

# Operating and Service Manual Modification

**Agilent Technologies**  
**85320A/B H20**  
**Mixer Modules**  
**0.1 to 3 GHz**

Use this modification with manual part number  
85320-90001.



**Part Number: 85320-90032**

**Printed in USA**

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Revision 2.2

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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.

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Malaysia	1-800-828-848	1-800-801664
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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

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## Safety Considerations

### General

Review this product and related documentation to familiarize yourself with safety markings and instructions before you operate the instrument. This product has been designed and tested in accordance with international standards.

### Safety Symbols

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#### WARNING

The **WARNING** notice denotes a hazard. It calls attention to a procedure, practice, or the like, that, if not correctly performed or adhered to, could result in personal injury. Do not proceed beyond a **WARNING** notice until the indicated conditions are fully understood and met.

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#### CAUTION

The **CAUTION** notice denotes a hazard. It calls attention to an operating procedure, practice, or the like, which, if not correctly performed or adhered to, could result in damage to the product or loss of important data. Do not proceed beyond a **CAUTION** notice until the indicated conditions are fully understood and met.

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The product will be marked with this instruction manual symbol when it is necessary for you to refer to the instruction manual.



Indicates hazardous voltages.



Indicates earth (ground) terminal.

### Safety Earth Ground

This is a Safety Class I product (provided with a protective earthing terminal). An uninterruptible safety earth ground must be provided from the main power source to the product input wiring terminals, power cord, or supplied power cord set. Whenever it is likely that the protection has been impaired, the product must be made inoperative and secured against any unintended operation.

## **Before Applying Power**

Verify that the product is configured to match the available main power source as described in the input power configuration instructions in this manual.

If this product is to be powered by autotransformer, make sure the common terminal is connected to the neutral (grounded) side of the AC power supply.



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## Description

This manual modification describes the differences in the HP 85320A H20 and HP 85320B H20 compared to the standard HP 85320A and HP 85320B.

The HP 85320A H20 and the HP 85320B H20 are identical in function to the standard HP 85320A and HP 85320B except that the frequency range of operation is 0.1 to 3.0 GHz instead of 2.0 to 26.5 GHz. Fundamental mixing is the only mode of operation.

The HP 85320A H20 test mixer and the HP 85320B H20 reference mixer are designed for use with the HP 85309A H20 and H21 LO/IF distribution units.

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## Accessories

HP 85320A/B H20 Mixer Modules	
Operating and Service Manual Modification (1) .....	85320-90032
RF adapter, Type-N (m)/(m), (1) for each module .....	1250-1475
Mounting bolts, (4) for each module .....	2940-0287

## Specifications

### Operating Frequency Range:

0.1 to 3.0 GHz (fundamental mixing mode ONLY)

### Maximum Input Levels:

Maximum RF level at RF and LO inputs (damage level): +20 dBm

**Table 1-1. Minimum LO Input Levels under Normal Operations**

LO Frequency	Minimum Power	Typical Power	Maximum Power
0.1 - 3 GHz	+ 8 dBm	+ 10 dBm	+ 16 dBm

**Table 1-2. Conversion Loss (LO at +10 dBm)**

LO Frequency	LO Harmonic	Typical Loss	Maximum Loss
0.1 - 3 GHz	1	-12 dB	-16 dB

### Connector Types:

Type-N female (all ports)

### Weight (approximate):

HP 85320A H20: 0.70 Kg (1.52 lb)

HP 85320B H20: 1 kg (2.2 lb)

### Dimensions (excluding connectors):

HP 85320A H20: width = 97 mm (3.8 in)  
 length = 122 mm (4.8 in)  
 height = 34 mm (1.3 in)

HP 85320B H20: width = 97 mm (3.8 in)  
 length = 186 mm (7.3 in)  
 height = 31 mm (1.2 in)

**Rebuilt/Exchange Parts:**

This program does not apply to the HP 85320A/B H20

Mechanical mounting information can be found on the last page of this document.

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## 85310A System Performance Notes

### **HP 85320A/B H20 Mixers and the HP 85309A H2x**

The HP 85320A/B H20 mixer modules were designed to be used with HP 85309A H20 and H21 LO/IF distribution units. This combination of products will provide full HP 85320A/B H20 frequency range of operation.

The frequency range of operation consists of two bands: low band operating from 0.1 to 1.0 GHz and high band operating from 0.3 to 3.0 GHz.

### **HP 85320A/B H20 Mixers and the Standard HP 85309A**

If the HP 85320A/B H20 mixer modules are used with a standard HP 85309A, the frequency range of operation is limited to 0.3 to 3 GHz.

### **HP 85320A/B-H20 Mixer System Performance Note**

System performance data — when the HP 85309A H20, -H21, HP 85320A H20, HP 85320B H20, and HP 8510/8530 are combined in a system—is shown in Table 2.

Refer to "Table 5-3" in the "General Information" section of the HP 85310A Operating and Service Manual (85310-90001) when using Table 2.

Table 2. HP 85310A System Performance Data with the HP 85320A/B H20 Mixer		
	0.1 to 0.5 GHz	0.5 to 3.0 GHz
Sensitivity (S/N=1, 0 averages)	-100 dBm	-113 dBm
Compression Level (at 0.1 dB)	-24 dBm	-24 dBm
Dynamic Range	76 dB	89 dB
Crosstalk	90 dB	100 dB
Minimum Phase Lock Power	-55 dBm	-55 dBm
RF Port Match	8 dB	8 dB
Conversion Gain ( $\pm 2$ dB)	10 dB	10 dB

### Definitions:

*Sensitivity:* The calculated difference between IF noise and RF-IF conversion gain or loss. Averaging will improve sensitivity by  $10 \log$  (averaging factor).

*Compression level:* The point where an RF input level and IF output level are no longer relatively linear within 0.1 dB.

*Dynamic range:* The calculated difference between compression and sensitivity.

*Crosstalk:* The coherent RF leakage from the reference channel to the test channel with 1024 averages.

*Minimum Phase Lock Power:* This term refers to systems using an HP 8350 LO source. Minimum phase lock power is the minimum RF power needed going into the reference mixer to achieve phase lock. *This does not apply to systems with a synthesized LO source.*

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## Avoiding the Effects of Spurs

The spurious signal levels seen on the HP 8510/30 from the LO source are dependent on the LO power level setting. When using an HP 8360 series synthesized sweeper as the LO source, it is recommended that you set the output power level to +10 dBm. This will minimize potential HP 85310A system spurious signals generated by the HP 8360A source when it is in low band (< 2.0 GHz). With the recommended +10 dBm setting, spur levels may be no greater than -100 dBm. With a power level of +25 dBm you may detect spurs as high as -60 dBm.

In normal HP 8510/30 operation, there are sixteen frequencies that should be avoided due to potential spurs. These frequencies are listed in Table 3. The spurs can be avoided or removed by a number of techniques, such as:

- changing the start or stop frequency by as little as 5 KHz
- using frequency list mode to avoid potential spur frequencies
- changing the multiple source equations on the HP 8510/30 to move the spur to a new frequency
- additionally reducing the LO source power to yield a 4 dB improvement per dB of source power change (Lowering the source power will result in an increase in the noise floor of the measurement system which is not recommended.)

## Calculating Potential Spurs

1. Determine if any frequencies of interest are potential spur frequencies. Note that spurs only exist for frequencies < 2.0 GHz.

The mixing spurs have an "order" (M,N) associated with them which determines the mixing products used in their generation. As a rule, orders greater than (12,12) can be ignored. The equations used to predict if a spur problem exists are:

### High Side LO

A potential problem if the spur is less than 10 KHz.

$$\left| F - \left( \frac{5.4 \times 10^9 \times (M-N) - 20 \times 10^6}{1-M} \right) + 20 \times 10^6 \right|$$

### Low Side LO

A potential problem if the spur is less than 10 KHz. Where (M,N) are ... -3, -2, -1, 1, 2, 3 ... and F is the frequency of interest in MHz.

$$\left| F - \left( \frac{5.4 \times 10^9 \times (M-N) + 20 \times 10^6}{1-M} \right) - 20 \times 10^6 \right|$$

2. Determine the impact on measurement.

If a frequency of interest has a potential spur, its impact should be assessed. The closer equation a.) or b.) is to zero, the larger the spur impact. Figure 1 may be used to approximate the level of the spur.

3. Decide how to minimize spur impact.

The spurs can be avoided or removed by a number of techniques. See "Avoiding the Effects of Spurs" on the previous page.

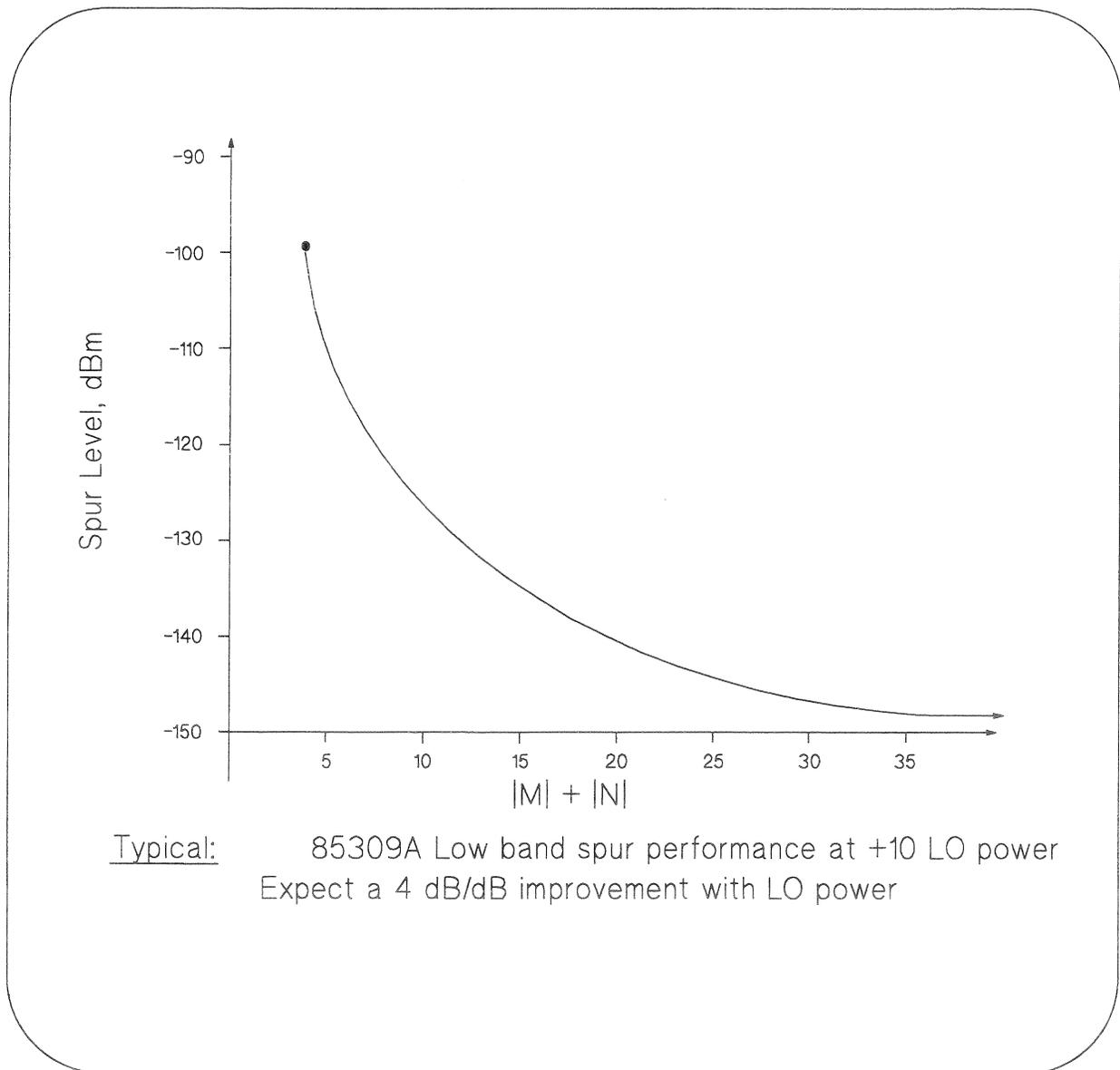
The top sixteen potential spur frequencies are listed in Table 3.

**Table 3. Potential Spurs**

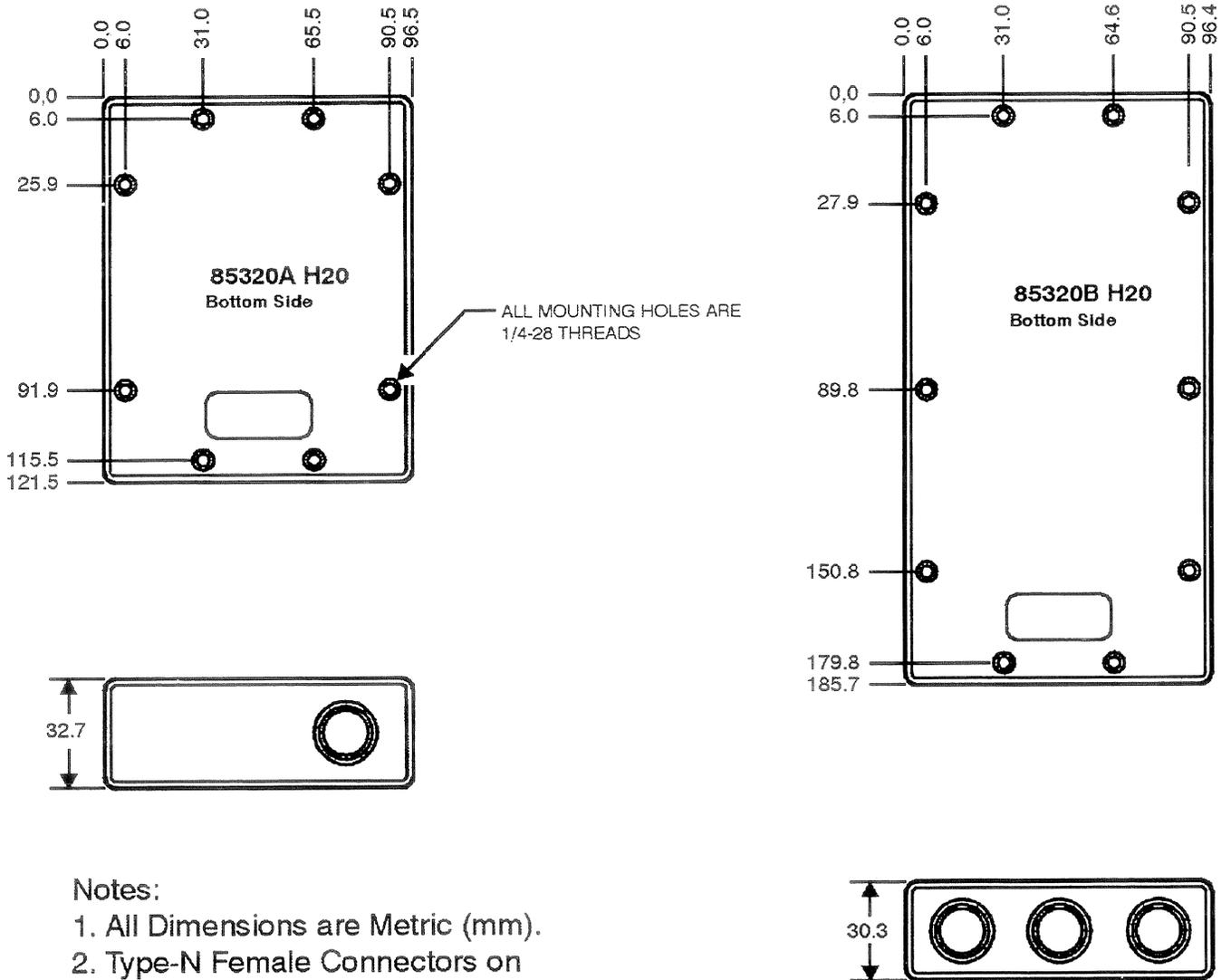
Spur Order (M,N)	Normal	8530A Operation
	High Side Frequency (MHz) Source 2:1 (Freq. + 0.02) GHz	Low Side Frequency (MHz) Source 2:1 (Freq. - 0.02) GHz
(-2,-3)	1786.67	1813.33
(7,9)	1776.67	1823.33
(4,5)	1773.33	1826.67
(9,11)	1327.50	1372.50
(5,6)	1325.00	1375.00
(-4,-5)	1064.00	1096.00
(6,7)	1056.00	1104.00
(-5,-6)	883.33	916.67
(7,8)	876.67	923.33
(-6,-7)	754.29	788.57
(8,9)	748.57	794.29
(-7,-8)	657.50	692.50
(9,10)	652.50	697.50
(-8,-9)	582.22	617.78
(10,11)	577.78	622.22
(-10,-11)	472.73	509.09

**Notes**

1. No spurs will be seen for  $F > 2.0$  GHz.
2. This list is not all encompassing. It is only a list of sixteen frequencies which may cause problems.
3. Figure 1 may be used to assess the magnitude of the problem.



*Figure 1. Spur Level Performance in Low Band*



85320A H20  
muntinfo.cdr  
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7/9/96

Figure 2. Mechanical Mounting Information

\*\* For Agilent Internal Reference Only

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Manufacturing Part Number

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