

Notice

Hewlett-Packard to Agilent Technologies Transition

This documentation supports a product that previously shipped under the Hewlett-Packard company brand name. The brand name has now been changed to Agilent Technologies. The two products are functionally identical, only our name has changed. The document still includes references to Hewlett-Packard products, some of which have been transitioned to Agilent Technologies.



Agilent Technologies

By internet, phone, or fax, get assistance with all your test and measurement needs.

Table 1-1 Contacting Agilent

Online assistance: www.agilent.com/find/assist

United States (tel) 1 800 452 4844	Latin America (tel) (305) 269 7500 (fax) (305) 269 7599	Canada (tel) 1 877 894 4414 (fax) (905) 282-6495	Europe (tel) (+31) 20 547 2323 (fax) (+31) 20 547 2390
New Zealand (tel) 0 800 738 378 (fax) (+64) 4 495 8950	Japan (tel) (+81) 426 56 7832 (fax) (+81) 426 56 7840	Australia (tel) 1 800 629 485 (fax) (+61) 3 9210 5947	

Asia Call Center Numbers

Country	Phone Number	Fax Number
Singapore	1-800-375-8100	(65) 836-0252
Malaysia	1-800-828-848	1-800-801664
Philippines	(632) 8426802 1-800-16510170 (PLDT Subscriber Only)	(632) 8426809 1-800-16510288 (PLDT Subscriber Only)
Thailand	(088) 226-008 (outside Bangkok) (662) 661-3999 (within Bangkok)	(66) 1-661-3714
Hong Kong	800-930-871	(852) 2506 9233
Taiwan	0800-047-866	(886) 2 25456723
People's Republic of China	800-810-0189 (preferred) 10800-650-0021	10800-650-0121
India	1-600-11-2929	000-800-650-1101

Operating and Service Manual

Agilent Technologies

11612A Bias Network
Includes Option 001

SERIAL NUMBERS

This manual applies directly to Agilent 11612A Bias Networks with serial number prefix 2301A and higher.



Agilent Technologies

Manual Part Number 11612-90001

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Microfiche Part Number 11612-90002

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CERTIFICATION

Hewlett-Packard Company certifies that this product met its published specifications at the time of shipment from the factory. Hewlett-Packard further certifies that its calibration measurements are traceable to the United States National Institute of Standards and Technology (NIST, formerly NBS), to the extent allowed by the Institute's calibration facility, and to the calibration facilities of other International Standards Organization members.

WARRANTY

This Hewlett-Packard instrument product is warranted against defects in material and workmanship for a period of one year from date of delivery. During the warranty period, Hewlett-Packard Company will, at its option, either repair or replace products which prove to be defective.

For warranty service or repair, this product must be returned to a service facility designated by HP. Buyer shall prepay shipping charges to HP and HP shall pay shipping charges to return the product to Buyer. However, Buyer shall pay all shipping charges, duties, and taxes for products returned to HP from another country.

HP warrants that its software and firmware designated by HP for use with an instrument will execute its programming instructions when properly installed on that instrument. HP does not warrant that the operation of the instrument, or software, or firmware will be uninterrupted or error free.

LIMITATION OF WARRANTY

The foregoing warranty shall not apply to defects resulting from improper or inadequate maintenance by Buyer, Buyer-supplied software or interfacing, unauthorized modification or misuse, operation outside of the environmental specifications for the product, or improper site preparation or maintenance.

NO OTHER WARRANTY IS EXPRESSED OR IMPLIED. HP SPECIFICALLY DISCLAIMS THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

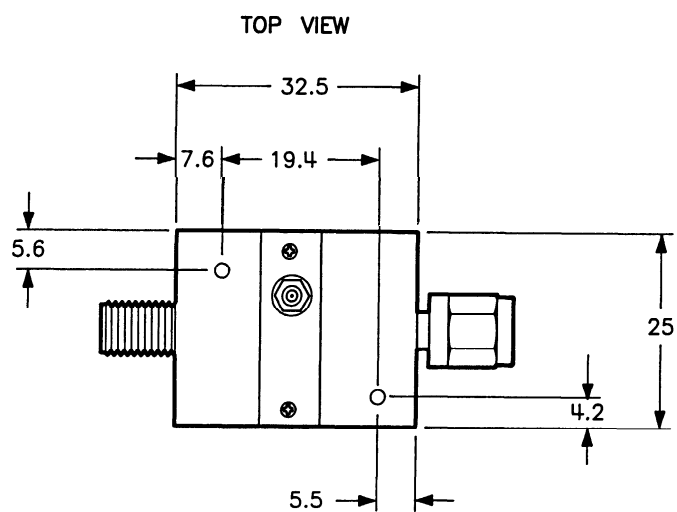
EXCLUSIVE REMEDIES

THE REMEDIES PROVIDED HEREIN ARE BUYER'S SOLE AND EXCLUSIVE REMEDIES. HP SHALL NOT BE LIABLE FOR ANY DIRECT, INDIRECT, SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES, WHETHER BASED ON CONTRACT, TORT, OR ANY OTHER LEGAL THEORY.

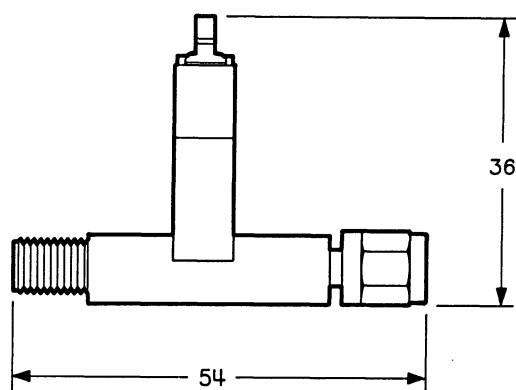
ASSISTANCE

*Product maintenance agreements and other customer assistance agreements are available for **Hewlett-Packard** products.*

For any assistance, contact your nearest Hewlett-Packard Sales and Service Office. Addresses are provided at the back of this manual.



SIDE VIEW



NOTE: All dimensions are in millimeters.

Figure 1. HP 11612A Dimensions

GENERAL INFORMATION

The HP **11612A** bias network provides a means of supplying dc bias to the center conductor of a coaxial line of a component or device while blocking the dc bias to the RF input port.

This manual contains information required to install, operate, and test the HP 11612A bias network.

Option 001

In addition to the capabilities of the standard bias network, the HP 11612A option 001 high current bias network can achieve higher bias levels above 0.4 **GHz**. These bias levels are useful in applications such as transistor testing.

Instruments Covered by Manual

Each bias network has a five digit serial number. The contents of this manual apply to bias networks having a serial number equal to or higher than the serial number listed on the title page of this manual.

The microfiche part number is listed on the title page of this manual. Use this number to order 4x6 inch microfilm transparencies of the manual.

INCOMING INSPECTION

If the bias network or its case appear to be damaged, set aside the device and all packaging materials and contact the nearest Hewlett-Packard office listed inside the back cover of this manual.

Hewlett-Packard will arrange for repair or replacement of incomplete or damaged shipments without waiting for a settlement from the transportation company.

PREPARATION FOR USE

Interconnections

The HP **11612A** bias network is connected in line with the device to be biased. The bias is applied through the **SMB** snap-on connector. Refer to Figure 3. A BNC to SMC adapter cable is also included in the HP 11612A bias network assembly (HP part number 5062-4550).

Operating Environment

Operate the bias network within the following limits:

Temperature	0 to +55°C
Humidity	up to 95%
Altitude	Up to 7,625 meters (25,000 feet), mean sea level

SPECIFICATIONS

Specifications describe the device's warranted performance. Table 1 lists the specifications of the HP 11612A bias network; Table 2 lists the specifications of the HP 11612A Option 001 high current bias network.

Table 1. HP 11612A Specifications

Operating Temperature	0 to 55°C	Insertion Loss — Maximum	
Frequency Range	0.045 to 26.5 GHz	0.045 to 12.4 GHz	0.8 dB
		12.4 to 26.5 GHz	1.3 dB
Return Loss (both ports) — minimum		Maximum Bias Current	500 mA
0.045 to 8 GHz	20 dB	Maximum Bias Voltage	± 40 Vdc
8 to 18 GHz	18 dB		
18 to 26.5 GHz	14 dB		

Table 2. HP 11612A Option 001 Specifications

Operating Temperature	0 to 55°C	Maximum Bias Current	2 amps DC; up to 32 amps in pulsed mode, refer to Figures 5 and 6.
Frequency Range¹	0.4 to 26.5 GHz	Maximum Bias Voltage	± 100 Vdc
Return Loss (both ports) — minimum		Duty Cycle — Maximum	Refer to Figures 5 and 6, the duty cycle curves
0.4 to 1 GHz	14 dB	Pulse Width — Maximum	Refer to Figures 5 and 6, the duty cycle curves
1 to 18 GHz	18 dB		
18 to 26.5 GHz	14 dB		
Insertion Loss — Maximum			
0.4 to 12.4 GHz	1.0 dB		
12.4 to 26.5 GHz	1.5 dB		

¹ Operation below 0.4 GHz is possible but not specified.



It is critical that you properly set the power levels before connecting the bias network to the power supply. Failure to do so may result in **irreparable** damage to the bias coil. Bias coils damaged by overheating are not covered under warranty.

SUPPLEMENTAL CHARACTERISTICS

Supplemental characteristics are non-warranted performance parameters. They are included to provide useful operating information. Table 3 lists the supplemental characteristics of the HP **11612A** bias network. Table 4 lists the supplemental characteristics of the HP **11612A** Option 001 high current bias network.

Table 3. HP 11612A Supplemental Characteristics

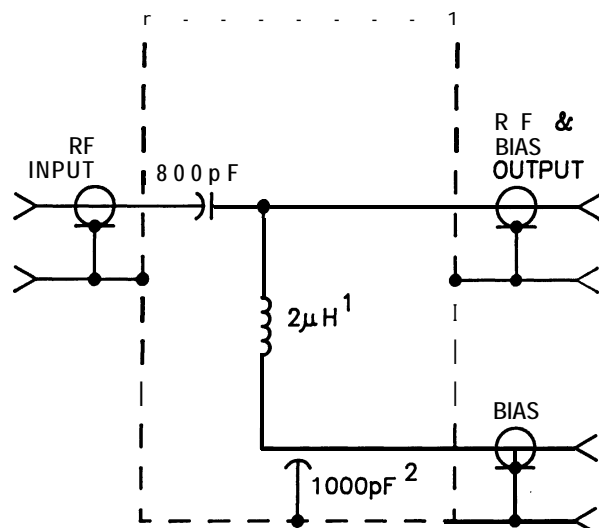
Pin Depth¹	0.000 to 0.127 mm (0.0000 to 0.0050 in)	RF Connectors	
		RF Input	3.5 mm ² female
		RF Output	3.5 mm male
Impedance	50 ohms, nominal	Bias Connector (non-hermetic)	SMB male
DC Resistance from Bias Port to Output Port (typical)		Net Weight	0.075 kg (0.165 lb)
At 23°C	.5 ohms	Dimensions (nominal not including connectors)	30 mm x 33 mm x 25 mm (1.2 in x 1.3 in x 1.0 in)
At 23°C, full rated current	.7 ohms		
¹ The electrical performance of the bias network is independent of its pin depth within the range stated above.			
² 3.5 mm connectors mate with SMA connectors.			

Table 4. HP 11612A Option 001 Supplemental Characteristics

Pin Depth¹	0.000 to 0.127 mm (0.0000 to 0.0050 in)	RF Connectors	
		RF Input	3.5 mm ² female
		RF Output	3.5 mm male
Impedance	50 ohms, nominal	Bias Connector (non-hermetic)	SMB male
DC Resistance from Bias Port to Output Port (typical)		Net Weight	0.075 kg (0.165 lb)
At 23°C	.1 ohms	Dimensions (nominal not including connectors)	30 mm x 33 mm x 25 mm (1.2 in x 1.3 in x 1.0 in)
At 23°C, full rated current	.12 ohms		
¹ The electrical performance of the bias network is independent of its pin depth within the range stated-above.			
² 3.5 mm connectors mate with SMA connectors.			

OPERATION

Figure 2 shows a schematic diagram of the bias network. The circuit is a 'tee' in which the capacitor in the left arm acts as a DC block/high pass filter. The vertical arm, with its series inductance and shunt capacitance, acts as a low pass filter.



1. Option 001 is approximately 100 nH.
2. Option 001 is approximately 100 pF.

Figure 2. Bias Network Schematic Diagram

Figure 3 shows the HP 11612A bias network connected in a typical measurement setup. Although other applications are possible, the general method of setup and operation is the same.

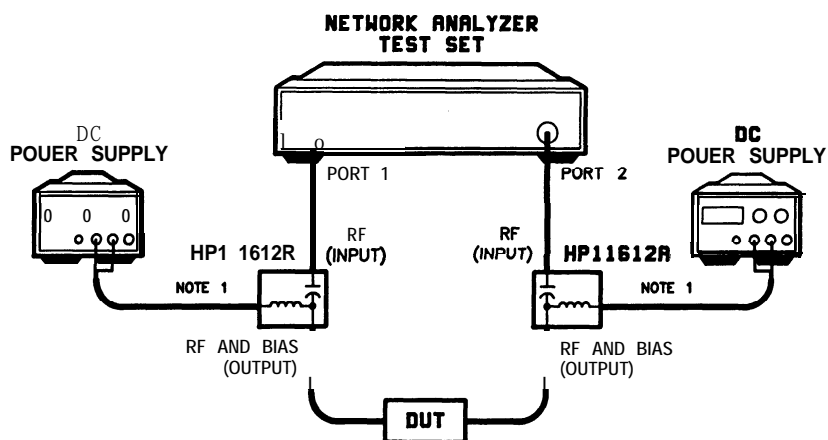


Figure 3. Typical Measurement Setup

NOTE 1: Transistors and negative resistance devices may oscillate if the bias port of the HP 11612A bias network is not properly terminated. Hewlett-Packard recommends that bias from the bias supply be routed through the HP 11635A bias decoupling network before being applied to the bias port of the HP 11612A. An adapter cable (HP part number 5062-4550) is included to connect the bias network and the bias decoupling network.

NOTE FOR PULSED OPERATION USERS (OPTION 001)

Follow the procedure below to set the correct power levels for the bias network when you're using it for pulsed measurements. This procedure applies only to the HP 11612A option 001 high current bias network and should not be used with the standard HP 11612A.



It is critical that you properly set the power levels before connecting the bias network to the power supply. Failure to do so may result in **irreparable** damage to the bias coil. Bias coils damaged by overheating are not covered under warranty.

Setting the Bias Current and Repetition Rate

The following procedure uses a 0.1 ohm wire wound high power resistor to simulate the bias network so the correct bias level and repetition rate can be set before the bias network is connected.

1. Connect the equipment as shown in Figure 4; do not connect the bias network yet.

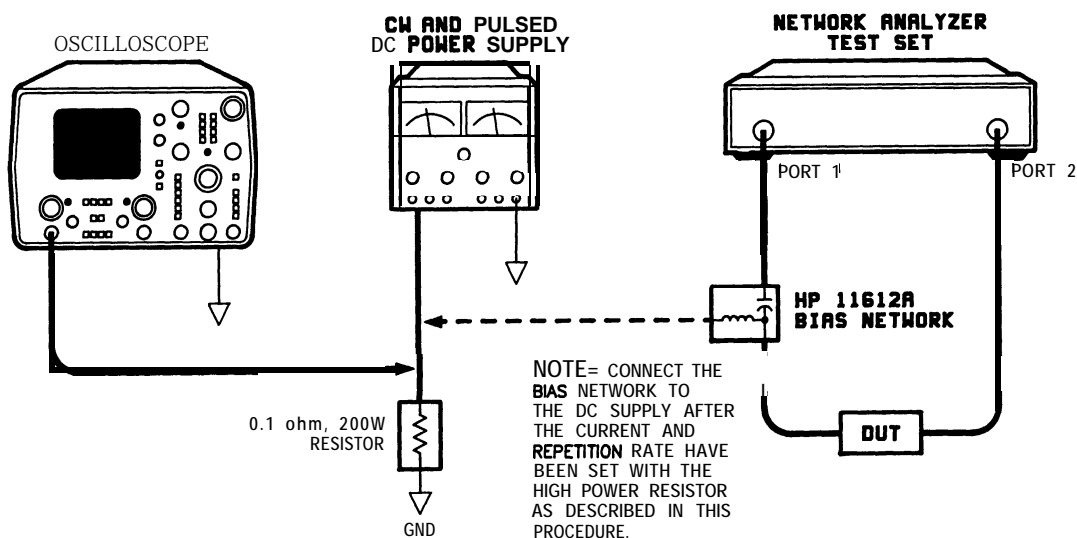


Figure 4. HP 11612A Option 001 Bias Level Setup

2. Measure the voltage across the resistor with an oscilloscope.
3. Set the current and repetition rate to the appropriate values (taken from the curve in Figure 6).
4. When the bias current and repetition rate are within the allowed limits, remove the resistor and insert the bias network.

STORAGE AND SHIPMENT

Store and ship the bias network within the following limits:

Temperature	-40 to +75°C
Humidity	up to 95%
Altitude	Up to 7,625 meters (25,000 feet), mean sea level

Tagging for Service

If you need to return the bias network to Hewlett-Packard for service, complete one of the blue repair tags located at the end of this manual and attach it to the device. If no repair tag is available, attach a tag indicating the type of service required, your return address, model number, and serial number of the device to be repaired.

Packaging

Containers and materials like those used in factory packaging are available through HP offices.

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

- a. Wrap the device in heavy paper or plastic (include a service tag as described above).
- b. Use a strong shipping container.
- c. Use a layer of shock absorbing material 70 to 100 mm (3 to 4 inches) thick around each side of the device to provide firm cushioning and prevent movement inside the container.

Regardless of which type of packaging you use, always:

- d. Seal the shipping container securely.
- e. Mark the shipping container FRAGILE to ensure careful handling.
- f. In any correspondence refer to the device by model number and serial number.

PERFORMANCE TESTS

The procedures in this section test the **electrical** performance of the HP 11612A using the specifications of Tables 1 and 2 as performance standards.

Performance may be verified using either a vector or scalar network analyzer setup. 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.

Record the results of the performance tests in Table 5, the Performance Test Record, at the end of the procedures.

Return Loss of Input and Output Ports

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

1. Connect the equipment for a standard reflection measurement.
2. Calibrate the system with an open and a short.
3. Connect the appropriate RF port of the HP 11612A to the test port. Terminate the opposite port with a 50 ohm load.

NOTE: The return loss of the terminating load should be at least 20 **dB** better than the desired measurement value.

4. Measure the return loss. Refer to Tables 1 and 2 for specifications.

Insertion Loss

1. Connect the equipment for a standard insertion loss measurement.
2. Calibrate the system with a through line.
3. Replace the through line with the HP 11612A.
4. Measure the insertion loss. Refer to Tables 1 and 2 for specifications.

Table 5. HP 11612A Performance Test Record

Serial Number _____	Test Date _____	Tested By _____
Standard HP 11612A	HP 11612A Option 001	
Return Loss	Return Loss	Measured Value
<u>Input Port</u>	<u>Input Port</u>	
0.045 to 8 GHz	0.4 to 1 GHz	_____
8 to 18 GHz	1 to 18 GHz	_____
18 to 26.5 GHz	18 to 26.5 GHz	_____
<u>output Port</u>	<u>output Port</u>	
0.045 to 8 GHz	0.4 to 1 GHz	_____
8 to 18 GHz	1 to 18 GHz	_____
18 to 26.5 GHz	18 to 26.5 GHz	_____
Insertion Loss	Insertion Loss	
0.045 to 12.4 GHz	0.4 to 12.4 GHz	_____
12.4 to 26.5 GHz	12.4 to 26.5 GHz	_____

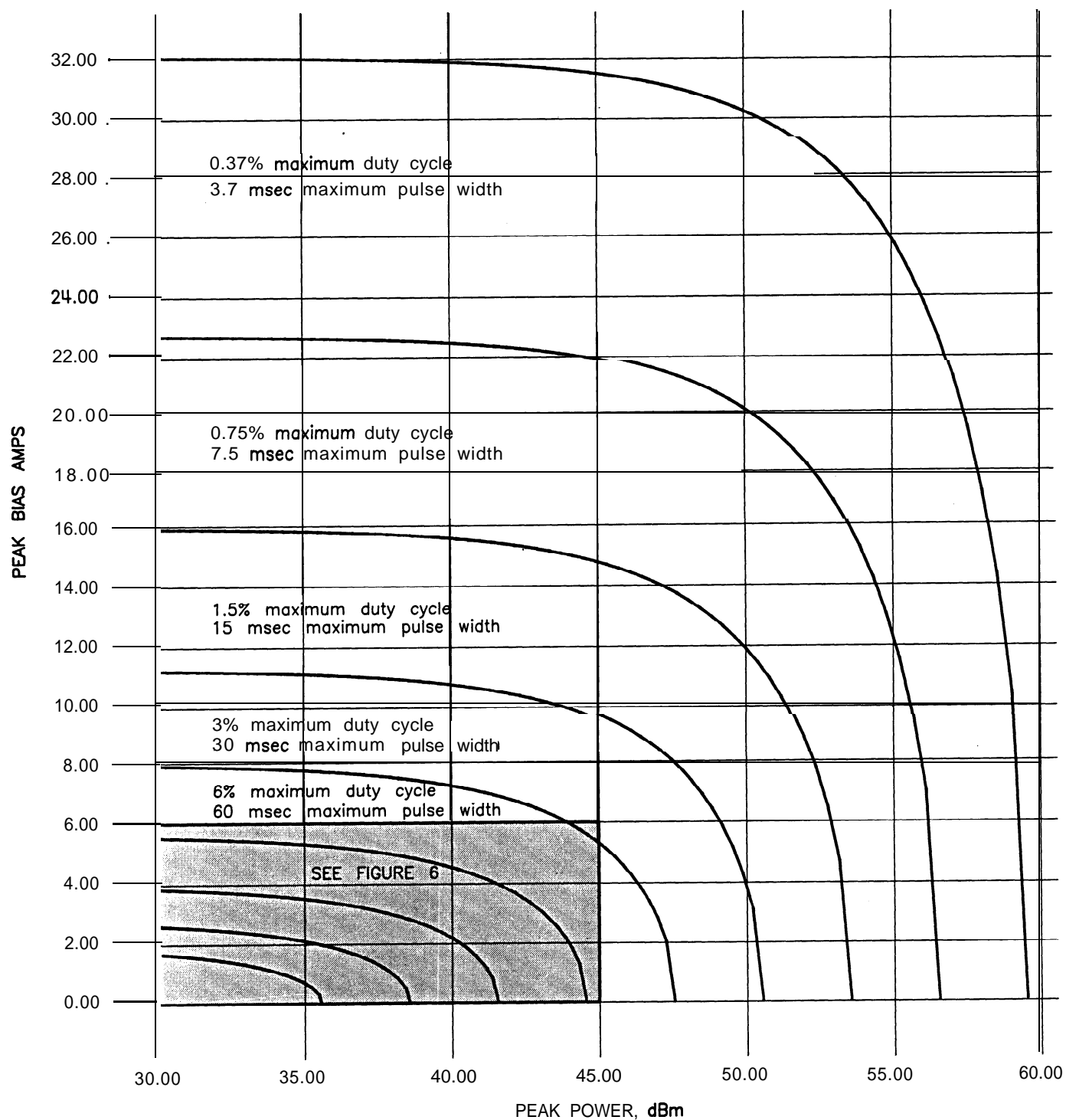


Figure 5. HP 11612A Option 001 Duty Cycle Curves
Overall View

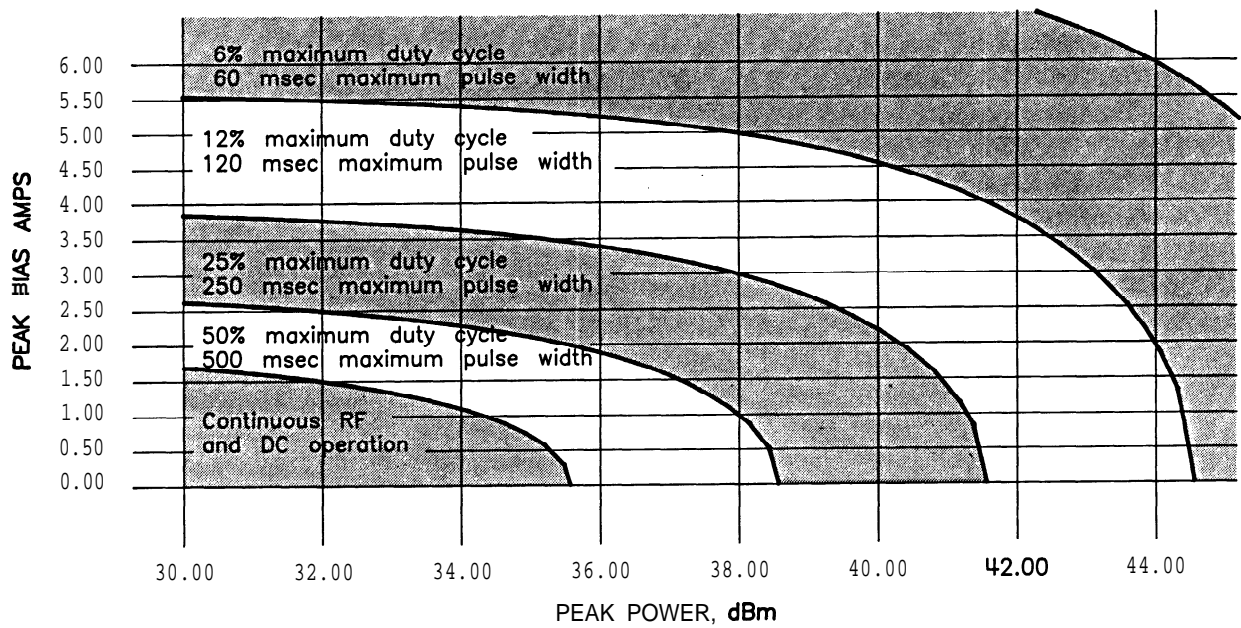


Figure 6. HP 11612A Option 001 Duty Cycle Curves
Exploded View

