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DIRECTIONAL COUPLERS
High directivity—low SWR
770, 780, 790 Series

MICROWAVE TEST EQUIPMENT

770 Dual Directional Couplers

The economical HP 774D-777D Couplers cover frequency spreads of more than two-to-one, each centered on one of the important VHF/UHF bands. With their high directivity, these couplers are ideal for reflectometer applications. Reflectometers can save appreciable time in the design and manufacture of broadband antennas, ECM equipment, television receivers and transmitters, etc. The close tracking of the auxiliary arms makes these couplers particularly useful for reflectometers driven by externally-leveled sweep oscillators such as the HP 8690 series. The forward signal is detected and used to level the output of the sweep oscillator while the reflected signal, after detection, is applied to a display device such as an oscilloscope or graphic recorder. Changes in the leveled power due to the coupling variation in the forward arm are virtually cancelled by a similar coupling variation in the reverse arm.

The couplers are also capable of materially improving the speed and accuracy of power measurements because of their accurate coupling and low SWR. The units are capable of handling fairly high amounts of power and have low insertion loss so they can be permanently installed in coaxial lines for continuous monitoring. Also, a power meter can be alternately connected to the "incident" and "reflected" ports to aid in adjusting for maximum forward power.

780 Directional Detectors

The HP 780-series Directional Detectors are directional couplers with built-in crystal detectors. The couplers have flat frequency response and good directivity, while the detectors also have good frequency response plus high sensitivity. The configuration of the directional detector reduces the number of ambiguities over the standard system of separate coupler and detector and makes possible tighter correlation between main-arm power and detected signal.

The directional detector is well-suited to closed-loop leveling applications, for it permits establishment of a leveled-power point anywhere in a system irrespective of the characteristics of intervening cables, connectors, etc.

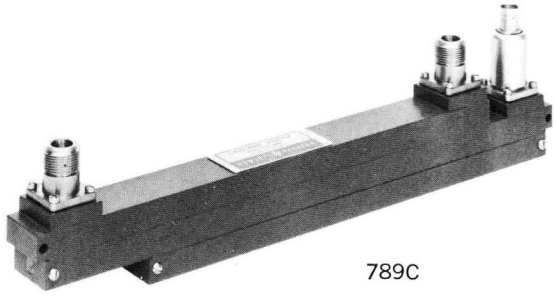
These directional detectors can also be used to monitor power, with a voltmeter or oscilloscope indicating detected output. For applications where conformance to square law is important, factory-selected load resistors can be supplied.

The 786D, 787D, 788C, and 789C are strictly coaxial devices, both RF connectors being Type N. The X781A is a hybrid, having a Type N RF input connector and a waveguide cover flange RF output. The X781A is intended for monitoring or leveling the output of a signal source with a coaxial output when it is being used to drive a waveguide system.

Detector elements can be replaced without special tools or procedures. Type N connectors are stainless steel for long wear.

790 Directional Couplers

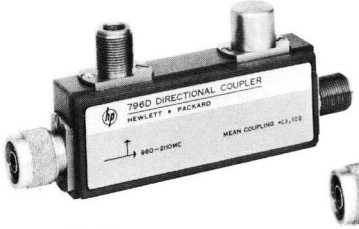
The 790 Directional Couplers are ultra-flat, high directivity couplers which are ideal for power-monitoring applications in coaxial systems. Output coupling (ratio of output power from main and auxiliary arms) is specified rather than coupling factor. Thus, no corection factor is required to account for insertion and coupling losses in the main arm.



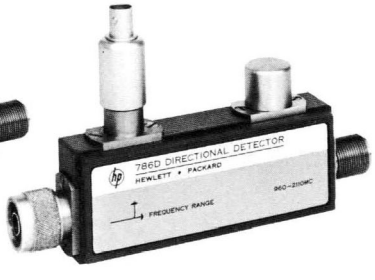
789C



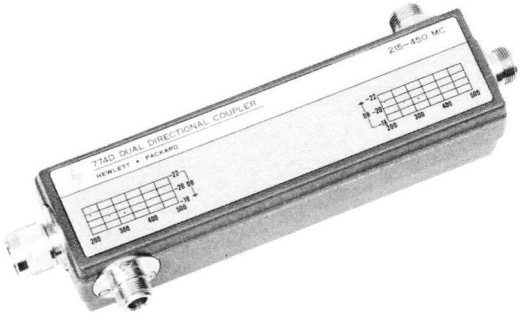
X781A



796D



786D



774D

Specifications, 774D — 777D

HP Model	774D	775D	776D	777D
Frequency range	215 to 450 MHz	450 to 940 MHz	940 to 1900 MHz	1900 to 4000 MHz
Minimum directivity[1]	40 dB	40 dB	40 dB	30 dB
Coupling attenuation (each auxiliary arm)	20 dB	20 dB	20 dB	20 dB
Accuracy of coupling (each auxiliary arm)	mean coupling level within 0.5 dB of specified values			
Max. coupling variation (50-ohm terminations)	±1 dB	±1 dB	±1 dB	±0.4 dB
Auxiliary arm tracking[2]	——	——	≤0.3 dB	≤0.5 dB
Max. primary line SWR[1] (50-ohm terminations)	1.15	1.15	1.15	1.2
Max. auxiliary arm SWR (50-ohm terminations)	1.2	1.2	1.2	1.25
Power-handling capacity	50 watts avg. 10 kW peak	50 watts avg. 10 kW peak	50 watts avg. 10 kW peak	50 watts avg. 10 kW peak
Primary line insertion loss	0.3 dB max.	0.4 dB max.	0.35 dB max.	0.75 dB max.
Primary line connectors	Type N, one male, one female[3]			
Auxiliary arm connectors	Type N, female[3]			
Accessories available	11511A Type N Female Shorting Jack, $4; 11512A Type N Male Shorting Plug, $5			
Length	9-1/16" (230 mm)	9-1/16" (230 mm)	6-5/16" (161 mm)	8-7/8" (225 mm)
Shipping weight	4 lb (1,8 kg)	4 lb (1,8 kg)	3 lb (1,4 kg)	3 lb (1,4 kg)
Price	$225	$225	$225	$275

[1] Measured with HP 907A Sliding Termination or H01-909A Termination.
[2] Maximum change in the coupling curve of one auxiliary arm relative to the other.
[3] Compatible with connectors whose dimensions conform to MIL-C-39012 or MIL-C-71.

Specifications, 780 Series

HP Model	Frequency range (GHz)	Freq. resp. (dB)[1]	Low-level sens. (μV/μWCW)	Directivity (dB)[1]	Equiv. source SWR[2]	Max. SWR	Max. input (W, peak or avg.)	Max. Insertion loss (dB)	Length (in)	Length (mm)	Shipping weight (lb)	Shipping weight (kg)	Price
786D	0.96 to 2.11	±0.2	>4	30	1.13	1.15	10	0.4	6	152	2	0,9	$300
787D	1.9 to 4.1	±0.2	>4	26	1.16	1.15	10	0.5	4⅞	124	2	0,9	$300
788C	3.7 to 8.3	±0.3	>40	20	1.25	1.20	1	0.8	4⅞	124	2	0,9	$325
789C	8.0 to 12.4	±0.5	>20	17	1.25	1.40	1	1.2	11⅝	295	2	0,9	$350
X781A	8.0 to 12.4	±0.5	>20	17	1.07	1.25	1	1.2	15¾	400	2	0,9	$350

[1] Includes coupler and detector variation with frequency as read on a meter calibrated for square-law detectors (e.g., HP 415E SWR Meter).
[2] The apparent reflection coefficient at the output of an RF generating system, using a directional detector in a closed-loop leveling system.
[3] Type N connectors mate compatibly with connectors whose dimensions conform to MIL-C-39012 or MIL-C-71.

For all models

Detector output impedance: 15 kΩ max. shunted by approx. 10 pF.

Detector element: supplied.

Noise: <200 μV peak-to-peak with CW power applied to produce 100 mV output.

Detector output polarity: negative.

Detector output connector: BNC female.

RF connectors:[3] Type N, one male (input), one female (789C: both female); X781A: input, Type N female; output, precision cover flange, fits 1" x ½" waveguide (EIA WR90).

Options

02. Furnished with load resistor for optimum square law characteristics at 24°C (75°F), <±0.5 dB variation from square law over a range of at least 30 dB from low level up to 50 mV peak output (working into external load >75 kΩ); sensitivity typically one-fourth of unloaded sensitivity; add $20.
03. Positive polarity detector output; no additional charge.

Specifications, 790 Series

HP Model	Frequency range (GHz)	Mean output coupling (dB)[1]	Output coupling variation (dB)[2]	Directivity (dB)[2]	Equiv. source match[2,3]	Max. primary line SWR	Max. aux. arm SWR	Max. input (W)	Max. Insertion loss (dB)[4]	Length (in)	Length (mm)	Shipping weight (lb)	Shipping weight (kg)	Price
796D	0.96 to 2.11	20 ±0.5	±0.2	30	1.13	1.15[2]	1.20[2]	50	0.4	6	152	2	0,9	$200
797D	1.9 to 4.1	20 ±0.5	±0.2	26	1.16	1.15[2]	1.25[2]	50	0.5	4⅞	124	2	0,9	$200
798C	3.7 to 8.3	10 ±0.3	±0.3	20	1.25	1.20	1.20	10	0.8	4⅞	124	2	0,9	$225
For all models: RF connectors: primary line: type N, one male (input), one female; auxiliary arm: type N female.[5]														

[1] Difference in dB between power out of primary line and auxiliary arm.
[2] Swept-frequency tested.
[3] The apparent SWR at the output port of a directional coupler when it is used in a closed-loop leveling system.
[4] Includes loss due to coupling.
[5] Type N connectors mate compatibly with connectors whose dimensions conform to MIL-C-39012 or MIL-C-71.

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