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## HP References in this Manual

This manual may contain references to HP or Hewlett-Packard. Please note that Hewlett-Packard's former test and measurement, semiconductor products and chemical analysis businesses are now part of Agilent Technologies. We have made no changes to this manual copy. In other documentation, to reduce potential confusion, the only change to product numbers and names has been in the company name prefix: where a product number/name was HP XXXX the current name/number is now Agilent XXXX. For example, model number HP8648A is now model number Agilent 8648A.

INSTALLATION AND SERVICE MANUAL

# HP 11643A-series TEST SET KITS



## **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 Bureau of Standards, to the extent allowed by the Bureau's calibration facility, and to the calibration facilities of other International Standards Organization members.*

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# HP **11643A-SERIES** TEST SET **KITS**

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**HEWLETT  
PACKARD**



# HP 11643A-series Test Set Kits

## INTRODUCTION

This manual applies to five HP11643A millimeter-wave band test set kits: R, Q, U, V and W. These kits are assembled to make waveguide reflection/transmission test sets for mm-wave measurements using the HP 8510 Network Analyzer and other mm-wave components. Refer to the HP 8510 mm-wave System manual for complete system level information.

These band dependent kits provide waveguide routing and separation for the reference ( $a_1$ ), reflected ( $b_1$ ), and transmitted ( $b_2$ ) signals. Each kit also includes three band dependent mixers that allow the source LO (local oscillator) to mix with the test signal so that an IF (intermediate frequency) is produced for each of the signals. In addition, each kit contains four band dependent isolators, a fixed load for terminating the final coupler and various components to complete the test set kit.

The table below shows the frequency range and waveguide type of each band:

Band	Frequency Range (GHz)	Electronic Industry Association Number
R	26.5 - 40	WR-28
Q	33 - 50	WR-22
U	40 - 60	WR-19
V	50 - 75	WR-15
W	75 - 100	WR-10

### How to use this manual

This manual should be used to identify the parts in your kit, order replacement parts, and assemble the test set for use with a properly configured HP 8510 mm-wave Network Analyzer system.

This manual contains:

- Test Set Kit Assembly Procedure (for all bands)
- Test Set Kit Component Identification Sheet (for all bands)
- Test Set Kit Photographs
- Test Set Kit Assembly Diagrams
- Test Set Kit Parts Lists for each band

## Receiving Inspection

Inspect the packaging and all parts for damage. Keep all packaging materials for return shipment, if necessary. If any part is missing or damaged, notify the carrier and your nearest Hewlett-Packard office.



The LO and IF ports of the three harmonic mixers (A7-9) are easily damaged by electrostatic discharge. Be careful when handling them. Before connecting cables to them, short the cable outer conductor to ground. Then short the cable inner conductor to the outer conductor. Finally, short the outer conductor to ground again.

## Assembly Procedure

Follow the procedure below to assemble your test set kit on a flat surface before connecting it to the HP 8510 millimeter-wave system. Use the required screws (see identification sheet), and use the waveguide stands supplied in the HP 85100A LO/IF Kit (stands support AT2, DC2, DC3 and AT4) or supplied with racked systems.

Refer to the Test Set Assembly Diagram and Photograph to properly connect the test set kit.

All of the directional coupler flanges can be easily damaged by improper connections. If you are not using the HP 11644A waveguide calibration kit straights (with precision flanges) on the test port side of the couplers, HP 899B series straights can provide a suitable alternative to avoid damage to the coupler flanges.

**Screws and Alignment Pins.** Alignment pins and screws should always be used in a consistent and proper manner as follows:

**R band** – Use two alignment pins in opposite corners to align the square shaped flanges. Then lightly connect them with two screws and nuts. Remove the alignment pins and install the other two screws and nuts. Gradually tighten all four screws in an X pattern.

**Q, U, V and W bands** – Captive screws are used to make the connections. These partially threaded screws are designed for repeated use in the tapped round waveguide flanges. Connect all four screws lightly. Gradually tighten one screw and then the opposite screw to provide even torque.

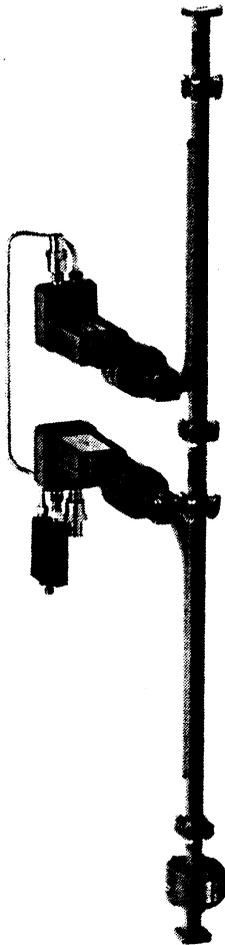
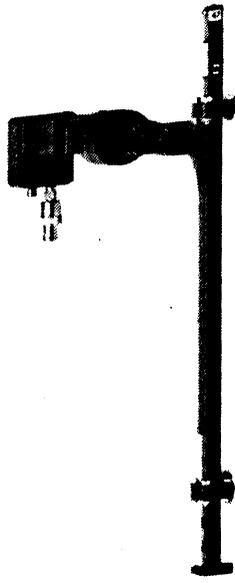
**NOTE:** Proper connection of waveguide flanges is critical to making good measurements. Be sure to make the connections as consistent as possible and never overtighten the connections.

**Racked systems (HP 85106A).** Refer to the Getting Started section of the HP 8510B mm-wave system manual for instructions about connecting the Test Set kit to the system. The HP 85106A has portions of the LO/IF section and Test Set kit connections that differ slightly from bench top configurations.

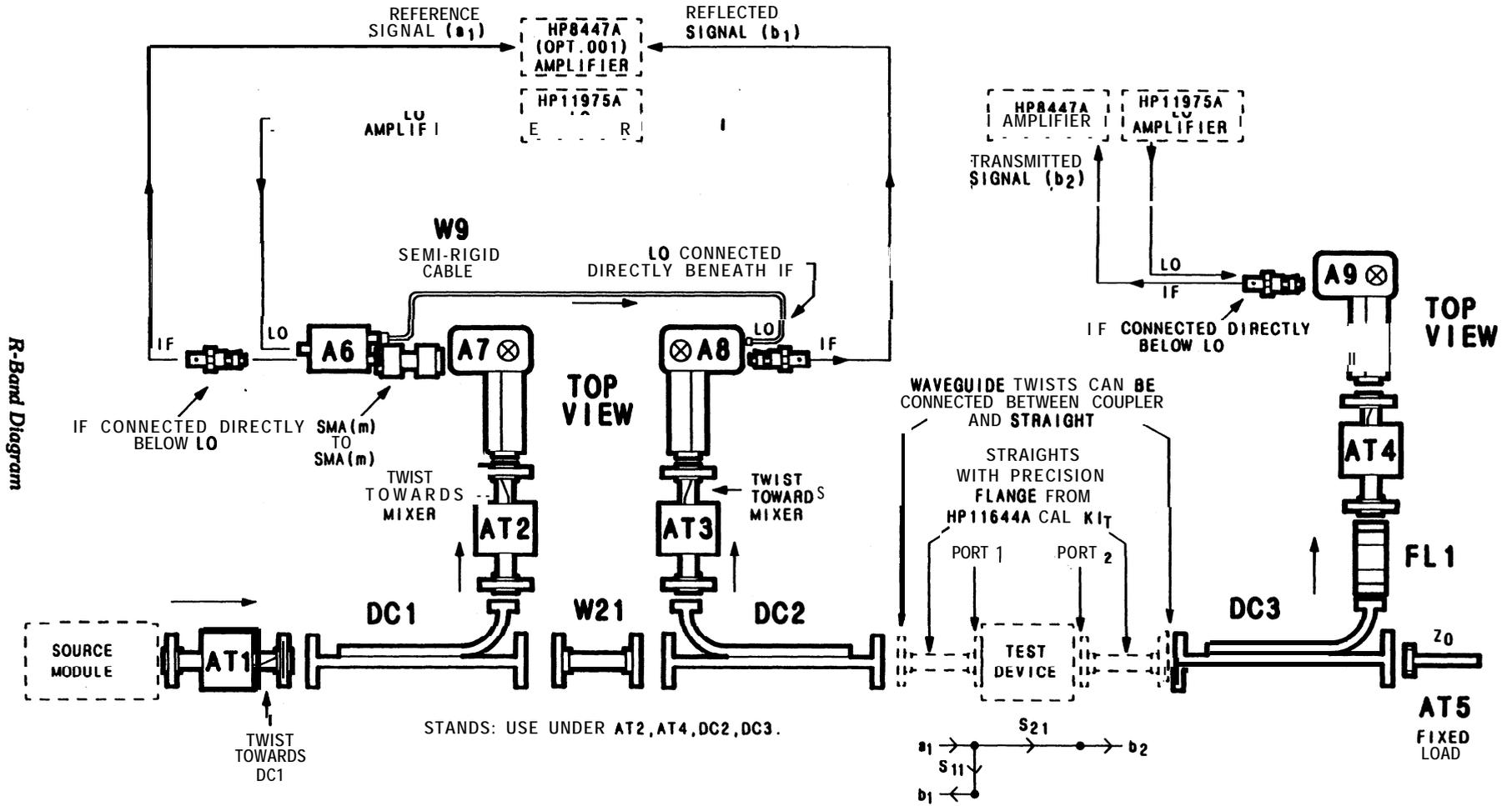
**Assembly Procedure.** Refer to the diagram and the photograph to be sure that the test set kit is properly configured.

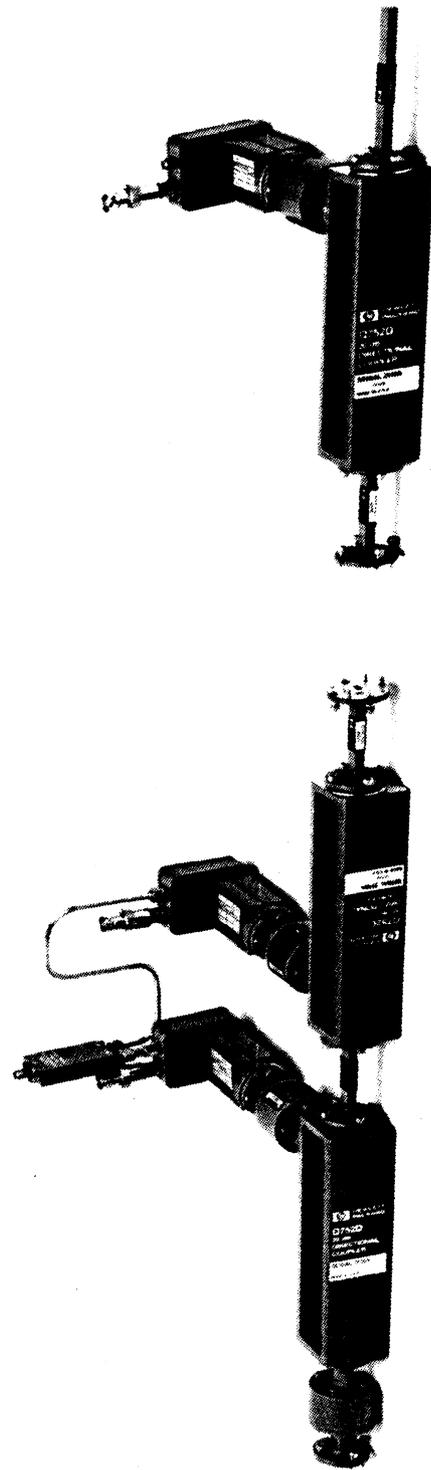
1. Attach isolator AT1 (twist side) to directional coupler DC1.
2. Connect isolator AT2 (twist side) to mixer A7 (use short screws).
3. Connect isolator AT3 (twist side) to mixer A8 (use short screws).
4. Attach AT2/A7 to directional coupler DC1.  
Then attach AT3/A8 to directional coupler DC2.
5. Connect directional couplers DC1 to DC2: For R, Q and U bands connect the W21 (5cm) straight section between DC1 and DC2. Note that V and W bands do not use the W21 straight between the two couplers.
6. Use the E2 SMA(m) to SMA(m) adapter to attach one of the A6 power divider outputs to the LO input of the A7 mixer.
7. Loosely connect one end of the W9 cable to the other A6 power divider output. Then loosely connect the other end of the W9 cable to the LO input of the A8 mixer. Carefully tighten the connections.
8. Attach E1 and E3 SMA(m) to BNC adapters to the IF outputs of both mixers A7 and A8.
9. Place the assembled portion of the test set on stands so that it matches the height of the source module. The source module output flange can now be connected to the AT1 isolator input.
10. Attach the AT5 fixed load to the directional coupler DC3. If you have an R band kit, also attach the filter FL1 to DC3.
11. Attach isolator AT4 to mixer A9.
12. Then connect AT4/A9 to the directional coupler DC3, or for R band, to the other side of the filter FL1.
13. Attach E4 SMA (m) to BNC adapter to the IF port of mixer A9. Then place the remaining assembled section of the test set on stands.
14. If desired, the waveguide twists W22/W23 can be attached to the directional couplers DC2/DC3 for device measurements that require the test ports to be rotated 90 degrees.
15. At this point, the test set kit is assembled. The HP 11644A calibration kits contain the waveguide straights (5cm). These straights will be attached to the directional couplers to provide the port 1 and port 2 measurement planes where devices will be connected.
16. Connect the test set kit to the LO/IF portion as described in the Getting Started section of the appropriate HP mm-wave system manual. For HP 8510A systems, refer to the HP 85129 manual (HP Part No. 85129-90006). For HP 8510B systems, refer to the HP 85106 manual (HP Part No. 85106-90001).

**TROUBLESHOOTING NOTE:** Refer to the HP 8510 mm-wave system manual, Troubleshooting section, for information about troubleshooting the Test Set Kit components in an HP 8510 mm-wave Network Analyzer system.



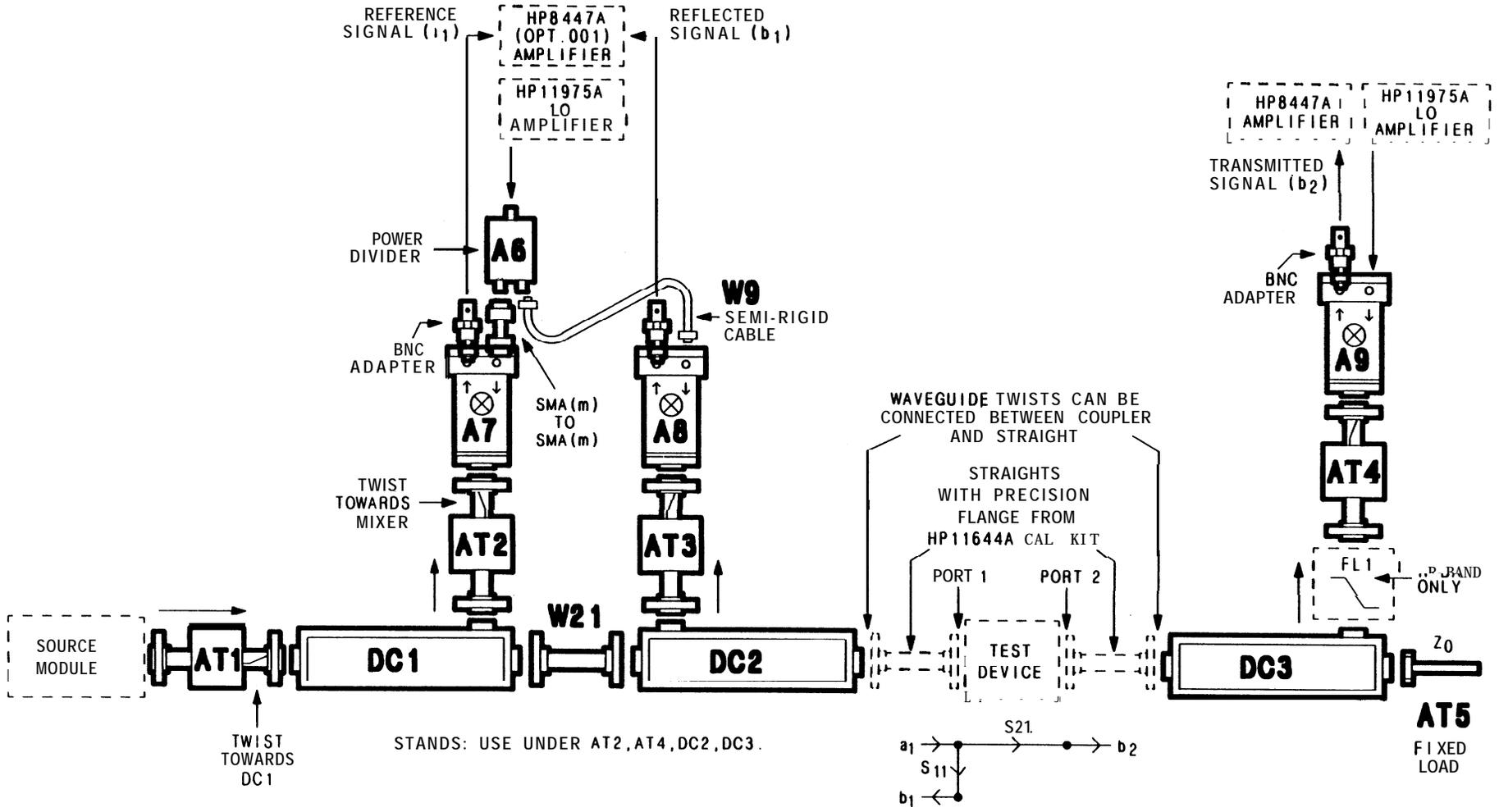
*R-Band Test Set Kit*

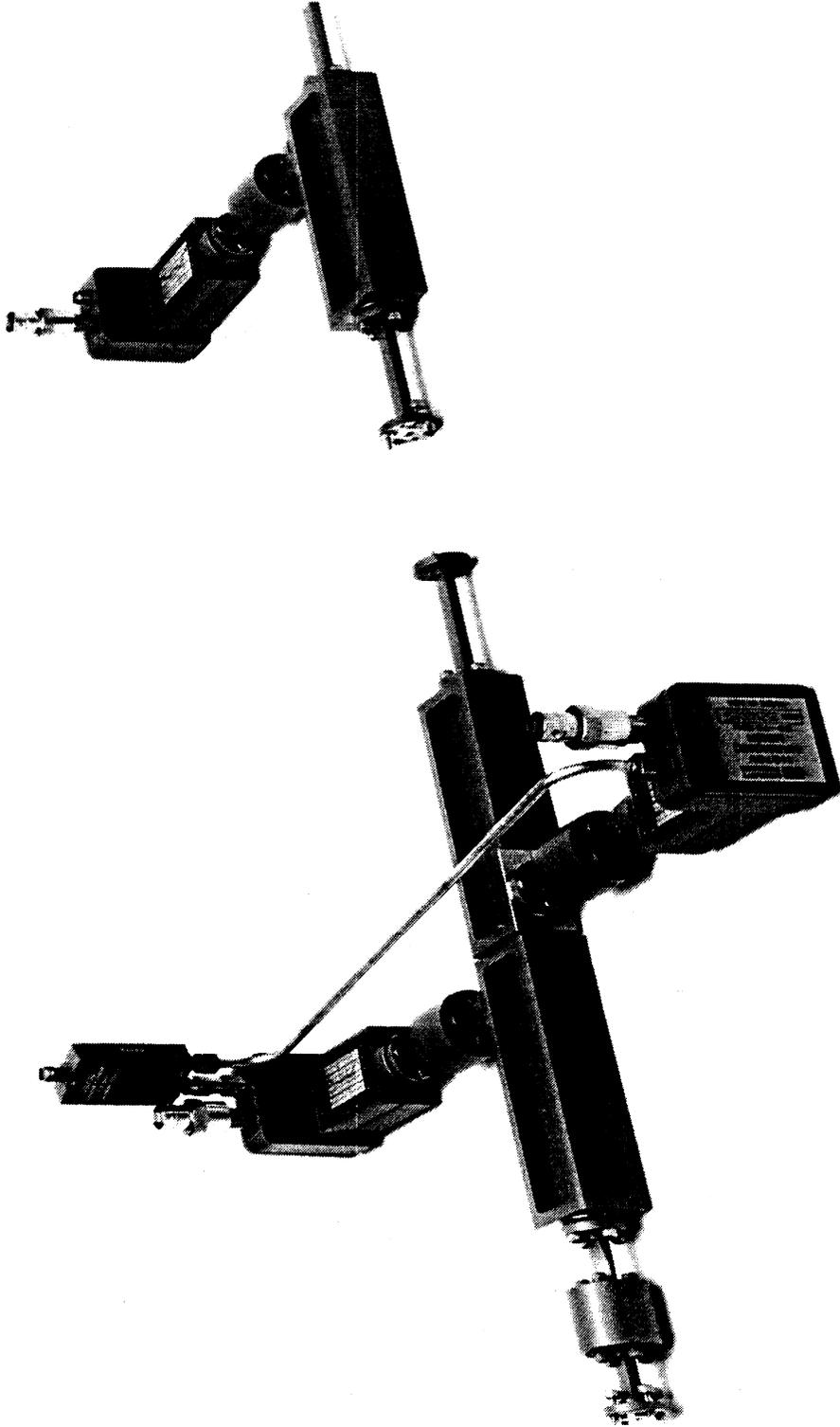




*Q and U Band Test Set Kit*

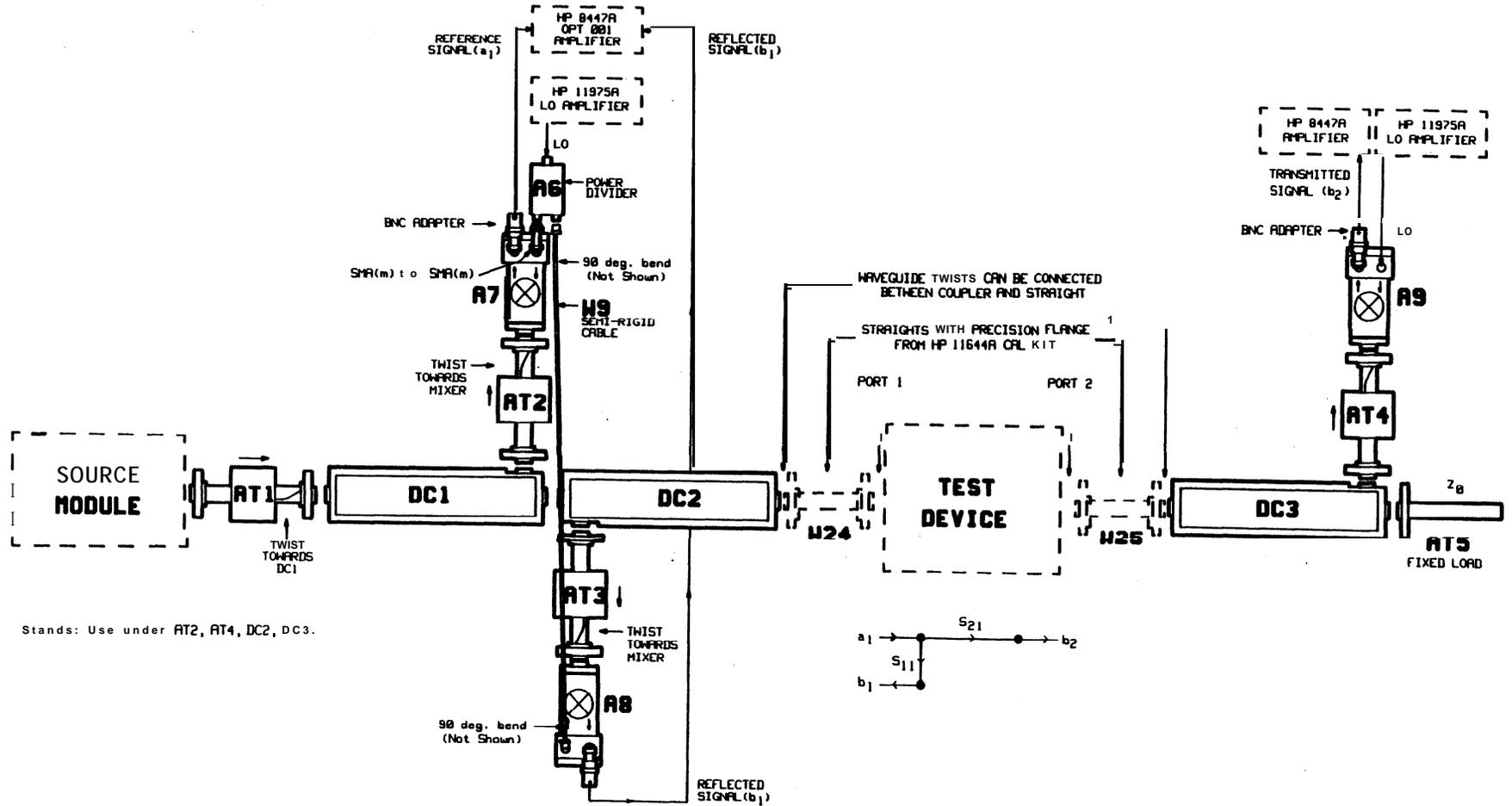
Q and U Band Diagram



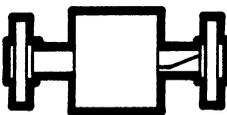
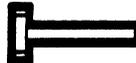
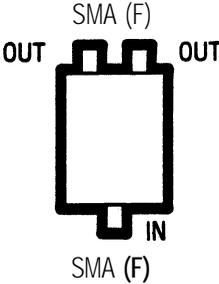
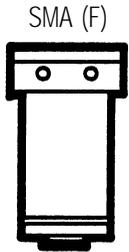
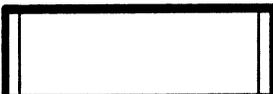
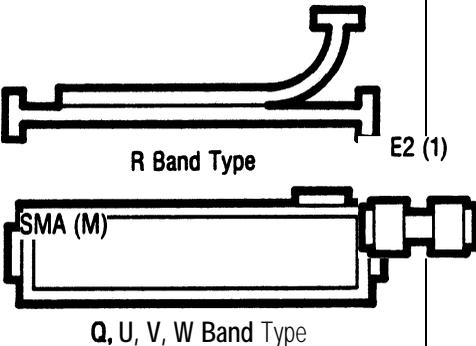
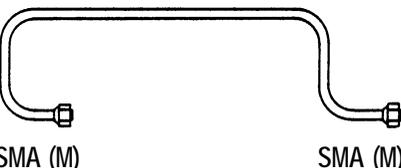
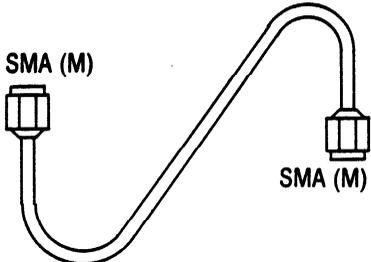
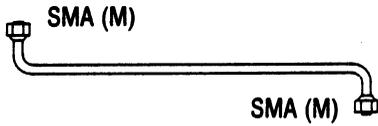
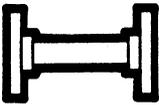
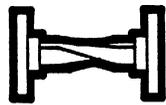


*V and W Band Test Set Kit*

V and W Band Diagram



# HP 11643A-SERIES TEST SET KIT COMPONENT IDENTIFICATION SHEET

<p><b>AT1-4 Isolators (4)</b></p>  <p><b>AT5 Fixed Load (1)</b></p> 	<p><b>A6 Power Divider (1)</b></p> 	<p><b>A7-9 Mixers (3)</b></p> 
<p><b>FL1 Low Pass Filter (1)</b></p>  <p style="text-align: center;"><b>For R Band Only</b></p>	<p><b>DC1-3 Directional Couplers (3)</b></p> 	<p><b>Adapters EI, 3, 4 (3)</b></p>  <p style="text-align: right;"><b>SMA (M)</b></p>
<p><b>R Band: W9 Semi-Rigid Cable (1)</b></p> 	<p><b>Q and V Band: W9 Semi-Rigid Cable (1)</b></p> 	<p><b>V and W Band: W9 Semi-Rigid Cable (1)</b></p> 
<p><b>R, Q, U Bands: W21 Waveguide Straight (1)</b></p>  <p style="text-align: right;">(5 cm long)</p> <p><b>W22-23 Waveguide Twists (2)</b></p>  <p style="text-align: right;">90°</p>	<p><b>MP1-2 Hex Ball Driver (2)</b></p> 	<p><b>4-40 Screws - Nuts (100 ea.)</b></p> <p><b>R Band:</b></p>  <p style="text-align: right;">MP3 (.375 in)</p>  <p style="text-align: right;">MP4 (.500 in)</p>  <p style="text-align: right;">NUT - MP5 (Use With MP4)</p> <p><b>Q, U, V, and W Bands: (No Nuts Required)</b></p>  <p style="text-align: right;">MP6 (.312 in)</p>
<p><b>NOTE: Semi-rigid cables may require some bending to make a proper fit. Avoid kinks.</b></p>		

**R Band - HP 11643A-series Test Set Kit Replaceable Parts List**

<b>Reference Designator</b>	<b>Description</b>	<b>HP Part Number</b>	<b>HP Model Number</b>	<b>Qty.</b>
A6	2-8 GHz POWER DIVIDER	0955-0264		1
A7	26.540 GHz HARMONIC MIXER	11643-60027	*11970A	1
A8	26.5-40 GHz HARMONIC MIXER	11643-60027	*11970A	1
A9	26.5-40 GHz HARMONIC MIXER	11643-60027	*11970A	1
<b>AT1</b>	26.5-40 GHz ISOLATOR	11643-60002	R365A	1
<b>AT2</b>	26.5-40 GHz ISOLATOR	11643-60002	R365A	1
AT3	26.5-40 GHz ISOLATOR	11643-60002	R365A	1
AT4	26.5-40 GHz ISOLATOR	11643-60002	R365A	1
AT5	26.5-40 GHz FIXED LOAD	11643-60013	R910A	1
DC1	26.5-40 GHz DIRECTIONAL COUPLER	11643-60005	R752D	1
DC2	26.5-40 GHz DIRECTIONAL COUPLER	11643-60005	R752D	1
DC3	26.5-40 GHz DIRECTIONAL COUPLER	11643-60005	R752D	1
E1	BNC (F) TO SMA (M) ADAPTER	1250-1200		1
E2	SMA (M) TO SMA (M) ADAPTER	1250-1159		1
E3	BNC (F) TO SMA (M) ADAPTER	1250-1200		1
E4	BNC (F) TO SMA (M) ADAPTER	1250-1200		1
FL1	LOW PASS FILTER	11643-60001	R362A	1
<b>MP1</b>	HEX BALL DRIVER	8710-1539		1
<b>MP2</b>	HEX BALL DRIVER	8710-1539		1
<b>MP3</b>	4-40 SKT HD SCREW .375 IN LONG (SEE NOTE BELOW)	3030-0221		100
MP4	440 SKT HD SCREW .500 IN LONG	3030-0209		100
<b>MP5</b>	4-40 HEX NUT .062 IN. THICK (USE WITH MP4)	2260-0002		100
<b>W9</b>	SEMI-RIGID CABLE	85100-20006		1
w21	WAVEGUIDE 5 CM STRAIGHT	11643-60016	R899B	1
W22	WAVEGUIDE TWIST	11643-60008	R898A	1
W23	WAVEGUIDE TWIST	11643-60008	R898A	1
---	SERVICE MANUAL	11643-90015		1

. Not replaceable by part number. Order HP model number listed.

**NOTE:** MP3 – Use this screw to connect Isolator AT1 to the source module and to connect Isolators AT2-4 to the flanges of mixers A7-9.

**Q Band - HP 11643A-series Test Set Kit Replaceable Parts List**

Reference Designator	Description	HP Part Number	HP Model Number	Qty.
A8	2-8 GHz POWER DIVIDER	0955-0264		1
A7	33-50 GHz HARMONIC MIXER	11643-60028	*11970Q	1
A8	33-50 GHz HARMONIC MIXER	11643-60028	• 11970Q	1
A9	33-50 GHz HARMONIC MIXER	11643-60028	*11970Q	1
<b>AT1</b>	33-50 GHz ISOLATOR	11643-60003	Q365A	1
AT2	33-50 GHz ISOLATOR	11643-60003	Q365A	1
AT3	33-50 GHz ISOLATOR	11643-60003	Q365A	1
<b>AT4</b>	33-50 GHz ISOLATOR	11643-60003	Q365A	1
AT5	33-50 GHz FIXED LOAD	11643-60014	Q910A	1
DC1	33-50 GHz DIRECTIONAL COUPLER	11643-60006	Q752D	1
<b>DC2</b>	33-50 GHz DIRECTIONAL COUPLER	11643-60006	Q752D	1
<b>DC3</b>	33-50 GHz DIRECTIONAL COUPLER	11643-60006	Q752D	1
E1	BNC (F) TO SMA (M) ADAPTER	1250-1200		1
E2	SMA (M) TO SMA (M) ADAPTER	1250-1159		1
E3	BNC (F) TO SMA (M) ADAPTER	1250-1200		1
E4	BNC (F) TO SMA (M) ADAPTER	1250-1200		1
<b>MP1</b>	HEX BALL DRIVER	8710-1539		1
<b>MP2</b>	HEX BALL DRIVER	8710-1539		1
<b>MP6</b>	4-40 CAPTIVE SCREW .312 IN LONG (Use for all test set connections - no nut required)	1390-0671		100
<b>W9</b>	SEMI-RIGID CABLE	85100-20007		1
w21	WAVEGUIDE 5 CM STRAIGHT	11643-60011	Q899B	1
W22	WAVEGUIDE TWIST	11643-60009	Q898A	1
W23	WAVEGUIDE TWIST	11643-60009	Q898A	1
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.Not **replaceable** by part number. Order HP model number listed.

**U Band - HP 11643A-series Test Set Kit Replaceable Parts List**

Reference Designator	Description	HP Part Number	HP Model Number	Qty <sup>a</sup>
A6	2-8 GHz POWER DIVIDER	0955-0264		1
A7	40-60 GHz HARMONIC MIXER	11643-60029	*11970U	1
A8	40-60 GHz HARMONIC MIXER	11643-60029	*11970U	1
A9	40-60 GHz HARMONIC MIXER	11643-60029	*11970U	1
AT1	40-60 GHz ISOLATOR	11643-60004	U365A	1
AT2	40-60 GHz ISOLATOR	11643-60004	U365A	1
AT3	40-60 GHz ISOLATOR	11643-60004	U365A	1
AT4	40-60 GHz ISOLATOR	11643-60004	U365A	1
AT5	40-60 GHz FIXED LOAD	11643-60015	U910A	1
<b>DC1</b>	40-60 GHz DIRECTIONAL COUPLER	11643-60007	U752D	1
<b>DC2</b>	40-60 GHz DIRECTIONAL COUPLER	11643-60007	U752D	1
DC3	40-60 GHz DIRECTIONAL COUPLER	11643-60007	U752D	1
E1	BNC (F) TO SMA (M) ADAPTER	1250-1200		1
E2	SMA (M) TO SMA (M) ADAPTER	1250-1159		1
E3	BNC (F) TO SMA (M) ADAPTER	1250-1200		1
E4	BNC (F) TO SMA (M) ADAPTER	1250-1200		1
<b>MP1</b>	HEX BALL DRIVER	8710-1539		1
<b>MP2</b>	HEX BALL DRIVER	8710-1539		1
<b>MP6</b>	440 CAPTIVE SCREW .312 IN LONG	1390-0671		100
<b>W9</b>	SEMI-RIGID CABLE	85100-20007		1
w21	WAVEGUIDE 5 CM STRAIGHT	11643-60012	U899B	1
W22	WAVEGUIDE TWIST	11643-60010	U898A	1
W23	WAVEGUIDE TWIST	11643-60010	U898A	1
---	SERVICE MANUAL	11643-90015		1

<sup>a</sup> . Not replaceable by part number. Order HP model number listed.

**V Band - HP 11643A-series Test Set Kit Replaceable Parts List**

Reference Designator	Description	HP Part Number	HP Model Number	Qty <sup>a</sup>
A6	2-8 GHz POWER DIVIDER	0955-0264		1
A7	50-75 GHz HARMONIC MIXER	1164340030	●11970v	1
A8	50-75 GHz HARMONIC MIXER	11643-60030	*11970V	1
A9	50-75 GHz HARMONIC MIXER	11643-60030	*11970v	1
AT1	50-75 GHz ISOLATOR	1164340017	V365A	1
<b>AT2</b>	50-75 GHz ISOLATOR	1164340017	V365A	1
AT3	50-75 GHz ISOLATOR	11643-60017	V365A	1
AT4	50-75 GHz ISOLATOR	1164340017	V365A	1
AT5	50-75 GHz FIXED LOAD	1164340025	V910A	1
DC1	50-75 GHz DIRECTIONAL COUPLER (20 dB)	11643-60021	V752D	1
DC2	50-75 GHz DIRECTIONAL COUPLER (20 dB)	11643-60021	V752D	1
DC3	50-75 GHz DIRECTIONAL COUPLER (20 dB)	11643-60021	V752D	1
E1	BNC(F) TO SMA(M) ADAPTER	1250-1200		1
E2	SMA(M) TO SMA(M) ADAPTER	1250-1159		1
E3	BNC(F) TO SMA(M) ADAPTER	1250-1200		1
E4	BNC(F) TO SMA(M) ADAPTER	1250-1200		1
<b>MP1</b>	HEX BALL DRIVER	8710-1539		1
<b>MP2</b>	HEX BALL DRIVER	871 0-1539		1
<b>MP6</b>	4-40 CAPTIVE SCREW, 3/12 IN LONG (Use for all test connections - no nut required)	1390-0671		100
<b>W9</b>	SEMI-RIGID CABLE	85100-20010		1
W22	WAVEGUIDE TWIST	11643-60023	V898A	1
W23	WAVEGUIDE TWIST	11643-60023	V898A	1
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\* Not replaceable by part number. Order HP model number listed.

**W Band - HP 11643A-series Test Set Kit Replaceable Parts List**

<b>Reference Designator</b>	<b>Description</b>	<b>HP Part Number</b>	<b>HP Model Number</b>	<b>Qty.</b>
A6	2-8 GHz POWER DIVIDER	0955-0264		1
A7	75-I 10 GHz HARMONIC MIXER	11643-60031	● 11970w	1
A8	75-I 10 GHz HARMONIC MIXER	11643-60031	*11970W	1
A9	75-110 GHz HARMONIC MIXER	11643-60031	*11970W	1
AT1	75-I 10 GHz ISOLATOR	11643-60018	W365A	1
<b>AT2</b>	75-I 10 GHz ISOLATOR	11643-60018	W365A	1
AT3	75-I 10 GHz ISOLATOR	11643-60018	W365A	1
<b>AT4</b>	75-I 10 GHz ISOLATOR	11643-60018	W365A	1
AT5	75-110 GHz FIXED LOAD	11643-60026	W910C	1
<b>DC1</b>	75-I 10 GHz DIRECTIONAL COUPLER (20 dB)	11643-60022	W752D	1
DC2	75-I 10 GHz DIRECTIONAL COUPLER (20 dB)	11643-60022	W752D	1
<b>DC3</b>	75-I 10 GHz DIRECTIONAL COUPLER (10 dB)	11643-60020	W752C	1
E1	BNC(F) TO SMA(M) ADAPTER	1250-1200		1
E2	SMA(M) TO SMA(M) ADAPTER	1250-1159		1
E3	BNC(F) TO SMA(M) ADAPTER	1250-1200		1
E4	BNC(F) TO SMA(M) ADAPTER	1250-1200		1
<b>MP1</b>	HEX BALL DRIVER	8710-1539		1
<b>MP2</b>	HEX BALL DRIVER	8710-1539		1
<b>MP6</b>	4-40 CAPTIVE SCREW, 3/12 IN LONG (Use for all test connections - no nut required)	1390-0671		100
<b>W9</b>	SEMI-RIGID CABLE	85100-20011		1
<b>W22</b>	WAVEGUIDE TWIST	11643-60024	W898A	1
W23	WAVEGUIDE TWIST	11643-60024	W898A	1
---	SERVICE MANUAL	11643-90015		1

• Not replaceable by part number. Order HP model number listed.



## REGIONAL SALES AND SUPPORT OFFICES

*For information relating to Sales or Support of Hewlett-Packard products first contact your local Hewlett-Packard office listed in the white pages of your telephone directory. If none is listed locally, contact one of the addresses listed below to obtain the address or phone number of the Hewlett-Packard Sales or Support office nearest you.*

### ASIA

Hewlett-Packard Asia Ltd.  
47/F, 26 Harbour Road,  
Wanchai, HONG KONG  
G.P.O. Box 863, Hong Kong  
Tel: (652) 5-8330833  
Telex: 76793 HPA HX  
Cable: HPASIAL TD

### AUSTRALASIA

Hewlett-Packard Australia Ltd.  
31-41 Joseph Street  
BLACKBURN, Victoria 3130  
Australia  
Tel: (61) 895-2895  
Telex: 31-024  
Cable: HEWPARD Melbourne

### CANADA

Hewlett-Packard (Canada) Ltd.  
6877 Goreway Drive  
MISSISSAUGA, Ontario L4V 1M8  
Tel: (416) 678-9430  
Telex: 069-8644

### JAPAN

Yokogawa-Hewlett-Packard Ltd.  
29-21 Takaido-Higashi, 3 Chome  
Suginami-ku TOKYO 168  
Tel: 03 (331) 6111  
Telex: 232-2024 YHPTOK

### MEDITERRANEAN AND MIDDLE EAST

Hewlett-Packard S.A.  
Mediterranean and Middle East  
Operations  
Atrina Centre  
32 Kifissias Avenue  
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Greece  
Tel: (30) 662 88 11  
Telex: 21-6588 HPAT GR  
Cable: HEWPACKSA Athens

### BENELUX & SCANDINAVIA

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Telex: 18 919 hpner nl

### SOUTH & EAST EUROPE, AFRICA

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Telex: 27635 hmea  
Cable: HEWPACKSA Geneve

### FRANCE

Hewlett-Packard Franc8  
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91040 EVRY Cedex  
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Telex: 6923 15F

### GERMAN FEDERAL REPUBLIC

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Telex: 410 844 hpbhg

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NAVIGLIO  
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Telex: 334632

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### EASTERNUSA

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### MIDWESTERN USA

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

### SOUTHERN USA

Hewlett-Packard Co.  
2000 South Park Place  
P.O. Box 105005  
ATLANTA, GA 30348  
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### WESTERN USA

Hewlett-Packard Co.  
5161 Lankershim Blvd.  
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### OTHER INTERNATIONAL AREAS

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