

Operating and Service Manual

**Agilent Technologies
11590B
Bias Network**



Manufacturing Part Number: 11590-90020

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Austria <i>(tel)</i> 0820 87 44 11* <i>(fax)</i> 0820 87 44 22	Belgium <i>(tel)</i> (+32) (0)2 404 9340 <i>(fax)</i> (+32) (0)2 404 9395	Denmark <i>(tel)</i> (+45) 7013 1515 <i>(fax)</i> (+45) 7013 1555	Finland <i>(tel)</i> (+358) (0) 10 855 2100 <i>(fax)</i> (+358) (0) 10 855 2923
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1. GENERAL INFORMATION

2. This Operating and Service Manual contains information required to install, operate and test the Hewlett-Packard Model 11590B and 11590B option 001 bias networks. The HP 11590B is equipped with Type N Female connectors and operates to 12.4 GHz. The HP 11590B opt 001 is equipped with precision 7 mm connectors and operates to 18.0 GHz.

3. Listed on the back cover is a microfiche part number. This number can be used to order 4 x 6 inch microfilm transparencies of the manual.

4. Specifications

5. Instrument specifications are listed in Table 1. These specifications are the performance standards or limits against which the instrument is tested.

Table 1. Specifications

Electrical	
Frequency Range	
Standard	0.1 to 12.4 GHz
Option 001	0.1 to 18.0 GHz
Impedance	50 ohms nominal
Port Match (both ports); Minimum Return Loss	
Standard	
0.1 to 1.0 GHz	16 dB
1.0 to 12.4 GHz	19 dB
Option 001	
0.1 to 1.0 GHz	16 dB
1.0 to 12.4 GHz	19 dB
12.4 to 18.0 GHz	14 dB
Insertion Loss; Maximum	
Standard	
0.1 to 1.0 GHz	1.0 dB
1.0 to 12.4 GHz	0.8 dB
Option 001	
0.1 to 1.0 GHz	1.0 dB
1.0 to 12.4 GHz	0.8 dB
12.4 to 18.0 GHz	1.2 dB
Maximum Bias Voltage	100 Vdc
Maximum Bias Current (each bias port)	500 mA
DC Resistance from Bias Port to Output Port at 23° (typical)	3.0 ohms
General	
Operating Temperature	0 to 55°C
RF Connectors (non-hermetic)	
Standard	Type N female
Option 001	Precision 7 mm
Bias Connector (non-hermetic)	BNC female
Net Weight	0.30 kg (0.7 lbs)
Dimensions	
In millimeters	54 x 51 x 28
In inches	2.2 x 2 x 2.1

6. Description

7. The HP 11590B bias network provides a means of supplying dc bias to the center conductor of a coaxial line and thus to a biasable component or device (such as a transistor), while blocking the dc bias from the input RF circuit.

8. A schematic diagram of the HP 11590B is shown in Figure 1. The capacitor in the RF input arm acts as a dc block/high pass filter. The vertical arms are identical and act as bias/bias sense arms. Because the BIAS/BIAS SENSING port draws no current (it is connected to a high impedance voltmeter), the voltage measured is identical to the voltage at the RF and Bias Output. To double the maximum current handling capability, both BIAS/BIAS SENSING ports may be used for bias input.

9. A vertical arm is comprised of a series inductance and shunt capacitance which act together as a low pass filter. The ferrite beads and R-C filter decouple the power supply from the RF section and help to reduce the possibility of inductance related oscillation.

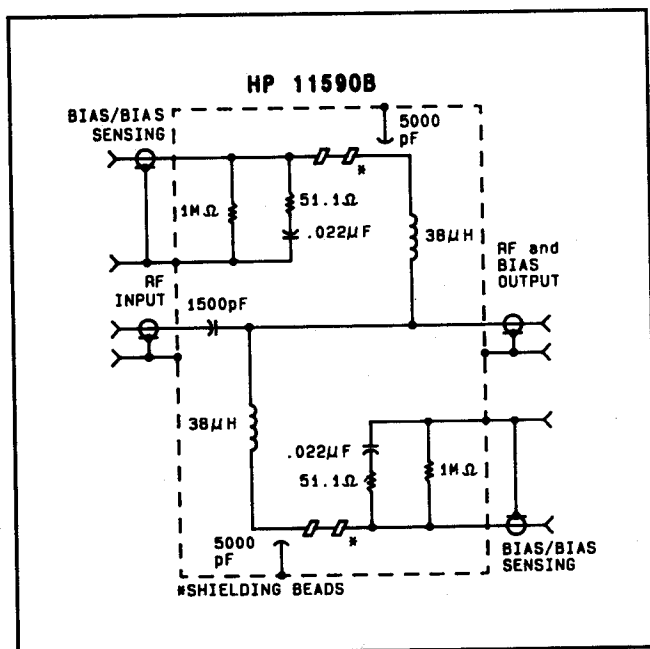


Figure 1. Schematic Diagram

10. INSTALLATION

11. Initial Inspection

12. Inspect the shipping container for damage. If the shipping container or cushioning material is damaged, it should be kept until the contents of the shipment have been checked for completeness and the instrument has

been checked mechanically and electrically. Procedures for checking electrical performance are given under "PERFORMANCE TESTS". If the contents are incomplete, if there is mechanical damage or defect, or if the HP 11590B bias network does not pass the Performance Tests, notify the nearest Hewlett-Packard office. If the shipping container is damaged, or the cushioning material shows signs of stress, notify the carrier as well as the Hewlett-Packard office. Keep the shipping materials for the carrier's inspection. The HP office will arrange for repair or replacement at HP option without waiting for claim settlement.

13. Preparation For Use

14. **Interconnections.** The HP 11590B bias network is connected in line with the device to be biased. The bias is applied through either BIAS/BIAS SENSING port, and is sensed through the other BIAS/BIAS SENSING port.

15. **Mating Connectors.** The mating connectors for Type N connectors are the opposite sex Type N connectors. Precision 7 mm connectors (Option 001) are sexless.

16. Operating Environment

17. The instrument may be operated in environments within the following limits:

Temperature 0° to +55 °C
 Humidity Up to 95 %
 Altitude Up to 7625 meters (25,000 feet)

The instrument should be protected from temperature and humidity conditions which cause condensation within the instrument.

18. STORAGE AND SHIPMENT

19. The instrument may be stored in environments within the following limits:

Temperature -40 °C to +75 °C
 Humidity Up to 95 %
 Altitude Up to 7625 meters (25,000 feet)

The instrument should be protected from temperature and humidity conditions which cause condensation within the instrument.

20. Packaging

21. **Tagging for Service.** If the instrument is being returned to Hewlett-Packard for service, attach a tag indicating the type of service required, return address, and model number. In any correspondence, refer to the instrument by model number.

22. Original Packaging. Containers and materials identical to those used in factory packaging are available through Hewlett-Packard offices. Mark the container **FRAGILE** to ensure careful handling.

23. Other Packaging. The following general instructions should be used for re-packing with commercially available materials:

- Wrap the instrument in heavy paper or plastic (If shipping to a Hewlett-Packard office or service center, attach a tag as explained in paragraph 21).
- Use a strong shipping container
- Use a thick layer of shock absorbing material 70 to 100 mm (3 to 4 inches) thick around all sides of the instrument to provide firm cushioning and prevent movement inside the container.
- Seal the shipping container securely.
- Mark the shipping container **FRAGILE** to ensure careful handling.
- In any correspondence, refer to the instrument by model number and full serial number.

24. OPERATION

25. Operating Instructions

26. Figure 2 shows the HP 11590B bias network connected in a typical measurement set-up. Many other applications are possible but not shown because the general method of set-up and operation is the same.

27. The HP 11590B contains an in line filter which will help prevent inductance related oscillations. However, to eliminate the possibility of oscillation with bipolar transistors, it is recommended that the HP 11635A bias decoupling network be used with the HP 11590B.

28. PERFORMANCE TESTS

29. The procedures in this section test the electrical performance of the HP 11590B using the specifications of Table 1 as performance standards.

30. Test Record. Results of the performance tests may be tabulated on the Test Record at the end of the procedures.

31. Performance may be verified using either a vector or scalar network analyzer set-up. Errors due to directivity, source match, and return loss of the "opposite port" termination (and detector match in a scalar system) will add uncertainties to your measurement. The most accurate method uses an error corrected instrument. However, a scalar system will give acceptable results depending on the quality of the components.

32. The following general instructions apply to both vector and scalar network analyzers.

33. Return Loss Of Input and Output Ports (Port Match)

- Connect the equipment for a standard reflection measurement.
- Calibrate the system with the appropriate standards.
- Connect the appropriate instrument port of the HP 11590B to the test port. Terminate the opposite port of the HP 11590B with a 50 ohm load.

NOTE

The Return loss of the load should be at least 20 dB better than the desired measurement value.

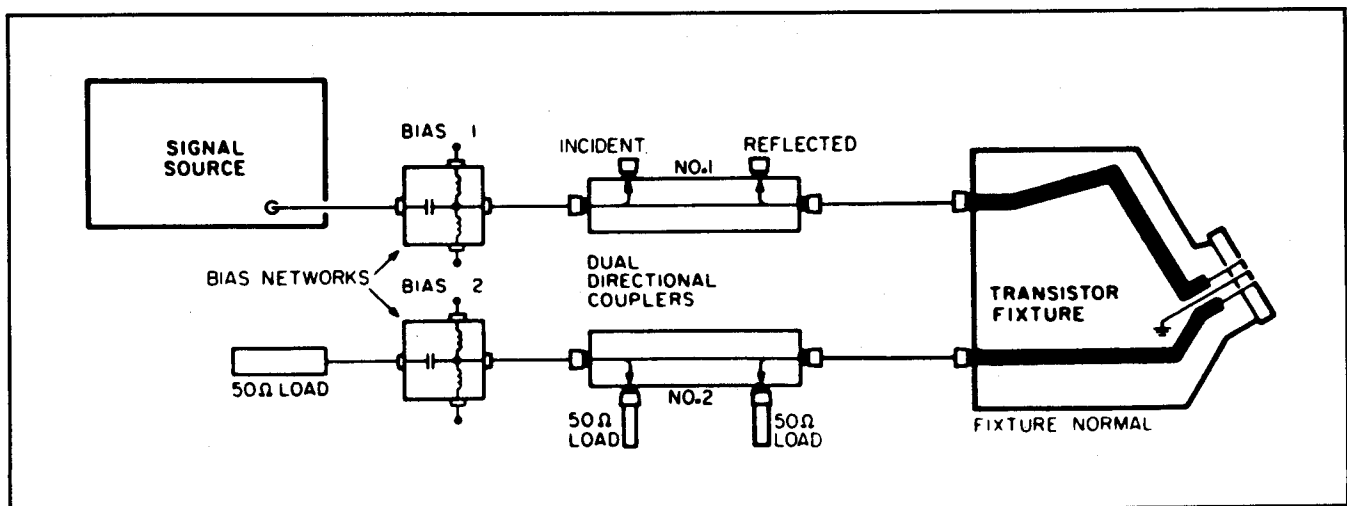


Figure 2. Typical Measurement Set-up

- d. Measure the port match. The specifications are as follows:

Port Match (both ports) — Minimum Return Loss

Standard

0.1 to 1.0 GHz	16 dB
1.0 to 12.4 GHz	19 dB

Option 001

0.1 to 1.0 GHz	16 dB
1.0 to 12.4 GHz	19 dB
12.4 to 18.0	14 dB

34. Insertion Loss

- Connect the equipment for a standard insertion loss measurement.
- Calibrate the system with a through line.
- Replace the through line with the HP 11590B.
- Measure the insertion loss. The specifications are as follows:

Insertion Loss — Maximum

Standard

0.1 to 1.0 GHz	1.0 dB
1.0 to 12.4 GHz	0.8 dB

Option 001

0.1 to 1.0 GHz	1.0 dB
1.0 to 12.4 GHz	0.8 dB
12.4 to 18.0	1.2 dB

35. ADJUSTMENTS

36. There are no mechanical or electrical adjustments on the HP 11590B bias network.

37. REPLACEABLE PARTS

38. Inner Conductor Contact; Option 001. The center conductor collet (Figure 3) in the precision 7 mm connector, HP Part No. 1250-0907, may be replaced using a special extractor tool; HP Part No. 5060-0236. Examine the collet with a magnifying glass to determine if it is damaged. The collet must be free of burrs and the prongs must be equally spaced. If the collet needs to be replaced, perform the following procedure:

- Place the instrument so that the connector faces down.
- Tap the connector lightly on the outside ring and the center conductor collet should protrude slightly.
- Compress the handle of the collet extractor tool, causing the jaws to expand, and insert the tool into the precision 7 mm connector.

- Release the compression on the extractor tool, allowing the jaws of the tool to close on the center conductor collet. Pull the tool straight out from the connector without twisting. The collet will come out of the connector with the tool. Do not reuse the extracted collet.
- To install a new center conductor collet, push the collet into the center conductor until it snaps into place. No special tool is required for this operation.

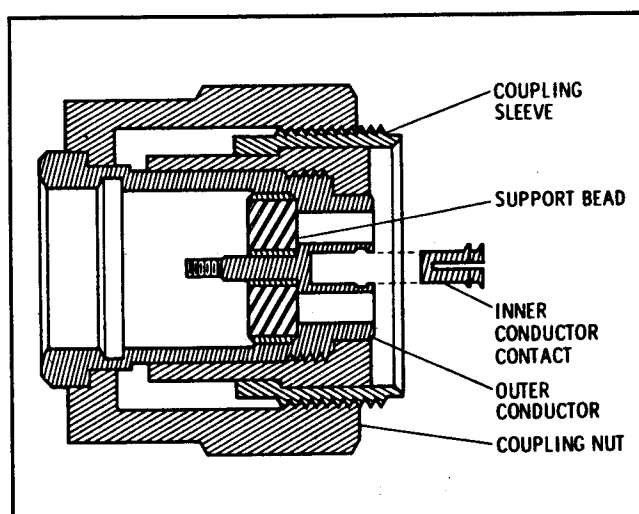


Figure 3. Precision 7 mm Connector

- 39. SERVICE** There are no serviceable parts in the HP 11590B bias network.

40. TEST RECORD

Specifications Tested	Step	Test Cond. (GHz)	Limit (dB)	Result (dB)
Port Match (Return Loss)				
Std.	39	0.1-1.0	≥ 16	_____
		1.0-12.4	≥ 19	_____
Option 001	39	0.1-1.0	≥ 16	_____
		1.0-12.4	≥ 19	_____
		12.4-18.0	≥ 14	_____
Insertion Loss				
Std.	40	0.1-1.0	≤ 1.0	_____
		1.0-12.4	≤ 0.8	_____
Option 001	40	0.1-1.0	≤ 1.0	_____
		1.0-12.4	≤ 0.8	_____
		12.4-18.0	≤ 1.2	_____

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7, Rue du Bois-du-Lan
CH-1217 **MEYRIN 2**, Switzerland
Tel: (022) 83 12 12
Telex: 27835 hpse
Cable: HEWPACKSA Geneve

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Hewlett-Packard Asia Ltd.
47th Floor, China Resources Bldg.
26 Harbour Rd., Wanchai
HONG KONG
Tel: 66678 HEWPA HX
Cable: HEWPACK HONG KONG

CANADA

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6877 Goreway Drive
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Tel: (416) 678-9430
Telex: 610-492-4246

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Paradissos-Amarousion, **ATHENS**
Greece
Tel: 682 88 11
Telex: 21-6588 HPAT GR
Cable: HEWPACKSA Athens

EASTERN EUROPE

Hewlett-Packard Ges.m.b.h.
Lieblgasse 1
P.O. Box 72
A-1222 **VIENNA**, Austria
Tel: (222) 2365110
Telex: 1 3 4425 HEPA A

NORTHERN EUROPE

Hewlett-Packard S.A.
Uilenstede 475
P.O. Box 999
NL-1180 **AZ AMSTELVEEN**
The Netherlands
Tel: 20 437771

SOUTH EAST EUROPE

Hewlett-Packard S.A.
7, Rue du Bois-du-Lan
CH-1217 **MEYRIN 2**, Switzerland
Tel: (022) 83 12 12
Telex: 27835 hpse
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OTHER EUROPE

Hewlett-Packard S.A.
P.O. Box
150, Rte du Nant-D'Avril
CH-1217 **MEYRIN 2**, Switzerland
Tel: (022) 83 8111
Telex: 22486 hpsa
Cable: HEWPACKSA Geneve

EASTERN USA

Hewlett-Packard Co.
4 Choke Cherry Road
ROCKVILLE, MD 20850
Tel: (301) 258-2000

MIDWESTERN USA

Hewlett-Packard Co.
5201 Tollview Drive
ROLLING MEADOWS, IL 60008
Tel: (312) 255-9800

SOUTHERN USA

Hewlett-Packard Co.
2000 South Park Place
P.O. Box 105005
ATLANTA, GA 30348
Tel: (404) 955-1500

WESTERN USA

Hewlett-Packard Co.
3939 Lankershim Blvd.
P.O. Box 3919
LOS ANGELES, CA 91604
Tel: (213) 506-3700

OTHER INTERNATIONAL AREAS

Hewlett-Packard Co.
Intercontinental Headquarters
3495 Deer Creek Road
PALO ALTO, CA 94304
Tel: (415) 857-1501
Telex: 034-8300
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