

# **Agilent 85320A/B H50 Mixer Modules 2.0 to 50 GHz**

**Operating and Service Manual Supplement**



---

Agilent 85320A/B H50  
Mixer Modules  
2.0 to 50 GHz

Operating and Service  
Manual Supplement

---

Use this modification with manuals  
p/n 85310-90001 and 85320-90001

Agilent p/n: 85320-90028  
Printed in USA  
25 August 1998 Revision 4.0

---

## Notice

The information contained in this document is subject to change without notice.

Agilent makes no warranty of any kind with regard to this material, including, but not limited to, the implied warranties of merchantability and fitness for a particular purpose. Agilent shall not be liable for errors contained herein or for incidental or consequential damages in connection with the furnishing, performance, or use of this material.

Agilent assumes no responsibility for the use or reliability of its software on equipment that is not furnished by Agilent.

This document contains proprietary information which is protected by copyright. All rights are reserved. No part of this document may be photocopied, reproduced, or translated to another language without prior written consent of Agilent Technologies.

### **Restricted Rights Legend**

Use, duplication, or disclosure by the U.S. Government is subject to restrictions as set forth in subparagraph (c)(1)(ii) of the Rights in Technical Data and Computer Software clause at DFARS 252.227-7013 for DOD agencies, and subparagraphs (c)(1) and (c)(2) of the Commercial Computer Software Restricted Rights clause at FAR 52.227-19 for other agencies.

Agilent Technologies  
Santa Rosa Systems Division  
1400 Fountaingrove Parkway  
Santa Rosa, CA 95403-1799, U.S.A.

© Copyright Agilent Technologies 1997–2001

---

## Warranty

### Certification

*Agilent Technologies certifies that this product met its published specifications at the time of shipment from the factory. Agilent 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 Agilent system product is warranted against defects in materials and workmanship for a period corresponding to the individual warranty periods of its component products. Instruments are warranted for a period of one year. During the warranty period, Agilent Technologies will, at its option, either repair or replace products that prove to be defective.

Warranty service for products installed by Agilent and certain other products designated by Agilent will be performed at Buyer's facility at no charge within Agilent service travel areas. Outside Agilent service travel areas, warranty service will be performed at Buyer's facility only upon Agilent's prior agreement and Buyer shall pay Agilent's round trip travel expenses. In all other areas, products must be returned to a service facility designated by Agilent.

For products returned to Agilent for warranty service, Buyer shall prepay shipping charges to Agilent and Agilent shall pay shipping charges to return the product to Buyer. However, Buyer shall pay all shipping charges, duties, and taxes for products returned to Agilent from another country.

Agilent warrants that its software and firmware designated by Agilent for use with an instrument will execute its programming instructions when properly installed on that instrument. Agilent 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. AGILENT SPECIFICALLY DISCLAIMS THE IMPLIED WARRANTIES OR MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.**

**EXCLUSIVE REMEDIES.** THE REMEDIES PROVIDED HEREIN ARE BUYER'S SOLE AND EXCLUSIVE REMEDIES. AGILENT 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 Agilent products.

For assistance, call your local Agilent Sales and Service Office, refer to **Contacting Agilent**, page -5.

## Contacting Agilent

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

**Online assistance:** [www.agilent.com/find/assist](http://www.agilent.com/find/assist)

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

---

## Safety and Regulatory Information

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.

---

### 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.

---









### 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.

## Instrument Markings

---

	When you see this symbol on your instrument, you should refer to the instrument's instruction manual for important information.
	This symbol indicates hazardous voltages.
	The laser radiation symbol is marked on products that have a laser output.
	This symbol indicates that the instrument requires alternating current (ac) input.
	The CE mark is a registered trademark of the European Community. If it is accompanied by a year, it indicates the year the design was proven.
	The CSA mark is a registered trademark of the Canadian Standards Association.
1SM1-A	This text indicates that the instrument is an Industrial Scientific and Medical Group 1 Class A product (CISPER 11, Clause 4).
	This symbol indicates that the power line switch is ON.
	This symbol indicates that the power line switch is OFF or in STANDBY position.

---





## **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.

---

## Typeface Conventions

- Italics**
  - Used to emphasize important information:  
Use this software *only* with the Agilent xxxxxX system.
  - Used for the title of a publication:  
Refer to the *Agilent xxxxxX System-Level User's Guide*.
  - Used to indicate a variable:  
Type `LOAD BIN filename`.
- Instrument Display**
  - Used to show on-screen prompts and messages that you will see on the display of an instrument:  
The Agilent xxxxxX will display the message `CAL1 SAVED`.
- [Keycap]**
  - Used for labeled keys on the front panel of an instrument or on a computer keyboard:  
Press `[Return]`.
- {Softkey}**
  - Used for simulated keys that appear on an instrument display:  
Press `{Prior Menu}`.
- User Entry**
  - Used to indicate text that you will enter using the computer keyboard; text shown in this typeface must be typed *exactly* as printed:  
Type `LOAD PARMFILE`
  - Used for examples of programming code:  
`#endif // ifndef NO_CLASS`
- Path Name**
  - Used for a subdirectory name or file path:  
Edit the file `usr/local/bin/sample.txt`
- Computer Display**
  - Used to show messages, prompts, and window labels that appear on a computer monitor:  
The `Edit Parameters` window will appear on the screen.
  - Used for menus, lists, dialog boxes, and button boxes on a computer monitor from which you make selections using the mouse or keyboard:  
Double-click `EXIT` to quit the program.

---

# Contents

Notice .....	1-2
Restricted Rights Legend .....	1-2
Warranty .....	1-3
Certification .....	1-3
Warranty .....	1-3
Assistance .....	1-4
Safety and Regulatory Information .....	1-6
Safety Earth Ground .....	1-7
Before Applying Power .....	1-7
Typeface Conventions .....	1-8
Introduction .....	1-1
Description .....	1-1
Operating Note .....	1-2
Internal Crystal Detector Output Voltage Label .....	1-2
Specification .....	1-3
Operating Frequency Range .....	1-3
Maximum Input Levels .....	1-3
<i>Table 1. LO Input Levels</i> .....	3
<i>Table 2. Conversion Loss (LO at +12 dBm).</i> .....	3
General Specifications .....	1-3
Connector Types .....	1-3
Weight (Approximate) .....	1-3
Size (Excluding Connectors) .....	1-3
85310A System Performance Notes .....	1-4
Typical System Performance .....	1-4
<i>Table 3. Fundamental and 3rd Harmonic Performance.</i> .....	4
<i>Table 4. 5th Harmonic Mode Performance</i> .....	5
<i>Table 5. 7th Harmonic Mode Performance</i> .....	5
Service .....	1-6
Replaceable Parts and Accessories .....	1-6
Accessories .....	1-6
Rebuild/Exchange Parts .....	1-6
Replaceable Parts, 85320A H50 .....	1-7
85320A H50 Component Layout .....	1-8
Replaceable Parts, 85320B H50 .....	1-9
85320B H50 Component Layout .....	1-10
Mechanical Mounting Information .....	1-11
Appendix A .....	A-1
Optimizing LO Drive Power .....	A-1
Determining Detector Voltage .....	A-1
<i>Figure A-1. Equipment Configuration</i> .....	1

New Voltage Marking ..... A-2  
    ADD New Voltage Marking to Agilent 85320B Label ..... A-2  
*Figure A-2. Agilent 85320B Millimeter Scale Value Marking* ..... 2

---

## Introduction

This manual supplement describes the differences in the 85320A H50 and the 85320B H50 as compared to the standard 85320A/B. It also describes the manual changes necessary to document the Agilent 85320A/B option H50

## Description

The 85320A H50 and the 85320B H50 are identical in function to the standard 85320A and 85320B except that the frequency range of operation is 2 to 50 GHz instead of 2 to 26.5 GHz.

The 85320A H50 test mixer and the 85320B H50 reference mixer are designed for use with the 85309A distributed frequency converter as described in the *85320A/B Mixer Module User's Guide*. These mixers allow operation over the full 2 to 50 GHz frequency range. See the *System Performance Notes* section for more details.

## Operating Note

### Internal Crystal Detector Output Voltage Label

The 85320B H50 reference mixer module has a label attached to it; the bottom half of the label has a millivolt value scale marking. The marking indicates what the internal crystal detector output voltage is when approximately +16 dBm, at 6 GHz, is being applied to the 85320B LO Input port.

The marked reading value can be used to set the 85309A front panel display reading. This value should provide the required LO drive level to the 85320 mixers when used in an 85310 system configuration.

If the LO drive coax cables used to conduct this 2-18 GHz drive signal from the 85309A to 85320 mixers has an excessive amount of loss, either by being extremely long or lossy, the label reading will not be achievable over the full 2 to 18 GHz range.

A failure to achieve this setting on the 85309A is indicated by the “Red” front panel indicator coming on during some portion of the 2-18 GHz LO frequency band. If the “Red” indicator flashes ON, refer to Appendix A for an alternate L.O. drive power setting.

---

### NOTE

---

The new drive power setting will require that you lower the drive power to as low as the minimum +12 dBm level.

---

## Specification

**Operating Frequency Range** 2 to 18 GHz (fundamental mixing mode)  
18 to 50 GHz (3rd harmonic mode)

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

**Table 1 LO Input Levels**

LO Frequency	Minimum Power	Typical Power	Maximum Power
2 - 18 GHz	+12 dBm	+14 dBm	+17 dBm

**Table 2 Conversion Loss (LO at +12 dBm)**

RF Frequency	LO Harmonic	LO Frequency	Typical Loss	Maximum Loss
2 - 18 GHz	fundamental	2 - 18 GHz	-6 dB	15 dB
18 - 50 GHz	3 rd.	6 - 16.7 GHz	-24 dB	30 dB

### General Specifications Connector Types

Type-N female except for R.F. Input (2.4 mm male).

#### Weight (Approximate)

Net Weight:

85320A H50: 794 g (1.75 lb)

85320B H50: 1021 g (2.25 lb).

#### Size (Excluding Connectors)

85320A H50: width = 97 mm (3.8 in.)  
length = 122 (4.8 in.)  
height = 34 mm (1.3 in.)

85320B H50: width = 97 mm (3.8 in.)  
length = 186 mm (7.3 in.)  
height = 31 mm (1.2 in.)

---

#### NOTE

Mechanical mounting information can be found on page 10 of this document.

---

## 85310A System Performance Notes

System performance data (when the 85309A, 85320A H50, 85320B H50, and the 8510/8530 are combined in a system) is shown below. Refer to “Table 5-3” in the *General Information* section of the 85310A Operating and Service manual as a reference for the following tables.

### Typical System Performance

**Table 3 Fundamental and 3rd Harmonic Performance**

System Parameter		GHz	2 to 3	3 to 18	18 to 40*	40 to 50*
1	Sensitivity (S/N=1, 0 average)	-dBm	120	118	103	100
2	Compression Level (at 0.1 dB)	-dBm	18	19	15	25
3	Dynamic Range	dB	102	99	88	76
4	Channel Isolation	dB	118	118	110	95
	Input Return Loss	-dB	6	6	6	6
	* 3rd Harm. Mode					

1. Sensitivity is the calculated difference between IF noise and RF/IF conversion gain/loss. Averaging will improve sensitivity by 10 log (avg. factor).
2. RF level for 0.1 dB compression: the RF input level where the RF and the IF levels are no longer tracking each other linearly within 0.1dB.
3. Dynamic range is the calculated difference between 0.1dB compression and sensitivity.
4. Crosstalk is the coherent RF leakage from the reference channel to the test channel with 1024 averages.



**Table 4 5th Harmonic Mode Performance**

System Performance (Typical)	GHz	<sup>1</sup> 10 to 14	14 to 30	30 to 33	33 to 50
Sensitivity	-dBm	85	83	83	83
Compression (@ 0.1 dB)	-dBm	22	26	21	21
Channel Isolation	dB	95	95	95	90

1. 14 to 50 GHz is the maximum recommended range of operation.

**Table 5 7th Harmonic Mode Performance**

System Performance (Typical)	GHz	<sup>1</sup> 20 to 33	33 to 50
Sensitivity	-dBm	72	75
Compression (@ 0.1 dB)	-dBm	17	26
Channel Isolation	dBm	88	88

1. 33 to 50 GHz is the maximum recommended range of operation.

---

## Service

### Replaceable Parts and Accessories

#### Accessories

Description	Part Number	Qty
RF adapter, 2.4 (f) / (f), for each module	1250-2188	1
Mounting bolts, 1/4-28x1/2". for each module	2940-0287	4
Manual, Operating and Service	85320-90001	1
Manual, Operating and Service Manual Supplement	85320-90028	1

#### Rebuild/Exchange Parts

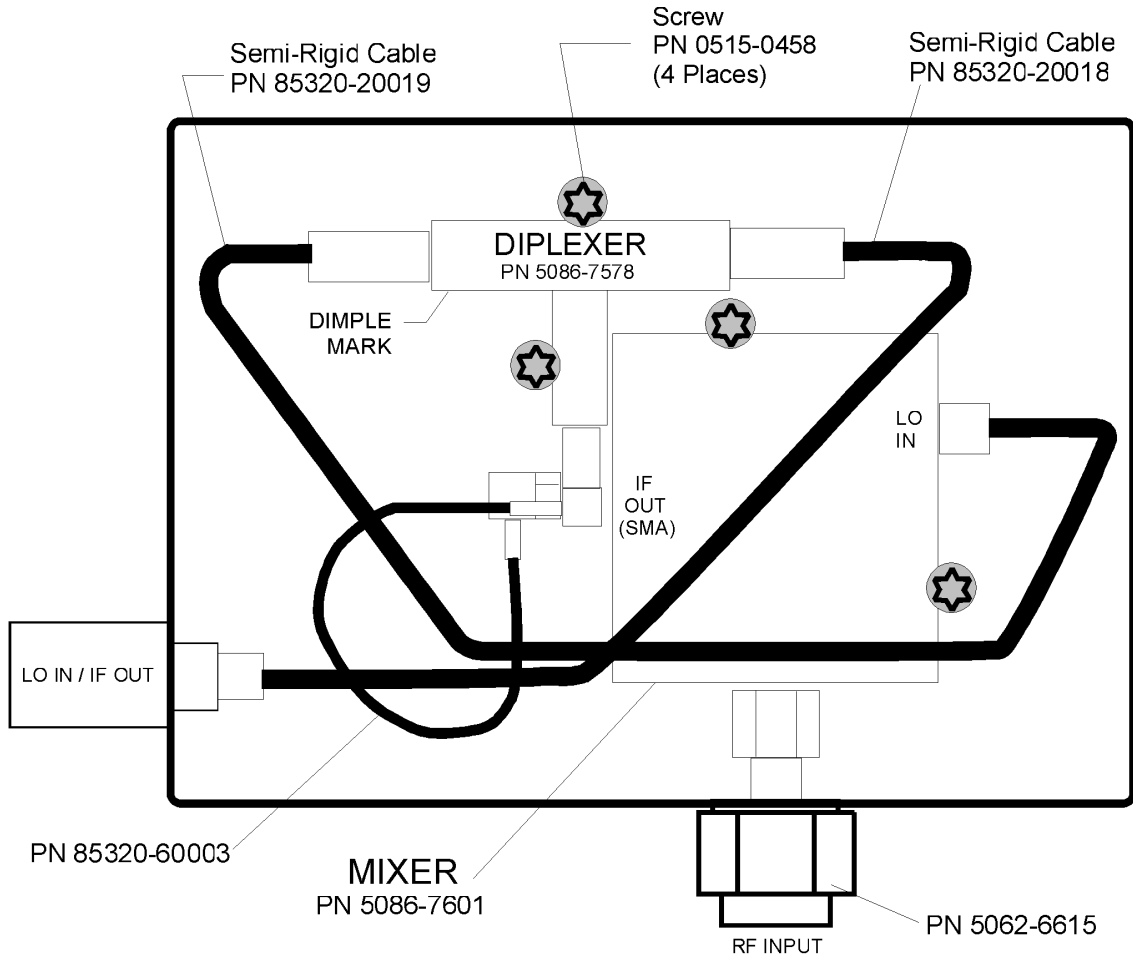
This program does not apply to the 85320A/B H50.

## Replaceable Parts, 85320A H50

The 85320A H50 consists of the following replaceable parts and assemblies. See Figure 1.

Description	Part Number	Qty
Screw, LID, SMM 3.5, T10 Torx	0515-0458	8
O-ring, 0.364 ID, (not shown)	0900-0012	2
Connector, 2.4 (m) / (f), RF IN port	5062-6615	1
Diplexer (test mixer)	5062-7578	1
*Mixer, 2 to 50 GHz	5086-7601	1
Connector, SMA (f) / N (f), LO / RF IN port	08340-60221	1
*Gasket, housing lid	85320-00002	1
*Housing	85320-20014	1
*Housing lid	85320-20015	1
*RF cable assembly, 0.086 rigid	85320-20018	1
*RF cable assembly, 0.086 rigid	85320-20019	1
Cable assembly	85320-60003	1
*These special parts are Agilent manufacturing division controlled		

# 85320A H50 Component Layout



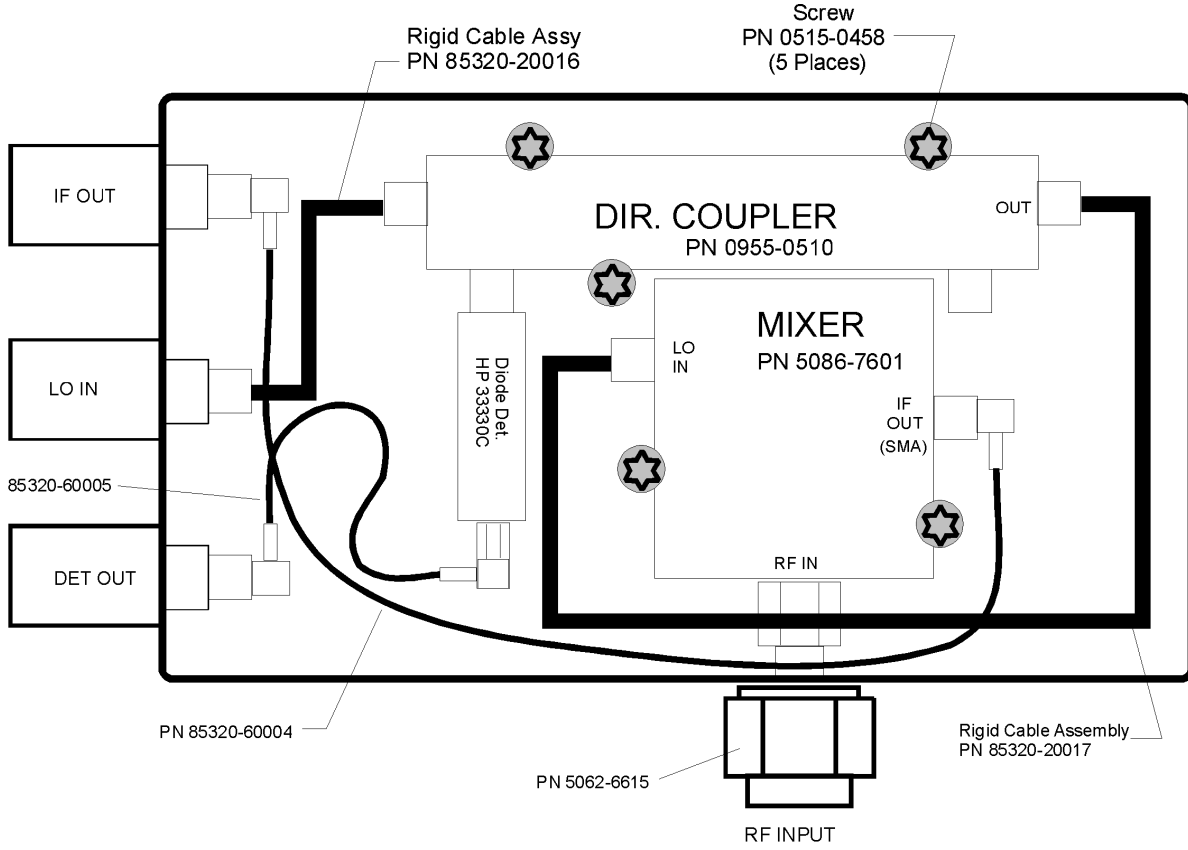
*Figure 1 85320A H50 Internal Parts Locations*

## Replaceable Parts, 85320B H50

The 85320B H50 consists of the following replaceable parts and assemblies.

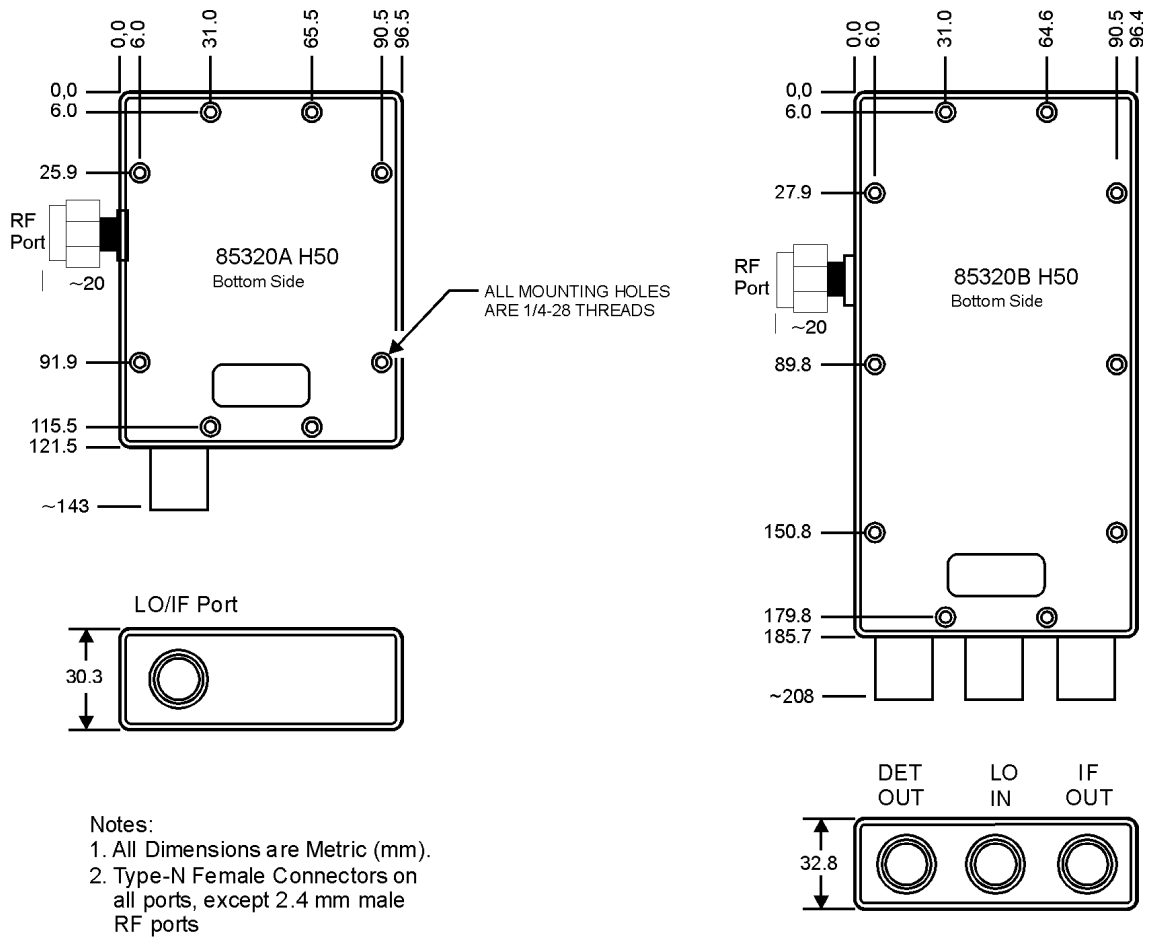
Description	Part Number	Qty
Screw, lid, SMM 3.5, T10 Torx	0515-2038	10
Connector, SMA (f) / N (f)	08340-60221	3
O-ring, 0.364 ID (not shown)	0900-0012	4
Coupler, 1 to 20 GHz, SMA	0955-0510	1
Diode detector 0.1 to 26.5 GHz	33330C	1
Connector assembly, 2.4 (m) / (f), RF IN port	5062-6615	1
*Mixer, 2 to 50 GHz	5086-7601	1
*Gasket, housing lid	85320-00001	1
*Housing	85320-20012	1
*Housing lid	85320-20013	1
*RF cable assembly, 0.086 rigid	85320-20016	1
*RF cable assembly, 0.086 rigid	85320-20017	1
Cable assembly	85320-60004	1
Cable assembly	85320-60005	1
*These special parts are Agilent manufacturing division controlled		

# 85320B H50 Component Layout



*Figure 2 85320B H50 Internal Parts Locations*

## Mechanical Mounting Information



**Figure 3** Mechanical Mounting Information

## Mechanical Mounting Information



## Appendix A

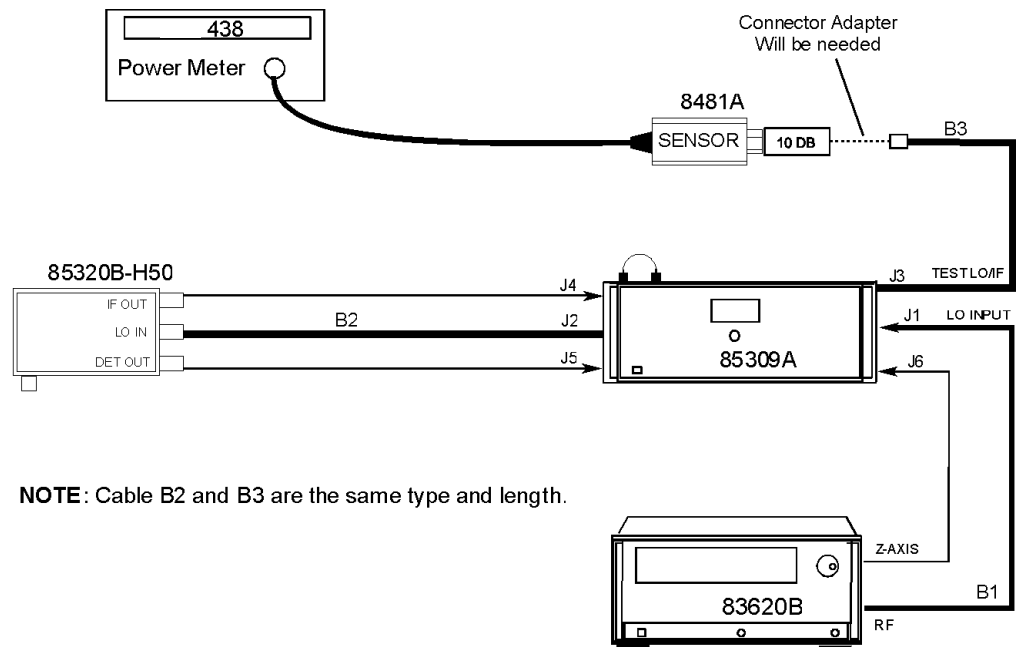
### Optimizing LO Drive Power

There are special system configurations in which the recommended “detector voltage” reading on the Agilent 85320B mixer module is not compatible. The “detector voltage” value that is on the mixer module assumes that the LO coax cables (B2, B3) used to interface the Agilent 85309A to the Agilent 85320 mixers are similar to the Agilent 85381A cable assembly that is not greater than 5 meters in length or a cable loss of less than 5 dB at 18 GHz.

#### Determining Detector Voltage

To determine the correct “detector voltage” for your special application, follow this procedure.

- Procedure**
1. Configure your equipment as shown in Figure A-1 below.



**Figure A-1** Equipment Configuration

2. Calibrate and Zero the power meter and sensor
3. Connect the power sensor to the end of the “B3” cable.

## Appendix A

4. Set the Agilent 85309A front panel display reading to the value indicated on the Agilent 85320B mixer.
5. Manually set the RF source so that it will slowly sweep across the LO frequency range that you wish to operate in. Note power meter settling time requirement.
6. If the Red front panel indicator light on the Agilent 85309A *does not flash ON* and the minimum power measured by the power sensor (minus the 10 dB attenuator loss) is  $\geq +12$  dBm, then use this detector voltage setting.
7. If the Red indicator light flashes, readjust the Agilent 85309A front panel adjustment to a lower value until the Red indicator light no longer flashes. Now insure that the minimum measured power is  $\geq +12$  dBm.

If you are not able to achieve a  $\geq +12$  dBm power reading *with no Red indicator*, you have one of these possible problems:

- a. B2 and B3 cable length are too lossy, find alternative.
- b. Cable B3 or B2 are not equal or one is defective.
- c. The Agilent 85309A is defective. Insure that the power levels at ports J2 and J3 (without the Agilent 85320B connected) exceed their specified levels.

## New Voltage Marking

### ADD New Voltage Marking to Agilent 85320B Label

For future reference in this special system configuration, it is recommended that you re-mark the *Agilent 85320B* millivolt scale to indicate the new system detector voltage value.

Next to the new marked value, note the minimum LO power level measured during the measurement portion of this procedure.



**Figure A-2** *Agilent 85320B Millimeter Scale Value Marking*