MANUAL SUPPLEMENT

HEWLETT-PACKARD

8672A
SYNTHESIZED SIGNAL GENERATOR
OPTION 008

SUPPLEMENT PART
NO. 08672-90067

USE THIS SUPPLEMENT WITH EITHER
MANUAL PART NO. 08672-90063
PRINTED JUNE 1980
OR
MANUAL PART NO. 08672-90086
PRINTED MARCH 1983

HEWLETT PACKARD

HP 8672A
OPTION 008

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MANUAL CHANGES

MANUAL IDENTIFICATION
Model Number: 8672A Opt 008
Date Printed: June 1980
Part Number: 08672-90067

SYNTHESIZED SIGNAL GENERATOR OPTION 008

This supplement contains important information for correcting manual errors and for adapting the manual to instruments containing improvements made after the printing of the manual.

To use this supplement:

Make all ERRATA corrections

Make all appropriate serial number related changes indicated in the tables below.

Serial Prefix or Number	Make Manual Changes

Serial Prefix or Number	Make Manual Changes

► NEW ITEM

ERRATA

► Page 1-1, DESCRIPTION:
In last line, change +4 dBm to +9 dBm.

► Page 5-3, Paragraph 5-36A:
Add step 11A. Tune to 18 GHz and wait at least 10 minutes for the YTM to stabilize.

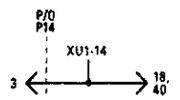
NOTE

Do not skip this step.

► Page 6-1, REPLACEABLE PARTS:
Under Manual Changes, change A1MP11 part number to 08672-20119.

Page 8-2, Figure 8-25A:
Replace with Figure 8-25A supplied in this supplement.

► Page 8-3, Figure 8-27A (1-A1):
On the left side of the schematic at A1A13P14 pin 3 (+5V), add connection to XU1 pin 14 as shown below:



NOTE

Manual change supplements are revised as often as necessary to keep manuals as current and accurate as possible. Hewlett-Packard recommends that you periodically request the latest edition of this supplement. Free copies are available from all HP offices. When requesting copies quote the manual identification information from your supplement, or the model number and print date from the title page of the manual.

6 February 1981
2 Pages

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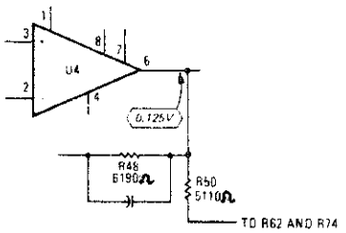
ERRATA (Cont'd)

Page 8-3, Figure 8-27A (1-A1) (Cont'd):

In middle of the schematic between U4 and U5, add R50 5110 ohm resistor as shown below:



In the upper right corner of the schematic, change U9 to U8. Add U9 part number 1826-0013 to the Transistor and Integrated Circuit Part Number table.

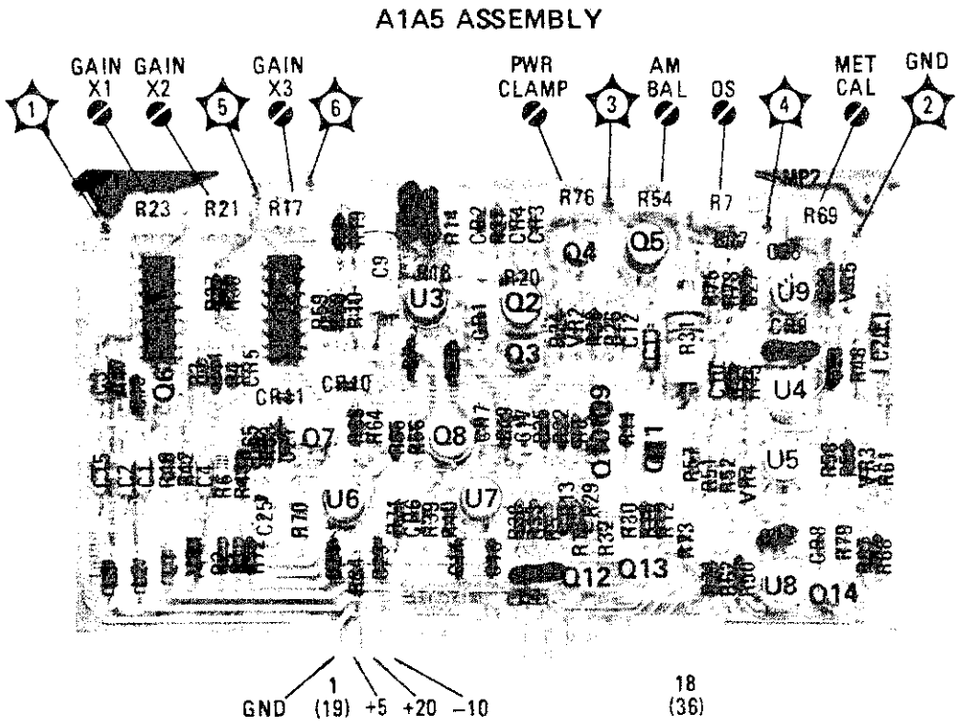


Figure 8-25A. A1A5 ALC Assembly Component, Adjustment, and Test Point Locations (Option 008)

MANUAL SUPPLEMENT

8672A SYNTHESIZED SIGNAL GENERATOR OPTION 008

SERIAL NUMBERS

This supplement applies directly to instruments with serial numbers prefixed 2018A.

With the changes described in Section VII, this manual also applies to instruments with serial numbers prefixed 1906A, 1913A, 1914A, 1930A, 1940A, 2002A, 2005A through 2008A, 2010A, 2012A, 2014A, 2016A, and 2017A.

For additional important information about serial numbers, see INSTRUMENT COVERED BY MANUAL in Section I.

HEWLETT PACKARD

SUPPLEMENT PART NO. 08672-90067
Microfiche Part No. 08672-90068

Printed: JUNE 1980

SECTION I
GENERAL INFORMATION

INTRODUCTION

This manual supplement contains information pertinent to the operation, testing, adjusting, and servicing the Hewlett-Packard Model 8672A Option 008 Synthesized Signal Generator. The Model 8672A will generally be referred to as the Synthesizer throughout this manual. This supplement is intended to be used with the Operating and Service Manual for the 8672A (the part number of the manual is listed on the front cover of this supplement).

NOTE

Make all necessary changes to this manual supplement from the Manual Change sheets. Then make all appropriate changes to the Synthesizer manual from this supplement.

SPECIFICATIONS

Table 1-1 lists the specifications that change the standard instrument's specifications. The specifications listed in Table 1-1 are the standards or limits against which the Option 008 Synthesizer can be tested.

DESCRIPTION

Option 008 provides +8 dBm leveled output power from 2.0 to 18.0 GHz for the standard Synthesizer. The leveled output power for Options 001 and 008 is +10 dBm, for Options 004 and 008 is +7 dBm, and for Options 005 and 008 is +4 dBm.

RECOMMENDED TEST EQUIPMENT

Table 1-2 lists the test equipment required (in addition to the equipment listed in the Synthesizer manual) to check, adjust, and repair the Synthesizer equipped with Option 008. If any of the recommended equipment is not available, instruments with equivalent minimum specifications may be used.

Table 1-1. Specifications Option 008

RF OUTPUT CHARACTERISTICS

Level: +8 to −120 dBm, +15°C to +35°C.[1]

Total Indicated Meter Accuracy (+15°C to +35°C):

Frequency Range (GHz)	Indicated Meter Accuracy at OUTPUT LEVEL RANGE Switch Setting +10 dBm
2.0— 6.2	±1.75 dB
6.2—12.4	±2.0 dB
12.4—18.0	±2.25 dB

Flatness (+10 dBm range, +15°C to +35°C): ±0.75 dB, 2.0—6.2 GHz
±1.00 dB, 2.0—12.4 GHz
±1.25 dB, 2.0—18.0 GHz

AMPLITUDE MODULATION CHARACTERISTICS

Depth (for vernier meter readings ≤0 dB and power level settings ≤0 dBm, +15°C to +35°C):
0—75% from 2.0—6.2 GHz
0—60% from 6.2—12.4 GHz
0—50% from 12.4—18.0 GHz

Rates (3 dB bandwidth): 10 Hz—50 kHz

Distortion (for rates ≤10 kHz and vernier meter readings ≤0 dB and power level settings ≤0 dBm, +15°C to +35°C): <3% at 30% depth
<4% at 50% depth
<5% at 75% depth

REMOTE PROGRAMMING CHARACTERISTICS

Output Level: programmable in 1 dB steps, +8 to −120 dBm, plus 5 dB of overrange.

[1] For power settings >+3 dBm and changes in frequency setting from <10 GHz to >16 GHz, a settling period may be required for output power to stabilize at the set level.

Table 1-2. Recommended Test Equipment Option 008

Instrument	Critical Specifications	Recommended Model	Use*
Analyzer, Distortion	Measurement accuracy of <0.5% at 10 kHz	HP 334A	P

*P = Performance Test

SECTION IV
PERFORMANCE TESTS

INTRODUCTION

The following procedures test the electrical performance on the Synthesized Signal Generator to the specifications in Table 1-1. The specifications in Table 1-1 are only those which apply to Option 008 and differ from the standard HP 8672A. In addition to these tests, perform all applicable tests in the manual. Table 4-1 lists all applicable performance tests for your instrument.

EQUIPMENT REQUIRED

Equipment required for these performance tests is listed under Recommended Test Equipment, Tables 1-2 in this supplement and in the manual. Any equipment that satisfies the critical specifications given in the tables may be substituted for the recommended model(s).

Table 4-1. List of Applicable Performance Tests

Para. No.	Test
4-11A.	Operational Verification Checks
4-12A.	Output Level Flatness
4-16A.	AM Distortion
4-17A.	Amplitude Modulation Depth, Rates, Frequency Response, Sensitivity, Meter Accuracy, Incidental Phase Modulation

PERFORMANCE TESTS

4-11A. OPERATIONAL VERIFICATION CHECKS (Option 008)

DESCRIPTION: This procedure checks the Synthesizer to give reasonable assurance that is is working properly by performing selected tests of all major functions. As each step is completed it may be checked off on Table 4-2. If remote verification is required, the Remote Operator's Check in Section VIII is recommended.

EQUIPMENT:

Spectrum Analyzer	HP 8565A
Power Meter/Sensor	HP 436A with HP 8481A
Test Oscillator	HP 651B
Digital Voltmeter	HP 3455A
Frequency Counter	HP 5340A

PROCEDURE:

1. Connect the Synthesizer to the power mains and allow sufficient warm-up time for the OVEN annunciator to go out.

2. Press the left hand FREQUENCY RESOLUTION key; the light bar under the 10 GHz, 1 GHz, and 100 MHz digits should light. Turn the TUNING knob to assure the frequency changes in 100 MHz steps. The 1 kHz digit may change when tuning above 6.2 GHz, this is normal.

3. Press the next resolution key; the light bar under the 10 MHz and 1 MHz digits should light. Turn the TUNING knob to assure the frequency changes in 1 MHz steps.

4. Press the next resolution key; the light bar under the 100 kHz and 10 kHz digits should light. The frequency should tune in 10 kHz steps.

5. Press the last resolution key. The 1 kHz light bar should light and the frequency should tune in 1, 2, or 3 kHz steps depending on the center frequency. (1 kHz below 6.2 GHz, 2 kHz between 6.2 and 12.4 GHz, and 3 kHz above 12.4 GHz.)

6. Press the HOLD key. All the light bars should go out and the TUNING knob should not change the frequency. Press the PRESET key; the frequency should change to exactly 3000.000 MHz.

7. Connect a power meter to the Synthesizer's RF OUTPUT connector. Set the Synthesizer's controls for 2 GHz with the OUTPUT LEVEL RANGE set to +10 dBm, OUTPUT LEVEL VERNIER control fully clockwise, and the ALC switch set to either the XTAL or PWR MTR position. Set the METER mode switch to LEVEL and the modulation switches OFF. Set the RF OUTPUT switch ON. Under these conditions the instrument should be delivering maximum available power and the meter should indicate zero.

8. Tune from 2 to 18 GHz in 100 MHz steps. The output power should remain above +8 dBm over the entire frequency range. The graph in Figure 4-1A shows the typical output power available under these conditions. Be sure the NOT PHASE LOCKED annunciator is off before making power measurements. Change the CAL FACTOR control on the power meter as the frequency is changed.

PERFORMANCE TESTS

4-11A. OPERATIONAL VERIFICATION CHECKS (Option 008) (Cont'd)

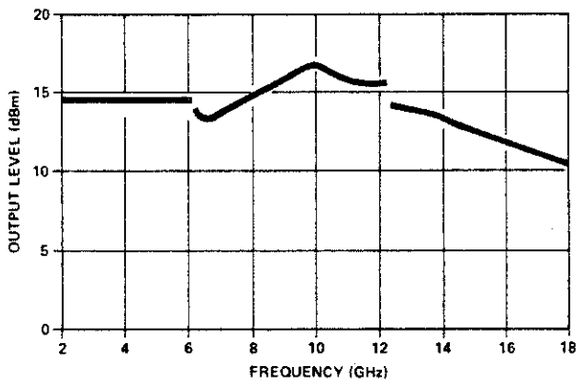


Figure 4-1A. Typical Maximum Power Available.

9. Set the ALC switch to INTernal. Adjust the VERNIER control to obtain a meter reading of +8 dBm. Tune in 100 MHz steps from 2 to 18 GHz. The LEV UNCAL lamp should not remain on at any frequency in this range. Some flickering of the lamp is normal when tuning from one frequency to the next. Total power variation should be within these limits:

   2 to 6.2 GHz ±0.75 dB
   2.0 to 12.4 GHz ±1 dB
   2.0 to 18.0 GHz ±1.25 dB

   For option 004 and 005 instruments, add ±0.25 dB to these numbers.

10. Set the Synthesizer frequency to 2 GHz at 0 dBm as indicated on the power meter.

11. Connect the spectrum analyzer to the Synthesizer's RF OUTPUT in place of the power meter. Adjust the spectrum analyzer to center the output signal and place it at the top graticule line with 10 dB per division sensitivity.

12. Change the Synthesizer OUTPUT LEVEL RANGE from 0 dBm to −110 dBm while observing the spectrum analyzer display to assure that the output in fact changes in 10 dB steps. Adjust the spectrum analyzer as necessary to observe the low level signal, it will be close to the noise floor of the spectrum analyzer in the −100 and −110 dBm positions. Use video filtering if necessary to see the signal.

13. Set the Synthesizer to 0 dBm range with the vernier set for a full scale reading on the meter. Set the spectrum analyzer to obtain 2 dB per vertical division with convenient bandwidth. Adjust the analyzer to place the signal at the top graticule line. Vary the Synthesizer's VERNIER while observing the meter and spectrum analyzer display to assure there is good correlation between them. This test can also be done with the power meter if desired.

PERFORMANCE TESTS

4-11A. OPERATIONAL VERIFICATION CHECKS (Option 008) (Cont'd)

14. Set the output level range to 0 dBm and connect the modulation source 50 ohm output to the Synthesizer FM input; set modulation frequency to exactly 100 kHz. Set the FM DEVIATION switch to the 0.3 MHz position and adjust the output of the modulation source to obtain the first Bessel null of the carrier as observed on the spectrum analyzer. This should occur between 0.517 and 0.661 Vrms (0.567 Vrms nominal) for ambient temperatures between 15°C and 35°C. Set the front panel meter switch to FM. The meter should indicate between 210 and 270 kHz deviation. The actual deviation for the first null will be 240.48 kHz.

15. The results of this step are typical and are included for completeness. Set the modulation input frequency and adjust the input voltage to obtain the first Bessel null of the carrier at these settings:

Deviation Range	Modulation Rate	Input Voltage	Expected Deviation
30 kHz	10 kHz	.567 Vrms	24.05 kHz
100 kHz	40 kHz	.680 Vrms	96.19 kHz
300 kHz	100 kHz	.567 Vrms	240.5 kHz
1 MHz	400 kHz*	.680 Vrms	961.9 kHz
3 MHz	1 MHz*	.567 Vrms	2.405 MHz
10 MHz	4 MHz*	.680 Vrms	9.619 MHz

*Make sure the voltmeter or oscilloscope can measure these frequencies.

16. Set the FM switch OFF, meter switch to AM, AM switch to 100% and connect the 600 ohm output of the modulation source to the AM input. Set the modulation frequency to 10 kHz. Set the spectrum analyzer vertical sensitivity to 2 dB per division. Adjust spectrum analyzer to place the carrier at the top graticule line.

17. Adjust the test oscillator output level to place the first sidebands 10 dB below the carrier. This should occur at a test oscillator output between 0.377 Vrms and 0.518 Vrms (0.477 Vrms nominal). The meter should indicate between 58.25% and 68.25% (63.25% nominal) for ambient temperatures between 15°C and 35°C. The sidebands may not be at exactly the same level. This is normal and due to incidental FM. Merely average the levels of the upper and lower sidebands to make the measurements.

18. Set the Synthesizer AM switch to the 30% range. Set the spectrum analyzer to 5 dB per division vertical sensitivity. Adjust output level to set the first modulation sidebands 18.06 dB below the carrier. The input voltage should be between 0.518 and 0.660 Vrms (0.589 Vrms nominal) and the meter should read between 23.5% and 26.5% modulation (25% nominal). After making measurements set the AM switch to OFF'

19. Set all modulation off and adjust spectrum analyzer to place signal at the top graticule line using 10 dB per division vertical sensitivity.

PERFORMANCE TESTS

4-11A. OPERATIONAL VERIFICATION CHECKS (Option 008) (Cont'd)

20. Set RF switch OFF. The signal should completely disappear from the spectrum analyzer display, the LEV UNCAL lamp, and the NOT PHASE LOCKED lamp should light.

21. If any of the steps in this procedure seem to have failed, do the related performance tests or refer to the service information in Section VIII as appropriate.

Table 4-2. Record of Operational Verification Checks

Step	Description	Results
1.	OVEN annunciator is not lighted.	_____
4.	Panel meter indicates zero (LEVELED) LVL UNCAL annunciator is lighted.	_____ _____
8.	The NOT PHASE LOCKED annunciator is not lighted.	
9.	The LVL UNCAL annunciator is not lighted. Power variation (leveled flatness) is: ±0.75 dB maximum from 2.0 to 6.2 GHz ±1.00 dB maximum from 6.2 to 12.4 GHz ±1.25 dB maximum from 12.4 to 18.0 GHz	 _____ _____ _____
12.	OUTPUT LEVEL change is about 10 dB for each OUTPUT LEVEL RANGE switch setting from 0 to −110 dBm.	_____
14.	Frequency Modulation drive voltage is within tolerance. Frequency Modulation metering accuracy is within tolerance.	_____ _____
18.	Amplitude Modulation drive voltage is within tolerance. Amplitude Modulation metering accuracy is within tolerance.	_____ _____

4-12A. OUTPUT LEVEL FLATNESS (Option 008)

SPECIFICATION: ±0.75 dB from 2.0 to 6.2 GHz
±1.00 dB from 2.0 to 12.4 GHz
±1.25 dB from 2.0 to 18.0 GHz

For option 004 and 005 instruments, flatness is degraded by an additional ±0.25 dB.

DESCRIPTION: A power meter is used to measure the output power as the Synthesizer is tuned from 2 to 18 GHz in the 0 dBm and +10 dBm ranges. The test may be conducted either in local or remote mode.

EQUIPMENT: Power Meter/Sensor . . . . . HP 436A with HP 8481A

PERFORMANCE TESTS

4-12A. OUTPUT LEVEL FLATNESS (Option 008) (Cont'd)

PROCEDURE:

1. Calibrate and zero the power meter.
2. Connect the power sensor directly to the Synthesizer's RF OUTPUT connector.
3. Set the OUTPUT LEVEL RANGE switch to 0 dBm position and set the OUTPUT LEVEL VERNIER to +3 dB. Set Synthesizer to 2 GHz and press the dB REL button on the power meter.
4. Tune the Synthesizer from 2 to 18 GHz in 100 MHz steps while recording the minimum and maximum power variations observed. Be sure to change the power meter's calibration factor as the frequency is changed. Add the largest ± variations together and divide by 2 to check compliance with the ± specification.

NOTE

The plus and minus specification for output power is not referenced to a particular frequency. The specification represents the total power variation over the entire frequency range.

2.0—6.2 GHz	±0.75 dB	Minimum _____	
		Maximum _____	
		Total Variation _____	1.50 dB
2.0—12.4 GHz	±1.00 dB	Minimum _____	
		Maximum _____	
		Total Variation _____	2.00 dB
2.0—18.0 GHz	±1.25 dB	Minimum _____	
		Maximum _____	
		Total Variation _____	2.50 dB

5. Set the OUTPUT LEVEL RANGE switch to +10 dBm and the OUTPUT LEVEL VERNIER to −2 dB. This should yield a nominal output power to +8 dBm. Press the dB REL button to establish a new reference.
6. Again tune from 2 to 18 GHz while observing and recording the maximum and minimum power variations observed. Be sure to change the power meter's calibration as the frequency is changed. Add the maximum variations together and divide by 2 to determine if the ± specifications have been met.
7. If the output level flatness is not within specifications, perform the YTM and ALC adjustments in Section V.

4-16A. AM DISTORTION (Option 008)

SPECIFICATION: For rates less than 10 kHz, and for temperatures between 15°C and 35°C, and at power levels below +3 dBm.
< 3% at 30% AM
< 4% at 50% AM
< 5% at 75% AM

PERFORMANCE TESTS

4-16A. AM DISTORTION (Option 008) (Cont'd)

DESCRIPTION: A spectrum analyzer is used in the zero scan mode to demodulate the AM signal from the Synthesizer. The demodulated signal is measured on a distortion analyzer.

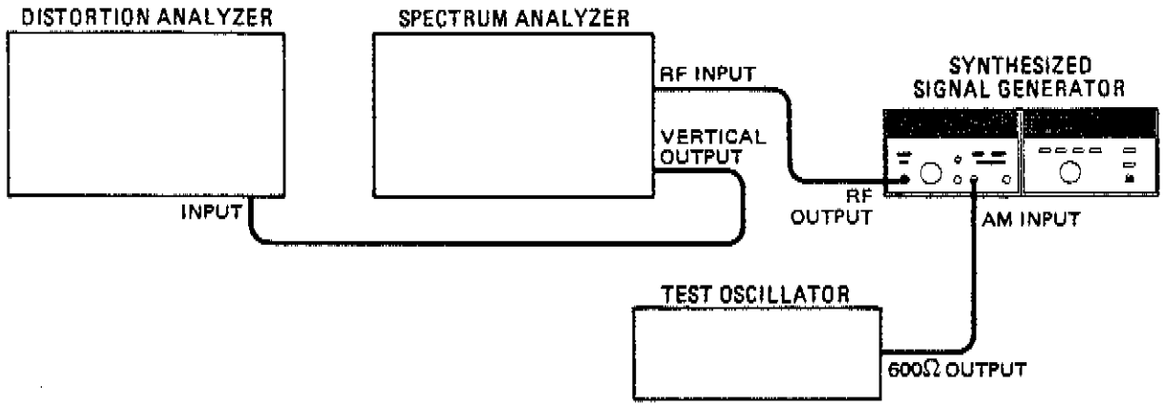


Figure 4-4A. AM Distortion Test Setup

EQUIPMENT:

Spectrum Analyzer	HP 8565A
Distortion Analyzer	HP 334A
Test Oscillator	HP 651B

PROCEDURE:

1. Connect equipment as shown in the figure.
2. Set the Synthesizer to obtain +3 dBm power output on the +10 dBm OUTPUT POWER RANGE. Set internal leveling, FM off and AM to 30% range. Set Synthesizer's output to any frequency desired.
3. Adjust output of the test oscillator to obtain 10 kHz at about 0.707 Vrms or whatever voltage is needed to obtain an indicated 30% modulation on the Synthesizer meter.
4. Tune spectrum analyzer to center the Synthesizer RF OUTPUT on the display. Switch to zero scan and adjust spectrum analyzer to obtain the maximum recovered modulation on the display. Use 1 MHz per division span width, 30 kHz resolution bandwidth, linear amplitude scale, and 50 microseconds per division scan time with video triggering.
5. Measure distortion of the vertical output signal on the distortion analyzer. The distortion should be less than 3%.
6. Change the AM switch to 100% range and decrease modulation input voltage to obtain an indicated 50% AM on the Synthesizer meter. The distortion should be less than 4% as indicated on the distortion analyzer.
7. Change the AM switch to 100% range and adjust the modulation input voltage to obtain an indicated 75% modulation on the Synthesizer's meter. The distortion should be less than 5% as indicated on the distortion analyzer.
8. This test can be repeated if desired for different modulation frequencies below 10 kHz and for different RF frequencies.

PERFORMANCE TESTS

4-17A. AMPLITUDE MODULATION DEPTH, METER ACCURACY, AND INPUT ACCURACY (Option 008)

SPECIFICATIONS:

AM depth (+0 dBm and below, +15°C to +35°C):
75% maximum, 2—6.2 GHz
60% maximum, 6.2—12.4 GHz
50% maximum, 12.4—18.0 GHz

AM Rates (3 dB bandwidth): 10 Hz to 50 kHz.

AM Frequency Response (100 Hz to 10 kHz rates): ±0.25 dB

AM Sensitivity: 30%/volt and 100%/volt. 1 volt peak into 600 ohms nominal for full scale depth indication on both ranges.

Indicated AM Meter accuracy (100 Hz to 10 kHz rates): ±5% of range

Accuracy relative to input level (100 Hz to 10 kHz rates): ±10% of range

Incidental phase modulation (rates ≤ 10 kHz, 30% depth):
<0.5 radians, 2.0—6.2 GHz
<1.5 radians, 6.2—12.4 GHz
<1.0 radians, 12.4—18.0 GHz

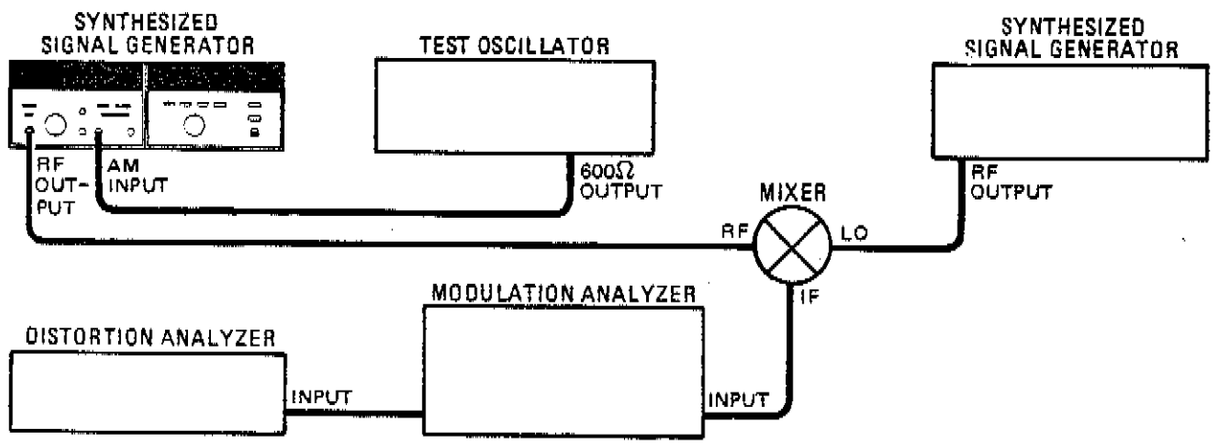


Figure 4-5A. Amplitude Modulation Depth, Meter Accuracy, and Input Accuracy Test Setup

DESCRIPTION: The output of the Synthesizer is mixed down to the input of a modulation analyzer. The demodulated output from the modulation analyzer is measured for distortion (when required) on a distortion analyzer.

EQUIPMENT:

Synthesized Signal Generator	HP 8672A
Modulation Analyzer	HP 8901A
Test Oscillator	HP 651B
Distortion Analyzer	HP 334A
Double Balanced Mixer	RHG DM1—18

PROCEDURE:

1. Connect the equipment as shown in the figure.

2. Set the Synthesizer under test to +0 dBm at 3000 MHz with internal leveling, AM to 100% range, and FM off. Set METER switch to AM.

PERFORMANCE TESTS

4-17A. AMPLITUDE MODULATION DEPTH, METER ACCURACY, AND INPUT ACCURACY (Option 008) (Cont'd)

3. Set the local oscillator to 3500 MHz at maximum power with all modulation off.

4. Set the audio oscillator to 10 kHz at the output voltage required to obtain 50% modulation as indicated on the Synthesizer meter.

5. Measure the percentage distortion of the demodulated output from the modulation analyzer. It should be less than 4%.

6. Tune the Synthesizer under test and the local oscillator in 100 MHz steps up to 18 GHz and observe the modulation distortion over the range. At no point should the distortion be greater than 4% and the measured modulation should remain within ±10% over the entire RF frequency range.

7. Set RF frequencies to 3 GHz and 3.5 GHz for the Synthesizer under test and the local oscillator, respectively.

8. Set the modulation frequency to 1 kHz. And press the modulation analyzer button to set dB relative readings.

9. Tune the audio source from 100 Hz to 10 kHz. The total excursion of indicated modulation should be less than 0.5 dB from lowest to highest.

10. Now tune from 10 Hz to 50 kHz to assure that the 3 dB points are less than 10 Hz and greater than 50 kHz.

11. Set the modulation source to obtain a modulation indication of 50% on the Synthesizer meter. The modulation analyzer should indicate a modulation percentage between 45% and 55% after pressing the AM button.

12. Adjust the input voltage to obtain 50% modulation as indicated on the modulation analyzer. Measure the modulation input voltage. It should be 0.354 ±0.071 Vrms.

13. Set the Synthesizer to the 30% AM range and adjust modulation source to obtain an indicated 30% modulation on the Synthesizer meter. The modulation analyzer should indicate 30% ±1.5%.

14. Change the input voltage to obtain 30% modulation as indicated on the modulation analyzer. The input voltage should be 0.707 ±0.071 Vrms.

15. Press the phase modulation key on the modulation analyzer. It should indicate less than 0.5 radians of incidental phase modulation.