TYPE N DUAL COAXIAL REFLECTOMETER COUPLERS

- **Exceptionally High Directivity for Reflectometry Measurements**
- **Broadband Frequency Coverage**
- **Bilateral Male and Female Output Ports**
- **Low VSWR**
- **High Power**

SPECIFICATIONS

FREQUENCY RANGE (GHz)	MODEL	NOMINAL COUPLING (dB)	DIRECTIVITY dB (Min)	VSWR		EQUIVALENT RESIDUAL VSWR Max	ABSOLUTE CALIBRATION ACCURACY (Per 10 dB)	INSERTION LOSS	TRACKING (dB)	MAXIMUM DEVIATION from NOMINAL (dB)	POWER AVERAGE			WEIGHT Lbs / Kg (Max)
				PRIMARY LINE POWER	SECONDARY LINE						INCIDENT W	REFLECTED W	PEAK kW	
0.05-1	3020A	20*	35	1.05	1.10	1.04	±0.1	.2	0.3	±1.0 from 250-1000 MHz	500	500	10	2.4 / 1.1
1-4	3022	20	1-3 GHz:30 3-4 GHz:27	1.15	1.15	1.09	±0.1	.3	0.3	±1.0	500	500	10	1.9 / 0.7
4-8	3024	20	25	1.15	1.20	1.12	±0.1	.6	0.3	±1.0	500	500	10	1.6 / 0.7

*Coupling from 250 MHz to 50 MHz increase from 20 dB to 33 dB

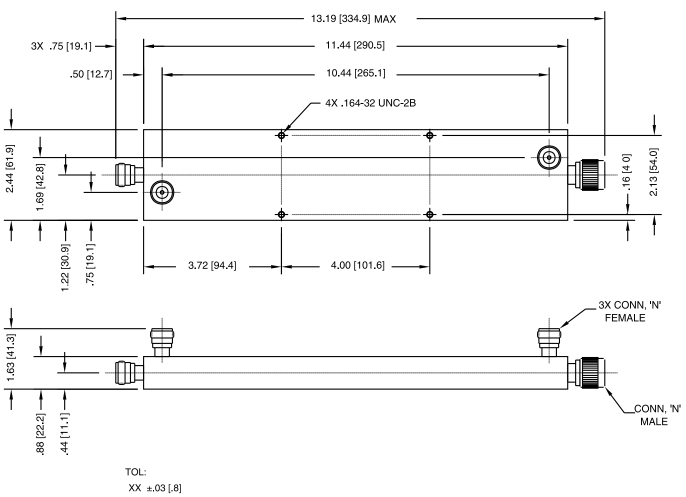
NOTES:
Primary Connectors: 1 female, 1 male, Type N
Secondary Connectors: 2 female, Type N

Accessories supplied with all units above:
1 male short
1 female short

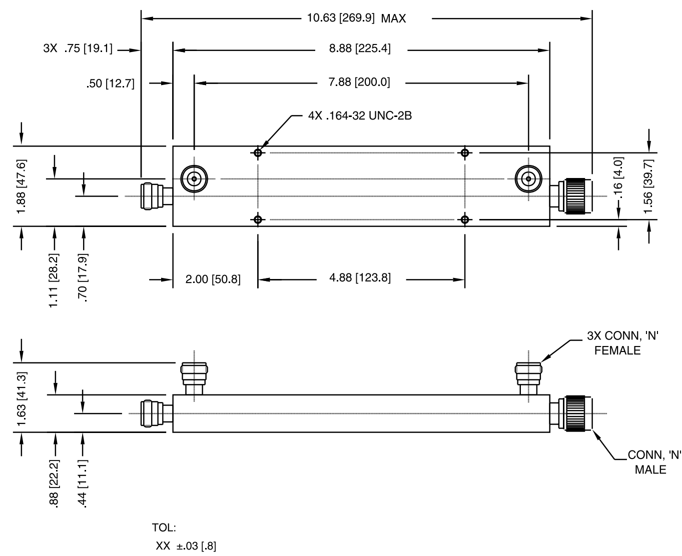
See pages 16-17 for **Wireless** Band Dual Directional Couplers

Couplers

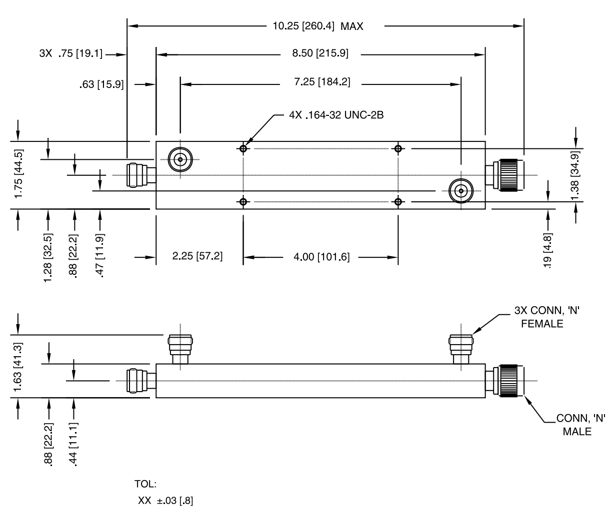
OUTLINE DRAWINGS



MODEL 3020A



MODEL 3022



MODEL 3024

All dimensions are Max. unless otherwise specified

narda
an L3 communications company
USA TEL: (1) 631 231-1700 • INT'L TEL: (1) 631 231-1390 • FAX (1) 631 231-1711
E-MAIL: nardaeast@L-3COM.com • www.nardamicrowave.com

7 mm PRECISION HIGH-DIRECTIVITY DIRECTIONAL COUPLERS

- **Exceptionally High Directivity**
- **Extended Octaves**
- **Precision Connectors**
- **Increased Dynamic Range**
- **Allows Swept Measurements with High Accuracy**

SPECIFICATIONS

FREQUENCY RANGE (GHz)	MODEL	NOMINAL COUPLING (dB)	DIRECTIVITY dB (Min)	VSWR PRIMARY LINE	VSWR SECONDARY LINE Max	FREQUENCY SENSITIVITY (dB) Max	ABSOLUTE CALIBRATION ACCURACY (dB)	POWER* (Watts) AVG. (dB)	WEIGHT Oz / Gr (Max)
0.95-2.2	3092	10	45	1.10	1.10	±1.2	±0.1	5	13 / 369
1.7-4.2	3093	10	42	1.10	1.10	±1.2	±0.1	5	11 / 312
3.7-8.3	3094	10	37	1.20	1.20	±1.2	±0.1	5	20 / 567
7-12.4	3095	10	33	1.20	1.25	±1.2	±0.1	5	14 / 397
7-18	3096	10	25	1.25	1.30	±1.5	±0.1	5	15 / 425

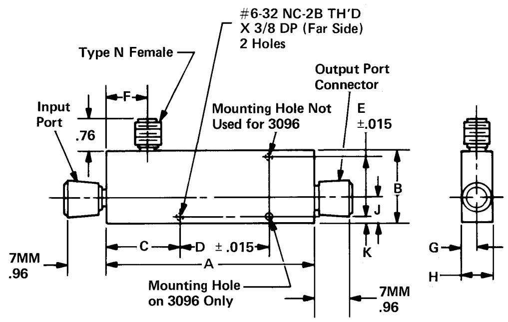
Primary input and output connectors are 7 mm.
Secondary line connectors are Type N female.

*Power rating of 5 watts into an open circuited load (VSWR=∞)

NOTE: Custom order models available upon request. Consult the factory.

Couplers

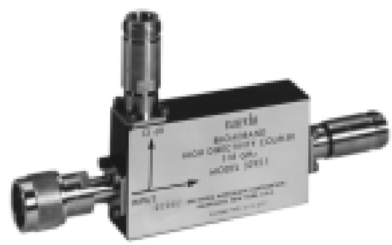
OUTLINE DRAWINGS



MODEL	A	B	C	D	E	F	G	H	J	K	Mtg. Holes Dia. or Thread
3092	4.69	1.76	.51	3.000	1.375	.51	.38	.76	.64	.20	6-32 NC-2B Tapped Holes 3/8 DP 2 Places
3093	3.97	1.60	.51	3.000	1.218	.51	.38	.76	.63	.20	
3094	7.58	1.76	.89	5.000	1.375	.50	.38	.76	.63	.20	
3095	5.05	1.44	.89	3.000	1.062	.63	.44	.88	.63	.20	
3096	5.24	1.51	.76	3.732	—	.91	.44	.88	.70	.22	8-32 NC-2B Tapped Holes 7/16 DP 2 Places

All dimensions are Max. unless otherwise specified.

narda
an L3 communications company
USA TEL: (1) 631 231-1700 • INT'L TEL: (1) 631 231-1390 • FAX (1) 631 231-1711
E-MAIL: nardaeast@L-3COM.com • www.nardamicrowave.com



1-18 GHz

BROADBAND HIGH DIRECTIVITY COUPLERS

- **Broadband Frequency Coverage from 1 to 18 GHz in a Single Unit**
- **High Directivity**
- **Increased Dynamic Range**
- **Flat Frequency Response**

SPECIFICATIONS

FREQUENCY RANGE (GHz)	MODEL	NOMINAL COUPLING* dB	DIRECTIVITY dB (Min)		VSWR		FREQUENCY SENSITIVITY dB (Max)		CONNECTORS		WEIGHT Oz / Gr (Max)
		1.9- 12.4 GHz	1-5	5-12.4	PRIMARY LINE (Max)	SECONDARY LINE (Max)	1-1.9	1.9-12.4	PRIMARY LINE INPUT 1-9.9	SECONDARY LINE OUTPUT	
1-12.4	3293-1	10(±1)	30	26	1.25	1.30	4	±1.0	Type N Male	Type N Female	12 / 340
	3293-2	10(±1)	30	26	1.25	1.30	4	±1.0	Type N Female	Type N Male	12 / 340
	5293	10(±1)	30	26	1.25	1.30	4	±1.0	7 mm Male	7 mm Female	12 / 340

FREQUENCY RANGE (GHz)	MODEL	NOMINAL COUPLING* dB	DIRECTIVITY dB (Min)		VSWR		FREQUENCY SENSITIVITY dB (Max)		CONNECTORS		OPTIONS AVAILABLE	WEIGHT Oz Gr (Max)
		1.5-18 GHz	1-8	8-18	PRIMARY LINE (Max)	SECONDARY LINE (Max)	1-1.5	1.5-18	PRIMARY LINE INPUT 1-1.5	SECONDARY LINE OUTPUT		
1-18	3292-1	13(±1)	27	25	1.35	1.40	4	±1.5	Type N Male	Type N Female	-02	12 340
	3292-2	13(±1)	27	25	1.35	1.40	4	±1.5	Type N Female	Type N Male	-02	12 340
	5292	13(±1)	28	26	1.30	1.30	4	±1.5	Precision 7 mm	Precision 7 mm	-01 -02	12 340

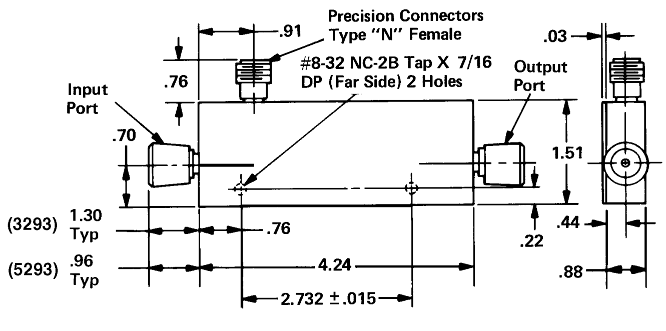
*Refer to Typical Coupling Curve on page 312 for frequency ranges 1-1.9 GHz and 1-1.5 GHz.

Nominal Coupling is defined as average coupling over the designated frequency range $\left(\frac{\text{MAX. COUPLING} + \text{MIN. COUPLING}}{2}\right)$

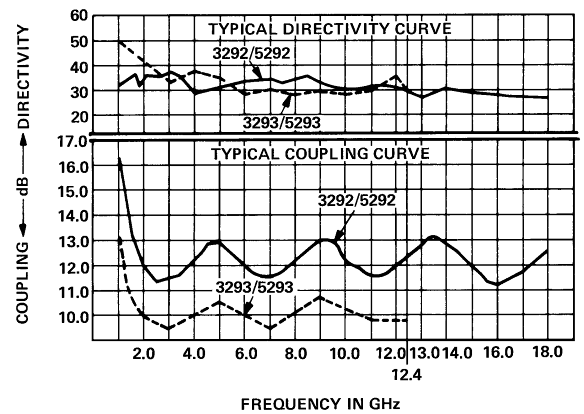
OPTIONS:
-01 Precision Stainless Steel Type N Female Connector on the secondary line.
-02 Precision Stainless Steel SMA Female Connector on the secondary line.

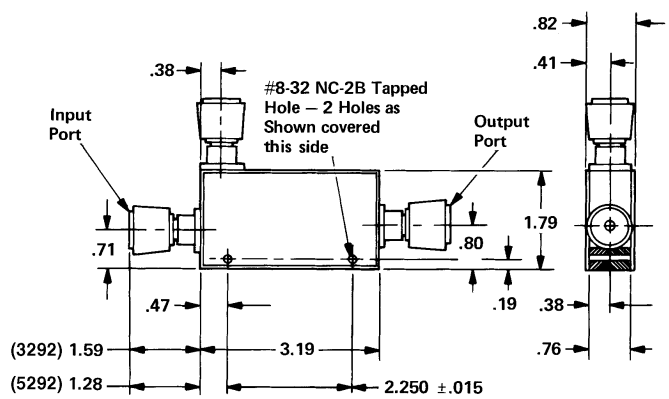
POWER RATING: 5 W average, 100 W peak

OUTLINE DRAWINGS



MODEL 3293, 5293





MODELS 3292, 5292

All dimensions are Max. unless otherwise specified.

narda
an L3 communications company
USA TEL: (1) 631 231-1700 • INT'L TEL: (1) 631 231-1390 • FAX (1) 631 231-1711
E-MAIL: nardaeast@L-3COM.com • www.nardamicrowave.com

One of the oldest circuits for impedance measurements is the Wheatstone bridge. Narda has developed a microwave embodiment of this circuit with 35 dB directivity over the entire frequency range of 2 to 16 GHz. All ports are well matched for minimum contribution to measurement error.

BASIC DESCRIPTION

In the bridge of Figure 1a, resistors A, B, and C are 50W. If any two of the three ports, generator, detector, and Z_x, are terminated by 50W, the impedance looking into the third port is also 50W and its VSWR is unity. Reflection coefficient is measured directly with this circuit, as shown by the following bridge equation.

Equation 1. $$\frac{V_d}{V_g} = \frac{1}{8}\frac{(50 - Z_x)}{(50 + Z_x)} = \frac{\Gamma_x}{8}$$

In this equation, Γ_x is the reflection coefficient of Z_x, R_d is the detector impedance, V_d is the detector voltage and V_g is the generator voltage.

Transmission lines of $Z_o = 50\Omega$ are connected at the Z_x and detector ports as shown in Figure 1b. The actual microwave embodiment is shown in Figure 1c. Special thin film resistors were developed for A and B, and a proprietary process is used to obtain resistor C. These resistors are precisely 50W within 0.5% from 2 to 18 GHz.

In its microwave form, this basic Wheatstone bridge circuit requires a means of connecting the two balanced-to-ground terminals 1 and 2 to a coaxial connector having a grounded outer conductor. Circuits that accomplish this balance-to-unbalance transformation are called "baluns". In previous microwave bridges, the balun has been responsible for rather high VSWR into at least one of the three ports at the lower and upper limits of the usable frequency band. The Narda Model 5282 Bridge incorporates a unique balun circuit that yields low VSWR at all ports throughout the 1.9 to 18.5 GHz band.

OPERATION OF A MICROWAVE BRIDGE

An ideal bridge has 6 dB insertion loss between the input and test ports and between the test and output ports. If a unity reflection coefficient load (0 dB return loss) is connected to the test port, the insertion loss between input and detector port will be 12 dB. For other loads the total insertion loss will be 12 dB, plus the load's return loss. In practical direct measurement of return loss, one establishes the 0 dB return loss reference by connecting a short or open circuit to the test port and then measures the device to be tested with respect to this reference. Higher accuracy in setting the 0 dB reference is achieved by

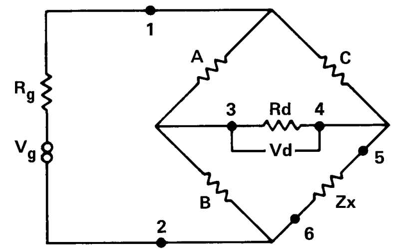


Figure 1a. Basic Wheatstone Bridge Circuit

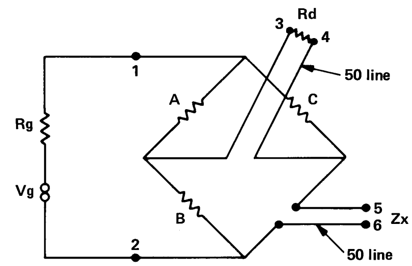


Figure 1b. Wheatstone Bridge Using Transmission Lines

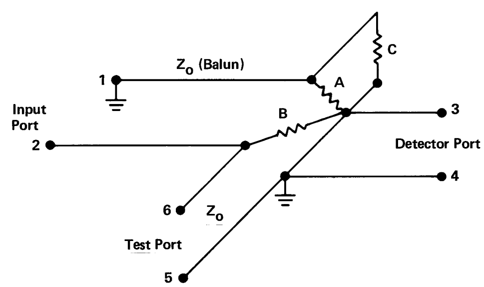


Figure 1c. Microwave Wheatstone Bridge

Figure 1. Evolution of a Microwave Wheatstone Bridge Terminals 1,2,3,4,5,6 correspond in the diagrams

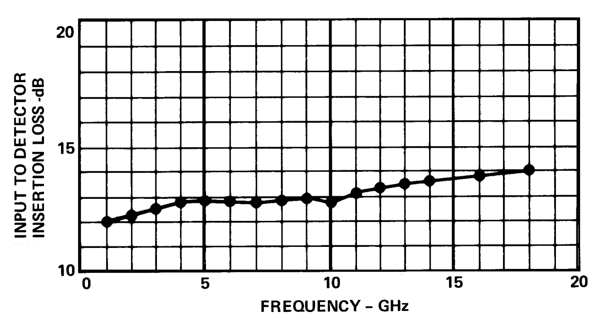


Figure 2. Typical Bridge Insertion Loss

averaging the reference signal levels obtained with both open and short circuit terminations.

The insertion loss of a real bridge will be slightly higher than 12 dB, by 0.2 to 2 dB, due to the line losses. For ease of measurement, it is desirable that the insertion loss remain flat with frequency. Insertion loss performance of a typcial bridge is shown in Figure 2.

COMPARISON OF THE MICROWAVE BRIDGE WITH A DIRECTIONAL COUPLER

The bridge performs essentially the same function as a high directivity coupler and the two devices may be used interchangeably in reflectometer and network analyzer applications. In fact, the Narda Precision Bridge closely resembles a high directivity coupler in external appearance and connector locations. The only significant difference is that the bridge has a 6 dB insertion loss in both the input-to-test and test-to-output paths, while the coupler has almost zero loss in the primary line and loss equal to the coupling value in the coupled path. If the coupling is about 12 dB, the two devices provide equal system sensitivity. For example, Narda precision high directivity couplers have 10 dB coupling and the Narda broadband 1-18 GHz high directivity coupler has about 13 dB coupling. Thus the bridge and any of the couplers can be interchanged with almost identical system sensitivity. The difference between the individual path insertion losses in the two types of devices does not affect inherent measurement accuracy, but does affect system performance in ways that are usually of minor signifigance. Measurement situations where one or the other would be favored are discussed later.

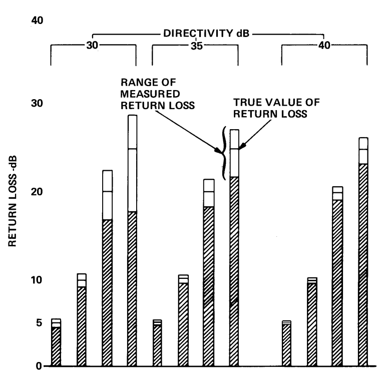


Figure 3. Return Loss Error Due to Finite Bridge Directivity

MEASUREMENT ACCURACY AFFECTED BY FINITE DIRECTIVITY

Directivity (D) of either a coupler or a bridge, is equal to the input-to-output insertion loss in dB, with an ideal reflectionless termination at the test port, minus the sum of the insertion losses of the two individual paths. Directivity would ideally be infinite dB in a perfect bridge or coupler. The measurement error effect due to finite directivity may be represented by a reflection-coefficient phasor of amplitude ρ_D which adds by phasor addition to the true reflection coefficient ρ. Therefore, the actual measured value of reflection coefficient, ρ_m, has an error bounded by $\pm\rho_D$, depending on the relative phase angle between phasors ρ and $\rho\rho_D$. In terms of VSWR accuracy, directiveness of 40, 35, and 30 dB respectively correspond to measurement with an instrument residual VSWR of 1.02, 1.036, and 1.065. Figure 3 shows the range of error in return loss for several values of directivity. Directivity of a typical unit, compared with specification limits, is plotted for the 1 to 22.5 GHz frequency range in Figure 4.

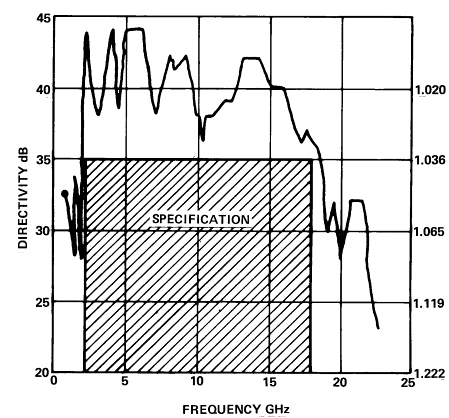


Figure 4. Directivity of a Narda Bridge Over an Extended Frequency Range

MEASUREMENT ACCURACY AFFECTED BY TEST PORT REFLECTIONS

A second error contribution with either a coupler or bridge arises from reflection interaction between the device being measured and the test port reflection, having a coefficient ρ_{TP}. The first order amplitude of this error term is $\rho_{TP_\rho}{}^2$, which adds a phasor to the true reflection coefficient ρ. Test port VSWRs of 1.15, 1.2, 1.25 and 1.5 correspond

narda an L3 communications company
USA TEL: (1) 631 231-1700 • INT'L TEL: (1) 631 231-1390 • FAX (1) 631 231-1711
E-MAIL: nardaeast@L-3COM.com • www.nardamicrowave.com

respectively to ρ_{TP} magnitudes of 0.07, 0.09, 0.11, and 0.20. Actual test port VSWR of a typical bridge and the production specification are shown in Figure 5.

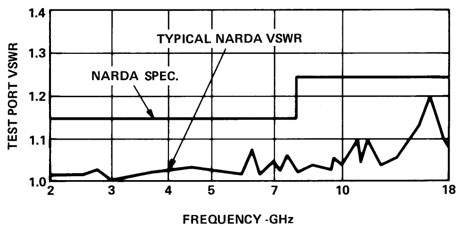


Figure 5. Test Port VSWR-Model 5282 Specification Limit and Typical Performance

COMBINED MEASUREMENT ACCURACY

The measured reflection coefficient is given to the first order by equation 2.

Equation 2.

$$\rho_m = \rho(1 + \rho_D/\rho + \rho_{TP2})$$

The terms inside the parenthesis are combined by phasor addition. In the usual situation of unknown phase angles between the various components, the error contribution to the magnitude $|\rho|$ is:

Equation 3.

$$|\Delta\rho| = \pm|\rho_{D|\pm|\rho TP\rho}{}^{2|}$$

For example, in the 2 to 18 GHz range, the Narda Precision Bridge is specified at 35 dB minimum directivity. Test port reflection coefficient is specified at 0.07 maximum from 2.0 to 8.0 GHz and 0.11 maximum from 8.0 to 18.0 GHz. The total reflection coefficient error, therefore, is expressed by:

$$|\Delta\rho| = \pm 0.018 \pm 0.07|\rho^{2|}, \; 2.0 - 8.0 \text{ GHz}$$

$$|\Delta\rho| = \pm 0.018 \pm 0.07|\rho^{2|}, \; 8.0 - 18.0 \text{ GHz}$$

These define maximum measurement error when the 0 dB return loss reference is accurately established and detection law and electronic circuit deviations are negligible or compensated. Notice that the first term of $|\Delta\rho|$, derived from D, has its greatest relative effect for $|\rho|$ small, while the second term is important only for $|\rho|$ greater than about 0.2. A convenient graph of this error, due to test port reflection, expressed in terms of return loss, is given in Figure 6.

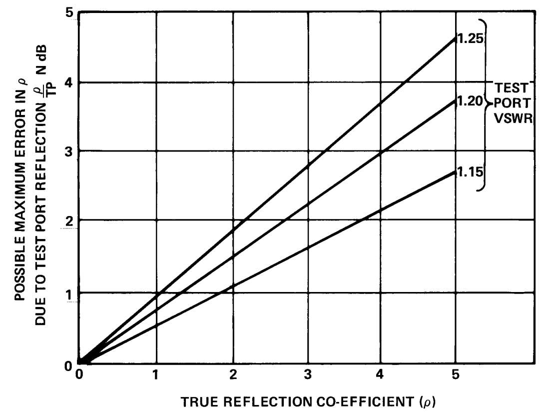


Figure 6. Error Due to Test Port VSWR

CALIBRATION TO ELIMINATE REFLECTION ERROR

The 0 dB return loss reference is most conveniently established by placing a short or open circuit on the test port, and $\rho=\pm1$ in Equations 2 and 3. The first error term yields an uncertainty of only ±0.15 dB for 35 dB directivity. The second error term, however, yields a maximum error in the 0 dB reference of ±0.6 dB from 2 to 8 GHz, and ±1.0 dB from 8 to 18 GHz. Actually, these errors are slightly on the low side since the total reflection coefficient looking into the test port is the phasor sum of ρ_{TP} plus one-fourth the source and detector reflection coefficients. Fortunately, the error in the 0 dB reference can be reduced almost to zero by several simple procedures.

An especially convenient method of removing most of the 0 dB reference uncertainty is to place open and short circuits successively on the test port, and to set the 0 dB reference equal to the average of the detector levels for this pair of termination conditions. Because the reflection coefficients are exactly +1 and -1 for open and short circuits, the error due to the test port mismatch will be the same phasor $\Delta\rho = \rho_D + \rho_{TP}$ for both cases. Equation 2 then yields

$$\rho_{moc} = 1 + \rho_D + \rho_{TP}$$

$$\rho_{msc} = -1 + \rho_P + \rho_{TD}$$

and the phasors combine as shown in Figure 7.

The detector output responds only to the magnitudes of ρ_{moc} and ρ_{msc}. Thus, if the error magnitudes are small compared to unity, the average of ρ_{moc} and ρ_{msc} will be very close to unity, yielding an accurate 0 dB return loss reference. If the frequency is swept, the test port error phasor

ρ_{TP} will vary in magnitude and phase, but at each frequency the phasor sum of ρ_D and ρ_{TP} will be the same for the short and open circuit terminations. Thus $|\rho_{moc}|$ and $|\rho_{msc}|$ will ripple about unity but 180° phase, resulting in a swept display as indicated in Fig. 8. On a recording of $|\rho_{moc}|$ and $|\rho_{msc}|$ for example, the average of the two traces can be easily sketched, and will serve adequately as the corrected 0 dB reference for subsequent measurements.

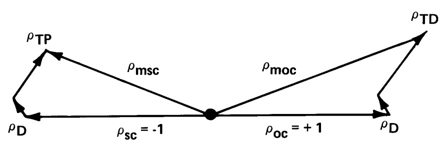


Figure 7. True open and short circuit phasors combined with the error phasors

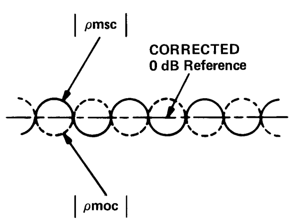


Figure 8. Swept Display with Short and Open Circuits

EFFECT OR INPUT AND OUTPUT PORT VSWR

Input and output port reflections will interact with source and detector reflections to cause amplitude variations as a function of frequency. To the first order, these effects will be the same for all return loss levels. Therefore, in a return loss measurement with respect to a corrected 0 dB reference, these input and output interactions will not contribute error to the measured return loss.

They will, however, introduce irregular variation of return loss calibration lines across the swept frequency band. If these variations are large, they will be an annoying inconvenience that adds to the time spent in interpreting data. The Narda precision bridge has especially low VSWR at the input and output ports, as well as at the test port. Consequently, these variations are substantially smaller throughout the specified frequency band than those produced by other bridges. Of course, to preserve this advantage, the Narda precision bridge should be used with well-matched source and detector.

MEASUREMENTS USING ADAPTERS

The Narda bridge uses the standard APC-7 precision 7 mm connector at the test port. However, most equipments are terminated with other types of connectors. Fortunately, low reflection adapters are available to allow measurements with a minimum of error due to the adapter. Typical Narda adapters are listed in Table 1.

Table I - Precision Adapters, APC-7

Connector Type	Model Number	VSWR (max.) 0-12.4 GHz	VSWR (max.) 12.4-18 GHz
Precision N Male	5066	1.013 to 1.063	1.063 to 1.085
Precision N Female	5067	1.013 to 1.063	1.063 to 1.085
SMA Male	5068	1.06	1.15
SMA Female	5069	1.06	1.15
TNC Male	5064	1.08	1.12
TNC Female	5065	1.08	1.12

The effects of adapters on the accuracy of VSWR measurements come from an effective decrease in the bridge directivity (as shown in Figure 9) and from the increased interaction between the test port reflection and the DUT, as shown in Figure 10.

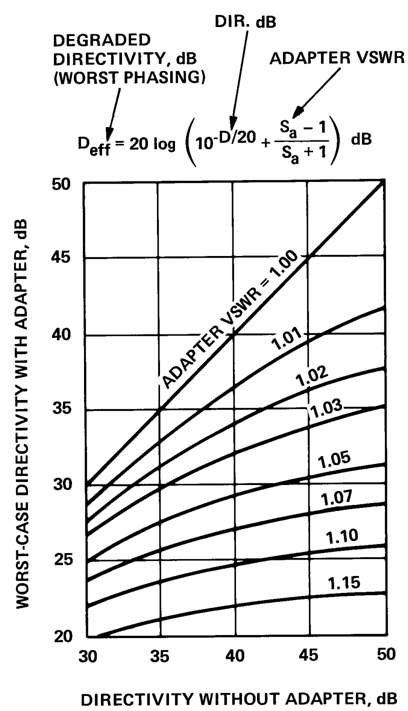


Figure 9. Directivity Degradation Due to Adapter VSWR (worst case phasing)

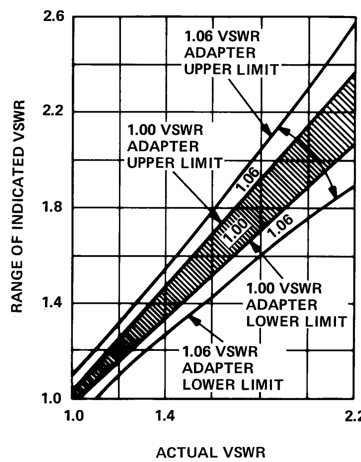


Figure 10. Error in VSWR Measurement Due to the use of Adapter (Worst Case Phasing)

CHOOSING BETWEEN A BRIDGE AND A COUPLER

As mentioned earlier, couplers and bridges yield substantially equivalent results in reflectometer and network analyzer applications. For best overall performance, however, difference in VSWR at their respective ports should be considered, along with the insertion losses of their respective paths. In some cases isolators or pads with small values of attenuation may be necessary at the input or output to achieve equivalent reflection interaction effects. Narda octave band precision high directivity couplers have insertion loss of about 0.5 dB in the primary line and about 10.5 dB from input to output when a reactive termination is placed at the test port. The Narda precision bridge averages about 6.5 dB in its two paths, and about 13 dB overall with a reactive termination.

For multiple octave measurements, the Narda bridge would usually be preferable. However, for applications falling in the octave or extended octave ranges, Narda high directivity couplers are less expensive. Also, these couplers provide higher directivity specifications in bands up to 8.3 GHz and the same 35 dB directivity in the 7 to 12.4 GHz model, but have less directivity in the 7 to 18 GHz model. This comparison is summarized in Table II.

Table II - Bridge vs. Coupler Directivity

Instrument Number	Model	Frequency (GHz)	Directivity (dB)
Narda Bridge	5282	2-18	33
Narda Coupler	3093	1.7-4.2	42
Narda Coupler	3094	3.7-8.3	37
Narda Coupler	3095	7-12.4	33
Narda Coupler	3096	7-18	25

There are certain applications where the high directivity coupler would have a definite advantage. In some cases, input to test port insertion loss would need to be minimized in order to provide maximum possible power at the test port. In other cases, the need may be to minimize power delivered to a low-power amplifier without sacrificing measurement sensitivity. This can be done by reversing the customary input and output connections, thus placing the 10 dB coupling loss between the signal source and the test port, and the low loss of the primary line between the test port and detector. Directivity and signal level at the detector will be unaffected by this change of connections. A coupler should be used when power levels in excess of 0.5W are employed. Narda reflectometer couplers will handle up to 30W average power.

Bridges

2.0-18.0 GHz

HIGH DIRECTIVITY MICROWAVE BRIDGE

- **Broadband Frequency Coverage in a Single Unit from 2 to 18 GHz**
- **High Directivity - 35 dB Min.**

SPECIFICATIONS

FREQUENCY RANGE (GHz)	MODEL	DIRECTIVITY (dB Min)	ACCURACY (Where ρ is the reflection coefficent being measured) 2.0-8.0 GHz	8.0-18.0 GHz	VSWR INPUT PORT	VSWR TEST PORT 2-8 GHz	8-18 GHz	VSWR DETECTOR Port	POWER RATING Watts	CONNECTORS INPUT PORT	DETECTOR PORT	TEST PORT
2-18	5282	33	$0.027+0.07\rho^2$	$0.027+0.11\rho^2$	1.45	1.15	1.25	1.45	0.5	Type N (Female)	7mm (Type N as Option)	7mm

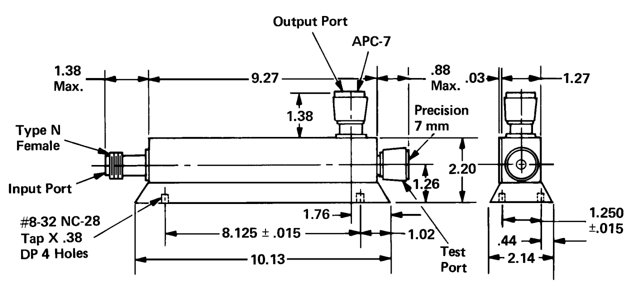
Model 5282 consists of the following components:
- Model 5082 - Precision SWR Bridge and Stand
- Model 5066 - 7mm to type N male adapter
- Model 5067 - 7mm to type N female adapter
- Model 5231 - 7mm short
- Carrying case

Available Options:

5282-01
- Option 01 Model 5068 - 7mm to SMA Stainless Steel Male Adapter
- Model 5069 - 7mm to SMA Stainless Steel Female Adapter
- Model 5379 - Precision 7mm Termination

5282-02
- Option 02 Model 5064 - 7mm to TNC Stainless Steel Male Adapter
- Model 5065 - 7mm to TNC Stainless Steel Female Adapter

OUTLINE DRAWINGS



All dimensions are Max. unless otherwise specified.

narda
an L3 communications company
USA TEL: (1) 631 231-1700 • INT'L TEL: (1) 631 231-1390 • FAX (1) 631 231-1711
E-MAIL: nardaeast@L-3COM.com • www.nardamicrowave.com

0.01-18.0 GHz

ULTRA BROADBAND SCHOTTKY DETECTORS

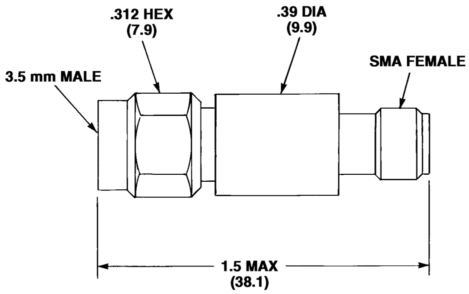
- **Zero Biased Detectors**
- **Excellent Sensitivity, Rugged**
- **Matched Detector; Good VSWR Characteristics**

SPECIFICATIONS

FREQUENCY RANGE (GHz)	MODEL	FLATNESS dB 0.01-18.0	VSWR 0.01-18.0	SENSITIVITY* (mV/mW)	CAPACITANCE	POLARITY	CONNECTORS INPUT MALE	CONNECTORS OUTPUT FEMALE
0.01-18	4506	±0.5	1.5	500	30pf	Neg.	SMA M	SMA F

*Referenced to -20 dBm maximum

OUTLINE DRAWINGS



All dimensions are Max. unless otherwise specified.

Dimensions in parentheses are in millimeters and for reference only.

USA TEL: (1) 631 231-1700 • INT'L TEL: (1) 631 231-1390 • FAX (1) 631 231-1711
E-MAIL: nardaeast@L-3COM.com • www.nardamicrowave.com

Detectors

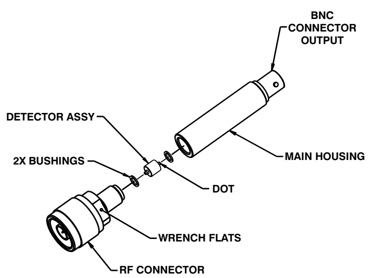
.01-18 GHz

MINIATURE FLAT, ZERO BIASED SCHOTTKY DETECTORS

- **Broadband Coverage**
- **Flat Frequency Response**
- **High Sensitivity**
- **Field Replaceable Diode**
- **Negative or Positive Output Available**

FREQUENCY RANGE (GHz)	MODEL	FLATNESS (dB) (GHz)	SENSITIVITY mV/μW)	VSWR (Max)	INPUT POWER (mW Max)	POLARITY	CONNECTORS	
							INPUT	OUTPUT
0.01 - 18	503A	±0.6	0.5	<1.6	100	Neg.	Type N-M	BNC-F
0.01 - 18	503A-03	±0.6	0.5	<1.6	100	Pos.	Type N-M	BNC-F
0.01 - 18	4503A	±0.6	0.5	<1.6	100	Neg.	SMA-M	BNC-F
0.01 - 18	4503A-03	±0.6	0.5	<1.6	100	Pos.	SMA-M	BNC-F

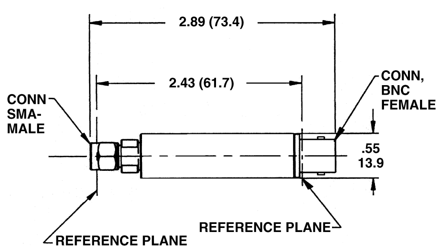
Replacement Diodes	
Detector	**Replacement Diode**
503A, 4503A	4829
503A-03, 4503A-03	4829-03



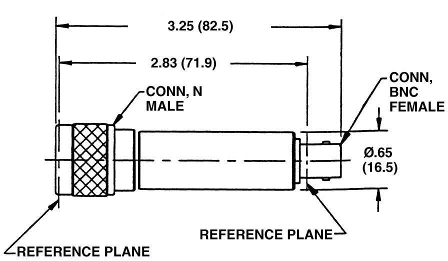
Field Diode Replacement Procedure
Using approved ESD guidelines:
1. Hold Detector by main housing (side with BNC connector). Unscrew RF Input connector by applying a wrench to flats provided.
2. Remove detector assembly.
3. Insert bushings into each assembly.
4. Insert replacement diode into RF connector side – dot should be facing out.
5. Reassemble the connector and hand tighten.

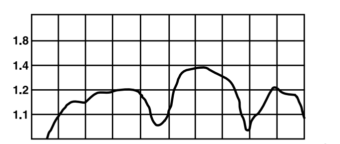
OUTLINE DRAWINGS

Models 4503A, 4503A-03

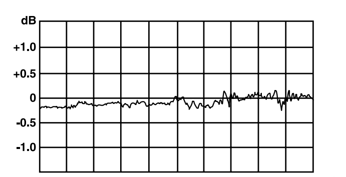


Models 503A, 503A-03



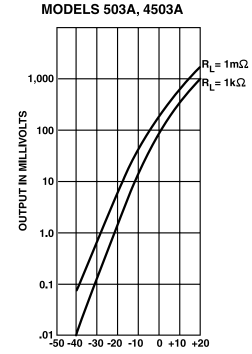


TYPICAL VSWR CURVE



TYPICAL RESPONSE CURVE

TYPICAL DETECTOR SENSITIVITY
MODELS 503A, 4503A



All dimensions are Max. unless otherwise specified.

narda
an L3 communications company
USA TEL: (1) 631 231-1700 • INT'L TEL: (1) 631 231-1390 • FAX (1) 631 231-1711
E-MAIL: nardaeast@L-3COM.com • www.nardamicrowave.com