

Product: 1990 HP 5347A/48A Microwave Counter/Power Meter Service Repair Workshop Manual

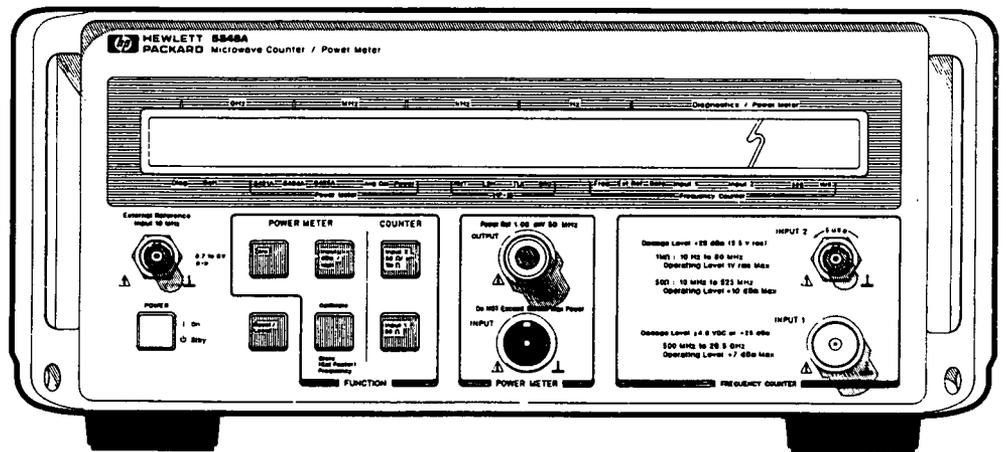
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HP 5347A/48A

Microwave Counter/Power Meter

SERVICE MANUAL



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SERVICE MANUAL

HP 5347A/48A Microwave Counter/Power Meter

SERIAL NUMBER PREFIX: 3009

This manual applies to instruments with serial numbers prefixed 3009, unless accompanied by a Manual Change Sheet indicating otherwise.

For additional information about serial numbers, refer to INSTRUMENT AND MANUAL IDENTIFICATION in Section 1 of the Operating and Programming Manual.

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MANUAL PART NUMBER 05348-90003
MICROFICHE PART NUMBER 05348-90004



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Safety Considerations

GENERAL

This product and related documentation must be reviewed for familiarization with safety markings and instructions before operation.

This product is a Safety Class I instrument (provided with a protective earth terminal).

BEFORE APPLYING POWER

Verify that the product is set to match the available line voltage and the correct fuse is installed. Refer to instructions in this appendix.

SAFETY EARTH GROUND

An uninterruptible safety earth ground must be provided from the mains power source to the product input wiring terminals or supplied power cable.

Safety Symbols



Instruction manual symbol; the product will be marked with this symbol when it is necessary for the user to refer to the instruction manual.



Indicates hazardous voltages.



Indicates earth (ground) terminal.



Indicates terminal is connected to chassis when such connection is not apparent.



Alternating current.



Direct current.

WARNING

THIS DENOTES A HAZARD. IT CALLS ATTENTION TO A PROCEDURE, PRACTICE, OR THE LIKE, WHICH, IF NOT CORRECTLY PERFORMED OR ADHERED TO, COULD RESULT IN PERSONAL INJURY. DO NOT PROCEED BEYOND A WARNING SIGN UNTIL THE INDICATED CONDITIONS ARE FULLY UNDERSTOOD AND MET.

CAUTION

This 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 or destruction of part or all of the product. Do not proceed beyond a CAUTION sign until the indicated conditions are fully understood and met.

Safety Information

WARNING

Any interruption of the protective grounding conductor (inside or outside the instrument) or disconnecting the protective earth terminal will cause a potential shock hazard that could result in personal injury. (Grounding one conductor of a two conductor outlet is not sufficient protection.)

Whenever it is likely that the protection has been impaired, the instrument must be made inoperative and be secured against any unintended operation.

If this instrument is to be energized via an autotransformer (for voltage reduction) make sure the common terminal is connected to the earthed pole terminal (neutral) of the power source.

Instructions for adjustments while covers are removed and for servicing are for use by service-trained personnel only. To avoid dangerous electric shock, do not perform such adjustments or servicing unless qualified to do so.

For continued protection against fire, replace the line fuse(s) only with 250V fuse(s) of the same current rating and type (for example, normal blow, time delay). Do not use repaired fuses or short circuited fuseholders.

When measuring power line signals, be extremely careful and always use a step-down isolation transformer whose output voltage is compatible with the input measurement capabilities of this product. This product's front and rear panels are typically at earth ground, so **NEVER TRY TO MEASURE AC POWER LINE SIGNALS WITHOUT AN ISOLATION TRANSFORMER.**

Safety Considerations

PRODUCT SAFETY NOTICE

HP COUNTER/POWER METER MODEL 5347A AND 5348A PORTABILITY AND CARRYING STRAPS

Hewlett-Packard has discovered that the use of carrying straps or other carrying appliances attached to the front handles may cause failure of the front panel casting.

**INJURY TO PERSONNEL AND/OR DAMAGE TO THE PRODUCT
MAY OCCUR.**

**In order to prevent injury or physical damage, PLEASE DO NOT USE
ANY STRAP OR CARRYING APPARATUS ATTACHED TO THE
FRONT PANEL CASTING.**

ALL USERS SHOULD BE CAUTIONED ABOUT THIS SITUATION.

The user should carry the instrument **BY HAND**, via the casting handles or with Option 070 Carrying Case, HP part number 05348-60214.

ACOUSTIC NOISE EMISSION:

LpA 47 dB at operator position, at normal operation, tested per ISO 7779. All data are the results from type test.

(German) GERAAUSCHEMISSION:

LpA 47 dB am Arbeits platz, normaler Betrieb, Geprueft nach DIN 45635 Teil 19. Die Angaben beruhen auf Ergebnissen von Typpruefungen.

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PERFORMANCE TESTS

4-1. INTRODUCTION

This section contains procedures for testing the electrical performance of the HP 5347A /48A Microwave Counter/Power Meter, using the specifications listed in Appendix A, as performance standards.

4-2. OPERATIONAL VERIFICATION

The Operational Verification, beginning at Section 4-8, is an abbreviated series of checks that may be performed to give a high degree of confidence that the instrument is operating properly without performing the complete Performance Test. An operational verification should be useful for incoming inspection, routine maintenance, and after instrument repair.

4-3. PERFORMANCE TEST

The complete Performance Test procedures begin at Section 4-16. All tests can be performed without access to the inside of the instrument.

4-4. HP-IB VERIFICATION (FOR OPTION 011)

An HP-IB Verification program, described in Section 4-25, exercises the instrument through the majority of its command set via the HP-IB Interface. The program is written for an HP 9000 series 200 or 300 Desktop Computer as the controller. If the instrument successfully completes all phases of the verification program, there is a very high probability that the HP-IB Interface is working properly. The HP-IB program is available on floppy discs, HP Part Number 05348-13502 (5-1/4 inch LIF disc) and HP Part Number 05348-13501 (3-1/2 inch LIF disc). These discs are included in the HP 5347A /48A Service Accessories Kit (see *Table 8-2*).

4-5. EQUIPMENT REQUIRED

The equipment required for all test procedures in this section is listed in *Table 4-1*. Any equipment that satisfies the required characteristics given in the table may be substituted for the recommended models. (Appendix B, RECOMMENDED TEST EQUIPMENT, in the Service Manual is a complete list of the recommended test equipment for the performance tests, adjustments, and troubleshooting procedures.)

4-6. CALIBRATION CYCLE

The HP 5347A /48A requires periodic verification of operation. Depending on the use and environmental conditions, the HP 5347A /48A should be checked using the operational verification procedure at least once every year. A full calibration procedure, including adjustments and a full Performance Test, should be performed at least once every 6 months.

4-7. TEST RECORD

Results of the operational verification should be recorded on a copy of the Operational Verification Record, *Table 4-2*, located at the end of the operational verification procedures. Results of the Performance Tests should be recorded on a copy of the Performance Test Record, located at the end of the performance test procedures. Results of the HP-IB verification test should be recorded on a copy of the HP-IB Verification Test Record, *Table 4-3*, located at the end of the HP-IB verification test procedures.

Table 4-1. Equipment Required

Instrument	Required Characteristics	Recommended Model
Sweep Oscillator	.01-20 GHz [26.5 GHz] Frequency Modulation capability 14 MHz p-p	HP 8350B mainframe/HP 83595A plug-in
Attenuator	dc to 26.5 GHz 0 - 70 dB in 10-dB steps	HP 8495D
Synthesizer	10 Hz to 10 MHz -20 dBm to +5 dBm	HP 3325B with Option 001 (10 MHz Oven Output)
Synthesizer	2 GHz to 26.5 GHz 1 Hz Accuracy +4 dBm output	HP 8673B or HP 8340B
Synthesized Signal Generator	10 MHz - 2.6 GHz 5% AM, 200 kHz FM p-p, -40 dBm to +10 dBm	HP 8660C/ HP 86603A/HP 86632B or HP 8642A
Power Meter	50 MHz to 40 GHz	HP 437B
Power Sensor	50 MHz to 26.5 GHz, -30 to +10 dBm	HP 8485A
Power Splitter	dc to 26.5 GHz	HP 11667B
Power Meter	Range: 1 mW Transfer accuracy: 0.2% (input to output)	HP 432A
Thermistor Mount	SWR: 1.05 at 50 MHz Accuracy: $\pm 0.5\%$ at 50 MHz	HP 478A-H75 or HP 478A-H76
Fixed Attenuator	dc to 26.5 GHz, 10dB	HP 8493C
Feedthrough	50 Ω	HP 10100C
Spectrum Analyzer	RF inputs from 1 MHz	HP 8565A
Digital Voltmeter (Multimeter)	4 1/2 digit AC/DC	HP 3466A
Synthesized Sweeper	10 MHz to 26.5 GHz	HP 8340B
50 Ω Termination	dc to 26.5 GHz	HP 909D
Vector Signal Generator	1 GHz with Frequency Modulation, 20 MHz p-p, 1 KHz modulating frequency	HP 8780A
Range Calibrator	Calibration functions: 3, 10, 30, 100, and 300 μ W; 1, 3, 10, 30, and 100 mW	HP 11683A
Sensor Cable	3.0 metres (10 ft.)	HP 11730A

4-8. OPERATIONAL VERIFICATION PROCEDURES

The checks included here are not as thorough and exhaustive as the performance tests. This group of checks is intended only to serve as a method for giving the operator a high degree of confidence that the instrument is performing properly. **No attempt is made to check the specifications of the instrument.**

4-9. Preliminary Procedure

The following operational verification and performance test procedures require measurement of the actual input sensitivity of the HP 5347A / 48A. Before measuring actual sensitivity, perform the following:

1. To perform valid verification and testing of the specifications, allow the instrument to warm up for 30 minutes.
2. Be sure to calibrate the power meter according to the frequency calibration data provided on the power sensor to be used in the test.
3. Decrease the input level to the HP 5347A / 48A until it stops counting, then slowly increase the input level until the HP 5347A / 48A measures the input properly (as defined by the particular procedure being performed).

4-10. Power-Up Self Test

1. Turn on the HP 5347A / 48A and verify the Power-Up Self Test routine, as follows:
 - a. Immediately after switching the power on, the HP 5347A / 48A performs a Display Test in which all segments of the Liquid Crystal Display are turned on. The display should remain in this state for about three seconds. Check that no segments are missing.
 - b. The next portion checks a number of internal circuits. If any of the internal tests fail, the results of the first test that failed will be displayed after the display test. Pressing the **Reset/Local** key will display the next test, if any, that failed. When all tests that failed have been displayed, the HP-IB address is displayed 5 seconds. If the Option 011 HP-IB Interface is not installed in the HP 5347A / 48A, then the "HP-IB NOT INSTALLED" message will be displayed. If the tests pass, the HP-IB address or "HP-IB NOT INSTALLED" message is displayed immediately after the Display Test.
 - c. After the HP-IB address is displayed, the HP 5347A / 48A should go into the measurement mode last selected if the instrument had been previously left in the Standby mode.
 - d. If a FAIL message is displayed during the Power-Up Self Test, refer to troubleshooting procedures in Section 8, Service, for information about specific diagnostic failures.

2. Mark Pass or Fail on the Operational Verification Record card (*Table 4-2*), line 1.

4-11. Frequency Counter Checks

4-12. INPUT 2, GATING AND COUNTING CHECK

Description: A 10 MHz input is connected to INPUT 2 to check that the HP 5347A/48A gates and counts with INPUT 2 impedance set at both 1 M Ω and 50 Ω .

1. Set up an HP 3325B Synthesizer to output an 1 V_{p-p}, 10 MHz, sine-wave signal.
2. Connect the 10 MHz signal to INPUT 2 connector of the HP 5347A/48A.
3. Press POWER key to turn ON the HP 5347A/48A.
4. Press **Input 2 50 Ω /1M Ω** key to set the HP 5347A/48A to the INPUT 2, 50 Ω impedance mode. (This key toggles INPUT 2's impedance between 50 Ω and 1 M Ω as indicated by the front panel 50 Ω and 1 M Ω annunciators). Observe that the (∇) annunciator above the 50 Ω label on the front panel indicates that the INPUT 2 impedance is set to 50 Ω .
5. Verify the HP 5347A/48A displays 10 MHz.
6. Mark Pass or Fail on the Operational Verification Record card, line 2 (a).
7. Now, press **Input 2 50 Ω /1M Ω** key to set INPUT 2 impedance to 1 M Ω .
8. Verify the HP 5347A/48A displays 10 MHz.
9. Mark Pass or Fail on the Operational Verification Record card, line 2 (b).

4-13. INPUT 2, 10 Hz-525 MHz INPUT SENSITIVITY CHECK

Specification: 50 Ω : 10 MHz to 525 MHz, 25 mV rms
1M Ω : 10 Hz to 80 MHz, 25 mV rms

Description: This check is in two parts to check both the high frequency measuring capability of the 50 Ω input impedance and the low frequency measuring capability of the 1 M Ω input impedance of INPUT 2. In Part I, the HP 5347A/48A is set to the 10 MHz-525 MHz range, 50 Ω impedance, and a 25 mV rms (-19.3 dBm) signal is applied to INPUT 2. The source is set to selected frequencies and the HP 5347A/48A is checked for proper counting. Next, the HP 5347A/48A's 1M Ω impedance for the lower frequency range is checked. Since the same test setup in *Figure 4-1* with the addition of a 50 Ω feedthrough is used to perform the 80 MHz check, the 80 MHz check is performed before the 10 Hz-50 MHz check. A 25 mV rms (-19.3 dBm) 80 MHz signal is applied to INPUT 2 through a 50 Ω feedthrough, and the HP 5347A/48A is checked for proper counting. In Part II, the test setup is changed to *Figure 4-2* to test the 10 Hz-50 MHz range.

Part I: INPUT 2, 50 MHz-525 MHz (50Ω) Check

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

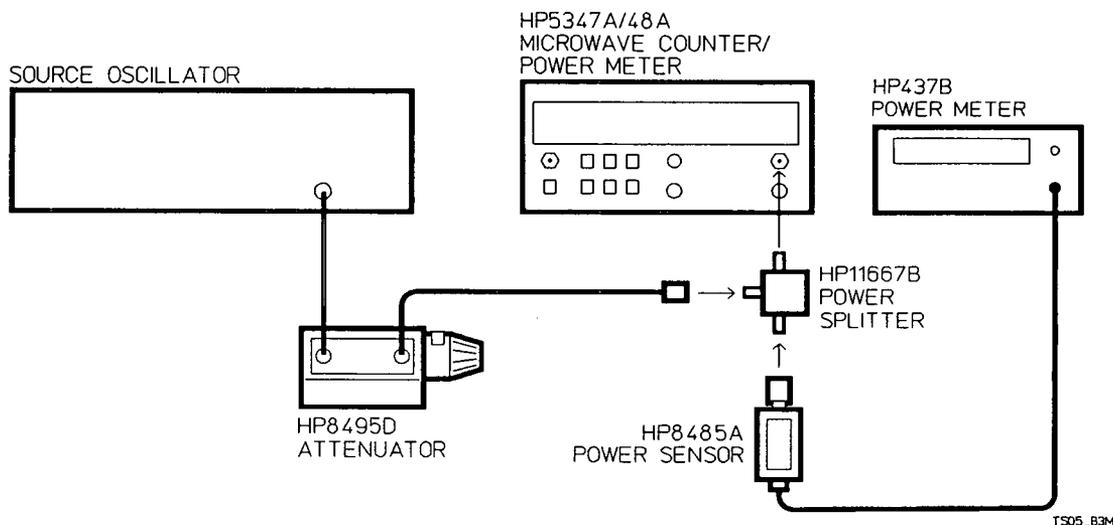


Figure 4-1. INPUT 2, 50 MHz-525 MHz Verification Test Setup

2. Press **Input 2 50 Ω/1M Ω** key to set the HP 5347A /48A to the 10 MHz-525 MHz range, 50Ω impedance. Observe that the ∇ annunciator indicates that INPUT 2 impedance is set to 50 Ω.
3. Set source to 50 MHz, and for an output level of 25 mV rms (-19.3 dBm) as measured on the HP 437B Power Meter. Measure actual sensitivity and verify that the HP 5347A /48A counts properly at 50 MHz, 100 MHz, 250 MHz, and 525 MHz. (Note that exact frequencies may not be achieved due to the frequency stability characteristics of the source.)
4. Mark Pass or Fail on the Operational Verification Record card, lines 3 through 6.

INPUT 2, 80 MHz (1M Ω) Check (Part of Part I)**NOTE**

The 1 M Ω impedance of INPUT 2 is checked with an 80 MHz input signal before it is checked with signals from 10 Hz through 50 MHz. This is done for convenience since to perform the 80 MHz check you need to use the test setup in Figure 4-1 with the addition of the 50 Ω feedthrough between the power splitter and INPUT 2 connector.

1. Using the test setup in *Figure 4-1*, insert a 50 Ω feedthrough (HP 10100C) between the HP 1667B power splitter and INPUT 2 of the HP 5347A/48A.
2. Press **Input 2 50 Ω /1M Ω** key to select the 1M Ω impedance, 10 Hz-80 MHz input. Observe that the 1M Ω annunciator (∇) lights.
3. Set the source to 80 MHz, and for a level of 25 mV rms (-19.3 dBm) as measured on the HP 437B Power Meter.
4. Verify that the HP 5347A/48A counts properly at 80 MHz at 25 mV rms, and mark Pass or Fail on the Operational Verification Record card, line 7.

Part II: INPUT 2, 10 Hz-50 MHz (1M Ω) Check

1. Connect the equipment as shown in Figure 4-2.

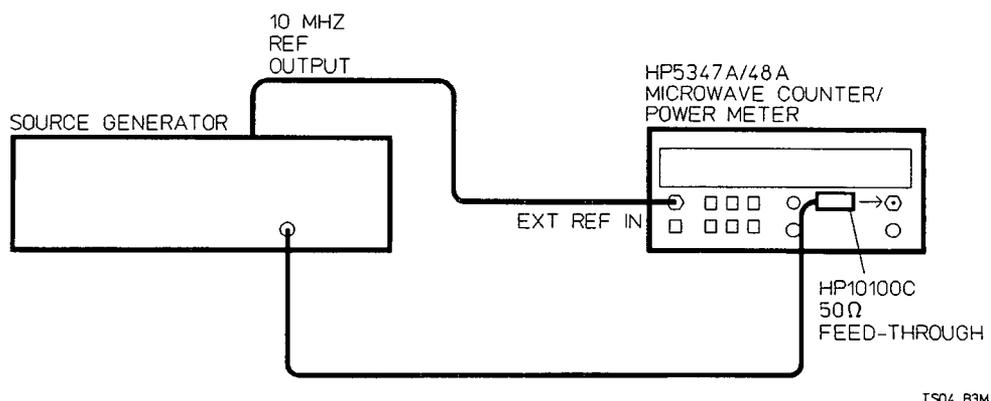


Figure 4-2. INPUT 2, 10 MHz-50 MHz Verification Test Setup

2. The HP 5347A/48A settings are the same as in the 80 MHz test (INPUT 2, 1M Ω).
3. Set the source for an output of 25 mV rms (-19.3 dBm) at 10 Hz.
4. Verify that the HP 5347A/48A counts properly at 10 Hz, 50 kHz, 1 MHz, 10 MHz, and 50 MHz. Mark Pass or Fail on the Operational Verification Record card, lines 8 through 12.

4-14. INPUT 1, 500 MHz-20 GHz [26.5 GHz for HP 5348A] INPUT SENSITIVITY CHECK

	Standard Instrument	Option 006
Specifications:	HP 5347A/48A = -32 dBm, 500 MHz – 12.4 GHz	-29 dBm
	-27 dBm, 12.4 GHz – 20 GHz	-23 dBm
	HP 5348A only = -16 dBm, 20 GHz – 26.5 GHz	-15 dBm

Description: The HP 5347A/48A is set to the 500 MHz-20 GHz [26.5 GHz for HP 5348A] range and the appropriate input signal is applied to INPUT 1. The source generator is set to selected frequencies and levels appropriate for the HP 5347A/48A, and the actual sensitivity of the HP 5347A/48A is measured up to 20 GHz [26.5 GHz for HP 5348A].

1. Connect the equipment as shown in *Figure 4-3*.

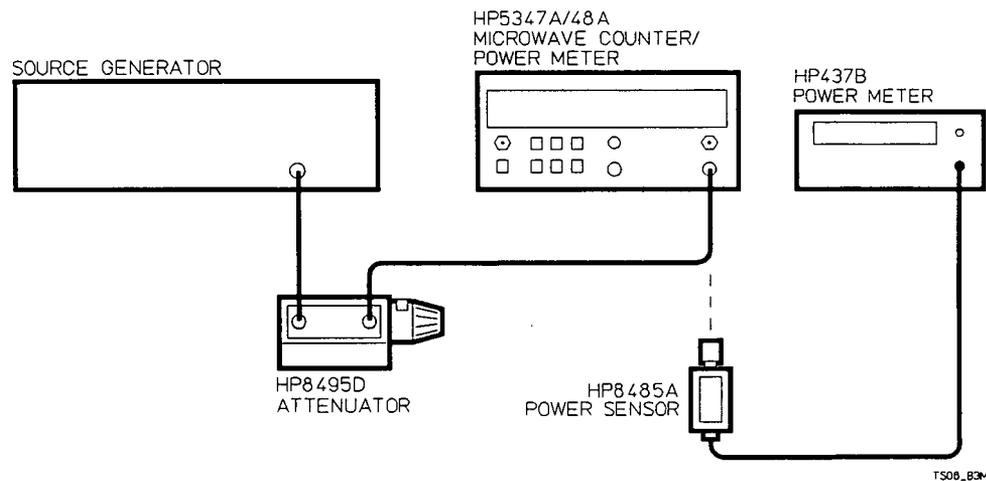


Figure 4-3. INPUT 1, 500 MHz-26.5 GHz Verification Test Setup

2. Press **Input 1 50 Ω** key to set the HP 5347A/48A to INPUT 1.
3. Set the source to 500 MHz, and set the output for -32 dBm as measured on the HP 437B. If Option 006 is installed, set the input to -29 dBm.
4. Measure the actual sensitivity at 500 MHz, 1 GHz, 5 GHz, and 12.4 GHz. (Verify the signal level with the HP 437B Power Meter at each of these frequencies.) Mark Pass or Fail on the Operational Verification Record card, lines 13 through 16.
5. Set the source to 18 GHz, and the output for -27 dBm as measured on the HP 437B. If Option 006 is installed, set the input to -23 dBm.
6. Measure the actual sensitivity at 18 GHz and 20 GHz. (Verify the signal level with the HP 437B Power Meter at each of these frequencies.) Mark Pass or Fail on the Operational Verification Record card, lines 17 and 18.
7. For the **HP 5348A only**, set the source for -16 dBm at 22 GHz. Measure the dBm at 22 GHz. Measure the actual sensitivity at 22 GHz and 26.5 GHz. Mark Pass or Fail on the Operational Verification Record card, lines 19 and 20. If Option 006 is installed, set the input to -15 dBm.

4-15. Power Meter Checks

Description: Checks the HP 5347A/48A ability to zero, and to calibrate on the 1 mW, 50 MHz Power Reference Oscillator signal.

Equipment

Power Sensor HP 8485A
Power Sensor Cable HP 11730A

Procedure

1. With the HP 5347A/48A OFF, set the **SENSOR TYPE** switches of the rear panel DIP switch to select the 8485A sensor.
2. Connect the equipment as shown in *Figure 4-4*.

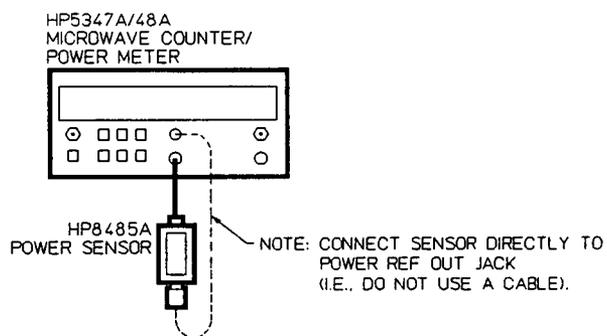


Figure 4-4. Power Meter Mode Verification Test Setup

3. Turn on the HP 5347A/48A
4. Press **Input dBm/Watt** key.
5. Press the **Zero** key, and observe the "ZEROING" message in the display during the process, which takes from 10 to 20 seconds. When completed, the HP 5347A/48A will show random readings, reflecting residual noise in the Power Meter circuits.

6. Press **Input dBm/Watt** key again, and verify that the reading is $0.00 \pm 0.06 \mu\text{W}$. Mark Pass or Fail on the Operational Verification Record card, line 21.
7. Press **Calibrate/Store** key, and observe the "CALIBRATING" message in the display during the process, which takes about 5 seconds.
8. Correct operation is signaled by the fact that after "CALIBRATING" message disappears, the display will show random readings, and no error message appears. (Note: the Power Reference Oscillator is ON **only** during the actual calibration process. The Performance Tests [Section 4-24] contain a test procedure to check the Power Reference Oscillator output level.)
9. Verify random readings. Mark Pass or Fail on the Operational Verification Record card, line 22.

Table 4-2. Operational Verification Record

Hewlett-Packard Model 5347A/48A Microwave Frequency Counter/Power Meter		Repair/Work Order No. _____
Serial Number: _____	Temperature: _____	
Test Performed By: _____	Relative Humidity: _____	
Date: _____	Post Calibration Test: <input type="checkbox"/>	
Notes: _____	Pre Calibration Test: <input type="checkbox"/>	

PARA. NO.	TEST	TEST RESULTS	
		PASS	FAIL
4-10.	Power-Up Self Test	1. _____	_____
4-12.	INPUT 2, Gating and Counting Check (50Ω/1MΩ):	2 (a). _____	_____
		2 (b). _____	_____
4-13.	INPUT 2, 10 Hz-525 MHz Input Sensitivity Check(50 Ω/1MΩ):		
	Part I 50 Ω: 50 MHz	3. _____	_____
	100 MHz	4. _____	_____
	250 MHz	5. _____	_____
	525 MHz	6. _____	_____
	1M Ω: 80 MHz	7. _____	_____
	Part II 1M Ω: 10 Hz	8. _____	_____
	50 kHz	9. _____	_____
	1 MHz	10. _____	_____
	10 MHz	11. _____	_____
	50 MHz	12. _____	_____
4-14.	INPUT 1, 500 MHz - 20 GHz [26.5 GHz] Input Sensitivity Test:		
	Part I 500 MHz	13. _____	_____
	1 GHz	14. _____	_____
	5 GHz	15. _____	_____
	12.4 GHz	16. _____	_____
	Part II 18 GHz	17. _____	_____
	20 GHz	18. _____	_____
	(HP 5348A only) 22 GHz	19. _____	_____
	26.5 GHz	20. _____	_____
4-15.	POWER METER CHECKS		
	0.00 ± 0.06 μW	21. _____	_____
	random readings	22. _____	_____

4-16. PERFORMANCE TEST PROCEDURES

4-17. Frequency Counter Tests

4-18. INPUT 2, 10 Hz-525 MHz INPUT SENSITIVITY TEST

Specification: 50Ω : 10 MHz to 525 MHz, 25 mV rms
 $1M\Omega$: 10 Hz to 80 MHz, 25 mV rms

Description: This test is in two parts to check both the high frequency measuring capability of the 50Ω input impedance and the low frequency measuring capability of the $1M\Omega$ input impedance of INPUT 2. In Part I, the HP 5347A/48A is set to the 10 MHz-525 MHz range, 50Ω impedance, and a 25 mV rms (-19.3 dBm) signal is applied to INPUT 2. The source oscillator is set to selected frequencies and the HP 5347A/48A is checked for proper counting. Next, the HP 5347A/48A $1M\Omega$ impedance for the lower frequency range is checked. Since the same test setup in *Figure 4-5* with the addition of a 50Ω feedthrough is used to perform the 80 MHz check, the 80 MHz check is performed before the 10Hz-50MHz check. A 25 mV rms (-19.3 dBm) 80 MHz signal is applied to INPUT 2 through a 50Ω feedthrough, and the HP 5347A/48A is checked for proper counting. In Part II, the test setup is changed to *Figure 4-6* to test the 10 Hz-50 MHz range.

Part I: INPUT 2, 50 MHz-525 MHz (50Ω) Test

1. Connect the equipment as shown in *Figure 4-5*.

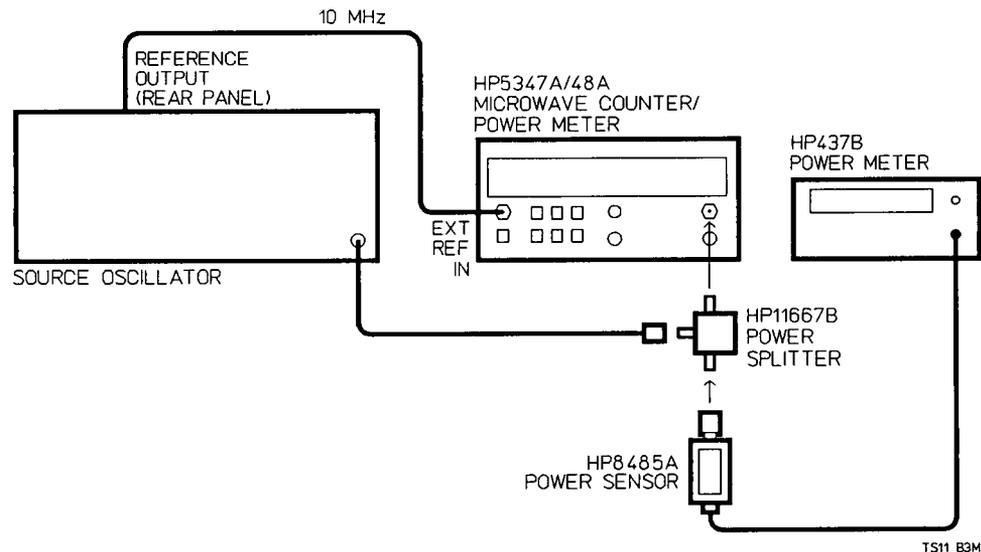


Figure 4-5. INPUT 2, 50 MHz-525 MHz Test Setup

2. Press **Input 2 50 Ω /1M Ω** key to set the HP 5347A /48A to the 10MHz-525 MHz range, 50 Ω impedance. Observe that 50 Ω annunciator lights.
3. Set the source to 50 MHz, and for an output level of 25 mV rms (-19.3 dBm) as measured on the HP 437B Power Meter. Verify that the HP 5347A /48A counts 50 MHz, 100 MHz, 200 MHz, 400 MHz, and 525 MHz, \pm 1 Hz. Record the actual sensitivity at each frequency on the Performance Test Record, located at the end of the performance test procedures.

INPUT 2, 80 MHz (1 M Ω) Test (Part I)

1. Using the test setup in *Figure 4-5*, connect the HP 11667B to INPUT 2 of the HP 5347A /48A via a 50 Ω feedthrough (HP 10100C).
2. Press **Input 2 50 Ω /1M Ω** key to select the 1 M Ω impedance of INPUT 2.
3. Set the source to 80 MHz, and for an output level of 25 mV rms (-19.3 dBm) as measured on the HP 437B Power Meter.
4. Verify that the HP 5347A /48A counts 80 MHz, \pm 1 Hz, at 25 mV rms (-19.3 dBm). Enter the results on the Performance Test Record.

Part II: INPUT 2, 10 Hz-10 MHz (1 M Ω) Test

1. Connect the equipment as shown in *Figure 4-6*.

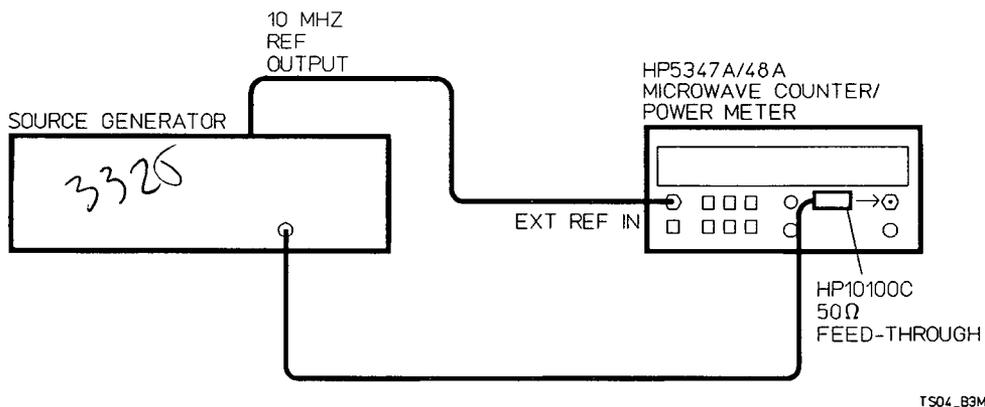


Figure 4-6. INPUT 2, 10 Hz-10 MHz Test Setup

2. The HP 5347A /48A settings are the same as in the 80 MHz test (INPUT 2, 1 M Ω).

3. Set the source for an output of 25 mV rms (-19.3 dBm) at 10 Hz.
4. Verify that the HP 5348A counts properly at 10 Hz, 1 kHz, 500 kHz, 1 MHz, and 10 MHz, ± 1 Hz. Record the actual sensitivity on the Performance Test Record.

If the HP 5347A/48A fails any of the above sensitivity tests, refer to Section 5 (Adjustments) and verify the INPUT 2 sensitivity adjustment (Peak Detector Adjustment, A2R1). If this adjustment is correct, and the HP 5347A/48A continues to fail the sensitivity tests, refer to Section 8, for troubleshooting procedures for the following assemblies, in the order shown:

A2 Low Frequency Input Assembly
A3 Counter Assembly

4-19. INPUT 1, 500 MHz-20 GHz [26.5 GHz for HP 5348A] INPUT SENSITIVITY TEST

The following test is in two parts, *Figure 4-7* is the test setup for Part I (500 MHz to 1 GHz), and *Figure 4-8* is the test setup for Part II (2.5 GHz to 20 GHz [26.5 GHz for HP 5348A]).

	Standard Instrument	Option 006
Specifications:	HP 5347A/48A = -32 dBm, 500 MHz - 12.4 GHz	-29 dBm
	-27 dBm, 12.4 GHz - 20 GHz	-23 dBm
	HP 5348A only = -16 dBm, 20 GHz - 26.5 GHz	-15 dBm

Description: In Part I, the HP 5347A/48A is set to the 500 MHz - 20 GHz [26.5 GHz for HP 5348A] range and the appropriate input signal is applied to INPUT 1. The source generator is set to selected frequencies up to 1 GHz, and the actual sensitivity of the HP 5347A/48A is measured. In Part II, the test setup is changed to *Figure 4-8* to measure sensitivity in the 2.5 GHz-20 GHz [26.5 GHz for HP 5348A] range. The source generator is set to the appropriate test level, and the actual sensitivity is measured at selected frequencies up to 20 GHz [26.5 GHz for HP 5348A].

Part I: INPUT 1, 500 MHz – 1 GHz Test

1. Connect the equipment as shown in Figure 4-7.

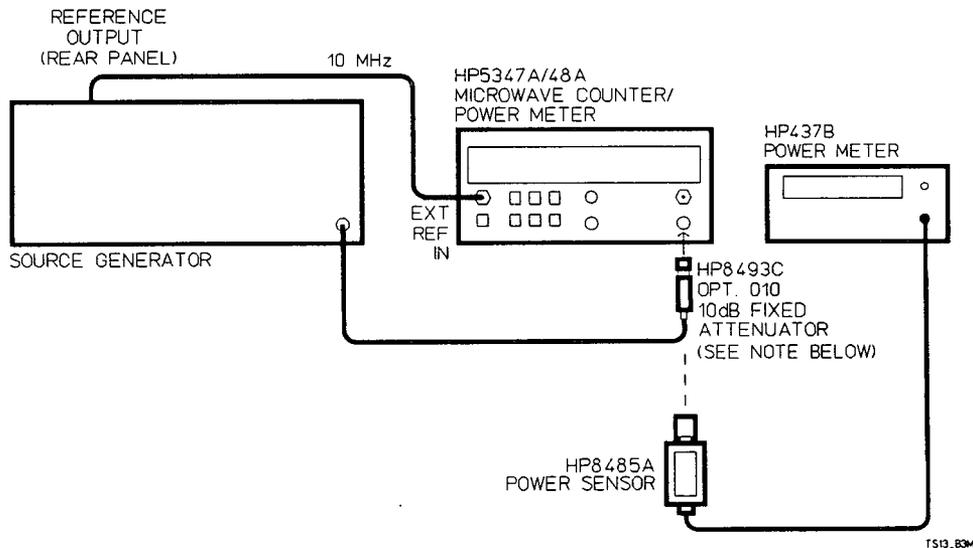


Figure 4-7. INPUT 1, 500 MHz-1 GHz Test Setup

2. Press **Input 1 50 Ω** key to set the HP 5347A/48A to INPUT 1.
3. Set the source to 500 MHz, and for an output of -22 dBm as measured on the HP 437B, **without** the attenuator in line. If Option 006 is installed, set the output to -29 dBm.

NOTE

The HP 8485A Power Sensor measures down to -30 dBm; therefore; it is not possible to set the signal level at -32 dBm. By using the 10 dB Fixed Attenuator and setting the level at -22 dBm, an output of -32 dBm can be attained at the input of the Counter.

(If Option 006 is installed, the attenuator is not needed.)

4. Connect the source to the HP 5347A /48A with the attenuator in line.
5. Measure the actual sensitivity at 500 MHz and 1 GHz. (The HP 5347A /48A should measure these frequencies to ± 4 Hz). Verify the signal levels with HP 437B Power Meter at each frequency. Enter the result on the Performance Test Record.

Part II: INPUT 1, 2.5 GHz – 20 GHz [26.5 GHz for HP 5348A] Test

1. Connect the equipment as shown in *Figure 4-8*.

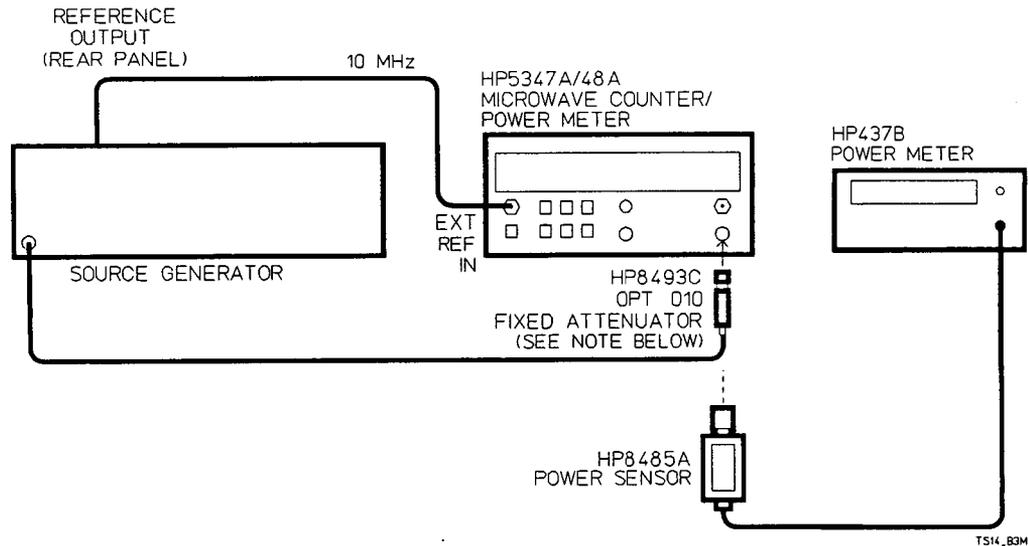


Figure 4-8. INPUT 1, 2.5 GHz-20 GHz [26.5 GHz] Test Setup

2. The HP 5347A/48A settings are the same as in Part I (INPUT 1).
3. Set the source to 2.5 GHz at a level of -22 dBm, as measured on the HP 437B, **without** the attenuator in line. If Option 006 is installed, set the output to -29 dBm.

NOTE

The HP 8485A Power Sensor measures down to -30 dBm; therefore; it is not possible to set the signal level at -32 dBm. By using the 10 dB Fixed Attenuator and setting the level at -22 dBm, an output of -32 dBm can be attained at the input of the Counter.

(If Option 006 is installed, the attenuator is not needed.)

4. Connect the source to the HP 5347A/48A with attenuator in line. If Option 006 is installed, do not use the attenuator.
5. Measure actual sensitivity at 2.5, 5, 10, and 12.4 GHz, by first verifying the signal level with the 437B/8485A, and then verifying that each of the frequencies is counted to ± 4 Hz.
6. Set the source to 18 GHz at a level of -17 dBm, as measured on the HP 437B, with the 10 dB attenuator in place. (Since the -27 dBm signal desired is within the power sensor

range, the 10 dB attenuator can be removed, if desired. In this case, adjust the source for -27 dBm signal level.) If Option 006 is installed, do not use the attenuator, and set the output level to -23 dBm.

7. Measure actual sensitivity at 18, 19, and 20 GHz, by first verifying the signal level with the HP 437B, and then verifying that each of the frequencies is counted to ± 4 Hz.
8. **For the HP 5348A only**, repeat the above procedure for 20-26.5 GHz at the appropriate input level (-6 dBm) with the 10 dB attenuator in place. (Since the -16 dBm signal desired is within the power sensor range, the 10 dB attenuator can be removed, if desired. In this case, adjust the source for -16 dBm signal level.) Measure actual sensitivity at 22 GHz, 24 GHz, and 26.5 GHz, ± 4 Hz. If Option 006 is installed, do not use the attenuator, and set the output level to -15 dBm.
9. Enter the results on the Performance Test Record.

If the HP 5347A/48A fails any of the above sensitivity tests, refer to Section 5 (Adjustments) and verify the A6 IF Amplifier/Detector Assembly adjustments. If these adjustments are correct, and the HP 5347A/48A continues to fail the above tests, refer to Section 8 (Service) for troubleshooting procedures for the following assemblies:

Microwave Module (A12 Microwave Assembly, U1 Sampler)

A6 IF Amplifier/Detector Assembly

A3 Counter Assembly

A5 Synthesizer Assembly

4-20. AUTOMATIC AMPLITUDE DISCRIMINATION TEST

Specification: The HP 5347A/48A measures the largest of all signals present, provided that the signal is 6 dB (typical) above any signal within 500 MHz; 20 dB (typical) above any signal, 500 MHz to 20 GHz [26.5 GHz for HP 5348A].

Description: Two microwave source generators are used to provide two signals to the HP 5347A/48A. The relative level of the two signals is adjusted to the specification, and the HP 5347A/48A must count the higher amplitude signal.