

When using the 8444A with an 8558B, 8565A, or 8568A Spectrum Analyzer the 8444A 500 MHz OUTPUT and its THIRD LO INPUT must be interconnected with a short cable.

Figure E-11. Location of 500 MHz LO OUTPUT BNC Connector Added on Rear Panel of the 8444A, Option 059

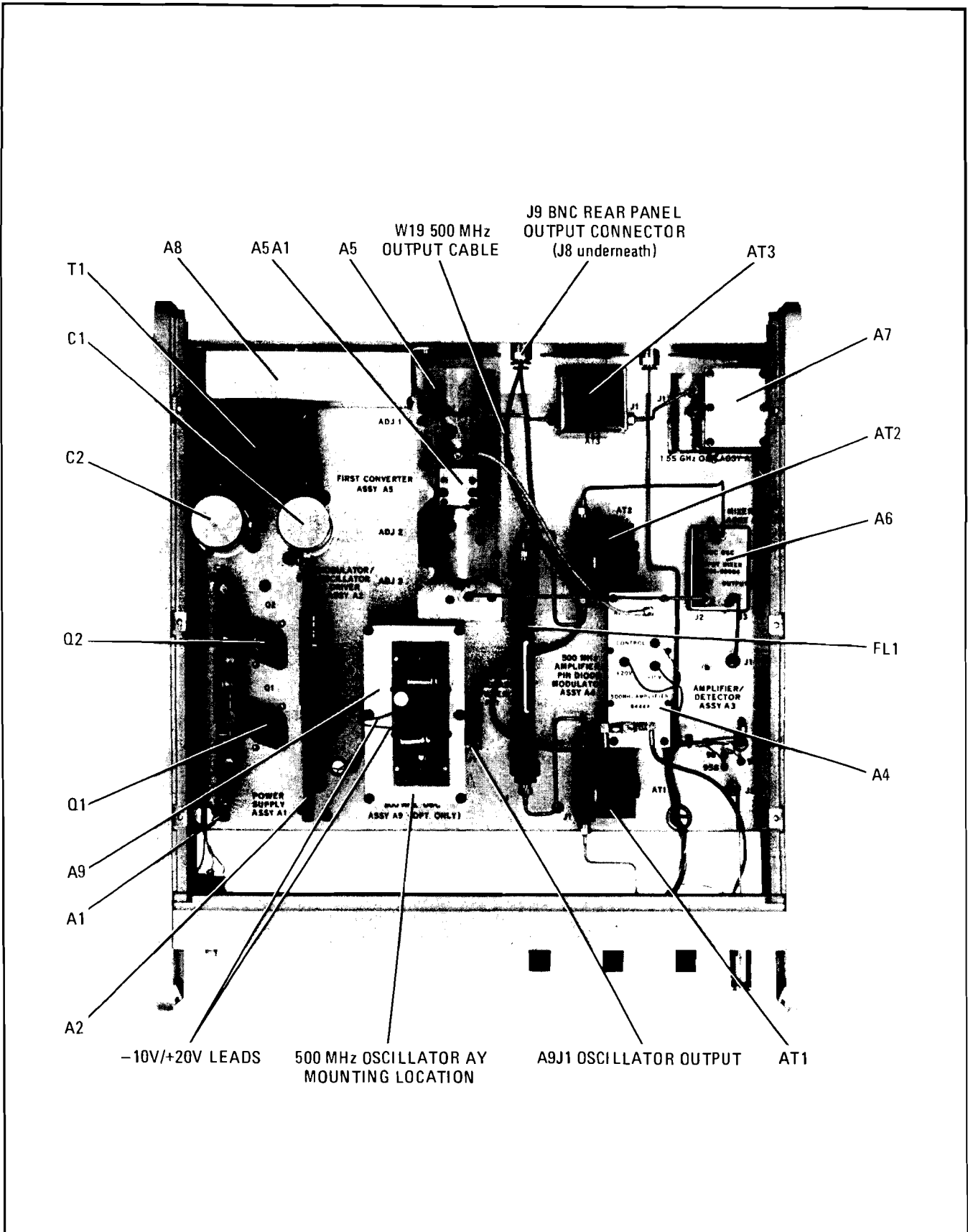


Figure E-10. 500 MHz LO Mounting Location and Output Port for the 8444A Option 059

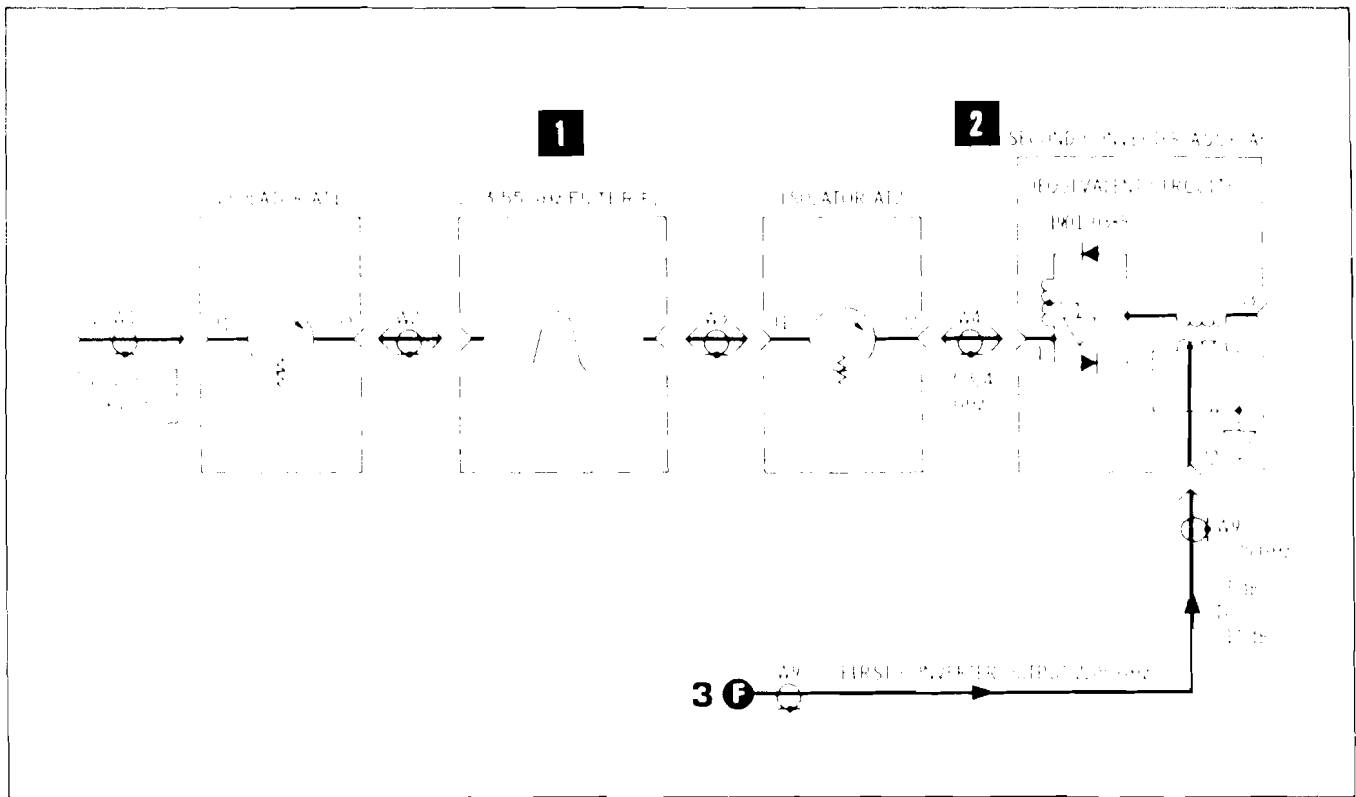


Figure E-8. P/O Second Converter Circuits Showing Replacement Filter for Option 059

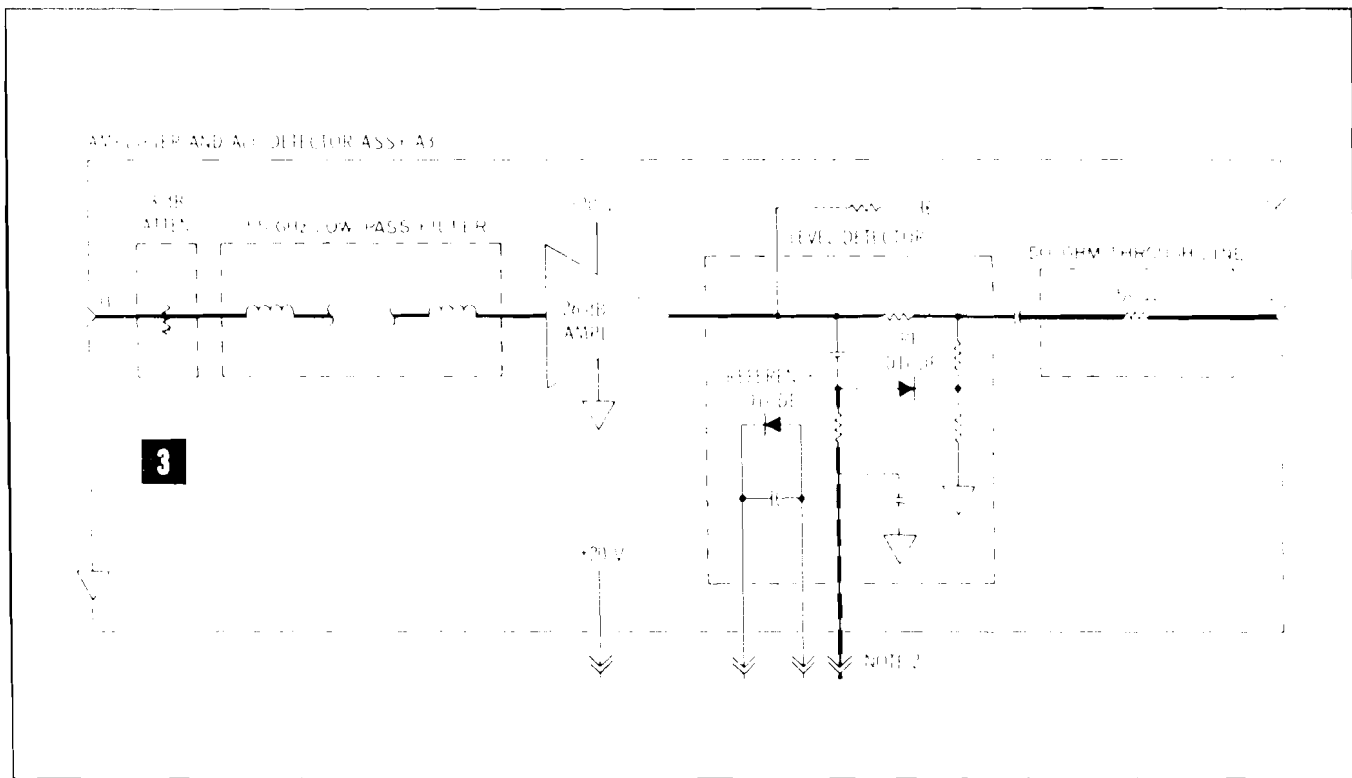


Figure E-9. P/O Second Converter Circuits Showing Replacement Amplifier and ALC Detector for Option 059

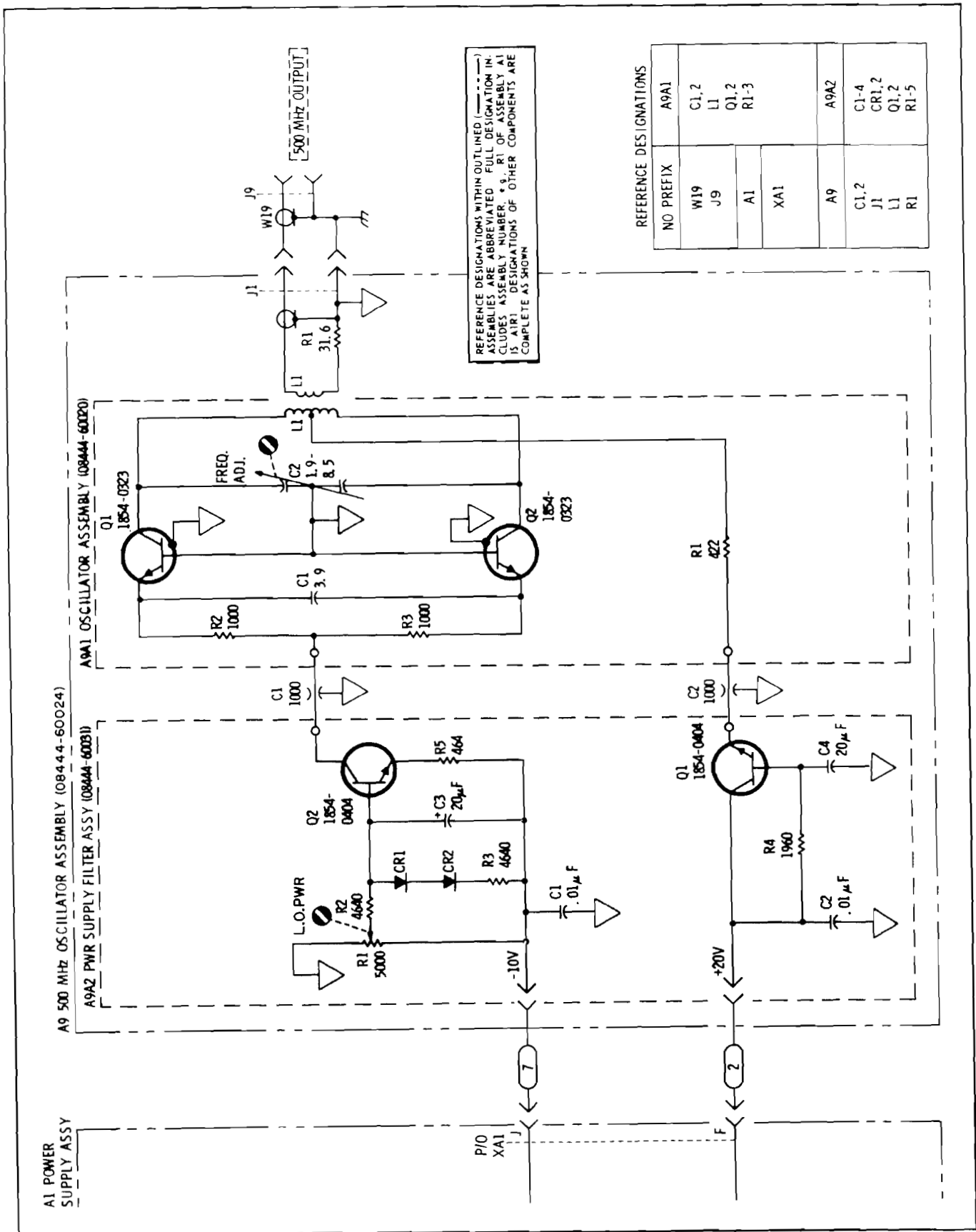


Figure E-7. A9 500 MHz Oscillator Assembly, Schematic

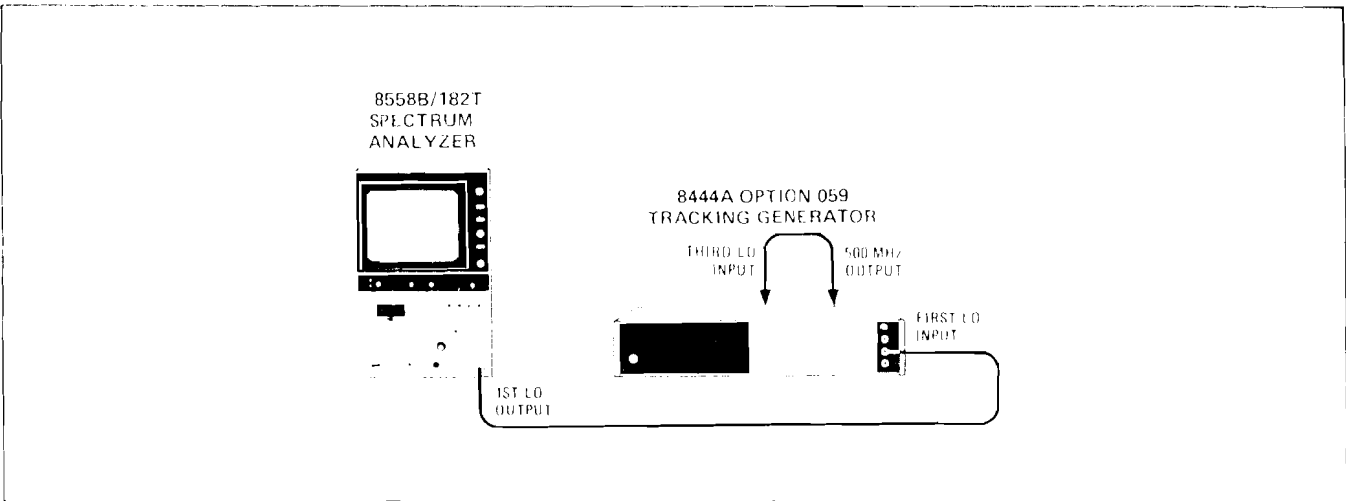


Figure E-4. Equipment Connections for 8444A Option 059/8558B

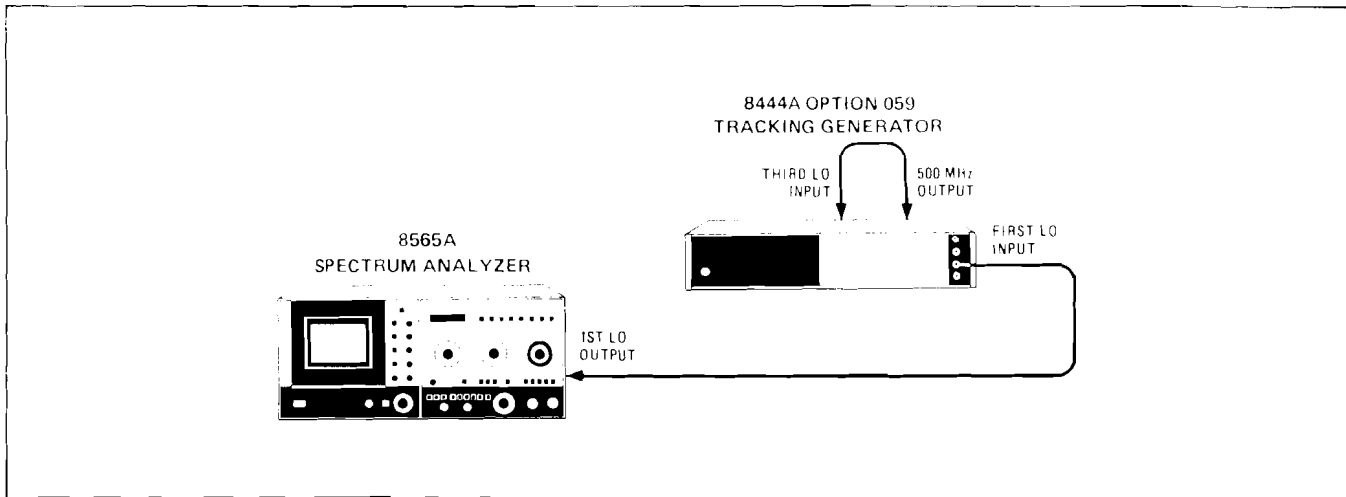


Figure E-5. Equipment Connections for 8444A Option 059/8565A

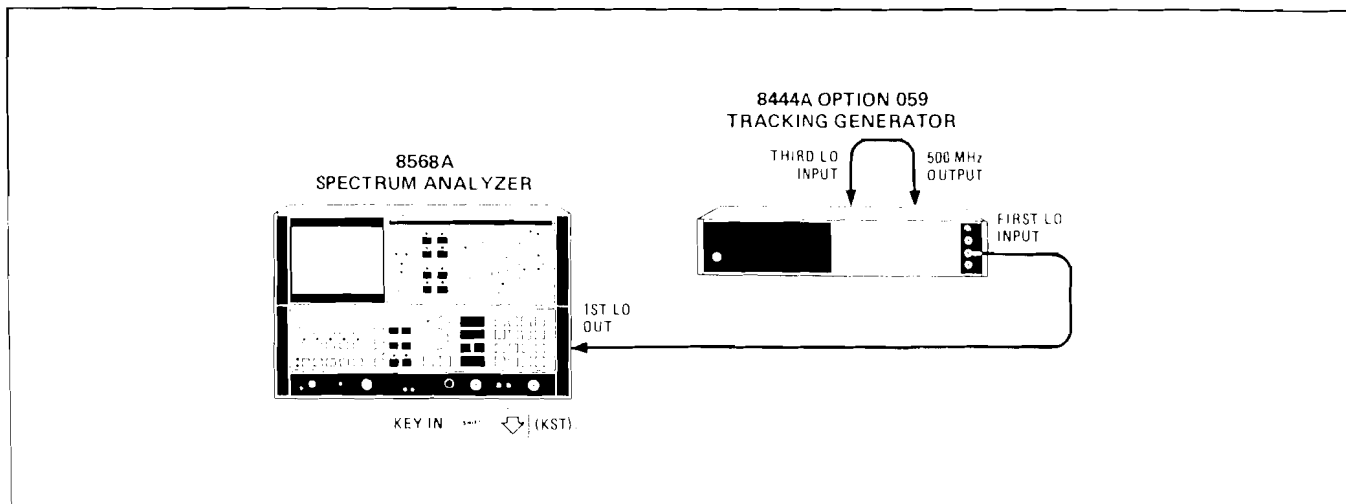


Figure E-6. Equipment Connections for 8444A Option 059/8568A

Table E-3. Replaceable Parts Additions for Option 059

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A9	08444-60024	1	500 MHz OSCILLATOR ASSEMBLY	28480	08444-60024
A9C1	0160-2357	2	C:FXD 1000PF +80 -20% 500WVDC CER	28480	0160-2357
A9C2	0160-2357		C:FXD 1000PF +80 -20% 500WVDC CER	28480	0160-2357
A9J1	1250-0828	1	CONNECTOR: 50 OHM	28480	1250-0828
A9L1	08554-00015	1	COUPLING: LO OUTPUT	28480	08554-00015
A9R1	0698-7200	1	R:FXD 31.6 OHM 2% .05W	24546	C3-1/8-TOO-31R6-G
A9A1	08444-60020	1	OSCILLATOR ASSEMBLY: 500 MHz	28480	08444-60020
A9A1C1	0160-2247	1	C:FXD 3.9PF ±.25PF 500WVDC CER	28480	0160-2247
A9A1C2	0121-0414	1	C:VAR TRMR 1.9 -- 8.5PF; AIR	74970	189-253-5 MODIFIED
A9A1L1	08554-00007	1	INDUCTOR: 500 MHz OSC.	28480	08554-00007
A9A1Q1	1854-0323	2	TRANSISTOR: NPN	28480	1854-0323
A9A1Q2	1854-0323		TRANSISTOR: NPN	28480	1854-0323
A9A1R1	0698-3447	1	R:FXD 422 OHM 1% 1/8W	16299	C4-1/8-TO-422R-F
A9A1R2	0757-0280	2	R:FXD 1K OHM 1% 1/8W	24546	C4-1/8-TO-1001-F
A9A1R3	0757-0280		R:FXD 1K OHM 1% 1/8W	24546	C4-1/8-TO-1001-F
A9A2	08444-60031	1	POWER SUPPLY FILTER ASSEMBLY	28480	08444-60031
A9A2C1	0160-2055	2	C:FXD .01 UF +80 -20% 100WVDC CER	28480	0160-2055
A9A2C2	0160-2055		C:FXD .01UF +80 -20% 100WVDC CER	28480	0160-2055
A9A2C3	0180-0049	2	C:FXD 20UF +75 -10% 50WVDC AL	56289	300206G050CC2
A9A2C4	0180-0049		C:FXD 20UF +75 -10% 50WVDC AL	56289	300206G050CC2
A9A2CR1	1901-0040	2	DIODE: SWITCHING 2NS 30V 50MA	28480	1901-0040
A9A2CR2	1901-0040		DIODE: SWITCHING 2NS 30V 50MA	28480	1901-0040
A9A2Q1	1854-0404	2	TRANSISTOR: NPN	28480	1854-0404
A9A2Q2	1854-0404		TRANSISTOR: NPN	28480	1854-0404
A9A2R1	2100-1775	1	R:VAR 5K OHM 5% WW	28480	2100-1775
A9A2R2	0698-3155	2	R:FXD 4.64K OHM 1% 1/8W	16299	C4-1/8-TO-4641-F
A9A2R3	0698-3155		R:FXD 4.64K OHM 1% 1/8%	16299	C4-1/8-TO-4641-F
A9A2R4	0698-0083	1	R:FXD 1.96K OHM 1% 1/8W	16299	C4-1/8-TO-1961-F
A9A2R5	0698-0082	1	R:FXD 464 OHM 1% 1/8W	16299	C4-1/8-TO-4640-F
W19	08444-60025	1	CABLE: COAX; 500 MHz OUTPUT	28480	08444-60025

Table E-4. Replaceable Parts Changes for Option 059

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A3	5086-7330	1	AMPLIFIER AND ALC DETECTOR	28480	5086-7330
FL1	08444-60037	1	FILTER: BANDPASS (2-3.55 GHz)	28480	08444-60037
MP13	08444-00033	1	PANEL: FRONT (OLIVE BLACK/ MINT GRAY	28480	08444-00033
W16	08444-60039	1	CABLE ASSY: RF INTERCONNECT	28480	08444-60039

Table E-2. System Performance Characteristics



PERFORMANCE CHARACTERISTICS			
The following characteristics outline the typical performance of the tracking generator/spectrum analyzer system using the HP Model 8444A Option 059 Tracking Generator with various HP spectrum analyzers. These are not specifications. They are intended only as additional information regarding instrument performance.			
Description	8444A-059 with 8558B	8444A-059 with 8565A	8444A-059 with 8568A
SWEPT FREQUENCY RESPONSE MEASUREMENTS			
Dynamic Range	>90 dB	>90 dB	>90 dB
Average Noise ¹	<-107 dBm	<-100 dBm	<-105 dBm
Calibration Range			
Spectrum Analyzer:			
Log	-117 dBm to +30 dBm	-102 dBm to +30 dBm	-99.9 dBm to +30 dBm
Frequency Range	500 kHz to 1500 MHz	10 MHz to 1500 MHz	500 kHz to 1500 MHz
Scan Width			
Full Span	Not Available	1500 MHz	1500 MHz
Per Division	5 kHz to 100 MHz	1 kHz to 100 MHz	1 kHz to 150 MHz
Residual FM ²	1 kHz	300 Hz	300 Hz
Frequency Response:			
(system flatness, 0.5--1500 MHz)	±1.75 dB (3.5 dB)	±2.0 dB (4.0 dB)	±1.75 dB (3.5 dB)
SWEEP/CW GENERATOR			
Frequency Range	500 kHz to 1500 MHz	10 MHz to 1500 MHz	500 kHz to 1500 MHz
Frequency Accuracy ³	Same as 8558B	Same as 8565A	Same as 8568A
Output Flatness	±0.75 dB	±0.75 dB	±0.75 dB
Spectral Purity			
Residual FM ²	1 kHz	300 Hz	300 Hz
Harmonic Distortion	-25 dBc	-25 dBc	-25 dBc
Spurious Signals	-35 dBc	-35 dBc	-35 dBc
Long Term Stability			
Drift	30 kHz/10 min.	13 kHz/10 min.	10 kHz/10 min. ⁴
Sweep Width	50 kHz to 1000 MHz	10 kHz to 1500 MHz	100 Hz to 1500 MHz
Sweep Rate (Per Div.)	5 ms to 10 sec ⁵	2 ms to 10 sec ⁶	2 ms to 150 sec ⁶
¹ With 10 kHz resolution bandwidth selected. ² Residual FM of tracking generator is typically <300 Hz. ³ Frequency accuracy, when using the 8558B or 8565A spectrum analyzer, may be improved by use of an external frequency counter connected to rear-panel AUX RF OUTPUT. 8568A contains an internal counter, so should be used alone for best accuracy. ⁴ Plus analyzer drift during one sweep. ⁵ Although faster sweep rates are available, for best tracking, the 8558B should not be swept faster than 5 ms. ⁶ Do not use coupled sweep times in Full Span. For best operation with 8568A, use   (KST) to lock 2nd LO frequency for spans ≤1 MHz.			

Table E-1. Specifications

SPECIFICATIONS

The following specifications are for the HP 8444A Tracking Generator **ONLY** and should not be confused with system specifications listed in Table 1-1. Typical system performance characteristics are located in Table E-2.

SWEPT FREQUENCY RESPONSE MEASUREMENTS

Absolute Amplitude Calibration Range:

Frequency Range: 500 kHz to 1500 MHz

Stability:

Residual FM: Depends on analyzer being used. Refer to Table E-2.

Amplitude Accuracy:

Frequency Response (flatness)¹ :

0.5 to 1300 MHz, ±0.5 dB

0.5 to 1500 MHz, ±0.75 dB

Tracking Generator Calibration: 0 dBm ±0.5 dB at 30 MHz

SWEEP/CW GENERATOR

Frequency Range: 500 kHz to 1500 MHz

Frequency Accuracy: Same as analyzer being used.²

Output Flatness: 0.5 to 1300 MHz, ±0.5 dB; 0.5 to 1500 MHz, ±0.75 dB

Drive Level to Test Device: 0 to -10 dBm continuously variable.

Spectral Purity:

Residual FM: Depends on analyzer being used. Refer to Table E-2.

Spurious Signals: ≥ 35 dB below output level.

¹ This is output flatness of tracking generator only. System frequency response is determined by combining this figure with frequency response figure for spectrum analyzer used. Refer to Table E-2 for typical values using various analyzers.

² Frequency accuracy, when using the 8558B or 8565A spectrum analyzers, may be improved by use of an external frequency counter connected to rear-panel AUX RF OUTPUT connector. 8568A Spectrum Analyzer contains an internal frequency counter, so should be used alone for best accuracy.

5. Use FREQUENCY FINE TUNE control to center signal on CRT and adjust LINEAR SENSITIVITY control to place peak of signal at LOG REF LEVEL (top graticule line).
6. Set spectrum analyzer SCAN WIDTH to ZERO.
7. Use FREQUENCY FINE TUNE to place signal between 2 and 5 divisions down from top of display.
8. Peak-to-peak deviation of signal trace should be ≤ 0.6 divisions.
9. This corresponds to ≤ 120 Hz residual FM. This is calculated by multiplying the peak-to-peak deviation times 200 Hz/division modulation sensitivity. Modulation sensitivity can be measured by performing steps 13 and 14 of Paragraph 5-10 in Section V.

E-22. REPLACEABLE PARTS

E-23. Replaceable parts for the standard 8444A Tracking Generator are listed in Section VI. Table E-3 lists the additional parts contained in the 8444A Option 059. Table E-4 lists those parts used in the 8444A Option 059 which replace parts used in the standard 8444A.

E-24. SERVICE

E-25. Description of Option 059. When the Option 059 modification is installed in the 8444A Tracking Generator, a 500 MHz fixed-tuned local oscillator (A9 assembly) is added. This oscillator provides the 500 MHz Third L.O. signal not available from various spectrum analyzers. In addition, the Amplifier and ALC Detector (A3 assembly) and the Band – Pass Filter (FL1) are replaced to extend the upper frequency limit to 1500 MHz.

E-26. Figures E-7 through E-9 are schematic diagrams which illustrate the additions and changes to the 8444A when Option 059 is installed. Figures E-10 and E-11 are photographs of the 8444A Option 059 showing the addition of the 500 MHz oscillator (A9 assembly) and rear-panel 500 MHz Output connector.

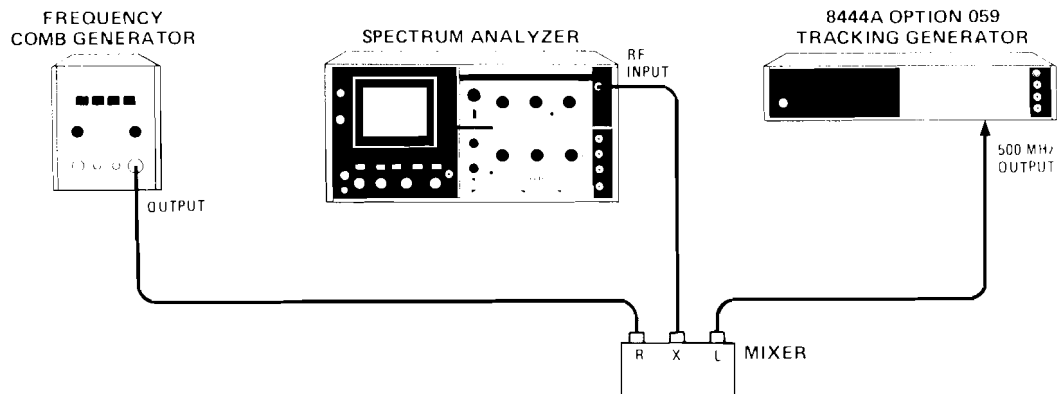


Figure E-3. 500 MHz L.O. Residual FM Check Equipment Setup

EQUIPMENT:

Spectrum Analyzer	HP 8553B/8552B/141T
Comb Generator	HP 8406A
Mixer	Vari-L 400A

PROCEDURE:

1. Connect equipment as shown in Figure E-3.
2. Set instrument controls as follows:

8406A Comb Generator:

OUTPUT	MAX
COMB FREQ	100 MHz

8553B Spectrum Analyzer RF Section:

FREQUENCY	100 MHz
BANDWIDTH	10 kHz
SCAN WIDTH/DIV2 MHz

8552B Spectrum Analyzer IF Section:

SCAN TIME/DIV	10 ms
VIDEO FILTER	OFF
LOG/LINEAR	LINEAR

8444A Option 059 Tracking Generator:

TRACK ADJ	Fully Counterclockwise
-----------------	------------------------

3. Tune the 100 MHz signal to the center of the CRT display.
4. Change spectrum analyzer control settings as follows:

SCAN WIDTH/DIV	2 kHz
BANDWIDTH	1 kHz
TUNING STABILIZER	ON
SCAN TIME/DIV1 sec
VIDEO FILTER	10 kHz

E-19. The procedures in Section V indicate the use of either an HP 8554B or HP 8555A Spectrum Analyzer. An HP 8558B, HP 8565A, or HP 8568A Spectrum Analyzer may be used but some of the control names will be different than stated in the procedures.

E-20. 500 MHz Local Oscillator Adjustment

REFERENCE: Figure E-7

DESCRIPTION:

The internal 500 MHz oscillator is adjusted for proper output level and frequency using a power meter and frequency counter to monitor the rear-panel output.

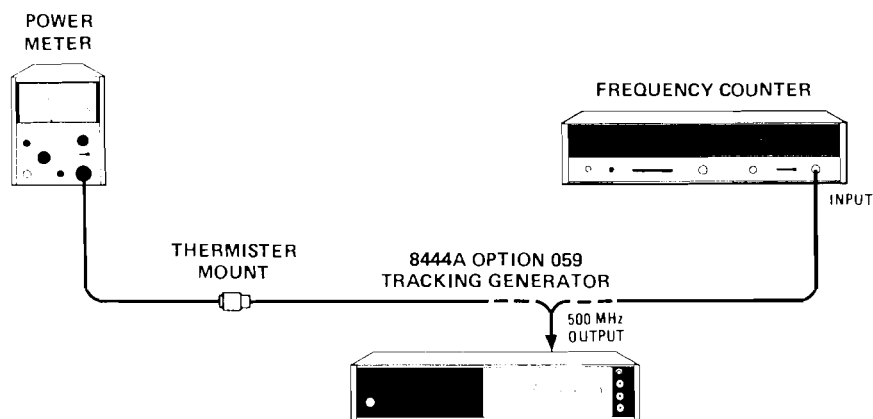


Figure E-2. 500 MHz Local Oscillator Adjustment Setup

EQUIPMENT:

Frequency Counter	HP 5340A
Power Meter/Thermistor Mount	HP 432A/478A

PROCEDURE:

1. Connect equipment as shown in Figure E-2 with power meter connected to rear-panel 500 MHz OUTPUT.
2. Adjust A9 LO PWR adjustment for an output level of $+4 \text{ dBm} \pm 0.5 \text{ dB}$.
3. Disconnect power meter and connect frequency counter to rear-panel 500 MHz OUTPUT.
4. Adjust A9 FREQ ADJ adjustment for an output frequency of $500 \pm 0.2 \text{ MHz}$.
5. Repeat steps 1 through 4 until both output power and frequency are within specifications.

E-21. 500 MHz Local Oscillator Residual FM Check

REFERENCE: Figure E-7

DESCRIPTION:

The residual FM of the oscillator is checked by mixing the 500 MHz output with a 400 MHz comb tooth and displaying the resulting 100 MHz difference frequency on a spectrum analyzer.

2. Set spectrum analyzer controls as follows:

LOG/LINEAR.	LOG
FREQ SPAN/DIV.	0 kHz
RESOLUTION BW	10kHz
START/CENTER	CENTER
SWEEP TIME/DIV	20 ms
FREQUENCY MHz.	30 MHz

3. Adjust the spectrum analyzer TUNING control for a frequency counter indication of 30 MHz.
4. Set tracking generator output LEVEL control to the 0 dBm position.
5. Adjust tracking generator TRACK ADJ for maximum displayed signal level on spectrum analyzer display.
6. Connect power meter/thermistor mount to tracking generator RF OUTPUT. FIRST LO INPUT may be removed to zero power meter, then reconnected.
7. Tracking generator output level, as indicated on power meter, must be 0 dBm \pm 0.5 dB.
8. Set tracking generator output LEVEL control fully counterclockwise.
9. Tracking generator output level, as indicated on power meter, must be between - 10 and - 12 dBm.
10. Adjust tracking generator output LEVEL control for an output of - 1 dBm as indicated on power meter.
11. Adjust spectrum analyzer TUNING control for a frequency counter indication of 500 \pm 1 kHz.
12. Slowly adjust spectrum analyzer TUNING control for frequency from 500 kHz to 1300 MHz while monitoring output level on power meter.
13. Record highest and lowest output level indications.
 Highest_____ Lowest_____
14. The difference between the highest and lowest output levels must be \leq 1.0 dB (\pm 0.5 dB).
15. Slowly adjust spectrum analyzer TUNING control for frequency from 1300 to 1500 MHz while monitoring output level on power meter.
16. Record highest and lowest output level indications.
 Highest_____ Lowest_____
17. Using the recorded values from steps 13 and 16, record the highest and lowest output level indications for frequency from 500 kHz to 1500 MHz.
 Highest_____ Lowest_____
18. The difference between the highest and lowest output levels must be \leq 1.5 dB (\pm 0.75 dB).

E-17. ADJUSTMENTS

E-18. In addition to the adjustment procedures outlined in Section V, the following adjustment, Paragraph E-20, must be performed. This procedure is used to adjust the internal 500 MHz oscillator (A9 assembly) which is added by the Option 059 modification. Also, an FM check of the oscillator is included, Paragraph E-21, to aid in locating the source of excessive residual FM.

E-14. The procedures in Section IV indicate the use of either an HP 8554B or HP 8555A Spectrum Analyzer. An HP 8558B, HP 8565A, or HP 8568A Spectrum Analyzer may be used for complete testing up to 1500 MHz but some of the control names will be different than stated in the procedures.

E-15. The following test indicates the use of an HP 8558B Spectrum Analyzer. An HP 8565A or HP 8568A Spectrum Analyzer may be used but some of the control names will be different than stated in the procedure.

E-16. Output Level and Flatness Test

SPECIFICATION:

Amplitude Accuracy:

Frequency Response(flatness): 0.5 to 1300 MHz; ± 0.5 dB(1 dB)
 0.5 to 1500 MHz; ± 0.75 dB(1.5 dB)

Tracking Generator Calibration: 0 dBm ± 0.5 dB at 30 MHz

Drive Level to Test Device: 0 to -10 dBm continuously variable

DESCRIPTION:

The Tracking Generator output is checked for proper calibration level (0 dBm ± 0.5 dB) at 30 MHz and proper range (0 to -10 dBm). Next, output flatness is checked from 0.5 to 1300 MHz and 0.5 to 1500 MHz.

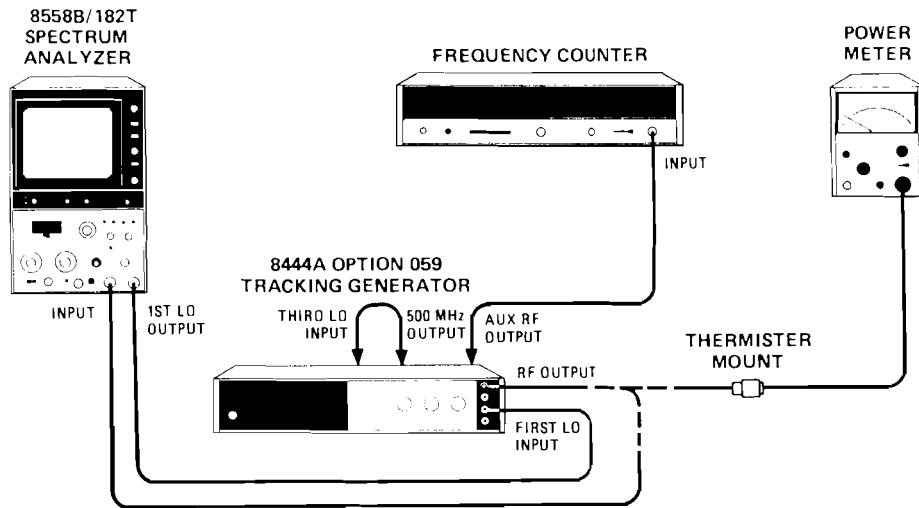


Figure E-1. Output Level and Flatness Test Setup

EQUIPMENT:

Spectrum Analyzer	HP 8558B/182T
Frequency Counter	HP 5340A
Power Meter/Thermistor Mount	HP 432A/478A

PROCEDURE:

1. Connect equipment as shown in Figure E-1 with frequency counter connected to tracking generator rear-panel AUX RF OUTPUT and tracking generator front-panel RF OUTPUT connected to spectrum analyzer RF INPUT.

APPENDIX E

MODEL 8444A TRACKING GENERATOR, OPTION 059

E-1. INTRODUCTION

E-2. This appendix describes the Model 8444A Option 059 Tracking Generator as compared to the standard 8444A Tracking Generator. The use of this tracking generator with various Hewlett-Packard spectrum analyzers is also explained.

E-3. DESCRIPTION

E-4. The standard 8444A Tracking Generator is intended to provide either a 0.5 to 1250 MHz tracking signal for the 8554B/8552/140 Spectrum Analyzer or a 10 to 1300 MHz tracking signal for the 8555A/8552/140 Spectrum Analyzer. To provide this tracking signal, a First L.O. signal of approximately 2 to 4 GHz and a Third L.O. signal of 500 MHz are required. Both of these signals are available from the 8554B and 8555A Spectrum Analyzer RF Sections.

E-5. To use the 8444A Tracking Generator with the 8558B installed in a 180 series mainframe, 8565A, or 8568A Spectrum Analyzer, the Option 059 modification must be installed in the tracking generator. This modification adds an internal 500 MHz oscillator to provide the Third L.O. signal which the above mentioned analyzers do not provide. Also, this modification extends the upper frequency limit to 1500 MHz to allow coverage of the full frequency range of these analyzers.

E-6. SPECIFICATIONS

E-7. Table E-1 lists the specifications for the 8444A Option 059 Tracking Generator only. Typical system performance characteristics for the tracking generator when used with the 8558B, 8565A, or 8568A Spectrum Analyzer are located in Table E-2. Specifications for the 8444A Option 059 when used with either the 8554B or 8555A are the same as listed in Table 1-1 for the standard 8444A Tracking Generator up to a frequency of 1300 MHz.

E-8. OPERATION

E-9. Figures E-4 through E-6 illustrate the proper equipment connections for operation of the 8444A Option 059 Tracking Generator with the 8558B, 8565A, or 8568A Spectrum Analyzer.

E-10. The 8444A Option 059 may also be used with the 8554B or 8555A Spectrum Analyzer. However, for proper operation, the Third L.O. output from the spectrum analyzer should be used rather than the output of the tracking generator's internal oscillator. Equipment connections for operation with the 8554B or 8555A is illustrated in Section III.

E-11. PERFORMANCE TESTS

E-12. To test the 8444A Option 059 Tracking Generator for compliance with specifications, perform the Harmonic and Distortion Test outlined in Section IV using the specification from Table E-1. In addition to this test in Section IV, perform the following test, Paragraph E-16, Output Level and Flatness Test.

E-13. Other performance tests outlined in Section IV (except Output Level and Flatness) may be used to test system performance for the purpose of comparison with typical system performance characteristics outlined in Table E-2. Such testing should provide a high level of confidence for measurement results obtained using the tracking generator/spectrum analyzer system.