
4391A**	High-speed CW, PEP and Peak pulse for pulsed RF, radar, TV, telemetry.	0.1–10,000	0.45–2700	± 5% FS	Digital	21

Note 1: * = Portable THRULINE® style instrument with internal line section and QC connectors.
** = POWER ANALYST® style instrument with digital display and pushbutton controls.

PANEL-MOUNT – For Control Racks and Permanent Installations

MODEL	SPECIAL FEATURES	POWER (WATTS)	FREQ. (MHz)	ACCURACY	DISPLAY TYPE	SEE PAGE
4527	Dual elements, dual meters and fixed RF tap. For 2-way mobile radio.	0.1–1,000	2–512	± 5% FS	Analog	17
4521	Single meter with single rotatable element (rack-mount Model 43).	0.1–10,000	0.45–2700	± 5% FS	Analog	17
4522	Dual elements with single, switchable meter.	0.1–10,000	0.45–2700	± 5% FS	Analog	17
4526	Dual elements and dual meters for simultaneous fwd and refl readings.	0.1–10,000	0.45–2700	± 5% FS	Analog	17
3128A	Forward and reflected power monitor/alarm; 43-type elements.	0.1–10,000	0.45–2700	± 5% FS	Analog	19
3170A	High-speed, forward and reflected power monitor/alarm; 43-type elements.	0.1–10,000	0.45–2700	± 5% FS	Analog	20
4201-Series	12 or 24 channel, dual meters	0.1–10,000	0.45–2700	± 5% FS	Analog	18

PRECISION INSTRUMENTS – For Laboratories, Research, and Other High-Accuracy Applications

MODEL	SPECIAL FEATURES	POWER (WATTS)	FREQ. (MHz)	ACCURACY	DISPLAY TYPE	SEE PAGE
4420	Direct reading of power, VSWR, return loss. Uses external sensor.	0.1–10,000	0.1–2500	± 3% of rdg.	Analog	7
4421	Direct reading of power, VSWR, return loss. Uses external sensor.	0.1–10,000	0.1–2500	± 3% of rdg.	Digital	6
6085	Calorimeter with separate power sensor. Use with external load.	See Note 2	See Note 2	± 3% of rdg.	Digital	8
6091	Calorimeter. Broadband, high accuracy, self contained.	10–200	DC–2500	± 1.25% of rdg.	Digital	8

Note 2: Model 6085 is used with a separate ECONOLOAD®. Load determines power and frequency range. Typical capability > 10kW.

THRULINE® WATTMETERS DELIVER RF POWER MEASUREMENTS YOU CAN TRUST

Cable Products

The development of the first Bird Model 43 THRULINE® Wattmeter in 1952 heralded a major breakthrough in the search for a solution to quickly and easily measure radio-frequency power. It is difficult today to realize that for most of the first half century of radio communications, the most basic parameters of broadcasting could be measured only by tedious and painstaking procedures. While transmit power could be derived via RF voltage measurements or calorimetry, neither procedure could measure reflected power in real-world antenna systems. Slotted-line devices could be used to derive VSWR, but their operation was exacting, time consuming, and often imprecise.

VINTAGE 43 WATTMETER
This well used Model 43 from Bird's first production run still delivers accurate measurements today. It was donated to Bird in 1996 by Justin Dennis.

The Model 43 revolutionized power measurement by providing a means to measure FORWARD and REFLECTED power flow in a coaxial transmission line that was both elegant in concept and simple in application.

- Just connect the THRULINE® Wattmeter into the coaxial line, using readily interchangeable RF connectors.
- Insert a precalibrated element into the THRULINE® sample port to define the power and frequency range.
- Rotate the element to the stop to select the direction of power flow to be measured.
- Energize the line and take a reading.

A difficult task became exceptionally simple.

Accurate, dependable and ruggedly built to last. The Model 43 quickly became the preferred method for measuring RF power in coaxial transmission lines and made ±5% of full scale the new standard of accuracy. And the Model 43's rugged construction spawned a legendary reputation for performing under the toughest conditions. While we strongly discourage abuse of this precision instrument, stories abound of Model 43's that survived drops from towers, immersion in floods, falls from moving vehicles and, in at least one instance, the weight of a bulldozer. Our 1995-1996 search for vintage units yielded numerous Model 43's from Bird's initial 1952 product run that were still in regular use. Justin Dennis, the owner of the oldest instrument we located, captured the essence of the Model 43 when he told us "If it says 80 watts, it's 80 watts."

Power meters for every application. Today, Bird offers a wide selection of general and special purpose RF power meters. The single element Model 4304A and Model 4308 offer a wide-frequency range, multiple power ranges and ±6 to 7 percent of full- scale accuracy. The industry standard Model 43, with its several variations, still provides the pace setting ±5% of full-scale accuracy. For even more precision, choose from the 4410 Series with their multirange elements and ±5% of reading accuracy. The highest accuracy available today in THRULINE® technology is the digital display 4421 Laboratory Grade Wattmeter, which offers ±3% of reading accuracy, automatically computes VSWR, displays power in either watts or dBm and retains minimum and maximum readings in memory.

Other THRULINE® Power Meters and test sets are available to measure peak envelope power, pulsed RF, avionic and television power levels. Bird also offers a full range of fixed communications site monitoring instruments, from wattmeters for use with up to 6⅛" broadcast lines to our multifunction WATTCHER® RF Monitors.

State-of-art power meters for PCS and more. Our newest wattmeter, the Advanced Power Measurement Model APM-16, is specially designed for use on today's digitally modulated RF communication systems. The APM-16 combines proven THRULINE® technology with state-of-art circuitry to take average power readings of CDMA, FDMA, GSM, TDMA, and other digital technologies used in today's cellular, PCS, and similar systems.

APM-16
The new Model APM-16 accurately measures complex digital as well as analog signals.

Whether your next purchase is the new Model APM-16, a WATTCHER® RF Monitor or any Bird product, you can be confident it will perform exactly as you'd expect. Every unit we build today contains the same care and pride that went into our 1952 vintage Model 43s that still give their owners dependable power measurements over 40 years later.

FINDING THE RIGHT POWER METER

We've included selection guides in this catalog to help you quickly zero-in on the right wattmeter for your application. Bird's expert staff is ready to assist you.

Phone: 440-248-1200 • Fax: 440-248-5426

THRULINE® RF DIRECTIONAL WATTMETERS

Advanced Power Measurement For Digital RF Signals

AVERAGE-READING POWER METER — MODEL APM-16

Bird developed the APM-16 for engineers and technicians who work with today's increasingly common digital RF technology systems. The complex waveforms of many PCS, cellular, and other digitally-encoded services can depart significantly from AM, FM, and CW, making power measurement difficult and uncertain. The APM-16 meets the challenge by delivering precise average power readings for virtually any digital or analog system.

New APM series plug-in elements cover 2 through 2300 MHz and 1 through 1000 watts. Read forward or reflected power instantly by simply rotating the element. The shock-mounted meter features a linear scale with mirror band to improve reading accuracy. Interchangeable QC connectors add to the APM-16's versatility.

The APM-16's high-accuracy, broad power/frequency handling, interchangeable connectors, and capability to measure digital and analog signals give you an instrument that will handle almost any RF power measurement application.

- Accurately measures complex digital and analog RF signals.
- Ideal for multicarrier transmission systems.
- Easy-to-use. Operates just like any THRULINE® wattmeter.
- Versatile plug-in elements cover all your present and future needs.
- Ruggedly constructed and truly portable for demanding field use.

Power Range: 1 W to 1000 W
Frequency Range: 2 MHz to 2.3 GHz
Accuracy:
10° to 35° C ±4% reading, ±1% full scale
–20° 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
Settling 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° to 50° C operating; –25° to 65° C storage
Humidity: 95% ±5% max. (noncondensing)
EMC: Complies with 92/31/EEC. Emissions, EN55011; Immunity: EN-50082-2 at 10 V/M.
Safety: Complies with EN61010-1
Battery: Internal 9 volt "transistor" (NEDA No. 1604A) (100 hour life min.)
Connectors: QC Type (Female N normally supplied)
Finish: Beige powder coat
Nominal Size: 6⅞" L × 5⅛" W × 3⅝" D, (175 mm × 130 mm × 92 mm)
Weight: 3 lbs. (1.4 kg)
Elements: Special APM Series
Recommended Accessories: Case (page 24), spare battery (page 61), extra QC connectors (page 60)

APM ELEMENTS FOR APM-16

POWER RANGE	FREQUENCY BANDS (MHz) 2-30	25-60	50-125	100-250	200-500	400-1000	950-1260	1100-1800	1700-2200	2200-2300
1W	—	APM-1A	APM-1B	APM-1C	APM-1D	APM-1E	APM-1J	APM-1K	APM-1L	APM-1M
2.5W	—	APM-2.5A	APM-2.5B	APM-2.5C	APM-2.5D	APM-2.5E	APM-2.5J	APM-2.5K	APM-2.5L	APM-2.5M
5 W	APM-5H	APM-5A	APM-5B	APM-5C	APM-5D	APM-5E	APM-5J	APM-5K	APM-5L	APM-5M
10 W	APM-10H	APM-10A	APM-10B	APM-10C	APM-10D	APM-10E	APM-10J	APM-10K	APM-10L	APM-10M
25 W	APM-25H	APM-25A	APM-25B	APM-25C	APM-25D	APM-25E	APM-25J	APM-25K	APM-25L	APM-25M
50 W	APM-50H	APM-50A	APM-50B	APM-50C	APM-50D	APM-50E	APM-50J	APM-50K	APM-50L	—
100 W	APM-100H	APM-100A	APM-100B	APM-100C	APM-100D	APM-100E	APM-100J	—	—	—
250 W	APM-250H	APM-250A	APM-250B	APM-250C	APM-250D	APM-250E	APM-250J	—	—	—
500 W	APM-500H	APM-500A	APM-500B	APM-500C	APM-500D	APM-500E	—	—	—	—
1000 W	APM-1000H	APM-1000A	APM-1000B	APM-1000C	APM-1000D	APM-1000E	—	—	—	—

Protect your wattmeter and organize accessories with a sturdy case. See page 24.

E-mail: sales@bird-electronic.com • **Internet:** www.bird-electronic.com

THRULINE®
RF DIRECTIONAL WATTMETERS
Model 43, Accessory Guide

Cable Products

THE INDUSTRY STANDARD — MODEL 43

Over 250,000 Model 43 wattmeters have been produced!

The Model 43 THRULINE® Directional Wattmeter accurately measures forward or reflected power in coaxial transmission lines under any load condition. Each Model 43 consists of a line section, "QC" (Quick Change) connectors and an indication meter housed in a rugged, corrosion-resistant aluminum case.

The line section is a high-precision 50-ohm coaxial air line that inserts between the transmitter and the antenna or load. A socket is provided in each line section for a plug-in element with the desired power rating and frequency range. Line section ends are equipped with "QC"-type connectors.

The Model 43 is supplied with two female "N"-type "QC" connectors. These connectors can be interchanged in the field without affecting instrument calibration.

The instrument's indicating meter is a shock-mounted 30-microampere meter with scales of 25, 50, and 100; permitting full-scale direct-power reading from 100 milliwatts to 10,000 watts.

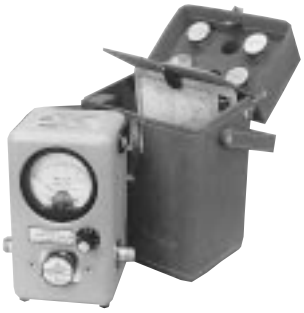
Plug-in elements determine the power rating and the frequency range, and these values are marked on each element. The elements rotate to read both forward and reflected power. There is no need for calibration charts or instrument adjustments. Elements can be purchased at any time and replaced in the field. For added convenience, Model 43 connectors and elements are interchangeable with many other Bird wattmeters.

Remote installation can easily be achieved by removing the Model 43's RF line section and inserting it at any desired point in the line. For best visibility, the meter itself can be relocated using the 32-inch meter cable supplied in the instrument housing. Additional meter cable lengths can be ordered separately.

Power Range: 100 mW to 10 kW using Bird Plug-in Elements.*
Frequency Range: 450 kHz to 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) 6⅞" H × 5⅛" W × 3⅝" D, (175 mm × 130 mm × 92 mm)
Weight: 3 lbs. (1.4 kg)
Optional Case: See page 24
Elements: Tables 1, 2, 3, 3A, 4, 6 on pages 25 – 26

*Quoted accuracy only when used with other Bird products.

ACCESSORIES, OPTIONS AND PARTS



Protect your wattmeter with a sturdy case. Shown is a CC-1 carrying case with elements and Model 4410 Series Wattmeter.

Use the table below to quickly find products to enhance the versatility of your THRULINE® Wattmeter.

Phone: 440-248-1200 • **Fax:** 440-248-5426

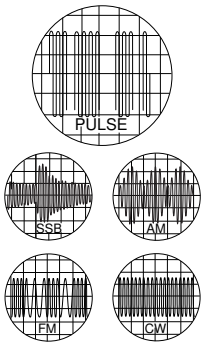
PEP WATTMETER — MODEL 4314B

Portable peak-reading instrument designed specifically for measurement of air navigational aids and other pulsed RF systems — such as telemetry, radar, television, and command and control — as well as peak envelope power (PEP) measurement of SSB and AM signals. Measures practically any type of 50-ohm coaxial transmission: pulsed, AM, FM, CW.

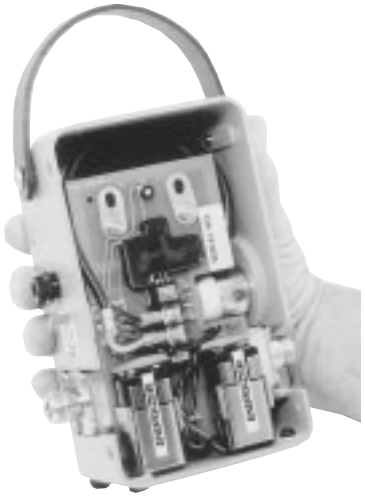
An improved power system using two internal, 9-Volt alkaline, transistor batteries enhances portability. An AC power adapter is also supplied.

Power Range: 100 mW to 10 kW using Bird Plug-in Elements*
Frequency Range: 450 kHz to 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 1×10^{-4} min.
Battery: Two 9-Volt alkaline transistor batteries
Battery Life: 20 hours of operation, typical
AC Power: (using Bird adapter) 120 Vac, 60 Hz or 220 Vac, 60 Hz

Connectors: QC Type (Female N normally supplied)
Finish: Light Gray powder coat
Nominal Size: (includes connectors) 6⅞" H × 5⅛" W × 3⅝" D, (175 mm × 130 mm × 92 mm)
Weight: 3 lbs. (1.4 kg)
Elements: Tables 1, 2, 3, 3A, 4, 5, 6 on pages 25 – 26
Recommended Accessories: Case (page 24), spare batteries (page 61), extra QC-connectors (page 60).



PEAK POWER RETROFIT KIT — MODEL 4300-400



In 15 minutes, with no soldering, adapt your Model 43 wattmeter to read true peak power output at ±8% of full-scale accuracy. The following specifications are as installed in a Bird Model 43.

Power Range: 100 mW to 10 kW using Bird Plug-in Elements.*
Frequency Range: 450 kHz to 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

* Quoted accuracy only when used with other Bird products.

Accurately measure power in digital RF technology systems with our new APM-16 Advanced Power Measurement Wattmeter. See page 11.

THRULINE®
RF DIRECTIONAL WATTMETERS
High-Power, RF Tap

Cable Products

HIGH-POWER WATTMETER — MODEL 4305A

The Model 4305A provides the ±5% of full-scale accuracy of the Model 43, but offers extended power handling to 25 kW.

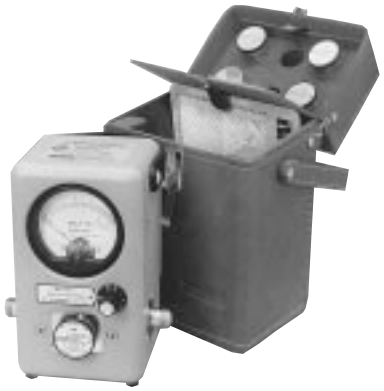
Power Range: 50 W to 25 kW using Bird Plug-in Elements**
Frequency Range: 450 kHz to 2.3 GHz (depending on element)
Insertion VSWR: with N connectors 1.05 max.
Accuracy: ±5% of full scale
Connectors: QC Type (Female N normally supplied)
Finish: Gray powder coat
Nominal Size: (includes connectors) 6 5/16" H × 5 1/8" W × 4 1/4" D, (161 mm × 131 mm × 108 mm)
Weight: 3 1/4 lbs. (1.5 kg)
Elements: Tables 8, page 27 and 1 5/8" AA, page 37
Recommended Accessories: Case (page 24), extra QC connectors (page 60).

VARIABLE RF TAP — MODEL 4431

The combination Model 4431 THRULINE® Wattmeter provides the advantage of an RF signal sample (for use with counters, oscilloscopes, spectrum analyzers, etc.) at the same time a power measurement is made. Amplitude of the RF sample is readily adjusted by a signal-coupling control knob mounted on the front of the wattmeter case. Uses the same plug-in elements as the Model 43 Wattmeter within its frequency and power ratings.

Power and Frequency Range: 5 kW max. 2 to 30 MHz, 1 kW max. 30 to 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 × 5 1/8" W × 3 5/8" D, (175 mm × 130 mm × 92 mm)
Weight: 3 1/2 lbs. (1.6 kg)
Elements: Tables 1, 2, 3, 3A, 4, 6 on pages 25 – 26 (within power/frequency range limits stated above)
Recommended Accessories: Case (page 24), extra QC connectors (page 60).

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



CUSTOM TEST SETS

Our wide selection of power meters, elements, cases, loads, and other accessories can be combined into a power measurement test set that's perfect for you. Please contact your local sales office to have a test set custom-tailored to your exact requirements.

See page 60 for a wide selection of QC connectors.

Phone: 440-248-1200 • Fax: 440-248-5426

FIXED 25–1000 MHz, 5–500 WATT ELEMENT MODEL 4304A

The Model 4304A wattmeter is a popular choice of wireless communications professionals. This rugged instrument is ideal for anyone who needs to quickly test multiple power and frequency ranges. The versatile 4304A uses a single, permanently mounted, 25–1000 MHz element to deliver full-scale measurements from 5 to 500 watts. A high-quality line section keeps insertion loss to less than 0.10 dB from 25–512 MHz and 0.13 dB from 512–1000 MHz. The resulting full-scale accuracy of ±6 to 7% (depending on frequency) is ideal for many two-way communications applications.

Performance is stable to 1000 MHz. Insertion VSWR with the supplied N female connectors is a maximum of 1.12 at 512–1000 MHz and will not exceed 1.08 VSWR at 25–512 MHz.

Operation is exceptionally easy. Select the power range you want to measure with the 5-position power selector switch. Forward and reflected power are then measured by simply rotating the element. A chart mounted to the back of the instrument lets you easily determine antenna or load VSWR from power measurements.

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 to 1.0 GHz
Insertion VSWR: 25–512 MHz, 1.08 max. (with UHF female conn.) 512–1000 MHz, 1.12 max.
Insertion Loss: 25–512 MHz, 0.10 dB max. with UHF female conn. 512–1000 MHz range, 0.15 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: 6⅞" H × 5⅛" W × 3⅝" D, (175 mm × 130 mm × 92 mm)
Weight: 3 lbs. (1.36 kg)
Recommended Accessories: Case (page 24), extra QC-connectors (page 60).

CELLULAR SPECIALIST WATTMETER MODEL 4308

The Model 4308 was designed to provide easy ±5% full-scale accurate measurements of analog cellular systems and subscriber equipment. If you work with digital cellular, we recommend the APM-16 found on page 11 that handles both digital and analog RF technologies.

A permanently mounted element and 4-position power selector switch facilitate measurements of 1.5, 5, 15, or 50 watts full-scale from 440 to 960 MHz. This instrument is also a good choice for low-to-medium power measurements in the UHF and 800–960 MHz bands.

Power Ranges: 1.5, 5, 15, 50 W, with no scale limitations
Frequency Range: 440–960 MHz
Insertion VSWR: 1.05 with TNC connectors (QC type)
Accuracy: ±5% of full scale
Impedance: 50 ohms, nominal
Connectors: QC Type (Female TNC normally supplied)
Finish: Gray powder coat
Nominal Size: 6⅞" H × 5⅛" W × 3⅝" D, (175 mm × 130 mm × 92 mm)
Weight: 3 lbs. (1.36 kg)
Recommended Accessories: CC-1 case (page 24).

Need to measure complex digital technology signals? See the new APM-16 on page 11.

THRULINE®
RF DIRECTIONAL WATTMETERS
Multipower Level, Superior Sensitivity

Cable Products

Each **4410 Series** power element has seven overlapping power levels to reduce the number of elements you need.

MULTIPOWER, ±5% READING ACCURACY — 4410 SERIES

Our 4410 Series high-sensitivity wattmeters are solid choices for field-service applications where the greater dynamic range of the plug-in elements substantially reduces the number of elements needed to cover multiple power and frequency ranges. The 4410 series is also well-suited to laboratory work where power levels as low as 2 milliwatts must be measured with high accuracy.

Each 4410 Series wattmeter plug-in element is capable of reading seven different power ranges covering 0.002* to 10,000 watts. The power ranges of the different elements overlap and include: 0.002–10 W, 0.02–100 W, 0.2–1000 W and 2–10,000 W. All ranges are in frequency bands from 200 kHz to 2300 MHz. Any one of the seven power ranges is selected by a rotary switch located on the front of the wattmeter. Forward and reflected power measurements are accomplished by rotating the element. See Element Tables 9 through 12 on page 27.

Exceptional ±5% of reading accuracy is achieved via a built-in temperature compensation circuit. This stated accuracy applies from 100% of full scale down to 20% of full scale across all seven ranges.

Two portable models are available:

Model 4410A powered by a 9-volt alkaline, transistor-type, battery.

Model 4412 AC powered with rechargeable NiCd battery.

Models: 4410A and 4412
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 to 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˚ to 122˚F), and 4410-20 through 27 from 20˚C to 30˚C (68˚ to 86˚F).
Over-Range Protection: To 120% of nominal full scale (i.e. 12 W, 120 W, 1,200 W, or 12,000 W). No damage or degradation to the unit will result, regardless of the Range Selector Switch position.
Battery Life: Model 4410A: 24 hrs. min. with standard 9 V alkaline "transistor" battery (NEDA No. 1604A supplied). Model 4412: 7 hrs. min. (rechargeable).
AC Power: Models 4412: 105–125/210–250 Vac, 50/60 Hz with integral selector switch
Connectors: QC Type (Female N normally supplied)
Finish: Gray powder coat
Nominal Size: (includes connectors) 6⅞" H × 5⅛" W × 3⅝" D, (175 mm × 130 mm × 92 mm)
Weight:
Model 4410A: 3 lbs. (1.4 kg).
Model 4412: 3⅓ lbs. (1.5 kg)
Elements: Tables 9, 9A, 10, 11, 12 on page 27
Recommended Accessories: Case (page 24), spare battery (page 61), extra QC-connectors (page 60).

* On the 10 mW scale

Need even greater accuracy? See our laboratory grade instruments on pages 6–8.

Phone: 440-248-1200 • **Fax:** 440-248-5426

THRULINE® RF DIRECTIONAL WATTMETERS

Panel-Mount Wattmeters with Line Sections

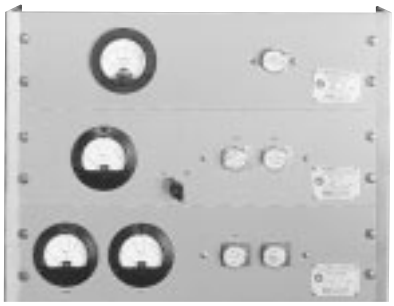
0.45–2700 MHz MODELS 4521, 4522, AND 4526

Bird's 4500 Series wattmeters are panel-mount versions of the time-tested Model 43 wattmeter. They will measure power in CW and FM systems that employ 50-ohm cable or 7/8" EIA transmission line. All models include a precision line section and either one or two 3-scale analog meters to give you full-scale direct readings from 100 mW to 10 kW. The rack panel fits standard 19-inch equipment racks. Plug-in elements — the same used with the Model 43 — are sold separately. Depending on the element selected, Models 4521, 4522 and 4526 will cover frequencies from 0.45 to 2700 MHz. Measurement accuracy is ±5% of full scale.

The Model 4521 has a single element socket and meter. Forward and reflected power are measured by rotating the element.

The single-meter Model 4522 has two element sockets. The second socket permits the use of a more sensitive element to measure reflected power and let you more accurately determine VSWR. A selector switch changes the display between forward and reflected power.

In addition to the sensitivity advantage provided by two element sockets, the dual meter Model 4526 simultaneous displays forward and reflected RF power.



Top to Bottom:
MODELS 4521, 4522, 4526

Models: 4521, 4522, 4526
Power Range: 100 mW to 10 kW using Bird Plug-in Elements.*
Frequency Range: 450 kHz to 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 × 5 7/32" H × 1 11/16" D, (483 mm × 133 mm × 43 mm)
Weight: 3½ lbs. (1.6 kg)
Elements: Tables 1, 2, 3, 3A, 4, 6 on pages 25 – 26

2–512 MHz WITH SAMPLER PORT MODEL 4527

The panel-mount Model 4527 is tailored for 2-way mobile applications in the 2–512 MHz range. Like the Model 4526 described above, it has dual-element sockets and meters. These features let you determine VSWR more precisely via using a more sensitive reflected power element, and simultaneously read forward and reflected power. In addition, an RF sampling output (female BNC) is included. Select elements up to 1000 watts from 2 – 200 MHz and up to 500 watts from 200 – 512 MHz.

MODEL 4527

Power Range: 100 mW to 1 kW using Bird Plug-in Elements.*
Frequency Range: 2 to 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 × 5 7/32" H × 1 11/16" D, (483 mm × 133 mm × 43 mm)
Weight: 3½ lbs. (1.6 kg)
Elements: 2 to 512 MHz models within Tables 1, 2, 6 on pages 25–26

* Quoted accuracy only when used with other Bird products.

Wattmeters for rigid line use are on pages 29–33 and 35.

Cable Products

12 AND 24 CHANNEL POWER METERS — 4201 SERIES

MODEL 4201A504
12 Channel RF Power Meter

The 4201 Series panel-mount wattmeters make it easy to measure RF power in cellular sites and two-way radio base stations that have multiple transmitters. You can monitor up to 24 transmitters by simply turning a channel-selector knob on the front panel. Dual meters simultaneously display forward and reflected power at ±5% full scale accuracy.

Power Sensors (see below) or Plug-in Elements determine frequency and power ranges. Each transmitter requires a power sensor or a dual-socket line section with two elements.

MODEL	CHANNELS	METER SCALE	EACH TRANSMITTER REQUIRES
4201A501	24	25/50/100 W	Dual Line Section and Elements
4201A502	12	25/50/100 W	Dual Line Section and Elements
4201A503	24	15/30/60 W	Power Sensor
4201A504	12	15/30/60 W	Power Sensor

MODEL 4201A503
24 Channel RF Power Meter

Models: 4201A501, 4201A502
Power Range: 10 mW to 10 kW using Bird Plug-in Elements*
Frequency Range: 450 kHz to 2.7 GHz (depending on elements)
Accuracy: ±5% of full scale
Meter Scales: FWD and RFL 25, 50, and 100 W
Meter Sensitivity: 30 µA/1400Ω
Front Panel Controls: One or two rotary channel selector switches, channel A/B push-button on 24 channel, enable/disable push-button on 12 channel.
Connectors: RCA phono jacks

Finish: Gray powder coat
Nominal Size: 19" W × 5 7/32" H × 5" D, (483 mm × 133 mm × 127 mm)
Weight:
4201A501: 3 3/4 lbs. (1.7 kg)
4201A502: 2 7/8 lbs. (1.3 kg)
Required Products:
Line Section: 4230-053 or 4522-002-5 on page 23
Elements: Tables 1, 2, 3, 3A, 4, 6 on pages 25–26
Cables: 10 ft. – 4201A008-1, 15 ft. – 4201A008-2, 25 ft. – 4201A008-3

Models: 4201A503, 4201A504
Power Range: Sensor dependent
Frequency Range: Sensor dependent
Accuracy: ±5% of full scale
Meter Scales: FWD and RFL 15, 30, and 60 W
Meter Sensitivity: 30 µA/1400Ω
Front Panel Controls: One or two rotary channel selector switches, channel A/B push-button on 24 channel, enable/disable push-button on 12 channel.
Connectors: RCA phono jacks

Finish: Gray powder coat
Nominal Size: 19" W × 5 7/32" H × 5" D, (483 mm × 133 mm × 127 mm)
Weight:
4201A503: 3 3/4 lbs. (1.7 kg)
4201A504:2 7/8 lbs. (1.3 kg)
Required Products:
Power Sensor: Order from below
Cables: 10 ft. – 4201A007-1, 15 ft. – 4201A007-2, 25 ft. – 4201A007-3

* Quoted accuracy only when used with other Bird products.

POWER SENSORS FOR 4201A503/4201A504

MODEL	FORWARD POWER MAXIMUM	REFLECTED POWER MAXIMUM	FREQUENCY RANGE
4152-220	150 W	15 W	30 – 88 MHz
4163-240	150 W	15 W	118 – 250 MHz
4164-240	150 W	15 W	420 – 512 MHz
4169-300	60 W	6 W	805 – 960 MHz

Insertion VSWR: 1.1 max.
Insertion Loss: 0.2 dB
Directivity: 25 dB min.
Accuracy: ±5% of full scale
Connectors:
RF Input: Female N
RF Output: Female N
DC Outputs: Solder Lugs

Finish: Gray powder coat
Nominal Size: (includes connectors) 4 1/2" W × 1 1/4" H × 1" D, (114 mm × 32 mm × 25 mm)
Weight: 4.5 oz. (128 grams)

Need to measure complex digital technology signals? See the new APM-16 on page 11.

Phone: 440-248-1200 • **Fax:** 440-248-5426

100 mW – 10 kW WATTCHER® MODEL 3128A

The Model 3128A WATTCHER® RF monitoring and alarm system can automatically activate a variety of safety and equipment protection measures when it detects an abnormal antenna system load condition. The 3128A WATTCHER® simultaneously displays forward and reflected power for 100 mW to 10 kW systems and signals audible and visual alarms if reflected power exceeds the limit you set for more than 50 ms. The instrument's DPDT interlock relay can also be wired to shutdown the transmitter, activate de-icing equipment, signal a remote alarm and initiate other measures to protect your equipment from high VSWR.

MODEL 3128A
Features a reflected power alarm

Some important Model 3128A features include:

- Mirrored scale meters aid reading and help eliminate parallax.
- Separate push-button reset control and LED indicators added.
- Improved circuitry reduces the chance of false alarms.
- Can be wired for automatic, unattended reset when alarm condition clears.
- Rear connection panel speeds installation or removal.
- Tested and found EMC compliant.

Power Range: 100 mW to 10 kW using Bird Plug-in Elements*
Frequency Range: 450 kHz to 2.7 GHz
Accuracy: ±5% of full scale
Meter Scales: FWD and RFL 25, 50, and 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 × 5 7/32" H × 3 3/4" D, (483 mm × 133 mm × 95 mm)
Weight: 5 lbs. (2.28 kg)
Required Products:
Line Section: 4230-053 or 4522-002-5 from page 23
QC Connectors: Two from page 60
Elements: Two from Tables 1, 2, 3, 3A, 4 or 6 on pages 25-26

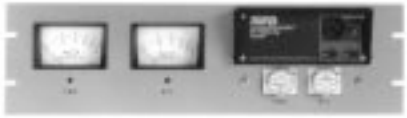
* Quoted accuracy only when used with other Bird products.

WATTCHERS for 250 – 100,000 watt rigid line systems are found on pages 32–33.

THRULINE®
RF DIRECTIONAL WATTMETERS
High-Speed WATTCHER® RF Monitoring System

Cable Products

HIGH SPEED, FWD/RFL ALARM WATTCHER® MODEL 3170A



MODEL 3170A
Features 25 µs response, forward and reflected power alarms

Our Model 3170A WATTCHER® gives you ultra fast response time and a forward power drop-off alarm in addition to the capabilities of the Model 3128A. It also includes a line section complete with two QC-type N (Female) connectors to insert in your coaxial transmission line, and handles power from 100 mW to 10 kW.

This RF monitoring system can protect your transmitting equipment from damage — and loss of air time — when faults cause high-standing waves. It can warn a remote operator of: 1) low power due to detuning, component deterioration, or AC line difficulties, and 2) high reflected power due to factors such as antenna icing, transmission line problems, physical accidents and lightning strikes. The solid state Model 3170A:

- Displays a continuous, simultaneous view of forward and reflected power which can be remoted.
- Provides fast-fault response time — 250 times faster than other monitors — for forward and reflected power monitoring.
- Alerts you to forward power drop-off below a set level (e.g. to conform to appropriate FCC requirements).
- Activates audible/visual alarms when reflected power increases.
- Allows remote reset in the event of a false alarm or momentary disturbance which leaves transmission unimpaired.
- Operates from AC or DC.

Power Range: 100 mW to 10 kW using Bird Plug-in Elements*
Frequency Range: 450 kHz to 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, and 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 × 5 7/32" H × 9 5/16" D, (483 mm × 133 mm × 237 mm)
Weight: 7 lbs. (3.2 kg)
Required Products: Elements: Two from Tables 1, 2, 3, 3A, 4 or 6 on pages 25–26

* Quoted accuracy only when used with other Bird products.

WATTCHERS for 250 – 100,000 watt rigid line systems are found on pages 32–33.

Phone: 440-248-1200 • **Fax:** 440-248-5426

RUGGED, PEP RF POWER ANALYST® MODEL 4391A

The ruggedly built, multifunction Model 4391A RF POWER ANALYST® features a digital display, microprocessor-based operation, and simplified, push-button control. This wattmeter is well suited to C^3, telemetry, two-way communications, avionics and radar, as well as standard radio and television applications.

- Frequency: 0.45 to 2700 MHz. Power: 100 mW to 10 kW with 20% over-range.
- Reads forward and reflected CW or FM power in watts or dBm, Peak Envelope Power of SSB/DSB and symmetrical AM in watts, and peak power for pulses as narrow as 0.8 µs.
- Calculates SWR, return loss in dB and % modulation
- Stores peak and null readings to facilitate adjustment of maximum and minimum signal levels.
- Shock-resistant keyboard and range switches. RFI protection. Built-in international power supply/charger.

MODEL 4391A

Model: 4391A
Power Range: 100 mW to 10 kW using Bird Plug-in Elements*
Frequency Range: 450 kHz to 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 ⅓ 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: 3½ 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 1×10^{-4} min.
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 × 5 7/32" W × 4 5/16" H (243 mm × 158 × 110 mm)
Weight: 5¾ lbs. (2.6 kg)
Elements: Select 2 elements in a 10:1 power ratio from Tables 1, 2, 3, 3A, 4, 5, 6 and 14 on pages 25 – 28.
Recommended Accessories: Case (page 24).

MODEL 4391A AND 4380A-488
(Model 4380A-488 IEEE-488 interface unit described below.)

BUS INTERFACE UNITS MODELS 4380A-488, 4380A-232

Our interface units (IEEE-488 shown above or RS-232) let you remotely control a POWER ANALYST® Wattmeter's functions. Either interface requires a 15-pin connector on the rear of any Model 4380/4390 Series wattmeter. The connector and internal cabling are installed in a new Model 4391A POWER ANALYST®, or in older wattmeters having the suffix -832 in the Model number (e.g. Model 4391-832). Any 4380/4390 Series Wattmeter you already own without this connector can be retrofitted at our plant.

IEEE-488 Model: 4380A-488
Output: 3½ digit ASCII format
Logic Levels: Meets all IEEE standards 488-1978 specifications
GPIB Capabilities: Supports AH1, SH1, T5, L4 SR1, RL0, PP0, DC1, DT1, C0 and E1
Environment: Operating temperature range 0˚C to +50˚C. Storage temperature range –40˚C to +100˚C
AC Power: 100–130/200–260 Vac 50/60 Hz
Dimensions and Weight: 5⅜" L × 3¼" W × 10½" H (137 mm × 82 mm × 267 mm); 2 lb. 10 oz. (1.2 kg)
Output Connector: 24-pin IEEE-488 standard connector
Cable Supplied: 20 in. interconnecting cable to Bird RF POWER ANALYST®
Optional Cables: 3¼ ft. (1 m) IEEE-488 bus interface cable, P/N 5-1317-1; 6½ ft. (2 m) IEEE-488 bus interface cable, Bird P/N 5-1317-2; Use of longer bus interface cables is not recommended.

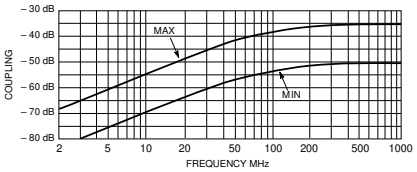
RS-232 Model: 4380A-232
Output: 3½ digit ASCII format
Logic Levels: Meets all EIA standard RS-232C specifications
Environment: Operating temperature range 0˚C to +50˚C. Storage temperature range –40˚C to +100˚C
AC Power: 100–130/200–260 Vac 50/60 Hz
Dimensions and Weight: 5⅜" L × 3¼" W × 10½" H (137 mm × 82 mm × 267 mm); 2 lbs. 10 oz. (1.2 kg)
Output Connector: Standard 25-pin subminiature D style RS-232
Cable Supplied: 20 in. interconnecting cable to Bird RF POWER ANALYST®
Optional Cables: 5 ft. (1.5 m) RS-232 bus interface cable, Bird P/N 5-1662-1; 10 ft. (3 m) RS-232 bus interface cable, Bird P/N 5-1662-2.

* Quoted accuracy only when used with other Bird products.

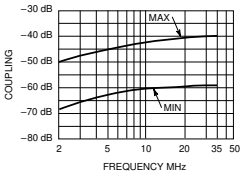
VARIABLE RF SIGNAL SAMPLERS, FIELD-STRENGTH METERS

RF SIGNAL SAMPLERS — MODELS 4273, 4275

MODEL 4273-030



MODEL 4275



MODEL 4273

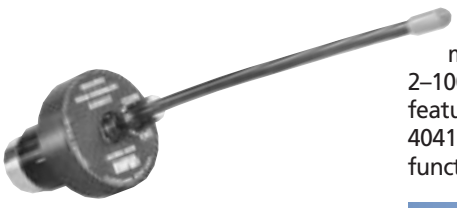
The Model 4273 (1.5 to 35 MHz, 5 kW max.) and Model 4275 (20 to 1000 MHz, 1 kW max.) are "stand-alone," wide-range THRULINE® RF coupling probes for spectrum analysis, RF signal observation on a scope, or frequency counting and control. They feature very low VSWR throughout a broad frequency and attenuation 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 line connectors are Bird QC type.

Power Ratings: Model 4273: 5 kW max; Model 4275; 1 kW max.
Frequency Range: Model 4273: 1.5 – 35 MHz; Model 4275: 20 – 1000 MHz
Impedance: 50 ohms nominal
Insertion VSWR: with N connectors Model 4273: 1.07 max. Model 4275: 1.1 max. 2 to 512 MHz, 1.25 max. 512 to 1000 MHz.
Insertion Loss: Model 4273: 0.1 dB max. Model 4275: 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 as specified (no connectors required for 4275-100, which is a sampler accessory for Bird instruments already equipped with QC connectors)
Finish: Bright silver plate
Nominal Size: 2 51/64" L × 2 7/8" W × 1 1/4" D, (71 mm × 73 mm × 32 mm)
Weight: 10 oz. (280 g)

MODEL/PART NO:		QC – CONNECTORS:
4273-020	4275-020	N: Male/Female
4273-025	4275-025	N: Female/Female
4273-030	4275-030	UHF: Male/Female
4273-035	4275-035	UHF: Female/Female
4273	4275	None*
4273-100	4275-100	None Required**

*Choose any two connectors from page 60.
**Accessory sampler for a Bird Instrument. Remove the instrument's QC connector, place on sampler and bolt both with the instrument.

FIELD-STRENGTH ELEMENT AND METER MODELS 4030, 4041



MODEL 4030 ELEMENT

The modestly priced Model 4030 Relative Field-Strength Element expands the capabilities of the Model 43 and other Bird THRULINE® wattmeters with 30 µA meters by helping you optimize the radiated signal of any transmitter from 2–1000 MHz. It automatically turns on when plugged into the element socket and features a gain control to adjust sensitivity to various field intensities. The Model 4041 Meter is a self-contained, compact instrument that performs exactly the same functions as the 4030 Element.

Model: 4030
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
Output Characteristics: Compatible with 30 µA meter instruments (Models 43, 43P, 4305A, 4314B, 4410, 4430, 4431, 4521, 4522, 4526, 4527)
Battery Life: 100 hours min.
Battery Type: Three, 3V Lithium-Manganese Dioxide, cells (Duracell DL2032 or equivalent)
Ambient Temp Range: 0˚C to +50˚C
Weight: (includes batteries) 3 oz.

MODEL 4041 METER

Model: 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
Finish: Black anodized
Nominal Size: (w/o antenna) 4 3/8" L × 2 1/4" W × 1 15/16" D, (111mm × 57mm × 49mm)
Weight: (includes batteries) 10 oz. (283 g)

Phone: 440-248-1200 • Fax: 440-248-5426

THRULINE® WATTMETER COMPONENTS

Meter Movement and Line Sections for 50-Ohm Cable Wattmeters

METER MOVEMENT — 30 µA

The Model 8-000 and Model 4210A100 meters, when combined with appropriate 7/8" line section, QC connectors, and elements, enable you to assemble custom rack-mount or benchtop wattmeters. The Model 8-000 is the same 3½"-diameter unit used in our Model 43. The 4210A100 is 3¼" square meter premounted in an aluminum case. Both feature 30 µA/1400 Ω movements and include a cable with DC connector. Both are used with elements from Tables 1, 2, 3, 3A, 4, 6 and14.

MODEL	TYPE	CURRENT	SCALES	USE WITH ELEMENT TABLES
8-000	3½" Round Kit w/ Cable	30 µA/1400 Ω	25/50/100W	1, 2, 3, 3A, 4, 6, and 14
4210A100	3¼" Square Meter in Housing	30 µA/1400 Ω	25/50/100W	1, 2, 3, 3A, 4, 6, and 14

MODEL 8-000

MODEL 4210A100

LINE SECTIONS — CABLE, 7/8" RIGID LINE

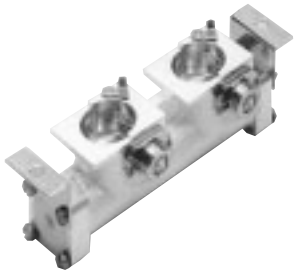
Line sections to use with 50-ohm cable and 7/8" rigid line are listed below. Page 34 contains 1⅝", 3⅛", 4 1/16", and 6⅛" line sections.

Elements for the line sections below are found in Tables 1, 2, 3, 3A, 4, 6, and 14 on pages 25–28. Table 5 on page 27 can also be used with these products.

See page 60 for QC-Type connectors.

MODEL	LINE TYPE*	CONNECTOR TYPE	ELEMENT SOCKETS	LENGTH (INCHES)	WEIGHT (LBS.)	USE WITH WATTMETERS
4230-018	Cable	QC-N(F)	1	5½	1⅓	—
4230-006-1	Cable	QC(not incld.)	1	4	1	—
4230-059	Cable	QC(not incld.)	1 w/bracket	4	1¼	—
4230-053	Cable	QC(not incld.)	2	4	1	3128A, 4201A501, 4201A502, 4210A100, 8-000
4522-002-5	Cable	QC(not incld.)	2 panel mt.	6 7/32	1¼	3128A, 4201A501, 4201A502, 4210A100, 8-000
4501-000	7/8"	Flg.	1	4	1	—
4502-000	7/8"	Flg.	2	4	1¼	3128A, 4201A501, 4201A502, 4210A100, 8-000

* Cable = Use with cable connectors.
7/8" = Use with 7/8" rigid line.



MODEL 4522-002-5

MODEL 4230-053

Pages 25–28 present the full range of Plug-in Elements.

WATTMETER AND ACCESSORY CASES

Cable Products

MODEL CC-1

MODEL EC-1

MODEL 4300-085

MODEL 4300A215

CASES — CC, EC, 4300 SERIES

We offer a complete selection of sturdy cases specially designed to protect your THRULINE® Wattmeter and organize elements and accessories.

CC Series cases are crafted from top-grade expanded vinyl that looks and feels like brown leather, but requires none of the care. Brass-plated hardware and an embossed Bird seal add to the handsome appearance. The interiors of the Models CC-1 and CC-3 feature velcro closures and cutouts to secure accessories plus a 43-size wattmeter.

The Model EC-1 element case lets you organize up to 12 Plug-In elements in a die-cut foam insert. The exterior is crafted from high-density expanded vinyl, with a tanned brown finish and gold-tone hardware.

Hard-sided 4300 Series cases include shock-absorbing laminated die-cut foam inserts. These cases feature fold down handles, quick-release latches, rigid aluminum frame and durable polyurethane shell.

MODEL	CASE HOLDS
CC-1	Portable THRULINE® Wattmeter* and 6 elements
CC-2	Mini-Monitor
CC-3	Portable THRULINE® Wattmeter*, load, and 3 elements
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 4 elements
4300-055	4410 Wattmeter, load, elements, and other accessories
4300A215	4421 Wattmeter and power sensors
7000A850	AT-100, AT-400, AT-800 Antenna Testers

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

See our other wattmeter accessories: Attenuators (pages. 54–58), Batteries (page 61), Connector Adapters and Kits (page 61), Loads (pages. 42–53), Signal Samplers (page 22), and QC and SQC Connectors (pages. 60).

Phone: 440-248-1200 • Fax: 440-248-5426

PLUG-IN ELEMENTS

Selection Guides, Standard and Low Power

All Bird Plug-In Elements are manufactured in accordance with meticulous calibration procedures, supported by more than a quarter-century history of mean deviation values. This assures adherence to advertised specifications of our current instruments as well as field interchangeability with Bird equipment you might have purchased many years ago. Stated instrument accuracies cannot be guaranteed with components not supplied by Bird.

Pages 25–28 contain the most popular elements for wattmeters used with 50-ohm cable (elements for rigid line use are on pages 36–38). While our large selection lets you almost customize your Bird wattmeter, one or two elements are sufficient for most applications. Always specify your wattmeter or line section number when ordering elements.

Unless noted otherwise, element tables listed below are found on pages 25–28.

ELEMENT SELECTION GUIDE

WATTMETER MODEL	SELECT ELEMENT FROM TABLE(S)
APM-16	APM Table
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
4304A	—
4305A	8, 1⅝AA**
4308	—
4314B	1, 2, 3, 3A, 4, 5, 6, 14*
4391A	1, 2, 3, 3A, 4, 5, 6, 14*
4410A, 4412	9, 10, 11, 12, 14*
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	1, 2, 6, 14*
6151	1, 2, 3

* 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.

** See page 37 for Table 1-5/8AA

ELEMENT TABLE FREQUENCY AND POWER LIMITS

ELEMENT TABLE	MIN PWR (WATTS F.S.)	MAX PWR. (WATTS F.S.)	MIN FREQ (MHz)	MAX FREQ (MHz)	SEE PAGE
APM	1	1000	2	2300	28
1	5	5000	2	1000	25
2	1	2.5	25	1000	25
3	1	250	950	2700	26
3A	0.1	0.5	950	2600	26
4	1000	10,000	0.45	2.5	26
5	500	10,000	2	1260	27
6	0.1	0.5	45	1000	26
8	50	25,000	0.45	2300	27
9	0.01	10	30	1000	27
9A	0.001	1	864	970	27
10	0.1	100	25	2300	27
11	1	1000	2	1000	27
12	10	10,000	0.2	30	27
14	1000	1000	50	1250	28

TABLE 1 — STANDARD ELEMENTS

POWER RANGE	FREQUENCY BANDS (MHz) 2-30	25-60	50-125	100-250	200-500	400-1000
5 W	—	5A	5B	5C	5D	5E
10 W	—	10A	10B	10C	10D	10E
25 W	—	25A	25B	25C	25D	25E
50 W	50H	50A	50B	50C	50D	50E
100 W	100H	100A	100B	100C	100D	100E
250 W	250H	250A	250B	250C	250D	250E
500 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

1.0 WATT	MODEL	2.5 WATTS	MODEL
25–30 MHz	025-1	25–30 MHz	025-2
30–35 MHz	030-1	30–40 MHz	030-2
35–40 MHz	035-1	40–50 MHz	040-2
40–50 MHz	040-1	50–60 MHz	050-2
50–60 MHz	050-1	60–80 MHz	060-2
60–80 MHz	060-1	80–95 MHz	080-2
80–95 MHz	080-1	95–150 MHz	095-2
95–125 MHz	095-1	150–250 MHz	150-2
110–160 MHz	110-1	200–300 MHz	200-2
150–250 MHz	150-1	250–450 MHz	250-2
200–300 MHz	200-1	400–850 MHz	400-2
275–450 MHz	275-1	800–1000 MHz	801-2
425–850 MHz	425-1	—	—
800–1000 MHz	801-1	—	—

Elements for wattmeters used with rigid lines are found on pages 36–38.

PLUG-IN ELEMENTS

High Frequency, Low Frequency and Milliwatt

Cable Products

Protect and organize your elements with a case.
See page 24.

TABLE 3 — **HIGH-FREQUENCY ELEMENTS. ENTIRE TABLE ±8% FS**

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

TABLE 3A — **HIGH-FREQUENCY MILLIWATT ELEMENTS**

POWER RANGE	FREQUENCY BANDS (MHz) 950-1260	1250-1500	1500-1700	1700-2200	2200-2300	2300-2400	2400-2500	2500-2600
100 mW	430-82	430-209	430-210	430-178	430-41	430-211	430-182	430-90
250 mW	430-83	430-236	430-237	430-1	430-238	430-239	430-240	430-241
500 mW	430-84	430-259	430-260	430-95	430-78	430-261	430-159	430-262

TABLE 4 — **LOW-FREQUENCY ELEMENTS**

POWER RANGE	FREQUENCY BANDS (MHz) 0.45 TO 2.5
1000 W	1000P
2500 W	2500P
5000 W	5000P
10,000 W	10000P

TABLE 6 — **MILLIWATT ELEMENTS**

100 mW	MODEL	250 mW	MODEL	500 mW	MODEL
45–50 MHz	430-266	45–50 MHz	430-267	45–54 MHz	430-242
50–60 MHz	430-191	50–60 MHz	430-212	54–60 MHz	430-243
60–66 MHz	430-192	60–66 MHz	430-213	60–66 MHz	430-244
66–72 MHz	430-193	66–72 MHz	430-214	66–72 MHz	430-245
72–76 MHz	430-2	72–76 MHz	430-22	72–76 MHz	430-33
76–82 MHz	430-194	76–82 MHz	430-215	76–88 MHz	430-246
82–88 MHz	430-195	82–88 MHz	430-216	88–108 MHz	430-247
88–97 MHz	430-170	88–108 MHz	430-217	105–120 MHz	430-26
97–108 MHz	430-171	105–120 MHz	430-20	120–136 MHz	430-248
108–136 MHz	430-57	116–126 MHz	430-48	136–150 MHz	430-249
135–175 MHz	430-86	125–136 MHz	430-218	150–170 MHz	430-53
170–190 MHz	430-62	130–150 MHz	430-13	170–190 MHz	430-250
190–210 MHz	430-63	150–180 MHz	430-15	190–216 MHz	430-251
210–216 MHz	430-176	170–190 MHz	430-64	216–240 MHz	430-252
216–230 MHz	430-196	190–210 MHz	430-65	240–290 MHz	430-27
230–240 MHz	430-197	210–220 MHz	430-184	290–340 MHz	430-253
240–250 MHz	430-198	216–230 MHz	430-219	340–360 MHz	430-157
250–260 MHz	430-199	230–240 MHz	430-220	350–400 MHz	430-254
260–270 MHz	430-200	240–250 MHz	430-221	400–450 MHz	430-255
270–280 MHz	430-201	250–260 MHz	430-222	450–500 MHz	430-256
280–290 MHz	430-202	260–270 MHz	430-223	500–600 MHz	430-257
290–300 MHz	430-203	270–280 MHz	430-224	600–800 MHz	430-258
300–320 MHz	430-204	280–290 MHz	430-225	800–1000 MHz	430-265
320–340 MHz	430-205	290–300 MHz	430-226	—	—
340–360 MHz	430-164	300–320 MHz	430-227	—	—
360–380 MHz	430-206	320-–340 MHz	430-228	—	—
380–400 Mhz	430-207	340–360 MHz	430-229	—	—
400–420 MHz	430-7	360–380 MHz	430-230	—	—
420–450 MHz	430-208	375–400 MHz	430-231	—	—
450–470 MHz	430-8	400–450 MHz	430-232	—	—
470–500 MHz	430-179	450–470 MHz	430-61	—	—
500–600 MHz	430-168	470–500 MHz	430-233	—	—
600–800 MHz	430-169	500–600 MHz	430-234	—	—
800–1000 MHz	430-263	600–800 MHz	430-235	—	—
—	—	800–1000 MHz	430-264	—	—

Elements for wattmeters used with rigid lines are found on pages 36–38.

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TABLE 5 — **PULSE-POWER ELEMENTS ENTIRE TABLE ±8% OF FULL SCALE**

POWER RANGE	FREQUENCY BANDS (MHz) 2-30	25-60	50-125	100-250	200-500	400-1000	950-1260
500 W	—	—	—	—	—	—	500J
1000 W	—	—	—	—	—	—	1000J
2500 W	—	2500A	2500B	2500C	2500D	2500E	2500J
5000 W	—	5000A	5000B	5000C	5000D	5000E	5000J
10000 W	10000H	10000A	10000B	10000C	10000D	10000E	10000J

Table 5 Notes:
Elements 500–10,000 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 2500A, 2500B, 2500C, 5000A, and 10000H are capable of reading peak and average power.

TABLE 8 — **PLUG-IN ELEMENTS FOR MODEL 4305A***

FREQUENCY (MHz)	POWER	MODEL
.45–2.5	25 kW	25KP7
2–30	10 kW	10KH7
25–60	2500 W	2500A7
25–60	5000 W	5000A7
50–125	2500 W	2500B7
50–125	5000 W	5000B7
100–250	2500 W	2500C7
200–500	2500 W	2500D7
400–1000	2500 W	2500 E7
1100–1800	50 W	50K7
1100–1800	100 W	100K7
1700–2200	50 W	50L7
1700–2200	100 W	100L7
2200–2300	50 W	50M7
2200–2300	100 W	100M7

*4305A may also use elements from Table 1⅝AA on page 37.

TABLE 9 — **4410 ELEMENTS**

FULL-SCALE POWER AND FREQUENCY RANGES 0–10, 30, 100, 300 MILLIWATTS 1, 3, 10 WATTS	
MHz	MODEL
30–50	4410-20
50–88	4410-21
88–108	4410-27
100–152	4410-22
150–250	4410-23
225–400	4410-24
400–800	4410-25
800–900	4410-26
900–1000	4410-28

TABLE 10 — **4410 ELEMENTS**

FULL-SCALE POWER AND FREQUENCY RANGES 0–100, 300 MILLIWATTS 1, 3, 10, 30, 100 WATTS	
MHz	MODEL
25–80	4410-10
50–125	4410-11
100–250	4410-12
200–500	4410-13
400–1000	4410-14
1000–1800	4410-15*
1800–2300	4410-16*

*Accuracy is ±8% of reading

TABLE 9A — **4410 ELEMENTS**

FULL-SCALE POWER AND FREQUENCY RANGES 0–1, 3, 10, 30, 100, 300 MILLIWATTS AND 1 WATT		
MHz	MODEL	ACCURACY
864–868	4410-38	±10% of reading accuracy on 100 mW, 300 mW and 1 W, ±5% on all other scales
917–970	4410-29	±5% 10 mW to 1 W only

TABLE 11 — **4410 ELEMENTS**

FULL-SCALE POWER AND FREQUENCY RANGES 0–1, 3, 10, 30, 100, 300, 1000 WATTS	
MHz	MODEL
2–30	4410-3
25–80	4410-5
50–200	4410-6
144–520	4410-7
200–1000	4410-8

TABLE 12 — **4410 ELEMENTS**

FULL-SCALE POWER AND FREQUENCY RANGES 0–10, 30, 100, 300, 1000, 3000, 10,000 WATTS	
MHz	MODEL
0.2–0.535	4410-1
0.45–2.5	4410-2
2–30	4410-4

Elements for wattmeters used with rigid lines are found on pages 36–38.

PLUG-IN ELEMENTS
Sampler, Coupler, and APM

Cable Products

Variable 4274-050 (lower left) and wide-range 4274-025 (upper right) sampler elements shown with a standard element.

The 4274 Series sampler elements are nondirectional couplers that replace the standard element in your Bird wattmeter for such applications as RF signal observation, spectrum analysis or frequency counting and control where main line power does not exceed 500 W. The Model 4274-025 is a wide-range device that provides an unrectified signal at about –50 dB ± 2 dB from 25–1000 MHz tapering to –66 dB at 2 MHz. The Model 4274-050 delivers a variable unrectified signal from –35 to –48 dB (± 1 dB) from 100–400 MHz.

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

The directional coupler plug-in elements in Table 14 below are used for signal leveling, frequency control, wave-shape monitoring, local oscillator or marker-signal injection, etc. They extract a calibrated amount of power from the main line signal flowing in the direction of the arrow. This attenuated signal is NOT rectified (as in the standard measuring elements), but is brought out through a female BNC connector on top of the element. Coupler elements fit the standard sockets, but there are no DC output tabs on the element body since no DC is produced. An added convenience is rotating the element between 0° and 180° varies the amount of coupling like a variable attenuator. Minimum attenuation of the main line signal is the nominal coupling ±1 dB shown for each unit within the stated frequency band.

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

*The power rating of the directional couplers cannot exceed the peak and average power ratings of the transmission line.

APM ELEMENTS FOR APM-16

POWER RANGE	FREQUENCY BANDS (MHz) 2-30	25-60	50-125	100-250	200-500	400-1000	950-1260	1100-1800	1700-2200	2200-2300
1W	—	APM-1A	APM-1B	APM-1C	APM-1D	APM-1E	APM-1J	APM-1K	APM-1L	APM-1M
2.5W	—	APM-2.5A	APM-2.5B	APM-2.5C	APM-2.5D	APM-2.5E	APM-2.5J	APM-2.5K	APM-2.5L	APM-2.5M
5 W	APM-5H	APM-5A	APM-5B	APM-5C	APM-5D	APM-5E	APM-5J	APM-5K	APM-5L	APM-5M
10 W	APM-10H	APM-10A	APM-10B	APM-10C	APM-10D	APM-10E	APM-10J	APM-10K	APM-10L	APM-10M
25 W	APM-25H	APM-25A	APM-25B	APM-25C	APM-25D	APM-25E	APM-25J	APM-25K	APM-25L	APM-25M
50 W	APM-50H	APM-50A	APM-50B	APM-50C	APM-50D	APM-50E	APM-50J	APM-50K	APM-50L	—
100 W	APM-100H	APM-100A	APM-100B	APM-100C	APM-100D	APM-100E	APM-100J	—	—	—
250 W	APM-250H	APM-250A	APM-250B	APM-250C	APM-250D	APM-250E	APM-250J	—	—	—
500 W	APM-500H	APM-500A	APM-500B	APM-500C	APM-500D	APM-500E	—	—	—	—
1000 W	APM-1000H	APM-1000A	APM-1000B	APM-1000C	APM-1000D	APM-1000E	—	—	—	—

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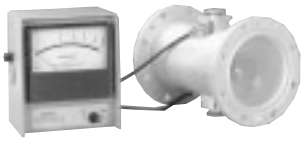
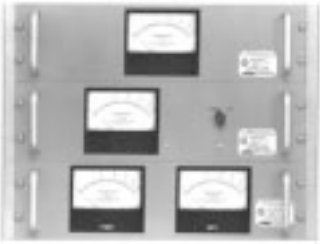
Rigid Line Products

RF POWER METER SELECTION GUIDE

Power Meters For Rigid Line Use



HIGH-POWER WATTMETERS Pages 30–31
LINE SECTIONS Page 34



PANEL-MOUNT METERS Page 35

WATTCHER® RF MONITORING SYSTEMS Pages 32–33

ELEMENTS Pages 36–38

Bird High-Power Wattmeters measure forward and reflected power in 1⅝" through 6⅛" rigid line systems up to 250kW. The 4600A, 4700A, 4800A, and 4900A Series are prepackaged, semiportable systems consisting of a line section and meter with attached 10-foot cabling. Selected packages include a dual-element line section and switchable meter unit, permitting convenient forward or reflected power readings at the flip of a switch. For maximum flexibility, you can also assemble a custom system from a 6810-Series portable meter or 3127-Series panel-mount meter (page 35) and an appropriate line section (page 34).

Wattmeter packages, as well as the 3127 and 6810 Series meters, contain 100 µA movements designed for use with Bird Plug-in Elements from the "A", "B", or "C" tables (pages 37–38). Order elements according to your line section size, the required power and frequency, and meter scales.

The WATTCHER® Models on pages 32–33 are designed to protect your equipment from damage caused by high VSWR or abnormal load conditions. These instruments provide visual and audible alarms as well as switching capabilities to shut down a transmitter, turn on deicing equipment, etc.

The table below will help direct you to a Bird 1⅝", 3⅛", 4 1/16", or 6⅛" High-Power Wattmeter package to fit your needs. Turn to the referenced page for full product descriptions and specifications. You can also contact Bird or any authorized distributor for further assistance.

If your applications include ⅞" coaxial systems, please see the wattmeter selection guide on page 9.

HIGH-POWER WATTMETER PACKAGES

LINE SIZE	POWER	FREQ. (MHz)	FULL-SCALE ACCURACY	DISPLAY TYPE	SEE PAGE
1⅝" EIA	100W – 25kW	2–1000	±5% FS	Analog	30
3⅛" EIA	100W – 100kW	2–1000	±5% FS	Analog	30
4 1/16"	1500W – 80kW	50–1000	±5% FS	Analog	31
6⅛" EIA	1000W – 250kW	2–1000	±5% FS	Analog	31

This catalog contains RF Terminations that will terminate up to 80 kW. See pages 42–53.

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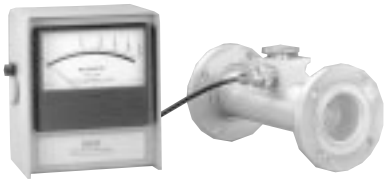
THRULINE®
RF DIRECTIONAL WATTMETERS
1⅝" and 3⅛" WATTMETER PACKAGES

Rigid Line Products



MODEL 4712A shown.
All models on pages 30–31 include meter and line section.

1⅝" WATTMETER PACKAGES - 50 OHMS NOMINAL

Insertion VSWR: 1.05 max.
Accuracy: ±5% of full scale
Cable/Connectors: Permanently attached 10 foot cable(s) with DC connector(s)
Finish:
Meter: Gray powder coat
Line Section: Bright silver plated

Nominal Size (Meter): 5 9/16" W × 6½" H × 3⅜" D, (141 mm × 165 mm × 85 mm)
Weight (Meter): 3 lbs. (1.4 kg)

MODEL NO.	FREQ. RANGE (MHz)	POWER RANGE (kW)	FLG/UNFLG	NUMBER SOCKETS	SCALE DIVISIONS	ELEMENT TABLE	LINE SECTION LENGTH	LINE SECTION WEIGHT
4712A	2–1000	0.1–25	EIA Flg.	Single	5/10/25	1⅝A	6¾" (171 mm)	3 lbs. (1.4 kg)
4715-200A	2–1000	0.1–25	EIA Flg.	Double	5/10/25	1⅝A	6¾" (171 mm)	3¼ lbs. (1.48 kg)
4720A	2–1000	0.1–25	Unflg. (Rec. 0.438")	Single	5/10/25	1⅝A	6⅜" (162 mm)	1¼ lbs. (0.6 kg)
4723-200A	2–1000	0.1–25	Unflg. (Rec. 0.438")	Double	5/10/25	1⅝A	6⅜" (162 mm)	1½ lbs.(0.7 kg)
4712-037A	2–1000	0.3–15	EIA Flg.	Single	15/30/60	1⅝A	6¾" (171 mm)	3 lbs. (1.4 kg)
4715-300A	2–1000	0.3–15	EIA Flg.	Double	15/30/60	1⅝A	6¾" (171 mm)	3¼ lbs. (1.48 kg)

MODEL 4610-200A

3⅛" WATTMETER PACKAGES - 50 OHMS NOMINAL

Insertion VSWR: 1.05 max.
Accuracy: ±5% of full scale
Cable/Connectors: Permanently attached 10 foot cable(s) with DC connector(s)
Finish:
Meter: Gray powder coat
Line Section: Bright silver plated

Nominal Size (Meter): 5 9/16" W × 6½" H × 3⅜" D, (141 mm × 165 mm × 85 mm)
Weight (Meter): 3 lbs. (1.4 kg)

MODEL NO.	FREQ. RANGE (MHz)	POWER RANGE (kW)	FLG/UNFLG	NUMBER SOCKETS	SCALE DIVISIONS	ELEMENT TABLE	LINE SECTION LENGTH	LINE SECTION WEIGHT
460A	2–1000	0.1–100	EIA Flg.	Single	5/10/25	3⅛A	7 1/32" (179 mm)	7 lbs. (3.2 kg)
4610-200A	2–1000	0.1–100	EIA Flg.	Double	5/10/25	3⅛A	7 1/32" (179 mm)	7¼ lbs. (3.3 kg)
4805A	2–1000	0.1–100	Unflg. (Flush)	Single	5/10/25	3⅛A	6½" (165 mm)	4 lbs. (1.82 kg)
4802-200A	2–1000	0.1–100	Unflg. (Flush)	Double	5/10/25	3⅛A	6½" (165 mm)	4¼ lbs. (1.94 kg)
4600-037A	50–1000	0.6–30	EIA Flg.	Single	15/30/60	3⅛B	7 1/32" (179 mm)	7 lbs. (3.2 kg)
4610-300A	50–1000	0.6–30	EIA Flg.	Double	15/30/60	3⅛B	7 1/32" (179 mm)	7¼ lbs. (3.3 kg)
4805-037A	50–1000	0.6–30	Unflg. (Flush)	Single	15/30/60	3⅛B	6½" (165 mm)	4 lbs. (1.82 kg)
4802-300A	50–1000	0.6–30	Unflg. (Flush)	Double	15/30/60	3⅛B	6½" (165 mm)	4¼ lbs. (1.94 kg)

Elements for rigid line wattmeter packages are found on pages 36–38.

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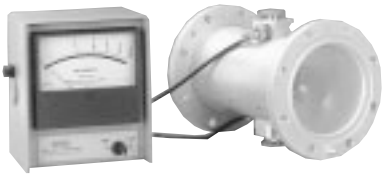
4 1/16" WATTMETER PACKAGES - 50 OHMS NOMINAL

Insertion VSWR: 1.05 max.
Accuracy: ±5% of full scale
Cable/Connectors: Permanently attached 10 foot cable(s) with DC connector(s)
Finish:
Meter: Gray powder coat
Line Section: Bright silver plated

Nominal Size (Meter): 5 9/16" W × 6 1/2" H × 3 3/8" D, (141 mm × 165 mm × 85 mm)
Weight (Meter): 3 lbs. (1.4 kg)



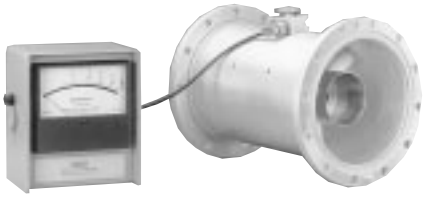
MODEL 4642-200A

MODEL NO.	FREQ. RANGE (MHz)	POWER RANGE (kW)	FLG/UNFLG	NUMBER SOCKETS	SCALE DIVISIONS	ELEMENT TABLE	LINE SECTION LENGTH	LINE SECTION WEIGHT
4641A	50–1000	2.5–50	EIA Flg.	Single	5/10/25	4 1/16A	8 3/8" (213 mm)	8 5/8 lbs. (3.9 kg)
4642-200A	50–1000	2.5–50	EIA Flg.	Double	5/10/25	4 1/16A	8 3/8" (213 mm)	8 7/8 lbs. (4.0 kg)
4843A	50–1000	2.5–50	Unflg. (Rec. 0.531")	Single	5/10/25	4 1/16A	7 1/2" (191 mm)	2 5/8 lbs. (1.2 kg)
4844-200A	50–1000	2.5–50	Unflg. (Rec. 0.531")	Double	5/10/25	4 1/16A	7 1/2" (191 mm)	2 7/8 lbs. (1.3 kg)
4641-037A	50–1000	3–60	EIA Flg.	Single	15/30/60	4 1/16B	8 3/8" (213 mm)	8 5/8 lbs. (3.9 kg)
4642-300A	50–1000	3–60	EIA Flg.	Double	15/30/60	4 1/16B	8 3/8" (213 mm)	8 7/8 lbs. (4.0 kg)
4843-037A	50–1000	3–60	Unflg. (Rec. 0.531")	Single	15/30/60	4 1/16B	7 1/2" (191 mm)	2 5/8 lbs. (1.2 kg)
4844-300A	50–1000	3–60	Unflg. (Rec. 0.531")	Double	15/30/60	4 1/16B	7 1/2" (191 mm)	2 7/8 lbs. (1.3 kg)
4641-080A	50–1000	8–80	EIA Flg.	Single	8/80	4 1/16C	8 3/8" (213 mm)	8 5/8 lbs. (3.9 kg)
4843-080A	50–1000	8–80	Unflg. (Rec. 0.531")	Single	8/80	4 1/16C	7 1/2" (191 mm)	2 5/8 lbs. (1.2 kg)

6 1/8" WATTMETER PACKAGES - 50 OHMS NOMINAL

Insertion VSWR: 1.05 max.
Accuracy: ±5% of full scale
Cable/Connectors: Permanently attached 10 foot cable(s) with DC connector(s)
Finish:
Meter: Gray powder coat
Line Section: Bright silver plated

Nominal Size (Meter): 5 9/16" W × 6 1/2" H × 3 3/8" D, (141 mm × 165 mm × 85 mm)
Weight (Meter): 3 lbs. (1.4 kg)



MODEL 4902A

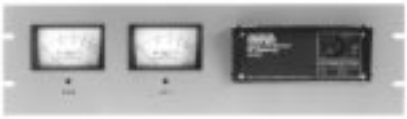
MODEL NO.	FREQ. RANGE (MHz)	POWER RANGE (kW)	FLG/UNFLG	NUMBER SOCKETS	SCALE DIVISIONS	ELEMENT TABLE	LINE SECTION LENGTH	LINE SECTION WEIGHT
4902A	2–1000	1–250	EIA Flg.	Single	5/10/25	6 1/8A	10 7/32" (260 mm)	16 3/4 lbs. (7.6 kg)
4905-200A	2–1000	1–250	EIA Flg.	Double	5/10/25	6 1/8A	10 7/32" (260 mm)	17 lbs. (7.7 kg)
4907A	2–1000	1–250	Unflg. (Rec. 0.968")	Single	5/10/25	6 1/8A	9 5/8" (245 mm)	12 1/2 lbs. (5.7 kg)
4909-200A	2–1000	1–250	Unflg. (Rec. 0.968")	Double	5/10/25	6 1/8A	9 5/8" (245 mm)	12 3/4 lbs. (5.8kg)
4902-037A	50–1000	3–60	EIA Flg.	Single	15/30/60	6 1/8B	10 7/32" (260 mm)	16 3/4 lbs. (7.6 kg)
4905-300A	50–1000	3–60	EIA Flg.	Double	15/30/60	6 1/8B	10 7/32" (260 mm)	17 lbs. (7.7 kg)
4902-080A	50–1000	8–80	EIA Flg.	Single	8/80	6 1/8C	10 7/32" (260 mm)	16 3/4 lbs. (7.6 kg)
4907-080A	50–1000	8–80	Unflg. (Rec. 0.968")	Single	8/80	6 1/8C	9 5/8" (245 mm)	12 1/2 lbs. (5.7 kg)

Elements for rigid line wattmeter packages are found on pages 36–38.

THRULINE®
RF DIRECTIONAL WATTMETERS
High-Speed WATTCHER® RF Monitoring Systems

Rigid Line Products

HIGH-SPEED, FWD/RFL ALARM WATTCHER® MODEL 3171A



MODEL 3171A
Features 25 µs response, 5/10/25 kW meter scales, forward and reflected power alarms.

Bird's high-speed WATTCHER® Systems can protect your transmitting equipment from damage caused by high-standing waves and warn you about low transmit power. Our 3171A Series instruments offer ultra-fast response time and a forward power drop-off alarm in addition to the reflected power monitor/alarm capabilities of the WATTCHER® models on the next page. Two models are available: the Model 3171A (100 W – 250 kW) and Model 3171A-020 (300 W – 60 kW).

Both solid state models can warn a remote operator of: 1) low power due to detuning, component deterioration, or AC line difficulties; and 2) high reflected power due to factors such as antenna icing, transmission line problems, physical accidents and lightning strikes. The 3171A Series:

- Displays a continuous, simultaneous view of forward and reflected power which can be remoted.
- Provides fast fault response time – 250 times faster than other monitors – for forward and reflected power monitoring.
- Alerts you to forward power drop-off below a set level (e.g. to conform to appropriate FCC requirements).
- Activates audible/visual alarms when reflected power increases.
- Allows remote reset in the event of a false alarm or momentary disturbance which leaves transmission unimpaired.
- Operates from AC or DC.

Power Range: 100 W to 250 kW using Bird Plug-in Elements*
Frequency Range: 2 MHz to 1 GHz
Accuracy: ±5% of full scale
Meter Scales:
3171A: FWD and RFL 5/10/25 kW
3171A-020: 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 V @ 400 mA max.
Finish: Gray powder coat
Nominal Size: 19" W × 5 7/32" H × 9 21/64" D, (483 mm × 133 mm × 237 mm)
Weight: 5½ lbs. (2.5 kg)
Required Products:
Line Section: 1⅝", 3⅛", 4 1/16", or 6⅛" from page 34
Elements (pages 37–38):
3171A: Two from Tables 1⅝ AA, 3⅛ AA, 4 1/16 AA, or 6⅛ AA.
3171A-020: Two from Tables 1⅝ BB, 3⅛ BB, 4 1/16 BB, or 6⅛ BB.
Cable: If length other than 25 ft. is desired, order two BNC (M) cables from page 61.

* Quoted accuracy only when used with other Bird products.

WATTCHERS for 0.1 – 10,000 watt cable systems are found on pages 19–20.

Phone: 440-248-1200 • **Fax:** 440-248-5426

100 W – 250 kW WATTCHER® MODELS 3126A, 3127A

Bird's WATTCHER® RF monitoring and alarm systems can automatically activate a variety of safety and equipment protection measures when they detect an abnormal antenna system load condition. Besides providing simultaneous displays of forward and reflected power, these instruments signal audible and visual alarms if reflected power exceeds the limit you set for more than 50 ms. A DPDT interlock relay can also be wired to shutdown the transmitter, activate deicing equipment, signal a remote alarm and initiate other measures to protect your equipment from high VSWR.

The Model 3126A monitors power from 300 W to 60 kW. The Model 3127A covers systems that output 100 W to 250 kW of RF power. Both models have been refined over the previous 3126 and 3127 to provide increased performance and user requested features.

- Mirrored scale meters aid reading and help eliminate parallax.
- Separate push-button reset control and LED indicators added.
- Improved circuitry reduces the chance of false alarms.
- Can be wired for automatic, unattended reset when alarm condition clears.
- Rear connection panel speeds installation or removal.
- Tested and found EMC compliant.

MODEL 3127A
Features a reflected power alarm for 100 W to 250 kW RF systems.

Power Range:
3126A: 300 W to 60 kW using Bird Plug-in Elements*
3127A: 100 W to 250 kW using Bird Plug-in Elements*
Frequency Range: 2 MHz to 1 GHz
Accuracy: ±5% of full scale
Meter Scale FWD:
3126A: 15/30/60 kW
3127A: 5/10/25 kW
Meter Scale RFL:
3126A: 1.5/3/6 kW
3127A: 1/2.5/5 kW
Meter Sensitivity: 100 µA/3000Ω
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
DC Power: 9 to 16 V @ 1A
Finish: Gray powder coat
Nominal Size: 19" W × 5 7/32" H × 3 3/4" D (483 mm × 133 mm × 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 34
Elements (pages 37–38):
3126A: Two from Tables 1 5/8 B, 3 1/8 B, 4 1/16 B, or 6 1/8 B
3127A: Two from Tables 1 5/8 A, 3 1/8 A, 4 1/16 A, or 6 1/8 A
Cable: If length other than 25 ft. is desired, order two BNC (M) cables from page 61.

* Quoted accuracy only when used with other Bird products.

WATTCHERS for 0.1 – 10,000 watt cable systems are found on pages 19–20.

THRULINE®
WATTMETER COMPONENTS
Rigid Line Sections

Bird offers 1⅝", 3⅛", 4 1/16", and 6⅛" RF air line sections which, with the appropriate meter and Plug-in Elements, form a complete power measurement system. These precision sections insert in the transmission line, between the transmitter and antenna or load, and are available with flanged, unflanged/flush, or unflanged/recessed connections.

Line sections contain one element socket, or dual opposing sockets. Dual socket models permit forward and reflected readings using just one line section and a switchable meter or dual-meter panel.

Plug-in Elements (pages 36–38) must be ordered according to the desired frequency and power ranges, line section size, and the scales of the meter selected for use with the line section:

- 5/10/25 Scales: Element Tables 1⅝ A, 3⅛ A, 4 1/16 A, 6⅛ A
- 15/30/60 Scales: Element Tables 1⅝ B, 3⅛ B, 4 1/16 B, 6⅛ B
- 8/80 Scales: Element Tables 1⅝ C, 3⅛ C, 4 1/16 C, 6⅛ C

MODEL 4715-000

1⅝" RIGID LINE SECTIONS

MODEL	LINE SIZE	CONNECTOR TYPE	ELEMENT SOCKETS	LENGTH (INCHES)	WEIGHT (LBS.)
4712-000	1⅝"	EIA Flg.	1	6.75	3
4715-000	1⅝"	EIA Flg.	2	6.75	3.25
4720-000	1⅝"	UnFlg. (Rec. 0.438")	1	6.38	1.25
4723-000	1⅝"	UnFlg. (Rec. 0.438")	2	6.38	1.5

MODEL 4805-000

3⅛" RIGID LINE SECTIONS

MODEL	LINE SIZE	CONNECTOR TYPE	ELEMENT SOCKETS	LENGTH (INCHES)	WEIGHT (LBS.)
4600-000	3⅛	EIA Flg.	1	7.03	7
4610-000	3⅛"	EIA Flg.	2	7.03	7.25
4801-000	3⅛"	UnFlg. (Rec. 0.688")	1	6.5	4
4801-100	3⅛"	UnFlg. (Rec. 0.688")	2	6.5	4.25
4802-000	3⅛"	UnFlg. (Flush)	2	6.5	4.25
4805-000	3⅛"	UnFlg. (Flush)	1	6.5	4

MODEL 4843-000

4 1/16" RIGID LINE SECTIONS

MODEL	LINE SIZE	CONNECTOR TYPE	ELEMENT SOCKETS	LENGTH (INCHES)	WEIGHT (LBS.)
4641-000	4 1/16"	EIA Flg.	1	8.38	8.63
4642-000	4 1/16"	EIA Flg.	2	8.38	8.88
4843-000	4 1/16"	UnFlg. (Rec. 0.531")	1	7.5	2.63
4844-000	4 1/16"	UnFlg. (Rec. 0.531")	2	7.5	2.88

MODEL 4902-000

6⅛" RIGID LINE SECTIONS

MODEL	LINE SIZE	CONNECTOR TYPE	ELEMENT SOCKETS	LENGTH (INCHES)	WEIGHT (LBS.)
4902-000	6⅛"	EIA Flg.	1	10.22	16.75
4905-000	6⅛"	EIA Flg.	2	10.22	17
4907-000	6⅛"	UnFlg. (Rec. 0.968")	1	9.63	12.5
4909-000	6⅛"	UnFlg. (Rec. 0.968")	2	9.63	12.75

Phone: 440-248-1200 • Fax: 440-248-5426

METERS — 3127, 6810 SERIES

The 100 µA meters presented on this page form a complete power measurement system when combined with the appropriate 1⅝", 3⅛", 4 1/16", or 6⅛" rigid line section (page 34) and Plug-in Elements (pages 36–38).

The 3127 Series meters are available in six 19" panel-mount configurations with dual meters, single meter, or single meter with forward/reflected power switch. Scale choices include 15/30/60 kW and 5/10/25 kW.

The 6810 Series housed meters are offered with a choice of meter scales, with or without a forward/reflected power switch. Scale choices include 15/30/60 kW, 5/10/25 kW, and 8/80 kW. These are the same meters included in the complete high-power wattmeter packages on pages 30–31.

Plug-in Elements must be ordered according to the desired frequency and power ranges, the meter scales, and size of the line section selected for use with the meter:

- 5/10/25 Scales: Element Tables 1⅝ A, 3⅛ A, 4 1/16 A, 6⅛ A
- 15/30/60 Scales: Element Tables 1⅝ B, 3⅛ B, 4 1/16 B, 6⅛ B
- 8/80 Scales: Element Tables 1⅝ C, 3⅛ C, 4 1/16 C, 6⅛ C (6810 Series, only)

DIMENSIONS AND WEIGHT:

- 3127 Series Panel-Mount Meters: 19" W × 5 7/32" H × 4⅜" D, (483 mm × 133 mm × 112 mm). Weight: 3 lbs. (1.4 kg)
- 6810 Series Housed Meters: 5 9/16" W × 6½" H × 3⅜" D, (142 mm × 166 mm × 86 mm). Weight: 3 lbs. (1.4 kg)

Top to Bottom:
MODEL 3127-070, MODEL 3127-055, MODEL 3127-040

MODEL	TYPE	SCALES	DC CABLE (FT.)	USES LINE SECTION
3127-035	Single 4½" rectangular on panel	5/10/25 kW	25	Single socket from page 34
3127-040	Dual 4½" rectangular on panel	5/10/25 kW	25	Double socket from page 34
3127-055	Single 4½" rectangular on panel w/fwd. and rfl. switch	5/10/25 kW	25	Double socket from page 34
3127-070	Single 4½" rectangular on panel	15/30/60 kW	25	Single socket from page 34
3127-075	Dual 4½" rectangular on panel	15/30/60 kW	25	Double socket from page 34
3127-080	Single 4½" rectangular on panel w/fwd. and rfl. switch	15/30/60 kW	25	Double socket from page 34
6810-220	4½" rectangular in housing w/fwd. and rfl. switch	5/10/25 kW	10	Double socket from page 34
6810-230	4½" rectangular in housing w/fwd. and rfl. switch	15/30/60 kW	10	Double socket from page 34
6810-250	4½" rectangular in housing w/fwd. and rfl. switch	8/80 kW	10	Double socket from page 34
6810-265	4½" rectangular in housing	8/80 kW	10	Single socket from page 34
6810-307	4½" rectangular in housing	15/30/60 kW	10	Single socket from page 34
6810-309-7	4½" rectangular in housing	5/10/25 kW	10	Single socket from page 34

MODEL 6810-220

MODEL 6810-309-7

Elements for rigid line wattmeters are found on pages 36–38

PLUG-IN ELEMENTS

Selection Guides – Standard and Low Power

Rigid Line Products

ELEMENT SELECTION GUIDE

WATTMETER* MODEL	SELECT ELEMENT FROM TABLE(S)
3126A	1⅝ B, 3⅛ B, 4 1/16 B, 6⅛ B
3127A	1⅝ A, 3⅛ A, 6⅛ A
3127-035	1⅝ A, 3⅛ A, 4 1/16A, 6⅛ A
3127-040	1⅝ A, 3⅛ A, 4 1/16A, 6⅛ A
3127-055	1⅝ A, 3⅛ A, 4 1/16A, 6⅛ A
3127-070	1⅝ B, 3⅛ B, 4 1/16 B, 6⅛ B
3127-075	1⅝ B, 3⅛ B, 4 1/16 B, 6⅛ B
3127-080	1⅝ B, 3⅛ B, 4 1/16 B, 6⅛ B
3171A	1⅝ AA, 3⅛ AA, 4 1/16 A A, 6⅛ AA
3171-020	1⅝ BB, 3⅛ BB, 4 1/16 BB, 6⅛ BB
4305A	8**, 1⅝AA
4382, 84, 86, 88	1⅝ A, 3⅛ A, 6⅛ A
460A	3⅛ A
4600-037A	3⅛ B
4610-200A	3⅛ A
4610-300A	3⅛ B
4641A	4 1/16 A
4641-037A	4 1/16 B
4641-080A	4 1/16 C
4642-200A	4 1/16 A
4642-300A	4 1/16 B
4643-080A	4 1/16 C
4712A	1⅝ A
4712-037A	1⅝ B
4715-200A	1⅝ A
4715-300A	1⅝ B
4720A	1⅝ A
4723-200A	1⅝ A
4802-200A	3⅛ A
4802-300A	3⅛ B
4805A	3⅛ A
4805-037A	3⅛ B
4843A	4 1/16 A
4843-037A	4 1/16B
4844-200A	4 1/16 A
4844-300A	4 1/16 B
4902A	6⅛ A
4902-037A	6⅛ B
4902-080A	6⅛ C
4905-200A	6⅛ A
4905-300A	6⅛ B
4907A	6⅛ A
4907-080A	6⅛ C
4909-200A	6⅛ A

The Bird Plug-In Elements on these pages are for wattmeters used with rigid line sections (See pages 25–28 for 50-ohm cable wattmeter elements). Use the Selection Guide on this page or call us for assistance to find the right element.

Except for directional coupler elements, all 1⅝" to 6⅛" rigid line elements must be calibrated with the wattmeter where they will be used to ensure stated accuracy. We highly recommend ordering elements in identical pairs, recording the meter reading of both and storing one in a safe place. This will help you avoid the inconvenience of returning an entire wattmeter for recalibration (e.g., if an element is dropped.)

Always specify your wattmeter or line section number when ordering elements.

ELEMENT TABLE VS. METER SENSITIVITY AND SCALES

ELEMENT TABLE	METER CURRENT	METER SCALE
1⅝A, 3⅛A, 4 1/16A, 6⅛A	100 µA	5/10/25
1⅝AA, 3⅛AA, 4 1/16AA, 6⅛AA	30 µA	5/10/25
1⅝B, 3⅛B, 4 1/16B, 6⅛B	100 µA	15/30/60
1⅝BB, 3⅛BB, 4 1/16BB, 6⅛BB	30 µA	15/30/60
1⅝C, 3⅛C, 4 1/16C, 6⅛C	100 µA	80
15, 16, 17*	—	—

TABLE 15 DIRECTIONAL COUPLER ELEMENTS FOR 1⅝" 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
750–1250	–50 dB	5 kW	501-750

TABLE 16 DIRECTIONAL COUPLER ELEMENTS FOR 3⅛" 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 6⅛" 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
225–450	–60 dB	60 kW	606-225
400–870	–60 dB	60 kW	606-400

* In addition to the elements listed, these meters can use Tables 15, 16 and17 coupler elements for RF sampling. The instrument meter does not read when these elements are installed. Typically, Table 15–17 elements are used with line sections, but also provide RF sampling when used with metered instruments where the meter simply serves as a line section. Directional coupler power ratings cannot exceed the peak and average rating of the transmission line.

** See page 27 for Table 8

Phone: 440-248-1200 • Fax: 440-248-5426

PLUG-IN ELEMENTS
For 1⅝" and 3⅛" Lines

ELEMENTS FOR 1⅝" LINE SECTIONS

TABLE 1⅝A — STANDARD ELEMENTS 100 µA

POWER RANGE	FREQUENCY BANDS (MHz) 2-30	25-60	50-125	100-250	200-500	400-1000
100 W	—	100A1	100B1	100C1	100D1	100E1
250 W	—	250A1	250B1	250C1	250D1	250E1
500 W	—	500A1	500B1	500C1	500D1	500E1
1000 W	—	1000A1	1000B1	1000C1	1000D1	1000E1
2500 W	2500H1	2500A1	2500B1	2500C1	2500D1	2500E1
5000 W	5000H1	5000A1	5000B1	5000C1	5000D1	5000E1
10 kW	10KH1	10KA1	10KB1	10KC1	—	—
25 kW	25KH1	25KA1	25KB1	—	—	—

TABLE 1⅝AA — STANDARD ELEMENTS 30 µA

POWER RANGE	FREQUENCY BANDS (MHz) 2-30	25-60	50-125	100-250	200-500	400-1000
100 W	—	100A12	100B12	100C12	100D12	100E12
250 W	—	250A12	250B12	250C12	250D12	250E12
500 W	500H12	500A12	500B12	500C12	500D12	500E12
1000 W	1000H12	1000A12	1000B12	1000C12	1000D12	1000E12
2500 W	2500H12	2500A12	2500B12	2500C12	2500D12	2500E12
5000 W	5000H12	5000A12	5000B12	5000C12	5000D12	5000E12
10 kW	10KH12	10KA12	10KB12	10KC12	—	—
25 kW	25KH12	25KA12	25KB12	—	—	—

TABLE 1⅝B — STANDARD ELEMENTS 100 µA

POWER RANGE	FREQUENCY BANDS (MHz) 2-30	25-60	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	3000A1	3000B1	3000C1	3000E1
6000 W	6000H1	—	6000B1	6000C1	6000E1
15 kW	15KH1	—	15KB1	—	—

TABLE 1⅝BB — STANDARD ELEMENTS 30 µA

POWER RANGE	FREQUENCY BANDS (MHz) 2-30	50-125	100-250	400-1000
300 W	300H12	300B12	300C12	300E12
600 W	600H12	600B12	600C12	600E12
1500 W	1500H12	1500B12	1500C12	1500E12
3000 W	3000H12	3000B12	3000C12	3000E12
6000 W	6000H12	6000B12	6000C12	6000E12
15 kW	15KH12	15KB12	—	—

TABLE 1⅝C — STANDARD ELEMENTS 100 µA

POWER RANGE	FREQUENCY BANDS (MHz) 25-60	50-125	100-250
8000 W	8000A1	8000B1	8000C1

ELEMENTS FOR 3⅛" LINE SECTIONS

TABLE 3⅛A — STANDARD ELEMENTS 100 µA

POWER RANGE	FREQUENCY BANDS (MHz) 2-30	25-60	50-125	100-250	200-500	400-1000
100 W	—	—	100B3	100C3	100D3	100E3
250 W	—	—	250B3	250C3	250D3	250E3
500 W	—	500A3	500B3	500C3	500D3	500E3
1000 W	—	1000A3	1000B3	1000C3	1000D3	1000E3
2500 W	2500H3	2500A3	2500B3	2500C3	2500D3	2500E3
5000 W	5000H3	5000A3	5000B3	5000C3	5000D3	5000E3
10 kW	10KH3	10KA3	10KB3	10KC3	10KD3	10KE3
25 kW	25KH3	25KA3	25KB3	25KC3	25KD3	25KE3
50 kW	50KH3	50KA3	50KB3	50KC3	—	—
100 kW	100KH3	—	—	—	—	—

TABLE 3⅛AA — STANDARD ELEMENTS 30 µA

POWER RANGE	FREQUENCY BANDS (MHz) 2-30	25-60	50-125	100-250	200-500	400-1000
100 W	—	100A32	100B32	100C32	100D32	100E32
250 W	—	250A32	250B32	250C32	250D32	250E32
500W	500H32	500A32	500B32	500C32	500D32	500E32
1000 W	1000H32	1000A32	1000B32	1000C32	1000D32	1000E32
2500 W	2500H32	2500A32	2500B32	2500C32	2500D32	2500E32
5000 W	5000H32	5000A32	5000B32	5000C32	5000D32	5000E32
10 kW	10KH32	10KA32	10KB32	10KC32	10KD32	10KE32
25 kW	25KH32	25KA32	25KB32	25KC32	25KD32	25KE32
50 kW	50KH32	50KA32	50KB32	50KC32	—	—
100 kW	100KH32	—	—	—	—	—

TABLE 3⅛B — STANDARD ELEMENTS 100 µA

POWER RANGE	FREQUENCY BANDS (MHz) 50-125	100-250	400-1000
600 W	600B3	600C3	600E3
1500 W	1500B3	1500C3	1500E3
3000 W	3000B3	3000C3	3000E3
6000 W	6000B3	6000C3	6000E3
15 kW	15KB3	15KC3	15KE3
30 kW	30KB3	30KC3	30KE3

TABLE 3⅛BB — STANDARD ELEMENTS 30 µA

POWER RANGE	FREQUENCY BANDS (MHz) 50-125	100-250	400-1000
600 W	600B32	600C32	600E32
1500 W	1500B32	1500C32	1500E32
3000 W	3000B32	3000C32	3000E32
6000 W	6000B32	6000C32	6000E32
15 kW	15KB32	15KC32	15KE32
30 kW	30KB32	30KC32	30KE32

TABLE 3⅛C — STANDARD ELEMENTS 100 µA

POWER RANGE	FREQUENCY BANDS (MHz) 100-250
8000 W	8000C3

Note – transmission line power rating should not be exceeded.

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PLUG-IN ELEMENTS
For 4 1/16" and 6 1/8" Lines

Rigid Line Products

ELEMENTS FOR 4 1/16" LINE SECTIONS

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	10K352
25 kW	25KB52	25KC52	25KE52
50 kW	50KB52	50KC52	—

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	—

ELEMENTS FOR 6 1/8" LINE SECTIONS

TABLE 6 1/8A — STANDARD ELEMENTS 100 µA

POWER RANGE	FREQUENCY BANDS (MHz) 2-30	25-60	50-125	100-250	200-500	400-1000
1000 W	—	1000A6	1000B6	1000C6	1000D6	1000E6
2500 W	—	2500A6	2500B6	2500C6	2500D6	2500E6
5000 W	—	5000A6	5000B6	5000C6	5000D6	5000E6
10 kW	10KH6	10KA6	10KB6	10KC6	10KD6	10KE6
25 kW	25KH6	25KA6	25KB6	25KC6	25KD6	25KE6
50 kW	50KH6	50KA6	50KB6	50KC6	50KD6	50KE6
100 kW	100KH6	100KA6	100KB6	100KC6	—	—
250 kW	250KH6	—	—	—	—	—

TABLE 6 1/8AA — STANDARD ELEMENTS 30 µA

POWER RANGE	FREQUENCY BANDS (MHz) 2-30	25-60	50-125	100-250	200-500	400-1000
250 W	—	250A62	250B62	250C62	250D62	250E62
500 W	—	500A62	500B62	500C62	500D62	500E62
1000 W	1000H62	1000A62	1000B62	1000C62	1000D62	1000E62
2500 W	2500H62	2500A62	2500B62	2500C62	2500D62	2500E62
5000 W	5000H62	5000A62	5000B62	5000C62	5000D62	5000E62
10 kW	10KH62	10KA62	10KB62	10KC62	10KD62	10KE62
25 kW	25KH62	25KA62	25KB62	25KC62	25KD62	25KE62
50 kW	50KH62	50KA62	50KB62	50KC62	50KD62	50KE62
100 kW	100KH62	100KA62	100KB62	100KC62	—	—
250 kW	250KH62	—	—	—	—	—

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

Note – transmission line power rating should not be exceeded.

Phone: 440-248-1200 • Fax: 440-248-5426

TERMALINE®
RF ABSORPTION WATTMETERS
Selection Guide, 60 Watt

Absorption wattmeters were first produced by Bird in 1948 and we continue to refine these instruments.

TERMALINE® Absorption Wattmeters give you the convenience of a combination measuring and terminating unit for servicing 50-ohm systems. These instruments consist of a direct-reading meter and load resistor that dissipates RF power during measurement. Their individual frequency coverage is generally wider than that of directional meters.

Power ratings range from 150 watts to 2500 watts, and are conservative rated. Most of the Models have been purchased under U.S., European or Middle East military standards.

The 6730 Series absorption wattmeters feature a choice of three power ranges selected through a rotary switch.

The 6100 Series wattmeters and load sections are joined with Bird latch connectors which permit easy separation. This feature allows use of the resistor as an independent termination.

Use the Selection Guide below to find the absorption wattmeter best for your needs.

60–150 watts
Pages 39–40

250–2500 watts
Pages 40–41

ABSORPTION WATTMETER SELECTION GUIDE

*FULL SCALE POWER RATING	CALIBRATED FREQUENCY RANGE MHz	POWER SCALES IN WATTS 0.2	0.8	1	2	2.5	3	5	6	10	15	20	25	30	50	60	100	120	150	250	500	MODEL	PAGE
60 W	25–512				•				•			•				•						6104	39
100 W	2–2700			•		•		•		•			•		•		•					6151A	40
150 W	25–1000							•			•				•				•			6154	40
150 W	25–512							•			•				•				•			6156	40
250 W	25–1000									•					•					•		6732B	40
500 W	25–1000												•				•				•	6734B	40
500 W	1.5–35												•				•				•	6734B030	40
RATING	**RANGE MHz**												**50**	**100**	**120**	**250**	**500**	**600**	**1000**	**1200**	**2500**	**MODEL**	**PAGE**
1000 W	25–1000												•			•			•			6736A	41
1000 W	1.5–35												•			•			•			6736-030A	41
1200 W	25–1000														•			•		•		6735-300A	41
2500 W	25–1000													•			•				•	6737A	41
2500 W	1.5–35													•			•				•	6737-030A	41

60 WATT — MODEL 6104

Power Range: 60 W
Power Scales: 2/6/20/60 W
Frequency Range and VSWR: 1.1 max. 25–512 MHz
Accuracy: ±5% of full scale
Connector: Female N
Load Coolant: 0.1 gal (378.5 ml) refined mineral oil

Finish: Gray powder coat
Nominal Size: (includes connector) 9⅝" L × 6⅜" H × 3 5/16" W (244 mm × 162 mm × 100 mm)
Weight: 7 lbs. (3.2 kg)
Meter Housing: Can be detached from load for convenient reading. 3 ft. cable

See our connector adapter kits on page 61.

E-mail: sales@bird-electronic.com • Internet: www.bird-electronic.com

TERMALINE®
RF ABSORPTION WATTMETERS
100, 150, 250, 500 Watt

100 WATT — MODEL 6151A

Power Rating: Up to 100 W depending on element*
Frequency Range: 2–2700 MHz depending on element*
Power Scales: 1/2.5/5/10/25/50/100 W determined by plug-in element*
VSWR: 1.1 max. DC-1000 MHz, 1.25 min. 1000–2300 MHz
Accuracy: ±5% of full scale to 1 GHz, ±8% to 2.3 GHz
Connector: QC type (Female N normally supplied)
Load Coolant: 1 pint (473 ml) refined mineral oil
Finish: Gray powder coat
Nominal Size: 12⅞" L × 6⅜" H × 3¹⁵⁄₁₆" W (326 mm × 162 mm × 100 mm)
Weight: 8 lbs. (3.6 kg)
Elements: Tables 1, 2, 3 on pages 25–26.

*Select plug-in element(s) to suit your frequency and power range.
Do not exceed the power rating of the element or 100 W, whichever is less.

150 WATT — MODELS 6154, 6156

Power Rating: 150 W
Power Scales: 5/15/50/150 W
Frequency Range and VSWR:
6154: 1.1 max. 25–1000 MHz
6156: 1.1 max. 25–512 MHz
Accuracy:
6154: ±5% of full scale 25–512 MHz, ±10% of full scale 512–1000 MHz
6156: ±5% of full scale 25–512 MHz
Connector: Female N
Load Coolant: 0.1 gal (378.5 ml) refined mineral oil
Finish: Gray powder coat
Nominal Size: (includes connector) 12⁵⁄₃₂" L × 6⅜" H × 3¹⁵⁄₁₆" W (309 mm × 162 mm × 100 mm)
Weight: 8 lbs. (3.6 kg)
Meter Housing: Separates from load for convenient reading. 3 ft. cable.

250 WATT — MODEL 6732B

Power Rating: 250 W
Power Scales: 10/50/250 W
Frequency Range and VSWR:
1.1 max. 25–1000 MHz
Accuracy: ±5% of full scale 25–512 MHz, ±10% of full scale 512–1000 MHz
Connector: QC type (Female N normally supplied)
Load Coolant: 0.35 gal. (1.3 liters) silicone oil
Finish: Gray powder coat
Nominal Size: Load 12⅝" L × 8½" W × 5¹⁵⁄₁₆" H (321 mm × 216 mm × 151 mm); Meter 5⅞" H × 3⅝" W × 3¹⁵⁄₁₆" D , (149 mm × 92 mm × 100 mm)
Weight: 13 lbs., 11 oz. (6.2 kg)
Meter: Separates from load for convenient reading. 4 ft. cable.

500 WATT — MODELS 6734B, 6734B030

Power Rating: 500 W
Power Scales: 25/100/500 W
Frequency Range and VSWR:
6734B: 1.15 max. 25–1000 MHz
6734B030: 1.15 max. 1.5–35 MHz
Accuracy:
6734B: ±5% of full scale, 25–512 MHz, ±10% of full scale, 512–1000 MHz
6734B030: ±10% of full scale, 1.5–35 MHz
Connector: QC type (Female N normally supplied)
Load Coolant: 0.9 gal. (3.4 liters) refined mineral oil
Finish: Gray powder coat
Nominal Size: Load 19¹⁵⁄₁₆"L × 8½"H × 5-15/16"W (506 mm x 216 mm × 151 mm); Meter 5⅞" H × 3⅝" W × 3¹⁵⁄₁₆" D, (149 mm × 92 mm × 100 mm)
Weight: 23 lbs., 11 oz. (10.6 kg)
Meter: Separates from load for convenient reading. 4 ft. cable.

Bird oil-dielectric wattmeters have never been and are not now manufactured with Poly Chlorinated Biphenyls (PCBs).

Phone: 440-248-1200 • **Fax:** 440-248-5426

1000 WATT — MODELS 6736A, 6736-030A

Power Rating: 1000 W
Power Scales: 50/250/1000 W
Frequency Range and VSWR:
6736A: 1.15 max. 25–1000 MHz
6736-030A: 1.15 max.1.5–35 MHz
Accuracy:
6736A: ±5% of full scale, 25–512 MHz, ±10% of full scale, 512–1000 MHz
6736-030A: ±10% of full scale, 2–32 MHz
Connector: QC type (Female LC normally supplied and Female N supplied unmounted)

Load Coolant: 1.1 gal. (4.1 liters) silicone oil
Finish: Gray powder coat
Nominal Size: Load 21" L × 8½" H × 5 15/16"W (533 mm x 216 mm x 151 mm); Meter 5 9/16" H × 6½" W × 3 11/32" D, (141 mm × 165 mm × 85 mm)
Weight: 6736A: 30 lbs. (13.5 kg), 6736-030A: 30.5 lbs. (13.7 kg)
Meter: Separates from load for convenient reading. 4 ft. cable.

1200 WATT — MODEL 6735-300A

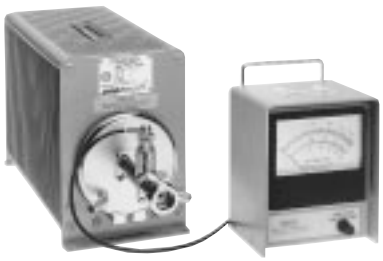
Power Rating: 1200 W for ½ hour, 1000 W continuous
Power Scales: 120/600/1200 W
Frequency Range and VSWR: 1.15 max. 25–1000 MHz
Accuracy: ±5% of full scale 25–512 MHz, ±10% of full scale 512–1000 MHz
Connector: QC type (Female LC normally supplied, and Female N supplied unmounted)

Load Coolant: 2.9 gal. (11 liters) refined mineral oil
Finish: Gray powder coat
Nominal Size: Load 21½" L × 17 3/16" H × 7" W (546 mm × 437 mm × 178 mm); Meter 5 9/16" H × 6½" W × 3 11/32" D, (141 mm × 165 mm × 85 mm)
Weight: 63 lbs. (28.4 kg)
Meter: Separates from load for convenient reading. 4 ft. cable.

2500 WATT — MODELS 6737A, 6737-030A

Power Rating: 2500 W continuous with water cooling, 200 W without.
Power Scales: 100/500/2500 W
Frequency Range and VSWR:
6737A: 1.15 max. 25–1000 MHz
6737-030A: 1.15 max. 1.5–35 MHz
Accuracy:
6737A: ±5% of full scale, 25–512 MHz ±10% of full scale, 512–1000
6737-030A: ±10% of full scale, 2–32 MHz
Connector: QC type (Female LC normally supplied)
Load Coolant: 0.9 gal. (3.4 liters) refined mineral oil, water cooled
Water Connections: ⅜" tubing to accept rubber hose

Flow Rate: ½ gpm (2 liters/min)
Operating Position: Vertical - connector down above 200 W when water cooled
Finish: Gray powder coat
Nominal Size: Load 20 13/16" L × 8½" H × 5 15/16" W (529 mm × 216 mm × 151 mm); Meter 5 9/16" H × 6½" W × 3 11/32" D, (141 mm × 165 mm × 85 mm)
Weight: 6737A 33 lbs. (14.9 kg), 6737-030A 33.5 lbs. (15.1 kg)
Meter: Separates from load for convenient reading. 4 ft. cable.



Bird oil-dielectric wattmeters have never been and are not now manufactured with Poly Chlorinated Biphenyls (PCBs).

TERMALINE®
RF COAXIAL TERMINATIONS
Product Selection Guide and Model Number Definition

TERMINATION SELECTION GUIDE

POWER RATING (CW)	MODEL/SERIES AND INPUT CONNECTOR CHOICES†	DIELECTRIC MEDIUM	COOLING METHOD	SEE PAGE
2 W	2-T Series BNC (F), BNC (M), N (F), N (M), TNC (F), TNC (M)	Air	Convection	43
5 W	5-T Series BNC (F), BNC (M), N (F), N (M), TNC (F), TNC (M)	Air	Convection	43
10 W	10-T Series BNC (F), BNC (M), N (F), N (M), TNC (F), TNC (M)	Air	Convection	43
25 W	25-T Series BNC (F), BNC (M), N (F), N (M), TNC (F), TNC (M)	Air	Convection	43
25 W	25-CT Series SMA (M), DMA (M)	Air	Conduction	43
50 W	50-T Series BNC (F), BNC (M), N (F), N (M), TNC (F), TNC (M)	Air	Convection	44
50 W	50-CT Series SMA (M), SMA (M)	Air	Conduction	44
75 W	75-T Series BNC (F), BNC (M), N (F), N (M), TNC (F), TNC (M)	Air	Convection	44
100 W	100-T Series BNC (F), BNC (M), IEC 7/16 (F), IEC 7/16 (M), N (F), N (M), TNC (F), TNC (M)	Air	Convection	44
100 W	100-CT Series SMA (F), SMA (M)	Air	Conduction	44
150 W	150-T Series BNC (F), BNC (M), IEC 7/16 (F), IEC 7/16 (M), N (F), N (M), TNC (F), TNC (M)	Air	Convection	45
150 W	150-CT Series BNC (F), BNC (M), N (F), N (M), SMA (F), SMA (M), TNC (F), TNC (M)	Air	Conduction	45
150 W	8135 QC N (F)	Oil	Convection	45
250 W	250-CT Series BNC (F), BNC (M), N (F), N (M), SMA (F), SMA (M), TNC (F), TNC (M).	Air	Conduction	45
250 W	8141 QC N (F)	Oil	Convection	45
300 W	300-T Series BNC (F), BNC (M), IEC 7/16 (F), IEC 7/16 (M), N (F), N (M), TNC (F), TNC (M)	Air	Convection	46
300 W	8072A-1 N (F)	Air	Conduction (needs heatsink)	46
500 W	500-CT Series BNC (F), BNC (M), N (F), N (M), SMA (F), SMA (M), TNC (F), TNC (M). For IEC 7/16, specify 500-CT-FE1 for IEC 7/16 (F), or 500-CT-ME1 for IEC 7/16 (M)	Air	Conduction	46
500 W	8201 QC N (F)	Oil	Convection	46
600 W	8401 QC N (F)	Oil	Convection	47
600 W	8431 SQC N (F) 500 W in horizontal position	Air	Convection	46
1 kW	8251 QC LC (F), N (F) unmounted	Oil	Convection	47
1 kW	8833-300 QC LC (F), N (F) unmounted	Oil	Convection	47
1 kW	8710 Series N (F,M); C (F,M); 7/8" EIA Flg.	Air	Water (tap)	49
1.5 kW	8860 Series QC LC (F); 1 5/8" and 3 1/8" Unflg. or EIA Flg.	Oil	Convection	47
2.5 kW	8230 Q LC (F); 200 W without water cooling	Oil	Water (tap)	47
2.5 kW	8890-300 Series QC LC (F); 1 5/8" and 3 1/8" Unflg. or EIA Flg.	Oil	Convection	48
5 kW	8890-300 Series plus BA-300 blower 1 1/4 kW with blower turned off, connectors as above	Oil	Forced Air	48
5 kW	8890-315, –320 Series assembly, connectors as above	Oil	Forced Air	48
5 kW	8720, 8726 1 5/8" EIA Flg., QC LC (F)	Air	Water (tap)	50
5 kW	8921 Series QC LC (F), 1 5/8" EIA Flg., 3 1/8" Unflg. or EIA Flg.	Oil	Convection	49
10 kW	8931-115, –230 Series QC LC (F), 1 5/8" EIA Flg., 3 1/8" Unflg. or EIA Flg.	Oil	Forced Air	49
10 kW	8730 Series 1 5/8" EIA Flg., 3 1/8" Unflg. or EIA Flg.	Air	Water (tap)	50
10 kW	8631-115, –230 1 5/8 EIA Flg., 3 1/8" EIA Flg., 3 1/8" Unflg.	Air	Water/Forced Air	51
10 kW	8578 Series 1 5/8 EIA Flg., 3 1/8" Unflg.	Air	Forced Air	52
15 kW	8578 Series 1 5/8 EIA Flg., 3 1/8" Unflg.	Air	Forced Air	52
20 kW	8745/46 3 1/8" EIA Flg., 3 1/8" Unflg.	Air	Water (tap)	50
25 kW	8572A/73A-115-6, –230-5 3 1/8" EIA Flg., 3 1/8" Unflg.	Air	Forced Air	53
25 kW	8645-115, –230 3 1/8" EIA Flg., 3 1/8" Unflg.	Air	Water/Forced Air	51
30 kW	8755/56 3 1/8" EIA Flg., 3 1/8" Unflg.	Air	Water (tap)	50
40 kW	8765/76 3 1/8" EIA Flg., 3 1/8" Unflg.	Air	Water (tap)	51
50 kW	8775/76 3 1/8" EIA Flg., 3 1/8" Unflg.	Air	Water (tap)	51
50 kW	8655/56-115, -230 3 1/8" EIA Flg., 3 1/8" Unflg.	Air	Water/Forced Air	52
80 kW	8792/93 6 1/8" EIA Flg., 6 1/8" Unflg.	Air	Water (tap)	51

† Where QC quick-change or SQC small quick-change connectors are shown, the type listed is normally supplied when no other is specified. For other choices, see page 60.

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

*** Termination Model Number Definition:**

100 – T – FN

Power Rating (Watts)

Product Type
T – Convection-colled Termination
CT – Conduction-cooled Termination

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

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2 WATT — 2-T SERIES*

Power Rating:
2 W max. @ 40°C
2.4 W max. @ 25°C
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)

Impedance: 50 ohms, nominal
Ambient Temperature Range: –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 × 0.8" Dia., (40.7 mm × 20.4 mm)
Weight: 1.9 oz. (55 g)

5 WATT — 5-T SERIES*

Power Rating:
5 W max. @ 40°C
6 W max. @ 25°C
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)

Impedance: 50 ohms, nominal
Ambient Temperature Range: –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 × 0.8" Dia., (40.7 mm × 20.4 mm)
Weight: 1.9 oz. (55 g)

10 WATT — 10-T SERIES*

NEW

Power Rating:
10 W max. @ 40°C
12 W max. @ 25°C
Connectors: BNC, N, TNC
Frequency Range and VSWR:
DC to 1 GHz at 1.10:1 max.
1 GHz to 4 GHz at 1.25:1 max.
Impedance: 50 ohms, nominal

Ambient Temperature Range: –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 × 2.3" Dia., (50.8 mm × 58.5 mm)
Weight: 5.1 oz. (146 g)

25 WATT — 25-T SERIES*

NEW

Power Rating:
25 W max. @ 40°C
30 W max. @ 25°C
Connectors: BNC, N, TNC
Frequency Range and VSWR:
DC to 1 GHz at 1.10:1 max.
1 GHz to 4 GHz at 1.25:1 max.
Impedance: 50 ohms, nominal

Ambient Temperature Range: –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 × 2.3" Dia., (119.4 mm × 58.5 mm)
Weight: 10.7 oz. (305 g)

25 WATT — 25-CT-FA, 25-CT-MA

NEW

Power Rating:** 25 W max. @ 100°C flange temperature, derated to 0 W @ 150°C.
Frequency Range and VSWR:
DC to 1 GHz at 1.15:1 max.
1 GHz to 3 GHz at 1.25:1 max.
Connectors: SMA
Coolant: Dry (Conduction cooled)
Operating Position: Any

Impedance: 50 ohms, nominal
Finish: Silver or Tri-alloy plated
Nominal Size (includes connector): 0.9" L × 1.0" W × 0.5" H, (22.9 mm × 25.4 mm × 12.7 mm)
Base to Connector Centers: 0.25" (6.4 mm)
Mounting Centers: 0.614" (15.6 mm)
Weight: 0.4 oz. (11.4 g)

* See page 42 for a Model Number Definition that instructs you how to order the correct part.
** When mounted to a suitable heatsink capable of maintaining a 100°C flange temperature.

TERMALINE
RF COAXIAL TERMINATIONS®
Dry- and Oil-Dielectric Loads

NEW

50 WATT — 50-T SERIES*

Power Rating:
50 W max. @ 40°C
60 W max. @ 25°C
Connectors: BNC, N, TNC
Frequency Range and VSWR:
DC to 1 GHz at 1.10:1 max.
1 GHz to 4 GHz at 1.25:1 max.
Impedance: 50 ohms, nominal

Ambient Temperature Range: –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 × 2.3" Dia., (119.4 mm × 58.5 mm)
Weight: 1.13 lb. (0.52 kg)

NEW

50 WATT — 50-CT-FA, 50-CT-MA

Power Rating:** 50 W max. @ 100°C flange temperature, derated to 0 W @ 150°C
Frequency Range and VSWR: DC to 3 GHz at 1.15:1 max. 3 GHz to 6 GHz at 1.25:1 max.
Connectors: SMA
Coolant: Dry (Conduction cooled)
Operating Position: Any
Impedance: 50 ohms, nominal

Finish: Silver or Tri-alloy plated
Nominal Size (includes connector): 0.86" L × 0.75" W × 0.39" H, (21.9 mm × 19.2 mm × 10.0 mm)
Base to Connector Center: 0.162"(4.12 mm)
Mounting Centers: 0.52" (13.3 mm)
Weight: 1.1 oz.. (31.2 g)

NEW

75 WATT — 75-T SERIES*

Power Rating:
75 W max. @ 40°C
90 W max. @ 25°C
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.
Impedance: 50 ohms, nominal

Ambient Temperature Range: –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 × 2.3" Dia., (170.2 mm × 58.5 mm)
Weight: 1.575 lbs. (0.72 kg)

100 WATT — 100-T SERIES*

Power Rating: 100 W max. @ 40°C
120 W max. @ 25°C
Connectors: BNC, IEC 7/16, N, TNC
Frequency Range and VSWR:
DC to 1 GHz at 1.10:1 max.
1 GHz to 2.4 GHz at 1.25:1 max.
Impedance: 50 ohms, nominal
Ambient Temperature Range: –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): $6\frac{13}{32}$" H × $2\frac{1}{4}$" W × $6\frac{13}{16}$" D, (162.6 mm × 66.1 mm × 172.8 mm)
Weight: 3.6 lbs. (1.64 kg)

NEW

100 WATT — 100-CT-FA, 100-CT-MA

Power Rating:** 100 W max. @ 100°C flange temperature, derated to 0 W @ 150°C
Frequency Range and VSWR: DC to 2 GHz at 1.15:1 max. 2 GHz to 3 GHz at 1.25:1 max.
Connectors: SMA
Coolant: Dry (Conduction cooled)
Operating Position: Any
Impedance: 50 ohms, nominal

Finish: Silver or Tri-alloy plated
Nominal Size (includes connector): 1.34" L × 1.375" W × 0.56" H, (34.1 mm × 35.0 mm × 14.3 mm)
Base to Connector Center: 0.26" (6.6 mm)
Mounting Centers: 0.625" × 1.125" (15.9 mm × 28.6 mm)
Weight: 1.0 oz. (28.4 g)

* See page 42 for a Model Number Definition that instructs you how to order the correct part.
** When mounted to a suitable heatsink capable of maintaining a 100°C flange temperature.

Phone: 440-248-1200 • Fax: 440-248-5426

150 WATT — 150-T SERIES*

Power Rating: 150 W max @ 40°C
180 W max @ 25°C
Connectors: N, TNC, BNC, 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.
Impedance: 50 ohms, nominal
Ambient Temperature Range:
–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):
11 15/16" H × 2 5/8" W × 6 13/16" D,
(302 mm × 66 mm × 173 mm)
Weight: 6.0 lbs. (2.73 kg.)

150 WATT — 150-CT SERIES*

NEW

Power Rating:** 150 W max @ 100°C flange temperature, derated to 0 W @150°C
Frequency Range and VSWR: DC to 1 GHz at 1.10:1 max. 1 GHz to 2.4 GHz at 1.25:1 max.
Connectors: N, BNC, TNC, SMA
Coolant: Dry (conduction cooled)
Operating Position: Any
Impedance: 50 ohms, nominal

Finish: Silver or Tri-alloy plated
Nominal Size (with N connector):
1.86" L × 1.25" W × 1.062" H,
(47.3 mm × 31.8 mm × 27.0 mm)
Base to Connector Center: 0.531" (13.5 mm)
Mounting Centers: 0.575" × 0.825"
(14.6 mm × 21.0 mm)
Weight (with N connector): 2.2 oz. (62.5 g)

150 WATT — MODEL 8135

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 Temperature Range: –40˚C to +45˚C
Connector: QC type
(Female N normally supplied)

Load Coolant: 0.1 gal. (380 ml) refined mineral oil
Operating Position: Horizontal only
Finish: Gray powder coat
Nominal Size: (includes connector)
9 1/2" L × 6 11/32" H × 3 15/16" W
(241 mm × 161 mm × 100 mm)
Weight: 6 lbs. (2.7 kg)

250 WATT — 250-CT SERIES*

NEW

Power Rating:** 250 W max. @ 100°C flange temperature, derated to 0 W @ 150°C
Frequency Range and VSWR:
SMA: DC to 2 MHz at 1.15:1 max.
2 MHz to 3 MHz @ 1.25:1 max.
All Others: DC to 1 MHz @ 1.15:1 max.
1 MHz to 2.4 MHz @ 1.25:1 max.
Connectors: N, BNC, TNC, SMA
Coolant: Dry (conduction cooled)
Operating Position: Any

Impedance: 50 ohms, nominal
Finish: Silver or tri-alloy plated
Nominal Size (with N connector):
2.36" L × 2.00" W × 1.062" H,
(60.0 mm × 50.8 mm × 27.0 mm)
Base to Connector Center: SMA: 0.26" (6.6 mm) **N:** 0.515" (13.1 mm)
Mounting Centers: 0.875" × 1.625" (22.3 mm × 41.3 mm)
Weight: (with N connector): 5.2 oz. (147.6 g)

Note: Model 250-CT-FA shown; 250-CT-FN is identical in appearance to 500-CT-FN

250 WATT — MODEL 8141

Power Rating: 250 W continuous
Frequency Range and VSWR:
DC to 1 GHz at 1.1 max.
1 to 1.8 GHz at 1.2 max.
1.8 to 2.5 GHz at 1.3 max.
Ambient Temperature Range:
–40˚C to +45˚C
Connector: QC type
(Female N normally supplied)

Load Coolant: 0.35 gal. (1.3 liters) silicone oil
Operating Position: Horizontal only
Finish: Gray powder coat
Nominal Size: (includes connectors)
9 9/16" L × 8 1/2" H × 5 15/16" W
(243 mm × 216 mm × 151 mm)
Weight: 10 lbs. (4.5 kg)

* See page 42 for a Model Number Definition that instructs you how to order the correct part.
** When mounted to a suitable heatsink capable of maintaining a 100°C flange temperature.

TERMALINE®
RF COAXIAL TERMINATIONS
Dry- and Oil-Dielectric Loads

300 WATT — 300-T SERIES*

Power Rating: 300 W max @ 40°C
360 W max @ 25°C
Connectors: N, TNC, BNC, 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.
Impedance: 50 ohms, nominal
Ambient Temperature Range:
–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 15/16" H × 5 13/32" W × 6 13/16" D,
(276.9 mm × 137.2 mm × 172.8 mm)
Weight: 11.5 lbs. (5.23 kg.)

300 WATT — MODEL 8072A-1

Power Rating: 300 W continuous when attached to suitable heat sink
Connectors: N Female normally supplied
Frequency Range and VSWR:
DC to 800 MHz at 1.10:1 max.
800 to 1500 MHz at 1.20:1 max.
1500 to 2500 MHz at 1.30:1 max.
Impedance: 50 ohms, nominal
Ambient Temperature Range: –40°C to +45°C

Heat Sink Required: 800 Sq. Inch Plate × 1/8" or equivalent (5200 cm² × 3 mm)
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 25/64" L × 2" W × 1 1/32" H
(110 mm × 51 mm × 26 mm)
Weight: 12 oz. (340 g.)

NEW

500 WATT — 500-CT SERIES*

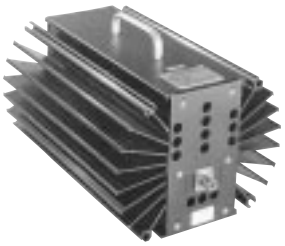
Power Rating:** 500 W max. @ 100°C flange temperature, derated to 0 W @ 150°C
Frequency Range and VSWR:
DC to 1 GHz at 1.10:1 max.
Connector: N, BNC, TNC, SMA, or IEC 7/16
Coolant: Dry (conduction cooled)
Operating Position: Any
Impedance: 50 ohms, nominal
Finish: Silver or tri-alloy plated

Nominal Size (includes connector):
N: 2.36" L × 2.00" W × 1.062" H,
(60.0 mm × 50.8 mm × 27.0 mm)
IEC 7/16: 2.80" L × 2.00" W × 1.20" H,
(71.2 mm × 50.8 mm × 30.5 mm)
Base to Connector Center: N: 0.515"
(13.1 mm) **IEC 7/16:** 0.675" (17.2 mm)
Mounting Centers: 0.875" × 1.625"
(22.3 mm × 41.3 mm)
Weight: N: 8.2 oz. (232.9 g)
IEC 7/16: 6.0 oz. (170.3 g)

500 WATT — MODEL 8201

Power Rating: 500 W continuous
Frequency Range and VSWR:
DC to 1 GHz at 1.1 max.
1 to 2.5 GHz at 1.25 max.
Ambient Temperature Range:
–40°C to +45°C
Connector: QC type
(Female N normally supplied)

Load Coolant: 0.9 gal. (3.42 liters) refined mineral oil
Operating Position: Horizontal only
Finish: Gray powder coat
Nominal Size: (includes connectors)
16 13/16" L × 8 1/2" H × 5 15/16" W
(427 mm × 216 mm × 151 mm)
Weight: 21 lbs. (9.5 kg)



600 WATT (DRY) — MODEL 8431

Power Rating:
600 W continuous, vertical
500 W continuous, horizontal
Connectors: SQC Type
(Female N normally supplied)
Frequency Range and VSWR:
DC to 1 GHz at 1.10:1 max.
1 GHz to 2.5 GHz at 1.25:1 max.
Impedance: 50 ohms, nominal

Ambient Temperature Range:
–40°C to +45°C
Operating Position: Horizontal or vertical
Coolant: Dry (Convection cooled)
Finish: Black powder coat with anodized fins.
Nominal Size: (with N-type connector):
9 5/16" H × 8 1/2" W × 13 5/16" D,
(235 mm × 216 mm × 336 mm)
Weight: 13 lbs (5.91 kg.)

* See page 42 for a Model Number Definition that instructs you how to order the correct part.
** When mounted to a suitable heatsink capable of maintaining a 100°C flange temperature.

Phone: 440-248-1200 • Fax: 440-248-5426

600 WATT — MODEL 8401

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

1 kW — MODEL 8251

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

1 kW — MODEL 8833-300

Power Rating: 1000 W continuous
Frequency Range and VSWR:
DC to 1 GHz at 1.1 max.
1 to 2.5 GHz at 1.25 max.
Ambient Temperature Range: –40˚C to +45˚C
Connector: QC type (Female LC normally supplied) Female N supplied unmounted
Load Coolant: 2.9 gal. (11 liters) refined mineral oil
Operating Position: Horizontal only
Finish: Gray powder coat
Nominal Size: (with connectors)
23 1/8" L × 17 3/16" H × 7 1/8" W
(587 mm × 437 mm × 181 mm)
Weight: 54 lbs., 10 oz. (24.8 kg)

1.5 kW — MODEL 8860 SERIES

Power Rating: 1500 W continuous
Frequency Range and VSWR:
DC to 1 GHz at 1.1 max.
1 to 2.0 GHz at 1.25 max.
Ambient Temperature Range: –40˚C to +45˚C
Load Coolant: 1.5 gal. (5.68 liters) silicone oil
Operating Position: Horizontal only
Finish: Gray powder coat
Nominal Size: 7 1/2"W × 13 1/8"H
(184 mm × 333 mm)

MODEL	CONNECTOR	OVERALL LENGTH	WEIGHT
8860	QC-LC(F)	17 1/8" (445 mm)	30 lbs. (13.6 kg)
8861	1 5/8" Unflg.	17 7/8" (454 mm)	31 lbs. (14.1 kg)
8862	1 5/8" EIA flg.	17 1/8" (445 mm)	31 lbs. (14.1 kg)
8863	3 1/8" Unflg.	18 5/8" (473 mm)	32 lbs. (14.5 kg)
8864	3 1/8" EIA flg.	19 1/2" (495 mm)	32 lbs. (14.5 kg)

2.5 kW (WATER COOLED) — MODEL 8230

Power Rating: With cooling water: 2500 W
Without cooling water: 200 W in vertical position, 500 W in horizontal position
Frequency Range and VSWR:
DC to 1 GHz at 1.1 max.
1 to 2.5 GHz at 1.25 max.
Ambient Temperature Range: –40˚C to +45˚C
Water Temperature Range: +8˚C to +80˚C
Water Flow Rate: 1/2 gal./minute
(2 liters/minute) min.
Connector: QC type (Female LC normally supplied)
Load Coolant: 0.9 gal. (3.4 liters) refined mineral oil
Operating Position: Vertical, connector down (when water cooled)
Finish: Gray powder coat
Nominal Size: (with connectors)
17 23/32" L × 8 1/2" H × 5 15/16" W
(450 mm × 216 mm × 151 mm)
Weight: 27 lbs. (12 kg)

TERMALINE®
RF COAXIAL TERMINATIONS
Oil-Dielectric Loads

MODEL 8890-300 (left)
MODEL 8891-300 (right)
with BA-300-115

2.5 kW AND 5 kW — 8890 SERIES

The 8890 Series is rated at 2.5 kW with convection cooling or 5 kW with the BA-300 forced-air cooling option. Both configurations can be ordered with an optional Overload Thermoswitch (P/N 8890-008) or with two thermoswitches for "standby service" as a reject load for dual transmitter systems.

With dual thermoswitches, one normally open switch closes to activate the blower when power is applied to the load and coolant temperature rises, as when one transmitter fails. The second normally closed switch, is an over-temperature interlock safety switch. For completely assembled and wired dual thermoswitch units, order 8890/91/92/95/97/98-315 for 115 Vac, 50/60 Hz units, or 8890/91/92/95/97/98-320 for 230 Vac, 50/60 Hz units.

2.5 kW — 8890-300 SERIES

Power Rating: 2500 W continuous
Frequency Range and VSWR:
DC to 1 GHz at 1.1 max.
1 to 2 GHz at 1.25 max.
2 to 2.4 GHz at 1.3 max.
Impedance: 50 ohms nominal
(8896-300 51.5 ohms nominal)
Ambient Temperature Range: –40˚C to +45˚C
Load Coolant: 2.9 gal. (11 liters) silicon oil
Operating Position: Horizontal only
Finish: Gray powder coat
Nominal Size: 7" W × 17 3/16" H
(178 mm × 547 mm). See table for length.

MODEL	CONNECTOR	RECESS (IN.)	OVERALL LENGTH	WEIGHT
8890-300	QC-LC(F)	—	23 1/8" (587 mm)	57 lbs. (26 kg)
8892-300	1 5/8" EIA Flg.	0.625	23 1/8" (587 mm)	58 lbs. (26 kg)
8895-300	1 5/8" Unflg.	0.438	22 3/16" (564 mm)	58 lbs. (26 kg)
8891-300	3 1/8" EIA Flg.	0.922	25 1/8" (638 mm)	59 lbs. (27 kg)
8896-300 (51.5 Ω)	3 1/8" Unflg.	0.0	24 5/32" (626 mm)	59 lbs. (27 kg)
8897-300	3 1/8" Unflg.	0.0	24 5/32" (626 mm)	59 lbs. (27 kg)
8898-300	3 1/8" Unflg.	0.688	24 5/32" (636 mm)	59 lbs. (27 kg)

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

5 kW — 8890-300 SERIES WITH BA-300-115, -230

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 to 2 GHz at 1.25 max.
2 to 2.4 GHz at 1.3 max.
Impedance: 50 ohms nominal
(8896-300 51.5 ohms nominal)
Ambient Temperature Range:
–40˚C to +45˚C
Load Coolant: 2.9 gal. (11 liters) silicone oil
Operating Position: Horizontal only
Finish: Gray powder coat
Nominal Size: 7 3/8" W × 22 11/16" H
(187 mm × 560 mm). See table for length.
Blower AC Power:

Model BA-300-115: 115 Vac, 50/60 Hz, 0.6 A
Model BA-300-230: 230 Vac, 50/60 Hz, 0.3 A

MODEL	CONNECTOR	RECESS (IN.)	OVERALL LENGTH	WEIGHT
8890-300 with BA-300***	QC-LC(F)	—	23 1/8" (587 mm)	70 lbs. (32 kg)
8892-300 with BA-300***	1 5/8" EIA Flg.	0.625	23 1/8" (587 mm)	72 lbs. (33 kg)
8895-300 with BA-300***	1 5/8" Unflg.	0.438	22 3/16" (564 mm)	72 lbs. (33 kg)
8891-300 with BA-300***	3 1/8" EIA Flg.	0.922	25 1/8" (638 mm)	73 lbs. (33 kg)
8896-300 with BA-300***	3 1/8" Unflg.	0.0	24 5/32" (614 mm)	73 lbs. (33 kg)
8897-300 with BA-300***	3 1/8" Unflg.	0.0	24 5/32" (614 mm)	73 lbs. (33 kg)
8898-300 with BA-300***	3 1/8" Unflg.	0.688	24 5/32" (614 mm)	73 lbs. (33 kg)

NOTE: Overload thermoswitch P/N 8890-008 is optional. Free assembly when ordered as a package.
*** Specify –115 for 115 Vac Blower or –230 for 230 Vac blower.

Bird oil-dielectric load resistors have never been and are not now manufactured with Poly Chlorinated Biphenyls (PCBs).

Phone: 440-248-1200 • **Fax:** 440-248-5426

5 kW OIL DIELECTRIC — 8921 SERIES

Power Rating: 5000 W continuous
Frequency Range and VSWR:
DC to 1 GHz at 1.1 max.
Ambient Temperature Range: –40˚C to +45˚C
Load Coolant: 6⅔ gals. (25.3 liters) silicone oil
Operating Position: Horizontal only
Finish: Gray powder coat
Nominal Size: 9½" W × 25 13/16" H (241 mm × 656 mm). See table for length.

MODEL	CONNECTOR	OVERALL LENGTH	WEIGHT
8921	QC-LC(F)	30 27/32" (783 mm)	119 lbs. (54 kg)
8922	1⅝" EIA flg.	30 27/32" (783 mm)	121 lbs. (55 kg)
8926	3⅛" EIA flg.	32¾" (832 mm)	126.5 lbs. (57 kg)
8927	3⅛" Unflg.	31⅞" (809 mm)	126 lbs. (57 kg)

NOTE: An 8890-008 over-temperature interlock safety switch is included.

10 kW OIL DIELECTRIC — 8931-115, -230 SERIES

Power Rating: 10 kW continuous
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
Load Coolant: 6⅔ gals. (25.3 liters) silicone oil
Operating Position: Horizontal only
Finish: Gray powder coat
Nominal Size: 9½" W × 33 5/16" H (241 mm × 821 mm). See table for length.

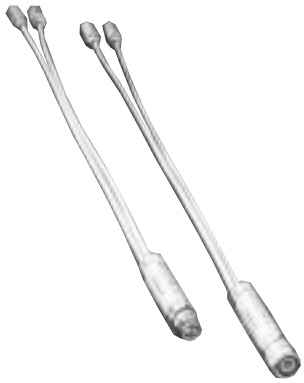
MODEL	CONNECTOR	OVERALL LENGTH	WEIGHT
8931-***	QC-LC(F)	30 7/32" (768 mm)	135 lbs. (61 kg)
8932-***	1⅝" EIA flg.	30 7/32" (768 mm)	137 lbs. (62 kg)
8936-***	3⅛" EIA flg.	32⅛" (816 mm)	142.5 lbs. (64.8 kg)
8937-***	3⅛" Unflg.	31¼" (793 mm)	142 lbs. (64.5 kg)

NOTE: Both an 8892-333 blower control switch and an 8890-017 over-temperature interlock safety switch are included.
*** AC power 115 or 230 Vac, 50/60 Hz (add suffix –115 or –230 to Model number)

1 kW DIRECT WATER COOLED — 8710 SERIES

Power Rating: 1000 W continuous
Frequency Range and VSWR:
DC to 1 GHz at 1.10 max.
1 to 3 GHz at 1.3 max.
3 to 3.5 GHz at 1.35 max.
Water Temperature Range: +8˚C to +80˚C
Water Flow Rate: 1 quart/minute @ 8°C to 3qpm @ 80°C (0.95 liters/minute @ 8°C to 2.84 lpm @ 80°C)
Connectors: Waterlines ⅛" FPT
Model 8710F (N Female)
Model 8710M (N Male)
Model 8711F (C Female)
Model 8711M (C Male)
Model 8713 ⅞" EIA Flg.

Load Coolant: Potable water
Operating Position: Any
Finish: Silver plated
Nominal Size: (excl. 18" waterlines) 3 21/32" × 11/16" Dia., (93 mm × 17 mm)
Weight: Models 8710, 8711 5 oz. (142 g), Model 8713 14 oz. (397 g)

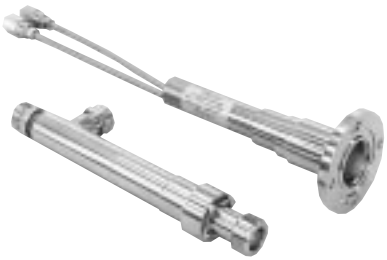


MODEL 8711 (LEFT)
MODEL 8710 (RIGHT)

Bird oil-dielectric load resistors have never been and are not now manufactured with Poly Chlorinated Biphenyls (PCBs).

TERMALINE®
RF COAXIAL TERMINATIONS
Direct Water-Cooled Loads

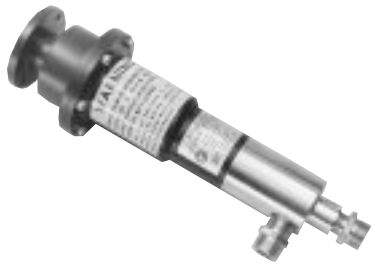
5 kW DIRECT WATER COOLED — MODELS 8720, 8726



MODEL 8720 (top)
MODEL 8726 (bottom)

Power Rating: 5 kW continuous
Frequency Range and VSWR:
Model 8720: DC to 500 MHz 1.1 max., 500 to 900 MHz 1.15 max., 900 to 2000 MHz 1.25 max.
Model 8726: DC to 500 MHz 1.1 max., 500 to 2000 MHz 1.25 max.
Water Temperature Range: +5˚C to +80˚C
Water Flow Rate: 1 gal./minute @ 5°C to 4gpm @ 80°C (3.8 liters/minute @ 5°C to 15.21 lpm @ 80°C)
Connectors: Waterlines ½" FPT (8720) or ¾" hose (8726)
Model 8720 1⅝" EIA Flg.
Model 8726 QC type
(Female LC normally supplied)
Load Coolant: Potable water
Operating Position: Any
Finish: Bright nickel plated
Nominal Size: (excl. 8" waterlines)
Model 8720, 8 1/32" × 1⅝" Dia., (204 mm × 41 mm). Input Flg. 3½" Dia.
Model 8726, 8⅞" × 1⅝" Dia., (225 × 41 mm)
Weight: Model 8720: 2 lbs. (900 g)
Model 8726: 2½ lbs. (1.1 kg)

10 kW ECONOLOAD® — MODELS 8730A, 8731, 8738A



Power Rating: 10 kW continuous
Frequency Range and VSWR:
Model 8731, 1.1 max. 1 kHz to 1 GHz (DC for continuity checks)
Models 8730A and 8738A, 1.1 max. DC to 1 GHz
Water Temperature 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)
Connectors: Waterlines ½" FPT or ¾" hose
Model 8730A, 1⅝" EIA Flg.
Model 8731, 3⅛" EIA Flg.
Model 8738A, 3⅛" Unflg. (Flush)
Load Coolant: Potable water
Operating Position: Any
Finish: Black powder coat
Nominal Size: 14¾" × 2¾" Dia., (375 mm × 70 mm). Input Flg.
Model 8730, 3½" Dia., (89 mm),
Model 8731, 5 3/16" Dia., (132 mm)
Weight: Model 8730 7 lbs. 14 oz. (3.6 kg),
Model 8731 6 lbs. 10 oz. (3 kg),
8738 6 lbs. (2.8 kg)

20 kW ECONOLOAD® — MODELS 8745, 8746

Power Rating: 20 kW continuous
Frequency Range and VSWR: 1.1 max. 1 kHz to 900 MHz (DC for continuity checks)
Water Temperature Range: +5˚C to +60˚
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)
Connector: Waterlines ½" FPT or ¾" hose
Model 8745 3⅛" EIA Flg.
Model 8746 3⅛" Unflg. (Flush)
Load Coolant: Potable water
Operating Position: Any
Finish: Black powder coat
Nominal Size: 19½" × 3½" Dia., (495 mm × 90 mm),
Input Flg. 5 3/16" Dia. (132 mm)
Weight: Model 8745 15 lbs. 13 oz. (7.2 kg),
Model 8746 15 lbs. 5 oz. (7.0 kg)

30 kW ECONOLOAD® — MODELS 8755, 8756

Power Rating: 30 kW continuous
Frequency Range and VSWR: 1.1 max. 1 kHz to 900 MHz (DC for continuity checks)
Water Temperature Range: +5˚C to +60˚C
Water Flow Rate: 7 gal./minute @ 5°C to 9 gal./minute @ 60°C (26.6 liters/minute @ 5°C to 34.2 lpm @ 60°C)
Connectors: Waterlines ½" FPT or ¾" hose
Model 8755 3⅛" EIA Flg.
Model 8756 3⅛" Unflg. (Flush)
Load Coolant: Potable water
Operating Position: Any
Finish: Black powder coat
Nominal Size: 19½" x 3½" Dia., (495 mm × 90 mm).
Input Flg. 5 3/16" Dia. (132 mm)
Weight: Model 8755 15 lbs. 13 oz. (7.2 kg),
Model 8756 15 lbs. 5 oz. (7.0 kg)

See page 53 for load accessories such as coupling kits, dollies, etc.

Phone: 440-248-1200 • Fax: 440-248-5426

40 kW ECONOLOAD® MODELS 8765, 8766

Power Rating: 40 kW continuous
Frequency Range and VSWR: 1.1 max. 1 kHz to 900 MHz (DC for continuity checks)
Water Temperature Range: +5˚C to +60˚C
Water Flow Rate: 8 gals./minute @ 5°C to 10 gpm @ 60 °C (30.4 liters/minute @ 5°C to 3.8 lpm @ 60°C)
Connectors: Waterlines ½" FPT or ¾" hose
Model 8765 3⅛" EIA Flg.
Model 8766 3⅛" Unflg. (Flush)

Load Coolant: Potable water
Operating Position: Any
Finish: Black powder coat
Nominal Size: 19½" × 3½" Dia., (495 mm × 90 mm), Input Flg. 5 13/16" Dia. (132 mm)
Weight: Model 8765 15 lbs. 13 oz. (7.2 kg), Model 8766 15 lbs. 5 oz. (7.0 kg)

50 kW ECONOLOAD® MODELS 8775, 8776

Power Rating: 50 kW continuous
Frequency Range and VSWR: 1.1 max. 1 kHz to 900 MHz (DC for continuity checks)
Water Temperature Range: +5˚C to +60˚C
Water Flow Rate: 9 gals./minute @ 5°C to 11 gpm @ 60°C (34.2 liters/minute @ 5°C to 41.8 lpm @ 60°C)
Connectors: Waterlines ½" FPT or ¾" hose
Model 8775 3⅛" EIA Flg.
Model 8776 3⅛" Unflg. (Flush)

Load Coolant: Potable water
Operating Position: Any
Finish: Black powder coat
Nominal Size: 19½" × 3½" Dia., (495 mm × 90 mm), Input Flg. 5 3/16" Dia., (132 mm)
Weight: Model 8775 15 lbs. 13 oz. (7.2 kg), Model 8776 15 lbs. 5 oz. (7.0 kg)

80 kW ECONOLOAD® MODEL 8792

Power Rating: 80 kW continuous
Frequency Range and VSWR: 1.15 max. 1 kHz to 800 MHz (DC for continuity checks)
Water Temperature Range: +5˚C to +60˚C
Water Flow Rate: 9 gals./minute @ 5°C to 12 gpm @ 60°C (34.2 liters/minute @ 5˚C to 45.6 lpm @ 60°C
Connector: 6⅛" EIA Flg.
Load Coolant: Potable water

Operating Position: Any
Finish: Black powder coat
Nominal Size: 34" × 5" Dia. (864 mm × 127 mm), Input Flg. 8⅛" Dia., (206 mm) add approximately 1¼" (32 mm) to length for rear water fitting
Weight: 30 lbs. 10 oz. (14 kg)

10 kW MODULOAD® MODELS 8631, 8635, 8638

Power Rating: 10 kW continuous
Frequency Range and VSWR: 1.1 max. 1 kHz to 1000 MHz (DC for continuity checks)
Ambient Temperature Range: (per power level and coolant mix)
≤10 kW: (35% Ethylene Glycol/65% Water) +5°C to +45°C
≤10 kW: (35% Ethylene Glycol/65% Water) –20°C to +35°C
Connector: 8635: 1⅝" EIA Flg.
8631: 3⅛" EIA Flg. 8638: 3⅛" Unflg.
Load Coolant: 10 pts. (4.75 liters) 100% water or 65% water/35% industrial Ethylene Glycol. With forced-air cooling
Operation Position: Horizontal only
Finish: Gray powder coat

Nominal Size: (excluding connectors) 22⅛" L × 15 15/16" W × 15 13/16" D, (562 mm × 405 mm x 402 mm)
Weight: 110 lbs. (50 kg)
AC Power: 115 V models: 9½ A nominal @ 115V ±10% 60Hz
230 V models: 4¾ A nominal @ 230V ±10% 50Hz
Optional Dolly: P/N 6771-011

Power	Basic P.N.	Add Suffix
115 V 50 Hz		-115-5
115 V 60 Hz	8631,8635,	-115
230 V 50 Hz	or 8638	-230
230 V 60 Hz		-230-6

TERMALINE®
RF COAXIAL TERMINATIONS
MODULOAD® Systems and Dry, Forced-Air Loads

25 kW MODULOAD® — MODELS 8645, 8646

Power Rating: 25 kW continuous
Frequency Range and VSWR: 1.1 max. 1 kHz to 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: 8645: 3⅛" EIA Flg. 8646: 3⅛" Unflg.
Load Coolant: 9 qts. (8.5 liters) 100% water or 65% water/35% industrial Ethylene Glycol. With forced-air cooling
Operation Position: Horizontal only
Finish: Gray powder coat

Nominal Size: (excluding connectors) 25 15/16" L × 19 5/32" W × 19 9/16" D, (659 mm × 487 mm × 497 mm)
Weight: 155 lbs. (70 kg)
AC Power: 115 V models: 11 A nominal @ 115V ±10% 60Hz
230 V models: 5½ A nominal @ 230V ±10% 50Hz
Optional Dolly: P/N 6771-011

Power	Basic P.N.	Add Suffix
115 V 50 Hz		-115-5
115 V 60 Hz	8645 or	-115
230 V 50 Hz	8646	-230
230 V 60 Hz		-230-6

50 kW — MODULOAD® MODELS 8655, 8656

Power Rating: 50 kW continuous
Frequency Range and VSWR: 1.1 max. 1 kHz to 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: 8655: 3⅛" EIA Flg.
8656: 3⅛" Unflg. (Flush)
Load Coolant: 17 qts. (16.1 liters) 100% water or 65% water/35% industrial ethylene glycol. With forced-air cooling
Operation Position: Horizontal only
Finish: Gray powder coat

Nominal Size: (excluding connectors) 46½" L × 19 5/32" W × 19 9/16" D, (659 mm × 487 mm × 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: Model 6772-011 on page 53
8655-115-6, 8656-115–6 for 60 Hz
8655-230-5, 8656-230–5 for 50 Hz

Power	Basic P.N.	Add Suffix
115 V 50 Hz		-115-5
115 V 60 Hz	8655 or	-115-6
230 V 50 Hz	8656	-230-5
230 V 60 Hz		-230-6

10 kW, 15 kW DRY, FORCED-AIR LOAD — MODEL 8578A100, MODEL 8578A150

Power Rating:
Model 8578A100: 10 kW continuous
Model 8578A150: 15 kW continuous
Frequency Range and VSWR:
1.15:1, DC to 108 MHz
Ambient Temperature Range: –40°C to +40°C
Connector: 1⅝" EIA Flanged (Swivel)
3⅛" Unflanged option
Load Coolant: Dry (forced air)
Resistors: Tubular type, parallel connection, 50 ohms nominal

Operation Position: Any (except blockage of air inlets and exhaust)
Finish: Gray powder coat
Nominal Size: (including connectors) 39 7/32" H × 16 15/32" W × 13 7/16" D, (996 mm × 418 mm × 341 mm)
Weight: 70 lbs. (31.8 kg)
AC Power:
115/230 ±10% Vac, 50/60 Hz 8.6 amps max. @ 115 Vac

See page 53 for load accessories such as coupling kits, dollies, etc.

Phone: 440-248-1200 • Fax: 440-248-5426

25 kW DRY, FORCED-AIR LOADS — MODELS 8572A/ 73A-115-6, -230-5

Power Rating: 25 kW continuous
Frequency Range and VSWR: 1.1 max. DC to 110 MHz
Ambient Temperature Range: –40˚C to +45˚C
Connector:
8572A: 3⅛" EIA Flg.
8573A: 3⅛" Unflg. (Flush)
Load Coolant: Dry. Forced-air cooled
Resistors: 20 tubular type, series/parallel
Operating Position: Any
Finish: Gray powder coat and black powder coat
Nominal Size: (includes connectors) 70¾" H x 16¼" W x 16¼" D (1797 mm x 413 mm x 413 mm)
Weight: 118 lbs. (54 kg)
AC Power: 115 V 60 Hz add suffix -115-6, 230 V 50 Hz add –230 –5 to Model Number. Uses 1150 W
Optional Hot Air Duct: Model 8572-078

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

DOLLIES

MODEL	DESCRIPTION
6771-011	For 10 and 25 kW MODULOAD®
6772-011	For 50 kW MODULOAD®
****-677-1	For ECONOLOAD®, 115 Vac
****-677-2	For ECONOLOAD®, 230 Vac

**** Add -677-1 or -677-2 to any ECONLOAD® Model No. (10 kW to 80 kW) to get it mounted on a dolly with a control box, water flow switch and bracket (for an optional wattmeter). 8776-677-1 shown. –1 = 115 Vac 50/60 Hz, –2 = 230 Vac 50/60 Hz.

FLANGE-TO-FLANGE ADAPTERS

MODEL	DESCRIPTION
4600-025	3⅛" Flg. to 1⅝" EIA Flg. 50 ohms
4712-015	1⅝" Flg. to ⅞" EIA Flg. 50 ohms
4902-025	3⅛" Flg. to 6⅛" EIA Flg. 50 ohms
7500-076	DC Connector Plug

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
8572-021	8572 Forced-Air Loads	25 kW

COUPLING KITS

MODEL	LINE TYPE	OHMS
4240-220	⅞" Flg.	50
4712-020	1⅝" Flg.	50
4600-020	3⅛" Flg.	50
5-289	3⅛" Unflg.	51.5*
5-726	3⅛" Unflg.	50
4902-020	6⅛" Flg.	50
5-1322	6⅛" Unflg.	50

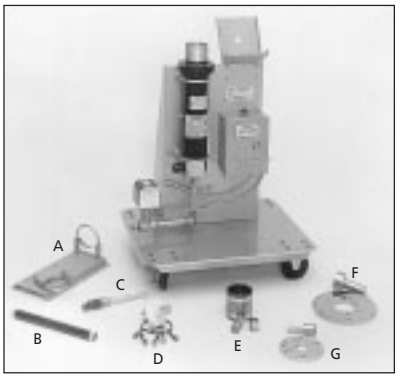
* 51.5 ohm with adapter to 50 ohm

WATER-COOLED LOAD 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
6770-125	Wall Mounting Bracket	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, 50 kW
5-898-7	Water Flow Switch	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
8892-333	Blower	Closes @ 60˚C	8930 Series
8890-017	Over Temp. Interlock	Opens @ 226˚C	8930 Series
8896-012	Automatic	Closes @ 100˚C	BA-300-115, -230



A 6770-125
B 8755-027-4
C 8890-008
D 4600-020
E 5-289
F 4902-025
G 4600-025

TENULINE®
RF COAXIAL ATTENUATORS
Product Selection Guide, 2-Watt SMA Attenuator

This catalog presents a wide selection of our new bi-directional TENULINE® Attenuators that handle power from 2 to 300 watts and give you an expanded choice of attenuation value and connector options. These new dry models and our established oil-cooled models now span 2 watts/1 dB to 4000 watts/30 dB. Intermediate or higher attenuation values can be achieved by linking these devices; for example, adding a 5 watt/10 dB attenuator to the output of a 4000 watts/30 dB attenuator results in a 4000 watts/40 dB Model. Or you can request custom attenuation values

Before Bird's TENULINE® Series in the late 1950s, common tasks like signal analysis and frequency checks required directional couplers that have several drawbacks a well designed attenuator can overcome.

- Directional couplers only maintain a stable coupling factor over a relatively narrow frequency range. Up to four couplers, versus one Bird high-power attenuator, are needed to cover 30 to 500 MHz. And the attenuation curve of one resistive device is more uniform than that of four resonant reactive devices.
- A Bird 30 dB high-power attenuator is actually a proper transmitter termination with 99.9 percent of the power being dissipated within it. An attenuator is not a recommended load substitute, however, for continuous-duty applications.
- You can easily verify the accuracy of a Bird high-power attenuator @ 60 Hz or with DC and Wheatstone bridge measurements.

The following Model Number Definition lets you specify your desired connector when ordering the new bi-directional attenuators presented on pages 54–57.

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

Power Rating (watts)

Product Type
A - Attenuator

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

Connectors+
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.

ATTENUATOR SELECTION GUIDE

MODEL	AVERAGE POWER (W)	NOMINAL FREQUENCY RANGE (GHz)	ATTENUATION (dB)**	BIDIRECTIONAL	MAX. VSWR	DIELECTRIC MEDIUM	CONNECTOR(S)	SEE PAGE
2-A-MFA-XX	2	DC-4	1, 2, 3, 6, 10, 20, 30	Yes	1.25	Air	SMA	54
2-A SERIES	2	DC-4	1, 2, 3, 6, 10, 20, 30	Yes	1.25	Air	BNC, N, TNC	55
5-A SERIES	5	DC-4	1, 2, 3, 6, 10, 20, 30	Yes	1.25	Air	BNC, N, TNC	55
10-A SERIES	10	DC-4	1, 2, 3, 6, 10, 20, 30	Yes	1.25	Air	BNC, N, TNC	55
25-A SERIES	25	DC-4	1, 2, 3, 6, 10, 20, 30	Yes	1.25	Air	BNC, N, TNC	55
8341	40	DC-1	3, 6, 10, 20	No	1.25†	Air (Req. Heatsink)	QC-N (F)	55
50-A SERIES	50	DC-2.4	1, 2, 3, 6, 10, 20, 30	Yes	1.25	Air	BNC, N, TNC	56
75-A SERIES	75	DC-2.4	1, 2, 3, 6, 10, 20, 30	Yes	1.25	Air	BNC, N, TNC	56
100-A SERIES	100	DC-2.4	1, 2, 3, 6, 10, 20, 30	Yes	1.25	Air	BNC, N, TNC	56
8343	100	DC-1	3, 6, 10, 20	No	1.25†	Air	QC-N (F)	56
8323	100	DC-0.5	30	No	1.1	Oil	QC-N (F)	57
150-A SERIES	150	DC-2.4	1, 2, 3, 6, 10, 20, 30	Yes	1.25	Air	BNC, IEC 7/16, N, TNC	57
8322	200	DC-0.5	30	No	1.1	Oil	QC-N (F)	57
300-A SERIES	300	DC-2.4	1, 2, 3, 6, 10, 20, 30	Yes	1.25	Air	BNC, IEC 7/16, N, TNC	57
8325	500	DC-0.5	30	No	1.1	Oil	QC-N (F)	58
8327-300	1000	DC-0.5	30	No	1.1	Oil	QC-LC (F)	58
8329-300	2000	DC-0.5	30	No	1.1	Oil	QC-LC (F)	58
8329-300 with BA-300	4000	DC-0.5	30	No	1.1	Oil	QC-LC (F)	58

** Other attenuation values are available on special request. † Varies with frequency and attenuation.
Power Factor Formula for Attenuators: $\Delta dB = [(2.0 \times 10^{-6})\ (\text{freq. MHz})\ (\text{power Watts})]$. i.e. @ 1000 W and 100 MHz, $\Delta dB = 0.2$

2-WATT BI-DIRECTIONAL, SMA CONNECTOR 2-A-MFA-XX SERIES*

Power Rating: 2 W max. @ 40°C
2.4 W max. @ 25°C
Connectors: SMA (Male and Female)
Frequency Range and VSWR: DC to 1 GHz at 1.10:1 max. 1 GHz to 4 GHz at 1.25:1 max.
Impedance: 50 ohms, nominal
Ambient Temperature Range: –40°C to +40°C
Operating Position: Any
Cooling: Dry (convection cooled)
Finish: Nickel plated
Nominal Size: 1.32" L × 0.42" Dia., (33.6 mm × 10.7 mm)

Weight: 0.4 oz. (11.4 g)

ACCURACY			
dB Atten	Accuracy ± dB DC–1 GHz	Accuracy ± dB 1–4 GHz	"XX" Value
1	0.3	0.5	01
2	0.3	0.5	02
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

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2 WATT BI-DIRECTIONAL — 2-A SERIES*

Power Rating: 2 W max. @ 40°C
2.4 W max. @ 25°C
Connectors: N, BNC, TNC (Male or Female)
Frequency Range and VSWR:
DC to 1 GHz at 1.10:1 max.
1 GHz to 4 GHz at 1.25:1 max.
Impedance: 50 ohms, nominal
Ambient Temperature Range: –40°C to +40°C
Operating Position: Any
Coolant: Dry (convection cooled)
Finish: Silver or Tri-alloy plated, except Nickel plate for BNC
Nominal Size: (with N-type connectors): 2 3/16" L × 13/16" Dia., (55.9 mm × 20.4 mm)
Weight: 3.1 oz. (88 g)

ACCURACY

dB Atten	Accuracy ± dB DC-1 GHz	1-4 GHz	"XX" Value
1	0.3	0.5	01
2	0.3	0.5	02
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

5 WATT BI-DIRECTIONAL — 5-A SERIES*

Power Rating: 5 W max. @ 40°C
6 W max. @ 25°C
Connectors: N, BNC, TNC (Male or Female)
Frequency Range and VSWR:
DC to 1 GHz at 1.10:1 max.
1 GHz to 4 GHz at 1.25:1 max.
Accuracy: Same as 2-A Series above.
Impedance: 50 ohms, nominal
Ambient Temperature Range: –40°C to +40°C
Operating Position: Any
Coolant: Dry (convection cooled)
Finish: Silver or Tri-alloy plated, except Nickel plate for BNC
Nominal Size: (with N-type connectors): 2 3/16" L × 13/16" Dia., (55.9 mm × 20.4 mm)
Weight: 3.1 oz. (88 g)

10 WATT BI-DIRECTIONAL — 10-A SERIES*

NEW

Power Rating: 10 W max.@ 40°C
12 W max.@ 25°C
Connectors: N, BNC, TNC (Male or Female)
Frequency Range and VSWR:
DC to 1 GHz at 1.10:1 max.
1 GHz to 4 GHz at 1.25:1 max.
Accuracy: Same as 2-A Series above.
Impedance: 50 ohms, nominal
Ambient Temperature Range: –40°C to +40°C
Operating Position: Any
Coolant: Dry (convection cooled)
Finish: Black anodized. Silver or Tri-alloy plated connectors
Nominal Size: (with N-type connectors): 2 5/8" L × 2.3" Dia., (66.1 mm × 58.5 mm)
Weight: 6.12 oz. (176.7 g)

25 WATT BI-DIRECTIONAL — 25-A SERIES*

NEW

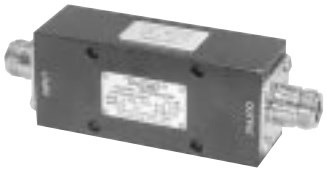
Power Rating: 25 W max. @ 40°C
30 W max. @ 25°C
Connectors: N, BNC, TNC (Male or Female)
Frequency Range and VSWR:
DC to 1 GHz at 1.10:1 max.
1 GHz to 4 GHz at 1.25:1 max.
Accuracy: Same as 2-A Series above.
Impedance: 50 ohms, nominal
Ambient Temperature Range: –40°C to +40°C
Operating Position: Any
Coolant: Dry (convection cooled)
Finish: Black anodized. Silver or Tri-alloy plated connectors
Nominal Size: (with N-type connectors): 5 5/16" L × 2.3" Dia., (134.7 mm × 58.5 mm)
Weight: 13.1 oz. (373.4 g)

40 WATT — 8341 SERIES

Power Rating: 40 W continuous when bolted to a heat sink
Connectors: QC type (Female N normally supplied)
Frequency Range and Output VSWR:
DC to 1 GHz @ 1.25:1 max.
Impedance: 50 ohms, nominal
Ambient Temperature Range: –40°C to +45°C
Heat Sink Required: Aluminum panel 1/8" × 400 sq. in. (3 mm × 1/4 sq. m), or equivalent
Coolant: Dry (conduction cooled)
Finish: Black powder coat
Nominal Size: (includes connectors)
3, 6, 20 dB 5 3/16" L (132 mm),
10 dB 4 11/16" L × 1 5/8" H × 1 1/4" D
(119 mm × 41 mm × 32 mm)
Weight: 12 1/2 to 15 oz. (350 to 420 g)

ACCURACY

Model	dB Atten	Accuracy ± dB and VSWR DC-0.5 GHz	0.5 – 1 GHz
8341-030	3	0.5 dB, 1.20	0.75 dB, 1.25
8341-060	6	0.5 dB, 1.20	0.75 dB, 1.25
8341-100	10	0.5 dB, 1.20	0.75 dB, 1.25
8341-200	20	0.5 dB, 1.20	0.75 dB, 1.25



*See page 54 for a Model Number Definition that instructs you how to order the correct part.

TENULINE®
RF COAXIAL ATTENUATORS
Dry Dielectric

NEW

50 WATT BI-DIRECTIONAL — 50-A SERIES*

Power Rating: 50 W max. @ 40°C
60 W max. @ 25°C
Connectors: N, BNC, TNC
Frequency Range and VSWR:
DC to 1 GHz at 1.10:1 max.
1 GHz to 2.4 GHz at 1.25:1 max.
Impedance: 50 ohms, nominal
Ambient Temperature Range: –40°C to +40°C
Operating Position: Any
Coolant: Dry (convection cooled)
Finish: Black Anodized.
Silver or Tri-alloy plated connectors
Nominal Size: (with N-type connectors):
5.3" L × 2.3" Dia.,
(134.7 mm × 58.5 mm)

Weight: 1.25 lbs. (0.57 kg)

ACCURACY

dB Atten	Accuracy ± dB DC–1 GHz	1–2.4 GHz	"XX" Value
1	0.3	0.5	01
2	0.3	0.5	02
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

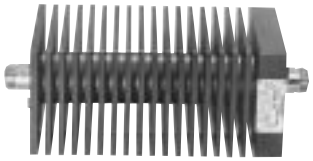
NEW

75 WATT BI-DIRECTIONAL — 75-A SERIES*

Power Rating: 75 W max. @ 40°C
90 W max. @ 25°C
Connectors: N, BNC, TNC
Frequency Range and VSWR:
DC to 1 GHz at 1.10:1 max.
1 GHz to 2.4 GHz at 1.25:1 max.
Accuracy: Same as 50-A Series above.
Impedance: 50 ohms, nominal
Ambient Temperature Range: –40°C to +40°C
Operating Position: Vertical
Coolant: Dry (convection cooled)
Finish: Black Anodized.
Silver or Tri-alloy plated connectors
Nominal Size: (with N-type connectors):
7.3" H × 2.3" Dia., (185.5 mm × 58.5 mm)
Weight: 1.6 lbs. (0.73 kg)

100 WATT BI-DIRECTIONAL — 100-A SERIES*

Power Rating: 100 W max. @ 40°C
120 W max. @ 25°C
Connectors: N, BNC, 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.
Accuracy: Same as 50-A Series above.
Impedance: 50 ohms, nominal
Ambient Temperature Range: –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 connectors
Nominal Size: (with N-type connectors):
6.4" H × 2.6" W × 6.8" D,
(162.6 mm × 66.1 mm × 172.8 mm)
Weight: 4.3 lbs. (1.95 kg)



100 WATT — 8343 SERIES

Power Range: 100 W continuous
Frequency Range: DC to 1000 MHz
Output: VSWR 1.25
Ambient Temperature Range: –40°C to +45°C
Connectors: QC type
(Female N normally supplied)
Coolant: Dry (convection air cooled)
Finish: Black powder coat
Nominal Size: (includes connectors)
7 23/32" × 2 3/4" sq. (196 mm × 70 mm)

Weight: 44 oz. (1.25 g)

ACCURACY

Model	dB Atten	Accuracy ± dB and VSWR DC–0.5 GHz	0.5–1 GHz
8343-030	3	0.5 dB, 1.20	0.9 dB, 1.25
8343-060	6	0.5 dB, 1.20	0.9 dB, 1.25
8343-100	10	0.5 dB, 1.15	0.9 dB, 1.20
8343-200	20	0.5 dB, 1.15	0.9 dB, 1.20

*See page 54 for a Model Number Definition that instructs you how to order the correct part.

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100 WATT — MODEL 8323

Power Rating: 100 W continuous
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 ±0.2dB)
Ambient Temperature Range: –40˚C to +45˚C
Connectors: QC type
(Female N normally supplied)

Coolant: 0.35 gal. (1.3 liters) refined mineral oil
Operating Position: Horizontal only
Finish: Gray powder coat
Nominal Size: (includes connectors)
10 11/32" L × 8 1/2" H × 5 15/16" W
(263 mm × 216 mm × 151 mm)
Weight: 11 lbs. (5 kg)

150 WATT BI-DIRECTIONAL — 150-A SERIES*

Power Rating: 150 W max. @ 40°C
180 W max. @ 25°C
Connectors: N, TNC, BNC, 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.
Impedance: 50 ohms, nominal
Ambient Temperature Range: –40°C to +40°C
Operating Position: Vertical
Cooling: Dry (convection cooled)
Finish: Black semigloss paint per federal standard 595. Silver or Tri-alloy plated connectors

Nominal Size: (with N connectors)
11 15/16" H × 2 5/8" W × 6 13/16" D,
(302 mm × 66 mm × 173 mm)
Weight: 6.5 lb (2.95 kg)

ACCURACY

dB Atten	Accuracy ± dB DC–1 GHz	1–2.4 GHz	"XX" Value
1	0.3	0.5	01
2	0.3	0.5	02
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

200 WATT — MODEL 8322

Power Rating: 200 W continuous
Frequency Range and VSWR:
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 ±0.2dB)
Ambient Temperature Range: 40˚C to +45˚C
Connectors: QC type
(Female N normally supplied)

Coolant: 0.7 gal. (2.65 liters) refined mineral oil
Operating Position: Horizontal only
Finish: Gray powder coat
Nominal Size: (includes connectors)
17 1/2" L × 8 1/2" H × 5 15/16" W
(445 mm × 216 mm × 151 mm)
Weight: 19 lbs. (9 kg)

300 WATT BI-DIRECTIONAL — 300-A SERIES*

Power Rating: 300 W max. @ 40°C
360 W max. @ 25°C
Connectors: N, TNC, BNC, 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.
Impedance: 50 ohms, nominal
Ambient Temperature Range: –40°C to +40°C
Operating Position: Vertical
Cooling: Dry (convection cooled)
Finish: Black semigloss paint per federal standard 595. Silver or Tri-alloy plated connectors

Nominal Size: (with N connectors)
10 15/16" H × 5 13/32" W × 6 13/16" D,
(276.9 mm × 137.2 mm × 172.8 mm)
Weight: 12 lb (5.45 kg)

ACCURACY

dB Atten	Accuracy ± dB DC–1 GHz	1–2.4 GHz	"XX" Value
1	0.3	0.5	01
2	0.3	0.5	02
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

*See page 54 for a Model Number Definition that instructs you how to order the correct part.

Other attenuation values are available on special request.

TENULINE®
RF COAXIAL ATTENUATORS
Oil-Cooled Dielectric

500 WATT — MODEL 8325

Power Rating: 500 W continuous
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 ±0.2dB)
Ambient Temperature Range: –40˚C to +45˚C
Connectors: QC type
(Female N normally supplied)

Coolant: 0.9 gals. (3.4 liters) refined mineral oil
Operating Position: Horizontal only
Finish: Gray powder coat
Nominal Size: (including connectors)
17½" L × 8½" H × 5⁵⁄₁₆" W
(445 mm × 216 mm × 151 mm)
Weight: 25 lbs. (11 kg)

1 kW — MODEL 8327-300

Power Rating: 1000 W continuous
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 ±0.2dB)
Ambient Temperature Range: –40˚C to +45˚C
Connectors: QC type (Female LC input, Female N output normally supplied, extra Female N supplied)

Coolant: 2.9 gals. (11 liters) refined mineral oil
Operating Position: Horizontal only
Finish: Gray powder coat
Nominal Size: (including connectors)
23¹⁵⁄₃₂" L × 17³⁄₁₆" H × 7⅛" W
(596 mm × 437 mm × 181 mm)
Weight: 57 lbs. (26 kg)
Note: Overload thermoswitch P/N 2450-056 is optional

2 kW — MODEL 8329-300

Power Rating: 2000 W continuous
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 ±0.2dB)
Ambient Temperature Range: –40˚C to +45˚C
Connectors: QC type (Female LC input, Female N output normally supplied)

Coolant: 2.9 gals. (11 liters) silicon oil
Operating Position: Horizontal only
Finish: Gray powder coat
Nominal Size: (including connectors)
23¹⁵⁄₃₂" L × 17³⁄₁₆" H × 7⅛" W
(596 mm × 437 mm × 181 mm)
Weight: 57 lbs. (26 kg)
Note: Overload thermoswitch P/N 8329-028 is optional

4 kW — MODEL 8329-300 WITH BA-300-115, -230

Power Rating: 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 ±0.2dB)
Ambient Temperature Range: –40˚C to +45˚C
Connectors: QC type (Female LC input, Female N output normally supplied)
Coolant: 2.9 gals. (11 liters) silicone oil with forced-air cooling
Operating Position: Horizontal only

Finish: Gray powder coat
Nominal Size: (including connectors)
23¹⁵⁄₃₂" L × 22¹⁄₁₆" H × 7⅛" W
(596 mm × 560 mm × 181 mm)
Weight: 70½ lbs. (32 kg)
Blower AC Power:
Model BA-300-115: 115 V, 50/60 Hz, 0.6 A
Model BA-300-230: 230 V, 50/60 Hz, 0.3A
Note: Overload thermoswitch P/N 8329-028 is optional. When ordered as a package, attenuator and blower are factory-assembled at no additional charge.

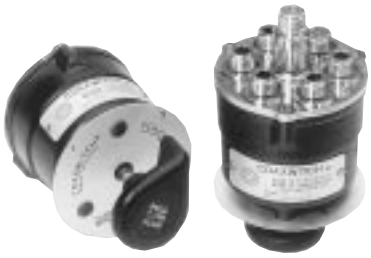
Bird oil dielectric attenuators have never been and are not now manufactured with Poly Chlorinated Biphenyls (PCBs).

Phone: 440-248-1200 • **Fax:** 440-248-5426

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

The unique, rugged and reliable design of Bird Coaxwitch® Coaxial Selector Switches permits positive contact, low-insertion VSWR, and negligible cross talk between channels. The switching mechanism is 4½" of RG-87/U Teflon cable that pulls away from the mating Male N connectors and rotates to the desired switch position. These switches cannot be operated accidentally because operation requires intentionally sequential movement. The knob must be grasped, pulled out, rotated, and pushed in to make contact.

Installation: Bird switches may be panel mounted. All connectors are located on the rear of the housing and are parallel to the shaft of the switch. The connecting cables may be laced together without the use of right-angle adapters.



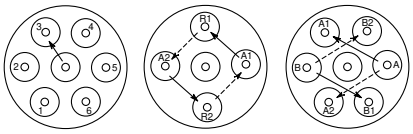
Useful Frequency Range: DC to 10 GHz
Maximum RF Voltage: 500 volts rms
Attenuation to Unused Channel: 75 dB (cross talk)
Ambient Temperature Range: –60°C to +65°C (–76°F to +149°F)
Weight: Varies by model, approx. 2½ lbs. (1.1 kg)

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

SWITCHING CONFIGURATIONS

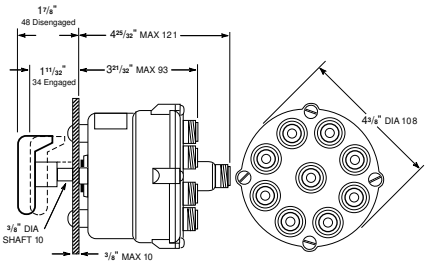
MODEL	7422	7441	7431	74	718	7181	72-2	72-R
Positions	2	3	4	6	8	10	2	reversing
Coaxial Circuits	1	1	1	1	1	1	2	2



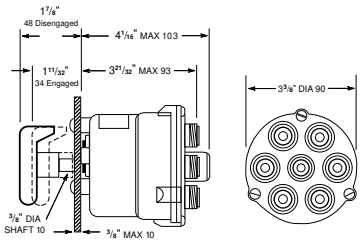
MODEL 74
Single-circuit six position

MODEL 72-R
Two-circuit reversing switch

MODEL 72-2
Two-circuit two position



Models 74/72-2 mounting dimensions 7/32" (6 mm) mtg holes for four 10-32 screws spaced at 90° on 1 5/16" (33 mm) radius



Models 72-R mounting dimensions 7/32" (6 mm) mtg holes for three 10-32 screws spaced at 120° on 1¼" (32 mm) radius

ACCESSORIES

QC-Type (Quick-Change), SQC (Small Quick-Change) Connectors

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

BNC (F)
4240-125

BNC (M)
4240-132

C (F)
4240-100

C (M)
4240-110

HN (F)
4240-268

HN (M)
4240-278

LC (F)
4240-031

LC (M)
4240-025

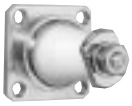
LT (F)
4240-018

LT (M)
4240-012

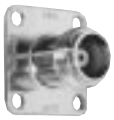
Mini-UHF (F)
4240-346

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

UHF (M)
4240-179

7/8" EIA
4240-002

1 5/8" EIA Fixed
4240-096

1 5/8" EIA Swivel
4240-208

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

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

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ADAPTER KITS — 4240 SERIES

Bird's adapter kits let you assemble compact, precision 50-ohm adapters to meet up to 45 different matching requirements. The adapters offer low VSWR because of precision machining and tight mating tolerances. The N (F)/N (M) combination, for example, is below 1.05 to 1 GHz and below 1.1 to 2.5 GHz. The Model 4240-400 lets you create 30 combinations. The Model 4240-401 can fashion 45 combinations. Both models include enough couplers to assemble 5 complete adapters at the same time.

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)	•	•	•	•	•	•	•	•	•

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

QC ADAPTERS, CONNECTORS

MODEL	DESCRIPTION
4240-165	QC (F) to QC (F)
4240-180	Copl. (M) to QC (F)
4240-187	3⅛" Unflg 51.5 ohms to QC (F)
4240-194	3⅛" Flg. to QC (F)
4240-201	⅞" Flg. to QC (F)
4240-244	Rt. Angle QC
4240-260	1⅝" 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	4412	9	NiCd	—
5-1375	4314B, 4410A, 4041, 4410, APM-16	9	Alkaline	—
5-1475	4030	3	Li-Mn	3 Required

DC CABLE ASSEMBLIES*

RG-58/U cables with a Model 7500-076 DC plug on one end and the connector in the table below on the other end.

MODEL	CONNECTOR	LENGTH	USE WITH GROUP
3170-058-1	BNC (M)	14"	I
3170-058-6	BNC (M)	6′	I
3170-058-2	BNC (M)	15′	I
3170-058-3	BNC (M)	25′	I
3170-058-4	BNC (M)	40′	I
3170-058-5	BNC (M)	50′	I
3170-058-7	BNC (M)	80′	I
3170-058-8	BNC (M)	90′	I
3170-058-9	BNC (M)	100′	I
4220-097-5	Spade Lug	16"	II
4220-097-1	Spade Lug	33"	II
4220-097-22	Spade Lug	48"	II
4220-097-7	Spade Lug	10′	II
4220-097-9	Spade Lug	15′	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	39½′	III
7500-072-3	DC Plug	5′	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, 3127-070.
Group III: 6810-020, 4305A, 6810-030, 4909, 4715, 4610, 4723, 4802.

TECHNICAL DATA
THRULINE® principle

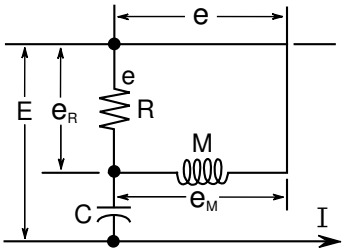

Figure 1

The basic sensing circuit of a THRULINE® plug-in element consists of the mutual inductance M between the loop and the center conductor and the voltage divider C and R. In Fig. 1, E is the voltage between outer and center conductor and I is the current. Elements can be rotated 180˚, resulting in either a positive or a negative M (Fig. 2 and 3). The output voltage in this lumped-constant directional coupler is the sum of two samples:

$$e_R \text{ from the division of E by R and C, } e_R = \frac{RE}{X_C} = RE\, j\omega C$$

$$\text{(if } R << X_C\text{), and } e_M \text{ by induction } e_M = I j\omega\ (\pm M).$$

$$\text{The sum } e_R + e_M = j\omega(CRE \pm MI) = e$$

Besides selecting R very much smaller that x_C, the components of the circuit are chosen so that

$$CR = M/Z_o.$$

The output voltage is now

$$e = j\omega(EM/Z_o \pm MI) = j\omega M(E/Z_o \pm I)$$

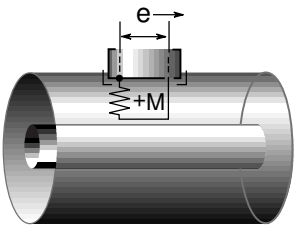

Figure 2

At any one point on a transmission line, the voltage E is the sum of the forward and reflected voltages $E_f + E_r$, and the current I is $E_f/Z_o - E_r/Z_o$ (Since the reflected wave travels in the opposite direction, $I_r = -E_r/Z_o$).

When the element is pointing toward the load, the output voltage is

$$e \rightarrow = j\omega M(E/Z_o + I) = j\omega M \left\{ \frac{E_f + E_r}{Z_o} + \frac{E_f - E_r}{Z_o} \right\} = \boxed{= \frac{j\omega M}{Z_o}(2E_f)}$$

and turning the element toward the source, it becomes ...

$$e \leftarrow = j\omega M(E/Z_o - I) = j\omega M \left\{ \frac{E_f + E_r}{Z_o} + \frac{E_f - E_r}{Z_o} \right\} = \boxed{= \frac{j\omega M}{Z_o}(2E_r)}$$

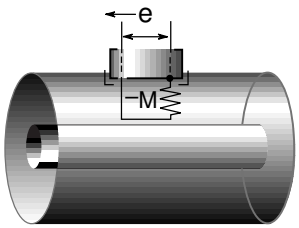

Figure 3

We have now proved what we set out to show, namely that the RF output voltage from the sensing element is directional and proportional to the voltage in the line due to either the forward or the reflected wave. It is also directly proportional to ω, that is to frequency (ω = 2πf). In order to make it frequency independent, we terminate e in a capacitive reactance which is inversely proportional to ω. The voltage across this capacitor is rectified, filtered and displayed on a meter calibrated in RF watts.

For additional details on THRULINE® principles, write for "WATT'S NEW FROM BIRD" vol. 2 no. 2.

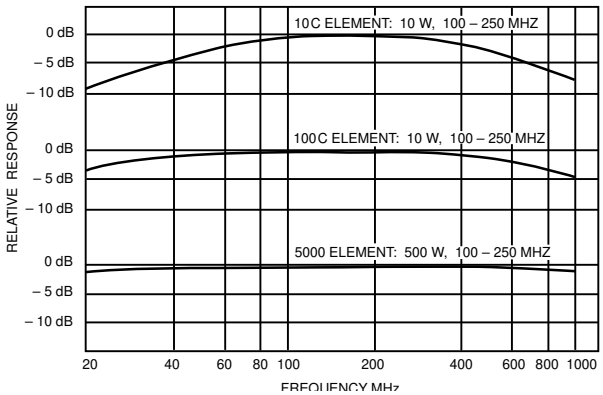

Figure 4

Frequency Response THRULINE® Elements, 100–250 MHz (C-Series)

Higher power elements have flatter frequency characteristics than tighter coupled lower-power units. Beyond the stated frequency range, measurement results cannot be predicted.

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

In the table below, Z_o = 50 ohms, 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, $PEV_{RMS} = \frac{PEV}{1.414}$. To obtain a detailed essay on this subject, write for "WATT'S NEW FROM BIRD" vol. 4, no. 2. For TV black level measurement (table H), refer to vol. 5, no. 3.

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

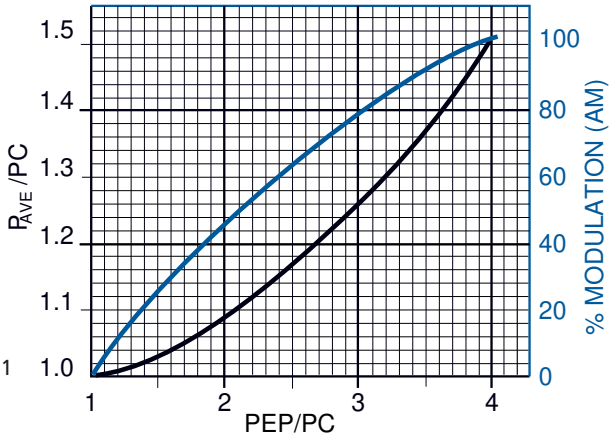


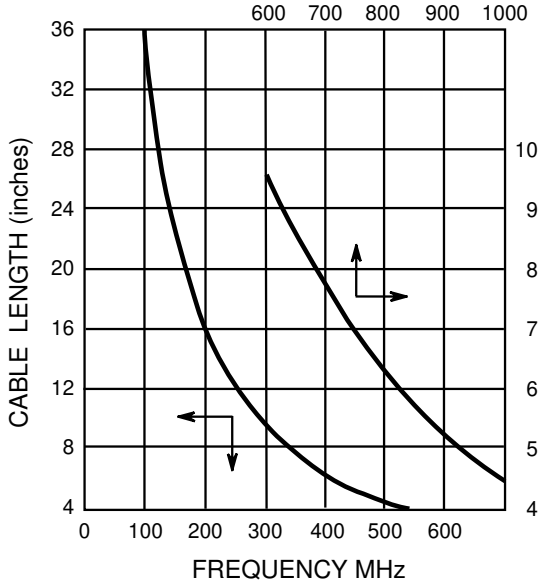
Figure 1

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

E-mail: sales@bird-electronic.com • Internet: www.bird-electronic.com

TECHNICAL DATA

Required length of cable to equal ½ or 1 wavelength when added to a THRULINE® wattmeter



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 (say 79%) divided by 66% (i.e. by a factor of 79% ÷ 66% = 1.2).

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, like 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 ½ 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 ½ wavelengths. This is easily done by making up a length of cable which, when added to the THRULINE®, equals one or more ½ wavelengths at the frequency of measurement. If more than one frequency is involved, one cable is needed for each frequency.

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

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

Phone: 440-248-1200 • Fax: 440-248-5426

INDEX
By Product and Model Number

* The Model Number Index does not include Plug-in Elements. See the Product Index, "Plug-In Elements."

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By Model Number

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SALES, TECHNICAL SUPPORT, CALIBRATION & REPAIR

Sales Offices, Distributors, and Representatives

Bird Electronic Corporation is represented worldwide through a network of Corporate Offices, Distributors, and Sales Organizations. To find the nearest Bird agent, contact our Customer Service Department at 440-248-1200, then press 4 or hold for the operator. You can find a complete international office listing on the Bird World Wide Web site at:

http://www.bird-electronic.com

For Technical Assistance

If you need technical assistance, contact your local sales representative, or a Sales Engineer at Bird. Call 440-248-1200, then press 6 or hold for the operator. For international customers we suggest you contact the sales representative in or near your country. You can also receive technical help by e-mail at:

sales@bird-electronic.com

To Order Bird Products

To order products, contact our Customer Service Department at 440-248-1200, then press 4 or hold for the operator.

We are pleased to provide pricing and delivery quotations by e-mail, postal mail, telephone, or fax. All formal quotations are valid for 60 days unless otherwise stated.

When requesting prices or placing an order, please supply:

- Complete address, fax, phone, or e-mail information so that we can contact you.
- Complete part number, description, quantity, and desired options.
- Any special calibration or specification requirements.
- Payment method, or Purchase Order Number when placing an order.
- Billing and shipping information.
- Name of your purchasing agent or buyer.
- Preferred Method of Shipment

You may be asked for other information to help us fill the order or quotation.

Repair and Calibration

Bird maintains a complete Repair and Calibration Department to provide expert, cost-effective repair and servicing of Bird Electronic equipment. For repair rates, minimums, payment terms, and warranty information, please contact our Repair and Calibration Department at 440-248-1200, then press 5 or hold for the operator.

Special Performance Data

Individual special performance data can be provided for many Bird Electronic products at a minimum charge of $50 per unit. Please contact our Repair and Calibration department for further information.

Limited Warranty

We are proud of the high quality of our products and we warrant them to the original purchaser, for a period of one year upon shipment, to be free from defects in materials and workmanship under normal operating conditions. When properly used products will perform to factory specifications during this period.

For complete warranty details, please contact your local Bird Electronic Sales office, or visit the Bird World Wide Web site.

Specifications

We reserve the right to discontinue any item without notice and to change physical and electrical specifications at any time without incurring any obligation to incorporate new features in instruments or parts previously sold.

For instruments offered with the "QC" Connector feature, maximum VSWR values listed in the specifications are obtained with the connector type shown as "normally supplied."

Listed power ratings for air cooled terminations are valid to 5000 feet. For operation at higher elevations, please contact us for applicable derating factor.

Taxes

California, Indiana, and Ohio residents must pay sales tax unless a tax exemption number is on file. International orders may be subject to other tariffs or duties.

HOW TO CONTACT US

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LOOK INSIDE FOR THESE NEW PRODUCTS...

The name Bird has echoed uncompromising quality throughout the world of RF and microwave communications for over a half century. Many technicians made their first RF power measurement with a Model 43 THRULINE® Wattmeter and still use this remarkably accurate, reliable, and rugged instrument today. But you'll also find many new products throughout this catalog to help you install, repair, maintain, and operate RF equipment and systems.

HF, VHF, and UHF Antenna Testers
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Bird's total commitment to research and development, advanced engineering and quality-driven manufacturing are found in everything from our new Advanced Power Meter to the latest Bi-directional Attenuators. And you can confidently purchase any of these state-of-art products with the assurance that it will deliver the performance you expect. At Bird, *new* never means *unproven*. No Bird design enters production without undergoing extensive field tests, no instrument leaves our plant unless it is exactly right.

The evolution and advance of RF technology and applications into the next millennium will be mirrored by Bird instruments that will keep you and your business on the cutting edge. You can count on it.

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