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Operating and Service Manual

U85026A Detector
40 to 60 GHz

Serial Numbers

This manual applies directly to U85026A detectors with serial numbers 100 and above. For additional information on serial numbers, refer to *Instruments Covered by Manual* in Section 1, General Information.



Agilent Technologies

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Printed in USA May 1986

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OPERATING AND SERVICE MANUAL

HP U85026A DETECTOR

40 to 60 GHz



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HP U85026A
DETECTOR
40 to 60 GHz

SERIAL NUMBERS

This manual applies directly to HP U85026A detectors with serial number 100 and above.

For additional information about serial numbers, refer to INSTRUMENTS COVERED BY MANUAL in Section I, General Information.

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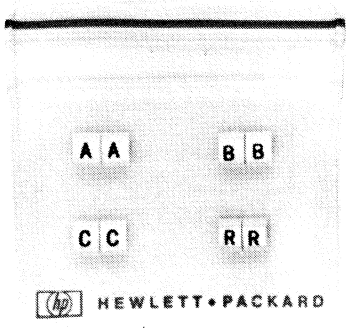
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HP U85026A DETECTOR



CABLE MARKER KIT
HP Part Number 5061-1044

Figure 1-1. HP U85026A and Accessories Supplied

Section I: General Information

INTRODUCTION

This manual contains information required to operate, test, and service the Hewlett-Packard U85026A detector. Figure 1-1 shows the instrument and the accessories supplied with it.

INSTRUMENTS COVERED BY THIS MANUAL

Each HP U85026A detector has a unique serial number. This manual applies to instruments with serial number 100 and above.

A detector manufactured after the printing of this manual may be different from the detector documented in this manual. The manual for newer instruments is accompanied by a yellow manual change supplement that contains serial-specific change information explaining how to adapt the manual for the newer instrument. In addition to change information, the supplement may contain replacement information that applies to all instruments, regardless of their serial number.

To keep this manual as current as possible, periodically request the latest manual change supplement. The supplement for this manual is keyed to its print date and part number, which appear on the title page. Complimentary copies of the supplement are available from your local Hewlett-Packard office.

DESCRIPTION

The HP U85026A detector is designed to be used with the HP 8757A scalar network analyzer (it is NOT compatible with the HP 8755C or 8756A scalar network analyzer). The HP U85026A enables the analyzer to measure either modulated (AC) or unmodulated (DC) test signals.

The HP U85026A detects 40 to 60 GHz RF signals at levels from −50 to +10 dBm (AC detection). The use of three HP U85026A detectors, and two waveguide directional couplers, enables simultaneous (amplitude only) transmission and reflection measurements via the analyzer CRT.

SPECIFICATIONS

Table 1-1 lists the HP U85026A specifications.

SAFETY CONSIDERATIONS

General

Become familiar with all safety instructions in this manual before you use the HP U85026A detector. This product was designed and tested in accordance with international standards.

Safety Symbols

WARNING

This indicates a personal hazard. **WARNING** calls attention to a procedure, practice, etc., that, if not performed correctly, can cause personal injury. Do not continue past a **WARNING** until you fully understand and meet the stated conditions.

CAUTION

This indicates a mechanical hazard. **CAUTION** calls attention to an operating procedure, practice, etc., that, if not correctly performed or adhered to, can cause damage to (or destruction of) part or all of the instrument. Do not continue past a **CAUTION** until you fully understand and meet the stated conditions.

ACCESSORIES SUPPLIED

The accessories supplied with the HP U85026A detector are shown in Figure 1-1.

Instrument Case

To protect the HP U85026A, when not using the detector, store it in its case.

Hex Balldriver

Use the 3/32 inch hex balldriver to tighten or loosen hex screws when making waveguide connections.

Flange Cover

When the HP U85026A is not in use, protect the waveguide with the flange cover.

Cable Markers

When you use more than one detector in a test setup, use the cable markers for identification.

EQUIPMENT REQUIRED BUT NOT SUPPLIED

To use the HP U85026A detector, you will need a network analyzer and a source.

Network Analyzer

With the HP 8757A scalar network analyzer, you can make measurements using AC detection (a 27.778 kHz amplitude modulated signal), or DC detection (an unmodulated signal). The HP 8757A, with up to four HP U85026A detectors (Opt. 001), measures amplitude levels of −50 to +10 dBm and amplitude ratios of up to 60 dB (AC detection). For more information, see the *HP 8757A Scalar Network Analyzer Operation Manual.*

To ensure that the HP U85026A meets its dynamic accuracy specification, the HP 8757A must have firmware revision 2.0.

Source

There are several source options:

- The HP 8350B sweep oscillator with an HP 83550A RF plug-in and an HP 83556A mm-wave source module.
- The HP 8350B sweep oscillator with an HP 83590 series RF plug-in, an HP 8349B microwave amplifier, and an HP 83556A mm-wave source module.
- The HP 8340A or 8341A synthesized sweeper with an HP 8349B microwave amplifier, and an HP 83556A mm-wave source module.

Note: The HP 8349B microwave amplifier requires a 0.5V/GHz input from the source. See SOURCE SYSTEM GUIDES in the *HP 83556A Millimeter-Wave Source Module U-Band System Manual.*

EQUIPMENT AVAILABLE

The following equipment is available for use with the HP U85026A detector:

HP U752C/D . . . . . Directional Coupler (10 dB/20 dB)
HP U532A . . . . . Frequency Meter
HP U382A . . . . . Precision Variable Attenuator

ACCESSORIES AVAILABLE

The following accessories are available for the HP U85026A detector:

HP 11679A	7.6 metre (25 foot) extension cable
HP 11679B	61 metre (200 foot) extension cable
HP 11540A	Waveguide stand. Locks waveguide at any height from 70 to 133 mm (2.7 to 5.25 in)
HP U362A	Waveguide Low Pass Filter
HP U365A	Isolator. Faraday-rotation-type
HP U910A	Fixed Load
HP U896A	Standard Section
HP U897A/B	Waveguide 90° Bend (E-Plane/H Plane)
HP U898A/B	Waveguide 90° Twist (R.H./L.H.)
HP U899A/B	Waveguide Straight Section (2.5 cm, 1 in/5.0 cm, 2 in)
HP U914A	Sliding Load
HP U920B	Moving Short
HP Q/U292A	Waveguide Adapter (WR22 to WR 19)
HP U/V292A	Waveguide Adapter (WR19 to WR15)

RECOMMENDED TEST EQUIPMENT

The equipment required for testing and/or troubleshooting the HP U85026A is listed in Table 1-2. Other equipment may be substituted if it meets or exceeds the critical specifications indicated in the table.

INITIAL INSPECTION

If the shipping container or cushioning material is damaged, keep it until the contents of the shipment are checked for completeness, and the instrument is checked both mechanically and electrically.

1. Check the package for completeness. Figure 1-1 shows the items you should receive with each detector.
2. Check connector, cable, and body for mechanical damage.
3. Test the detector electrically. Refer to OPERATOR'S CHECK in Section II.

Notify your nearest Hewlett-Packard office if any of the following conditions exist:

- The instrument does not pass the performance tests and using the procedures in Section IV, Service, you cannot correct the problem.
- The shipping contents are incomplete.
- There is mechanical damage or defect.

Also, notify the carrier if the shipping container is damaged or if the cushioning material shows signs of stress. Keep all shipping materials for the carrier's inspection. Hewlett-Packard will arrange for repair or replacement without waiting for a claim settlement.

PREPARATIONS FOR USE

Power Requirements

Power for each detector is supplied by the HP 8757A scalar network analyzer. Each detector requires approximately 0.5 watt.

Connecting the HP U85026A Detector

Connect the detector to the analyzer as follows:

1. Insert the HP U85026A multi-pin connector into the analyzer mating connector. The detector connector is keyed; insert the plug with the key downward.
2. Secure the multi-pin connector in the analyzer by turning the outer shell clockwise.
3. Connect the HP U85026A to the RF output as follows:

CAUTION

Do not apply more than +20 dBm RF power to the HP U85026A.

Using the 3/32 inch hex balldriver supplied, connect the HP U85026A to the RF output with four 4-40 socket cap screws. The HP part numbers for the two screw sizes most often used are 3030-0209 (0.5 in) and 3030-0349 (0.312 in). Use a 4-40 double chamfer hex nut where required (HP part number 2260-0001).

Mating Connector

The HP U85026A input connector is EIA size WR 19 waveguide. This waveguide should mate directly with a UG-383/U cover flange, and can be mated to waveguide EIA size WR15 with the use of an HP U/V292A waveguide adapter.

Detector Lead Identification

Use the furnished coded cable clips (cable marker kit) to identify detector cables when you use two or more detectors. Place matching clips on both ends of the same cable.

OPERATING ENVIRONMENT

HP U85026A detector operates within the following environmental limits:

Temperature: +0° to +55°C (+32° to +131°F).

Humidity: Up to 95%.

Altitude: Up to 7,620 m (25,000 ft).

Provide maximum protection from temperature extremes. Condensation can occur within the instrument if it is exposed to temperature extremes or to higher humidity levels.

STORAGE AND SHIPMENT

The instrument may be stored or shipped in environments within the following limits:

Temperature: −40° to +75°C (−40° to +167°F).

Humidity: Up to 95%.

Altitude: Up to 7,620 m (25,000 ft).

Provide protection from temperature extremes, which can cause condensation within the instrument.

Packaging

Containers and materials identical to those used in factory packaging are available through your local Hewlett-Packard office.

Returning Instrument for Service

If you ship the instrument to a Hewlett-Packard office or service center, please include the following information:

1. Your company name and address.
2. A technical contact person within your company, and their complete phone number.
3. The complete model and serial number of the instrument.
4. The type of service required.
5. Any other information that may expedite service.

When making inquiries, either by correspondence or by telephone, please refer to the instrument by model number and full serial number.

ADJUSTMENTS

There are no operator adjustable components on the HP U85026A detector.

ORDERING MANUAL/MICROFICHE

On the title page of this manual is a manual part number and a microfiche part number. Both can be used to order extra copies of this manual.

Microfiche are 10 × 15 cm (4 × 6 in) microfilm transparencies. Each microfiche contains reduced photocopies of the manual pages.

Also included in the microfiche package are the latest manual changes supplement and pertinent service notes.

The manual number also appears on the back cover, in the lower left hand corner.

Table 1-1. Specifications (20° to 30° C)

Frequency Range:	40 to 60 GHz
Flatness:	±2.0 dB
Return Loss:	≥12 dB (≤1.67 SWR)
Dynamic Accuracy:*	±(0.3 dB + .03 dB/dB) Referenced to 0 dBm Typically <±0.5 dB from +10 to −40 dBm
Dynamic Range:	AC +10 to −50 dBm DC +10 to −45 dBm
Maximum Input Power:	+20 dBm
Dimensions:	Cable length is 1.22 m (48 in)
Weight:	Net 0.24 kg (0.5 lb); Shipping 1.0 kg (2.2 lb)
Input Connector:	EIA size WR 19 waveguide
Cover Flange:	UG-383/U

* With HP 8757A firmware revision 2.0 or higher.

Table 1-2. Recommended Test Equipment

Instrument	Critical Specifications	Recommended Model	Use*
Network Analyzer	U85026A AC/DC compatible	HP 8757A with firmware rev. 2.0 or higher	O,P
mm-Wave Source System:	40 to 60 GHz		O,P
Sweep Oscillator	8757A compatible	HP 8350B	
RF Plug-In		HP 83550A**	
Source Module	WR 19	HP 83556A	
Directional Coupler (2 Required)	40 to 60 GHz WR 19	HP U752C	P
Detector (2 Required)	40 to 60 GHz	HP U85026A	P
Short	40 to 60 GHz WR 19	HP U921A	P
Low Pass Filter	40 to 60 GHz WR 19	HP U362A	P
Isolator	40 to 60 GHz	HP U365A	O,P
Power Meter	With frequency compatible sensor	Anritsu ML83A	P
Power Sensor	40 to 60 GHz	Anritsu MP715	P
Variable Attenuator	0 to 50 dB; 0.5% accuracy	HP U382A Opt. 890	P
Digital Voltmeter	Accuracy: ±0.01% Input Impedance ≥ 10M ohms	HP 3456A	S
Phillips Screwdriver	Size 0 Point	HP P/N 8710-0978	S
Flat Blade Screwdriver	Blade width ≤ 1/8 inch	HP P/N 8730-0008	S
Hex Nut Wrench	1/2 × 7/16	HP P/N 8720-0009	S

* O=Operator's Check P=Performance Tests S=Service

** The HP 83550A can be replaced by an HP 83590 Series plug-in and an HP 8349B microwave amplifier.

Section II: Operation

INTRODUCTION

This section contains information concerning the operation of the HP U85026A detector.

WARNING

Never look directly into the open end of a piece of waveguide when it is connected to a source of microwave energy. Microwave energy is extremely harmful to the eye.

FEATURES

The HP U85026A features are shown in Figure 2-1.

OPERATOR'S CHECK

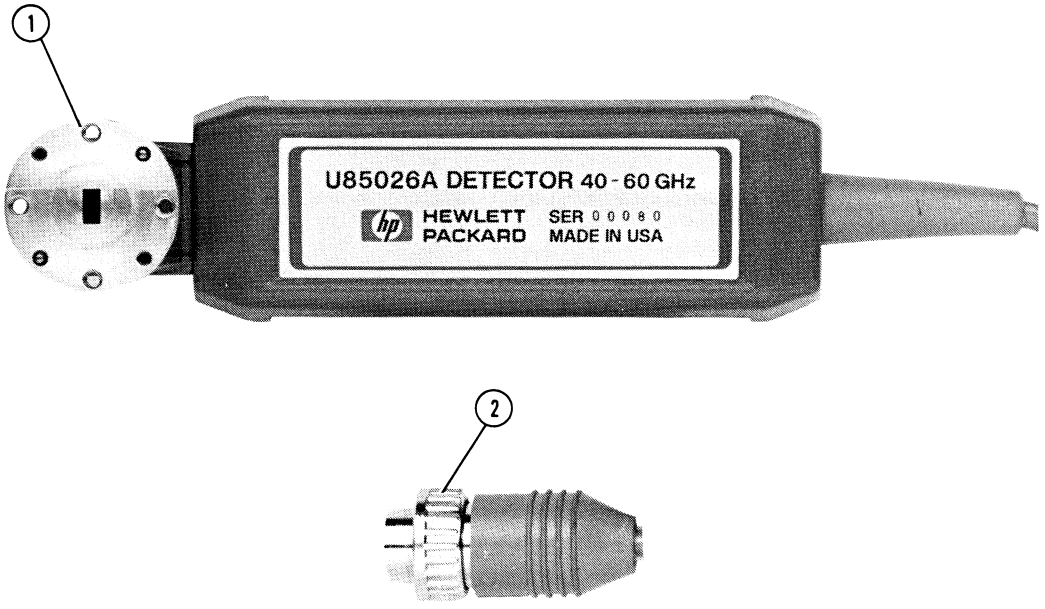
The OPERATOR'S CHECK (at the end of this section) verifies that the HP U85026A is functioning correctly. It does not thoroughly check all specifications to their limits, but it is an appropriate test for daily instrument verification, incoming inspection, or verification after digital circuit repair or replacement.

OPERATING PRECAUTIONS

CAUTION

Do not apply more than +20 dBm RF CW power to the HP U85026A, or damage can occur.

Do not drop the HP U85026A or subject it to mechanical shock. The detector is easily damaged.



1. **RF INPUT CONNECTOR** (WR 19 waveguide) accepts the RF signal.
2. **MULTI-PIN CONNECTOR** supplies the necessary DC voltage (from the analyzer) for the operation of the HP U85026A, and feeds the detector output signal to the network analyzer.

Figure 2-1. HP U85026A Features

OPERATING THEORY

The HP U85026A detects and adapts an input signal in the frequency range of 40 to 60 GHz that is either an unmodulated RF signal (DC detection mode) or a squarewave amplitude modulated RF signal (AC detection mode) so that it can be displayed on the HP 8757A scalar network analyzer. In either AC or DC detection mode, the detector provides a 27.778 kHz squarewave signal for the analyzer to interpret and display.

In AC detection, an RF or microwave signal is amplitude modulated with a 27.778 kHz squarewave. The HP U85026A demodulates (envelope detects) the signal to produce a 27.778 kHz squarewave whose peak-to-peak voltage corresponds to the RF signal magnitude at the detector input. This signal is amplified and passed to the analyzer.

In the DC detection mode, no modulation is required. The HP U85026A detector converts the RF signal to a proportional DC voltage that is then chopped at a 27.778 kHz rate. This chopped signal is amplified, and passed to the network analyzer.

MEASUREMENT SYSTEM CONFIGURATION

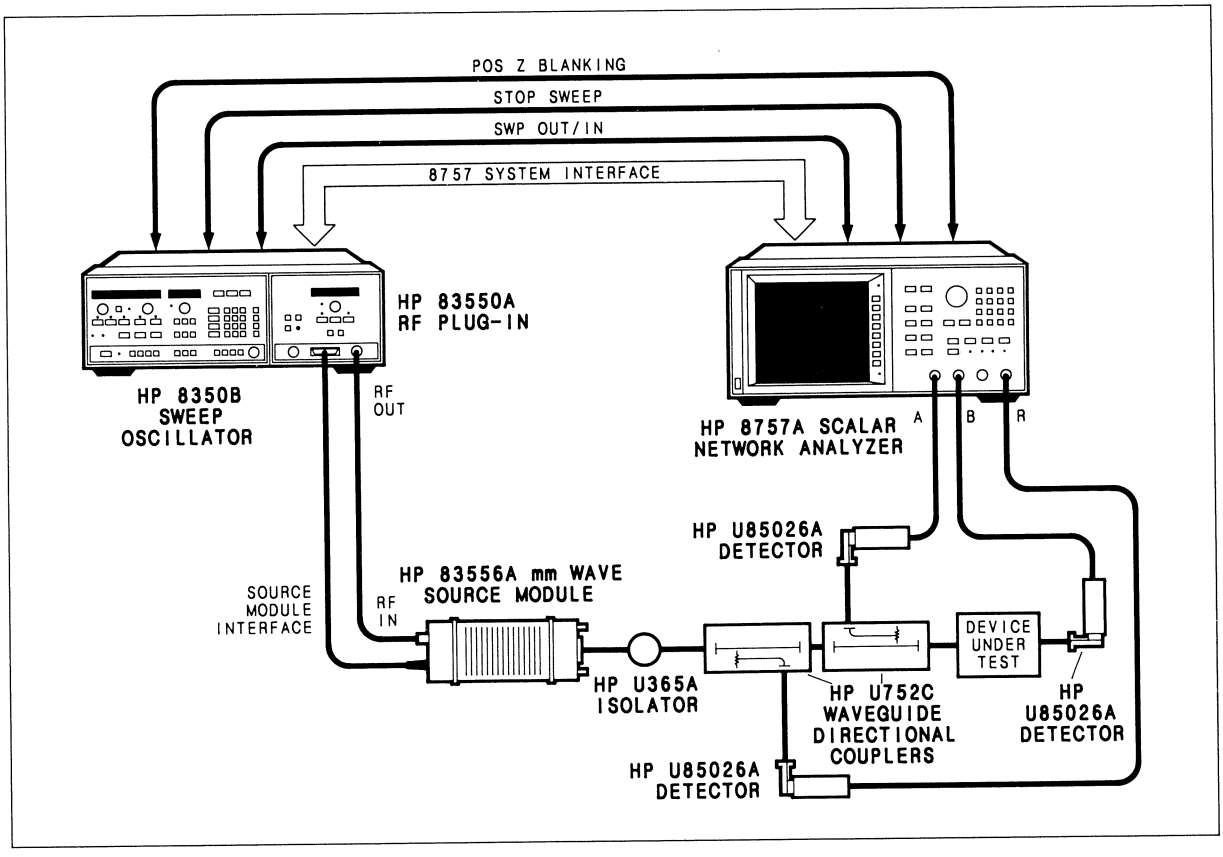


Figure 2-2. HP U85026A/8757A Typical Measurement Configuration

DETECTION MODES

AC Detection Mode

You do not have to set AC detection on the analyzer unless DC mode was used in the previous measurement (even if the HP 8757A is turned off, it remembers the measurement mode). If the last measurement was in DC mode, press **[SYSTEM]** and select **[MODE AC/DC]** to turn AC mode on (AC lights up). You can also press **[PRESET]** to set the AC detection mode; AC detection is automatically set when the analyzer presets.

For the majority of measurements, AC detection is the preferred method. It offers greater sensitivity and immunity to noise and drift with time and temperature. AC detection amplitude measurements require a modulated test signal. Modulation is provided via an internally modulated source (e.g. the HP 8350B), or from the HP 8757A rear panel modulator drive. Test set connections depend on the source; Figure 2-2 illustrates a typical measurement.

DC Detection Mode

DC detection offers greater power measurement accuracy and the ability to characterize oscillators and modulation sensitive devices. To use DC detection, you must first set the DC measurement mode on the HP 8757A. There is also a zeroing operation used in the DC mode that compensates for the effects of DC drift and temperature fluctuations.

The ability to make DC measurements and the softkeys specific to DC mode are not automatically accessible. The HP 8757A must acknowledge the presence of an AC/DC detector either at preset, or via the **[CONFIG SYSTEM]** softkey in the CAL menu.

1. Connect the equipment as shown in Figure 2-2.

   On the HP 8757A:

2. Press **[PRESET]**.

   During preset:

   - The analyzer reads each input port and identifies the detector or bridge connected to it (AC/DC or AC only).
   - The HP 8757A enables the DC mode softkeys (when an AC/DC detector or bridge is identified). Now you can access **[DC DET ZERO]** (in the CAL menu) and **[MODE AC/DC]** (in the SYSTEM menu).

3. To turn on the DC mode, press **[SYSTEM]** and select the softkey **[MODE AC/DC]**. AC dims and DC lights up.

   When you select DC mode with the softkey **[MODE AC/DC]**, the analyzer turns OFF the source internal squarewave modulation (HP 8350B) and disables the analyzer's rear panel modulation drive output (used with the HP 8340A/41A).

You can also have the analyzer read the inputs without using **[PRESET]**: Press **[CAL]** and select the softkey **[CONFIG SYSTEM]**.

If you remove and/or exchange a detector, you must reconfigure the system, using either **[PRESET]** or the softkey **[CONFIG SYSTEM]**, so that the correction factors match the port and device.

DC Zeroing. When you make a DC mode measurement, you should perform a zeroing operation to compensate for the effects of DC drift and temperature fluctuations (this is not required for AC detection). The zeroing operation eliminates small DC voltages from the diode detector that would otherwise cause amplitude measurement errors at low (−40 dBm and below) power levels.

On the HP 8757A:

1. Press **[CAL]** and select **[MORE] [DC DET ZERO]**. The analyzer displays SELECT DC DET ZERO.
2. Select **[AUTOZRO]**. The analyzer displays AUTOZERO IN PROGRESS . . . and then AUTOZERO COMPLETED.

Repeat Autozero, **[REPT AZ ON/OFF]**, repeats autozero at a selected interval (**[REPT AZ TIMER]**).

Repeat Autozero Timer, **[REPT AZ TIMER]**, allows you to set the time interval for the Repeat Autozero (from 1 to 60 minutes).

Manual Zero, **[MANUAL]**, is similar to zeroing a power meter. First, remove the RF signal from the detector. Then select **[MANUAL]** to perform the zeroing.

NOTES: If a device under test generates RF signals or noise, Autozero is not valid. Devices that can generate RF energy are microwave amplifiers and mixers with the local oscillator signal applied. If you are testing such devices, use Manual Zero.

For optimum performance when zeroing, the source RF output waveguide must be electrically connected to the detector input waveguide.

It is good practice to perform a DC zero operation every five minutes, and before making a low level measurement. This is especially important if the operating environment temperature changes significantly (several degrees centigrade).

Refer to the *HP 8757A Operating Manual* for detailed softkey information.

MOUNTING THE DETECTOR ON A WAVEGUIDE STAND

For stability and support, you can mount the HP U85026A on a waveguide stand in the attitude best suited for your setup.

To Attach the Detector to the Stand:

1. Slide the cradle/housing off of the detector (Figure 2-3).

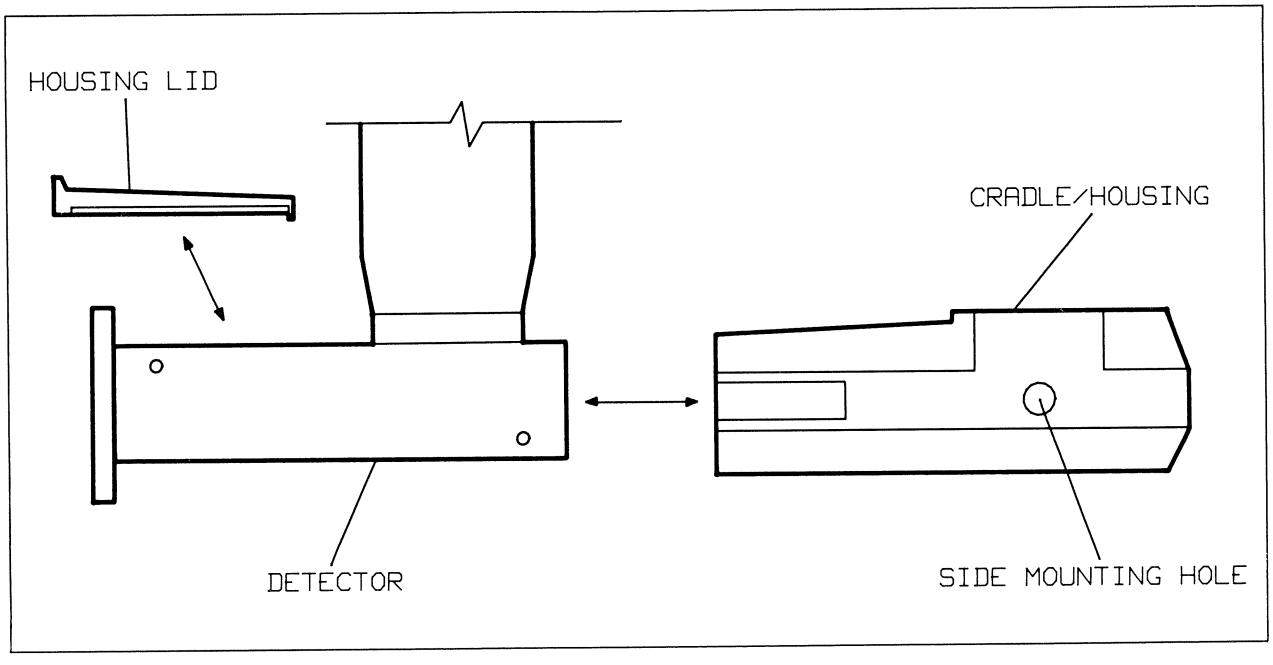


Figure 2-3. Detector and Removed Cradle/Housing

2. Determine the most convenient position for the detector in your test setup (refer to Figure2-4). You can use any one of the three holes in the cradle/housing to mount it on the stand.

3. Using a M4X0.7 screw (HP P/N 0515-1129), attach the cradle/housing to the waveguide stand. Note that if you mount the cradle/housing using one of the side holes, you must put the screw driver through the opposite side hole to reach the screw.

4. When the cradle/housing is secured to the stand, place the housing lid on the detector and slide the detector onto the cradle/housing (refer to Figure 2-3).



Figure 2-4. Detector Mounted on Waveguide Stand

OPERATOR'S CHECK

DESCRIPTION

The operator's check verifies that the HP U85026A is functioning properly. It does not thoroughly check all specifications to their limits, but is an appropriate test for daily instrument verification, incoming inspection, or verification after repair or replacement of digital circuits. It consists of checking the detector over a 50 dB range.

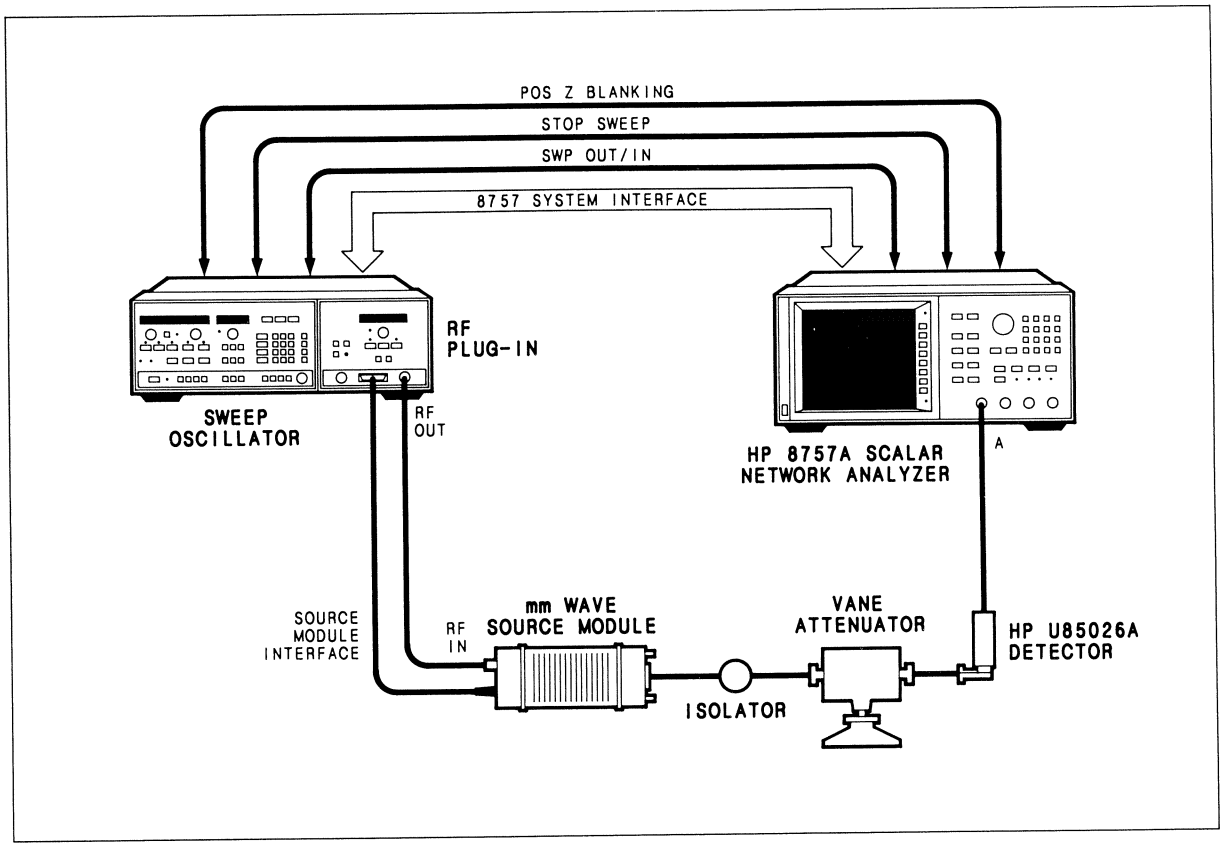


Figure 2-5. Equipment Setup for Operator's Check

EQUIPMENT

Sweep Oscillator Mainframe	HP 8350B
RF Plug-in	HP 83550A
mm-Wave Source Module	HP 83556A
Variable Attenuator	HP U382A
Isolator	HP U365A
Scalar Network Analyzer	HP 8757A

PROCEDURE

1. Connect the equipment as shown in Figure 2-5. Allow 30 minutes for warm-up.

On the HP 8757A:

2. Press **[PRESET]** to preset both the analyzer and the source.

On the HP 8350B:

3. Press **[START] [4] [0] [GHz]**.

4. Press **[STOP] [6] [0] [GHz]**.

On the HP 8757A:

5. Select the softkey **[CHAN 2 OFF]** to turn off the channel 2 trace.

NOTE: The first time through the procedure, you are checking the detector in the AC detection mode (AC is analyzer default condition).

6. Press **[CAL]** and select **[MORE] [DET OFFST]**. The analyzer displays SELECT DETECTOR OFFSET.

7. Select **[DET A]**. The analyzer displays A DETECTOR OFFST and the value of the offset.

8. Press **[0] [ENT]** to ensure that the detector offset is zero.

NOTE: When using DC mode, perform DC zeroing:
   a. Select **[PRIOR MENU]**.
   b. Select **[DC DET ZERO]**.
   c. Select **[AUTOZERO]**.

On the HP U382A attenuator:

9. Set the attenuation to 0 dB.

On the HP 8757A:

10. Press **[CURSOR]**. A cursor (+) appears at the center of the trace. Note the CRSR value displayed in the CRT's active entry area.

On the source:

11. Adjust the output power level until the cursor value on the CRT reads +3 dBm.

On the HP U382A attenuator:

12. Set the attenuator to 47 dB of attenuation.

On the HP 8757A:

13. Press **[AVG]** and select **[AVG ON/OFF]** to turn averaging on (ON lights up). The default average factor of 8 is displayed on the CRT. Wait approximately seven seconds for the trace to settle.

14. Press **[CURSOR]**. The active entry area should display a cursor value of −45 dBm ±3 dB.

15. Press **[AVG]** and **[AVG ON/OFF]** to turn averaging off.

16. Press **[SYSTEM]** and select **[MODE AC/DC]** to turn DC on.

17. Repeat steps 6 through 14 to check the detector in the DC detection mode.

If the HP U85026A does not pass the OPERATOR'S CHECK, refer to TROUBLESHOOTING in Section IV, Service.

Section III: Performance Tests

INTRODUCTION

The procedures in this section test the electrical characteristics of the HP U85026A detector against the specifications listed in Table 1-1 in Section I, General Information. These procedures do not require access to the interior of the detector.

There are three performance tests in this section:

1. Return Loss
2. Flatness
3. Dynamic Accuracy

Table 1-2 lists the recommended test equipment used in this section. Any equipment that satisfies the critical specifications given in that table may be substituted for the recommended model.

Results of the performance tests should be tabulated in *Table 3-1, Performance Test Record Card*. This record lists the tested specifications and their acceptable limits.

RETURN LOSS

Specification

40 to 60 GHz: ≥12 dB
At +20 to +30°C (+68° to +86°F)

Description

Two HP U85026A detectors and two waveguide directional couplers comprise a reflectometer test setup for a return loss measurement. The test setup is calibrated using a short to minimize frequency response errors.

The measured return loss should be greater than or equal to the specified value listed above. There is an uncertainty range of ±0.6 dB due to coupler directivity and mismatch uncertainty.

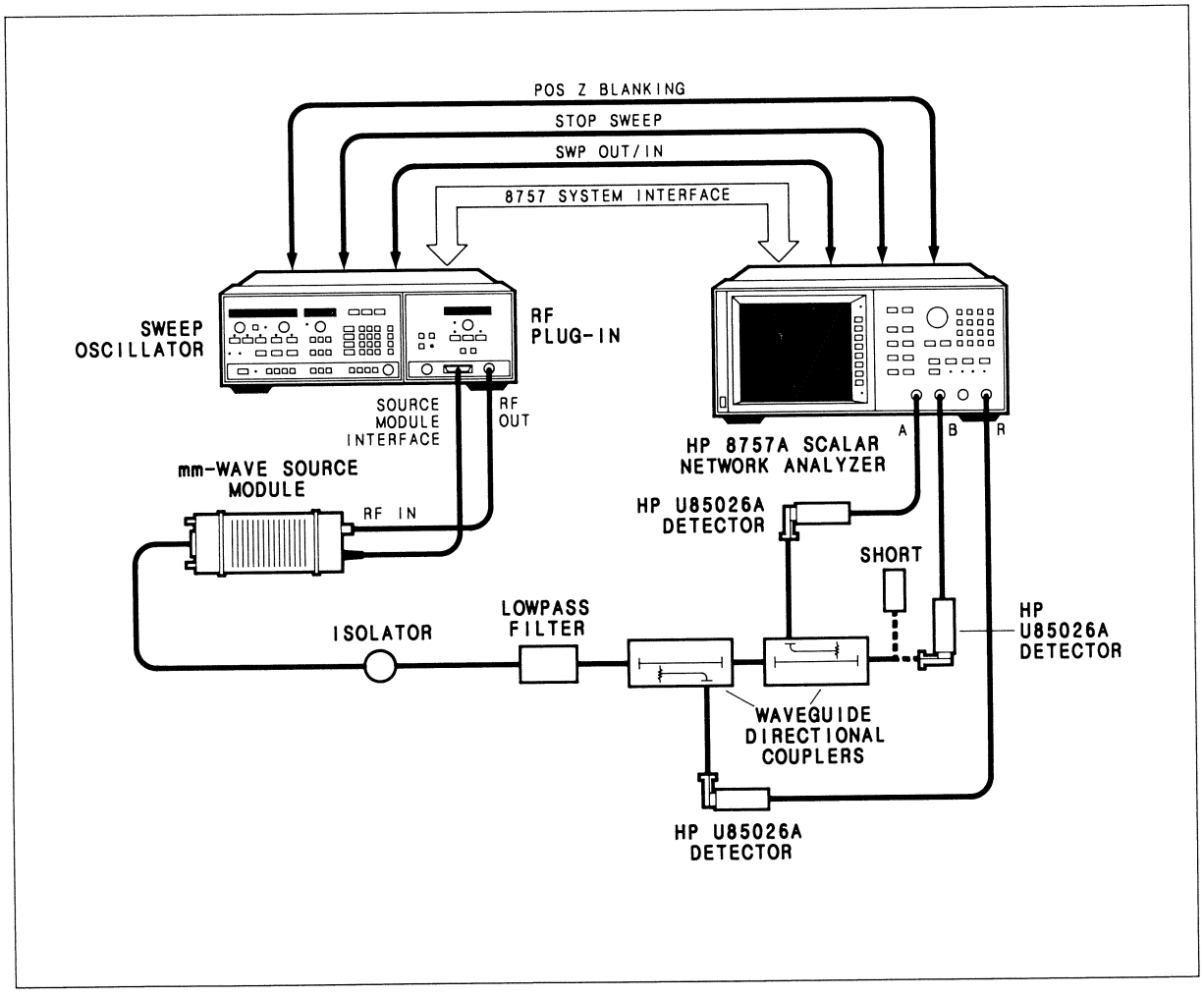


Figure 3-1. Return Loss Performance Test Setup

Equipment

Sweep Oscillator	HP 8350B
RF Plug-In	HP 83550A
Source Module	HP 83556A
Directional Coupler (two required)	HP U752C
Detector (two required plus DUT)	HP U85026A
Scalar Network Analyzer	HP 8757A
Short	HP Q/U921A
Low Pass Filter	HP U362A
Isolator	HP U365A

Procedure

1. Connect equipment as shown in Figure 3-1, with the short connected to the coupler, and allow the equipment to warm up for 30 minutes.

On the HP 8757A:

2. Press **[PRESET]** to preset both the HP 8757A and HP 8350B.

On the HP 8350B:

3. Press:

   [START] [4] [0] [GHz]
   [STOP] [6] [0] [GHz]

   This step sets the frequency range at the output of the HP 83556A source module.

On the HP 8757A:

4. Select **[CHAN 2 OFF]**.

5. Press **[MEAS]** and select **[A/R]** softkey.

6. Press **[DISPLAY]** and select **[MEAS→MEM]** to store the channel 1 display in memory.

7. Select **[MEAS–MEM]**. A flat trace is displayed on the CRT.

8. Connect the detector to be tested in place of the short in the test setup.

On the HP 8757A:

9. Press **[SCALE]** and select **[AUTOSCALE]** in the SCALE menu.

10. Press **[CURSOR]** and select the **[MAX]** softkey.

11. Read the worst case return loss from the cursor value given in the active entry area of the CRT. Record this value on the test record card.

FLATNESS

Specification

40 to 60 GHz: ±2.0 dB At 20° to 30°C (68° to 86°F)

Description

This procedure measures the flatness of the HP U85026A detector at various CW frequencies within the detector's frequency range. The Performance Test Record Card, Table 3-1, facilitates this measurement. The measured flatness should be within the specified values listed above. There is a ±0.6 dB uncertainty range in the flatness measurement.

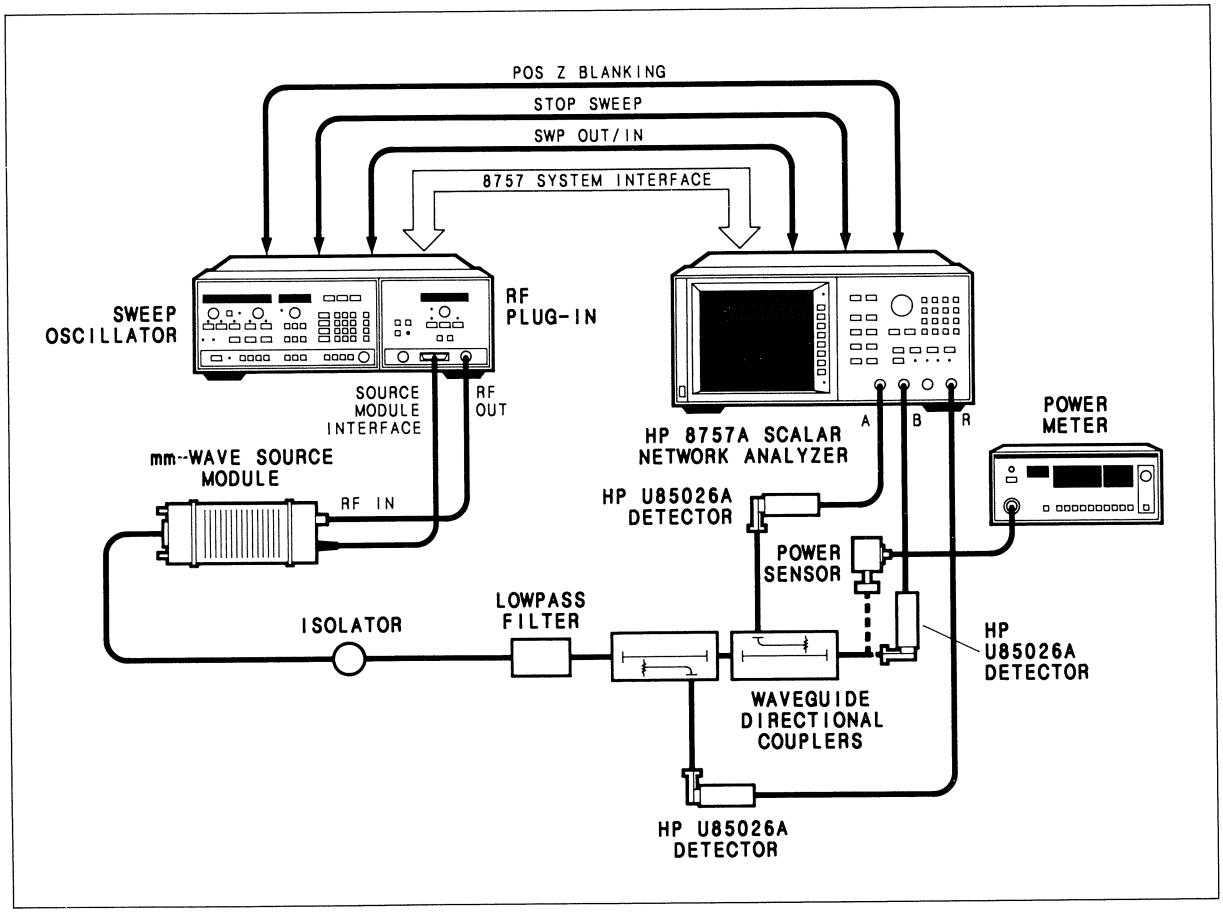


Figure 3-2. Flatness Performance Test Setup

Equipment

Sweep Oscillator	HP 8350B
RF Plug-In	HP 83550A
Source Module	HP 83556A
Network Analyzer	HP 8757A
Power Meter	Anritsu ML83A
Power Sensor	Anritsu MP715
Directional Coupler (two required)	HP U752C
Detector (two required plus DUT)	HP U85026A
Low-Pass Filter	HP U362A
Isolator	HP U365A

Procedure

1. Connect equipment as shown in Figure 3-2 with the power sensor connected to the coupler and allow the equipment to warm up for 30 minutes.

On the HP 8757A:

2. Press **[PRESET]** to preset both the HP 8757A and the HP 8350B.

3. Select **[CHAN 2 OFF]**.

4. Press **[SYSTEM]** and select the **[MODE AC DC]** softkey. DC lights up.

On the HP 8350B/83550A:

5. Select a CW frequency between 40 and 60 GHz. We recommend that you select a frequency at which your power sensor is calibrated. See the CAL FACTOR chart on your power sensor. Record this frequency in column 1 of the Performance Test Record Card (Actual Test Frequency).

On the power meter:

6. Set the CAL FACTOR dial to the value for the selected frequency (see the CAL FACTOR chart on your power sensor) and zero the power meter.

7. Reconnect the power sensor to the coupler. Read the displayed power and record this value in column 2 (Power Meter) of the Performance Test Record Card.

On the HP 8757A:

8. Press **[MEAS]** and select the **[R]** softkey.

9. Press **[CURSOR]**.

10. Read the displayed power level on the network analyzer and record this value in column 3 (R Detector) of the Performance Test Record Card.

11. Subtract column 2 from column 3 and record this new value in column 4 (R Detector — Power Meter).

12. Repeat steps 7 through 12 using several CW frequencies between 40 and 60 GHz. Again, we recommend that you select frequencies at which your power sensor is calibrated.

13. Disconnect the power sensor from the coupler. Connect the HP U85026A detector as shown in Figure 3-2.

On the HP 8350B:

14. Set the output to the first CW frequency listed in column 1 of the Performance Test Record Card.

On the HP 8757A:

15. Press **[MEAS]** and select the **[B/R]** softkey.

16. Read the displayed value on the network analyzer and record it in column 5 (B/R) of the Performance Test Record Card.

17. Add the value in column 4 to the value in column 5 and record this new value in column 6 (Error).

18. Repeat steps 16 through 18 using the frequencies listed in column 1 of the Performance Test Record Card.

19. After all of the frequencies have been tested, subtract the minimum error value (column 6) from the maximum error value and divide by two. The result should be within the ±2.0 dB specification (±0.6 dB uncertainty).

DYNAMIC ACCURACY

Specification

40 to 60 GHz: ±(0.3 dB + 0.03 dB/dB)
Referenced to 0 dBm
At 20° to 30°C (68° to 86°F)

Description

The performance test for dynamic accuracy is performed in both the AC and DC detection modes. In each case, the reference power is set to 0 dBm and attenuated in 5 dB steps. The results can be plotted on the accompanying graph.

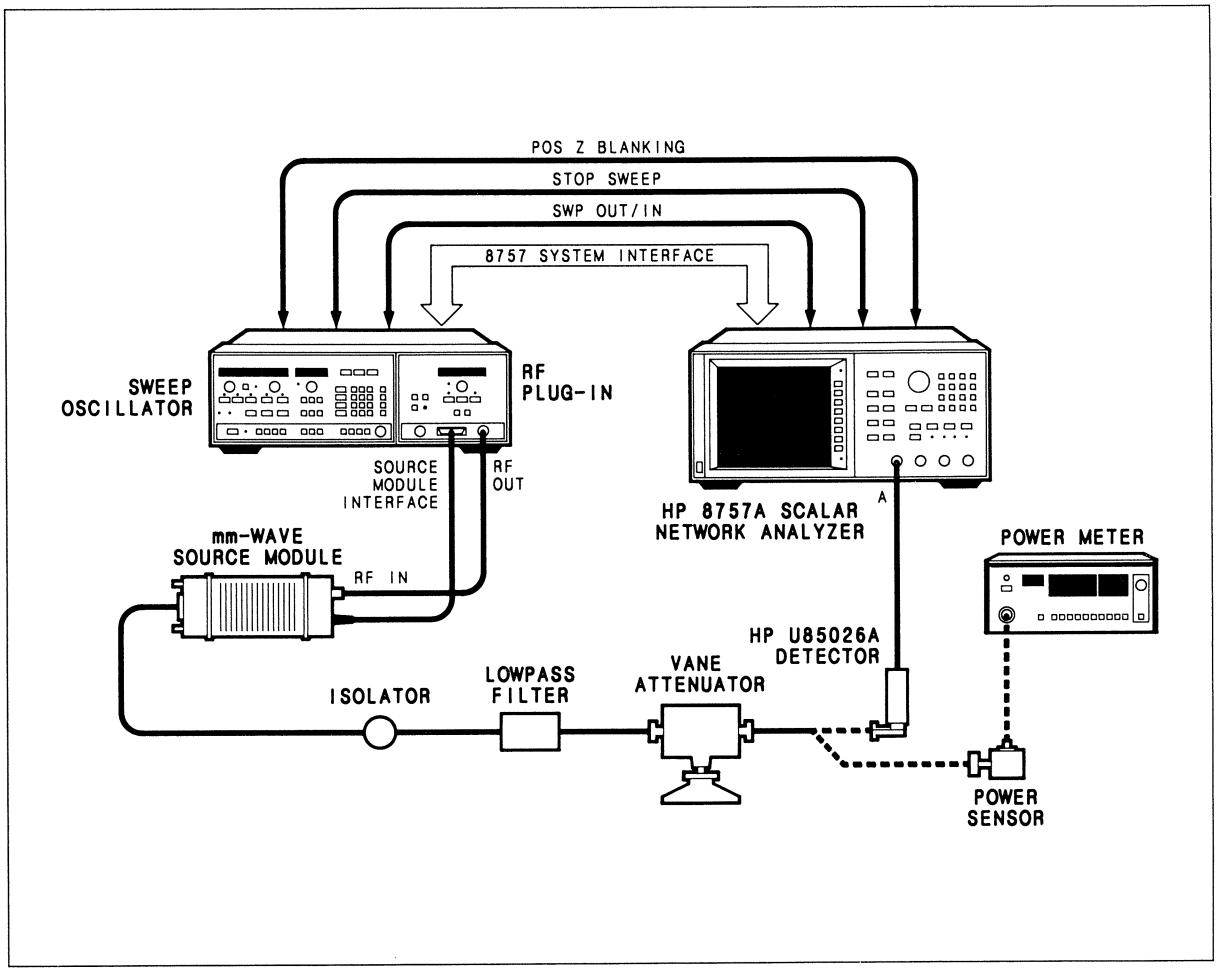


Figure 3-3. Dynamic Accuracy Test Setup

Equipment

Sweep Oscillator	HP 8350B
RF Plug-In	HP 83550A
Source Module	HP 83556A
Network Analyzer	HP 8757A
Power Meter	Anritsu ML83A
Power Sensor	Anritsu MP715
Isolator	HP U365A
Low-Pass Filter	HP U362A
Attenuator	HP U382A

Procedure

1. Connect the equipment as shown in Figure 3-3 with the power meter connected to the HP U382A attenuator. Allow the equipment to warm up for 30 minutes.

On the HP 8757A:

2. Press **[PRESET]** to preset both the HP 8757A and HP 8350B. Select **[CHAN 2 OFF]**.

3. Press **[SPCL]** and select **[SMOOTH ON OFF]**. ON lights up.

On the HP 8350B/HP 83550A:

4. Press **[CW] [5] [0] [GHz]**.

5. Press **[PWR LVL] [0] [dBm]**.

6. With the attenuator set to 0 dB, manually adjust the rotary knob on the RF plug-in until a −3 dBm power level is displayed on the power meter (0 dBm unmodulated).

7. Connect the HP U85026A detector to the attenuator.

On the HP 8757A:

8. Press **[CURSOR] [DISPLAY] [MEAS → MEM] [MEAS – MEM]**. The cursor should read 0 dB.

9. On the attenuator, increase the attenuation by 5 dB and read the power displayed on the HP 8757A CRT.

10. Add the attenuator value to the power displayed on the CRT. Plot the result on the graph in the performance test record card. For example, if the attenuator is set to 20 dB and the power indicated on the CRT is −19.8 dB, then plot +0.2 dB on the graph.

11. Repeat steps 9 and 10 until the attenuation is greater than 45 dB.

For testing in the DC detection mode, press **[SYSTEM]** and select the **[MODE AC DC]** softkey. DC lights up. Press **[CAL]** and select **[DC DET ZERO]** and **[AUTOZRO]**. Reset the attenuator to 0 dB and repeat steps 8 through 11.

Performance Test Record Card (1 of 2)

HP U85026A Detector

Tested By _____

Serial No. _____ Date _____

Humidity* _____ Temperature* _____

* Optional

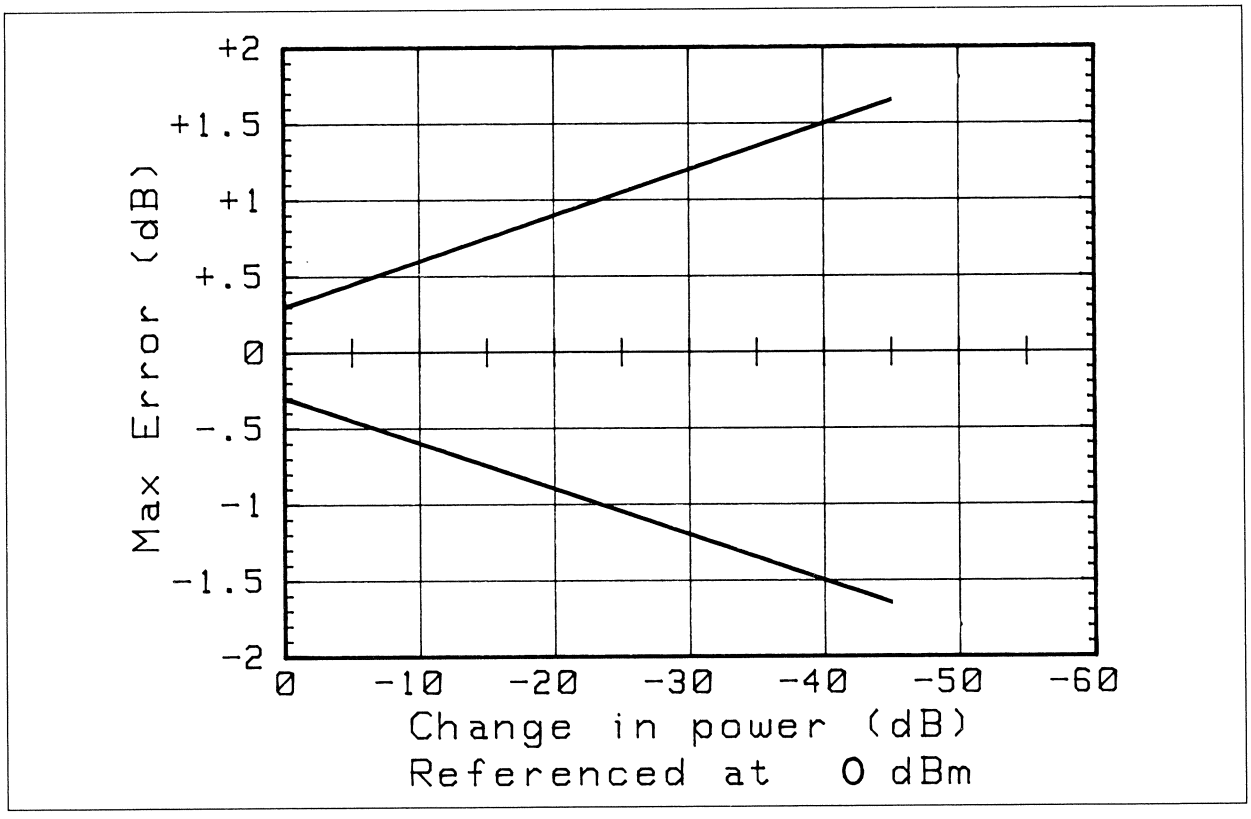
RETURN LOSS

Frequency Range	Minimum	Actual
40 to 60 GHz	12 dB	_____ dB

FLATNESS

Test Frequency		2 Power Meter	3 R Detector	4 R Detector minus Power Meter	5 B/R	6 Error Column 4 + 5
Recommended	1 Actual					
40 GHz	_____	_____	_____	_____	_____	_____
45 GHz	_____	_____	_____	_____	_____	_____
50 GHz	_____	_____	_____	_____	_____	_____
55 GHz	_____	_____	_____	_____	_____	_____
60 GHz	_____	_____	_____	_____	_____	_____

Performance Test Record Card (2 of 2)



Section IV: Service

INTRODUCTION

The HP U85026A detector is not field repairable to the component level. The only replaceable part is the cable assembly (W1), with all other repairs involving a detector exchange. This section provides cable troubleshooting and replacement procedures, and the information for ordering a restored detector.

WARNING

Any servicing or repair of this product must be performed by qualified personnel. Never look directly into the open end of a piece of waveguide that is connected to a source of microwave energy. Microwave energy is extremely harmful to the eye.

CABLE TROUBLESHOOTING

Equipment

Digital Voltmeter . . . . . HP 3456A

Cover Removal Procedure

1. On a flat surface, hold the detector as shown in Figure 4-1.

2. Between the side label and the raised edge of the plastic cover, as far forward on the detector as possible, insert, at a 45° angle, a small ($\leq$3.5 mm; 1/8 in) screwdriver (see Figure 4-1).

3. Rotate the screwdriver to approximately 90°, until the cover snaps apart.

4. Move the screwdriver to approximately 2/3 of the way toward the cable end of the detector (see Figure 4-1) and repeat steps 2 and 3.

5. Separate the plastic shell halves. If the cover does not separate easily, repeat steps 2, 3, and 4 on the opposite side of the detector.

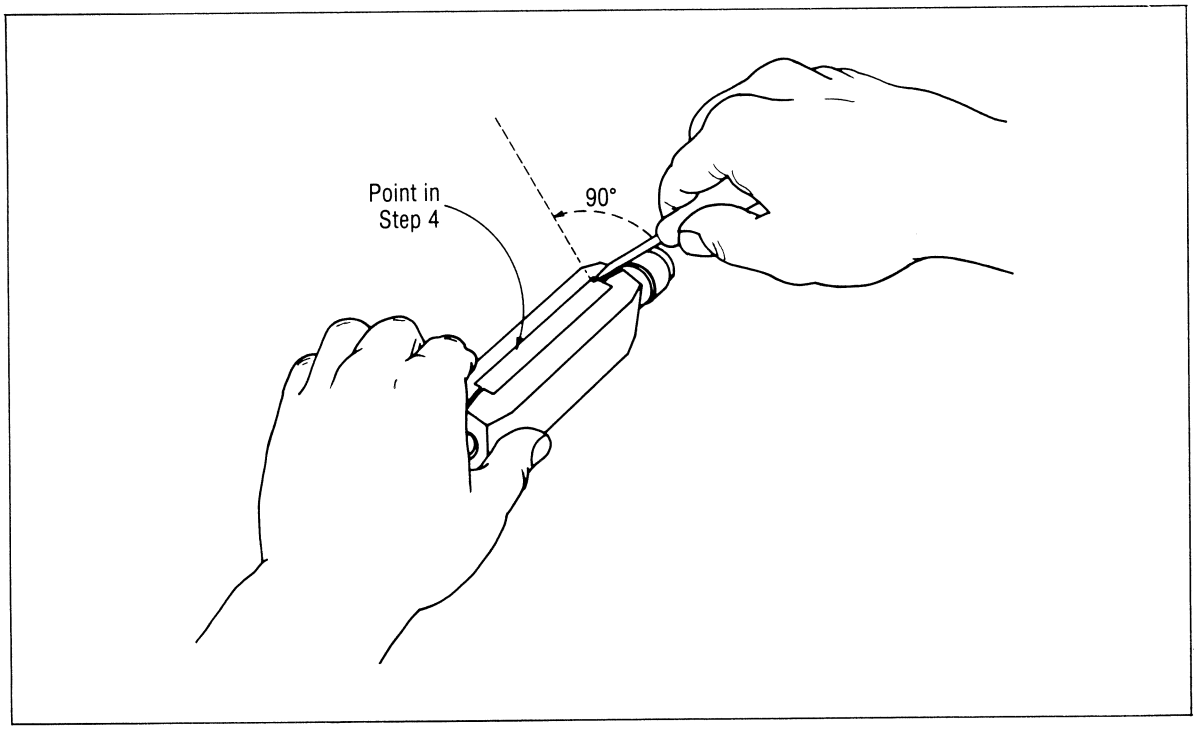
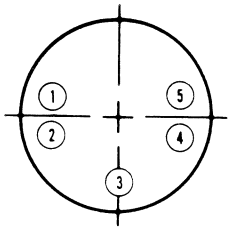


Figure 4-1. Cover Removal

Cable Continuity Check

1. Use a digital voltmeter (DVM) to check the continuity of the power cable conductors from the connector pins to the wire connections inside the detector adapter housing. Table 4-1 lists the cable connector pins and the corresponding wires.

Table 4-1. Cable Connectors and Wires

	Connector Pin	Conductor (Label)	Signal
	1	White (W)	Output
	2	Green (G)	Return
	3	Yellow (Y)	Control
	4	Blue (B)	−12.6v
	5	Red (R)	+15v

2. Use the DVM to check for possible shorts between the connector pins and ground (frame).

3. If there are any discontinuities, replace the cable by following the instructions in POWER CABLE REPLACEMENT.

POWER CABLE REPLACEMENT

Equipment

Phillips Screwdriver . . . . . HP 8710-0978
Flat Blade Screwdriver . . . . . HP 8730-0008
7/16 Inch Hex Nut Wrench . . . . . HP 8720-0009

Procedure

CAUTION

Electrostatic discharge (ESD) as low as 60 volts can destroy microwave diodes. If static discharge is noticed by the operator, it indicates a voltage of at least 20,000 volts. Materials conducive to static build-up include carpeting, nylon, dry air, paper, adhesive tape, styrofoam, vinyl. The best method of preventing ESD is for the operator to wear a grounding strap (HP Part Number 9300-0970) connected to a conductive bench mat (HP Part Number 9300-0797) that provides a path to ground of between 1 and 2.5 Megohms. Alternatively, the operator can ground himself by touching any grounding instrument chassis before touching the HP U85026A board assembly.

1. Remove the outer and inner covers by performing the Cover Removal under the CABLE TROUBLESHOOTING section.

2. Unsolder the wires connected to the power cable/circuit board assembly. Note that the pads to which the wires are soldered are labeled as indicated in Table 4-1.

3. Remove the 1/2 inch hex nut that fastens the cable to the end plate.

4. Remove the old cable.

5. Install the new cable by performing this procedure in reverse order.

ORDERING INFORMATION

Refer to Table 4-3 for the list of HP U85026A replaceable parts.

If your HP U85026A fails (other than W1), a restored detector is available from your nearest Hewlett-Packard sales or service office on an exchange basis, thus affording a considerable cost savings.

Exchange (factory repaired and tested) detectors are available ONLY on a trade-in basis. The defective HP U85026A MUST be returned for credit.

REPLACEABLE PARTS

Introduction

This section contains replaceable parts ordering information. Table 4-2 lists abbreviations used in the parts list, and throughout this manual. Table 4-3 lists all replaceable parts.

The following information is given for each replaceable part:

- The Hewlett-Packard part number.
- The part number check digit (CD).
- The total quantity (Qty) in the instrument.
- A description of the part.

Ordering Instructions

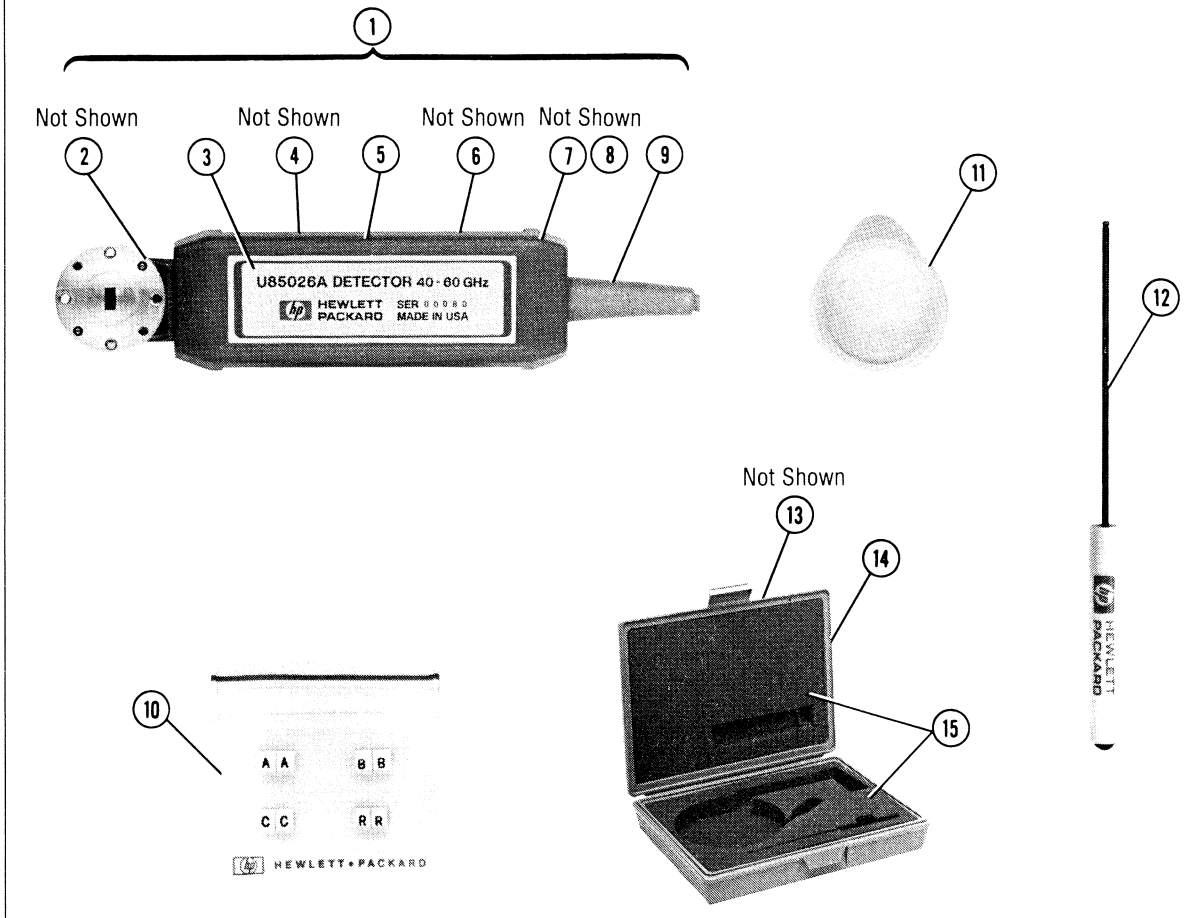
To order a part in Table 4-3, provide the Hewlett-Packard part number (with check digit), indicate the quantity required, and address your order to the nearest Hewlett-Packard office. The check digit ensures accurate and timely processing of your order.

To request information on a part not listed in the replaceable parts table, include the instrument model number, instrument serial number, and a description and function of the part. Address your inquiry to the nearest Hewlett-Packard office.

Table 4-2. Abbreviations

A	Assembly	**m**	Male; Metre
AC	Alternating Current	**MISC**	Miscellaneous
ADJ	Adjust	**mm**	Millimetre
cm	Centimetre	**ns**	Nanoseconds
dBm	Decibels referenced to 1 mW	**pf**	Picofarad
DUT	Device Under Test	**P/N**	Part Number
ESD	Electrostatic Discharge (static)	**PP**	Peak-to-Peak
F	Fahrenheit; Female	**RF**	Radio Frequency
GHz	Gigahertz	**SM**	Small
in	Inch	**V**	Volt; Voltage
k	Kilo (1000)	**VDC**	Volts, Direct Current
kg	Kilogram	**W**	Cable; Watt

Table 4-3. Replaceable Parts



Reference Designation	HP Part Number	C D	Qty	Description
1	85026-60003	3	1	RESTORED HP U85026A
2	85026-40003	1	1	CRADLE/HOUSING
3	85026-80002	4	1	LABEL: ID U85026A
4	85026-80003	5	2	LABEL: WARNING MAX INPUT (Not Shown)
5	85025-40001	8	2	SOLID PLASTIC HALF-BODY
6	85025-20007	2	1	INNER METAL SLEEVE
7	0515-0061	6	2	SCREW-MACHINE M2.5x0.45 4MM-LG (Not Shown)
8	2190-0583	9	2	LOCK WASHER, 2.5MM (Not Shown)
9	85025-60003	2	1	CABLE (W1)
10	5061-1044	9	1	CABLE MARKER KIT
11	1401-0211	8	1	FLANGE COVER
12	8710-1539	7	1	3/32 INCH HEX BALLDRIVER
13	85026-80009	1	1	STORAGE BOX LABEL (Not Shown)
14	1540-0181	5	1	STORAGE BOX
15	85026-80010	4	1	TOP AND BOTTOM PACKAGING FOAM

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