

OPERATING MANUAL

HP 11812A VERIFICATION KIT

 **HEWLETT
PACKARD**

HP 11812A VERIFICATION KIT

Operating Manual

SERIAL NUMBERS

This manual applies directly to instruments with serial numbers prefixed:

SERIAL PREFIXES

2740A

For additional important information about serial numbers, refer to "INSTRUMENTS COVERED BY THIS MANUAL".

First Edition

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

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HP 11812A Verification Kit

GENERAL INFORMATION

This Operating Manual contains information about initial inspection, operation, troubleshooting, and repair of the HP 11812A Verification Kit.

SPECIFICATIONS

Instrument specifications are listed in Table 1. These specifications are the performance standards or limits against which the instrument can be tested. The supplemental characteristics listed in Table 2 are not specifications but are typical characteristics included as additional information for the user.

Table 1. Specifications

Characteristics	Performance Limits	Conditions
Frequency Range	30 MHz	
Calibration Accuracy	$\pm(0.003 \text{ dB} + 0.003 \text{ dB/10 dB step})$	0 to 50 dB dial settings only.
Cumulative Tuned RF Level Accuracy	HP 8902A Option 050 worst case Cumulative Tuned RF Level Accuracy when verified with an HP 11812A. $\pm 0.01 \text{ dB/10 dB step}$ $\pm 0.050 \text{ dB/10 dB step}$ $\pm 0.015 \text{ dB/10 dB} \pm 1 \text{ digit}$	0 to -100 dBm -100.001 to -120dBm
Temperature	15° C to 30 ° C	

Table 2. Supplemental Characteristics

Supplemental characteristics are typical, but non-warranted performance parameters. They are only intended to provide information which can be useful in determining instrument application.
RF Input: Maximum Average Power: 2W Maximum Peak Power: 100 Wpk Input Impedance: 50 Ω nominal Input Connector: Type N (female)

INSTRUMENTS COVERED BY THIS MANUAL

This instrument has a two-part serial number in the form 0000A00000 which is stamped on the serial number plate attached to the instrument. The first four digits and the letter constitute the serial number prefix, and the last five digits form the suffix. The prefix is the same for all identical instruments. It changes only when a change is made to the instrument. The suffix, however, is assigned sequentially and is different for each instrument. The contents of this manual apply directly to instruments having the same serial number prefix(es) as listed under SERIAL NUMBERS on the title page.

An instrument manufactured after the printing of this manual may have a serial number prefix that is not listed on the title page. This unlisted serial number prefix indicates that the instrument is supplied with a Manual Changes supplement that documents the differences.

In addition to change information, the supplement may contain information for correcting errors in the manual. To keep this manual as current as possible, Hewlett-Packard recommends that you periodically request the latest MANUAL CHANGES supplement. The supplement for this manual is identified with the manual print date and part number, both printed on the manual title page. Complimentary copies of the supplement are available from Hewlett-Packard.

For information concerning a serial prefix not listed on the title page or in the Manuals Changes supplement, contact your nearest Hewlett-Packard office.

DESCRIPTION

The HP 11812A Verification Kit is used to verify the HP 8902A Measuring Receiver, Option 050. The kit includes an HP 355D Step Attenuator connected to two HP 8491A 10 dB Attenuators, a precision coaxial cable, and a walnut carrying case. The Attenuator Assembly is calibrated using a primary standard attenuator. Calibration data is supplied for the Attenuator Assembly's first 50 dB of attenuation.

The verification kit is used in conjunction with the HP 8902A Option 050 Performance Test. This test cannot fully verify the HP 8902A Option 050 specifications due to calibration accuracy limitations of the verification kit. Table 1 lists the specifications that the HP 8902A Option 050 can be tested to using the HP 11812A Verification Kit and a 30 MHz, +20 dBm signal source with a -140 dBc noise floor.

RECOMMENDED TEST EQUIPMENT

Functional testing requires only a suitable RF source (such as an HP 8640B Signal Generator) and a measuring instrument (such as an HP 8902A Measuring Receiver). Performance testing requires equipment with accuracy better than the parameter being measured as indicated in *Table 1. Specifications.*

INITIAL INSPECTION

Inspect the shipping container. If the container or packing material is damaged, it should be kept until the contents of the shipment have been checked mechanically and electrically. If there is mechanical damage or if the instrument does not pass performance tests, notify the nearest Hewlett-Packard office. Keep the damaged shipping materials (if any) for inspection by the carrier and a Hewlett-Packard representative.

STORAGE AND SHIPMENT

Environment

The Verification Kit should be stored in a clean, dry environment. The following environmental limitations apply to both storage and shipment.

1. Temperature: -55° C to +74° C
2. Relative Humidity: less than 95%
3. Altitude: less than 7600 meters (25 000 feet)

Original Packaging

Containers and materials identical to those used in factory packaging are available through Hewlett-Packard offices. If the module is being returned to Hewlett-Packard for servicing, attach a tag indicating the type of service required, returned address, model number, and full serial number. Also, mark the container FRAGILE to assure careful handling. In any correspondence, refer to the instrument by model number and serial number.

Other Packaging

The following general instructions should be used for repackaging with commercially available materials.

- a. Wrap the kit in heavy paper or plastic. (If shipping to a Hewlett-Packard office or service center, attach a tag indicating the type of service required, return address, model number, and full serial number.)
- b. Use a strong shipping container. A double-wall carton made of 2.4 MPa (350 psi) test material is adequate.
- c. Use enough shock-absorbing material (75 to 100 millimeter layer; 3 to 4 inches) around all sides of the instrument to provide a firm cushion and to prevent movement in the container.
- d. Seal the shipping container securely.
- e. Mark the shipping container FRAGILE to assure careful handling.

OPERATION

Operating Precautions

WARNING

BEFORE CONNECTING THE VERIFICATION KIT TO ANOTHER INSTRUMENT, ensure that the instrument is connected to the protective (earth) ground.

CAUTION

Do not apply torque to the Verification Attenuator's body when connecting or disconnecting the Type-N RF input connector.

Torque the Type-N connector as compatible to U.S. MIL-C 39012.

Exceeding the following energy and power levels may result in damage to the Verification Attenuator.

The absolute maximum RF power that may be applied to the Verification Attenuator is:

1. *Maximum Average Power: 2W*
2. *Maximum Peak Power: 100 Wpk*

Environment

The operating environment for the Sensor Module should be as follows:

1. Temperature: +15° C to +30° C
2. Relative Humidity: less than 95%
3. Altitude: less than 4600 meters (15 000 feet)

Operating Characteristics

For detailed information on the Verification Kit's characteristics, refer to *Table 1. Specifications* and *Table 2. Supplemental Characteristics*.

Calibration Table

A table of attenuation values is provided with the Verification Kit.

PERFORMANCE TESTS

No test procedures are included in this manual. Performance testing requires special equipment which measures attenuation values to the specifications listed in Table 1.

ADJUSTMENTS

No user-performed adjustments are given in this manual.

REPLACEABLE PARTS

Replaceable parts listed in this manual do not include replaceable parts listed in the HP 355D or HP 8491A manuals, refer to these manuals for further information.

The HP 11812A consists of the following replaceable parts.

Table 3. Replaceable Parts

Description	Model/Part Number	Qty.
Step Attenuator	HP 355D Option 001	1
Fixed Attenuator	HP 8491A Option 010	2
Precision Coaxial Cable	8120-4781	1
Top Foam Pad	08901-00187	1
Bottom Foam Pad	08901-00188	1
Walnut Carrying Case	08901-00186	1

HP 8902A Option 050 Tuned RF Level Performance Test Using the HP 11812A Verification Kit

SPECIFICATION

Characteristic	Specification	Range
TUNED RF LEVEL (Option 050)		
Relative Accuracy	$\pm 0.015 \text{ dB} + 0.010 \text{ dB/10 dB}$ $\pm 0.015 \text{ dB} + 0.050 \text{ dB/10 dB}$	0.000 dBm to -100.000 dBm -100.001 dBm to -127.000 dBm

DESCRIPTION

The HP 11812A Verification Kit and the following Performance Test procedures are provided to enable you to check the relative accuracy of the HP 8902A Option 050 Tuned RF Level measurement.

EQUIPMENT REQUIRED

Verification Kit HP 11812A
Signal Generator HP 8640B

NOTE

A signal generator other than the HP 8640B that can be set to +20dB and has a noise floor of $\leq -140\text{dBc}$ can be used. Because only relative measurements are made in this test, the output level accuracy of the signal generator is of secondary importance.

When setting up the equipment for this test, it is important to minimize the number of connections by avoiding unnecessary adapters and cables. Once all connections have been made, turn on the signal generator and HP 8902A, and allow them to warm up for at least 30 minutes before performing this test.

EQUIPMENT SETUP

1. Connect the equipment as shown in Figure 4-1.

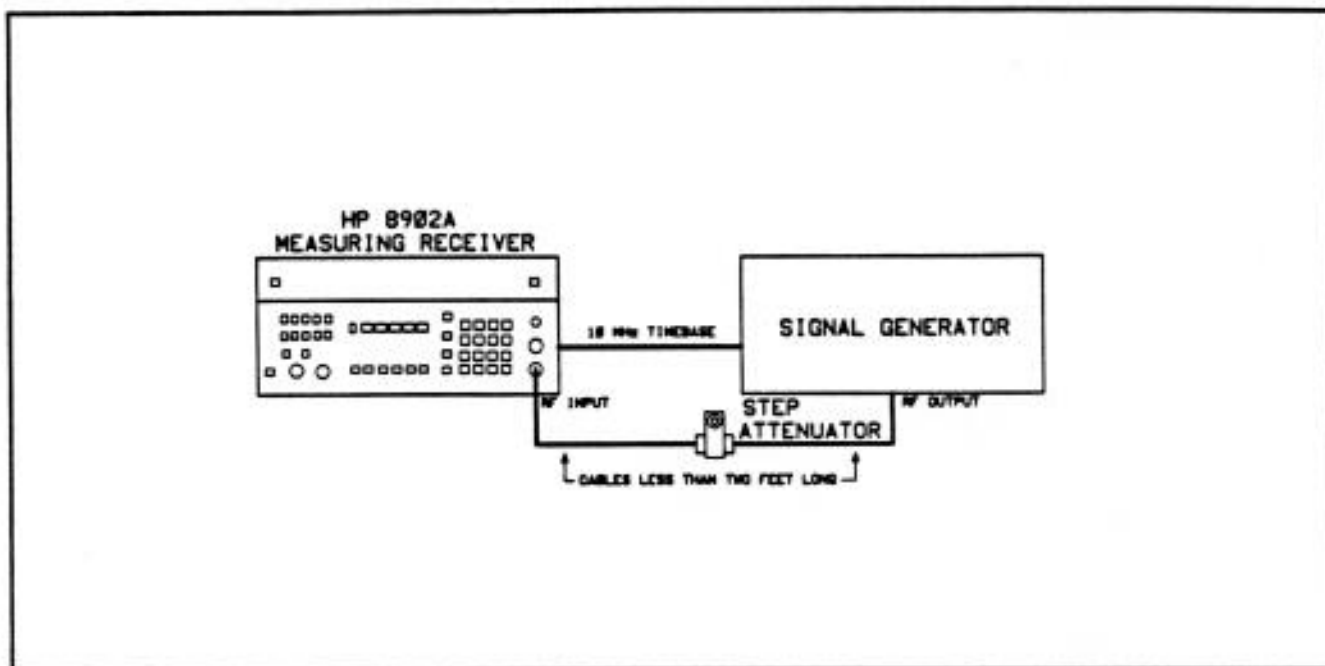


Figure 1. Tuned RF Level Performance Test Setup

EQUIPMENT CONFIGURATION

1. Set the signal generator output to 30 MHz at +20 dBm CW.
2. Set the HP 11812A Step Attenuator to 0 dB.
3. On the Measuring Receiver press INSTR PRESET (blue key then green key).
 - Wait for the Measuring Receiver to display 30 MHz. Then Press the MHz key to manual tune the Measuring Receiver.
 - Press S (Yellow key), TUNED RF LEVEL. Wait for a measurement to be displayed.
 - Key in 39.9 SPCL to clear any previous calibration factors for the Tuned RF Level measurement.
 - Key in 32.1 SPCL and 4.1 SPCL to enable 3 decimal dB resolution and 10 second averaging.
 - Press the LOG/LIN key for a log display in dB. Wait for a measurement to be displayed.
 - Press SET REF (blue key and ZERO key in lower left corner) to establish the current level as a reference. The Measuring Receiver should display 0.000 dB $\pm$ 0.005 dB; if it does not, press the blue key and the SET REF key again.

PROCEDURE**Measure 0 dBm to -50 dBm Error**

1. Set the Step Attenuator as indicated in the following table, and record the Measuring Receiver readings in the column labeled "HP 8902A Reading (dB)" for each setting. (If the HP 8902A's display is flickering between readings, record the average of the readings displayed.) When the RECAL annunciator lights, press CALIBRATE and wait for the calibration to be made. (Recalibration will take approximately 1 minute.)
2. Record the Incremental Attenuation value for each attenuator setting (use the values shown from the Calibration Report sent with the HP 11812A being used). Enter the values in the column labeled "Step Attenuator Value (dB)".
3. Determine the Measuring Receiver error as indicated in the column labeled "Calculated Error". Record the error in this column.

Step Attenuator Setting (dB)	Step Attenuator Value (dB)	HP 8902A Reading (dB)	Lower Limit	Calculated Error	Upper Limit
0	A1= 0.000 dB	A= _____	-0.005 dB	A1-A _____	+0.005 dB
10	B1= _____	B= _____	-0.025 dB	B1-B _____	+0.025 dB
20	C1= _____	C= _____	-0.035 dB	C1-C _____	+0.035 dB
30	D1= _____	D= _____	-0.045 dB	D1-D _____	+0.045 dB
40	E1= _____	E= _____	-0.055 dB	E1-E _____	+0.055 dB
50	F1= _____	F= _____	-0.065 dB	F1-F _____	+0.065 dB
0	G1= 0.000 dB	G= _____	-0.015 dB	G1-G _____	+0.015 dB

Measure -50 dBm to -100 dBm Error

1. Reduce the signal generator level to -30 dBm. Wait for a measurement to be displayed.
2. On the Measuring Receiver, press the blue key and SET REF to establish a new ratio reference. If the Measuring Receiver does not display 0.000 dB $\pm$ 0.005, press the blue key and SET REF again.
3. Repeat steps 1-3 under "Measure 0 dBm to -50 dBm Error," and record the data in the following table.

Step Attenuator Setting (dB)	Step Attenuator Value (dB)	HP 8902A Reading (dB)	Lower Limit	Calculated Error	Upper Limit
0	A1= 0.000 dB	A= _____	-0.005 dB	A1-A _____	+0.005 dB
10	B1= _____	B= _____	-0.025 dB	B1-B _____	+0.025 dB
20	C1= _____	C= _____	-0.035 dB	C1-C _____	+0.035 dB
30	D1= _____	D= _____	-0.045 dB	D1-D _____	+0.045 dB
40	E1= _____	E= _____	-0.055 dB	E1-E _____	+0.055 dB
50	F1= _____	F= _____	-0.065 dB	F1-F _____	+0.065 dB
0	G1= 0.000 dB	G= _____	-0.015 dB	G1-G _____	+0.015 dB

Measure -100 dBm to -120 dBm Error

1. Reduce the signal generator level to -80 dBm. Wait for a measurement to be displayed.
2. On the Measuring Receiver, press the blue key and SET REF to establish a new ratio reference. If the Measuring Receiver does not display 0.000 dB $\pm$ 0.005, press the blue key and SET REF again.
3. Repeat steps 1-3 under "Measure 0 dBm to -50 dBm Error," and record the data in the following table.

Step Attenuator Setting (dB)	Step Attenuator Value (dB)	HP 8902A Reading (dB)	Lower Limit	Calculated Error	Upper Limit
0	A1= 0.000 dB	A= _____	-0.005 dB	A1-A _____	+0.005 dB
10	B1= _____	B= _____	-0.065 dB	B1-B _____	+0.065 dB
20	C1= _____	C= _____	-0.115 dB	C1-C _____	+0.115 dB
0	D1= 0.000 dB	D= _____	-0.015 dB	D1-D _____	+0.015 dB

4. Record the test results in Table 4. Performance Test Record.

CALIBRATION

The HP 11812A Attenuator Assembly is calibrated and tested at the factory prior to shipment. A twelve-month recalibration cycle is recommended for the assembly, or whenever a repair is made to it. The Attenuator Assembly should be returned to a Hewlett-Packard facility for calibration.

VERIFICATION

If you wish to verify the relative accuracy of the Attenuator Assembly, perform the following steps:

1. Set the step attenuator to 0 dB, and connect a signal source to the Attenuator Assembly input. Adjust the signal source to 30 MHz, 0 dBm.
2. Connect a known good power-level measurement device to the output of the assembly. The output level should be -20 dBm, $\pm$ 1.2 dB.
3. Set the step attenuator to each of its settings from 0 to 50 and verify that the relative output-level change corresponds with each setting.

SERVICE

If you determine that the Attenuator Assembly is not functioning properly, the following procedures can be used to isolate the problem area.

CAUTION

Recalibration is required whenever the connection seals between the 10 dB attenuators and the step attenuator are broken.

1. Disconnect each 10 dB attenuator. Check that each provides an accurate 10 dB attenuation of an applied signal. (If either 10 dB attenuator is not functioning properly, it must be replaced with an HP 8491A Option 010 10 dB attenuator.)
2. Apply a signal to the step attenuator. Verify that it provides accurate attenuation steps for each of its setting. (If the step attenuator is not functioning properly, refer to the HP 355D Operating and Service Manual for further servicing procedures.)

Table 4. Performance Test Record

Hewlett-Packard Company HP 8902A Option 050				
		Tested By _____		
Serial Number _____		Date _____		
Test No.	Test Description	Results		
		Minimum	Actual	Maximum
1	TUNED RF LEVEL PERFORMANCE TEST			
	Relative Accuracy Error with HP 11812A			
	Attenuator Setting (–0 dBm to –50 dBm)			
	0 dB	–0.005 dB	_____	+0.005 dB
	10 dB	–0.025 dB	_____	+0.025 dB
	20 dB	–0.035 dB	_____	+0.035 dB
	30 dB	–0.045 dB	_____	+0.045 dB
	40 dB	–0.055 dB	_____	+0.055 dB
	50 dB	–0.065 dB	_____	+0.065 dB
	0 dB	–0.015 dB	_____	+0.015 dB
	Attenuator Setting (–50 dBm to –100 dBm)			
	0 dB	–0.005 dB	_____	+0.005 dB
	10 dB	–0.025 dB	_____	+0.025 dB
	20 dB	–0.035 dB	_____	+0.035 dB
	30 dB	–0.045 dB	_____	+0.045 dB
	40 dB	–0.055 dB	_____	+0.055 dB
	50 dB	–0.065 dB	_____	+0.065 dB
	0 dB	–0.015 dB	_____	+0.015 dB
	Attenuator Setting (–100 dBm to –120 dBm)			
	0 dB	–0.005 dB	_____	+0.005 dB
	10 dB	–0.065 dB	_____	+0.065 dB
	20 dB	–0.115 dB	_____	+0.115 dB
	0 dB	–0.015 dB	_____	+0.015 dB



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