

JFW INDUSTRIES

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www.jfwindustries.com

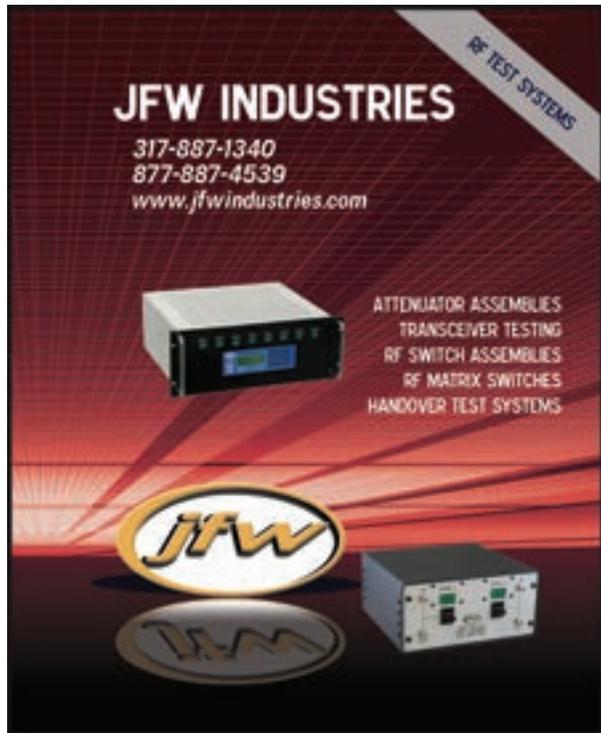
50 OHM
RF COMPONENTS



PROGRAMMABLE ATTENUATORS
MANUALLY VARIABLE ATTENUATORS
FIXED ATTENUATORS
TERMINATIONS
RF SWITCHES
POWER DIVIDERS AND COMBINERS
TEST ACCESSORIES



Additional JFW Brochures



Test Systems Brochure

Contains information on JFW's standard and custom RF test boxes, including:

- Matrix Switches
- Handover Test Systems
- Programmable Attenuator Assemblies
- Transceiver Test Systems
- Switch Assemblies
- Custom RF Assemblies

75 Ohm Components Brochure

See what JFW has to offer for cable TV and other 75 Ohm applications, including:

- Programmable Attenuators
- Rotary Attenuators
- Fixed Attenuators
- Terminations
- RF Switches
- Power Dividers
- Impedance Matching Pads
- DC Blocks
- RF Detectors
- Bias Taps



www.jfwindustries.com

JFW's Quality Policy

“JFW is committed to anticipating and exceeding customer’s requirements and expectations through cost-competitive, quality products and services that are delivered on time and through continual improvements to our quality management system.”

JFW's Standard Terms and Conditions

JFW Industries, Inc. has standard terms of Net 30 days with approved credit.

Alternate methods of payment include MASTERCARD,
American Express, VISA, COD or ADVANCE PAYMENT.

International Payment Terms are ADVANCE PAYMENT or
MASTERCARD, American Express and VISA.

Any other payment terms must be negotiated in advance.

Shipping terms are FOB JFW Ind for Domestic Customers and
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**ALL SHIPPING CHARGES will be PREPAID and ADDED TO THE INVOICE or
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JFW INDUSTRIES WARRANTY

JFW PRODUCTS ARE WARRANTED AGAINST DEFECTS IN WORKMANSHIP AND MATERIAL UNDER NORMAL USE AND SERVICE AS FOLLOWS: (2) TWO YEARS FROM DATE OF SHIPMENT FOR ALL FIXED AND SOLID STATE PRODUCTS. (1) ONE YEAR FROM DATE OF SHIPMENT FOR ALL MECHANICAL AND ELECTRO-MECHANICAL PRODUCTS. JFW INDUSTRIES' ONLY OBLIGATION UNDER THIS WARRANTY IS TO REPAIR OR REPLACE, AT ITS FACTORY, ANY JFW PRODUCT OR PART THEREOF THAT IS RETURNED TO JFW INDUSTRIES BY THE ORIGINAL PURCHASER WITHIN THE WARRANTY PERIOD.

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Solid-State Programmable Attenuators

- +20 dBm power handling typical
- Long lifetime solid-state design
- Frequencies up to 6 GHz
- 0.1, 0.25, 0.5, 1, 10 dB step sizes available
- Various Connectors available (SMA, N, BNC, TNC)

Featured Models* See website for complete specifications and drawings.			
Model	Range	Frequency	Max IL
50P-1867	0-31.75 x 0.25 dB	30-3000 MHz	2.5 dB
50P-1891	0-63.5 x 0.5 dB	30-3000 MHz	4.0 dB
50P-1893	0-63 x 1 dB	30-3000 MHz	4.0 dB
50P-1897	0-95 x 1 dB	30-3000 MHz	6.0 dB
50P-1782	0-127 x 1 dB	15-2000 MHz	6.0 dB
50P-1501	0-127 x 1 dB	200-3000 MHz	6.0 dB
50P-1900	0-127 x 1 dB	700-3000 MHz	6.0 dB



Wide Band Series

- 200-6000 MHz
- +20 dBm power handling
- Digitally latching models also available

Wide Band Series		
Model	Range	Max IL
50P-1855	0-31.5 x 0.5 dB	3.5 dB
50P-1853	0-63 x 1 dB	5.5 dB
50P-1857	0-95 x 1 dB	8.0 dB

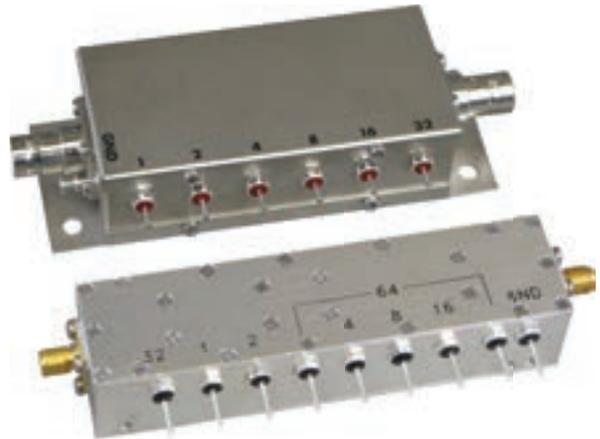


*Visit our website for an expanded list of models.

www.jfwindustries.com/programmables

Relay Programmable Attenuators

- 1 Watt power handling typical
- Low distortion
- Frequencies up to 6 GHz
- 0.1, 0.25, 0.5, 1, 10 dB step sizes available
- Various Connectors available (SMA, N, BNC, TNC)



Featured Models* See website for complete specifications and drawings.			
Model	Range	Frequency	Max IL
50P-542	0-10 x 1 dB	DC-2800 MHz	3.0 dB
50P-847	0-15 x 1 dB	DC-5000 MHz	4.0 dB
50P-1978	0-63 x 1 dB	DC-2700 MHz	4.0 dB
50P-1633	0-64.5 x 0.1 dB	DC-1000 MHz	4.0 dB
50P-1516	0-70 x 10 dB	DC-6000 MHz	3.5 dB
50P-591	0-85 x 1 dB	DC-3000 MHz	4.5 dB
50P-1976	0-127 x 1 dB	DC-1000 MHz	2.0 dB
50P-1436	0-127 x 1 dB	DC-2500 MHz	4.3 dB

High Power Models

- Designs with power handling up to 10 Watts available
- Frequencies up to 3 GHz
- Various step sizes available



Featured Models* See website for complete specifications and drawings.				
Model	Range	Frequency	Power	Max IL
50P-1941	0-15 x 1 dB	DC-3000 MHz	10 W	5.0 dB
50P-1930	0-63 x 1 dB	DC-200 MHz	10 W	0.2 dB
50P-1849	0-63 x 1 dB	DC-2700 MHz	10 W	4.0 dB

*Visit our website for an expanded list of models.

www.jfwindustries.com/programmables

Manually Variable Attenuators

Rotors (single shaft)

- 2W power handling
- See website for 6 GHz, 8 GHz and 18 GHz models
- Available in 0.1 dB, 1 dB and 10 dB steps

Featured Models* See website for complete specifications and drawings.			
Model	Range	Frequency	Max IL
50R-028	0-1 x 0.1 dB	DC-1000 MHz	1.0 dB
50R-215	0-1 x 0.1 dB	DC-2200 MHz	1.0 dB
50R-249	0-1 x 0.1 dB	DC-2500 MHz	1.0 dB
50R-019	0-10 x 1 dB	DC-2200 MHz	0.4 dB
50R-248	0-10 x 1 dB	DC-2500 MHz	0.5 dB
50R-310	0-10 x 1 dB	DC-2700 MHz	0.5 dB
50R-385	0-10 x 1 dB	DC-3000 MHz	0.6 dB
50R-029	0-70 x 10 dB	DC-2200 MHz	0.5 dB
50R-124	0-70 x 10 dB	DC-2500 MHz	0.5 dB
50R-246	0-70 x 10 dB	DC-2700 MHz	0.6 dB
50R-043	0-100 x 10 dB	DC-1000 MHz	0.3 dB
50R-234	0-100 x 10 dB	DC-2550 MHz	1.0 dB



Rotors (benchtop)

- Enclosed or L-bracket models available
- 2W power handling
- See website for 6 GHz, 8 GHz and 18 GHz models
- Available in 0.1 dB, 1 dB and 10 dB steps

Featured Models* See website for complete specifications and drawings.			
Model	Range	Frequency	Max IL
50BR-092	0-81 X 0.1 dB	DC-1000 MHz	1.5 dB
50BR-068	0-110 x 1 dB	DC-2550 MHz	1.8 dB
50BR-112	0-110 x 1 dB	DC-2700 MHz	2.2 dB



Don't see what you're looking for?

*Visit our website for additional models including Pushbutton, Toggle and Rocker Switch Attenuators.

www.jfwindustries.com/rotors

Manually Variable Attenuators

Rotors (dual shaft)

- 2W power handling
- See website for 6 GHz, 8 GHz and 18 GHz models
- Available in 0.1 dB or 1 dB steps

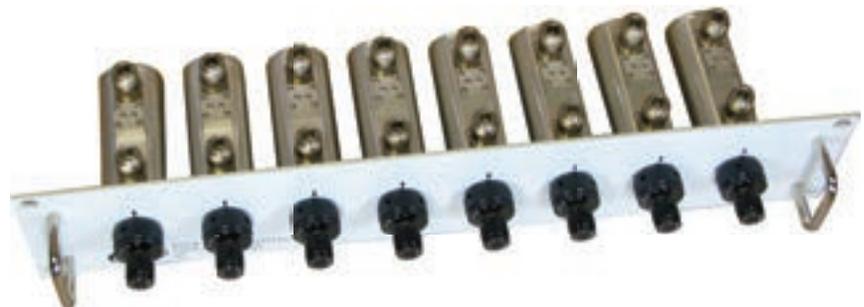
Featured Models* See website for complete specifications and drawings.			
Model	Range	Frequency	Max IL
50DR-060	0-11 X 0.1 dB	DC-2000 MHz	1.25 dB
50DR-055	0-30 X 1 dB	DC-2000 MHz	0.8 dB
50DR-096	0-30 X 1 dB	DC-3000 MHz	1.1 dB
50DR-063	0-50 X 1 dB	DC-1100 MHz	0.5 dB
50DR-046	0-50 X 1 dB	DC-2500 MHz	1.1 dB
50DR-111	0-60 X 1 dB	DC-2700 MHz	1.2 dB
50DR-061	0-80 X 1 dB	DC-2200 MHz	1.0 dB
50DR-125	0-80 X 1 dB	DC-2700 MHz	1.5 dB
50DR-001	0-110 x 1 dB	DC-1000 MHz	0.5 dB
50DR-082	0-110 x 1 dB	DC-2000 MHz	1.0 dB
50DR-119	0-110 x 1 dB	DC-2200 MHz	1.0 dB



Rotors (panel mounted)

- 19 inch rack mount panel typical
- Panel mounting available for any JFW rotor
- Custom designs in-line w/ catalog pricing

Featured Models* See website for complete specifications and drawings.			
Model	Range	Frequency	Panel Height
50PM-020	(8) 0-110 x 1 dB	DC-2000 MHz	2RU
50PM-060	(2) 0-50 x 1 dB	DC-2500 MHz	1RU
50PM-075	(4) 0-50 x 1 dB	DC-2500 MHz	1RU
50PM-003	(8) 0-50 x 1 dB	DC-2500 MHz	2RU
50PM-059	(2) 0-60 x 1 dB	DC-2700 MHz	1RU
50PM-074	(4) 0-60 x 1 dB	DC-2700 MHz	1RU
50PM-057	(8) 0-60 x 1 dB	DC-2700 MHz	2RU



Fixed Attenuators

Low Power

- See website for complete listing of low power fixed attenuators.

Featured Models* See website for complete specifications and drawings.			
Series	Frequency	Power	Connector
50F	DC-2200 MHz	1W	BNC or TNC
50HB	DC-6 GHz	2W	SMA
50HN	DC-6 GHz	2W	N
50HF	DC-18 GHz	2W	SMA or N



Medium Power

- See website for complete listing of 5-50 Watt fixed attenuators.

Featured Models* See website for complete specifications and drawings.			
Series	Frequency	Power	Heatsink
50FPE	DC-6 GHz	5W	None
50HF	DC-18 GHz	5W, 10W	Round*
50HF	DC-18 GHz	25W, 50W	Square
50FHC	DC-4 GHz	10W, 15W, 20W, 25W	Round*
50FHXC	DC-4 GHz	40W, 50W	Round*
50FH	DC-3 GHz	30W, 50W	Square

* These models with round heatsinks lack mounting holes.



High Power

- See website for complete listing of 75-1000 Watt fixed attenuators.

Featured Models* See website for complete specifications and drawings.			
Series	Frequency	Power	Heatsink
50FHAO	DC-3 GHz	75W	Square
50FH	DC-3 GHz	80W, 100W, 300W	Square
50FHAO	DC-3 GHz	100W, 150W, 200W	Round
50HF	DC-6 GHz	100W	Square
50FHDQ	DC-3 GHz	500W	Square
50FHIE	DC-3 GHz	1000W	Square



*Visit our website for an expanded list of models.

www.jfwindustries.com/fixed

Terminations

Low Power

- See website for complete listing of low power terminations/mismatches.

Featured Models* See website for complete specifications and drawings.			
Model	Frequency	Power	Connector
50T-001	DC-2200 MHz	1W	BNC male
50T-007	DC-8 GHz	2W	N male
50T-455	DC-18 GHz	1W	SMA male
50T-199	DC-18 GHz	2W	N male



Medium Power

- See website for complete listing of 5-50 Watt terminations/mismatches.

Featured Models* See website for complete specifications and drawings.				
Model	Frequency	Power	Connector	Heatsink*
50T-410	DC-4 GHz	5W	BNC, N, SMA, TNC or RPT	None
50T-128	DC-18 GHz	5W	SMA	Round*
50T-191	DC-18 GHz	5W	N	Round*
50T-439	DC-3 GHz	10W	BNC, N, SMA, TNC, 7/16	Round*
50T-440	DC-3 GHz	25W	BNC, N, SMA, TNC, 7/16	Round*
50T-506	DC-3 GHz	50W	BNC, N, SMA, TNC, 7/16	Round*
50T-533	DC-6 GHz	50W	N, SMA, 7/16	Square
50T-489	DC-18 GHz	50W	N, SMA	Square



* These models with round heatsinks lack mounting holes.

High Power

- See website for complete listing of 75-1000 Watt terminations/mismatches.

Featured Models* See website for complete specifications and drawings.				
Model	Frequency	Power	Connector	Heatsink
50T-549	DC-3 GHz	75W	BNC, N, SMA, TNC, 7/16	Square
50T-243	DC-3 GHz	100W	BNC, N, SMA, TNC, 7/16	Square
50T-390	DC-6 GHz	100W	N, 7/16	Round
50T-338	DC-3 GHz	200W	N, 7/16	Round
50T-421	DC-3 GHz	500W	N, TNC, 7/16	Square
50T-495	DC-3 GHz	1000W	N, 7/16	Square



Many terminations also available in mismatch version. *See website for more details.

www.jfwindustries.com/term

Solid-State RF Switches

- 1P1T to 1P16T standard configurations
- Long lifetime solid-state design
- 1 Watt power handling typical
- See website for 18 GHz models
- Typical switching speed in the microseconds
- Reflective or absorptive models available



Featured Models* See website for complete specifications and drawings.				
Model	Type	Frequency	Max IL	Min Isolation
50S-1560	1P1T	5-3000 MHz	3.5 dB	50 dB
50S-1970	1P2T	5-3000 MHz	3.5 dB	60 dB
50S-1971	1P4T	5-3000 MHz	3.5 dB	60 dB
50S-1972	1P8T	5-3000 MHz	3.5 dB	60 dB
50S-1220	1P2T	20-4300 MHz	3.0 dB	55 dB
50S-1075	1P4T	20-4300 MHz	4.0 dB	55 dB
50S-1310	1P8T	20-4300 MHz	4.5 dB	50 dB
50S-1567	1P12T	20-4300 MHz	4.5 dB	50 dB
50S-1584	1P16T	20-4300 MHz	5.5 dB	50 dB
50S-1876	1P2T	20-6000 MHz	2.5 dB	55 dB



High Power Models

- 1P2T to 1P6T standard configurations
- Frequencies up to 3 GHz
- Up to 250W cold-switching, 100W hot-switching and 2kW peak power handling
- Typical switching speeds < 40 microseconds

Featured Models* See website for complete specifications and drawings.					
Model	Type	Frequency	Max IL	Min Isolation	Input Power
50S-1872	1P2T	20-500 MHz	0.6 dB	50 dB	5W cold switch, 5W hot switch
50S-1559	1P2T	20-1000 MHz	0.75 dB	40 dB	150W cold switch, 50W hot switch
50S-1422	1P2T	100-500 MHz	0.5 dB	55 dB	250W cold switch, 100W hot switch
50S-1841	1P2T	500-3000 MHz	1.25 dB	55 dB	30W cold switch, 30W hot switch
50S-1820	1P2T	800-2700 MHz	1.2 dB	60 dB	100W cold switch, 30W hot switch
50S-1832	1P2T	960-1300 MHz	0.75 dB	40 dB	200W cold switch, 1kW peak w/ 35 usec pulse

*Visit our website for an expanded list of models.

www.jfwindustries.com/switch

Electro-Mechanical RF Switches

Reflective Switches (Unused ports open)

- All models operate from DC-18 GHz
- Voltage options include +12V, +15V, +24V, +28V
- TTL controlled models available upon request.
- 20 milliseconds typical switching speed



Featured Models* See website for complete specifications and drawings.			
Reflective Models	Type	Max IL	Min Isolation
50S-1313	1P2T failsafe	0.35 dB	60 dB
50S-1360	1P3T normally open	0.5 dB	60 dB
50S-1315	1P4T normally open	0.5 dB	60 dB
50S-1316	1P6T normally open	0.5 dB	60 dB
50S-1317	1P8T normally open	0.8 dB	55 dB
50S-1443	1P12T normally open	0.8 dB	60 dB
50S-1361	Transfer switch	0.5 dB	60 dB

Absorptive Switches (Unused ports self-terminating into 50 Ohms)

- All models operate from DC-18 GHz
- Voltage options include +12V, +15V, +24V, +28V
- TTL controlled models available upon request.
- 20 milliseconds typical switching speed



Featured Models* See website for complete specifications and drawings.			
Absorptive Models	Type	Max IL	Min Isolation
50S-1603	1P2T failsafe	0.5 dB	60 dB
50S-1657	1P3T normally open	0.5 dB	60 dB
50S-1650	1P4T normally open	0.5 dB	60 dB
50S-1437	1P6T normally open	0.5 dB	60 dB
50S-1614	1P8T normally open	0.5 dB	60 dB

Power Table								
Frequency Range	DC-100 MHz	100-200 MHz	200-500 MHz	500-1000 MHz	1-4 GHz	4-8 GHz	8-12 GHz	12-18 GHz
Max Average RF Power	500 Watts	400 Watts	300 Watts	200 Watts	100 Watts	90 Watts	70 Watts	60 Watts

*Visit our website for more models.

www.jfwindustries.com/switch

Resistive Power Dividers / Combiners

Resistive - Low Power

- Models listed below available with SMA only.
- See website for additional types and connector options (N, BNC, TNC).

Featured Models* See website for complete specifications and drawings.				
Model	Type	Frequency	Power	IL
50PD-016	2-Way	DC-4000 MHz	2W	6 dB
50PD-292	3-Way	DC-4000 MHz	2W	9.5 dB
50PD-293	4-Way	DC-4000 MHz	2W	12 dB
50PD-785	16-Way	DC-2000 MHz	1W	24 dB



DC-6 GHz Series

SMA female connectors
1W RF Input Power

Type	Model
2-Way	50PD-478
3-Way	50PD-469
4-Way	50PD-771
5-Way	50PD-732
7-Way	50PD-734
8-Way	50PD-746
9-Way	50PD-760
11-Way	50PD-735



High Power Models

Up to 200W RF Input Power

Model	Type	Frequency	Power
50PD-377	2-Way	DC-500 MHz	200W
50PD-670	2-Way	DC-3000 MHz	30W
50PD-667	3-Way	DC-3000 MHz	30W
50PD-631	4-Way	DC-2000 MHz	30W



Visit our website for an expanded list of models.

www.jfwindustries.com/divider

Reactive Power Dividers / Combiners

Reactive - Low Power

- Several series available that cover common frequency bands
- 5 Watts average power handling when used as a divider
- 20 dB isolation typical

Featured Models* See website for complete specifications and drawings.				
Frequency	Connector	2-Way	4-Way	8-Way
800-2400 MHz	SMA	50PD-559	50PD-560	50PD-570
20-3000 MHz	SMA	50PD-590	50PD-591	50PD-687
698-3000 MHz	SMA	50PD-659	50PD-660	50PD-665
698-3000 MHz	N	50PD-727	50PD-728	50PD-742
2000-6000 MHz	SMA	50PD-634	50PD-638	50PD-647
500-6000 MHz	SMA	50PD-645	50PD-650	50PD-662



19" Rack Assemblies

Contact JFW for your custom solution.
Custom designed in-line w/ catalog pricing.

Model	Description
50PDA-040	24-Way divider in a 3U 19" rack
50PDA-071	8-Way divider in a 1U 19" rack
50PDA-040	4-Way divider in a 1U 19" rack



High Power Models

Up to 250W RF Input Power
Various Connectors available (SMA, N, TNC)

Model	Type	Frequency	Power
50PD-700	2-Way	380-400 MHz	200W
50PD-424	2-Way	800-900 MHz	200W
50PD-698	2-Way	700-3000 MHz	100W
50PD-759	4-Way	350-500 MHz	250W



Visit our website for an expanded list of models.

www.jfwindustries.com/divider

Test Accessories

Impedance Matching

57Z series	57ZT series	57ZTT series
Typical Specifications		
Resistive Matching Pad	Toroidal Matching Transformer	Microstrip Matching Transformer
Frequency coverage from DC up to 3 GHz	Low Frequency 0.5-1000 MHz	Frequencies starting @ 300 MHz Up to 3 GHz
5.7 dB Insertion Loss	<1 dB Insertion Loss	<1 dB Insertion Loss
1W average	1W average	20W average



Resistive Coupler

Resistive couplers differ from standard directional couplers in several important ways:

- Minimum coupling value of 20dB
- Couples signal in both directions
- No directivity

Model	Frequency Range	Power
50C-041	DC-2 GHz	5 W
50C-045	DC-6 GHz	1 W
50C-051	DC-3 GHz	2 W



Visit our website for an expanded list of models.

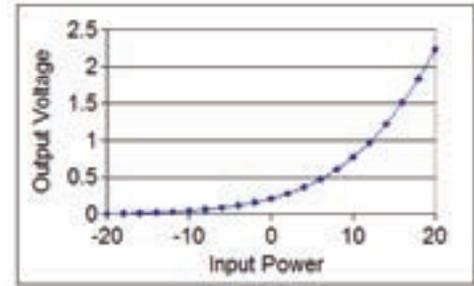
www.jfwindustries.com/testaccessories

Test Accessories

RF Detectors

- Converts an RF signal into a DC voltage level
- The DC voltage level corresponds to the RF signal amplitude

Featured Models* See website for complete specifications and drawings.		
Model	Frequency	Max RF Input Power
50D-050	1-1000 MHz	100 mW
50D-051	1-2000 MHz	100 mW
50D-052	1-3000 MHz	100 mW



DC Blocks

- Blocks DC voltage while passing RF signal

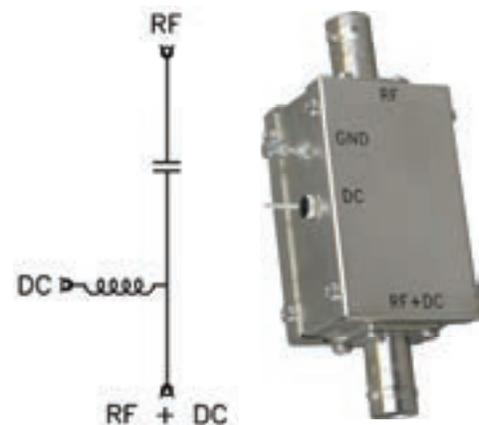
Featured Models* See website for complete specifications and drawings.		
Model	Frequency	Max DC Voltage
50DB-007	10 MHz-18 GHz	200V
50DB-009	10-4000 MHz	50V
50DB-039	200 KHz-2000 MHz	100V



Bias Taps

- Used to add or remove DC voltage from a coaxial cable

Featured Models* See website for complete specifications and drawings.			
Model	Frequency	DC Voltage	DC Current
50BT-014	800-2500 MHz	150V	5A
50BT-017	100-1750 MHz	200V	2A
50BT-029	250-3000 MHz	100V	1A
50BT-067	10-2200 MHz	100V	4A



Visit our website for an expanded list of models.

www.jfwindustries.com/testaccessories

Engineering Reference Guide

Effect of VSWR on Transmitted Power

VSWR	Return Loss (dB)	Trans. Loss (dB)	Volt Refl. Coeff.	Power Trans. (%)	Power Refl. (%)
1.01	46.1	.000	.01	99.9	.0
1.02	40.1	.000	.01	99.9	.0
1.03	36.6	.001	.02	99.9	.0
1.04	34.2	.002	.02	99.9	.0
1.05	32.3	.003	.02	99.9	.1
1.06	30.7	.004	.03	99.9	.1
1.07	29.4	.005	.03	99.9	.1
1.08	28.3	.006	.04	99.9	.1
1.09	27.3	.008	.04	99.8	.2
1.10	26.4	.010	.05	99.8	.2
1.15	23.1	.021	.07	99.5	.5
1.20	20.8	.036	.09	99.2	.8
1.25	19.1	.054	.11	98.8	1.2
1.30	17.7	.075	.13	98.3	1.7
1.40	15.6	.122	.17	97.2	2.8
1.50	14.0	.177	.20	96.0	4.0
1.60	12.7	.238	.23	94.7	5.3
1.70	11.7	.302	.26	93.3	6.7
1.80	10.9	.370	.29	91.8	8.2
1.90	10.2	.440	.31	90.4	9.6
2.00	9.5	.512	.33	88.9	11.1
2.50	7.4	.881	.43	81.6	18.4
3.00	6.0	1.249	.50	75.0	25.0
3.50	5.1	1.603	.56	69.1	30.9
4.00	4.4	1.938	.60	64.0	36.0
4.50	3.9	2.255	.64	59.5	40.5
5.00	3.5	2.553	.67	55.6	44.4
5.50	3.2	2.834	.69	52.1	47.9
6.00	2.9	3.100	.71	49.0	51.0
6.50	2.7	3.351	.73	46.2	53.8
7.00	2.5	3.590	.75	43.7	56.2
7.50	2.3	3.817	.76	41.5	58.5
8.00	2.2	4.033	.78	39.5	60.5
8.50	2.1	4.240	.79	37.7	62.3
9.00	1.9	4.437	.80	36.0	64.0
9.50	1.8	4.626	.81	34.5	65.5
10.00	1.7	4.807	.82	33.1	66.9
11.00	1.6	5.149	.83	30.6	69.4
12.00	1.5	5.466	.85	28.4	71.6
13.00	1.3	5.762	.86	26.5	73.5
14.00	1.2	6.042	.87	24.9	75.1
15.00	1.2	6.301	.88	23.4	76.6
16.00	1.1	6.547	.88	22.1	77.9
17.00	1.0	6.780	.89	21.0	79.0
18.00	1.0	7.002	.89	19.9	80.1
19.00	.9	7.212	.90	19.0	81.0
20.00	.9	7.413	.90	18.1	81.9
25.00	.7	8.299	.92	14.8	85.2
30.00	.6	9.035	.94	12.5	87.5

Power Conversion Table

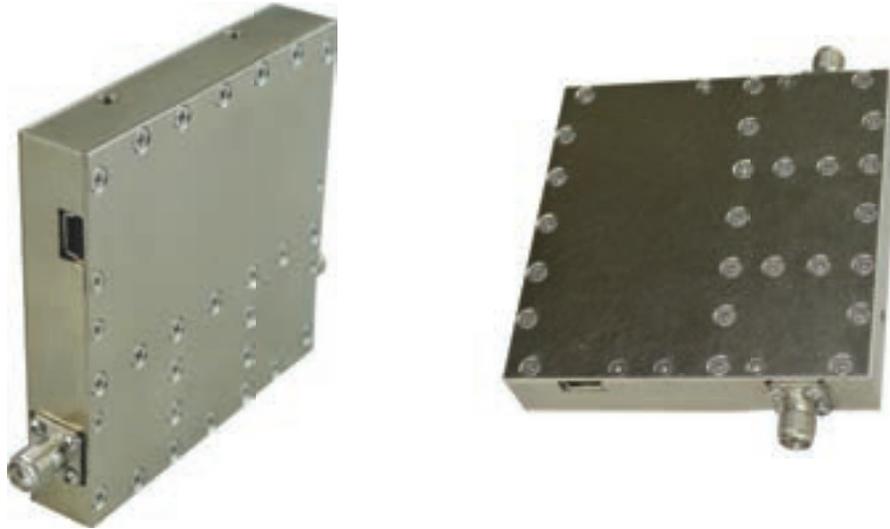
dBm	Milliwatts	dBm	Watts
-20	0.01	25.0	0.32
-19	0.01	25.5	0.35
-18	0.02	26.0	0.40
-17	0.02	26.5	0.45
-16	0.03	27.0	0.50
-15	0.03	27.5	0.56
-14	0.04	28.0	0.63
-13	0.05	28.5	0.71
-12	0.06	29.0	0.79
-11	0.08	29.5	0.89
-10	0.10	30.0	1.00
-9	0.13	30.5	1.12
-8	0.16	31.0	1.26
-7	0.20	31.5	1.41
-6	0.25	32.0	1.58
-5	0.32	32.5	1.78
-4	0.40	33.0	2.00
-3	0.50	33.5	2.24
-2	0.63	34.0	2.51
-1	0.79	34.5	2.82
0	1.00	35.0	3.16
1	1.26	35.5	3.55
2	1.58	36.0	3.98
3	2.00	36.5	4.47
4	2.51	37.0	5.01
5	3.16	37.5	5.62
6	3.98	38.0	6.31
7	5.01	38.5	7.08
8	6.31	39.0	7.94
9	7.94	39.5	8.91
10	10.00	40.0	10.00
11	12.59	40.5	11.22
12	15.85	41.0	12.59
13	19.95	41.5	14.13
14	25.12	42.0	15.85
15	31.62	42.5	17.78
16	39.81	43.0	19.95
17	50.12	43.5	22.39
18	63.10	44.0	25.12
19	79.43	44.5	28.18
20.0	100.0	45.0	31.62
20.5	112.2	45.5	35.48
21.0	125.9	46.0	39.81
21.5	141.3	46.5	44.67
22.0	158.5	47.0	50.12
22.5	177.8	47.5	56.23
23.0	199.5	48.0	63.10
23.5	223.9	48.5	70.79
24.0	251.2	49.0	79.43
24.5	281.8	49.5	89.13
		50.0	100.00

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